Coastal

Invasive Plant Management Strategy

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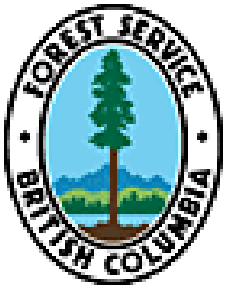

EXECUTIVE SUMMARY

Invasive plants have been a problem in Coastal British Columbia (BC) since earliest European settlement but little has been done to control these species until recently. The Coastal Invasive Plant Committee (CIPC) was formed in 2005 to service Vancouver Island and surrounding coastal communities. The committee consists of public and private sector groups, First Nations, industry, utilities, and conservation groups that share a common interest in promoting coordination and cooperation to manage invasive plants in the region. The CIPC area covers approximately 60,000 km^2 including Vancouver Island, mainland coast and Gulf Islands; and consists of eight regional districts, 34 municipalities, 15 Gulf Islands, and 57 First Nations.

The purpose of this strategic plan is to provide a framework for the long-term prevention, containment and control of invasive plants in the Coastal Invasive Plant Committee area. Based on the following guiding principles, the plan will:

- Emphasize awareness, education and training;
- Focus on "high value sites" such as parks, protected areas, and ecological reserves;
- Be directed towards invasive plant species of high ecological and economic value or of human health concern;
- Primarily concentrate on invasive species that occur in limited distribution and at low density where prevention, eradication or control can be reasonably expected;
- Maintain inventory and integrated pest management of priority invasive species; and
- Develop sub-regional programs based on regional district boundaries and local initiatives.

The plan is organized into three sections. The first section describes the goals, objectives and actions necessary to execute the plan. The second section consists of a work plan to address the activities summarized in the first section. Section three is a compendium of invasive plant profiles for the priority species covered under this plan.

GOAL 1. To Provide Structure and Capacity for Long-term Invasive Plant Management

1. Statutory Authority and Responsibility. Legislation, policies and mandates provide authority and direction for invasive plant management on Crown and private land in British Columbia. Although the CIPC has no legislated authority and does not conduct enforcement it can play an important role in improving compliance through education and awareness, and can participate in formulating and reviewing legislation. ***Actions:*** *The plan recommends the committee supports and participates in reviews of provincial legislation, regulations and policy that relate to the CIPC area and ensures that CIPC priority species are adequately represented when legislation is revised. It also suggests that the CIPC encourages and assists local governments to enact invasive plant bylaws.*

2. Leadership, Planning and Organization - A successful invasive plant program requires effective leadership and organization to implement and coordinate programs, and to develop partnerships. The CIPC acts as a liaison between local participants and the Invasive Plant Council of British Columbia to ensure that CIPC programs are coordinated internally and with

other regional programs, government agencies, and provincial priorities. ***Actions:*** *The plan recommends the committee advocate endorsement of the strategy by governments, First Nations, industry, and the general public. The committee should also continue to promote and develop a coordinated approach to invasive plant management in the CIPC area and the development of invasive plant management areas based on regional district boundaries.*

3. Funding and Administration - Fundraising and administration are fundamental processes required to establish and maintain an effective invasive plant management program. The CIPC has devoted considerable effort to fundraising and providing an administrative framework to meet program needs. ***Actions:*** *The plan recommends the CIPC continues efforts to acquire consistent and stable funding for all aspects of the program, and participates in coordinating funding opportunities with regional groups when required.*

4. Communication, Coordination and Partnerships - Cooperation and coordination among government agencies, industry, and private landowners is essential for effective invasive plant management because it allows treatment across jurisdictional boundaries in an ecologically effective manner. One of the primary purposes of the CIPC is to promote coordination and cooperation amongst stakeholders through education and training aimed at creating public and government awareness of weed issues, and in the organization and delivery invasive plant inventories and treatments within the CIPC area. ***Actions:*** *This strategy recommends the program continues to host annual meeting, maintain the CIPC website, and deliver newsletters to the membership. It also recommends the committee continues to establish partnerships with local governments, non-government agencies, First Nations, industry, and private land owners.*

5. Program Evaluation - Annual evaluations are important to determine program success. The strategic plan should be considered a dynamic document that requires regular review and amendments to improve its efficacy over the long-term. ***Actions:*** *The plan should be reviewed annually to monitor success, and to ensure that all components of the plan are meeting current and future needs.*

GOAL 2. To Prevent the Introduction, Establishment and Spread of Invasive Plants

1. Awareness and Education - Awareness and education help convey invasive plant issues to public and political attention and act as a catalyst for action. Well-trained land managers and an informed public are important assets for locating and reporting new infestations, which promotes prevention and control of invasive plants. The CIPC has focused on awareness, education and outreach as primary functions since its inception. ***Actions:*** *The plan recommends a continuation of producing brochures featuring CIPC priority species, writing local media articles, and delivering presentations on invasive plant management to professional associations, local governments, community organizations, industry, schools, service groups, and the general public. It also supports continuing workshops and training programs on invasive plant identification, management planning, the Invasive Alien Plant Program (IAPP) and inventory methods, and management options and techniques for controlling invasive plants.*

2. Invasive Plant Categories and Priorities - Classification of invasive plants is essential for developing effective weed management programs. Over 100 invasive plant species were

screened for inclusion on the CIPC priority species list and 46 species were classified into four categories based on the relative ability to prevent, eradicate, contain or control each species. ***Actions:*** *The plan recommends that the priority species list is reviewed and updated annually or as required. It also suggests that priority species lists should be prepared for invasive plant management areas with local input.*

3. Prevention, Early Detection and Rapid Response - Weed control is most successful, cost-effective, and the least environmentally damaging when invasive plants are found before they establish high-density, persistent populations. Early detection and rapid response can be accomplished effectively only when an agency (or agencies) has authority to act, and the financial, human, and physical resources available for immediate deployment. *Actions: The plan advocates a continuation of information sharing and involvement with adjoining jurisdictions to keep apprised on new species potentially entering the CIPC area. It also recommends negotiating appointment of an agency (or agencies) that has the authority to act; and the financial, human, and physical resources available to take immediate action.*

GOAL 3. To Manage Existing Invasive Plant Populations and Reduce Their Impacts

1. Inventory and Mapping - Inventory provides the basic information necessary for developing prevention practices, prioritizing and planning treatments, and designing monitoring strategies. ***Actions:*** *The plan recognizes the need for a baseline inventory that begins by compiling existing inventory information from the CIPC area and entering compatible data into the IAPP database. The plan recommends that this information should be mapped to identify geographical and species specific inventory gaps and to plan future inventories; and that that CIPC should continue to host training workshops to promote standardized inventory methods across all jurisdictions including private land.*

2. Integrated Invasive Pest Management - The CIPC advocates an Integrated Pest Management (IPM) approach to control invasive plants. Currently, several pest management plans cover parts of the CIPC area, which provide a foundation for invasive plant treatments in the region. ***Actions:*** *This strategy recognizes the need for coordination of priorities and techniques for invasive plant management but suggests that each agency is responsible for integrated pest management within their jurisdiction. Cultural and mechanical control treatments often generate significant biomass refuse. Guidelines and procedures for disposal are a high priority in the region.*

3. Monitoring and Evaluation - Monitoring is necessary to collect the physical and biological data required to evaluate on-the-ground management progress and performance. Monitoring can be used to assess the current situation or to evaluate changes over time. ***Actions:*** *The strategy suggests developing a monitoring plan for the CIPC operating area linked to priority species list and IAPP training needs. It also suggests updating invasive plant distribution and density maps as an ongoing program activity.*

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INTRODUCTION

Invasive plants have been a problem in Coastal British Columbia (BC) since earliest European settlement. Originally of agricultural concern, numerous species are now regarded as threats to natural environments by altering the structure and function of native ecosystems. Prevention and control is often complex, and can involve many land jurisdictions and wide range of legislation, government policies, and guidelines.

There has been growing recognition over the last two decades that effective invasive plant management can be accomplished only though coordinated programs that involve all jurisdictions where these species grow. In 2004, the Invasive Plant Council (IPC) of BC prepared a provincial strategy aimed to *build cooperation and coordination to …minimize the social and economic impacts caused by …invasive alien plants* (FBC 2004), which was endorsed by a wide range of agencies, organizations and concerned individuals. In addition, a regional approach to invasive plant management was considered essential for a successful provincial-wide program.

In March 2005, the BC Ministry of Agriculture and Lands sponsored a meeting held in Nanaimo to explore interest in forming a regional invasive plant committee to service Vancouver Island and surrounding coastal communities. Public and private sector groups, including all levels of government, First Nations, industry, utilities, and conservation groups, agreed that a regional committee was required to promote coordination and cooperation to manage invasive plants in the region. As a result, an interim board of directors was established and a program coordinator was hired in August 2005 to form the committee as a non-profit society, develop a membership, promote partnerships, and solicit funding. Non-profit society status was obtained in December 2005 and the First Annual Coastal Invasive Plant Committee (CIPC) Forum was held in Nanaimo in February 2006 (Brown 2006).

The CIPC has taken the lead role for coordinating an invasive plant program in an area covering eight Regional Districts on Vancouver Island (the Island) and the adjacent mainland (hereafter called the CIPC area). The primary purposes of the committee are to:

- Raise awareness and educate the public, government agencies and other land managers about invasive plants and their impacts;
- Minimize the introduction and spread of invasive plants through education and awareness, early detection and control, and coordinated integrated invasive plant management;
- Promote coordinated and collaborative management of invasive plants among agencies and land occupiers;
- Work towards the control/containment of highly invasive non-native plant species;
- Provide expertise and a conduit for information on invasive plants; and
- Develop and maintain a comprehensive inventory of invasive plant species within the area of responsibility.

Invasive Plants

Invasive plants have been defined in many ways but generally they are regarded as plants that are capable of adversely affecting agricultural and other economic pursuits, or detrimental to ecosystems, plants, animals, and human health. Most commonly, they are species that are not part of the native flora of a region and are often referred to as *alien*,[1] *exotic*, *non-indigenous*, or *introduced.*

Although some alien species become serious pests that are harmful to the environment or economy, most are beneficial or benign and assimilate with the native vegetation when they escape cultivation. For example, up to 600 species of alien plants are reported in Coastal British Columbia (MFR 2009) but only 46 species are considered in this plan. The terms *invasive plant* and *weed* will be used interchangeably in this document. *Noxious weed* will refer to those species designated noxious under the *Weed Control Act of BC*.

Potential Threats

Successful plant invasion results from a complex mix of plant biology, physical and ecological conditions, and climate. Wind, water, vehicles, boats, pets, domestic animals and wildlife, and humans all contribute to the introduction and spread of invasive plants. Disturbance often plays a significant role in their spread making roads, railroad right-of-ways, trails, utility corridors, and other travel routes primary dispersal corridors.

Alien plant species are usually introduced without the natural predators and other organisms that limit native populations. Although many species can establish over a wide range of environmental conditions, they usually succeed best in climates similar to their native habitats (Radosevich 2005). Numerous adaptations and characteristics enable invasive plants to invade and persist in new environments including:

- Continuous seed production;
- High seed production and long viability;
- Ability to self-fertilize and cross-pollinate easily;
- Ability to germinate in many environments and grow rapidly;
- Adaption for short- and long-distance dispersal;
- Reproduction both sexually and vegetatively; and
- Vigorous vegetative reproduction from fragments.

Some possible effects of invasive plants include:

- Displacement of native plants and animals and loss of biological diversity;
- Indefinite domination of disturbed habitats, which impedes ecological succession of native plant communities;

[1] See Appendix 1 for a glossary of technical terms.

- Modifications to habitat structure for mammals, reptiles and amphibians, insects, and possibly soil organisms;
- Reductions in forage production for wildlife and domestic livestock;
- Alterations of natural fire regimes;
- Changes to ecological processes such as nitrogen, hydrological, and nutrient cycles; and
- Adversely affecting agricultural production and possibly other commercial enterprises.

Although few comprehensive studies exist that evaluate the economic effects of invasive plants, loses from weeds on BC crop and rangelands have been estimated to cost $50 million annually before factoring in weed control (MAL 1998).

HISTORY AND SCOPE OF PROBLEM

Many non-native plant species have been purposely or unintentionally introduced into British Columbia since European settlement, but serious interest in their control has evolved in the CIPC area only over the last decade. Scotch broom[2] was introduced to Vancouver Island by Captain Walter Grant in 1850. From seeds collected in Hawaii, three plants established at Sooke and 160 years later this species is widespread on Vancouver Island, the Gulf Islands and adjacent mainland (Ziekle 1992).

Weed control in Coastal British Columbia officially began in 1877 when the provincial government enacted the *Thistle Control Act* to control an unspecified variety of thistle species on agricultural lands west of the Cascade Mountains. In 1888, when the legislation was renamed the *Noxious Weeds Act*, Canada thistle, oxeye daisy, burdock, and five other species were specifically named, many of which are still prevalent on Vancouver Island today. By 1915, more than 400 alien species were listed for southern British Columbia (Henry 1915). Of these, 15 (33%) are included as priority species in this strategic plan while many others remain persistent in the CIPC area.

Although noxious weed control was of growing importance to the BC agricultural industry in the late 1940s, considerably less interest was shown on Vancouver Island than in other parts of the province where agricultural activity was much higher. An exception was the poisonous Tansy Ragwort, which was first recorded at Nanaimo in 1950, and eventually became a problem in pastures on southern Vancouver Island and throughout the Fraser Valley. In 1962, Agriculture Canada introduced the first of three insects for biological control that ultimately suppressed this species although redistribution of the agents still continues (MAL undated).

Over the next 40 years, virtually all weed control within the CIPC area was affected by the Ministry of Agriculture and Lands through the *Weed Control Act* and by providing technical

[2] See Appendix 2 for scientific and common names of legislated and other plant species.

support for the management of invasive plants in the province. The Ministry of Transportation and Infrastructure also provided roadside weed control, and additional support was provided through vegetation management programs with BC Hydro, E & N Railway, local municipalities, and private landowners.

Although the Ministry of Forests initiated a weed program in 1982, the program focused on biological control of diffuse and spotted knapweed, and Dalmatian toadflax in the Southern Interior of the province. Interest in the coastal regions began to emerge in the early 2000s when the *Forest and Range Practice Act* included Scotch broom, gorse, and some of the knotweeds as invasive species. In 2001, the Ministry of Forests and Range introduced a landscape level invasive plant management program but a comprehensive program only began when the Coastal Invasive Plant Committee was formed in 2005.

OVERVIEW OF THE PLAN AREA

The CIPC area covers approximately 60,000 km^2 or about 6.5% of the provincial land base and includes Vancouver Island, mainland coast and Gulf Islands (Figure 1). Vancouver Island, which contains about half of the total CIPC area (32,284 km^2), extends 460 km from south to north and 50-80 km from east to west. The remaining area includes the Gulf Islands and mid-coastal region on the mainland.

Marine environments dominate the perimeters of the area with the Strait of Georgia, Johnstone Strait, and Queen Charlotte Strait separating Vancouver Island from the mainland. At its southern end, the Strait of Juan de Fuca separates the area from the Olympic Peninsula in Washington State (VILUPC 2000). The extensive coastlines, covering nearly 30,000 km of coastal British Columbia and over 6000 km on Vancouver Island and the Gulf Islands alone, set this area apart from most other places practicing invasive plant control world-wide.

Home to nearly 750,000 people (BC Stats 2009), the area consists of eight regional districts, 34 municipalities, 15 Gulf Islands, and 57 First Nations (Appendix 3, Appendix 4). Most of the population resides along the east coast of Vancouver Island, with over half concentrated in the urban centres of Victoria, Nanaimo, Courtenay/Comox, and Campbell River. Powell River is the principal urban centre on the mainland.

Physical Geography, Climate and Ecology

The CIPC area is characterized by a diversity of topography, climate, soils, and vegetation. The Vancouver Island Mountain Range bisects the Island from north to south and attains its highest point on Golden Hinde in Strathcona Park at 2,195 m elevation. To the east the topography gradually levels to coastal plains, while the west coast is rugged and sometimes mountainous, and fragmented by many fjords, bays and inlets. Similar fjords dominate the west coast of the mainland with mountains rising abruptly from the sea to elevations reaching 4,000 m on Mount Waddington in the Coast Mountains. The interior of the Island and the west coast of the mainland have many lakes and rivers that flow to the coast and terminate in extensive deltas and estuary complexes.

FIGURE 1. Map of the Coastal Invasive Plant Committee area.

The climate in the region is classified as maritime with warm, dry summers and wet, mild winters, especially in the lee of the Vancouver Island Mountains where the low-elevation climate has been described as dry Mediterranean. Average annual temperatures range from 3°C to 14°C but cooler conditions prevail in the north and at higher elevations. Annual precipitation varies dramatically from less than 750 mm near Victoria to more than 3500 mm on the western side of the Island. Most of the precipitation occurs in fall and winter, generally as rain at low elevations but snow is common on the higher altitudes of both mountain ranges in winter (VILUPC 2000). The temperate climate, which is the warmest in Canada, makes the region suitable for incursion by a host of invasive species that could not survive in harsher Canadian environments.

Most of the CIPC area falls within three biogeoclimatic zones and eleven subzone variants (Green and Klinka 1994; Appendix 5). The Coastal Douglas-fir Zone, which covers less than

5% of the CIPC area, occurs on the Gulf Islands and stretches along the coastal margins of southeastern Vancouver Island and the mainland to Powell River. Although small in extent, it occurs in the most populated part of the CIPC area and contains the highest valued ecosystems in the region for protection against invasive plants. This zone has been modified extensively by human disturbances such as settlement, industry and cultivation.

The Coastal Western Hemlock Zone covers over 80% in the CIPC area from sea level to about 900 m elevation depending on latitude and aspect. At higher elevations, the Mountain Hemlock Zone dominates about 10% of the Island to 1,800 m where it merges with the Coastal Mountain-Heather Zone above tree line (Green and Klinka 1994; VILUPC 2000). Abundant riparian habitat surrounds the shorelines of lakes, rivers, streams, and wetlands in all biogeoclimatic zones, which provides habitat for a wide range of plants and animals including rare and endangered species that may be vulnerable to weed invasion.

Land Use and Management Jurisdictions

Vancouver Island and the adjacent mainland have a diversified economy that is reflected in the land use patterns in the CIPC area. Numerous federal, provincial, and private jurisdictions exist and overlap, which challenges a collaborative and cooperative approach to invasive plant control.

Historically, the forest industry has been the dominant economic activity over the entire CIPC area. Although economic conditions have slowed in this sector over the last decade, the forest industry is projected to remain an important part of the regional economy (VILUPC 2000). More recently, added-value and non-timber resources such as recreation, tourism, First Nations traditional uses, and environmental and biodiversity values, have gained economic prominence in the area.

