SUMMARY REPORT: *City of Campbell River Invasive Plant Management and 5-Year Implementation Plan*

Prepared by:
Coastal Invasive Species Committee
www.coastalisc.com
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COASTAL ISC
Invasive Species Committee

City of Campbell River

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Acknowledgements

Many people have contributed to invasive plant management in the City of Campbell River over the last 12 years. Participants include City staff Grant Parker, Terri Martin, Lynn Wark (Baikie Island), as well as Greenways Land Trust staff, volunteers and board members. In particular, board member Sandra Milligan has made invasive plant management a major focus of her professional development at North Island College. The BroomBusters volunteers and leaders, Morgan Ostler and Carol Couture, have coordinated and engaged the community to tackle multiple "cut broom in bloom" events in recent years. The Nature Conservancy of Canada has provided substantial support for invasive plant control and restoration efforts in the Baikie Island area, along with Jim Van Tine and Dave Cunnings. In total, over 600 volunteer community hours each year have contributed to reducing the negative impact of invasive species in the city.

This project was managed by Rachelle McElroy, Coastal ISC and Cynthia Bendickson, Coastal ISC and Greenways Land Trust.

Executive Summary

Alien invasive species cause negative impacts to human health and safety, to the economy and to the environment. Local governments play a key role in minimizing the negative impacts invasive species have on communities by enacting bylaws, communicating with the public, acting as community leaders, and providing programs and services. Collecting invasive species data enables informed decision-making to ensure efficient use of resources for treating, disposing and monitoring invasive species infestations.

The Coastal Invasive Species Committee (Coastal ISC) was asked by the City of Campbell River (City) to inventory a number of priority municipal environmentally sensitive lands, summarize management efforts in the community, develop an invasive plant management implementation plan (five years) and recommend additional next steps. The goal of this project is to summarize existing invasive plant management activities taking place within the city in partnership with community groups, inventory priority invasive plants growing on municipal environmentally sensitive areas, and enter inventory data into the Provincial Invasive Alien Plant Program Database (IAPP) for planning, monitoring and decision making in line with the City's Invasive Plant Species Management Policy.

Inventory was prioritized to cover key City municipal environmentally sensitive areas to IAPP standards given resource constraints. The chosen sites are where priority invasive plant species are known to occur in important ecological areas where plant spread would undermine ecological function and thwart past conservation efforts. In addition, a selection of sites was included in the report where inventories have not been conducted and where the presence of priority invasive plant species was suspected.

Information from community groups was collated along with the IAPP inventory data to determine a series of recommendations and to suggest steps over the next five years for implementation of invasive plant management.

1 Introduction

1.1 Local Government and the Invasive Plant Problem

In 1998, the World Conservation Union declared invasive species as the second highest threat to biodiversity world-wide, second to human driven habitat loss. In coastal BC, invasive non-native (alien) plant infestations are recorded in the tens of thousands (IAPP database 2014).

Vancouver Island and the surrounding coastal communities possess some of the world's most diverse and rare ecosystems which support many rare and endangered species. As a gateway to the province, this region has numerous pathways of invasion and countless methods for invasive plant spread. Many high traffic areas including roadways, trails and parks already suffering from intense use are becoming increasingly vulnerable to the exposure of invasive alien plants.

Invasive alien plants are brought to Canada, either accidentally or intentionally, and include species such as Purple loosestrife, Japanese knotweed, and Scotch broom. These plants have the ability to establish quickly and are highly competitive due to prolific seed production, deep taproots, or early flowering. Because they arrive in Canada without their natural predators to keep them in balance, they can spread rapidly, forming dense patches over large areas and often displacing native plants.

Since animals rarely eat these plant species, infestations can impact wildlife habitat and high value conservation areas. Invasive plants can have huge economic impacts by competing with desirable agricultural crops and forest plantations. They can also pose significant threats to human health and safety by causing skin irritation or burns and reducing visibility along transportation corridors.

Social, economic and environmental impacts of various invasive plants and their geographic location are important to consider when land managers are drafting treatment plans, for instance:

- Invasive plants with associated human health and safety concerns are toxic to humans, given a higher priority in public areas;
- Plants that pose potential threat to infrastructure or sight lines and are located in transportation corridors and near bridge footings or building foundations are targeted for treatment;
- Similarly, fast growing and destructive invasive plants that are found in high value conservation areas or near watercourses are of greater concern as they can negatively impact fish habitat.

The top 10 reasons for local government to address invasive plant management[1] include:

1. **Property Value** – Invasive plants (IP) can reduce property value by leaving properties unsightly and damaging foundations (e.g. Japanese knotweed).
2. **Recreation** – IP can remove the recreational value from parks by inhibiting access to trails, rivers and lakes, puncturing tires (e.g. Himalayan blackberry) and reducing the aesthetic value.
3. **Human Health and Safety** – IP can pose health and safety risks to humans (Giant hogweed) and/or livestock (e.g. Tansy ragwort).
4. **Range, Agriculture and Forestry** – IP can outcompete tree seedlings, reducing yields, and introduce pests and diseases into crops.
5. **Economic Impacts** – In BC, the economic impact of seven invasive plant species, in the absence of any management, was estimated to be a minimum of $65 million in 2008, and is forecasted to rise to $139 million by 2020.
6. **Biodiversity** – In 1998, the World Conservation Union declared invasive species to be the second largest threat to biodiversity on the planet, second to human driven habitat loss.
7. **Fire Hazard** – Some IP are extremely flammable (e.g. Scotch broom) due to the high oil content.
8. **Rapid Spread** – IP will generally increase their distribution area an average of 14% annually.
9. **Compliance with Regulation** – Uncontrolled IP infestations may place local governments in contravention of provincial and federal laws. IP are regulated under the BC *Weed Control Act* (associated Regulated Noxious Weed List), *Integrated Pest Management Act* and *Forest and Range Practices Act*.
10. **Good Neighbour** – Since "invasive plants know no boundaries" collaboration and consistent invasive plant management between neighbouring jurisdictions is an important strategy.

Invasive species are gaining global recognition as a serious threat due to their impact and rapid spread. International, national and provincial regulations have been developed to address this problem. Local governments can play a key role in addressing invasive plant issues and thereby safeguard the negative impacts on communities.

1.2 About the Coastal Invasive Species Committee

The Coastal Invasive Species Committee (Coastal ISC) is a registered non-profit society (2005) serving the geographic areas of Vancouver Island, the Gulf Islands and the Regional Districts of

[1] ISCBC 2014. Invasive Species Toolkit for Local Government

Powell River, Sunshine Coast, Mount Waddington and Strathcona, reaching the mainland coast. Refer to *Figure 1 – Coastal ISC Service Area Map*. The Coastal ISC is one of 17 Regional Weed Committees working collaboratively in British Columbia; each committee is responsible for managing invasive species in their region.

The vision of the Coastal ISC is that communities, resources and ecosystems in the Coastal ISC service area are protected from the negative impacts of invasive alien species.

FIGURE 1: COASTAL ISC SERVICE AREA MAP

The Coastal ISC takes a leadership role to reduce the negative impacts of invasive alien species through:

- **Outreach and Education**: Working with community members, local governments, First Nations, industry, land managers, and others to exchange information and raise awareness about the impacts from, and management of, invasive alien species.
- **Collaboration**: Promoting efficient, cooperative management of invasive alien species.
- **Advice**: Providing advice and building capacity to manage invasive alien species.
- **Management**: Providing services to manage invasive alien species.
- **Support**: Seeking funding and other support to achieve the vision.

The Coastal ISC is able to pool funding from provincial and local government, and utilities (BC Hydro and Fortis BC Energy) to offer contracts to local invasive plant management area (IPMA)[2] contractors. Pooling resources is an efficient way to ensure more funds go towards invasive species management, minimizing travel time between sites and the point of commencement.

Currently, regional partnership consists of sub-committees to the Coastal ISC board of directors in the south island (the Capital Region Invasive Species Partnership or CRISP) and the North Island Invasive Species Partnership (NIISP). Regional partnerships are mutually beneficial. From Coastal ISC's perspective, information is shared and regional intimacy of local issues and knowledge is provided, and from the regional partnership perspective, benefits include a broader Island overview, stability, leadership and knowledge.

The City of Campbell River resides in the North Island IPMA and is part of the North Island Invasive Species Partnership (NIISP).

[2] The Coastal ISC service area is divided in four IPMAs by Regional District boundary. The South Island IPMA includes the Capital Regional District and the Cowichan Valley Regional District; the Central Island IPMA includes the Regional District of Nanaimo and the Port-Alberni Clayoquot Regional District; the North Island IPMA includes the Regional District of Strathcona and Mount Waddington; and the Sunshine Coast IPMA includes the Sunshine Coast and Powell River Regional Districts. The Coastal ISC is also committed to hiring and training local contractors, including First Nations groups and further benefiting coastal communities.

1.3 Invasive Plant Management in Campbell River

1.3.1 City of Campbell River

The City of Campbell River is committed to reducing the negative impacts of invasive plant species in the community. This is upheld by an *Invasive Plant Species Management Policy*[3] to guide management efforts and to help meet the requirements of the *Weed Control Act*[4]. The City also recognizes the importance that partnerships with non-profit organizations (NPO), community associations and interest groups play in meeting the challenge invasives pose. This report forms part of a deliverable, a strategic action identified in the *SCR Framework: Campbell River's Integrated Community Sustainability Plan*[5], to help coordinate invasive plant management efforts in a strategic and thoughtful direction.

Currently the City's response to the threat of invasive plant species has been strong but somewhat ad-hoc. Noxious weeds are referenced in the City's *Public Nuisance Bylaw 3543, 2014*[6], and in the City's Official Community Plan General Development Guidelines[7]. Other ways the City is working to control the spread of invasive plants includes efforts to manage yard waste and address illegal dumping.

Partnerships with community groups are also important to the City's management efforts; predominately Greenways Land Trust, BroomBusters and the Nature Conservancy of Canada, and the Coastal ISC. City park staff have been involved with managing Giant hogweed in City parks, Yellow flag iris on Baikie Island and attended invasive plant training in 2012, provided by the Coastal ISC.

[3] City of Campbell River Environmental Policy
[4] BC Weed Control Act
[5] SCR Framework: Campbell River's Integrated Community Sustainability Plan
[6] Public Nuisance Bylaw 3543, 2014
[7] General Development Permit Guidelines, City of Campbell River, 2012

1.3.2 Greenways Land Trust

Greenways Land Trust has taken an active role in invasive plant management in Campbell River for over 10 years. Greenways' focus is on matching community and school groups invasive removal activities to environmentally sensitive areas (ESAs). Greenways plants of concern have included Himalayan blackberry, Scotch broom, English ivy, Purple loosestrife and Yellow flag iris. Since 2012, GLT and the City have operated a Knotweed program in partnership with Sellentin Habitat Restoration and Invasive Species Management. Key invasive plant data produced by GLT is included in the results section of this report.

In 2014 Greenways volunteers contributed over 600 hours on invasive plant removal, including 168 hours dedicated through their annual Broom Bash, now in its 12th year. Greenways invasive removal projects have been bolstered through the establishment of a volunteer coordinator and the City picks up and disposes of plant material generated during these events.

In addition, the City has partnered with Greenways Land Trust (GLT) on the management of properties with ecological values, including invasive plant management. This is an important and valued partnership.

In 2012 Greenways initiated inventory and treatment of all knotweed infestations and continued management of these treatments through 2014, using funding from BC Hydro, TD Friends of the Environment and the City. Other successful funding applications have led to invasive plant removal and planting of 500 trees and shrubs on Myrt Thompson trail, 2012 (Evergreen Canon Take Root).

Educational projects included a workshop for City roads and parks crews in September 2012, as well as regular community notices and articles in the local media on invasive plant removal. Greenways volunteers and staff have participated in the Coastal ISC Forum and Annual General Meeting (AGM) and workshops for the past four years.

Greenways staff, volunteers and City staff began to discuss the idea of conducting invasive plant inventories at a meeting held on April 27, 2012 and since then inventories have formed an essential part of invasive plant management efforts.

1.3.3 BroomBusters

BroomBusters first formed in the city in 2012 and they have been very active since that time. Volunteers have cleared all four of the major entrances to the city, a section of Gold River Hwy near Haig-Brown House and all of South Dogwood Street through the Beaver Lodge Forest Lands to the Jubilee Parkway. The 2015 focus was on additional broom removal along the Jubilee Parkway. While

BroomBusters tends to work independently in a variety of locations around the community, City staff has been able to pick up and dispose of most Broom piles; staffing and resources sometimes limit the ability for complete removal.

2 Integrated Invasive Plant Management Overview

2.1 Management Components

Integrated invasive plant management is a realistic and achievable approach to invasive plants that makes efficient use of available resources while minimizing the negative impacts invasive plants have on human health and safety, ecosystems and the economy. Collaboration, education, outreach and regulation play a key role in successful programming.

Eight steps in integrated invasive plant management[8] include:

1. **Public Outreach** – To raise awareness about invasive plants and their impacts.
2. **Prevention** – To prevent new infestations and spread of existing ones.
3. **Landowner and Land Manager Incentives** – To provide incentives for landowners to encourage invasive plant management.
4. **Early Detection, Rapid Response (EDRR)** – To detect and eradicate species that are new invaders "Alert" species.
5. **Inventory and Data Management** – To identify invasive plant species and sites of concern.
6. **Prioritizing and Planning** – To assess which species to address, and when, where and how.
7. **Treatment, Disposal, and Monitoring** – To contain or control existing infestations (using mechanical, biological, cultural, and/or chemical control methods). To evaluate the effectiveness of invasive plant management activities and to adjust as necessary.
8. **Regulation** – To regulate and enforce activities to control the introduction and spread of invasive plants.

The Coastal ISC is addressing step 5, Inventory and Data Management and 6, Prioritizing and Planning in this report; however, steps 1-4, 7 and 8 form an integral part of an effective integrated invasive plant management program and these are discussed in the implementation section.

[8] Invasive Species Management for Local Government, ISCBC 2014

2.2 Inventory and Data Management

2.2.1 About the Invasive Alien Plant Program (IAPP)

IAPP is the Province of British Columbia's invasive species database; it is used to record and manage invasive plant data across BC by the Province, regional weed committees and land managers. The application, allows the entry, editing and querying of invasive plant information including: site details; invasive plant inventory information; planning; treatment methods and data; and, monitoring data. The public can access the map display module to view the IAPP data and create maps.

Having a single repository for invasive plant data in BC is a unique and an effective tool that can provide a more accurate picture of the invasive plant problem for strategic management purposes. IAPP also provides a standard for how invasive plant information is gathered and monitored, and how treatment data is collected giving the invasive plant industry rigour and consistency.

There are some challenges however. Access to data entry on IAPP and the analysis interface is password protected and limited to trained individuals which therefore, excludes participation from the general public. A data manager with the Province continuously improves and maintains the database, but it can be prone to crashing. Overall the contribution this database makes to the invasive plant industry is considerable and limited accessibility also works to safeguard the integrity of the data. IAPP can be learned in a few hours and at a low cost. The Province offers full day training sessions and the Coastal ISC offers one-on-one training to data managers. With any tool, the more often it is used, the easier and more beneficial the tool becomes.