The CIPC area contains over 1,300 known mineral occurrences on Vancouver Island alone (VILUPC 2000). In the past, the mining industry contributed to establishing many coastal communities extracting coal, gold, silver, copper and molybdenum, among others. Currently few mines remain active in the CIPC area, although exploration continues and prospects for accessing coal deposits southern Vancouver Island are being considered. Limestone quarries are still in production on Texada Island.

Approximately 96,500 ha of land (1.6% of CIPC area) are under agricultural production or considered to have a high potential for agriculture in the CIPC area (VILUPC 2000). Livestock and dairy are the largest agricultural operations on Vancouver Island, while vegetable, fruit and other plant products contributes to the remaining farmland under production. Most agricultural in the region takes places place on small holdings on the Saanich Peninsula, Duncan, Courtenay, and Comox. Other agricultural land is scattered throughout the CIPC area from Nanaimo to Fanny Bay, north to Campbell River, and on some of the Gulf Islands. Transportation and relocation of farm products can contribute to the spread of invasive plants but the industry actively participates in weed control.

Recreation and tourism brings visitors to the CIPC area from all parts of North America and abroad by land, sea and air. Victoria alone attracts more than 3.5 million visitors a year who

come to enjoy the scenery and a host of outdoor activities such as golf, skiing, kayaking, hiking, surfing, sports fishing, and whale watching among other things (RKA Inc. 2009). Such large a number of visitors, from a wide range of origins, provides opportunity for the introduction and spread of new species into the area.

First Nations middens dating back to the earliest habitation along coastal British Columbia (Streeter and Bond 2007) indicate a long history of harvesting marine resources within the CIPC area that continues today. In modern times, the commercial and recreational fisheries have grown considerably and involve over 90 species of wild and cultured fish, and shellfish. The provincial government is primarily responsible for the management of the shoreline but cooperates with other levels of government to manage resources under federal and local jurisdiction (GeoBC 2010).

Public utility and transportation corridors traverse the region including hydro and gas right-of-ways, highways, and railway lines. In addition to the main highway systems, a large network of secondary roads exists to service the forest and mining industries and utility companies in the region. All these corridors provide primary dispersal routes for invasive plants. Recreational use of utility right-of-ways and other Crown land is also common, which further contributes to weed dispersal.

Over 220 conservancy areas, ecological reserves, provincial parks, and wildlife management areas have been set aside by the provincial government throughout the CIPC area to protect terrestrial and marine environments and provide recreational opportunities for local and non-resident visitors (MFR 2009). High-traffic sites within these areas can be focal points for the introduction of new invaders from inside and outside the CIPC area.

Regional districts manage over 400 regional and community parks that are widely distributed over the CIPC area. Regional parks are divided into three types including multiple purpose parks, waterfront access parks, and regional trails. Each of these parks provides different opportunities for invasive plant establishment and challenges for prevention and control.

Thirty four municipalities are distributed throughout the CIPC area. In addition to residential property, urban lands contain developed and undeveloped parks, trails, green spaces, maintenance grounds, commercial and industrial grounds, and vacant land. Although urban lands cover only a small part of the total land base, they often harbor invasive plants and are centers for weed dispersal.

Lands under federal jurisdiction are rare and represent only about 1% of the total land base in the CIPC area. In addition to Pacific Rim National Park Reserve, which covers over 500 km^2, First Nations land, airports, national defense bases, ports, and federal marine protected areas and are scattered throughout the region. Most of these lands are high-traffic areas, which provide opportunity for the entry and dispersal of invasive plants.

The CIPC area probably contains a higher proportion of private land than most other parts of the province. Over 600,000 ha of private forest land is found on Vancouver Island alone, which accounts for nearly 18% of the land base (VILUPC 2000) or about 10 % of the CIPC

area. Most of the area is held in forest reserve with little disturbance, which minimizes threat from invasive plants.

Invasive Plant Management Areas

The CIPC area is physically large, topographically complex, ecologically diverse, and politically and economically varied. Consequently, invasive plant problems, priorities and solutions vary considerably from one part of the region to another. In order to address these problems, the CIPC proposes to divide the operating area into geographically based sub-units or Invasive Plant Management Areas (IPMAs) to:

- Create smaller, manageable areas where priorities for invasive plant management can be established that will meet local needs;
- Foster input among agency and private land managers who can contribute important local knowledge to the planning process;
- Facilitate better cooperation and coordination among all land managers and jurisdictions to address mutual invasive plant problems;
- Remove or reduce logistical impediments that constrain operating over jurisdictional boundaries established by government agencies, private companies, or private land owners; and
- Maintain a close working relationship between CIPC and local residents, government agencies and private land managers to improve effective and efficient invasive plant management in both the IPMA and the overall CIPC area.

Eight IPMAs are proposed that coincide with the regional district boundaries that are wholly or partly located on Vancouver Island (Figure 1; Appendix 3).

STRATEGIC PLAN

The purpose of this strategic plan is to provide a framework for the long-term prevention, containment and control of invasive plants in the Coastal Invasive Plant Committee area. Based on the following guiding principles, the plan will:

- Emphasize awareness, education and training;
- Focus on "high value sites" such as parks, protected areas, and ecological reserves;
- Be directed towards invasive plant species of high ecological and economic value or of human health concern;
- Primarily concentrate on invasive species that are known to occur in limited distribution and at low density where prevention, eradication or control can be reasonably expected (Figure 2);
- Maintain ongoing inventory and integrated pest management of priority invasive species; and
- Develop a sub-regional program based on regional district boundaries and local initiatives.

The plan is organized into three sections. The first section identifies goals, objectives and actions necessary to implement the plan and focuses on following three goals described in the CIPC constitution:

1) To provide a framework and capacity for long-term invasive plant management;
2) To prevent the introduction, establishment and spread of invasive plants; and
3) To manage existing invasive plant populations and reduce their impacts on biodiversity and natural resource values.

Issue areas are presented for each of the three broad goals described above. Each issue area is followed by text containing a generic description of the importance and elements of that issue as they pertain to the strategy, a short overview of the current status of the CIPC with the issue area, and a list of specific actions as guidelines for implementation. The actions listed are a summary of achievements or proposals documented in CIPC summary reports, forums and other documents between 2005 and 2009. Additional information was collected at public open house meetings in each of the eight regional districts in the CIPC area.

The second section provides a work plan to address the activities identified in the first section. Section three is a compendium of invasive plant profiles for the priority species covered under this plan and listed in Appendix 7.

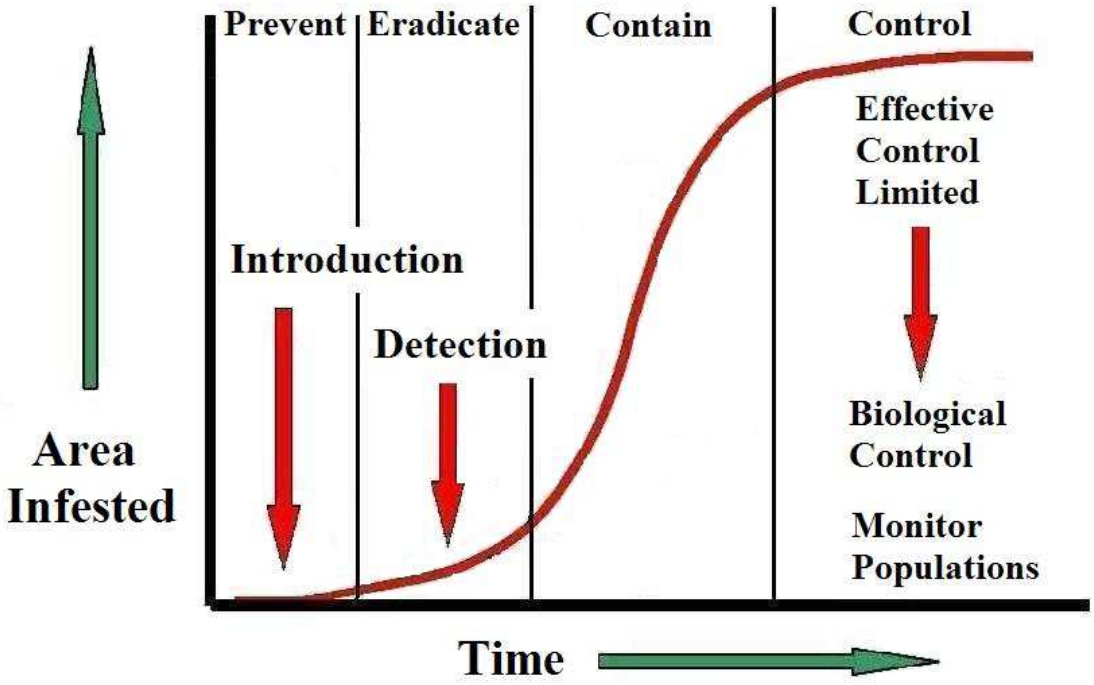

FIGURE 2. Invasive plant population growth and management curve.

1 GOAL To Provide Structure and Capacity for Long-term Invasive Plant Management

1.1 Statutory Authority and Responsibility

Legislation, policies and mandates provide authority and direction for invasive plant management on Crown and private land in British Columbia. The CIPC has no legislated authority and does not conduct enforcement (Wesley 2008). If local governments begin enforcing invasive plant control, however, the CIPC can play an important role in improving compliance through education and awareness. The following information is presented for land managers who have legal responsibilities under various provincial and federal Acts.

The *Weed Control Act, Forest and Range Practices Act, Community Charter Act,* and *Integrated Pest Management Act* are the principal legislation governing invasive plant management in the province. Numerous other acts, regulations, policies, and guidelines provide further authority and direction under specific circumstances (Appendix 6). Although higher level plans also can influence the direction and context of invasive plant control, the Vancouver Island Land Use Summary Plan does not contain provisions regarding invasive plant management (VILUPC 2000).

Issues and Actions:

- Support and participate in reviews of provincial legislation, regulations and policy that relate to invasive plant management in municipalities, regional district IPMAs and the CIPC area.
- Ensure that CIPC priority species are adequately addressed when legislation is revised.
- Encourage and assist local governments to enact invasive plant bylaws.
- Ensure that all contract employees are aware of, and understand, current legislation and policies, especially as they pertain to applying invasive plant treatments.

1.2 Leadership, Planning and Organization

A successful invasive plant program requires effective leadership and organization to implement and coordinate programs, and to develop partnerships. The Coastal Invasive Plant Committee acts as a liaison between local participants and the Invasive Plant Council of British Columbia to ensure that CIPC programs are coordinated internally and with other regional programs, government agencies and provincial priorities.

Issues and Actions:

- Advocate endorsement of the CIPC Invasive Plant Strategy by the provincial government, local governments, First Nations, industry, private landowners, and the general public.

- Continue preparing annual core service and action plans.
- Coordinate the development of invasive plant management areas with regional district partners.
- Identify roles and responsibilities of all partners involved in implementing the CIPC strategy.

1.3 Funding and Administration

Fundraising and administration are fundamental processes required to establish and maintain an effective invasive plant management program. The CIPC has devoted considerable effort to provide a foundation for acquiring funding and providing the administrative framework to meet the structural needs of the program. Some of these include preparing grant applications, accounting and financial management, organizing staff and volunteers, and reporting to clients, provincial government agencies and Revenue Canada.

Issues and Actions:

- Research new funding opportunities.
- Promote and solicit stable consistent program funding for staff, coordinating volunteers, public education, inventory, and control.
- Continue to identify long-term funding sources for program administration and delivery.
- Produce annual funding calendar, including funding opportunities and application deadlines.
- Write and submit grant letters and funding applications.
- Seek in-kind or matching funds from regional conservation organizations and government agencies for developing extension tools, workshops and publications.
- Liaise with treasurer and accountant to track revenues and expenses.
- Participate in coordinating funding opportunities with regional groups.
- Submit year-end reports to funding agencies, the Ministry of Small Businesses, and Revenue Canada.
- Review and update the CIPC Constitution and Bylaws.

1.4 Communication, Coordination and Partnerships

The distribution of invasive plants in CIPC area extends beyond jurisdictional boundaries. Therefore, cooperation and coordination among government agencies, industry and private landowners is essential because it allows treatment across boundaries in an ecologically effective manner.

One of the primary purposes of the CIPC is to “improve the effectiveness and efficiency of invasive plant management in the region by promoting coordination and cooperation amongst stakeholders” (Brown 2006). The Coastal Invasive Plant Committee will take the lead role in promoting coordinated management of invasive plants among agencies and land occupiers in the CIPC area. Coordination and cooperation will be sought in education and training aimed at creating public and government awareness of weed issues, and in the

organization and delivery invasive plant inventories and treatments within the CIPC area. The CIPC will also liaise with local participants and the Invasive Plant Council of BC to ensure that regional programs are harmonized with other regional invasive plant programs and provincial priorities.

Issues and Actions:

Communication

- Host annual general forum and annual general meetings.
- Review and revise annual report contents and format to streamline delivery.
- Prepare program report for funding agencies for inventory and treatment.
- Advise private land owners and land conservancies on invasive plant prevention and control.
- Continue to maintain and update the CIPC website including links to other invasive plant groups, universities and colleges, and government agencies.
- Continue to provide newsletters and updates to membership by email and on the website.
- Continue to advertise and issue media releases concerning upcoming invasive plant public activities and events through local media.
- Respond to questions and invasive plant reports from stakeholders, interest groups, and the general public.

Coordination

- Coordinate a communications subcommittee to provide feedback on draft action items and to promote invasive plant communication and CIPC membership expansion.
- Participate with the Invasive Plant Council and government agencies in developing a mechanism to communicate regularly with other regional districts, ministries, agencies, provinces, and adjoining American states to identify new or rapidly dispersing invasive species to the province and region.
- Coordinate public/private interface issues and cross-jurisdictional issues including sharing information and creating awareness.
- Coordinate management between private and public land occupiers including private residents.
- Coordinate education and promote the CIPC throughout the operating area.
- Coordinate the timing of invasive plant management with volunteers and funders disbursement.
- Develop coordination of techniques and priorities for invasive plant management.
- Form and coordinate a Best Management Practices working group.

Partnerships

- Promote partnerships with local governments, non-government agencies, landowners, conservation groups, and First Nations to assist in accomplishing mutual goals and objectives.

- Support partnerships and participate in developing and delivering public awareness programs through the Invasive Plant Council, government ministries and other regional programs.
- Identify gaps in the membership, develop membership agreement forms for CIPC contacts, and update the membership list regularly.
- Create new Local Government and Horticulture working groups.
- Re-initiation of the Carpet Burweed Working Group.
- Create CIPC Advisory Group.
- Maintain relationships with the Raincoast Education Society (Tofino, BC), the Mainland *Spartina* Team, the Pacific Northwest Invasive Plant Council.
- Represent CIPC on the Garry Oak Ecosystem Recovery Team Invasive Plant Steering Committee.
- Represent CIPC on the IPCBC Horticulture Advisory Committee, Aquatics Committee, Education and Outreach Training Committee, Training and Operations and Education and Awareness Committees.
- Explore opportunities for collaboration with Cowichan Stewardship Roundtable to regarding knotweed invasion in the Cowichan River watershed.

1.5 Program Evaluation

Annual evaluations are important to determine if the program is accomplishing its intended goals and objectives. Evaluations should review strengths and weakness of particular components of the program and determine if human and financial resources were adequate. They should also assess whether the program will be relevant and achievable in the future as issues, objectives and funding change over time. The strategic plan should be considered a dynamic document that requires regular review and amendments to improve the plan over the long-term.

Issues and Actions:

- Review plans annually to evaluate the success of program activities and inter-agency participation.
- Review program focus to ensure components of the program, such as administration, education and awareness, cooperation and coordination, inventory, treatment and monitoring, are meeting current and future needs.

2 GOAL To Prevent the Introduction, Establishment and Spread of Invasive Plants

2.1 Awareness and Education

Invasive plants and noxious weeds are equally important concerns for management of natural landscapes and agricultural production, and both have private and public components. Awareness and education help bring the issues of these plants to public and political attention and act as a catalyst for action. Well-trained land managers and an informed public are important assets for locating and reporting new infestations, which promotes timely and successful control of invasive plants.

The CIPC has focused on coordination, collaboration, and education and outreach as primary functions since it's inception in 2005 although the priorities have changed as the program developed (Wesley 2008). In the past, activities concentrated on preparing and delivering presentations, producing and distributing fact sheets, pamphlets and brochures on specific target weeds, and developing a display booth and website. More recently, there has been a proposal to redirect efforts towards workshops and training, inventory and control, and developing management and decision-making tools (Noel 2010a). Tools for extension and education should draw on existing resources or be developed in appropriate partnerships with government and non-government agencies.

Issues and Actions:

Awareness

- Support a "nurseries awards" for initiatives to eliminate invasive plants from their stock, and an "incentives program" for developers.
- Need dialogue with First Nations to understand their definition of invasive plants and which are culturally valued.

Brochures and Fact Sheets

- Produce species specific fact sheets
- Produce outdoor enthusiast fact sheets.
- Develop regional invasive plant brochures featuring CIPC priority plant species.

Newspaper and Articles

- Write local media articles featuring different priority invasive species and make arrangements for regular publication (e.g. monthly or bi-weekly from May to Oct).
- Prepare articles for publication in professional journals and newsletters (e.g. Western Canada Turfgrass Assoc. electronic newsletter, Logging and Sawmill Journal, Invasive Plant Council of BC newsletters, etc.).

Presentations, Posters and Display Board

- Prepare and deliver presentations to promote CIPC and invasive plant management to professional associations, regional district boards, community organizations, industry, schools, service groups, and the general public.

Education, Training, and Outreach Tools

- Conduct invasive plant management workshops to selected target audiences, such as municipal and regional district staff, provincial park staff and contractors, and transportation corridor maintenance contractors, industrial land managers, volunteers, and the general public on plant identification, treatment alternatives including non-chemical approaches.
- Provide First Nations invasive plant training on plant identification, developing management plans, the Invasive Alien Plant Program (IAPP), inventory, and management options and techniques.
- Provide education tools on current issues such as dumping of invasive plants in natural areas, disposal of weed biomass, and a gravel pit awareness program.
- Develop an invasive plant herbarium as an identification aid, and for training and education purposes.
- Produce and distribute carabineers with invasive plant information cards.
- Feature weed-free "Nursery of the Month" on website and articles.
- Circulate "invasive plant alerts" with photos, line drawings and descriptions of new species entering protected lands, regions, or the province.
- Host community weed pulls.

2.2 Invasive Plant Categories and Priorities

All invasive plant species will eventually disperse to their ecological limits without human intervention. While a complete knowledge of the ecological range of each species would be desirable to predict the spread and impact of specific species, the biological adaptations of most invasive plants in BC is incomplete or unknown. Currently, the known distribution of invasive species within the CIPC area, the province, and adjoining American states provides the best guide to their potential invasion and impact locally.

Classification of invasive plants is also essential for developing effective weed management programs. Numerous protocols have been developed to classify invasive plants in an objective and systematic manner outside BC (Morse et al. 2004), and one is under construction inside the province (Atwood 2010).

A priority species list was compiled for the CIPC using a committee consensus approach. Plant were placed into categories based on the regional status of weed species, and the relative ability to prevent, eradicate, contain or control each species (Table 1). Over 100 invasive plant species were screened for inclusion on the CIPC priority species list and 46 species were classified into the above categories (Appendix 7). All except 16 species are listed in provincial legislation (Appendix 2).

Issues and Actions:

- Review and update CIPC Priority Species List annually or as required.
- Prepare priority species lists for Regional Districts Invasive Plant Management Areas with local input.
- Develop of a species prioritization tool for coastal BC.

TABLE 1. Priority species categories and treatment approaches.

Category Name	Description	Management Approach
Prevent "Weed Alert"	Species not known to occur in the region but likely to establish if introduced.	Eradicate if found.
Eradicate	Species known to occur in limited distribution and low density.	Eradicate if found.
Contain	Established infestations found in portions of the region.	Contain existing infestations and prevent spread to un-infested areas.
Control	Established infestations are widespread throughout the CIPC region.	Focus control in high value conservation areas. Use biocontrol, if available, on a landscape level.

2.3 Prevention, Early Detection and Rapid Response

Weed control is most successful, cost-effective, and the least environmentally damaging when invasive plants are found before they establish high-density, persistent populations (Clark 2003). Control costs can escalate rapidly once new species establish and begin to disperse while the likelihood of local eradication diminishes.

Prevention involves the practical methods used to eliminate or reduce the geographic spread of invasive plants. The first step in an effective prevention program is to accurately identify invasive plants. Other measures that help prevent new introductions include education, regulation, inspection, and possibly quarantine to stop species from entering.

Prevention is not limited to new species entering the CIPC area. It also includes restricting the spread and establishment of invasive plants from one IPMA within the operating area to another where the weed is absent. All invasive species should give a high priority at this management level and eradication should be the main objective where practical.

New introductions may not be eliminated with even the most effective prevention program. Early detection and rapid response (EDRR) endeavors to find and eradicate new entries as soon as practically possible. Effective EDRR can be accomplished only when an agency (or agencies) has authority to act, and the financial, human, and physical resources available for immediate deployment.

The CIPC has taken several prevention and EDRR initiatives. A Hot-Line was created in 2006 to report new species to the area but any invasive plant can be reported to the Hot-Line. A Watch List, which was updated in 2010 provides a guide to which species need consideration.

In 2008, CIPC became involved in the United States (US) initiative to control and eradicate Cordgrass species (*Spartina* spp.) on the US Pacific (Wesley 2008). So far, *Spartina* is known from the Boundary Bay area on the mainland, near Fanny Bay south of Courtenay, and an IAPP record exists for a population near Powell River. In 2009, CIPC coordinated formation of the Islands *Spartina* Working Group for activities on Vancouver Island and surrounding coastal communities (Noel 2010a).

Issues and Actions:

- Collaborate with the Greater Vancouver Invasive Plant Council and bordering US counties to share information on invasive plant movement across shared borders;
- Continue involvement in the *Spartina* initiative;
- Develop an early detection-rapid response plan for new invaders;
- Immediately apply site- and species-specific measures to eradicate or obstruct new invaders from establishing and dispersing; and
- Negotiate appointment of an agency (or agencies) has authority to act, and the financial, human, and physical resources available to take immediate action.

3 GOAL To Manage Existing Invasive Plant Populations and Reduce Their Impacts

3.1 Inventory and Mapping

Inventory furnishes the basic information necessary for developing prevention practices, prioritizing and planning treatments, and designing monitoring strategies. Objectives for weed inventories vary but most surveys aim to document the species, locations and density of invasive plants on a geographic and ecological basis. Other objectives might include determining the area covered by invasive plants and their rate of spread. Weed populations are not static and inventory data can become obsolete quickly as infestations grow and disperse. Therefore, it is essential that management practices are implemented as quickly as possible.

From the beginning, one of the main objectives of CIPC was to "Develop and maintain a comprehensive inventory of invasive plant species within the area of responsibility" including traditional First Nations territories where interest exists" (Brown 2006). A survey of 46 municipal invasive plant management programs in the CIPC area revealed that only Victoria, Saanich and Sooke had "Comprehensive" programs (Atwood 2009). The category for comprehensive indicated that some level of inventory had been conducted. Ten municipalities indicated that they conducted "General" programs where some level of

inventory may or may not have been conducted. No regional district had a comprehensive management program in place.

Presently, the Ministries of Forests and Range, Transportation and Infrastructure, and Environment are responsible for conducting inventories throughout the region on Crown forest and range lands, transportation corridors, and in provincial parks and protected areas (Wesley 2008). Although the CIPC has had little capacity to conduct inventories directly, the committee has an important role to play in facilitating and coordinating inventory in the future. They also may participate in inventory and mapping on private land (Wesley 2008).

Currently, IAPP contains nearly 30,000 records for 87 invasive plant species, which provides the only opportunity to evaluate the abundance and distribution of invasive plants in the CIPC area. Russell Blake (Redtail Environmental Services) recently produced maps for 32 priority species in the CIPC area using IAPP data. These maps also include IPMA (regional district) boundaries, which provide valuable local information as well and a foundation for planning inventory and treatments within IPMAs.

Collectively, seven species make up 80% of the records in IAPP while 20% of the entries are comprised of the remaining 80 invasive plants. Scotch Broom, Canada Thistle and Himalayan Blackberry are the most common and widespread species in the CIPC area accounting for nearly 70% of all records and they are found in all eight IPMAs. Common Tansy, St. John's-wort, Oxeye Daisy, and Bull Thistle are also abundant and widespread in the CIPC area. Other species, such as Butterfly-bush, Cordgrass, and Garden Loosestrife, appear to be recent arrivals.

Most invasive plants occur in the low-elevation and in the most heavily populated parts of the CIPC area. Nonetheless, priority invasive plants are found in 8 of the 11 biogeoclimatic subzone variants and in all regional districts. Nearly 50% of IAPP records originate from the Very Dry Maritime Coastal Western Hemlock (CWHxm), 36% from the Moist Maritime Coastal Douglas-fir (CDFmm), and 12% from the Submontane Very Wet Maritime Coastal Western Hemlock (CWHvm) subzone variants. No records exist for four of the 11 subzones in the CIPC area (Appendix 5). A cursory review of IAPP data and mapping suggests that most invasive plant species in the CIPC area are concentrated along main highways, secondary road systems, and utility corridors such as power and gas right-of-ways, which act as primary sources for dispersal.

In 2009 the CIPC began on-the-ground inventories focusing on Ministry of Transportation and Infrastructure corridors and gravel pits in Northern Vancouver Island and all data have been entered into IAPP (Sellentin 2010; Noel 2010b). Other inventories appear to have been completed by various agencies in other parts of the CIPC area but do not appear in IAPP. Although some inventory progress has been made, additional information is required for many species before a comprehensive plan for treatment can be formulated. Each agency can conduct invasive plant inventories but it is essential that all inventory data are compiled, evaluated, and mapped to provide an overview of what has been done and to ensure that future inventory is conducted in a coordinate and efficient manner.

Issues and Actions:

- Compile and enter inventory data from all agencies and stakeholders into the IAPP database to determine the distribution and possible density of invasive species in the CIPC area.
- Prepare maps for all inventoried areas over the entire CIPC area and within Invasive Plant Management Areas.
- Evaluate current inventory information to determine gaps in the geographic area covered and the species inventoried.
- Develop an inventory plan based on new invasive plant priority list.
- Host IAPP and other training workshops to standardized inventory methods for all jurisdictions including private land.
- Conduct a comprehensive baseline inventory of region for priority species using IAPP inventory standards.
- Encourage First Nations, local governments, E & N Rail, utility companies, industry, and private landowners to conduct inventory and mapping within their jurisdictions.

3.2 Integrated Pest Management

No single strategy can successfully manage all invasive plant species in every environment. Therefore, the CIPC advocates an Integrated Pest Management (IPM) approach that combines the optimum mix of prevention, cultural, mechanical, chemical, and biological methods to control invasive plants. The IPM method does not eradicate all weed species under all circumstances but aims to prevent new invasive species from establishing while minimizing undesirable effects of established species.

Currently, BC Hydro, BC Transmission Corporation, and E & N Railway conduct vegetation management on parts of the CIPC area using approved pest management plans (PMP) (Appendix 9). All of the plans contain some invasive plant species. In 2009, an intergovernmental PMP was completed by the Ministry of Forests and Range that provides direction for treatment of invasive plants throughout the entire CIPC area on Crown lands under the combined jurisdiction of the Ministries of Forests and Range, Environment, Transportation and Infrastructure, and Agriculture and Lands (MFR 2009). The plan recommends using an IPM approach to control invasive plants throughout this area.

Since 2001, several agencies have participated in treating 49 weed species on over 950 sites within the CIPC area (IAPP 2005). Cultural or mechanical methods were applied on nearly 80% of the sites while treatment on the remaining sites was equally split between chemical and biological control. Traditionally, the Ministries of Forests and Range, and Agriculture and Lands, have conducted most biocontrol on Vancouver Island (Noel 2010a).

The CIPC became directly involved in on-the-ground treatments in 2009 by assisting the Invasive Plant Council in coordinating the “HOT SPOTS” program for chemical and mechanical control of invasive plants on Vancouver Island (Noel 2010c). Four crews conducted chemical and mechanical treatment in the Comox Valley, Campbell River area, Duncan (Cowichan Valley) and Victoria (Parks Canada) on Knotweeds, Scotch Broom,

Gorse, Giant Hogweed, Yellow Iris, Himalayan Blackberry, English Ivy, Holly and other priority invasive plants identified within the region. Following treatments, disturbed sites were seeded using either native or agronomic grass seed mixes, depending on the site, location and jurisdiction.

Mechanical control was also conducted on 25 sites identified during the North Island Highways Inventory conducted in 2009 (Sellentin 2010). Three Corrections crews also applied mechanical treatments to Scotch Broom, Gorse, Yellow Flag Iris, Purple Loosestrife, Himalayan Blackberry and Giant Hogweed along transportation corridors near Nanaimo beginning in April 2009 (Noel and Blake 2010).

Issues and Actions:

Organization and Planning

- Compile a list of all CIPC member programs (including volunteer) for invasive plant control.
- Develop management strategies for Invasive Plant Management Areas and local governments that are linked to the CIPC strategy.
- Each agency is responsible integrated pest management within their jurisdiction and in accordance with their mandates, legal obligations and procedures described in confirmed pest management plans or other land use plans (Appendix 8, Appendix 9). Weed management activities should be consistent with the objectives of the CIPC strategy and conducted in a coordinated fashion.

Technical

- Management of invasive plants in riparian areas is constrained because invasive plants can not be treated with glyphosate < 1m above the high water mark.
- Explore non-chemical treatment alternatives.
- Produce a comprehensive restoration plant matrix and listing of commercial outlets.
- Develop regional guidelines and procedures for disposal of invasive plant biomass following cultural and mechanical treatments.

3.3 Monitoring and Evaluation

Monitoring is necessary to collect the physical and biological data required to evaluate on-the-ground management progress and performance. Monitoring can be used to assess the current situation or to evaluate changes over time. Generally, the presence or absence of the target weed species following treatment is the most important information needed to decide whether a management practice has succeeded. However, secondary information regarding the response of non-target species or restoration treatments that were applied at the same time can also be obtained.

Although 10 agencies reported they are involved in monitoring (CIPC 2007), IAPP contains no monitoring records for chemical control treatments and only nine sites were monitored for cultural or mechanical control (IAPP 2005). In contrast, nearly 200 monitoring records exist for biocontrol agents dating back to releases made in 1964. Target species include Bull and

Canada Thistle; Diffuse, Meadow and Spotted Knapweed; Dalmatian and Yellow Toadflax; and Purple Loosestrife. Most of the monitoring has been carried out by the Ministry of Forests and Range and the Ministry of Agriculture and Lands.

Issues and Actions:

- Develop a monitoring plan for the CIPC operating area linked to the priority species list and IAPP training.
- Monitor high-risk areas to detect new invasions or range extensions of invasive plants within the region.
- Monitor and evaluate invasive plant treatments and restoration projects for effectiveness and improvements.
- Update invasive plant distribution and density maps, and databases, as an ongoing program activity.

INVASIVE PLANT MANAGEMENT WORK PLAN

The following work plan summarizes the issues and possible actions identified in the preceding gap analysis/draft strategy. Although all of action items described in the work plan are important for a successful invasive plant program, each action has been ranked as high, medium and low considering the criteria found in Table 2. The contents of the work plan follow the same format as the strategy text.

The plan should be reviewed annually to evaluate its success and to determine if modifications to the plan are necessary. The review process should include all stakeholders and participants in the program.

TABLE 2. Criteria for ranking invasive plant actions at a strategic level.

Ranking	Relative Importance	Timing
High (H)	**Fundamental** – The action item is of primary, essential, or underlying importance.	Important to be done earlier than later. Other priorities rely on it.
Medium (M)	**Important** - The action item is significant and necessary to program delivery.	Follows from earlier priorities but important for delivery of other action items.
Low (L)	**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.

Source: MOE 2006.

Goal 1 - To Provide Structure and Capacity for Long-term Invasive Plant Management		
Statutory Authority and Responsibility		
Action Item	***Comment/Action***	**Priority**
Support and participate in reviews of provincial legislation, regulations and policy that relate to invasive plant management in municipalities, regional district IPMAs and the CIPC area.	Ongoing. *Weed Control Act* under review.	M
Ensure that CIPC priority species are adequately addressed when legislation is revised.	Ongoing.	H
Encourage and assist local governments to enact invasive plant bylaws.	CIPC input into local bylaws helps coordinate invasive plant regulations towards priority species.	M
Ensure that all contract employees are aware of, and understand, current legislation and policies, especially as they pertain to applying invasive plant treatments.	Include legislation in training programs where appropriate.	M
Leadership, Planning and Organization		
Action Item	***Comment/Action***	**Priority**
Advocate endorsement of the CIPC Invasive Plant Strategy by the provincial government, local governments, First Nations, industry, private landowners, and the general public.	Follow up meetings with agency representatives in each of the IPMAs during summer and fall 2010 and upon approval of the final strategy.	H
Continue preparing annual core service and action plans.	Ongoing as required.	M
Continue to promote and develop a coordinated approach to invasive plant management in the CIPC area.	Work towards pooled resources model beginning in one of the IPMAs as a pilot project in 2011.	H
Coordinate the development of invasive plant management areas with regional district partners.	In progress in the Cowichan Valley and Capital Region.	H
Identify roles and responsibilities of all partners contributing to implementing the CIPC strategy.	The relative roles of CIPC and land occupiers in conducting inventory and/or treatments needs clarification.	M

Funding and Administration		
Action Item	***Comment/Action***	**Priority**
Continue to identify long-term funding sources for program administration and delivery.	Ongoing.	H
Write and submit grant letters and funding applications.	Ongoing.	H
Promote and solicit stable, consistent program funding for staff, coordinating volunteers, public education, inventory and control.	Adopt the strategic plan and continue to secure funding and resources to implement the plan.	H
Produce annual funding calendar, including funding opportunities and application deadlines.	Ongoing as time permits.	M
Seek in-kind or matching funds from regional conservation organizations and government agencies for developing extension tools, workshops and publications.	Ongoing on a project specific basis.	M
Liaise with treasurer and accountant to track revenues and expenses.	Ongoing.	H
Participate in coordinating funding opportunities to regional groups.	Ongoing as required.	H
Submit year-end reports to funding agencies, the Ministry of Small Businesses, and Revenue Canada.	Ongoing as a mandatory requirement.	H
Review and update the CIPC Constitution and Bylaws.	As required.	L

Communication, Coordination and Partnerships		
Action Item	***Comment/Action***	**Priority**
Communication		
Host annual general forum and annual general meetings.	Ongoing and required under *Society Act.*	H
Review and revise annual report contents and format to streamline delivery.	Standardize formats where possible to create reporting efficiencies.	H
Advise private land owners and land conservancies on invasive plant prevention and control.	Provide services where time and finances permit.	M

Communication, Coordination and Partnerships		
Action Item	***Comment/Action***	**Priority**
Continue to maintain and update the CIPC website including links to other invasive plant groups, universities and colleges, and government agencies.	Ongoing with monthly updates.	H
Continue to provide newsletters and updates to membership by email and on the website	Suggested change to quarterly newsletters (Spring, Summer, Fall and Winter).	H
Develop a chat-line service for stakeholders.	No time presently available.	L
Continue to advertise and issue media releases concerning upcoming invasive plant public activities and events through local media.	Ongoing as required.	M
Respond to questions and invasive plant reports from stakeholders, interest groups, and the general public.	Ongoing as required.	H
Coordination		
Coordinate a communications subcommittee to provide feedback on draft action items and to promote invasive plant communication and CIPC membership expansion.	No time presently available.	H
Participate with the IPC and government agencies in developing a mechanism to communicate regularly with other regional districts, ministries, agencies, provinces, and adjoining American states to identify new invasive species to the province and region.	Ongoing participation in local subcommittees and working groups as time and funding permits.	M
Coordinate public/private interface and cross-jurisdictional issues including sharing information and creating awareness.	Delivery possible through the above action item.	M
Coordinate education and promote the CIPC throughout the operating area.	Provide input and coordination as opportunities arise.	H
Coordinate management between private and public land occupiers including private residents.	Dependent of funding for invasive plant treatment contracts.	L
Coordinate techniques and priorities for invasive plant management.	Dependent of funding for invasive plant treatment contracts.	M

Communication, Coordination and Partnerships		
Action Item	***Comment/Action***	**Priority**
Form and coordinate a Best Management Practices working group.	Work in cooperation with IPC in developing BMPs for invasive species, which includes generic and regionally relevant information.	L
Partnerships		
Promote partnerships with provincial ministries, local governments, non-government agencies, landowners, First Nations, and others to assist in accomplishing mutual goals and objectives.	Seek support and involvement of regional partners and continue ongoing dialogue with plan participants.	H
Support partnerships and participate in developing and delivering public awareness programs through the IPC, government ministries and other regional programs.	Ongoing.	H
Identify gaps in membership, develop membership agreement forms for CIPC contacts, and update membership list regularly.	Ongoing.	M
Create horticulture working groups.	No time presently available.	L
Re-initiate the Carpet Burweed Working Group.	No time presently available.	L
Create CIPC Advisory Group.	No time presently available.	L
Maintain new relationships with the Raincoast Education Society (Tofino, BC), the Mainland *Spartina* Team, the Pacific Northwest Invasive Plant Council.	Ongoing as required.	L
Represent CIPC on the Garry Oak Ecosystem Recovery Team Invasive Plant Steering Committee.	Ongoing as required.	M
Represent CIPC on the IPCBC Horticulture Advisory Committee (HAC), Aquatics Committee, Education and Outreach Training Committee, Training and Operations and Education and Awareness Committees.	Participate in committees as time permits.	M
Explore opportunities for collaboration with Cowichan Stewardship Roundtable regarding knotweed in the Cowichan River watershed.	Ongoing involvement in the program.	H