2.2.2 IAPP Data Gaps

The IAPP database does not include a complete survey of all invasive plants in the Coastal ISC service area. The database has been in existence since 2005 and is continuously updated by various agencies and non-profit organizations involved in invasive plant management. Currently, IAPP data is influenced by site location, funding sources and public safety. Invasive plant sites that are highly visible and easily accessed are identified because of public concern and reporting. Government agencies are taking the lead on invasive species management and have focused efforts on high use public lands. Plants with higher health risks like Giant hogweed and Knotweed gain greater attention through media and public education influencing the focus of data collection. With time and greater awareness of invasive plants and IAPP, the database will become more robust and comprehensive.

2.3 Priority and Planning

The Coastal ISC priority plant list is an evolving document that is reviewed on an on-going basis and updated at least once a year by the Coastal ISC Board of Directors and its membership. Refer to *Appendix A – Coastal ISC Priority Invasive Plant List* for a complete list of species. The list was drafted following an extensive Coastal ISC management area inventory to determine plants of concern and the BC *Weed Control Act,* Noxious Weeds list was consulted[9]. The BC Proposed Prohibited Noxious Weed list was also consulted. This list documents plants that are not yet present, or present only in small populations in BC and these plants are candidates for the BC Early Detection Rapid Response program (EDRR).

The categorization of species in this list is representative of the Coastal ISC management area as a whole. The Coastal ISC works with regional partnerships to provide assistance in creating their own lists to highlight species of local concern and management. For instance, the CRISP has identified Lesser celandine as an 'Alert' species taking priority for local management, a plant not listed on the Coastal ISC list.

Similarly, the NIISP is working on developing a list of northern significant species taking into account the unique characteristics of the north. Given the growing season in the north is shorter, is less densely populated and the relative diversity and abundance of species is significantly less than the south. These characteristics help to inform the invasive plant management strategy for the north and the appropriate allocation of resources with more focus on public outreach and prevention in order to keep invasive species out.

Greenways Land Trust has compiled a list of the 'Top 10' invasive plants within the city to help guide education efforts (Appendix B). This is a great tool for bringing awareness to common invasive plants found; however, does not provide priorities for management and resource allocation. In comparison, the Coastal ISC priority invasive plant list contains all 'Top 10' species in addition to action levels for further prioritization.

Until a north island list has been completed, the Coastal ISC priority invasive plant list is recommended for invasive plant management decision making and resource allocation.

[9] Wikeem 2010.

2.3.1 Priority Action Level Categories

Priority action level categories are helpful in assigning order of importance to the multitude of invasive plants that exist in an area or region. The four action levels for different species are as follows:

A. **Prevent** - Species not known to occur in region, but likely to establish if introduced.
   Eradicate if found.
B. **Eradicate** - Species known to occur in limited distribution and low density.
   Eradicate if found.
C. **Contain** - Established infestations found in portions of the region.
   Contain existing infestations and prevent spread to un-infested areas.
D. **Control** - Established infestations common and widespread throughout the Coastal ISC region.
   Focus control in high value conservation areas.
   Use biological control, if available, on a landscape scale.

As one can see from the list above, the priorities are based on presence or absence of a species and density and distribution within a given area or region.

Newly introduced species or species bordering the Coastal ISC management area, are `Prevent' species. Smooth cordgrass, an intertidal grass species that is found in some estuaries in the lower mainland but not yet in the Coastal ISC management region is listed as a `Prevent' species. Working to prevent its introduction, members and agencies are encouraged to notify Coastal ISC if it is found and education dollars are spent to that end.

2.4 Treatment Options and Treatment Method Selection

Treatment occurs only after a treatment plan has been created, subsequent treatment requirements are determined following annual monitoring. Treatment options include education (i.e. invasive plant best practices for park maintenance), manual and mechanical (i.e. covering/smothering, cutting, digging/excavating, girdling, hand pulling, mowing, pruning, stabbing, tilling, spot burning), cultural (i.e. targeted grazing by sheep or goats), biological (i.e. systematic release of insects that feed exclusively on targeted invasive plant species) and chemical (i.e. judicious, strategically targeted use of herbicides)[10].

[10] Invasive Plant Pest Management Plan for Provincial Crown Lands in the South Coastal Region of British Columbia

Using a combination of treatment methods is shown to be more effective than using a single option alone[11]. Generally, repeat treatment is required; no individual method will control an infestation in a single treatment.

Invasive plant characteristics, site location, weather and pesticide regulations will determine what treatment methods are possible. In most cases, a combination of manual/mechanical and chemical treatment is the most effective.

Vigilant record keeping is a key to the program's success. The provincial IAPP application provides an excellent management system to store survey data and to make future monitoring and planning decisions.

2.5 Disposal of Invasive Plants

Often overlooked in the invasive plant management process is disposal. Improper disposal is a vector for spread and disposal options are to be carefully considered. Disposal selection is determined by invasive plant characteristics, site location and disposal methods available. Invasive plants cannot be disposed of in the same way as other plants and health and safety concerns associated with some plants should be recognized prior to handling and burning.

Responsible disposal starts with treating plants before seed set, ideally before flowering to reduce seed dispersal. Handling biomass as little as possible reduces spread and plants and seeds must be either land filled or burned. In some instances, in-vessel composting can kill viable seeds; each composting facility process to be evaluated individually for effectiveness. Backyard or outdoor hot or cold composts are not effective at killing seeds and in some instances stems and roots of certain invasive plants can survive.

Most often a combination of disposal methods are used, in some instances biomass can be left on-site, while reproductive parts of the plant are either taken off-site and landfilled or burned (subject to local burning restrictions). Plant characteristics inform the disposal option and trained contractors have the knowledge to make those decisions in the field. At the same time, local government can play a role in preventing the further spread of invasive plants by ensuring disposal option processes available to the community are effective in killing viable seed and plant parts.

[11] Invasive Plant Pest Management Plan for Provincial Crown Lands in the South Coastal Region of British Columbia

3 Methodology

An initial meeting to gather existing information and prioritize areas within the city that required inventory was held on Sept. 18, 2014 with representatives from the City, Coastal ISC, Greenways Land Trust, and BroomBusters.

From that meeting, it was determined that invasive plant data would be used from three different streams for municipal environmentally sensitive areas within the City of Campbell River: existing data already in the IAPP database, existing City and community group data recorded locally, but not within the IAPP database, and new inventory information collected a number of key sites.

3.1 Municipal Environmentally Sensitive Areas Invasive Plant Inventory

There has been significant invasive species mapping and control work carried out by the City and these community groups over several years; however, little of this information is contained within the provincial database (IAPP) and due to varying survey methodologies, much of it is not transferable to IAPP. Data collected by community groups are valuable and have been summarized in this report and considered in the implementation planning.

City owned lands prioritized for inventory were selected based on a number of criteria including ecological sensitivity[12], known locations of priority plants, high traffic areas and safety/operational considerations (for instance, Knotweed along traffic corridors or in ditches can obscure visibility and removal may need to be prioritized). The following locations were selected: Rotary Seawalk, Simms Creek Bike Path and Elk River Timber Road (ERT). Baikie Island was also discussed but an invasive plant inventory already exists. Similarly, an invasive plant list exists for Beaver Lodge Forest Lands and the parcel is not owned by the City. Of some concern is that much of this data has not been entered in IAPP, data entry of previously collected information was required. Field surveyors conducted inventories of the selected sites Rotary Seawalk, Simms Creek Bike Path and ERT Rd on October 14, 15 and 17, 2014 and entered this information into IAPP.

Results from an IAPP query, for existing invasive plant survey data (2001-2014) on municipal environmentally sensitive areas, contained valuable data and was included in this report. Areas

[12] Campbell River Environmentally Sensitive Areas as defined in the City of Campbell River Official Community Plan.

where existing data was available include: Nunns Creek, Rotary Seawalk, Baikie Island, Beaver Lodge Forest Lands, ERT, Willow Creek Park and estuary and Simms Creek Bike Path.

3.2 Inventory and Data Management

3.2.1 2014 Ground Inventory

From October 14 to 17 2014, the ERT Rd, Simms Creek Bike Path and the Rotary Seawalk were inventoried for invasive plants by a crew of two. The inventory was conducted by walking through the areas on a grid and looking for the 48 invasive plants of concern for the Coastal ISC management area. Refer to *Appendix A – Coastal ISC Priority Invasive Plant List*. Digital spatial data was recorded using a handheld ViaSat GPS unit and completing an Invasive Alien Plant Program (IAPP) Site and Invasive Plant Survey Record[13].

UTM coordinates, location and comments were the site details recorded. The survey agency, employer, surveyor, invasive plant code, area (dimension or hectares), survey type (cursory/operation/precise) and proposed treatment activity (manual, chemical or biological) were the survey details recorded. Information documented in the survey record in the field was then entered into the IAPP data base and queried for management decisions.

The ideal time to conduct invasive plant surveys is in June or July while most plants are flowering, making them easier to identify. City municipal environmentally sensitive area sites were surveyed in October 2014, when plants are typically dying off. While acknowledging the potential for error, it is unlikely that invasive plants were missed in this survey by the experienced field surveyors with extensive plant identification skills. Additionally, the late rain fall and the subsequent growth spurt made for easier identification of plants in the field.

All invasive plant survey data collected in 2014 and entered into IAPP was cursory and did not precisely measure out the infested area with a GPS to create a polygon; instead field staff collected point data and estimated the area visually.

[13] Invasive Alien Plant Program (IAPP) Site and Invasive Plant Survey Record

3.2.2 Existing IAPP Survey Data (2001 – 2014)

This section highlights the method used to analyze and summarize the IAPP data and recommends management decisions for consideration in the development of an invasive plant management program.

The inventories are considered cursory and data entry was completed by staff and contractors of various survey agencies between 2001 and 2014, including: Coastal ISC, Ministry of Forests and Range and Ministry of Transportation. This inventory standard is used to indicate the presence of an invasive plant that is endemic but not well represented, and to inform other field personnel and researchers about a given site.

Digital spatial data is recorded at that time using a handheld GPS unit and by completing an IAPP Site and Invasive Plant Survey Record.

UTM coordinates, site location, site comments, and site soil texture were the site details recorded; the survey agency, employer, surveyor, invasive plant code, area (dimension or Ha), survey type (cursory/operation/precise) and proposed treatment activity (manual, chemical or biological) were the survey details recorded. Information documented in the survey record in the field is then entered into the IAPP data base and queried for management decisions, as is the case in this report.

The data is not comprehensive and does not represent all invasive plants found on municipal ecologically sensitive lands in the city. For a true representation, trained field staff would be required to conduct and inventory and survey lands following a grid system and enter the data into the IAPP database. A survey of this type was carried out in the fall of 2014 by the Coastal ISC along Simms Creek Bike Path, ERT and the Rotary Seawalk. Survey data collected during the 2014 inventory is included in this analysis. However, it may give the reader the impression that more invasive plants exist within these areas given the lack of a thorough survey on other municipal ecologically sensitive lands, hence limited data does not necessarily mean less invasive plants are present, it may just mean, a thorough survey has not been conducted and the data entered in to the IAPP database.

Existing data was found in IAPP on the following municipal ecologically sensitive lands: Nunns Creek, Rotary Seawalk, Baikie Island, Beaver Lodge Forest Lands, ERT, Willows Creek Estuary, Simms Creek Bike Path (including Willow Point Park (Sportsplex)) and other locations in the city; however, to limit the scope of this report, the other locations were not included.

3.2.3 Data Analysis

In this analysis, invasive plant data stored in the IAPP database was queried and extracted for all invasive plants within the Strathcona Regional District. A total of 4446 sites were selected following the first query, listing 69 different invasive plant species. The list was further filtered down by jurisdiction, selecting for municipal, obsolete – municipal and private land, 33 species remained. Private land that specified in the comments section of the data that it was actually City of Campbell River jurisdiction was included, as the distinction of municipal land has not always been considered by the field staff prior to 2009, only crown or private land. Twenty-one priority species and 221 sites based on significance remained in this final query, selecting for: Coastal ISC priority invasive plants (Refer to Appendix A for a list of species), BC Proposed Prohibited Noxious Weeds (2012) and the South Island Capital Region Invasive Species Partnership (CRISP) Priority Invasive Plant List (Refer to Appendix B for a list of species). The Greenways Land Trust Top 10 Invasive Plants of Concern (Appendix C) are already listed in the Coastal ISC list and were therefore considered.

Note that some of the data included in this analysis is as much as 20 years old. Due to the spreading nature of invasive plants, infestations may be larger than recorded in the database or, absent due to landscape changes, such as development or effective treatment.

In the absence of a North Island priority invasive plant list, the Coastal ISC priority plant list was used for recommending action priorities for each plant species found in the city. Refer to *Appendix A – Coastal ISC Priority Invasive Plant List* for a complete list of plants listed by action level.

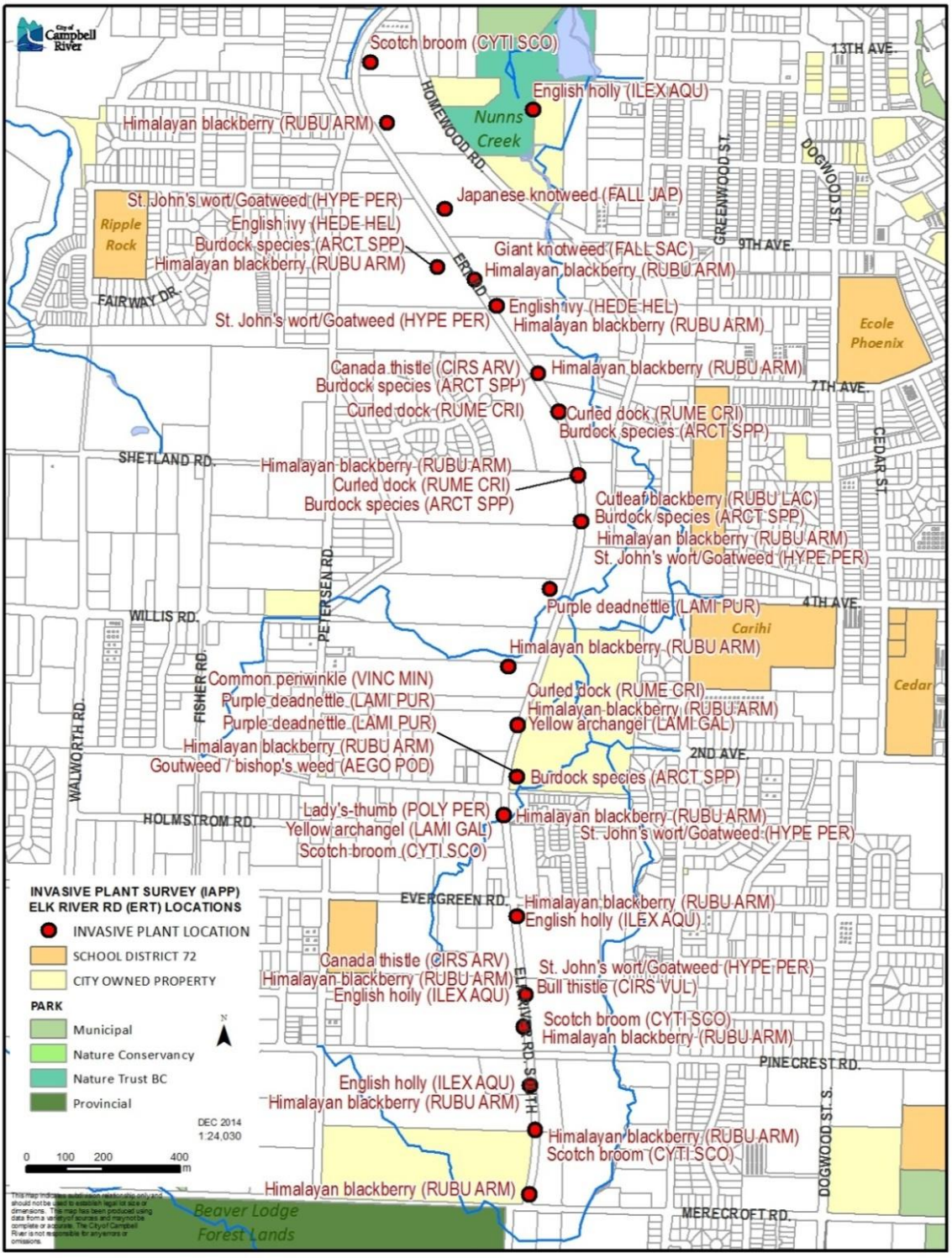
4 Results

4.1 On the Ground Inventory (2014)

Along the Elk River Timber Road (ERT) right of way (linear corridor) a total of 69 sites and 16 invasive plant species were inventoried. Refer to Table 1 for a full list of species and the area of each species in hectares and Map 1 for a visual representation.