Communication, Coordination and Partnerships		
Action Item	***Comment/Action***	**Priority**
Program Evaluation		
Action Item	***Comment/Action***	**Priority**
Review plans annually to monitor program success and inter-agency success.	Ongoing. Should be conducted during or after annual meetings.	H
Review program focus to ensure components of the program, such as administration, education and awareness, cooperation and coordination, inventory, treatments and monitoring, are meeting current and future needs.	Ongoing. Should be reviewed and adjusted as required during or after annual meetings.	H

Goal 2 - To Prevent the Introduction, Establishment and Spread of Invasive Plants		
Awareness and Education		
Action Item	***Comment/Action***	**Priority**
Awareness		
Support "nurseries awards" for initiatives to eliminate invasive plants from their stock, and an "incentives program" for developers.	Probably better initiated by the IPC and supported by CIPC and other regional programs.	L
Need dialogue with First Nations to understand their definition of invasive plants and which species are culturally valued.	First Nations involvement in the program would be an asset and should be pursued.	H
Brochures and Fact Sheets		
Produce species-specific and outdoor enthusiast fact sheets.	Consider a collaborative program with IPC and / or government agencies with generic information for each species augmented and regionally specific details.	L
Develop regional invasive plant brochure featuring local priority plant species.	Plant profiles prepared for this plan could be a useful basis for such a product.	H
Newspaper and Articles		
Write local media articles featuring different priority invasive species and make arrangements for regular publication (e.g. monthly or bi-weekly from May to Oct).	Useful for awareness and promotion tools where time and funding are available.	M
Prepare articles for publication in professional journals and newsletters (e.g. Western Canada Turfgrass Assoc. electronic newsletter, Logging and Sawmill Journal, Invasive Plant Council of BC newsletters, etc.).	Useful tools for awareness and promotion where time and funding are available.	L
Presentations, Posters, Display Board		
Prepare and deliver presentations to promote CIPC and invasive plant management to professional associations, regional district boards, community organizations, industry, schools, service groups, and the general public.	Priorities for audiences should be reviewed by the committee and presentations directed to the highest priority groups. Delivery dependent upon time available and funding.	H

Awareness and Education		
Comment/Action	**Priority**	
Education, Training, Outreach Tools		
Conduct invasive plant management workshops for municipal, regional district, and provincial park staff; contractors and industrial land managers, volunteers, and general public on plant identification and treatment alternatives including non-chemical approaches.	Target groups for workshops should be reviewed by the committee. Delivery dependent upon time available and funding.	H
Provide First Nations training on invasive plant identification, preparing management plans, IAPP and inventory, and management options and techniques.	This activity could be combined with general training although specific contents of First Nations training may vary depending on their specific needs.	H
Provide education tools on current issues such as dumping of invasive plants in natural areas, disposal of weed biomass, and a gravel pit awareness program.	Develop programs as time and funding permit or invite speakers on these, or similar topics, at annual forums.	H
Develop an invasive plant herbarium as an identification aid, and for training and education purposes.	Could be a useful tool for all training programs, time and funding permitted.	M
Produce and distribute carabineers with invasive plant information cards.	Ongoing.	L
Feature weed-free "Nursery of the Month" on website and articles.	Time permitting.	L
Circulate "invasive plant alerts" with photos, line drawings and descriptions of new species entering protected lands, regions, or the province.	CIPC can collaborate and circulate material within the region but IPC or provincial ministries are a more appropriate source for original material.	H
Host community weed pulls.	Participate in coordination as time and funding permit.	M

Invasive Plant Categories and Priorities		
Action Item	***Comment/Action***	**Priority**
Review and update CIPC Priority Species List on annual basis or as required.	Updated in 2010 considering input from regional open houses.	H
Prepare priority lists for Invasive Plant Management Areas with local input.	Collaborate with IPMA representatives.	H
Develop a species prioritization tool for coastal BC.	Provincial ranking tool in progress.	L

Prevention, Early Detection and Rapid Response		
Collaborate with the Greater Vancouver Invasive Plant Council and bordering US counties to share information on invasive plant movement across shared borders.	Ongoing as required.	M-H
Continue involvement in the *Spartina* initiative.	Ongoing.	M-H
Develop a rapid response plan for new invaders.	A provincial plan is being prepared, which CIPC will operate under.	N/A
Immediately apply site- and species-specific measures to eradicate or obstruct new invaders from establishing and dispersing.	Whether through direct committee involvement or by arms-length actions through CIPC partners.	H
Negotiate appointment of an agency (or agencies) that has authority to act, and the financial, human, and physical resources available to take immediate action when new invaders are discovered.	A provincial plan is being prepared, which CIPC will operate under.	N/A

Goal 3 - To Manage Existing Invasive Plant Populations and Reduce Their Impacts		
Inventory and Mapping		
Action Item	***Comment/Action***	**Priority**
Compile and enter inventory data from all agencies and stakeholders into the IAPP database to determine the distribution and possible density of invasive species in the CIPC area.	Solicit information from program partners to determine where inventory has been conducted.	H
Prepare maps of inventoried areas over the entire CIPC area and within Invasive Plant Management Areas.	Prepare maps covering the CIPC and IPMA areas.	H
Evaluate current inventory information to determine gaps in the geographic area covered and the species inventoried.	Use maps as the primary planning guide for future regional or IPMA inventories.	H
Develop a plan for future inventory based on new invasive plant priority list.	Consult with stakeholders to determine their individual inventory needs and ensure they coordinate with inventory work already completed.	H
Host IAPP and other training workshops to standardized inventory methods for all jurisdictions including private land.	Ongoing but could be updated to consider current priority species list.	H
Conduct a comprehensive baseline inventory of region for priority species including using IAPP inventory standards.	Conduct inventories.	H
Encourage First Nations, local governments, E & N Rail, utility companies, industry, and private landowners to conduct inventory and mapping within their jurisdictions.	Use inventory plan as a tool to encourage others to conduct inventory.	H

Integrated Pest Management		
Action Item	***Comment/Action***	**Priority**
Organization and Planning		
Compile a list of all CIPC member (including volunteer) programs for invasive plant control.	Provides background information for planning future treatments on who, where, when and which species have been treated.	M
Develop management strategies for Invasive Plant Management Areas and local governments that are linked to the CIPC strategy.	Will be required in the future if IPMAs are adopted and will require input by CIPC and local representatives.	M

Integrated Pest Management		
Action Item	***Comment/Action***	**Priority**
Each agency is responsible integrated pest management within their jurisdiction and in accordance with their mandates, legal obligations and procedures described in confirmed pest management plans or other land use plans.	CIPC should encourage jurisdictions to apply weed management activities that are consistent and coordinated with CIPC objectives.	H
Technical		
Management of invasive plants in riparian areas is constrained because invasive plants can not be treated with glyphosate < 1m above the high water mark.	Conduct literature search to determine alternative chemical and non-chemical treatments potentially available.	L
Explore non-chemical treatment alternatives.	Conduct literature search to determine alternative non-chemical treatments potentially available.	L
Produce a comprehensive restoration plant matrix and listing of commercial outlets.	A compendium of native plant species, habitat suitability, and potential sources for seeds and plant material would be a valuable tool for restoration managers.	H
Need regional guidelines and procedures for disposal of invasive plant biomass following cultural and mechanical treatments.	Conduct literature search and contact weed specialists within and outside BC to determine options presently available. Prepare a brochure or pamphlet summarizing results.	H

Monitoring and Evaluation		
Action Item	***Comment/Action***	**Priority**
Need monitoring plan for CIPC operating area linked to priority species list and IAPP training.	Prepare plan.	H
Monitor high-risk areas to detect new invasions or range extensions of invasive plants within the region.	Focus on the highest risk areas in the closest proximity to known infestations of priority species first. Expand program to secondary areas as time and financial resources become available.	H

Monitoring and Evaluation		
Action Item	***Comment/Action***	**Priority**
Monitor and evaluate invasive plant treatments and restoration projects for effectiveness and improvements.	Conduct efficacy monitoring for treatments and restoration activities using IAPP standards.	H
Update invasive plant distribution and density maps and databases as an ongoing program activity.	Update as required to document progress and provide background for planning future inventory and treatments.	H

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Appendix 1. Glossary

Alien (plant). Plant species that have established in an environment outside their natural distribution. Common synonyms include *non-native, exotic, adventives, introduced, naturalized,* and *non-indigenous* in contrast with terms such as *native, indigenous* and *endemic.*

Annual (plant). A plant species that lives for only one year or growing season.

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 using approved herbicides, rates and conditions specified in a confirmed Pest Management Plan.

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

Community. Any group of organisms interacting among themselves.

Containment. An invasive plant practice that aims to geographically isolate infestations and prevent them from increasing beyond the edge of their current infestations.

Control. An invasive plant practice that aims to prevent seed production and recruitment of new plants within the target patch, and eventually reduce the area and density of the target plant over time. Control measures acknowledge that a low level of the invasive plant will likely persist after treatment.

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

Cultural control. A weed management practice that manipulates plant populations by cultivation, pulling, digging, cutting, removing seed heads or other techniques that are applied by hand.

Dispersal. The scattering of seeds or spores of a plant to a new habitat.

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

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 pest management. An approach to invasive plant management that uses the optimum mix of control options including prevention, cultural, mechanical, chemical, and biological controls in an integrated program.

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 mowing, cultivation, 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.

Non-target. Any plant that a management practice is not aimed at, but may accidentally be injured by the application.

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

Perennial. A plant species that lives for more than two years.

Pesticide. Any substance used to control, prevent, destroy, repel, or mitigate insects, rodents, fungi, invasive plants, or other organisms that are considered to be pests.

Plant community. An association of plant species growing together in different areas with similar site characteristics.

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 species 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. Red- and blue-listed species in BC.

Target species. Invasive plant(s) that are the subject of eradication, control or containment.

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. Common and Scientific Names of Invasive Plant Species Listed in Text and in BC Legislation.

Invasive Plant Species Common Name[1]	Scientific Name	WCA[2]	FRPA[3]	CCA[4]
Annual Sow-thistle	*Sonchus oleraceus*	P[5]		●
Baby's Breath	*Gypsophila paniculata*		●	●
Black Knapweed	*Centaurea nigra*		●	
Blueweed	*Echium vulgare*	R[6]	●	
Bohemian Knotweed	*[Fallopia* x *bohemica]*			
Brown Knapweed	*Centaurea jacea*		●	
Bull Thistle	*Cirsium vulgare*		●	●
Bur Chervil	*[Anthriscus caucalis]*			
Burdock	*Arctium spp.*	R	●	
Butterfly-brush	*[Buddleja davidii]*			
Canada Thistle	*Cirsium arvense*	P	●	●
Carpet Burweed	*Soliva sessilis*			●
Cleavers	*Galium aparine*	R		
Common Barnyard-grass	*Echinochloa crusgalli*			●
Common Bugloss	*Anchusa officinalis*	R	●	
Common Crupina	*Crupina vulgaris*	P		●
Common Hound's-tongue	*Cynoglossum officinale*	P	●	●
Common Reed	*Phragmites australis*			●
Common Tansy	*Tanacetum vulgare*	R	●	
Common Toadflax	*Linaria vulgaris*	P	●	●
Curly Pondweed	*Potamogeton crispus*			●
Dalmatian Toadflax	*Linaria genistifolia* ssp. *dalmatica*	P	●	●
Dense-flowered Cordgrass	*Spartina densiflora*			
Diffuse Knapweed	*Centaurea diffusa*	P	●	●
Dodder	*Cuscuta spp.*	P		●
Downy Brome	*Bromus tectorum*			●
English Cordgrass	*[Spartina anglica]*			
English Holly	*[Ilex aquifolium]*			
English Ivy	*Hedera helix*			●
Eurasian Water-milfoil	*Myriophyllum spicatum*			●
Field Scabious	*Knautia arvensis*	R	●	
Flowering-rush	*Butomus umbellatus*			●
Fuller's Teasel	*Dipsacus fullonum*		●	

Invasive Plant Species Common Name[1]	**Scientific Name**	**WCA**[2]	**FRPA**[3]	**CCA**[4]
Garden (Yellow) Loosestrife	*[Lysimachia vulgaris]*			
Garlic Mustard	*Alliaria petiolata*			●
Giant Hogweed	*Heracleum mantegazzianum*			●
Giant Knotweed	*Polygonum sachalinense*		●	●
Giant Mannagrass	*[Glyceria maxima]*			
Giant Reed	*[Phragmites australis]*			
Gorse	*Ulex europaeus*	P	●	●
Green Foxtail	*Setaria viridis*	R		
Hairy Cat's Ear	*[Hypochaeris radicata]*			
Himalayan Blackberry	*Rubus discolor*			●
Himalayan Knotweed	*[Polygonum polystachum]*			
Hoary Alyssum	*Berteroa incana*	R	●	
Hoary Cress	*Cardaria draba*	R	●	
Hydrilla	*Hydrilla verticillata*			●
Japanese Knotweed	*Polygonum cuspidatum*		●	●
Jimsonweed/Devil's Apple	*[Datura stramonium]*			
Jointed Oatgrass	*Aegilops cylindrica*	P		●
Kochia	*Kochia scoparia*	R		
Kudzu	*Pueraria montana* var. *lobata*			●
Leafy Spurge	*Euphorbia esula*	P	●	●
Marsh Thistle	*Cirsium palustre*	R	●	
Meadow Hawkweed	*Hieracium pilosella*		●	
Meadow Knapweed	*Centaurea pratensis*	R	●	
Milk Thistle	*[Silybum marianum]*			
Night-Flowing Catchfly	*Silene noctiflora*	R		
Nodding Thistle	*Carduus nutans*		●	
Orange Hawkweed	*Hieracium aurantiacum*	R	●	
Orchardgrass	*Dactylis glomerata*			●
Oxeye Daisy	*Leucanthemum vulgare*	R	●	
Perennial Pepperweed	*Lepidium latifolium*	R	●	
Perennial Sow-thistle	*Sonchus arvensis*	P		●
Periwinkle Species	*Vinca major, V. minor*			
Plumeless Thistle	*Carduus acanthoides*	R	●	
Poison-hemlock	*Conium maculatum*			●
Policeman's Helmet	*Impatiens glandulifera*			●
Puncturevine	*Tribulus terrestris*	R	●	
Purple Loosestrife	*Lythrum salicaria*		●	●

Invasive Plant Species Common Name[1]	Scientific Name	WCA[2]	FRPA[3]	CCA[4]
Purple Nutsedge	*Cyperus rotundus*	P		●
Quackgrass	*Agropyron repens*	R		
Reed Canary Grass	*Phalaris arundinacea*			●
Rush Skeletonweed	*Chondrilla juncea*	P	●	●
Russian Knapweed	*Acroptilon repens*	R	●	
Russian Thistle	*Salsola kali*	R		
Salt Cedar	*Tamarix ramosissima, T. parviflora*			●
Salt-meadow Cordgrass	*[Spartina alterniflora]*			
Saltwater Cordgrass	*[Spartina patens]*			
Scentless Chamomile	*Matricaria perforate;* [*M. maritima*]	P	●	●
Scotch Broom	*Cytisus scoparius*		●	●
Scotch Thistle	*Onopordum acanthium*	R	●	
Smooth Brome	*Bromus inermis*			●
Spotted Knapweed	*Centaurea biebersteinii;* [*C. maculosa*]	P	●	●
Spurge-laurel	*Daphne laureola*			●
St. John's-wort	*Hypericum perforatum*		●	●
Sulphur Cinquefoil	*Potentilla recta*	R	●	
Tansy Ragwort	*Senecio jacobaea*	P	●	●
Tartary Buckwheat	*Fagopyrum tataricum*	R		
Velvetleaf	*Abutilon theophrasti*	P		●
White Cockle	*Lychnis alba*	R		
Wild Chervil	*Anthriscus sylvestris*	R		
Wild Mustard	*Sinapsis arvensis*	R		
Wild Oats	*Avena fatua*	P		●
Yellow Iris	*Iris pseudacorus*		●	●
Yellow Nutsedge	*Cyperus esculentus*	P		●
Yellow Salsify	*Tragopogon dubius*			●
Yellow Starthistle	*Centaurea solstitialis*	P	●	●
Total Legislated Species (n = 82)		**48**	**42**	**50**

[1] All common and scientific names follow Douglas et al. (2002) except scientific names in square brackets, which are the original scientific names listed in various legislation.

[2] *Weed Control Act.*

[3] *Forest and Range Practices Act.*

[4] *Community Charter Act.*

[5] P = Provincial noxious under the *Weed Control Act*.

[6] R = Regional noxious for Agricultural Regions in British Columbia under the *Weed Control Act*.

Appendix 3. Regional Districts in the CIPC Area.

Regional District	Approximate Area (km^2)
Capital	2,340
Cowichan Valley	3,475
Nanaimo	2,035
Alberni-Clayoquot	6,600
Comox Valley	1,685
Strathcona	18,330
Powell River	5,090
Mount Waddington	20,290
Sunshine Coast	3,780
Total Area	**59, 845**

Appendix 4. First Nations within the CIPC Area.[1]

Ahousaht First Nation	Namgis First Nation
Beecher Bay First Nation	Nanaimo (Snuneymuxw) First Nation
Campbell River First Nation	Nanoose (Snaw-naw-as) First Nation
Cape Mudge First Nation	Nuchatlaht First Nation
Central Region Board [2]	*Nuu-chah-nulth Tribal Council* *
Chemainus First Nation	Nuxalk Nation
Comox (K'omoks) First Nation	Pacheedaht First Nation
Cowichan Tribes	Pauquachin First Nation
Danaxda'xw-Awaetlala First Nation	Penelakut First Nation
Ditidaht First Nation	Qualicum First Nation
Ehattesaht Tribe	Quatsino First Nation
Esquimalt First Nation	Sechelt (Sheshalth) First Nation
Gwa'sala-'Nakwaxda'xw First Nation	Sliammon First Nation
Gwawaenuk Tribe	Songhees First Nation
Halalt First Nation	*Te'Mexw Treaty Association* *
Hamatla First Nation	Tla-o-qui-aht First Nation
Hesquiaht First Nation	Tlatlasikwala First Nation
Homalco First Nation	Tlowitsis Tribe
Hul'qumi'num Treaty Group *	Toquaht First Nation
Hupacasath First Nation	Tsartlip First Nation
Huu-ay-aht First Nation	Tsawataineuk First Nation
Ka:'yu:k't'h/Che:k:tles7et'h' First Nation	Tsawout First Nation
Klahoose First Nation	Tsawwassen First Nation
Kwakiutl First Nation	Tseshaht First Nation
Kwiakah First Nation	Tseycum First Nation
Kwicksutaineuk-Ah'Kwah'Ah'Mish First Nation	T'Sou-ke First Nation
Lake Cowichan First Nation	Uchucklesaht First Nation
Lil'wat (Mount Currie) First Nation	Ucluelet First Nation
Lyackson First Nation	Ulkatcho First Nation
Malahat Band	Wuikinuxv First Nation
Mamalilikulla Qwe'Qwa'Sot'Em First Nation	XeniGwetin First Nation
Mowachaht/Muchalaht First Nation	

[1] Source: MFR 2009.

[2] Umbrella organization.

Appendix 5. Biogeoclimatic Units on the CIPC Area.

Biogeoclimatic Unit [1]	Label
Coastal Mountain-Heather Alpine Zone	CMA
Coastal Douglas-fir Zone	CDF
Coastal Douglas-fir, Moist Maritime	CDFmm
Coastal Western Hemlock Zone	CWH
Dry Maritime	CWHdm
Submontane Moist Maritime	CWHmm1
Montane Moist Maritime	CWHmm2
Southern Very Wet Hypermaritime	CWHvh1
Submontane Very Wet Maritime	CWHvm2
Eastern Very Dry Maritime	CWHxm1
Western Very Dry Maritime	CWHxm2
Mountain Hemlock Zone	MH
Windward Moist Maritime	MHmm1
Windward Moist Maritime	MHmmp1

[1] Source: Ministry of Forests

Appendix 6. Legislation and Statutory Authority Relating to Invasive Plant Species

Federal Legislation

Fisheries Act. Outlines criteria to protect fish and fish habitat from pesticides.

Migratory Birds Convention Act. Explains obligations to protect migratory birds from pesticides.

Pest Control Products Act. Regulates products used for the control of pests in order to protect human health and safety, and the environment.

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

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

Seeds Act. Provides guidelines respecting the testing, inspection, quality, sale and transportation of seed in Canada including the species of plants classified as noxious weed seeds.

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

Waste Management Act. Describes methods for the safe disposal of pesticide wastes.

Provincial Legislation and Policy

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

Forest and Range Practices Act. Describes responsibility for preventing the introduction and spread of invasive plants resulting from a forest or range practice. Lists target species under the Invasive Plant Regulation.

Integrated Pest Management Act. Regulates the use of pesticides (including herbicides) for invasive plant control. Requires a confirmed Pest Management Plan before they can be applied to areas exceeding 50 hectares.

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

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

Pipeline Act. Designates responsibility to control noxious weeds along pipeline rights-of-way.

Ministry of Environment, BC Parks Conservation Program (Vegetation Management Policy). Describes conditions under which the ministry will consider control measures against invasive plant species within provincial protected lands.

Weed Control Act. Applies to all provincial Crown and private land in BC. Outlines the obligations to control designated noxious weeds by the land occupier.

Municipal Legislation

Community Charter Act. Provides municipalities with the authority to control or eradicate alien invasive species within their jurisdiction. Lists target species under the Regulation of the Act.

Comox Valley Regional Distict. Bylaw No. 2774. Regional District Weed Control Regulation.

Corporation of the District of Saanich. Bylaw No. 8080. To provide for the removal of noxious weeds and other vegetation from real property.

Appendix 7. Categories of Invasive Plant Species for the CIPC Area Based on Proposed Action and Treatment.

CIPC Draft Priority Species and Categories

Prevent - "Weed Alert" list. Species not known to occur in region, but likely to establish if introduced. Eradicate if found.	
Common Crupina	*Crupina vulgaris*
Common Reed	*Phragmites australis*
Giant Reed	*Arundo donax*
Kudzu	*Pueraria montana*
Russian Knapweed	*Acroptilon repens*
Salt-meadow Cordgrass	*Spartina alterniflora*
Yellow Starthistle	*Centaurea solstitialis*

Eradicate Species known to occur in limited distribution and low density. Eradicate if found.	
Bur Chervil	*Anthriscus caucalis*
Dense-flowered Cordgrass	*Spartina densiflora*
English Cordgrass	*Spartina anglica*
Garlic Mustard	*Alliaria petiolata*
Giant Hogweed	*Heracleum mantegazzianum*
Giant Mannagrass	*Glyceria maxima*
Jimsonweed /Devil's Apple	*Datura stramonium*
Milk Thistle	*Silybum marianum*
Orange Hawkweed	*Hieracium aurantiacum*
Saltwater Cordgrass	*Spartina patens*
Wild Chervil	*Anthriscus sylvestris*

Contain Established infestations found in portions of the region. Contain existing infestations and prevent spread to un-infested areas.	
Bohemian Knotweed	*Fallopia x bohemica*
Butterfly-bush	*Buddleja davidii*
Carpet Burweed	*Soliva sessilis*
Daphne / Spurge-Laurel	*Daphne laureola*
Diffuse Knapweed	*Centaurea diffusa*
Eurasian Water-milfoil	*Myriophyllum spicatum*
Garden /Yellow Loosestrife	*Lysimachia vulgaris*
Giant Knotweed	*Fallopia sachalinensis*
Gorse	*Ulex europaeus*
Himalayan Knotweed	*Polygonum polystachum*
Japanese Knotweed	*Fallopia japonica*
Policeman's Helmet / Himalayan Balsam	*Impatiens glandulifera*
Yellow Flag Iris	*Iris pseudacorus*

Control Established infestations are widespread throughout the CIPC region. Focus control in high value conservation areas. Use biocontrol, if available, on a landscape scale.	
Burdock Species	*Arctium lappa, A. minus*
Canada Thistle	*Cirsium arvense*
Common Tansy	*Tanacetum vulgare*
Dalmatian Toadflax	*Linaria dalmatica*
English Holly	*Ilex aquifolium*
English Ivy	*Hedera helix*
Hairy Cat's Ear	*Hypochaeris radicata*
Himalayan Blackberry	*Rubus armeniacus (discolor)*
Orchardgrass	*Dactylis glomerata*
Periwinkle Species	*Vinca major, V. minor*
Purple Loosestrife	*Lythrum salicaria*
Scotch Broom	*Cytisus scoparius*
Spotted Knapweed	*Centaurea maculosa*
St. John's-wort	*Hypericum perforatum*
Tansy Ragwort	*Senecio jacobaea*

Appendix 8. Selected List of Land Jurisdictions and Participants.

Federal
Airports
Canada Food Inspection Agency
Cowichan Tribes
Department of Fisheries and Oceans
Department of National Defense
First Nations
Parks Canada, Gulf Islands National Park Reserve
Provincial and Municipal
BC Ministry of Agriculture and Lands
BC Ministry of Environment
BC Ministry of Forests and Range
BC Ministry of Transportation and Infrastructure
BC Shellfish Growers Association
Capital Regional District
City of Nanaimo
City of Victoria
Cowichan Valley Regional District
District of North Cowichan
District of Oak Bay
District of Saanich
Regional District of Nanaimo
Royal BC Museum
Corporate
BC Transmission Corp.
BC Timber Sales
Forest Companies
Mines
E & N Rail
Terasen Gas
Private Forest Land
Private Land
Campgrounds
Farms

Recreational Property
Residential Property
Resorts
Rural acreages
Other Stakeholders and Interest Groups
BC Landscape & Nursery Association
BC Society of Landscape Architects
Butchart Gardens
Comox Valley Land Trust
Comox Valley Naturalist Society
Conservancy Hornby Island
Cortes Land Conservancy
Cowichan Community Land Trust Society
Denman Conservancy Association
Ducks Unlimited Canada
Galiano Conservancy Association
Garry Oak Ecosystem Recovery Team
Invasive Plant Council of BC
Island Farmer's Alliance
Islands Trust
Mayne Island Conservancy
Millard-Piercy Watershed Stewards
Nanaimo-Cedar Farmer's Institute
Native Plant Society of BC
Parksville Streamkeepers
Pender Islands Conservancy Association
Salt Spring Island Conservancy
Savary Island Land Trust Society
Sayward Farmers Institute
Shorekeepers
Somenos Basin Committee
Swan Lake-Christmas Hill Nature Sanctuary
Texada Island Conservancy
The Land Conservancy of BC
The Land Trust Alliance of BC
The Nature Trust of BC
Tsolum River Restoration Society
Western Canada Turfgrass Association

Appendix 9. Proposed Roles and Responsibilities of Land Managers for Invasive Plant Management in the Coastal Invasive Plant Committee Area.

- **Ministry of Agriculture and Lands, and the Integrated Land Management Bureau** will provide technical advice and financial support for regional weed program as directed under their mandate, and be responsible for invasive plant management on Crown land under their jurisdiction in accordance the *Weed Control Act of BC*.
- **The Ministry of Environment, BC Parks** will be responsible for inventory, monitoring and invasive plant management in provincial protected areas in accordance with provincial statutes and Ministry policy (Appendix 6; MELP 1997; MELP 1999).
- **The Ministry of Forests and Range** will treat invasive plants on Crown range and forestland, service roads, with emphasis on invading new species, in accordance with the treatment strategies outlined in the *Pest Management Plan for Invasive Alien Plant and/or Noxious Weed Control on Provincial Crown Lands within South Coastal British Columbia, BC* (MFR 2009). The Ministry program will also conduct inventory and monitoring within their jurisdiction using IAPP standards (IAPP 2005) and will continue to establish biological control agents with CIPC assistance where practical.
- **The Ministry of Transportation and Infrastructure** will continue to provide support for inventory and treatment of highways and secondary roads, gravel pits, and other areas under their jurisdiction using the methods and standards outlined in *Pest Management Plan for Invasive Alien Plant and/or Noxious Weed Control on Provincial Crown Lands within South Coastal British Columbia, BC* (MFR 2009) and IAPP (2005).
- **Regional Districts and Municipalities** will be encouraged to participate in managing invasive plants in Regional District Parks, gravel pits, maintenance areas, and rights-of-ways, and municipal-owned properties within the Regional Districts of the CIPC area as interpreted through the *Community Charter Act* (Appendix 6).
- **BC Transmission Corporation (BCTC)** has transmission lines and support facilities throughout most of British Columbia except in the Kootenay and Boundary regions between Creston and Rock Creek. The corporation operates under a *Pest Management Plan for Control of Vegetation Within Transmission Rights-of-way* (BCTC 2005). The plan describes methods for vegetation management along transmission corridors including control of invasive plants.
- **BC Hydro** operates under the *Pest Management Plan for Management of Vegetation at BC Hydro Facilities* (BC Hydro 2006). This plan describes the methods and standards they employ for inventory, monitoring, and treatment of invasive plants on all lands and facilities associated with their operations.
- **E & N Railway** will treat invasive plants on all track ballasts, E & N rights-of-way, station grounds, railway yards, maintenance areas, and all other areas under their

jurisdiction using the methods and standards outlined in *E & N Railway Pest Management Plan* (SEC 2005).

- **Terasen Gas** will inventory, map, apply invasive plant control treatments, and monitor sites in their jurisdiction.
- **Forest Companies, Community Forests and Woodlots Licensees** will implement measures to prevent the introduction and spread of invasive plants on Crown land according to approved Forest Stewardship Plans under the *Forest and Range Practices Act.*
- **Livestock Tenure Holders**. Invasive plant control measures will be implemented according to approved Range Use Plans under the *Forest and Range Practices Act.*

PRIORITY PLANT SPECIES PROFILES

Prevent - "Weed Alert" list.

Species not known to occur in region, but likely to establish if introduced.

Eradicate if found.

Common Crupina (*Crupina vulgaris*)

Family: Asteraceae (Sunflower)

Other Scientific Names: None.

Other Common Names: Bearded creeper.

Origin: Eurasia.

Growth Form/Reproduction: Annual. Seeds.

Legal Status: Weed Control Act, Community Charters Act.

Impacts:

Agricultural: Common crupina infests hay and other forage crops. It also reduces pasture capacity and livestock productivity.

Ecological: Infests grasslands and open forests where it competes with native species

Human: Information not available

Habitat: Pastures, grasslands, rangelands, hay fields, forests, riparian areas, roadsides, railroads and waste places.

Status and Distribution: Not present in BC at this time.

Management Strategy: Prevention includes using clean seed, hay, grain and straw and watching for common crupina in crops and disturbed areas. Maintain good ground cover in pastures. Infestations can be controlled with herbicides. Biocontrol agents are not available. Cutting or grazing can stimulate lateral growth producing larger quantities of seed and is not recommended.

Common Reed (*Phragmites australis*)

Family: Poaceae.

Other Common Names: None.

Origin: Two subspecies occur in BC; *Phragmites australis* ssp. *americanus* is native and *P. australis ssp. australis* is introduced from Eastern North America.

Growth Form/Reproduction: Seed, rhizomes and vegetative fragments.

Legal Status: None.

Impacts: Community Charters Act.

Agricultural: Too coarse for grazing. Potential to invade moist soils and around ponds and waterholes.

Ecological: Forms tall, dense stands from a network of rhizomes. Can produce large accumulations of leaf litter, and shading from tall plants inhibits growth by native species of wetlands and shore.

Human: Tall plants can block shoreline views and restrict recreational access to water.

Habitat: Adapted to open, rich sites with disturbed soils. Freshwater and brackish tidal wetlands, coastal shorelines, cattail marshes, sloughs, ponds and ditches.

Status and Distribution: The invasive form has been found in Interior BC but not known in CIPC area.

Management Strategy: Very difficult to eradicate once established; immediate action on new populations is required. Digging is usually ineffective because the rhizomes are so extensive. Cutting can control this species, but timing is critical to prevent stimulating the clones. Cutting in late July will reduce plant's vigor and prevent seed formation. Cut shoots and flower heads must be burnt or removed to prevent re-sprouting or seed maturation; cutting must be repeated for several seasons. Flooding can kill common reed but may also injure native species. An integrated approach using application of glyphosate followed by cutting or burning can be effective. Common reed remains actively growing in fall when other species are dormant; herbicide application in fall will minimize effects on native species. Common reed does not appear to invade densely vegetated sites; avoid disturbing soil or immediately replant disturbed sites to prevent its colonization. No biological controls are available.

Giant Reed (*Arundo donax*)

Family: Poaceae (Grass).

Other Common Names: Spanish reed, Giant Cane, elephant grass.

Origin: Mediterranean.

Growth Form/Reproduction: Perennial grass. Rarely by seed. Vegetatively from rhizomes, vegetative fragments, or rooting along prostrate stems.

Legal Status: None.

Impacts:

Agricultural: Interferes with drainage; can cause flooding.

Ecological: Colonies can spread over large areas in riparian habitats, where they can compete with native vegetation and reduce habitat for wildlife. Large clones can trap floating debris causing flooding.

Human: Ornamental landscape plant.

Habitat: Requires abundant moisture and sunlight. Tolerates many soil types including high salinity. Adapted best to disturbed, nitrogen-rich soils where water is at or near the soil surface. Grows in agricultural areas, riparian zones and coastlands. Found in ditches, wet meadows, brackish tidal marshes, and along rivers and streams.

Status and Distribution: Not know in BC.

Management Strategy: Small, individual plants can be hand-pulled but all rhizomes must be removed. Cutting or burning is not recommended as this stimulates new growth. Control can be achieved with glyphosate after flowering. Integrated control involves cutting followed by herbicide application. The cut stalks can be left 3-6 weeks to allow regrowth before applying a foliar application of herbicide, or concentrated herbicide can be applied directly to stems immediately following cutting.

Kudzu (*Pueraria montana*)

Family: Fabaceae (Pea).

Other Common Names: Foot-a-night vine, Ko-hemp.

Origin: Eastern Asia.

Growth Form/Reproduction: Climbing, trailing deciduous woody vine. Spreads primarily by rooting at stem nodes, seeds occasionally produced.

Legal Status: Community Charters Act.

Impacts:

Agricultural: Threat to timber and agricultural crops. Provides forage for grazing animals.

Ecological: Invaders semi-natural and natural habitat in United States; displaces native grass and forbs, kills existing trees and shrubs and competes with new tree seedlings.

Human: Infestations decrease property value and reduce recreational access. Important herb in traditional Chinese medicine; originally used as landscape ornamental.

Habitat: Requires full sun and abundant moisture. Adapted to a wide range of conditions and soil types but best adapted to deep, well-drained, sandy soils on disturbed sites. Grows in abandoned fields and urban lots, roadsides, forest edges, fields, croplands and pastures.

Status and Distribution: No occurrences of kudzu in BC or the CIPC area. Spot infestations present in Oregon and Washington.

Management Strategy: Kudzu is extremely difficult to control once established; early detection and rapid response is the main management focus. Small populations can be controlled by digging out all the root crowns that grow along the vines at the stem nodes, or the plants can be exhausted repeatedly defoliating the plant through mowing or brush cutting. Plants can also be covered under deep (30-60 cm) mulch or plastic sheeting to deplete root reserves. Grazing animals (cows, sheep, goats, and horses) can control small infestations. Herbicides are the only practical control for large infestations with 5-10 years of follow up monitoring and spot treatment. Dicamba or glyphosate is usually sprayed onto foliage once the plants are actively growing. Stem treatments can be used on smaller infestations or on climbing vines. No biocontrols are available.

Russian Knapweed (*Acroptilon repens*)

Family: Asteraceae (Sunflower).

Other Scientific Names: *Centaurea repens*.

Other Common Names: Turkestan thistle, mountain bluet, creeping knapweed.

Origin: Eurasia.

Growth Form/Reproduction: Perennial. Vegetatively from rhizomes; seeds.

Legal Status: Weed Control Act, Forest and Range Practices Act.

Impacts:

Agricultural: Can infest cultivated fields, grain and alfalfa crops and pastures. Toxic to horses.

Ecological: Russian knapweed forms dense stands that can displace native species and reduce forage production. Russian knapweed may contain allelopathic compounds that inhibit the growth of other plant species.

Human: No information available.

Habitat: Adapted to a wide range of soil conditions in low- to mid-elevation grasslands and forests. Disturbed sites, roadsides, grasslands, riverbanks, irrigation ditches, pastures, clear cuts, and cropland.

Status and Distribution: Not reported in the CIPC area.

Management Strategy: Mechanical control (cutting) will not kill this species, but repeated cutting before the plant bolts reduces vigor. Picloram, clopyralid, and 2,4-D, used either alone or in combination can provide control. A combination of cutting and herbicides can manage Russian knapweed but treatments may need to be repeated over several years; in autumn. Apply picloram to plants that have re-emerged following cutting.