TABLE 1 : ELK RIVER TIMBER ROAD 2014 INVENTORY BY INVASIVE PLANT (IAPP CODE) AND SUM OF ESTIMATED AREA (HECTARES)

Invasive Plant	Area
Bull thistle (CIRS VUL)	0.0001
Burdock species (ARCT SPP)	0.0016
Canada thistle (CIRS ARV)	0.0059
Common periwinkle (VINC MIN)	0.0004
Curled dock (RUME CRI)	0.034
Cutleaf blackberry (RUBU LAC)	0.0014
English holly (ILEX AQU)	0.0003
English ivy (HEDE HEL)	0.0014
Field bindweed (CONV ARV)	0.1263
Giant knotweed (FALL SAC)	0.08
Himalayan blackberry (RUBU ARM)	0.5928
Japanese knotweed (FALL JAP)	0.0129
Lady's-thumb (POLY PER)	0.0006
Scotch broom (CYTI SCO)	0.0086
St. John's wort/Saint John's wort/ Goatweed (HYPE PER)	0.0462
Yellow archangel (LAMI GAL)	0.0086
Grand Total	**0.9211**



MAP 1: ELK RIVER TIMBER ROAD (ERT), INVASIVE PLANT INVENTORY (2014)

Along the Simms Creek Bike Path a total of 51 sites, 15 invasive plant species were inventoried. Refer to Table 2 for a full list of species and the sum of the estimated area in hectares and Map 2 for a visual depiction.

TABLE 2: SIMMS CREEK BIKE PATH 2014 INVENTORY BY INVASIVE PLANT (IAPP CODE) AND SUM OF ESTIMATED AREA (HECTARES)

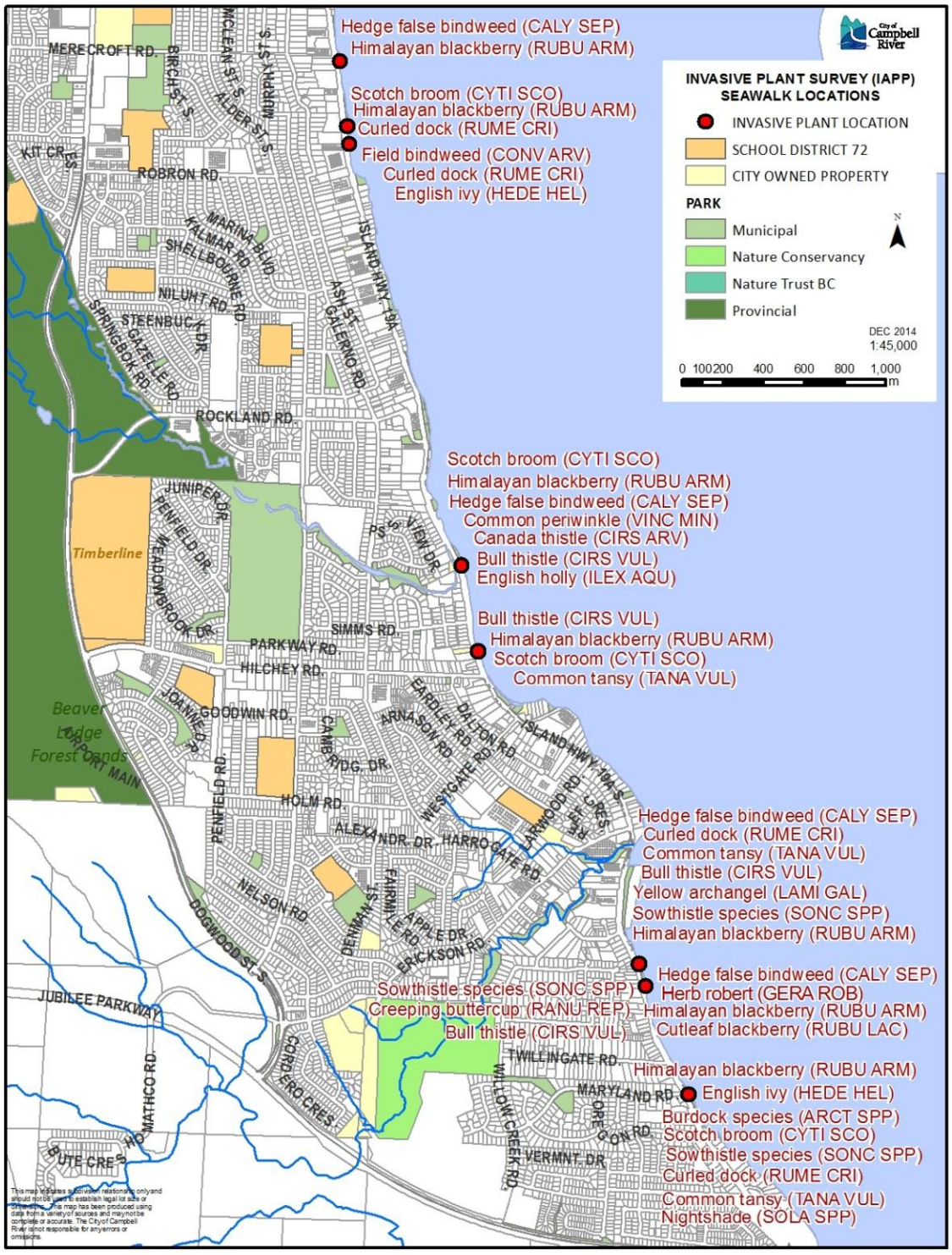
Invasive Plant	Sum of Estimated Area
Bull thistle (CIRS VUL)	0.0041
Burdock species (ARCT SPP)	0.0001
Canada thistle (CIRS ARV)	0.0004
Common periwinkle (VINC MIN)	0.0004
Common tansy (TANA VUL)	0.0001
Curled dock (RUME CRI)	0.0091
English holly (ILEX AQU)	0.0014
English ivy (HEDE HEL)	0.0013
Himalayan blackberry (RUBU ARM)	0.1421
Japanese knotweed (FALL JAP)	0.0312
Policeman's helmet / himalayan balsam (IMPA GLA)	0.0015
Scotch broom (CYTI SCO)	0.0003
St. John's wort/Saint John's wort/ Goatweed (HYPE PER)	0.0002
Yellow archangel (LAMI GAL)	0.0966
Grand Total	**0.2888**

MAP 2: SIMMS CREEK INVASIVE PLANT INVENTORY (2014)

Along the Rotary Seawalk a total of 35 sites, 17 invasive plant species were inventoried (Map 3). Refer to Table 3 for a full list of species and the sum of the estimated area in hectares.

TABLE 3: ROTARY SEAWALK INVENTORY 2014 BY INVASIVE PLANT (IAPP CODE) AND SUM OF ESTIMATED AREA (HECTARES)

Invasive Plant	Sum of Estimated Area
Bull thistle (CIRS VUL)	0.0006
Burdock species (ARCT SPP)	0.0002
Canada thistle (CIRS ARV)	0.0002
Common periwinkle (VINC MIN)	0.002
Common tansy (TANA VUL)	0.0003
Creeping buttercup (RANU REP)	0.0005
Curled dock (RUME CRI)	0.1501
Cutleaf blackberry (RUBU LAC)	0.0033
English holly (ILEX AQU)	0.0001
English ivy (HEDE HEL)	0.001
Hedge false bindweed (CALY SEP)	0.1207
Herb robert (GERA ROB)	0.0001
Himalayan blackberry (RUBU ARM)	0.315
Nightshade (SOLA SPP)	0.02
Scotch broom (CYTI SCO)	0.1507
Sowthistle species (SONC SPP)	0.0003
Yellow archangel (LAMI GAL)	0.0012
Grand Total	**0.7663**



MAP 3: ROTARY SEAWALK INVASIVE PLANT INVENTORY (2014)

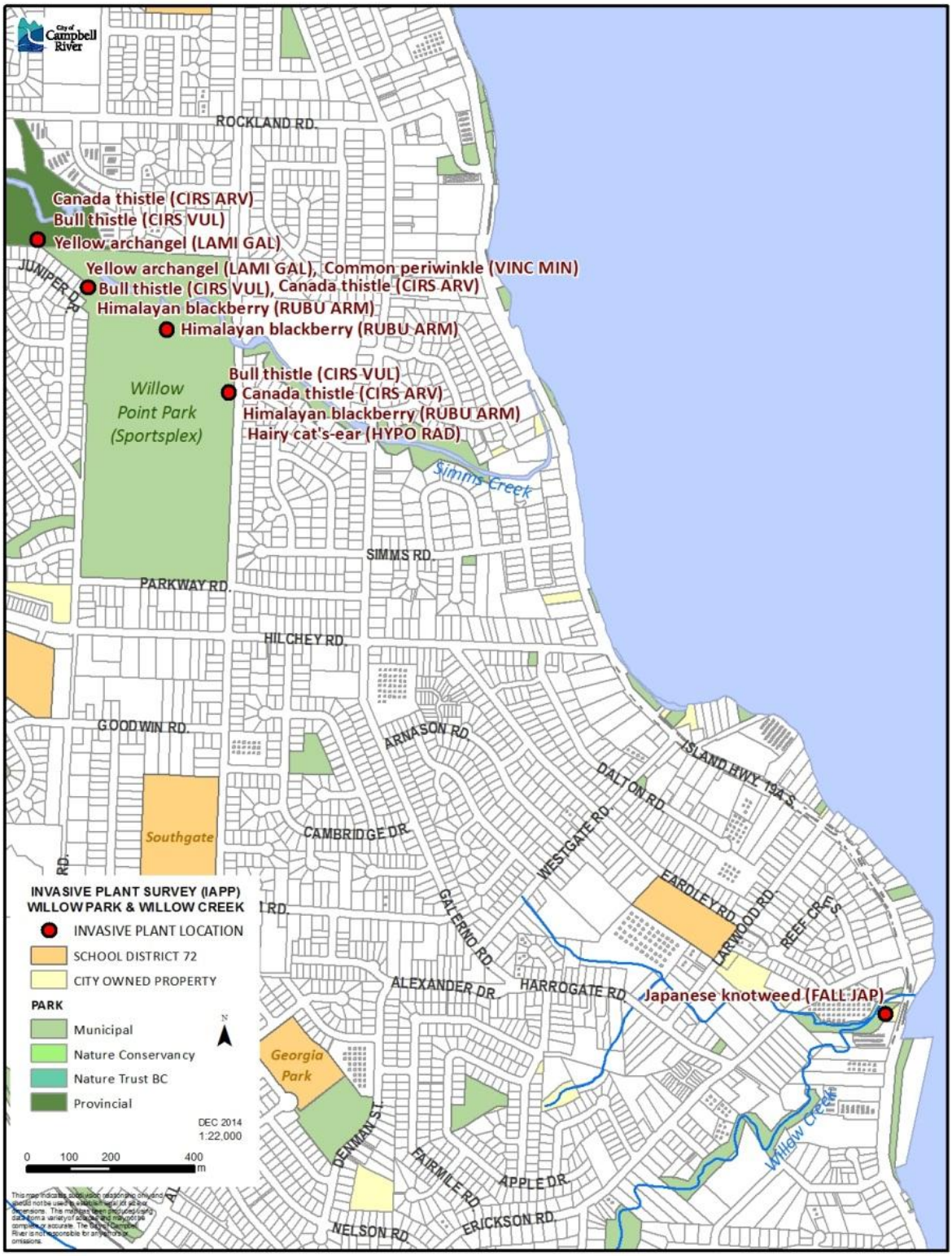
4.2 Existing IAPP Data

Invasive plant surveys conducted within the city on municipal land from 2001 to 2014 by various agencies are extensive. A total of 111 sites and 22 invasive plants are recorded in the database. Refer to Table 4 for a detailed list of species and sum of estimated area in hectares.

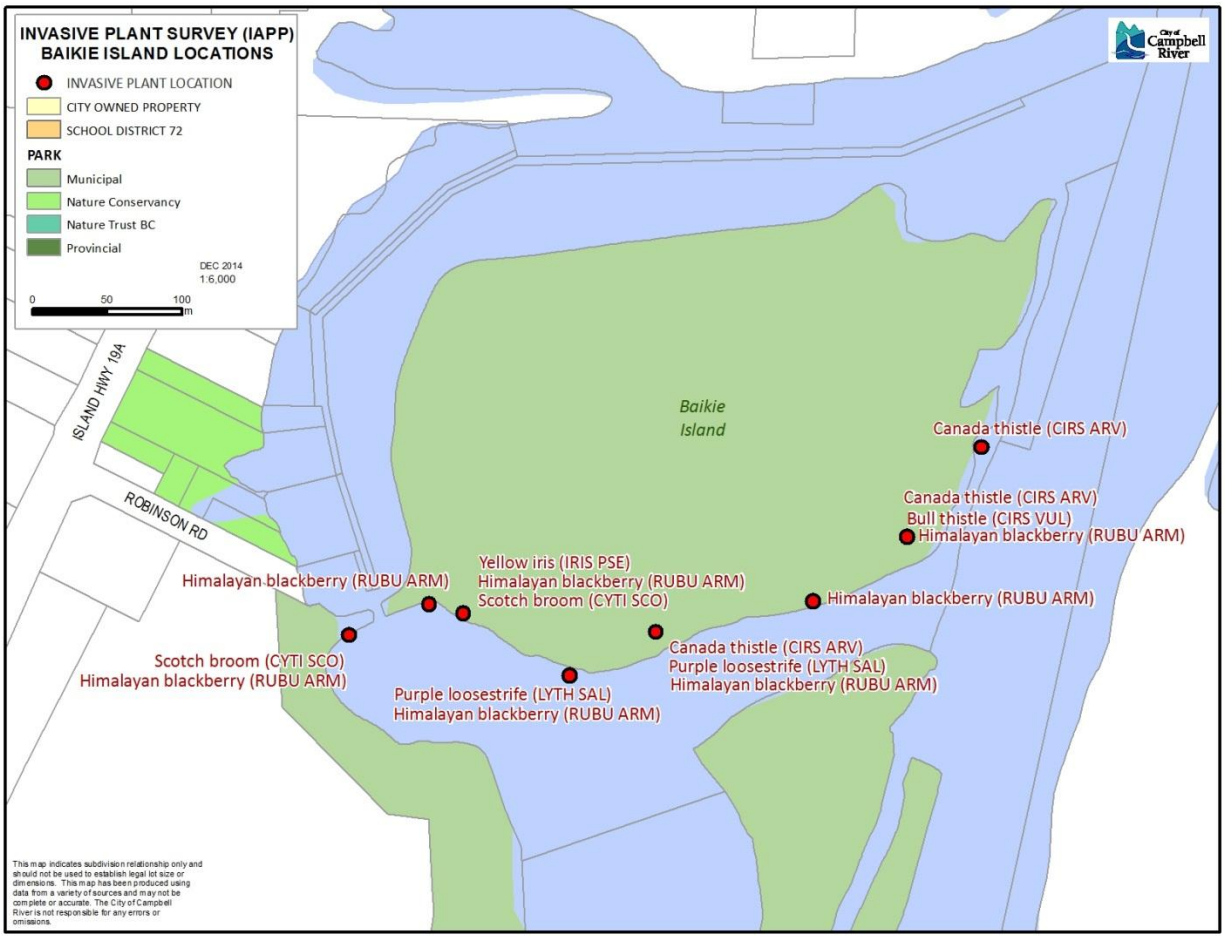
TABLE 4: EXISTING IAPP SURVEY DATA (2001-2014) ON MUNICIPAL LAND IN THE CITY OF CAMPBELL RIVER BY INVASIVE PLANT AND SUM OF ESTIMATED AREA (HECTARES)

Invasive Plant	Sum of Estimated Area
Bohemian knotweed (FALL BOH)	0.0279
Bull thistle (CIRS VUL)	0.0308
Burdock species (ARCT SPP)	0.0001
Canada thistle (CIRS ARV)	0.0655
Common periwinkle (VINC MIN)	0.003
Common tansy (TANA VUL)	0.0005
Curled dock (RUME CRI)	0.053
English holly (ILEX AQU)	0.0001
English ivy (HEDE HEL)	0.002
Field bindweed (CONV ARV)	0.051
Giant knotweed (FALL SAC)	0.0015
Hairy cat's-ear (HYPO RAD)	0.03
Himalayan blackberry (RUBU ARM)	1.228
Himalayan knotweed (POLY POL)	0.0009
Hound's-tongue (CYNO OFF)	0.0043
Japanese knotweed (FALL JAP)	0.2238
Lady's-thumb (POLY PER)	0.06
Purple loosestrife (LYTH SAL)	3.4046
Scotch broom (CYTI SCO)	2.0935
Tansy ragwort (SENE JAC)	0.045
Yellow archangel (LAMI GAL)	0.154
Yellow iris (IRIS PSE)	0.0001
Grand Total	**7.4796**

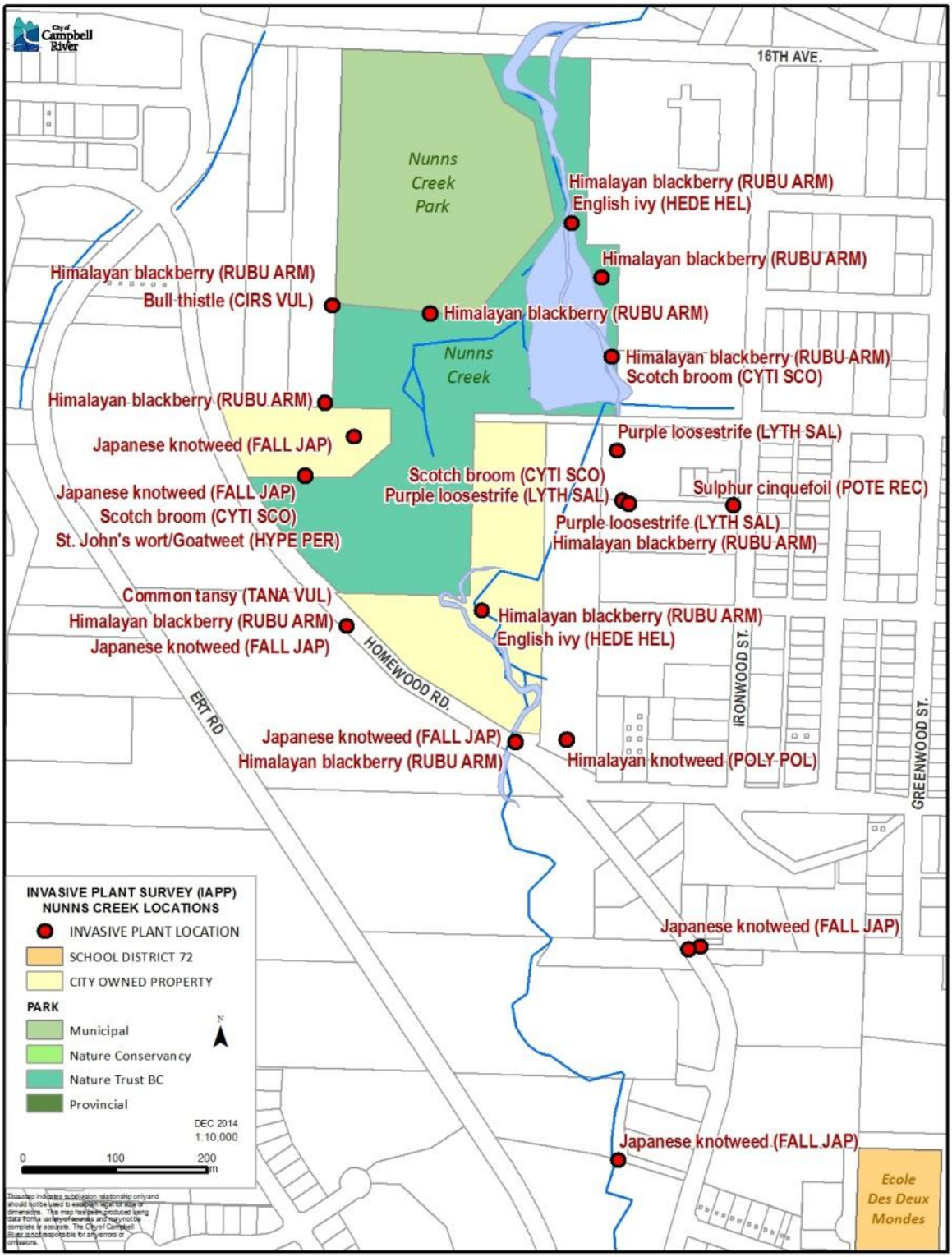
IAPP survey data exist from the following municipal environmentally sensitive areas: ERT (Elk River Timber) Road (Map 1), Simms Creek Bike Path (Map 2), Rotary Seawalk (Map 3), Willow Point Park and Willow Creek Estuary (Map 4), Baikie Island (Map 5), and Nunns Creek Park (Map 6).



MAP 4: WILLOW POINT PARK AND WILLOW CREEK ESTUARY, EXISTING INVASIVE PLANT (IAPP) SURVEY DATA



MAP 5: BAIKIE ISLAND, EXISTING INVASIVE PLANT (IAPP) SURVEY DATA



MAP 6: NUNNS CREEK, EXISTING INVASIVE PLANT (IAPP) SURVEY DATA

The IAPP data for Beaver Lodge Forest Lands, an environmentally sensitive area on Crown land within the city and managed by GLT, is also included as this area is an important community forest/natural area.

4.3 City of Campbell River and Community Group Data

The City and local community groups active in the area, predominantly GLT, have collected invasive plant data for ecologically sensitive areas in various forms and these are summarized in this section for the period 2012-2014. Data was either collected in tabular form, in lists or by drafting maps. Areas where invasive plant data exist include:

- Beaver Lodge Forest Lands (Crown Land)
- Simms Creek Bike Path
- Willow Point Park (Sportsplex)
- Rotary Seawalk
- Baikie Island
- Nunns Creek Park
- Willow Creek Estuary
- ERT Road

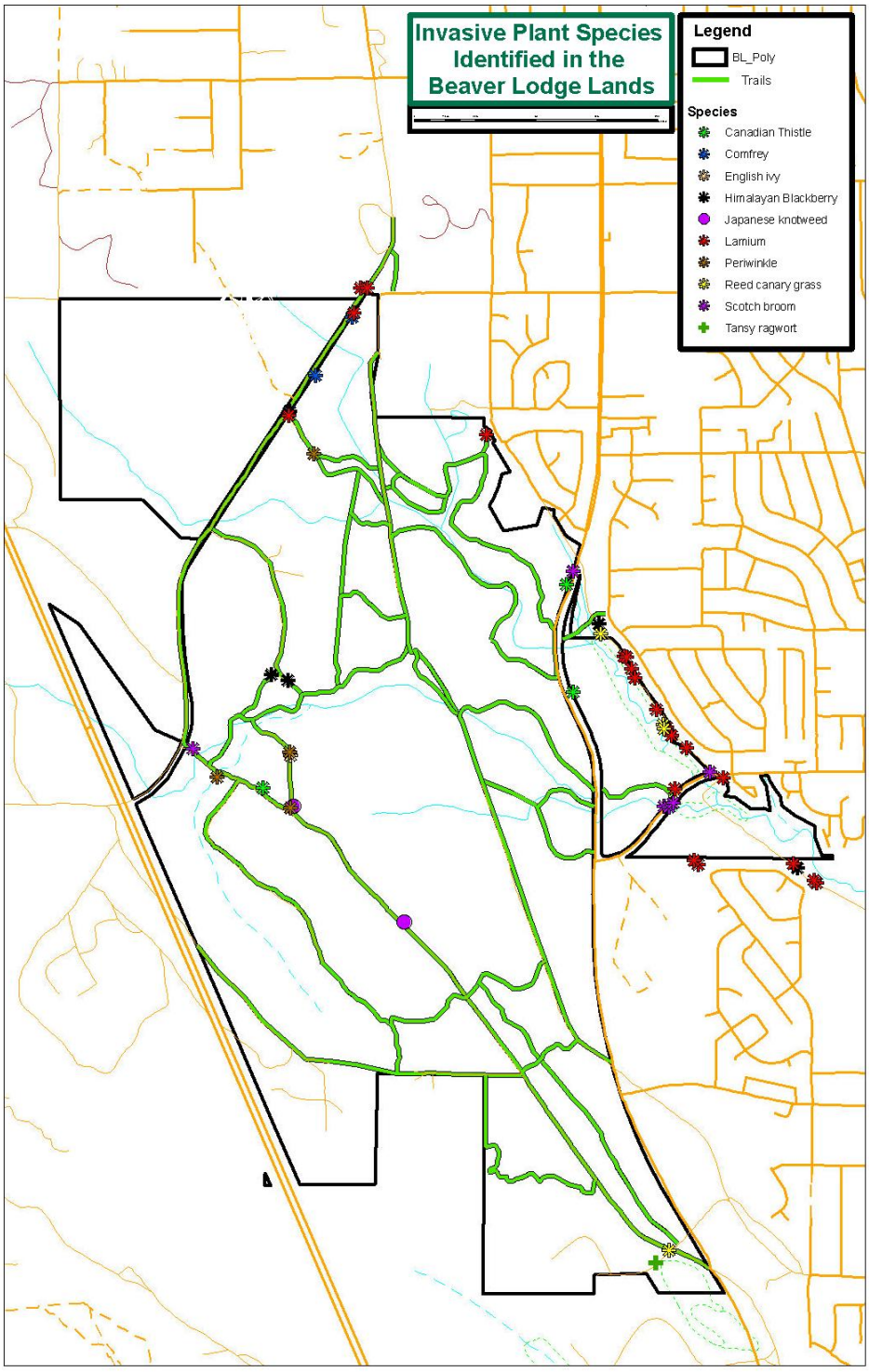
Beaver Lodge Forest Lands (BLFL)

In 2012, a map of invasive plants in BLFL was created[14] for GLT that lists ten invasive plants at various locations in the park (number of invasive plant infestations in brackets)[15] :

- Canada thistle (3)
- Comfrey* (1)
- English ivy (3)
- Himalayan blackberry (3)
- Japanese knotweed (2)
- Lamium (17)
- Periwinkle (1)
- Reed canary grass* (2)
- Scotch broom (6)
- Tansy ragwort (1)

[14] Volunteer Roy Myers created the map.
[15] *Greenways Land Trust 2012. Beaver Lodge Forest Lands meeting*

*Invasive plants not listed on the Coastal ISC priority invasive plant list; however, these are exotic species that hold invasive characteristics that are damaging to park values.



MAP 7: BEAVER LODGE FOREST LANDS INVASIVE PLANT MAP (BY ROY MYERS), 2012

Greenways Land Trust Invasive Species Program 2013 Annual Report

Greenways Land Trust Invasive Annual Report[16] outlines invasive plant activities by site as outlined in the list below. All invasive plants with the exception of Japanese knotweed and Yellow flag iris were removed by volunteers. Sellentin's Habitat Restoration and Invasive Species Management was hired to treat Knotweed and Yellow flag iris.

1. Willow Creek, Nature Trust Lands (not municipally owned) (Lamium and English ivy)
2. Rotary Seawalk (Japanese knotweed, Yellow flag iris and Himalayan blackberry)
3. Beaver Lodge Forest Lands (Crown land) (Tansy ragwort and Lamium)
4. ERT Road/Nunns Creek Watershed (Japanese knotweed and Lamium)
5. Baikie Island (Scotch broom and Yellow flag iris)

Only data collected on ecologically sensitive municipal land is included in this summary, with the exception of Beaver Lodge Forest Lands due to its ecological sensitivity; refer to the GLT (2013) report for more information about areas that are beyond the scope of this summary.

Baikie Island Yellow Flag Iris 2012 – 2014

Baikie Island Yellow flag iris management has been coordinated by the City in partnership with GLT, Coastal Invasive Species Committee and the Nature Conservancy of Canada from 2012-2014. The data has been compiled in two reports (2012, 2014) that summarize the work carried out by City staff, GLT staff, contractors and volunteers and includes recommendations.

In 2012, a total of 0.4986 hectares of Yellow flag iris was surveyed and 1907 square meters (0.1907 hectares) were removed using a combination of mechanical treatment using an excavator and volunteer hand removal[17].

In 2013, mechanical treatment using an excavator (13 tonnes) was conducted in some areas and volunteer hand removal (500 kg) in others; total area not provided[18].

In 2014, a total of 0.0263 hectares of Yellow flag iris was survey and assessed by priority action level: prevent, eradicate, contain and control. Areas identified as 'Eradicate' where plants are found in isolated clumps, cover 0.0068 hectares, 'Contain' for infestations with 25% or less

[16] Bendickson, 2013
[17] City of Campbell River. 2012. *Summary of Yellow Flag Iris Work on Baikie Island, Campbell River Estuary*
[18] Bendickson. 2014. *Baikie Island Yellow Flag Iris Assessment.*

coverage, 0.0212 hectares and 'Control' for areas with 50% or more cover [19]. Canada thistle is another species identified for management on Baikie Island in the report.

GLT Summary of Invasive Plant Projects and Priorities 2014

Volunteers and Sellentin's Habitat, Restoration and Invasive Species Management have been involved with managing various invasive plants on City property. Table 5 outlines priorities for treatment for either volunteers or contractors, or both.