Salt-meadow Cordgrass (*Spartina alterniflora*)

Family: Poaceae (Grass).

Other Common Names: None.

Origin: Atlantic coasts and Gulf of Eastern North America.

Growth Form/Reproduction: Perennial rhizomatous grass. Seeds, rhizomes and vegetative fragmentation.

Legal Status: None.

Impacts:

Agricultural: No known problems in agricultural areas.

Ecological: Can potentially displace native plants in coastal salt marshes. Colonizes open, tidal flats creating salt-water marshes , which may destroy habitat and food resources for fish, birds and other marine life.

Human: Reduces recreational access to beaches and for boating.

Habitat: Salt tolerant; able to withstand prolong inundation by saline and brackish waters. Primarily found in the lower tidal zone, it can occupy both high and low salt marshes and mud sandflats.

Status and Distribution: Currently not found in BC but is present in Washington State.

Management Strategy: Eradicate new or small populations. Seedlings can be hand-pulled. Excavate established plants being including all rhizomes. Scattered plants can be killed by burning with a hand-held propane torch. Repeated mowing will contain growth, limit seed set and eventually kill established clones. Mowing must start at green up, continue until plants die back in fall, and must be continued 3 to 4 years. Small clones can be eradicated by mowing followed by covering with woven fabric. Fabric must extend at least one meter beyond the edge of the clone and must be left in place for 1 to 2 growing seasons. Combinations imazapyr or glyphosate with surfactants has been used in the United States to eradicate or control larger populations with variable success. No biocontrol agents are presently available.

Yellow Starthistle (Centaurea solstitialis)

Family: Asteraceae (Sunflower).

Other Common Names: St. Barnaby's thistle, yellow cockspur.

Origin: Europe.

Growth Form/Reproduction: Winter annual. Seed.

Legal Status Central Kootenay: Weed Control Act, Forest and Range Practices Act, Community Charters Act.

Impacts:

Agricultural: Infestations can reduce forage quality and forage availability in pastures and in hay. Prolonged grazing by horses can result in a fatal nervous disorder.

Ecological: Competes with native grass species**.**

Human: Dense stands impede recreational access.

Habitat: Shade intolerant. Adapted to soils ranging from deep and loamy to well-drained shallow and rocky soils on sites where annual precipitation varies from 25 - 100 cm. Disturbed sites, grasslands, pastures, hayfields, roadsides, recreational areas, and cropland.

Status and Distribution: Not known to occur in BC.

Management Strategy: Good pasture management can prevent or limit new infestations of yellow starthistle. Small infestations can be controlled by hand-pulling. Herbicides, such as 2,4-D, provide good control at the seedling or rosette stage but are not effective once the plants begin flowering. Five biocontrol agents have been released in the western US but none are present in Canada.

Eradicate

Species known to occur in limited distribution and low density.

Eradicate if found.

Bur Chervil (*Anthriscus caucalis*)

Family: Apiaceae (Carrot)

Other Common Names: Bur parsley, burr chervil, bur-chervil

Origin: Europe.

Growth Form/Reproduction: Annual. Spiny seeds

Legal Status: None.

Impacts:

Agricultural: Information not available.

Ecological: Can form dense stands competing with native vegetation**.**

Human: Information not available

Habitat: Adapted to shaded sites and poor, sandy soils. Moist fields, ditches, disturbed sites and waste places.

Status and Distribution: Rare in Southeastern Vancouver Island and the Gulf Islands with populations reported in the Comox, Capital, Cowichan Valley, and Nanaimo Regional Districts.

Management Strategy: Eradicate new and small populations before seed bank is formed. Plants must be removed before seeds develop. Can be pulled when soil is moist or cut to ground level after flowering but before seeds mature. Remove cut material containing flowering stems from site.

Dense-flowered Cordgrass (*Spartina densiflora*)

Family: Poaceae (Grass).

Other Common Names: None.

Origin: Coastal South America.

Growth Form/Reproduction: Perennial bunchgrass**.** Seed.

Legal Status: None.

Impacts:

Agricultural: Not a problem on agricultural lands.

Ecological: Competes with native flora of upper tidal marshes reducing habitat for wildlife. Invasion of mudflats and channel edges of marshes eliminates foraging habitats for waterfowl.

Human: Information not available.

Habitat: Upper intertidal zone, cobble beaches, mid to high salt marsh zone near the mean high water mark, or just below it in open mudflats.

Status and Distribution: Present in Baynes Sound on East Vancouver Island.

Management Strategy: Eradicate while populations are small and easily controlled. Seedlings can be hand-pulled; taking care to remove roots and shoots. Dig out established plants being sure to remove all rhizomes. Scattered plants can be killed by burning with a hand-held propane torch. Repeated mowing will contain growth, limit seed set and eventually kill established populations; mowing must start at initial green up and continue until fall die back and must be continued 3 to 4 years. Small infestations can be killed by mowing followed by covering with woven fabric; fabric must extend at least a meter beyond the edge of the clone and must be left in place 1 to 2 growing seasons. No biocontrol agents are presently available.

English Cordgrass (*Spartina anglica*)

Family: Poaceae (Grass).

Other Common Names: None.

Origin: Hybrid of S. maritima (England) and S. alterniflora (E. North America).

Growth Form/Reproduction: Rhizomatous perennial. Seed, rhizomes and vegetative fragments.

Legal Status: None.

Impacts:

Agricultural: Not a problem on agricultural lands.

Ecological: Colonizing plant that potential can displace native plants of coastal salt marshes. Colonizes open, tidal flats creating salt-water marshes, which can affect habitat and food resources for fish, birds and other marine life.

Human: Can interfere with recreational activities.

Habitat: Salt tolerant**.** High marsh zone to intertidal mudflat.

Status and Distribution: Reported in the Fraser River Delta at Roberts Bank and Boundary Bay. None reported on Vancouver Island.

Management Strategy: Eradicate while populations are small and easily controlled. Small populations can be controlled with manual pulling of seedlings or digging of established plants, taking care to remove all rhizomes. Scattered plants can be killed by burning with a hand-held propane torch. Mowing can be effective but must start at initial green up and continue until fall die back and must be continued 3 to 4 years. Small clones can be killed by mowing followed by covering with woven fabric; fabric must extend at least a meter beyond the edge of the clone and must be left in place 1 to 2 growing seasons. No biocontrol agents are presently available.

Garlic Mustard (*Alliaria petiolata*)

Family: Brassicaceae (Mustard).

Other Common Names: Garlic root.

Origin: Europe.

Growth Form/Reproduction: Biennial/ Seeds

Legal Status: Community Charters Act.

Impacts:

Agricultural: No information available.

Ecological: Invades and dominates understory of forested areas.

Human: Culinary and medicinal herb. No information on negative effects.

Habitat: Prefers shade and moist, rich soil but tolerates full sun and a wide range of soil types. Grows in forests, riparian areas, disturbed sites, urban areas, trail edges and stream banks.

Status and Distribution: Rare in Capital Region in the Victoria area.

Management Strategy: In small populations, plants can be hand-pulled taking care to remove all of root system. For larger populations, cut flowering stems at or near ground level. Remove plant material from the site; seeds can continue to develop on severed plants. Glyphosate provides good control. Biocontrol is not presently available.

Giant Hogweed (*Heracleum mantegazzianum*)

Family: Apiaceae (Carrot).

Other Common Names: Giant Cow-parsnip, Hogweed.

Origin: Asia.

Growth Form/Reproduction: Herbaceous perennial. Seeds and from perennial buds at crown.

Legal Status: Community Charters Act.

Impacts:

Agricultural: Can infest agricultural areas.

Ecological: Strongly competitive plant; dense stands of very, tall plants outcompete native species in riparian areas. Roots are shallow compared to mixed native communities, which may increase erosion risks in riparian areas.

Human: Sap on exposed skin causes hypersensitivity to sunlight resulting in irritation, blistering and dermatitis. Scarring and blindness may result.

Habitat: Adapted to rich, damp soil and tolerates a wide range of light regimes. Grows on wet to moist disturbed sites at low elevations. Inhabits streams, wetlands, ditches, roads, right-of-ways, agricultural areas, wooded ravines, vacant lots, and other disturbed sites.

Status and Distribution: Present in all CIPC Regional Districts. Widespread in Nanaimo, common in Comox Valley, Cowichan Valley and Strathcona. Limited in Alberni-Clayoquot, Capital and Powell River. Most common in CDFmm and CWHxm but also reported in CWHvm and CWHvh.

Management Strategy: Use protective clothing and eyewear when handling this plant. Cut off flowers to prevent seed formation. Excavate plants, severing roots 8-12 cm below the soil surface. Do not compost; dispose of all plant parts in strong garbage bags. Return to site to check for regrowth. Immature plants can be controlled by covering with black plastic or by mowing at 2 week intervals; 3-5 years of follow-up treatment may be required. Chemical controls can be effective. Foliar applications are most effective in spring followed by a summer application on late appearing sprouts. Stem injections or cut stem and injections are effective after heavy sap flow in spring. No biological control agents are available.

Giant Mannagrass (*Glyceria maxima*)

Family: Poaceae (Grass).

Other Common Names: Reed mannagrass, reed sweetgrass.

Origin: Europe and temperate Asia.

Growth Form/Reproduction: Rhizomatous perennial grass. Seeds and rhizomes.

Legal Status: None.

Impacts:

Agricultural: Introduced as forage for grazing animals on seasonally inundated pasture. Cyanide poisoning of cattle can occur when animals graze young shoots. Dense stands can create drainage problems.

Ecological: Tall dense single-species stands in wetlands can affect native plant diversity and reduce wildlife food sources and habitat.

Human: No information available.

Habitat: Adapted to wet, nutrient-rich soil in full sun but tolerates light shade. Tolerates wide range of water levels. Seeds require bare, exposed soils to colonize. Lakes, watercourses, wetlands, banks of slow-moving rivers.

Status and Distribution: Rare in the Capital and Cowichan Valley Regional Districts. Not known elsewhere in the CIPC area.

Management Strategy: Individual plants can be excavated but all rhizomes must be removed; follow up treatment is usually necessary. Small populations can be cut, then covered with black plastic. Repeated cutting may reduce vigor of giant mannagrass while giving lower-growing plants a competitive advantage. Foliar spray of glyphosate can provide effective control.

Jimsonweed (*Datura stramonium*)

Family: Solanaceae (Potato).

Other Common Names: Devil's Apple, thorn apple, mad apple, stinkweed, angel's trumpet.

Origin: Uncertain.

Growth Form/Reproduction: Annual/ seeds.

Legal Status: None.

Impacts:

Agricultural: Poisonous to grazing animals if ingested**.** Can infest cultivated crops.

Ecological: No information available. Seeds of Jimsonweed are spread by birds.

Human: Highly poisonous plant; all parts are toxic. Can be fatal when ingested. Ornamental and medicinal plant.

Habitat: Does best on rich soils and plentiful rainfall. Usually grows on disturbed soils along trails and roadsides.

Status and Distribution: Rare in Capital Regional District and not present elsewhere in the CIPC area.

Management Strategy: Eradicate populations. Cut plants before seed formation and remove cut materials from site. Pre-emergence herbicides can be used on infested crops.

Milk Thistle (*Silybum marianum*)

Family: Asteraceae (Sunflower).

Other Common Names: Blessed milkthistle, spotted thistle, variegated thistle

Origin: Mediterranean region.

Growth Form/Reproduction: Biennial to short-lived perennial; seeds.

Legal Status: None.

Impacts:

Agricultural: Infests pastures and rangelands. Can cause nitrate poisoning in sheep and cattle

Ecological: Aggressive plant can replace native vegetation and reduce wildlife habitat.

Human: Ornamental and medicinal plant.

Habitat: Full sun to part shade; does best in disturbed soils. Moist to dry roadsides, ditches and disturbed waste places.

Status and Distribution: Rare in Nanaimo, Capital and Cowichan Valley Regional Districts. Not present elsewhere in the CIPC area.

Management Strategy: Eradicate small populations before seed bank is established; seeds remain viable for up to 9 years so monitoring is required on treated sites. On small sites, plants can be pulled or excavated by hand, before seeds develop. Dense stands can be cleared with brush cutters, or loppers. Triclopyr, 2,4-D, aminopyralid, and glyphosate are effective herbicides. No biocontrols are available.

Orange Hawkweed (*Hieracium aurantiacum*)

Family: Asteraceae (Sunflower).

Other Common Names: Orange-red king devil, devil's paintbrush.

Origin: Europe.

Growth Form/Reproduction: Perennial. Seeds, and from rhizomes and stolons.

Legal Status Central Kootenay: Weed Control Act, Forest and Range Practices Act.

Impacts:

Agricultural: Orange hawkweed is unpalatable to grazing animals. It invades pastures and rangelands, reducing forage available for grazing animals.

Ecological: Competes with native plant species and can affect wildlife habitat in open areas and forest understory.

Human: Ornamental landscape plant.

Habitat: Tolerates sun to part shade. Adapted to well drained, coarse-textured soils that are often acidic. Disturbed sites, roadsides, pastures, meadows and clearings

Status and Distribution: Widely distributed in CIPC area with populations occurring in the Cowichan Valley, Mount Waddington, Strathcona, and Alberni-Clayoquot Regional Districts.

Management Strategy: Eradicate small patches, or contain or control existing sites. Hand-pulling and hoeing can eradicate small infestations if roots and stolons are completely removed. Cutting reduces seed production but can stimulate vegetative reproduction. Picloram, and picloram plus 2,4-D, are effective during active growth.

Saltwater Cordgrass (*Spartina patens*)

Family: Poaceae (Grass).

Other Common Names: Salt meadowgrass, saltmeadow cordgrass.

Origin: Eastern North America.

Growth Form/Reproduction: Perennial grass. Seeds, rhizomes and vegetative fragmentation.

Legal Status: None.

Impacts:

Agricultural: None known.

Ecological: Can forms dense monocultures and has the potential to displace native vegetation in coastal salt marshes.

Human: Information not available.

Habitat: Open exposed sites. Well adapted to sandy-clay soils and tolerates occasional inundations by storm tides. Primarily a plant of the upper salt marsh tidal zone; also can colonize sand dunes, sand flats and coastal scrublands.

Status and Distribution: Rare in southwestern BC, known only at Port Moody and on Vancouver Island at Comox estuary spreading into Baynes Sound.

Management Strategy: Eradicate new or small populations. Seedlings can be hand-pulled. Excavate established plants being including all rhizomes. Scattered plants can be killed by burning with a hand-held propane torch. Repeated mowing will contain growth, limit seed set and eventually kill established clones. Mowing must start at green up, continue until plants die back in fall, and must be continued 3 to 4 years. Small clones can be eradicated by mowing followed by covering with woven fabric. Fabric must extend at least one meter beyond the edge of the clone and must be left in place for 1 to 2 growing seasons. Combinations imazapyr or glyphosate with surfactants has been used in the United States to eradicate or control larger populations with variable success. No biocontrol agents are presently available.

Wild Chervil (*Anthriscus sylvestris*)

Family: Apiaceae (Carrot).

Other Common Names: Cow parsley.

Origin: Europe.

Growth Form/Reproduction: Biennial or short-lived perennial. Seed, or root buds at the root crown.

Legal Status: None.

Impacts:

Agricultural: Invades pastures and hayfields reducing forage available for grazing animals; causes molding in hay crops. Can be a host for a virus that attacks carrot, celery and parsnip crops.

Ecological: Can form dense stands that compete with native vegetation in moist meadows and riparian areas.

Human: Used as in wildflower mixes. No known impacts.

Habitat: Semi-shade to open sun on wet to moist disturbed sites, especially on rich soils. Grows in fields, riparian areas, along forest margins, roadsides, fencelines, ditches, and pastures.

Status and Distribution: Rare in southwestern BC. Limited in Capital, Cowichan Valley, and Comox Valley Regional Districts. This species is spreading in the Fraser Valley.

Management Strategy: Seedlings and rosettes can be hand-pulled. Mature plants can be excavated but all of taproot must be removed to prevent re-sprouting. Cutting and herbicides generally are ineffective.

Contain

Established infestations found in portions of the region.

Contain existing infestations and prevent spread to un-infested areas.

Bohemian Knotweed (*Fallopia x bohemicum*)

Family: Polygonaceae (Buckwheat)

Other Scientific Names: Polygonum x bohemicum

Other Common Names:

Origin: Hybrid offspring of Japanese and Giant Knotweed. Much of what is called Japanese knotweed in North America is believed to be Bohemian Knotweed.

Growth Form/Reproduction: Perennial from creeping rhizomes and seeds.

Legal Status: None.

Impacts:

Agricultural: Knotweeds can be consumed by grazing animals.

Ecological: Considered more aggressive and better adapted to a wider range of habitats than either parent. Dense stands of Bohemian knotweed can compete with other plants and replace native vegetation.

Human: Ornamental landscape plants.

Habitat: Prefers open sunny sites. Occupies diverse habitats and tolerates both moist and dry sites, on soils of silt, loams or sands. Spreads most aggressively on moist disturbed sites such as ditches, stream banks and beaches.

Human: Landscape plant valued for its tall stature and attractive foliage.

Status and Distribution: Widespread in Cowichan Valley, common in Comox Valley, limited in Alberni-Clayoquot, Strathcona, Mount Waddington and Nanaimo. Most common in the CDFmm and CWHmm, present in the CHWvm, CWHvh and CWHdm.

Management Strategy: Once established, Bohemian knotweed is extremely difficult to control; the rhizomes extend meters beyond the clones and tiny fragments are able to regenerate. Digging or hand-pulling results in re-sprouting. Cutting, mowing, grazing and foliar herbicides can reduce top growth but repeated treatments are required for long-term control. A biocontrol program is under development but no biocontrol agents are presently available.

Butterfly-bush (*Buddleja davidii*)

Family: Buddlejaceaea (Buddleja)

Other Scientific Names: None.

Other Common Names: Summer lilac.

Origin: China.

Growth Form/Reproduction: Shrub**.** Reproduces from seeds and from cut stems.

Legal Status: None.

Impacts:

Agricultural: No information available.

Ecological: Dense thickets of Butterfly-bush can compete with native vegetation, especially in riparian areas. It can alter the proportions of nitrogen and phosphorous in the soil and can compete with juvenile Douglas-fir in forests.

Human: Popular landscape ornamental plant**.**

Habitat: Full sun. Adapted to moist, well drained fertile soils but tolerates poor soils and dry sites. Occupies disturbed sites in riparian zones, river banks and gravel beds, roadsides, pastures, logged areas and rocky slopes.

Status and Distribution: Limited distribution in Strathcona and Comox Valley Regional Districts in the CWHxm.