TABLE 5: INVASIVE PLANTS FOUND BY AREA NAME AND PRIORITY FOR TREATMENT FOR VOLUNTEERS AND/OR CONTRACTORS, GLT 2014

Area	Invasive Plant Found	Priority for Treatment	
		Volunteer	Contractor
Willow Creek Estuary	Himalayan Blackberry	√	
	Scotch Broom	√	
Willow Creek Ocean Side	Himalayan Blackberry	√	
	Scotch Broom	√	
Willow Creek West Side	Himalayan Blackberry	√	
	Scotch Broom	√	
	Knotweed		√
Rotary Seawalk (Frank James Park to Simms Creek)	Knotweed		√
	Himalayan Blackberry	√	
	English Ivy	√	
Myrt Thompson Trail	Purple Loosestrife	√	√
	Knotweed		√
	Himalayan Blackberry	√	
	Yellow Flag Iris	√	√
Baikie Island	Yellow Flag Iris	√	√
ERT Road	Lamium	√	
Simms Creek Bike Path	Lamium	√	

[19] C. Bendickson. 2014. *Baikie Island Yellow Flag Iris Assessment.*

4.4 Knotweed Location and Treatment Data

Between 2012 and 2014 the City and GLT worked together to identify and collect Knotweed location data, prioritize treatment sites and hire a contractor (Sellentin's Habitat Restoration and Invasive Species Management) to chemically treat infestations. Knotweed treatment data from 2012 and 2014 was entered into the IAPP for future management; 2013 data remains to be entered. Refer to Table 6 and Table 7 for a complete list of treated Knotweed sites.

GLT keeps a running list of Knotweed infestations (13 sites; refer to Appendix D). This list includes treated sites noted previously as well sites that require treatment as resources become available[20]. The list is organized by watershed, with the most upstream infestations listed first.

The City also compiles a running list of Knotweed locations as they are reported by staff and the public for future management. Since many of the locations are on private lands, this information has not been included in this report for privacy reasons. The City and GLT use these lists to jointly plan and prioritize knotweed treatments for the annual chemical treatment cycle.

[20] Greenways Land Trust, 2014.

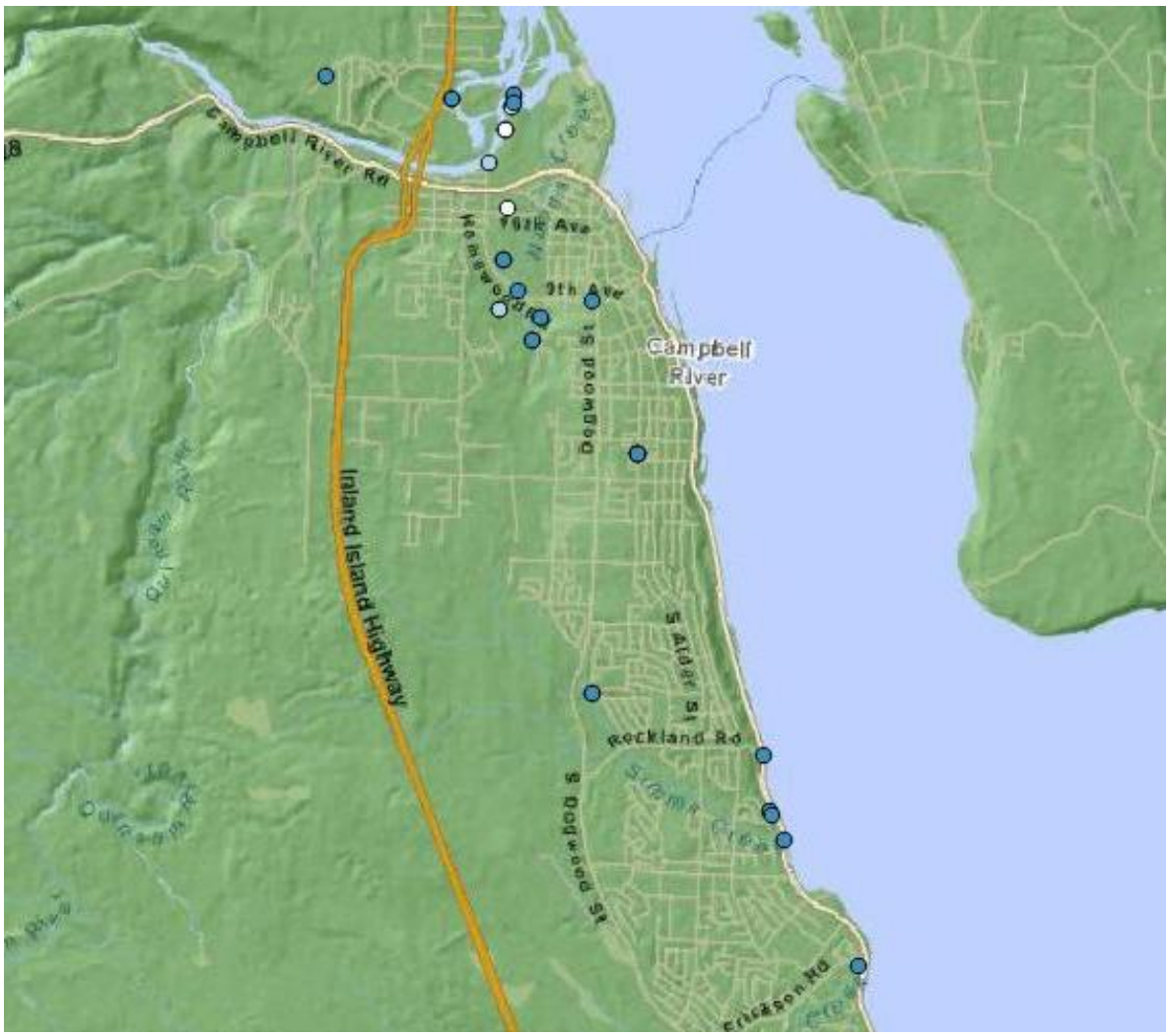
TABLE 6: KNOTWEED SPECIES TREATED (2012 AND 2014) IN THE CITY OF CAMPBELL RIVER, IAPP DATA, SITE ID, INVASIVE PLANT, TREATMENT DATA, PAPER FILE ID TREATED AREA (HA) AND LOCATION

Site ID	Invasive Plant	Treatment Date	Paper File ID	Area Treated	Location
112169	Japanese	21/07/2014	CR14-005	0.0002	corner of Birch and 1st Avenue
112169	Japanese	21/07/2014	CR14-006	0.0200	corner of Birch and 1st Avenue
112169	Japanese	28/07/2014	CR14-017	0.0396	corner of Birch and 1st Avenue
112169	Japanese	28/07/2014	CR14-018	0.0396	corner of Birch and 1st Avenue
217970	Japanese	09/07/2012	ES-004	0.0030	Hwy 19A and Rockland Rd
218008	Japanese	22/07/2014	CR14-027	0.0013	Adjacent to fish bearing creek.
218087	Japanese	06/08/2014	CR14-011	0.0022	Woodburn Road, near the end.
218128	Giant	22/07/2014	CR14-014	0.0048	Maple Street
227282	Japanese	21/07/2014	CR14-026	0.0086	Along ditch.
229498	Japanese	29/07/2014	CR14-020	0.0031	HWY 19a- along ditch.
290953	Japanese	09/07/2012	ES-005	0.0005	Old Island Hwy, 100m north of Simms Rd
290959	Japanese	09/07/2012	ES-007	0.0005	Hwy 19A, Ken Ford Boat ramp at Willow Creek Park.
290960	Bohemian	22/07/2014	CR14-012	0.0009	Campbell River esturary
290960	Bohemian	22/07/2014	CR14-013	0.0001	Campbell River esturary
290960	Bohemian	10/07/2012	ES-007	0.0024	Campbell River esturary
290961	Bohemian	11/07/2012	ES-008	0.0030	Campbell River, CR Esturary along Myrt Thompson trail.
290962	Bohemian	22/07/2014	CR14-032	0.0006	River-Parks, CR Estuary, Myrt Thompson Trail
290962	Bohemian	10/07/2012	ES-009	0.0030	River-Parks, CR Estuary, Myrt Thompson Trail
290964	Bohemian	22/07/2014	CR14-030	0.0001	River-Parks, CR Estuary, Myrt Thompson Trail
295758	Japanese	29/07/2014	CR14-021	0.0170	Simms Creek Bike Path off Springbok Rd across intersection from Eland Dr
295758	Japanese	29/07/2014	CR14-023	0.0081	Simms Creek Bike Path off Springbok Rd across intersection from Eland Dr
299203	Japanese	06/08/2014	CR14-007	0.0036	Homewood Rd, Nunns Creek in old BMX park
299203	Japanese	06/08/2014	CR14-008	0.0025	Homewood Rd, Nunns Creek in old BMX park
299784	Japanese	06/08/2014	CR14-009	0.0025	Highway 19A Campbell River, behind E&B Helicopters
299784	Japanese	06/08/2014	CR14-010	0.0025	Highway 19A Campbell River, behind E&B Helicopters
299884	Giant	22/07/2014	CR14-015	0.0800	Elk River Timber Road, City of Campbell River jurisdiction
299884	Giant	22/07/2014	CR14-016	0.0138	Elk River Timber Road, City of Campbell River jurisdiction
299889	Japanese	28/07/2014	CR14-019	0.0027	Homewood Road, in ditch and along private driveway
299889	Japanese	28/07/2014	CR14-020	0.0006	Homewood Road, in ditch and along private driveway
299891	Japanese	22/07/2014	CR14-024	0.0100	Homewood Road
299892	Japanese	21/07/2014	CR14-025	0.0120	SW Corner of Homewood Road and 9th Ave
299893	Japanese	22/07/2014	CR14-028	0.0013	Hwy 19A along Simms Creek
299894	Japanese	22/07/2014	CR14-029	0.0043	Myrt Thompson Trail
299895	Japanese	22/07/2014	CR14-031	0.0002	Parks, Myrt Thompson Trail
Grand Total				**0.2946**	

A total of 23 Knotweed sites were treated in the city in 2012 and 2014, with the majority of sites being treated in 2014 (17 sites, 0.2546 hectares) and six in 2012 (0.0040 hectares). Only one site was retreated in 2014 (site 290962, Bohemian Knotweed) with a 80% efficacy in its second year, in line with industry standards. A total of 0.4263 hectares of Knotweed has been inventoried in the city, Table 6.

TABLE 7: KNOTWEED TREATMENT SUMMARY (2013) IN THE CITY OF CAMPBELL RIVER (THE 2013 DATA HAS NOT YET BEEN ENTERED INTO THE IAPP DATABASE).

Priority	Watershed	Location	Size of infestation (meters)	# of 2-person crew days	First treatment	Retreatment Required
1	Woods Creek*	Seawave Road	3 m x 3 m	0.25	No	
1	Simms Creek	Just upstream of Hwy 19A	3 m	0.5	No	Yes
None	Foreshore	Willow Point and Larwood (proposed Tim Horton's site)	N/A			
2	Foreshore	Hwy 19A across from the pump station by Simms Creek	N/A	0.25	Yes	
1	Simms Creek Bike Path	Bike path behind Springbok. Access via foot path near 995 Springbok	35 m x 5 m	0.75	Yes	
1	Campbell River	Myrt Thompson Trail	One patch is 3 m x 5 m	0.5	No	
			Other patches treated (2013) not found			
1	Campbell River	Campbell River Rd	N/A	0.5	Yes	
1	Nunns Creek	Homewood Road	6 patches	1- 1.5 for whole area	No	Yes (3 patches only)
1	Nunns Creek	Homewood Road and 9th	15 m x 3 m		Yes	
1	Nunns Creek	Homewood Road	One patch at the bottom of driveway		Yes	
			small patches and 5 m x 2 m at end of driveway			
1	Nunns Creek	9th and Ironwood/Maple	5 m x 5 m		Yes	
2	Nunns Creek	BMX Track	N/A			
1	Nunns Creek	Likely on the ERT	N/A			



MAP 8: KNOTWEED SPECIES* TREATMENTS (2012 AND 2014) IN THE CITY OF CAMPBELL RIVER

** White points are Giant Knotweed, light blue are Bohemian and dark blue are Japanese Knotweed infestations.*

4.5 City of Campbell River Disposal Options

Most invasive plants found in the city can be disposed of at the Comox Strathcona Waste Management (CSWM) to prevent further spread. In some instances biomass can be left on site (either burial, chipping or elevating stems depending on the species and how it spreads) and landfilling reproductive parts; however, only a trained professional is able to make that decision in the field based on sightline, aesthetics and public safety issues. Weather can also be a deciding factor; plants are more likely to desiccate in the dry sunny weather and more likely to re-sprouting in wet, rainy conditions. On-going monitoring is essential.

CSWM offers a few disposal incentives for the public and community groups wanting to dispose of invasive plants responsibly. Disposal costs for invasive plants including noxious weeds are $65/tonne, which is the same price as for brush and other yard waste. This fee is about 50% cheaper than disposing of regular garbage which is $110/tonne. Volunteer groups can benefit from free disposal by completing an application. As CSWM staff identify invasive plant material, it is placed directly in the garbage bins (which are tipped at the face of the landfill for deep burial).

Uplands Excavating offers deep burial (10 feet) for knotweed which is the recommended practice for responsible disposal. Uplands Excavating require a $125 minimum charge for disposal of Knotweed and a dump truck load is $200/box. Scotch broom is considerably less to dispose of at $50/box and the material is burned onsite.

Other disposal facilities in the city do not provide invasive species disposal. A Wood Bulldozing cited work safety concerns associated with handling some species (e.g. Giant hogweed) and Renuable Resources did not provide a particular reason.

The curbside pick-up and yard waste drop-off company, Emterra Environmental does not require land owners or contractors to sort out invasive plants or noxious weeds from yard waste. Further research into how the yard waste is processed is required to ascertain if invasive plant viable seed and plants parts are effectively sterilized in their disposal process, if this isn't the case, the waste from this facility may be a vector for the spread of invasive species.

The two responsible invasive plant disposal options in the city, from this analysis, include CSWM and Uplands Excavating. CSWM appears to be more accessible to the public and volunteer groups compared to Uplands which is targeted to construction or commercial operations.

5 Discussion

The North Island is known to contain less invasive plants than southern regions and this is the case for the Campbell River. Since the growing season is shorter and the human population is comparatively smaller than in other areas, there is less opportunity and favourable conditions for invasives to take hold.

Evidence of this is in the on-the-ground survey and current IAPP data analysis, no 'Prevent' or 'Eradicate' species were found. Invasive plants that were found in the 'Contain' and 'Control' categories appear in smaller and less dense infestations than their southern cousins. Given this, the city has fewer species to contend with than other communities and an opportunity exists to work to control existing species, to get-ahead of the issue and/or work to prevent further introductions.

The City and community groups have been managing invasive species for years as opportunities arise, but without the benefit of an overarching plan. There is much work to be done and an overarching plan is required to use limited resources effectively. This is especially important with the extensive efforts of BroomBusters in recent years; the City must plan for pick up and disposal of a variety of plants from different events and must be cautious not to allocate all resources on Scotch broom while leaving debris piles of Yellow flag iris behind. Existing information and the 2014 field inventories conducted for this report at a number of key priority sites will help to inform an implementation plan.

5.1 Transferability of Community Group and City Data

Community group and City invasive plant information (see data analysis section of this report) is available for eight ecologically sensitive areas:

- Beaver Lodge Forest Lands (Crown Land)
- Simms Creek Bike Path
- Rotary Seawalk
- Baikie Island
- Nunns Creek
- Willow Creek Park and Estuary
- Willow Point Park
- Elk River Timber Road

The data, although valuable for making decisions by the organization or individual, lacks transferability to the IAPP database. Missing data includes location information (UTM), density,

distribution and area infested to meet IAPP requirements. The 2014 inventory captured all the species listed in the community data with the exception of two species found at the BLFL: Comfrey and Reed canary grass. Given these species are not listed on the priority invasive plant list they will not be included in the implementation plan; however, they are exotic plants that possess invasive characteristics.

Data gaps exist for the following areas: Beaver Lodge Forest Lands (Crown Land), Baikie Island, Nunns Creek Park, and Willow Point Park.

5.2 Combined Data Summary

Combined 2014 inventory data with the existing IAPP survey data (2001 – 2014) provides a comprehensive picture of invasive plants found on City owned property. A total of 32 species of invasive plants were found, refer to Table 8 for a complete list.

TABLE 8: COMPLETED LIST OF SPECIES OF INVASIVE PLANTS FOUND ON CITY OF CAMPBELL RIVER PROPERTY BY SPECIES (IAPP CODE), PRIORITY, CLASS, CONCERN AND AREA (HECTARES).

Invasive Plant	Priority	Class	Concern	Area (Ha)
Bohemian knotweed (FALL BOH)	Contain	BC Regulated Noxious Weed		0.0279
Bull thistle (CIRS VUL)				0.0357
Burdock species (ARCT SPP)	Control			0.0020
Canada thistle (CIRS ARV)	Control	BC Regulated Noxious Weed		0.0720
Common periwinkle (VINC MIN)	Control			0.0058
Common tansy (TANA VUL)	Contain		Toxic to Livestock	0.0009
Creeping buttercup (RANU REP)				0.0005
Curled dock (RUME CRI)				0.2464
Cutleaf blackberry (RUBU LAC)				0.0047
English holly (ILEX AQU)	Control		Toxic	0.0033
English ivy (HEDE HEL)	Control		Toxic - Mild	0.0057
Field bindweed (CONV ARV)				0.1773
Giant knotweed (FALL SAC)	Contain	BC Regulated Noxious Weed		0.1095
Goutweed / bishop's weed (AEGO POD)				0.0010
Hairy cat's-ear (HYPO RAD)				0.0320
Hedge false bindweed (CALY SEP)				0.1207
Herb robert (GERA ROB)				0.0001
Himalayan blackberry (RUBU ARM)	Control			2.2799
Himalayan knotweed (POLY POL)	Contain	BC Regulated Noxious Weed		0.0009
Hound's-tongue (CYNO OFF)				0.0043
Japanese knotweed (FALL JAP)	Contain	BC Regulated Noxious Weed		0.2774
Lady's-thumb (POLY PER)				0.0606
Nightshade (SOLA SPP)				0.0200
Policeman's helmet / himalayan balsa	Contain			0.0015
Purple deadnettle (LAMI PUR)				0.0030
Purple loosestrife (LYTH SAL)	Control	BC Regulated Noxious Weed		3.4046
Scotch broom (CYTI SCO)	Control			3.2541
Sowthistle species (SONC SPP)				0.0003
St. John's wort/Saint John's wort/ Goa	Control			0.0464
Tansy ragwort (SENE JAC)	Control	BC Regulated Noxious Weed	Toxic to Livestock	0.0450
Yellow archangel (LAMI GAL)	Contain			1.0748
Yellow Flag iris (IRIS PSE)	Contain	BC Regulated Noxious Weed	Toxic	0.0281
Grand Total				**11.346**

Blank spaces in Table 8 indicate species with no priority, class or concern, in other words are not listed on the Coastal ISC priority invasive plant list or the BC Regulated Noxious Weeds list and are not considered toxic to humans or livestock. While they are invasive species, they are not a priority for treatment regionally or provincially. The City may determine, in the drafting of a local priority list that some of these species have local significance and associate funding towards control following this assessment.

Just over half (18) of the 32 varieties of invasive plants found in the city are priority invasive plants. Of the 18 priority species, eight species are BC Regulated Noxious Weeds: Knotweed

species (four types), Canada thistle, Purple loosestrife, Tansy ragwort and Yellow flag iris. Two species are toxic to wildlife, Common and Tansy ragwort, three species toxic to humans if ingested, Yellow flag iris (flower and sap to humans and livestock), English holly (berries) and English ivy, (all parts are mildly toxic, ingested or through the skin, causing contact dermatitis in some).

Priority invasive plants on City property occupy an area of 10.640 hectares, or 94% of the total area measured, indicating that priority invasive plants contain the bulk of the infestations.

No Provincial watch list species, prevent or eradicate species have been located on City property from the inventory or existing IAPP survey data; all species were either Contain (eight species) or Control (ten species).

The invasive plants found with the smallest populations are Himalayan knotweed (0.0009 Ha), Common tansy (0.0009 Ha), Policeman's helmet (0.0015 Ha) and Burdock species (0.0020 Ha) (Table 9). Species with the largest populations are Scotch broom (3.2541 Ha), Purple loosestrife (3.4046 Ha) and Himalayan blackberry (2.2799 Ha) (Table 9).

5.3 Estimated Area, Density and Distribution

Looking at the estimated area of an infestation can provide valuable information in making management decisions. Estimated area values are further broken down into a distribution and density code in IAPP. The distribution of a plant can vary from rare to continuously dense: Similarly, the density differentiates if the plant occurs at a low level (less than 1 plant/m^2) to dense (less than 10 plants/m^2).

The density and distribution of various invasive plants found on City property can be viewed in the IAPP database. Often the distribution and density of different infestations can be species specific determined by growth and spread patterns. For instance, Himalayan blackberry stands are typically continuous occurrences giving it a distribution of 8 (continuous occurrence of a species with few gaps in the distribution) and a density of 4 (>10 plants/m^2). Conversely, Bull thistle does not grow in a continuous stand, individual plants predominate giving it a distribution of 1 (rare individual, a single occurrence) or for more widespread distributions a rating of 7 (continuous uniform occurrence of well-spaced individuals) with a density of 1 (<= 1 plant/m^2") or 2 (2-5 plants/m^2).

6 Five Year Implementation Plan

6.1 Purpose

The purpose of the implementation plan is to (1) assist the City of Campbell River's management of invasive plants in prioritized municipal ecologically sensitive areas given limited resourcing; and (2) to address gaps in realizing a comprehensive invasive plant management program in line with the City's Invasive Plant Species Management Policy.

The eight steps in integrated invasive plant management discussed in Section 2.1 of this report provide a framework to guide efforts and to assist in evaluating the performance of the City and the community in realizing a comprehensive program.

6.2 Invasive Plants of Concern in the City of Campbell River

A 2014 inventory of invasive plants in three ecologically sensitive municipal lands (ERT Road, Rotary Seawalk and Simms Creek Bike Path) was conducted and this data was combined with existing IAPP data (2001-2014) and transferable community group data for Baikie Island, Nunns Creek and Willow Creek estuary and Willow Point Park (Sportsplex) in order to present a complete picture of invasive plants. Table 9 lists the plants of concern prioritized from the data analysis and colour coded for regional Contain and Control categories.

TABLE 9: INVASIVE PLANTS OF CONCERN IN THE CITY OF CAMPBELL RIVER BY PRIORITY, CLASS, CONCERN AND AREA (HECTARES)

Invasive Plant	Priority	Class	Concern	Area (Ha)
Bohemian knotweed (FALL BOH)	Contain	BC Regulated Noxious Weed		0.0279
Common tansy (TANA VUL)	Contain		Toxic to Livestock	0.0009
Giant knotweed (FALL SAC)	Contain	BC Regulated Noxious Weed		0.1095
Himalayan knotweed (POLY POL)	Contain	BC Regulated Noxious Weed		0.0009
Japanese knotweed (FALL JAP)	Contain	BC Regulated Noxious Weed		0.2774
Policeman's helmet / himalayan balsam (IMPA GLA)	Contain			0.0015
Yellow archangel (LAMI GAL)	Contain			1.0748
Yellow Flag iris (IRIS PSE)	Contain	BC Regulated Noxious Weed	Toxic	0.0281
Burdock species (ARCT SPP)	Control			0.0020
Canada thistle (CIRS ARV)	Control	BC Regulated Noxious Weed		0.0720
Common periwinkle (VINC MIN)	Control			0.0058
English holly (ILEX AQU)	Control		Toxic	0.0033
English ivy (HEDE HEL)	Control		Toxic - Mild	0.0057
Himalayan blackberry (RUBU ARM)	Control			2.2799
Purple loosestrife (LYTH SAL)	Control	BC Regulated Noxious Weed		3.4046
Scotch broom (CYTI SCO)	Control			3.2541
St. John's wort/Saint John's wort/ Goatweed (HYPE PER)	Control			0.0464
Tansy ragwort (SENE JAC)	Control	BC Regulated Noxious Weed	Toxic to Livestock	0.0450

Since `weeds know no boundaries' a systems approach is necessary for effective invasive plant management to be realized. Setting priorities for eradication across a region ensures everyone is working towards managing the same priority species for success across the Coastal ISC management area, with some exceptions made for a few regionally specific priorities.

Scotch broom for example is widespread within the Coastal ISC management area. The Coastal ISC works to `Control' the plant in areas of high ecological value using mechanical or chemical treatment and to use low cost or no cost methods when it occurs on a landscape scale. Dense stands of Scotch broom are not ignored by Coastal ISC, but efforts and resources do not warrant eradication. The premise is, Coastal ISC's complete annual budget could be spent on Scotch broom and it still would not be eradicated. Accordingly, the Coastal ISC works with volunteer groups to manage the large infestations. Similar thinking is required in any management area; it is more cost-effective to spend resources on new infestations, before they become a problem and work to control more established infestations in key areas.

6.3 Strategic Management

The biological invasive curve (Figure 2) is helpful in understanding how quickly invasive species, once introduced, can spread and the rapid increase of control costs as infestations spread and the potential for eradication diminish. Often public awareness efforts begin once eradication is unlikely and intense efforts is required to contain and control infestations. Prevention, early detection and rapid response (EDRR) are the most effective and financially sound approaches.

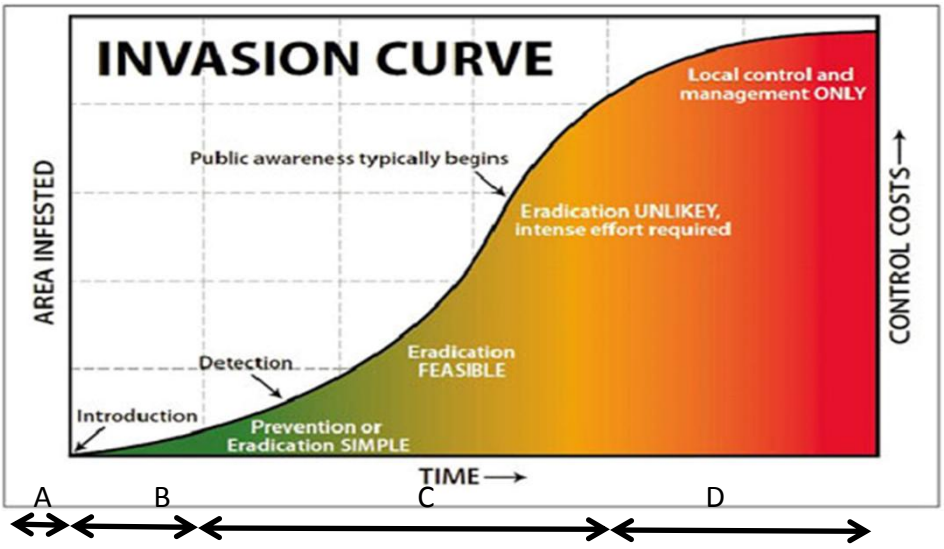


FIGURE 2: BIOLOGICAL INVASION CURVE: "A" PREVENT; "B" ERADICATE; "C" CONTAIN; AND "D" CONTROL AND ON-GOING MANAGEMENT

6.3.1 Prevention

The cheapest and most effective way to reduce the impact of invasive plants on ecologically sensitive areas is to prevent their establishment in the first place.

Prevention also includes limiting the spread of existing infestations to other areas. Vectors of spread include people's clothing (seeds can cling to cloth when brushing against), purchasing and planting known invasive plants, sharing invasive plant parts or seeds; environmental factors like wind, water, birds and wildlife; contaminated maintenance equipment including mowers, brush cutters, vehicle/bike tires and excavators; contaminated soil movement and improper disposal.

Strategic Actions:

1. *Encourage volunteer compliance from gardening enthusiasts, landscaping companies and nurseries to phase out the sale of invasive plants and the sharing of seeds and plant parts.*
2. *Use information from the Strathcona Regional District, North Island Invasive Plant Partnership (NIISP) and the Coastal ISC to identify emerging invasive plants before they establish in the city.*
3. *Use communication and education as the primary tool for preventing the introduction and distribution of invasive plants.*
4. *Giant hogweed (all parts of the plant are toxic to humans) is rare on City property and effectively managed by staff. Use an incentive based program to generate further awareness by local citizens about the toxicity of the plant and offer subsidized treatment, if infestations exist.*
5. *Monitor ecologically sensitive municipal lands every 3-5 years to assess the effectiveness of prevention actions.*

6.3.2 Early Detection and Rapid Response

Early detection and rapid response (EDRR) is both a cost effective and efficient way of managing invasive plants and is a provincial program led through the Inter-Ministry Invasive Species Working Group (IMISWG) in partnership with the Canadian Food Inspection Agency[21]. The strategy involves eradicating small populations of invasive plants first, before infestations become too large and widespread to manage.

[21] EDRR: Early Detection and Rapid Response

To effectively detect an invasive plant prior to its establishment, knowledge of emerging species is necessary and a reporting system must be established. The BC Proposed Prohibited Noxious Weed list[22] provides information about anticipated or present only in small populations in BC, and these plants are candidates for the BC EDRR. The BC Report-A-Weed website and mobile phone app[23] allows reporting of invasive plant sightings across BC. The Coastal ISC offers a Vancouver Island reporting hotline.

Once a species is reported to the provincial government it is necessary for a specimen to be sent to the Royal BC Museum for proper identification. Once confirmed management options are presented, costs are often incurred by the Province. Overall success is dependent on if the species can be eradicated and if sufficient resources are available.

Strategic Actions:

1. *Refer to Coastal ISC prevent and eradicate categories for a list of potential invaders to the city.*
2. *Use and promote the Report-A-Weed website and phone app or enter into an agreement with a local community group for a more localized reporting system and manage collected data in the IAPP database.*
3. *Launch a reporting and treatment campaign for eradication of small populations of Giant hogweed on private and public lands. Giant hogweed was not found in IAPP, in the inventory or noted by community groups working in the area. However Giant hogweed has been reported and treated on City lands by staff (personal communication Grant Parker, 2014) indicating this plant exists and can be eradicated. For the public, ID verification is important as it is easy to mistake it for its native cousin Cow parsnip. Given low levels of Giant hogweed infestation, it may be feasible to subsidize eradication efforts on private lands.*
4. *Focus treatment on high risk species as a priority (Knotweed and Giant hogweed) on small populations and infestations that have the potential to spread (including upstream and high traffic (walking and cycling sites).*

6.3.3 Management Priorities for Established Invasive Plants

The priority for established species designated as Contain and Control species in the Coastal ISC priority invasive plant list (Appendix A), are to: (1) protecting high value conservation areas,

[22] B.C. Proposed Prohibited Noxious Weeds List, 2012
[23] Report-A-Weed: Online or Mobile App

(2) containing existing infestations and preventing the spread to un-infested areas, which depend on (3) the likelihood of control; and (4) resources available and community interest.