Management Strategy: Minimize soil disturbance in Butterfly-bush infested sites. Butterfly-push is a prolific seed producer and the seeds readily germinate in open sites with disturbed soils. The plant can be controlled by hand-pulling small plants but all of the stems and roots must be removed. Larger plants can be cut to the base or dug up. Stumps can be treated with a glyphosate or the stump can be covered with a thick plastic bag or mulch. Remove new sprouts that may appear. If plants cannot be removed, cut off flower stems before seed set. No biocontrol is available in Canada.

Carpet Burweed (*Soliva sessilis*)

Family: Asteraceae (Aster).

Other Common Names: Field burrweed, lawnweed

Origin: South America.

Growth Form/Reproduction: Winter Annual. Spiny seeds.

Legal Status: Community Charters Act.

Impacts:

Agricultural: Infests pastures.

Ecological: Threatens native rare plants at some sites through direct competition and injury from improper treatment techniques or re-seeding practices.

Human: Nuisance in lawns and recreational areas. Spiny seeds can pierce skin injuring humans and pets.

Habitat: Lawns, playing fields, roadsides, pastures, campgrounds and other open sites. Well adapted to bare, compacted soils and disturbed areas.

Status and Distribution: Limited distribution in Capital, Nanaimo, Alberni-Clayoquot, Comox Valley and Strathcona Regional Districts. Present in the CDFmm CWHxm and CWHvh. All reported occurrences in recreational areas such as municipal parks and private and provincial campgrounds.

Management Strategy: Carpet burweed seeds are set by late spring and are easily spread by attaching to shoes, clothing, pets, tires, and equipment. Control by pulling, mulching, burning with propane torches, or with herbicides. Keep off infested areas and thoroughly clean footwear, clothing, pets, and equipment that have contacted these sites. Do not move infested soil. Promote dense cover of turf through fertilization, increasing mowing heights and preventing soil compaction. Sow cool-season perennial grasses into exposed soil to prevent re-infestation.

Daphne (*Daphne laureola*)

Family: Thymelaeaceae.

Other Common Names: Spurge Laurel, spurgelaurel.

Origin: Western Europe and Mediterranean.

Growth Form/Reproduction: Evergreen shrub. Seeds and vegetatively from lateral roots.

Legal Status: Community Charters Act.

Impacts:

Agricultural: Information not available.

Ecological: Can form dense stands in understory of Douglas-fir forests.

Human: Seeds and leaves are very poisonous; sap is an irritant.

Habitat: Found in roadsides and parks and in wood areas, especially in the understory of Douglas-fir forests. Spurge-laurel has a wide range of ecological tolerances but appears well adapted to partial and deep shade.

Status and Distribution: Common in Capital Regional District. Limited distribution in Comox Valley and Cowichan Valley; not reported in other Regional Districts.

Management Strategy: Protective clothing, gloves and eyewear required when handling spurge-laurel. Small plants can be hand-pulled while individual larger plants can be excavated. Bag and remove berries before disturbing the plant. Spot treatment of triclopyr on leaves and stem can be effective. No biocontrol agent is available.

Diffuse Knapweed (*Centaurea diffusa*)

Family: Asteraceae (Sunflower).

Other Common Names: Spreading knapweed, tumble knapweed.

Origin: Eurasia.

Growth Form/Reproduction: Biennial. Seeds.

Legal Status: Weed Control Act, Forest and Range Practices Act, Community Charters Act.

Impacts:

Agricultural: Reduces forage production for livestock and wildlife. Can infest hay crops, reducing value and productivity.

Ecological: A pioneer species that can quickly invade disturbed plant communities, reduce biological diversity.

Human: Dense stands reduce access to recreational areas.

Habitat: Poorly adapted to cultivation or moist sites. Disturbed sites, pastures, roadsides, utility corridors.

Status and Distribution: Common in Nanaimo. Not known in Powell River or Strathcona. Spot occurrences in remaining Regional Districts. Found in CDFmm, CWHxm and CWHvh.

Management Strategy: Hand-pulling can be effective to eradicate new, small patches. Picloram, dicamba, clopyralid, glyphosate and 2,4-D are all effective on seedlings, rosettes and mature plants. Two biocontrol agents have been released on Vancouver Island for this species, which are monitored by the Ministry of Forests and Range.

Eurasian Water-milfoil (*Myriophyllum spicatum*)

Family: Haloragaceae (Water-milfoil).

Other Common Names: None.

Origin: Eurasia and Africa.

Growth Form/Reproduction: Perennial. Seeds but mostly spreads vegetatively from rhizomes and plant fragments.

Legal: Community Charters Act.

Habitat: Adapted to disturbed lake beds and slow-moving streams with alkaline soils and a high concentrations of dissolved inorganic carbon. Lakes, ponds, reservoirs, slow-moving rivers and streams.

Impacts:

Agricultural: Eurasian water-milfoil can impede drainage and irrigation systems.

Ecological: Dense canopies of Eurasian water-milfoil adversely impact aquatic ecosystems by shading out native vegetation and providing poor habitat for fish and waterfowl. Decay of high amounts of biomass at the end of the growing season creates problems with water quality.

Human: Interferes with recreational activities such as boating, swimming and fishing.

Status and Distribution: Eurasian Water-milfoil has been reported in the Capital, Cowichan Valley, Comox Valley and Mount Waddington Regional Districts. It is present in the CDFmm and CWHmm.

Management Strategy: Eradicate or contain existing populations where feasible. Awareness and prevention are probably the best practices presently given the limited distribution of the plant in the CIPC area. Localized cultural control can be obtained around docks and swimming areas by laying down opaque barriers on the sediment. Mechanical control with machinery has been used with limited success.

Garden (Yellow) Loosestrife (*Lysimachia vulgaris*)

Family: Lythraceae (Loosestrife).

Other Common Names: Not to be confused with Yellow Loosestrife (*Lysimachia punctata*), which also grows in coastal British Columbia.

Origin: Eurasia.

Growth Form/Reproduction: Perennial. Seeds and long rhizomes.

Legal Status: None.

Impacts:

Agricultural: Information not available.

Ecological: Its dense growth habit can displace native vegetation in wetland habitats. Reduces habitat for waterfowl and fish.

Human: Ornamental landscape plant; used in traditional Chinese medicine.

Habitat: Moist roadsides and thickets, wet woods, wetlands, river and stream banks, and lake shores.

Status and Distribution: Rare in the Capital Regional District.

Management Strategy: Often a combination of cultural and mechanical methods is more effective than one alone. Most treatments need to be applied over several years. Dig up small isolated patches or individual plants by hand. Avoid breaking plants as they regenerate from roots. Black plastic can control seedlings and very small populations. No biological agents are available.

Giant Knotweed (*Fallopia sachalinense*)

Family: Polygonaceae (Buckwheat).

Other Scientific Names: *Polygonum sachalinensis*, *Reynoutria sachalinensis* (F. Schmidt ex Maxim.) Nakai.

Other Common Names: Sachaline.

Origin: Asia.

Growth Form/Reproduction: Perennial. Seeds and vegetatively from rhizomes.

Legal Status: Forest and Range Practices Act, Community Charters Act.

Impacts:

Agricultural: Knotweeds can provide forage for grazing animals.

Ecological: Dense stands can compete effectively with native plants.

Human: Knotweeds are used as landscape ornamentals; shoots are edible in spring.

Habitat: Moist disturbed sites, stream banks, roadsides, and railway corridors.

Status and Distribution: Present in all CIPC Regional Districts; widespread in Comox Valley, common in Cowichan Valley and Strathcona, limited in other regions. Most common in CDFmm and CWHxm but also present in the CWHvm.

Management Strategy: Shading with black plastic bags can provide some short-term control but is not practical for large areas. Cutting, mowing and grazing can temporarily control top growth but these treatments must be repeated numerous times per year for several years. Salt water treatments can give temporary top growth control. Foliar herbicides can control top growth but repeated treatments are required to control new sprouts. Stem injecting herbicides directly into the plant can be effective. No biocontrol agents are presently available.

Gorse (*Ulex europaeus*)

Family: Fabaceae (Pea).

Other Common Names: Common gorse, Furze, whin, prickly broom.

Origin: Europe.

Growth Form/Reproduction: Medium to tall deciduous shrub. Seed and resprouting from crown.

Legal Status: Weed Control Act, Forest and Range Practices Act, Community Charters Act.

Impacts:

Agricultural: Present in some pastures on Vancouver Island.

Ecological: This pioneer species invades disturbed habitats where it can compete with native vegetation, increase fire hazards, and has the potential to impair forest regeneration on logged areas. It has been a problem for forest regeneration in some cut-blocks on Vancouver Island.

Human: Prevents access to recreational areas. Oils in foliage present a fire hazard to property owners. Originally used for stock fodder, for stock-proof hedge-rows and as an ornamental.

Habitat: Occurs at low-elevations with mild winters and relatively dry, cool summers. Tolerates a wide range of soils from sands to clays and is adapted to low fertility. It grows best on acidic soils. Grows on dry, open, sandy or rocky clearings, coastal bluffs, old fields, flood plains, roadsides, logged areas, and utility corridors.

Status and Distribution: Reported in all CIPC Regional Districts except Mount Waddington. Abundant in Capital, common in Nanaimo, Cowichan Valley, Alberni-Clayoquot and Strathcona, and limited in Comox Valley and Powell River Regional Districts. Most common in CDFmm and CWHxm but also present in CWHvm and CWHvh.

Management Strategy: Gorse seeds remain viable in the soil for up to 30 years so established populations are difficult to control. Prevent establishment of new populations by minimizing soil disturbance and seeding competitive species on disturbed soils in susceptible areas. An integrated approach is required to control established populations and follow up is needed for all gorse control treatments. Burning or cutting alone of existing populations is ineffective as the plants will re-sprout. Herbicides can be applied to re-sprouting plants and seedlings following burning or cutting to ground level. Picloram and triclopyr provide effective control while 2,4-D and glyphosate produce variable results. Seeding to competitive species such as grasses after treatments will minimize establishment of new seedlings.

Himalayan Knotweed (*Fallopia polystachyum*)

Family: Polygonaceae (Knotweed).

Other Common Names: None.

Origin: Himalayas and China.

Growth Form/Reproduction: Perennial. Creeping rhizomes and seeds.

Legal Status: None.

Impacts:

Agricultural: Knotweeds are eaten by grazing animals.

Ecological: Tall dense stands of knotweeds with their extensive network of rhizomes compete with native vegetation.

Human: Knotweeds have been used as landscape ornamentals; they are eaten where indigenous.

Habitat: Knotweeds prefer open sunny sites. They occupy diverse habitats and tolerate both moist and dry sites, on soils of silt, loams or sands. They spread most rapidly on moist disturbed sites such as ditches, streambanks and beaches.

Status and Distribution: Common in Comox Valley; limited distribution in Capital, Cowichan Valley and Strathcona. Found in the CWHxm and CDFmm.

Management Strategy: Once established, knotweeds are extremely difficult to control; the rhizomes extend meters beyond the clones and tiny fragments are able to regenerate. Digging or hand-pulling results in re-sprouting. Cutting, mowing, grazing and foliar herbicides can reduce top growth but repeated treatments are required for long-term control.

Japanese Knotweed (*Fallopia cuspidatum*)

Family: Polygonaceae (Buckwheat).

Other Scientific Names: *Fallopia japonica*, *Polygonum cuspidatum Reynoutria japonica.*

Other Common Names: Fleeceflower, Huzhang, Hancock's curse, elephant ears, donkey rhubarb, Japanese bamboo, American bamboo, and Mexican bamboo.

Origin: Asia.

Growth Form/Reproduction: Deciduous perennial. Spread mainly vegetatively from rhizomes but will produce viable seed if Bohemian knotweed is nearby.

Legal Status: Forest and Range Practices Act, Community Charters Act.

Impacts:

Agricultural: Knotweeds can be eaten by grazing animals.

Ecological: Dense stands may compete with and replace native vegetation.

Human: Knotweeds have been used as landscape ornamentals.

Habitat: Adapted to moist conditions and to a variety of soil types; generally shade intolerant. Disturbed sites, roadsides, streams banks, ditches, wetlands, riparian areas, railroad and utility corridors

Status and Distribution: Widespread in all Regional Districts except Capital where it is common. Most common in CDFmm, CWHxm and CWHvm but present in CWHvh and CWHdm.

Management Strategy: Eradicate new infestation where feasible. Contain or control existing populations. Once established, knotweeds are extremely difficult to control; the rhizomes extend meters beyond the clones and they can regenerate from tiny fragments. Digging or hand-pulling can result in plants re-sprouting. Cutting, mowing, grazing and foliar herbicides can reduce top growth but repeated treatments are required for long-term control.

Policeman's Helmet (*Impatiens glandulifera*)

Family: Balsaminaceae (Balsam or Touch-me-not).

Other Scientific Names: *Impatiens roylei.*

Other Common Names: Himalayan balsam, Ornamental jewelweed.

Origin: India and the western Himalaya.

Growth Form/Reproduction: Annual. Seeds; plants have explosive seed capsules.

Legal Status: Community Charters Act.

Impacts:

Agricultural: Grazed by cattle and sheep.

Ecological: Himalayan balsam dominates vegetation of watercourses because of its tall stature (3 m), rapid growth and high seed production and dispersal. It exposes soils of stream banks to erosion once it dies back in autumn; the week root system is inadequate to protect against high winter flows.

Human: Landscape ornamental.

Habitat: Partially shade tolerant. Tolerates a wide range of soil condition; requires high soil moisture. Grows from low- to mid-elevations; cold temperatures may limit distribution. Disturbed sites, roadsides, riparian areas, streambanks, and meadows.

Status and Distribution: Present in all CIPC Regional Districts; common in Comox Valley, limited in other districts. Most common in CWHxm but also reported in CDFmm and CWHvm.

Management Strategy: Eradicate or contain plants to present sites. Policeman's helmet has a shallow root system and can be easily pulled. Effective control of this plant depends on controlling seed production since seeds are catapulted through the air great distances and the buoyant seeds travel easily along watercourses. Mowing or pulling should be done before seeds appear and treatments should begin upstream. Repeated treatments are required the following year since in-ground seeds remain viable. Intensive grazing may provide efficient control but riparian areas may be damaged. No biological controls are available and chemical control.

Yellow Flag Iris (*Iris pseudacorus*)

Family: Iridaceae (Iris).

Other Common Names: Yellow flag iris, paleyellow iris.

Origin: Europe.

Growth Form/Reproduction: Perennial. Seeds and vegetatively from rhizomes.

Legal Status: Forest and Range Practices Act, Community Charters Act.

Impacts:

Agricultural: Mildly poisonous to livestock but they usually avoid the plant. Plants can obstruct irrigation canals and block water pipes.

Ecological: Thick rhizomatous mats of dense colonies displace native vegetation and alter wildlife habitat.

Human: All plant parts are poisonous if ingested; contact with plant resins can cause skin irritation. Landscape ornamental.

Habitat: Moist ditches, wetlands, meadows and margins of ponds, lakes and stream banks.

Status and Distribution: Widespread in Nanaimo and Cowichan Valley, common in Comox Valley and Capital, spot occurrences in Mount Waddington and Powell River, not found in Alberni-Clayoquot. Most common in CDFmm and CWHxm but also present in CWHvm and CWHvh.

Management Strategy: Small populations can be excavated and removed. Remove seed heads on large populations to prevent seed production. Remove top growth to expose rhizomes, using sharp tool such as mattock cut to full depth, remove complete strips with mattock or crow bar. Follow up is necessary to check for re-sprouting.

Control

Established infestations are widespread throughout the CIPC region.

Focus control in high value conservation areas. Use biocontrol, if available, on a landscape scale.

Burdock (*Arctium* spp.)

Family: Asteraceae (Sunflower).

Other Scientific Names: Two introduced species in BC: *Arctium lappa, A. minus.*

Other Common Names: Common burdock, great burdock, lesser burdock, wild burdock, bardane, wild rhubarb, beggar's button.

Origin: Eurasia.

Growth Form/Reproduction: Biennial. Seeds.

Legal Status: Weed Control Act (Regional), Forest and Range Practices Act.

Impacts:

Agricultural: Intolerant of cultivation; not a problem in crops. Invades pastures and hayfields. Livestock eat common burdock but the foliage can impart a bitter taste to the milk. Burs can become entangled in the fleece of sheep reducing quality and value.

Ecological: Because of its biennial growth habit, common burdock is often confined to areas that are not severely disturbed on an annual basis.

Human: Common burdock is regarded as poisonous because of its diuretic effects.

Habitat: Adapted to a wide range of soil conditions in moist habitats from low- to high-elevations. Tolerant to partial shade. Roadsides, ditches, stream banks, pastures and riparian areas.

Status and Distribution: Present in all CIPC Regional Districts; widespread in Capital and Strathcona, common in Comox Valley, Cowichan Valley and Nanaimo, limited in Alberni-Clayoquot, Powell River and Mount Waddington. Most common in CDFmm and CWHxm, present in CWHvh and MHmm. Common along the Cowichan River.

Management Strategy: Prevention by seeding and minimizing soil disturbance. Small patches of newly established plants can be eradicated by hand-pulling seedlings and rosettes. Mowing and cutting seed heads will reduce seed production. Picloram, dicamba, glyphosate, and 2,4-D are effective, especially at the rosette stage.

Canada Thistle (*Cirsium arvense*)

Family: Asteraceae (Sunflower).

Other Common Names: Field thistle, Californian thistle.

Origin: Eurasia.

Growth Form/Reproduction: Perennial. Seeds and vegetatively from rhizomes.

Legal Status: Weed Control Act, Forest and Ranges Practices Act, Community Charters Act.

Impacts:

Agricultural: Infests crops, pastures, rangelands, roadsides, and riparian areas.

Ecological: Spreads rapidly from rhizomes that give rise to shoots. Its root system can grow up to 5.5 m annually but usually patches spread about 1-2 m per year. Can form dense patches and virtual monocultures.

Human: Thickets of prickly foliage can restrict recreational access to infested areas.

Habitat: Adapted to a wide range of soil types, environmental conditions and elevations. Best adapted to rich, heavy loam, clay loam, and sandy loam soils; tolerates slightly saline soils. Partially shade tolerant. Roadsides, pastures, fields, meadows, wetlands; utility corridors, forest edges, logged forests, and forest openings.

Status and Distribution: Widespread throughout the entire CIPC region. Most common in the CDFmm and CWHmm, present in the CWHvm, CWHvh and CWHdm.

Management Strategy: Prevention by seeding and minimizing soil disturbance. Contain existing populations by repeated mowing, which removes seed heads but plants can re-sprout from extensive root systems. Spring and autumn applications of clopyralid or dicamba/2,4-D mix can be effective on small patches. Two biocontrol agents are available for larger patches. Monitoring biocontrol agents released to determine agent status and efficacy.

Common Tansy (*Tanacetum vulgare*)

Family: Asteraceae (Sunflower).