All but one species found in the 2014 inventory and from IAPP data mining and community group data are listed under the Contain and Control categories in the Coastal ISC list (Appendix A). Giant hogweed is the only species that has been identified and managed in Campbell River in the Eradicate category. Given this, the Campbell River list can be further prioritized using the invasive biology methodology, by populations to identify established species Table 10.

TABLE 10: PRIORITY INVASIVE PLANTS RANKED BY AREA (HA)

Invasive Plant	Priority	Class	Concern	Area (Ha)
Giant hogweed (HERA MAN)	Eradicate	BC Regulated Noxious Weed	Toxic - Highly	0.0000
Himalayan knotweed (POLY POL)	Contain	BC Regulated Noxious Weed		0.0009
Common tansy (TANA VUL)	Contain		Toxic to Livestock	0.0009
Policeman's helmet / himalayan balsam (IMPA GLA)	Contain			0.0015
Burdock species (ARCT SPP)	Control			0.0020
English holly (ILEX AQU)	Control		Toxic	0.0033
English ivy (HEDE HEL)	Control		Toxic - Mild	0.0057
Common periwinkle (VINC MIN)	Control			0.0058
Bohemian knotweed (FALL BOH)	Contain	BC Regulated Noxious Weed		0.0279
Yellow Flag iris (IRIS PSE)	Contain	BC Regulated Noxious Weed	Toxic	0.0281
Tansy ragwort (SENE JAC)	Control	BC Regulated Noxious Weed	Toxic to Livestock	0.0450
St. John's wort/Saint John's wort/ Goatweed (HYPE PER)	Control			0.0464
Canada thistle (CIRS ARV)	Control	BC Regulated Noxious Weed		0.0720
Giant knotweed (FALL SAC)	Contain	BC Regulated Noxious Weed		0.1095
Japanese knotweed (FALL JAP)	Contain	BC Regulated Noxious Weed		0.2774
Yellow archangel (LAMI GAL)	Contain			1.0748
Himalayan blackberry (RUBU ARM)	Control			2.2799
Scotch broom (CYTI SCO)	Control			3.2541
Purple loosestrife (LYTH SAL)	Control	BC Regulated Noxious Weed		3.4046
Grand Total				**10.640**

Established species in Table 10 with infestations larger than a hectare include Yellow archangel, Purple loosestrife, Scotch broom and Himalayan blackberry. The next tier, infestations between 50 – 100 square meters (0.0050 – 0.0100 Ha) including English Ivy, Common periwinkle, Bohemian knotweed, Yellow flag iris, Tansy ragwort, St. John's wort and Canada thistle.

Strategic Actions:

1. *Develop a park stewardship volunteer program[24] with local citizens that neighbour ecologically sensitive lands and empower them by providing volunteer coordination, tools, disposal pick-up and recognition. Designate a park stewardship leader to coordinate each group per park. Engage BroomBusters in this effort. Focus management on established species where mechanical treatment is possible, see Control methods: Yellow archangel, Purple loosestrife, Scotch broom, Himalayan blackberry English Ivy, Common periwinkle, St. John's wort and Canada thistle.*
2. *Focus control on high value conservation areas protecting the most valuable habitats or ecologically sensitive features (streams, wetlands and wildlife habitat) first; note that works may require oversight by a Qualified Environmental Professional (QEP) in environmentally sensitive areas.*
3. *Engage and guide community groups and citizens in containing existing infestations and preventing the spread to un-infested areas; species include English Ivy, Common periwinkle, St. John's wort and Canada thistle. The management of Knotweed, Yellow flag iris, Tansy ragwort must be overseen/conducted by a QEP.*

6.3.4 Mapping/Data Records

The keeping of records is extremely important for effective invasive species management, as it allows for monitoring over time to ensure that prescribed treatments are successful. Good record keeping can also help to identify and prioritize treatment areas so that they provide value for money. IAPP also provides a secure and stable place for records so that data won't be lost through staff or organizational changes, as may have happened with some Campbell River BroomBusters data. It is a proven database and data is shared between all users province wide, so it can be easily used to develop partnerships. It also gives the Province an accurate picture of the invasive plant problems ensuring appropriate funding allocation.

Strategic Actions:

1. *Use the provincial IAPP database for storing data records from survey data, chemical and mechanical treatment and monitoring data. Download and use field forms available on the provincial website.*
2. *Select one agency to enter city data. Because IAPP requires training, and data entry is more efficient with system familiarity, it is suggested that one organization within Campbell River be chosen for this task, and resources directed towards ensuring that the organization has adequate capacity for keeping IAPP current.*

[24] District of Saanich Pulling Together Volunteer Program

3. *Stipulate in work plans and contracts that City staff, contractors and volunteers conducting invasive plant management are required to enter all of their work into IAPP, or to provide the necessary information to the organization responsible for IAPP data entry.*

6.4 Control Methods for Invasive Plants

The goal of controlling invasive plants is to reduce the negative impact that invasive plants have on ecosystem function, recreational use, human health and safety and aesthetic value so that ecosystems can continue to function. The target outcome is a native plant landscape in ecologically sensitive municipal lands. While this report focuses on the control of invasive plants, it is important to note that restoration by planting native plants (grasses, shrubs, trees) is part of any invasive plant management effort. The key to any successful invasive plant management effort is persistence; typically it is a 3-5 year commitment. Many sites will require monitoring and some level of maintenance in perpetuity.

Control methods for invasive plants include:

1. Cutting (manual or mechanical) of above ground stems, branches, and leaves by repeat mowing, cutting with loppers or using a brush cutter
2. Soil and root removal (manual or mechanical) such as pulling or excavation
3. Biological control such as the introduction of herbivorous insects and,
4. Herbicide application such as spraying cut stump or injecting

The effectiveness and various control methods for nineteen invasive plants are listed in Table 11. Table 12 provides the timing for the range of control methods.

TABLE 11: EFFECTIVENESS AND RANGE OF CONTROL METHODS FOR 19 PRIORITY INVASIVE PLANTS

A rating system to evaluate effectiveness of common control methods for invasive plants of concern in ecologically sensitive municipal lands in the city is used in Table 11. The effectiveness of each control method is rated on scale of 1-3, with 1 being effective at suppressing the plant in some instances and 3 demonstrating proven effectiveness. Boxes designated with a 1 indicate treatments that may worsen the infestation by increasing seed germination or dispersing root fragments

Control Method	Bohemian, Giant and Japanese Knotweed	Burdock Species	Canada Thistle	Common Periwinkle	Common Tansy	English Holly	English Ivy	Giant Hogweed	Himalayan Blackberry	Himalayan Knotweed	Policeman's helmet	Purple Loosestrife	Scotch Broom	St. John's wort	Tansy Ragwort	Yellow Archangel	Yellow Flag Iris
1. Cutting of Stems, Branches, and Leaves (not including roots)																	
Repeat Mowing	-1	1	1	-1			-1		2	-1	3	1					1
Cutting	-1						3[e]	2	2	-1		1[g]	2				
Brushcutting	-1			-1			-1		2	-1	3						
2. Root and/or Soil Removal (generally following cutting)																	
Root pulling[a]	-1			3	2	3	2		1	-1	2	2		1	2	2	3
Root cutting									1								
Tilling		-1	-1														
Excavating[b]						3		3	3		2			2		2	3
3. Biological Controls																	
Insects												3[f]					
4. Herbicide Application																	
Spraying[c]	2	3	3	3	3	3	2	3	3	3	3		2	3	3		
Cut Stump						3	2						2				
Stem injection[d]	3					3		3		n/a							

Notes: [a]by hand; [b]excavation of both roots and surrounding soil; [c]back-pack applicator using glyphosate (Roundup); [d]injection of glyphosate into the stem using specialized equipment; [e]removal from trees only; [f]introdction and maintenance of *Galerucella* beetles; [g]prevents flower development.

TABLE 12: RECOMMENDED TIMING FOR PRESCRIBED CONTROL METHODS (BY MONTH).

Control Method	Bohemian, Giant and Japanese Knotweed	Burdock Species	Canada Thistle	Common Periwinkle	Common Tansy	Giant Hogweed	English Holly	English Ivy	Himalayan Blackberry	Himalayan Knotweed	Policeman's helmet	Purple Loosestrife	Scotch Broom	St. John's wort	Tansy Ragwort	Yellow Archangel	Yellow Flag Iris
1. Cutting of Stems, Branches, and Leaves (not including roots)																	
Mowing		June - Aug[a]	June - Aug[a]						May - Sept		May - June[a]						All year
Cutting						May-June[a]			May - Sept		May - June[a]		April-May[a]				
Brushcutting									May - Sept								
2. Root and/or Soil Removal (generally following cutting)																	
Root pulling				All Year	May - July	April - June	May - July	All year[b]	May - Sept				All year		May - July	All year[b]	May - June[a]
Root cutting									May - Sept								
Tilling									May - Sept								
Excavating						April - June			All year								May - June[a]
3. Biological Controls																	
Insects												All Year*					
4. Herbicide Application																	
Spraying	Aug - Sept	June - Aug	Summer	Aug - Sept	May-July[a]	May	June-Aug	Aug or Oct	May-June or Sept-Oct	Aug - Sept	April - June		Aug -Oct	May, June		Aug- Sept	
Basel Bark Application							June-Aug	Aug , Oct or winter					Aug -Oct				
Stem injection	Aug - Sept					May	June-Aug										

Notes: [a]before seeds have formed; [b]mowing or cutting must be accompanied by removal of stems from the site to prevent resprouting; [c]Scotch broom new growth or young plants can be pulled; [d]repeated introductions of Galarucella may be required for successful establishment (or re-establishment).

If not done properly, invasive plant control may damage ecologically sensitive areas, impact other park values and can result in a wasted effort.

Strategic Actions:

1. *Review and update invasive plant control options that are suitable for ecologically sensitive areas as work progresses.*
2. *Where chemical control is recommended, refer to the City's Integrated Pest Management Policy to guide the use of herbicides. Herbicides may only be applied by a qualified professional with a pesticide applicators certificate for noxious weeds and industrial vegetation and with BC pesticide user licence.*
3. *Follow the Invasive Plant Pest Management Plan for Provincial Crown Lands in the South Coast Region of British Columbia*[25] *for best management practices for invasive plant management in riparian areas.*
4. *Consider rare and endangered species and bird habitat in clearing vegetation for invasive plant management.*

6.5 Work Plans for Prioritized Municipal Environmentally Sensitive Lands

Priority invasive plants have been summarized by species and total area, Tables 13 – 18 for Elk River Timber Road (ERT), Rotary Seawalk, Simms Creek Bike Path (including Willow Point Park (Sportsplex)), Willow Creek Estuary, Baikie Island and Nunns Creek Park. Each species is listed by regional priority, class and toxicity. Inventory maps are available for all seven areas.

All areas have infestations of Knotweed, a high priority species due to the damage it can cause to infrastructure and riparian ecosystems and the speed of spread. Rotary Seawalk inventory (Table 1) does not indicate Knotweed; however, Knotweed infestations do exist south of Rockland Road along HWY 19A IAPP sites: 217970,229498,290959,299784 and 299893. Refer to Map 5 for an overview and Table 8 for more detailed information about these sites.

More detailed survey data for each of these areas (Tables 13 – 18) is available including site ID, paper file ID, UTMs, survey date, invasive plant, area, density and distribution in the spreadsheet provided with this report.

[25] Invasive Plant Pest Management Plan for Provincial Crown Lands in the South Coast of BC, 2014

Table 13: Elk River Timber Road (ERT) Priority Treatment List

Priority Invasive Plant	Priority	Class	Concern	Area
Burdock species (ARCT SPP)	Control			0.0016
Canada thistle (CIRS ARV)	Control	BC Regulated Noxious Weed		0.0059
Common periwinkle (VINC MIN)	Control			0.0004
English holly (ILEX AQU)	Control		Toxic	0.0013
English ivy (HEDE HEL)	Control		Toxic	0.0014
Giant knotweed (FALL SAC)	Contain	BC Regulated Noxious Weed		0.108
Himalayan blackberry (RUBU ARM)	Control			0.5948
Japanese knotweed (FALL JAP)	Contain	BC Regulated Noxious Weed		0.0199
Scotch broom (CYTI SCO)	Control			1.0096
St. John's wort/Saint John's wort/ Goatweed (HYPE PER)	Control			0.0462
Yellow archangel (LAMI GAL)	Contain			0.0086
Grand Total				**1.7977**

Table 14: Rotary Seawalk Priority Treatment List

Priority Invasive Plants	Priority	Class	Concern	
Canada thistle (CIRS ARV)	Control	BC Regulated Noxious Weed		0.0002
Common periwinkle (VINC MIN)	Control			0.0020
Common tansy (TANA VUL)	Control			0.0003
English holly (ILEX AQU)	Control		Toxic	0.0001
English ivy (HEDE HEL)	Control		Toxic	0.0010
Himalayan blackberry (RUBU ARM)	Control			0.3150
Scotch broom (CYTI SCO)	Contain			0.1507
Yellow archangel (LAMI GAL)	Control			0.0012
Grand Total				**0.4705**

Table 15: Simms Creek Bike Path Priority Treatment List

Priority Invasive Plant	Priority	Class	Concern	Area
Canada thistle (CIRS ARV)	Control	BC Regulated Noxious Weed		0.0004
Common periwinkle (VINC MIN)	Control			0.0004
Common tansy (TANA VUL)	Contain		Toxic to Livestock	0.0001
English holly (ILEX AQU)	Control		Toxic	0.0018
English ivy (HEDE HEL)	Control		Toxic	0.0013
Hairy cat's-ear (HYPO RAD)	Control			0.002
Himalayan blackberry (RUBU ARM)	Control			0.1421
Japanese knotweed (FALL JAP)	Contain	BC Regulated Noxious Weed		0.0337
Policeman's helmet / himalayan balsam (IMPA GLA)	Contain			0.0015
Scotch broom (CYTI SCO)	Control			0.0003
St. John's wort/Saint John's wort/ Goatweed (HYPE PE	Control			0.0002
Yellow archangel (LAMI GAL)	Contain			0.911
Grand Total				**1.0948**

TABLE 16: BAIKIE ISLAND PRIORITY TREATMENT LIST

Priority Invasive Plant	Priority	Class	Concern	Area
Canada thistle (CIRS ARV)	Control	BC Regulated Noxious Weed		0.0125
Giant knotweed (FALL SAC)	Contain	BC Regulated Noxious Weed		0.0015
Himalayan blackberry (RUBU ARM)	Control			0.2090
Purple loosestrife (LYTH SAL)	Control	BC Regulated Noxious Weed		0.0016
Scotch broom (CYTI SCO)	Control			0.0210
Yellow iris (IRIS PSE)	Contain	BC Regulated Noxious Weed	Toxic	0.0282
Grand Total				**0.2738**

TABLE 17: NUNNS CREEK PARK AND ESTUARY PRIORITY TREATMENT LIST

Priority Invasive Plant	Priority	Class	Concern	Area
Common tansy (TANA VUL)	Contain	BC Regulated Noxious Weed	Toxic to Livestock	0.0005
English ivy (HEDE HEL)	Control			0.002
Himalayan blackberry (RUBU ARM)	Control			0.986
Himalayan knotweed (POLY POL)	Contain	BC Regulated Noxious Weed		0.0009
Japanese knotweed (FALL JAP)	Contain	BC Regulated Noxious Weed		0.0263
Purple loosestrife (LYTH SAL)	Control	BC Regulated Noxious Weed		1.103
Scotch broom (CYTI SCO)	Control			0.05
Grand Total				**2.1687**

TABLE 18: WILLOWS CREEK ESTUARY (KNOTWEED ONLY) AND WILLOW POINT PARK (SPORTSPLEX) PRIORITY TREATMENT LIST

Priority Invasive Plants	Priority	Class	Concern	Area
Canada thistle (CIRS ARV)	Control	BC Regulated Noxious Weed		0.023
Common periwinkle (VINC MIN)	Control			0.003
Hairy cat's-ear (HYPO RAD)	Control			0.03
Himalayan blackberry (RUBU ARM)	Control			0.019
Japanese knotweed (FALL JAP)	Contain	BC Regulated Noxious Weed		0.0007
Yellow archangel (LAMI GAL)	Contain			0.024
Grand Total				**0.0997**

Strategic Actions:

1. *Save your best first: Priorities should focus on the most valuable habitats such as marine foreshore, streamside and Campbell River estuary. Generally, areas that are part of a*

connected system are more valuable than isolated patches. Given this focus efforts should target Baikie Island and Simms Creek Bike Path due to their fragile ecosystems. The ERT Rd is a high traffic area with high potential for spread, however quite urbanized and doesn't hold as much ecological sensitivity. With the exception of treating Knotweed (as per action 2 below), comprehensive treatment of the ERT Rd is not a priority. Rotary Seawalk, located along marine foreshore is sensitive; however, restoration of the infested areas would prove to be difficult given the poor growing medium. Additionally, removal of large blackberry patches in areas where the shore is hardened with rip rap revetment and over-steepened would only exacerbate the potential for shoreline erosion. Invasive plant removal should focus on those areas of the beach that the City has reconstructed with a soft shore and planted with native vegetation by City staff and Knotweed treatments.