Other Common Names: Garden tansy.

Origin: Europe.

Growth Form/Reproduction: Perennial. Seeds and vegetatively from rhizomes.

Legal Status: Weed Control Act, Forest and Range Practices Act, Community Charters Act.

Impacts:

Agricultural: May be toxic to livestock; reduces available forage in pastures.
Ecological: Thick stands replace native grasses and herbs and reduce wildlife habitat.
Human: Can be toxic if large quantities are consumed; may cause dermatitis.

Habitat: Adapted to full sun and fertile, well-drained soil at low- to mid-elevations. Disturbed sites, roadsides, ditches, stream banks, lakeshores, riparian areas, pastures.

Status and Distribution: Present in all CIPC Regional Districts with heaviest concentrations along East Vancouver Island. Widespread in Comox Valley, Nanaimo, Cowichan Valley and Strathcona, Common in Alberni-Clayoquot, Capital, Mount Waddington and Powell River. Most common in the CWHxm and CDFmm. Present in CWHvm, CWHvh, CWHdm, and MHmm.

Management Strategy: Priority should be given to control and containment of populations near or in riparian habitat. These populations should be eradicated where possible but limiting their dispersal along riparian corridors should be prevented. Small plants can be pulled and excavated. Cutting reduces seed production. Picloram, dicamba and glyphosate can be effective early in growth.

Dalmatian Toadflax (*Linaria genistifolia* spp. *dalmatica*)

Family: Scrophulariaceae (Figwort).

Other Scientific Names: *Linaria dalmatica* (L.) Miller.

Other Common Names: Broad-leaved toadflax, wild snapdragon.

Origin: Europe.

Growth Form/Reproduction: Perennial. Seeds and vegetatively from horizontal roots.

Legal Status: Weed Control Act, Forest and Range Practices Act, Community Charters Act.

Impacts:

Agricultural: Low-till cultivation practices have contributed to the resurgence of toadflax populations on agricultural lands. Toxic to livestock but is generally considered unpalatable and reports of livestock poisonings are rare.

Ecological: Dalmatian toadflax is capable of forming dense populations through creeping root systems. Populations may compete with native plant species and alter species composition of natural communities. Toadflax can also reduce forage production for livestock and other ungulates.

Human: No information available.

Habitat: Adapted to a wide range of environmental conditions; tolerates low temperatures and coarse-textured soils. Disturbed sites, roadsides, cultivated fields, open forest.

Status and Distribution: Common in Cowichan Valley, Comox Valley and Nanaimo; rare in Capital and Strathcona. Present in CDFmm and CWHxm.

Management Strategy: Cutting reduces seed production but cutting and hand-pulling are generally not effective in killing plants. Autumn applications of picloram and 2,4-D have been effective on small patches. The biocontrol agent Mescinus janthinus has been released in the CIPC area.

English Holly (*Ilex aquifolium*)

Family: Aquifoliaceae (Holly).

Other Common Names: None.

Origin: Eurasia.

Growth Form/Reproduction: Evergreen shrub or small tree. Seed (berries) dispersed by birds, also spreads by suckering or layering; can re-sprout from stumps.

Legal Status: None.

Impacts:

Agricultural: Grown for Christmas decorations in the florist trade.

Ecological: Can form dense thickets in deciduous, coniferous or mixed forests. Tall shrubs create deep shade difficult for some native plants to grow in.

Human: Prickly leaves can hinder recreational use. Berries are poisonous (an emetic). Grown as an ornamental plant.

Habitat: Moist forests at low elevations. Prefers shade but can tolerate sun. Grows best on sandy or gravelly well-drained soils.

Status and Distribution: Common in Comox Valley and Strathcona, limited in Capital and Cowichan Valley. Reported in the CDFmm, CWHxm, CWHvh and CWHvm.

Management Strategy: Hand-pull small seedlings. Cut mature trees at ground level, being sure to remove all plant material including berries which contain seeds. Monitor cut stumps for regrowth. Foliar herbicides are not effective because of waxy leaves but direct application to cut stumps can be effective.

English Ivy (*Hedera helix*)

Family: Araliaceae (Ivy).

Other Common Names: None.

Origin: Eurasia.

Growth Form/Reproduction: Evergreen vine/shrub. Seeds dispersed by birds, also vegetatively by cuttings and rooting vines.

Legal Status: Community Charters Act.

Impacts:

Agricultural: No information available.

Ecological: Dense patches covering the ground shade and smother native plants and may introduce pathogens. The heavy weight of the arborescent forms can topple trees in wind storms.

Human: Grown as an ornamental plant. Poisonous if ingested.

Habitat: Forest floors and trees at low elevations; disturbed areas. Adapted to a wide range of conditions including drought, heat and wide pH range. Best adapted to moist, well-drained soils in part sun.

Status and Distribution: Present in all CIPC Regional Districts. Widespread in Mount Waddington and Strathcona and common in remaining Regional Districts. Most common in the CDFmm, CWHvm and CWHxm; also present in the CWHvh.

Management Strategy: English Ivy has two growth stages, the juvenile form where is grows as a vine along the ground, the arborescent form where it forms thick woody stems and grows up into trees. The vines can be hand-pulled with difficulty; treatment must be repeated many times. The upper portions of arborescent forms can be killed by cutting above ground. All removed portions should be disposed of at landfills and not be composted. No biocontrol agents are available.

Hairy Cat's Ear (*Hypochaeris radicata*)

Family: Asteraceae (Sunflower).

Other Common Names: Flat weed, false dandelion, common cat's ear.

Origin: Mediterranean.

Growth Form/Reproduction: Perennial. Seeds and from crowns and root segments.

Legal Status: None.

Impacts:

Agricultural: Infests pastures reducing productivity. Ingestion of large amounts can result in Australian Stringhalt (lameness) in horses. Can infest legume and seed crops.

Ecological: Common and persistent invasive plant of Garry Oak ecosystems, can displace native plants especially in open areas.

Human: Nuisance plant of lawns.

Habitat: Adapted to a wide range of habitats but does best in open (sunny), disturbed sites. Grows in lawns, pastures, meadows, roadsides, river banks and waste places.

Status and Distribution: Common in most of CIPC area but limited occurrence in Mount Waddington and Powell River Regional Districts.

Management Strategy: Plant is persistent and will return following treatments via airborne seeds, so best to control when it first appears. Small infestations can be hand dug taking care to remove crown. Larger populations can be controlled with either repeated cultivation (plowing) followed by reseeding, or, cultivation followed by solarization (plastic cover on soil). Foliar application of 2,4-D, dicamba and clopyralid can give good control and is best applied when plant is in rosette stage; spot spraying reduces injury to non-target species. No biocontrol agents are available.

Himalayan Blackberry (*Rubus discolor*)

Family: Rosaceae (Rose).

Other Scientific Names: *Rubus procerus, R. fruticosa, R. armeniacus*.

Other Common Names: None.

Origin: Asia.

Growth Form/Reproduction: Medium to tall evergreen shrub. Seeds and vegetatively from rooting stem tips and sprouts from root buds.

Legal Status: Community Charters Act.

Impacts:

Agricultural: Can establish on pastures and reduce access to grazing animals.

Ecological: Can complete with low-growing native vegetation and regenerating conifers through shading and deposits of plant litter. On stream banks and channels, large thickets replace more deeply-rooted vegetation, which may increase the risk of flooding and erosion.

Human: Dense impenetrable thickets can hinder access for recreational activities. Thickets reduce sight lines along right-of-ways. Berries are used as a food source.

Habitat: Tolerates a wide range of soil moisture conditions. Well adapted to rich, well-drained soils but can grow on infertile soils of varying textures. Does best in full sun but tolerates a range of light conditions. Forms dense thickets on disturbed sites along roadsides, fence lines, pastures, forest plantations, streambanks, riparian areas, and utility corridors.

Status and Distribution: Widespread throughout the CIPC area except in Alberni-Clayoquot where it is common. Most common in CDFmm and CWHxm but also present in CWHvm, CWHvh, CWHdm and MHmm.

Management Strategy: Control is very difficult especially on mature plants and established populations. Immediate eradication of new and small infestations should be a high priority. Hand-pulling and cutting are effective on young plants but brush cutters, weed-eaters and power saws are required for mature plants, and follow up treatments are often required. All plant material must be disposed of by burning or being deeply buried at a landfill. Several herbicides have been used with varying effectiveness including picloram, dicamba, triclopyr ester and amine, and 2,4-D. Spot application on foliage or stem injection/cut surface application is recommended to minimize non-target species injury. No biological control is available because of risk to closely related crop species.

Orchardgrass (*Dactylis glomerata*)

Family: Poaceae (Grass).

Other Common Names: Orchard grass, Orchardgrass, Cocksfoot

Origin: Europe.

Growth Form/Reproduction: Perennial bunchgrass. Seeds.

Legal Status: Community Charters Act.

Impacts:

Agricultural: Important agronomic plant for hay and pastures.

Ecological: Common in Garry Oak ecosystems where it can complete directly with native vegetation. Dense litter produced by this plant also may hinder regeneration of native plants.

Human: Used in grass-seed mixes for erosion control on clearings and road cuts.

Habitat: Dry meadows, Garry Oak woodlands, pastures, roadsides and disturbed areas; both shade and drought tolerant.

Status and Distribution: Widely distributed throughout most of the CIPC area and is most common on the southern half of Vancouver Island.

Management Strategy: A number of controls have been used for managing orchard-grass in Garry Oak ecosystems. Flaming with a roof torch, or cutting below the plant crown can be used on isolated plants or small patches. Mowing can be used on larger areas after the wild flowers have bloomed but repeated mowing is required annually and over several years. Ploughing or the use of barriers such as landscape fabric is recommended in areas with no native species. All treatment methods to be followed with immediate seeding or planting of native species and sites require monitoring afterwards. Biocontrol agents are not available.

Periwinkle Species (*Vinca major, V. minor*)

Family: Apocynaceae (Periwinkle).

Other Common Names: *V. major* - Bigleaf periwinkle, big periwinkle; *V. minor* - Small periwinkle, common periwinkle.

Origin: Eurasia.

Growth Form/Reproduction: Trailing evergreen perennials. Primarily vegetative reproduction from freely rooting stems and root fragments; can be dispersed by water. Seeds often not viable.

Legal Status: None.

Impacts:

Agricultural: No information available.

Ecological: In moist, shady habitats dense mats of periwinkle can compete with native vegetation and can interfere with regeneration of trees and shrubs.

Human: Used in landscapes as ornamental ground cover; medicinal uses.

Habitat: Moist, shady forests, along streams, roadsides and urban areas. Well adapted to shady areas with deep, rich soils but also grows on poor soils.

Status and Distribution: Both species are widespread in the CIPC area. Small periwinkle is found in the Capital, Cowichan Valley, Nanaimo, Comox Valley and Powell River Regional Districts, but it is probably found in all regional districts. Big periwinkle also is widespread and probably found in all regional districts but has been reported in the Capital and Cowichan Valley Regional Districts.

Management Strategy: All stolons and root nodes must be killed or removed for effective control. Hand removal can be effective but is difficult and requires regular monitoring to check for resprouting. Cutting or mowing alone is not recommended but can be effective when combined with an application of glyphosate. Follow-up treatments may be required in fall and again the next spring. No biocontrol agents are available.

Purple Loosestrife (*Lythrum salicaria*)

Family: Lythraceae (Loosestrife).

Other Common Names: Purple lythrum.

Origin: Eurasia.

Growth Form/Reproduction: Herbaceous perennial. Seeds and vegetatively from rhizomes.

Legal Status: Forest and Range Practices Act, Community Charters Act.

Impacts:

Agricultural: Can infest damp pastures and block agricultural drainages.

Ecological: An ornamental escape that occupies wetlands, stream banks and shallow ponds. It can form dense stands that reduce plant and animal diversity in wetland ecosystems. Dense infestations can impede water flow in canals and ditches.

Human: Ornamental landscape plant. Can impede recreational activities along waterways.

Habitat: Tolerates a variety of light and soil conditions from calcareous and acidic soils, and from low- to mid-elevation. Moderately shade tolerant, grows in standing water. Ditches, irrigation canals, marshes, stream and lake shores, and wetlands.

Status and Distribution: Common in Comox Valley, Strathcona and Alberni-Clayoquot, limited distribution in Nanaimo and Cowichan Valley. Present in the CDFmm and CWHxm.

Management Strategy: New colonies with small populations can be controlled with digging or pulling plants before seed set. Removing seed heads by hand-pulling or cutting can reduce the number of seeds entering the seed bank. Biological control can be used on larger and inaccessible infestations but will not eradicate the plant. No herbicides are registered for use on this species.

Scotch Broom (*Cytisus scoparius*)

Family: Fabaceae (Pea).

Other Common Names: European broom, Scots broom, Irish broom, English broom, broomtops, common broom.

Origin: Europe.

Growth Form/Reproduction: Medium to tall deciduous shrub. Seeds and resprouting from cut stems.

Legal Status: Forest and Range Practices Act, Community Charters Act.

Impacts:

Agricultural: Scotch broom can invade pastures replacing forage plants. Flowers used as food source by honeybees.

Ecological: Dense stands may be affecting understory species in Garry Oak woodlands. Scotch broom may compete with conifer seedlings and hinder establishment of Douglas-fir.

Human: Ornamental landscape plant.

Habitat: Shade intolerant. Adapted to a wide range of soil conditions from coarse textured, seasonally dry, soils to sites with low to moderate fertility. Does best on exposed, mineral soils. Disturbed sites, moist to dry fields, rocky slopes, roadsides, rail road and utility corridors, and logged areas at low- to mid-elevation

Status and Distribution: Widespread throughout entire CIPC region, especially along coastal southern and eastern Vancouver Island and along main road and utility corridors. Most common in the CDFmm, CWHxm and CWHvm but also present in the CWHvh, CWHdm, MHmm and CMAunp.

Management Strategy: Small plants can be hand-pulled while large plants can be cut to ground level. Roundup or 2,4-D can be effective on seedlings or, when applied with a diesel oil surfactant to cut stems on mature plants. Triclopyr, picloram, 2,4-D and glyphosate have some success but follow-up treatments are required. Non-target damage can be minimized by spot spraying or using basal stem injection or cut-surface application. Sites require repeated treatments over a number of years because of the large accumulation of seed in the seed bank and because plants can regenerate from stumps and roots. Minimize soil disturbance to prevent the creation of new seedbeds. No biocontrol agents are available in BC.

Spotted Knapweed (*Centaurea biebersteinii*)

Family: Asteraceae (Sunflower).

Other Scientific Names: *Centaurea maculosa.*

Other Common Names: None.

Origin: Europe.

Growth Form/Reproduction: Perennial. Seeds.

Legal Status: Weed Control Act, Forest and Range Practices Act, Community Charters Act.

Impacts:

Agricultural: Spotted knapweed reduces or displaces desirable forage plant species and reduces carrying capacity for livestock and wildlife.

Ecological: Spotted knapweed is a highly competitive weed that invades disturbed areas and degrades desirable plant communities. It forms near monocultures in some areas of western North America including BC. Although spotted knapweed is usually found in disturbed areas, it may invade adjacent areas that are relatively undisturbed.

Human: Spotted knapweed can cause skin irritation. Dense stands can reduce access to recreational areas.

Habitat: Adapted to well-drained, light to coarse-textured soils at low- to mid-elevation in grasslands and dry open forests. Intolerant of dense shade; best adapted to 30 -75 cm annual precipitation but survives in very dry climates.

Status and Distribution: Present in all CIPC Regional Districts; widespread in Nanaimo and Comox Valley, common in Strathcona and limited distribution in other regional districts. Most common in the CDFmm and CWHxm but also present in CWHvm and CWHdm.

Management Strategy: Plants can be hand-pulled or excavated on small patches and new infestations. Picloram, dicamba, clopyralid, glyphosate and 2,4-D are all effective on seedlings, rosettes and mature plants. Biological control agents are available for larger patches.

St. John's-wort (*Hypericum perforatum*)

Family: Clusiaceae (St. John's wort).

Other Common Names: St. John's-wort, Klamath weed, goatweed.

Origin: Eurasia.

Growth Form/Reproduction: Perennial. Seed, rhizomes below ground and creeping stems above ground.

Legal Status: Forest and Range Practices Act, Community Charters Act.

Impacts:

Agricultural: Invades grazed and disturbed sites. In dense stands, it reduces livestock and wildlife forage. The plant contains a toxin that causes skin irritation and blistering in light-colored livestock when they are exposed to sunlight.

Ecological: Dense stands can displace native plants.

Human: Contact with sap can cause irritation when skin is exposed to sun. Ornamental plant. Medicinal uses.

Habitat: Disturbed sites in grasslands and open forest**,** moist to dry fields and pastures, roadsides.

Status and Distribution: Widespread throughout the entire CIPC region, especially along major road corridors. Most common in CWHxm, CDFmm and CWHvm, present in the CWHvh, CWHdm and MHmm.

Management Strategy: This species is considered to be under biological control but some populations of the plant are out of phase with the agents. Tillage can control the plant in agricultural fields. Combinations of 2,4-D and picloram, or 2,4-D and glyphosate have produced control in the US. Several biocontrol agents are available to control large infestations. Monitor sites to confirm agents are present and the plant is not dispersing.

Tansy Ragwort (*Senecio jacobaea*)

Family: Asteraceae (Sunflower).

Other Common Names: Common ragwort.

Origin: Eurasia.

Growth Form/Reproduction: Biennial or short-lived perennial. Seed.

Legal Status: Weed Control Act, Forest and Range Practices Act, Community Charters Act.

Impacts:

Agricultural: Tansy ragwort can reduce forage production of pastures. Contains alkaloids which can poison livestock but livestock usually avoid the plant. Animals can be affected through contaminated hay or silage.

Ecological: Primarily a weed of agricultural land but has been appearing on coastal clear cuts in BC. Generally a pioneer of disturbed sites which can hinder colonization by native species; may compete with native grasses and forbs.

Human: Trace amounts of alkaloids appear in milk and honey produced from infested pastures.

Habitat: Best adapted to open sunlight and moist habitats. Tolerant of partial shade and a wide range of soil conditions. Disturbed sites, roadsides, pastures, hay fields, recently harvested forest sites.

Status and Distribution: Widespread in Nanaimo, Cowichan Valley and Capital Regional Districts. Common in Powell River, Strathcona and Mount Waddington; limited in Comox Valley and Alberni-Clayoquot. Most common in CDFmm and CWHxm but also present in CWHvm, CWHvh and CWHdm.

Management Strategy: Small plants can be hand-pulled. Thorough and frequent mowing prevents the plant forming seed. Good pasture management will improve competitive ability of agronomic species. Dicamba and 2,4-D, alone or in combination, can control seedlings and young plants. Biocontrol agents are available.