2. *Start with re-treating Knotweed sites in all locations. Refer to Table 6 and Table 7 for a complete list of sites treated in 2012 to 2014.*
3. *On Baikie Island, the mechanical treatment has left bare, disturbed patches of ground that are being colonized by Canada thistle. In concert with Yellow flag iris control, efforts to control Canada thistle should begin immediately to control it.*
4. *With respect to Purple loosestrife in the estuary area (including Nunns Creek), the plant is already under biological control (beetles). High numbers of the biological agent were released prior to 2000 and again in 2014. While hand removals in Nunns Creek (2004) saw very little success, the bioagents have been observed in high numbers. When there is a spike in plant numbers, it is followed by an attack from the biocontrol agent[26]. Continue to monitor success of the bioagent on Purple loosestrife.*
5. *Continue with management and focus on small populations first near sensitive areas, contain and control infestations in other areas.*

6.6 Monitoring and Adaptive Management

Monitoring is the process of recording change over time, in this instance the mechanical or chemical treatment is given an efficacy rating (on a scale of 10-90 % efficacy) and information on presence or absence of the plant or size of the remaining infestation recorded. An IAPP Chemical and Mechanical Monitoring Record[27] is available on the IAPP website. Photographs can be taken and uploaded to the database or filed for future analysis.

[26] Ernie Selletin, personal communication 2015.
[27] IAPP Chemical and Mechanical Monitoring Record

Strategic Actions:

1. *Ten percent of treated sites to be monitored annually for presence or absence of priority invasive plants and for efficacy of treatment. Use an IAPP monitoring record and upload into IAPP for future management decisions.*
2. *Based on site monitoring, adjust treatment plans accordingly for increased treatment efficacy. Sites found with 100% treatment efficacy (update IAPP survey record to plant not found) may no longer require treatment, however should continue to be monitored for presence/absence of priority invasive plants every 3-5 years in perpetuity.*

6.7 Education and Collaboration

Given that invasive plants know no boundaries the City will require the collaboration and involvement of a broad range of participants and partners from a provincial, regional and local level.

At the provincial level:

- Ministry of Transportation
- Ministry of Forests Lands and Natural Resource Operations
- Utility Companies
- The Invasive Species Council of BC

At the regional level:

- Coastal Invasive Species Committee
- North Island Invasive Species Partnership (NIISP) that includes Strathcona and Mount Waddington Regional Districts
-

At the local level:

- City of Campbell River
- Land Development community
- Local First Nations
- Landscape and nursery professionals and outfits
- Greenways Land Trust, BroomBusters, Nature Conservancy of Canada, The Nature Trust of B.C. and other stewardship groups and conservation organizations
- School District
- Park Neighbours
- General Public

6.7.1 Collaboration

Collaboration involves sharing information and knowledge, and building capacity. This is realized through workshops, strategic planning, meetings and co-funded projects.

Strategic Actions:

1. *Define the roles and responsibilities of invasive plant management within the city and in relation to key stakeholders listed previously.*
2. *In partnership with GLT, provide a forum for the dissemination of information on invasive plant management. Prepare an annual report and provide it on the City website.*
3. *Host an annual field tour and invite the public and City staff to review results of successful and unsuccessful projects.*
4. *Ensure co-chair representation on the NIISP from the Strathcona/Campbell River area.*
5. *In partnership with the NIISP, begin to formulate a North Island Priority Invasive Plant List by combining the Coastal ISC Prevent, Eradicate species with the species in Table 9.*
6. *Continue to support the work of the Coastal ISC as the regional node for invasive species management. Invite local stakeholders and encourage City staff to attend the Coastal ISC Annual Forum. Receive the Coastal ISC e-newsletter to stay abreast of pertinent regional and provincial invasive species information and legislation.*
7. *Build the capacity of a local community organization through a formal multi-year agreement (for example, one part-time, year round employee/contractor) for the planning and implementation of appropriate projects on public lands; data entry and management; maintenance and monitoring of existing projects; informal research or participation in research; participation in strategic planning; volunteer coordination; community education and outreach.*

6.7.2 Education

While carrying out this plan, education and communication are critical for increasing awareness, building momentum, and increasing capacity. It is important to meet the community where it's at; invasive species are a relatively new concern, and awareness levels vary widely.

Strategic Actions:

1. *Draft a communication plan to guide education and communication activities.*
2. *Update the City webpage to include: contact information for reporting invasive plants, the GLT top 10 invasive plant brochure, a link to the Coastal ISC priority invasive plant list, photos of invasive plants of concern, bylaw information and disposal information.*
3. *Provide periodic staff training to (1) raise awareness amongst professional staff in parks, engineering, and planning who are not familiar with invasive plant issues (the scope of the problem, how to ID known invasive plants, how to report infestations and local*

responsible disposal options); and (2) build technical skills for park and operations staff directly involved in invasive plant management (how to ID known invasive plants, BMP for maintenance contractors, how to report invasive plants, what is IAPP and field forms and disposal options). Field tours are recommended for both groups.

6.8 Legislation

The main legislation pertaining to invasive plants is currently held by the provincial government. The City is required to manage noxious weeds as a land manager under the BC *Weed Control Act*. Local governments have the power to enforce the BC *Weed Control Act* by creating bylaws under the *Community Charter*.

Bylaws are an important tool for enforcing invasive plant management. The City currently references noxious weeds (weeds regulated as Noxious under the BC *Weed Control Act*) in relation to unsightly premises, under *Public Nuisance Bylaw No. 3543, 2014*[28]. This is a great first step in addressing and enforcing noxious weeds; however, not all invasive plants of concern in the Coastal ISC service area are listed as noxious. In addition, the intent of the bylaw is to address unsightliness not to address the ecological impacts of noxious weeds.

The Resort Municipality of Whistler *Environmental Protection Bylaw 2000, 2012*[29] highlights a regional approach to the management of invasive species through their partnership with the local invasive species committee, including the emphasis on public education. Recently strengthened, the bylaw was amended (2014) to include prohibiting the planting of invasive species and the enforcement of the control of invasive plants species from a person's land. It is pursuant to plant species listed in the BC *Weed Control Act* and other alien invasive plants species identified as priority in the Sea to Sky Corridor (as per the Sea to Sky Invasive Species Committee priority list).

Strategic Actions:

1. *Amend the City's Environmental Protection Bylaw No. 3551, 2014 to include plant species listed in the BC Weed Control Act and other alien invasive plants species identified as priority in the Coastal ISC service area. The focus should be to prohibit the planting of invasive species and the requirement for owners to control invasive plants species on their property.*

[28] City of Campbell River Public Nuisance Bylaw 3543, 2014
[29] Resort Municipality of Whistler, Environmental Protection Bylaw

7 Recommendations

In order to advance invasive plant species management in the city over the next five years, a part-time (17 hrs/week) staff/contractor position is recommended to coordinate the strategic actions outlined in the implementation section of this report. In addition to existing funds already allocated to invasive species management by the City and GLT, an additional amount of $15,000 for first 3 years, reduced to $10,000 for year 4, 5 would support a strategic approach to invasive plant management. A sample budget table is included in Appendix D.

Duties would include:

- Education and outreach
- Communications
- Coordinating: inventory, treatment and monitoring activities
- IAPP data entry and data management
- Supervising and coordinating contractors and volunteer groups conducting invasive species management
- Disposal management
- Proposal writing for funding applications: Gaming BC, Walmart – Evergreen, Canada Summer Jobs and Canon Friends of the Environment, to name a few.
- Report writing

The above noted Campbell River invasive species coordinator would work with City staff, GLT and BroomBusters to:

- Refresh the invasive species page on the City's website
- Arrange training (invasive plant ID, reporting, and best management for managing invasive plants on roadways and in parks).
- Amend *Environmental Protection Bylaw No 3551, 2014.*
- Determine the feasibility of a city wide campaign to target Knotweed on private land (subsidizes or cost-share by the City) and public lands. Explore partnering with Strathcona Regional District on this initiative and other landowners for pooled funds to lower costs.
- Explore Federal Gas Tax Strategic Priorities Fund[30] for Knotweed management given negative impacts to infrastructure.

[30] Federal Gas Tax Strategic Priorities Fund, UBCM, 2014

Refer to Table 19 for a summary of the invasive plant management implementation recommendations from the Section 5 categorized on a short and medium term timeline. Short term recommendations are to be implemented within the first two years and medium term, three to five years depending on resources available.

TABLE 19: SUMMARY OF INVASIVE PLANT MANAGEMENT IMPLEMENTATION RECOMMENDATIONS

NO.	Short Term	Prevent	EDRR	Mgt
1	Build the capacity of a local community organization through a formal multi-year agreement (for example, one part-time, year round employee/contractor) for the planning and implementation of appropriate projects on public lands; data entry and management; maintenance and monitoring of existing projects; informal research or participation in research; participation in strategic planning; volunteer coordination; community education and outreach.	√	√	√
2	Update the City webpage to include: contact information for reporting invasive plants, the GLT top 10 invasive plant brochure, a link to the Coastal ISC priority invasive plant list, photos of invasive plants of concern, bylaw information and disposal information.	√		√
3	Draft a communication plant to guide education and communication activities.	√		
4	Use communication and education as the primary tool for preventing the introduction and spread of invasive plants.	√		
5	Refer to Coastal ISC prevent and eradicate categories for a list of potential invaders to the city.	√		
6	Giant hogweed (all parts of the plant are toxic to humans) is rare on City property and effectively managed by staff. Use an incentive based program to generate further awareness about the toxicity of the plant and offer subsidized treatment.	√		√
7	Ensure co-chair representation on the NIISP from the Strathcona/Campbell River area.		√	√
8	In partnership with the NIISP, begin to formulate a North Island Priority Invasive Plant List by combining the Coastal ISC Prevent, Eradicate species with the species in Table 9.			√
9	Use and promote the Report-A-Weed website and phone app or enter into an agreement with a local community group for a more localized reporting system and manage collected data in the IAPP.		√	

NO.	Short Term	Prevent	EDRR	Mgt
10	Focus treatment on high risk species as a priority (Knotweed and Giant hogweed) on small populations and infestations that have the potential to spread (including upstream and high traffic (walking and cycling sites).		√	√
11	Focus control on high value conservation areas protecting the most valuable habitats or ecologically sensitive features (streams, wetlands and wildlife habitat) first; note that works may require oversight by a Qualified Environmental Professional (QEP) in environmentally sensitive areas.			√
12	Select an agency to enter city data. Because IAPP requires training, and data entry is more efficient with system familiarity, it is suggested that one organization within Campbell River be chosen for this task, and resources directed towards ensuring that the organization has adequate capacity for keeping IAPP current.			√
13	Save your best first: Priorities should focus on the most valuable habitats such as marine foreshore, streamside and Campbell River estuary. Generally, areas that are part of a connected system are more valuable than isolated patches. Given this focus efforts should target Baikie Island and Simms Creek Bike Path due to their fragile ecosystems. The ERT Rd is a high traffic area with high potential for spread, however quite urbanized and doesn't hold as much ecological sensitivity. With the exception of treating Knotweed (as per action 2 below), comprehensive treatment of the ERT Rd is not a priority. Rotary Seawalk, located along marine foreshore is sensitive; however, restoration of the infested areas would prove to be difficult given the poor growing medium. Additionally, removal of large blackberry patches in areas where the shore is hardened with rip rap revetment and over-steepened would only exacerbate the potential for shoreline erosion. Invasive plant removal should focus on those areas of the beach that the City has reconstructed with a soft shore and planted with native vegetation by City staff and Knotweed treatments.			√
14	Continue with management and focus on small populations first near sensitive areas, contain and control infestations in other areas.			√

NO.	Short Term	Prevent	EDRR	Mgt
15	Start with re-treating Knotweed sites in all locations. Refer to Table 6 and Table 7 for a complete list of sites treated in 2012 to 2014.			√
16	Engage and guide community groups and citizens in containing existing infestations and preventing the spread to un-infested areas; species include English Ivy, Common periwinkle, St. John's wort and Canada thistle. The management of Knotweed, Yellow flag iris, Tansy ragwort must be overseen/conducted by a QEP.			√
17	Review and update invasive plant control options that are suitable for ecologically sensitive areas as work progresses.			√
18	Use the provincial IAPP database for storing data records from survey data, chemical and mechanical treatment and monitoring data. Download and use field forms available on the provincial website.			√
19	Stipulate in workplans and contracts that City staff, contractors and volunteers conducting invasive plant management are required to enter all of their work into IAPP, or to provide the necessary information to the organization responsible for IAPP data entry.			√
20	Where chemical control is recommended refer to the City's Integrated Pest Management Policy to guide the use of herbicides. Herbicides may only be applied by qualified professional with a pesticide applicators certificate for noxious weeds and industrial vegetation and with BC pesticide user licence.			√
21	Amend the City's Environmental Protection Bylaw No. 3551, 2014 to include plant species listed in the BC Weed Control Act and other alien invasive plants species identified as priority in the Coastal ISC service area. The focus should be to prohibit the planting of invasive species and the requirement for owners to control invasive plants species on their property.	√	√	√
22	Ten percent of treated sites to be monitored annually for presence or absence of priority invasive plants and for efficacy of treatment. Use an IAPP monitoring record and upload into IAPP for future management decisions.			√

NO.	Short Term	Prevent	EDRR	Mgt
23	Follow the Invasive Plant Pest Management Plan for Provincial Crown Lands in the South Coast Region of British Columbia for best management practices for invasive plant management in riparian areas.			√
24	Consider rare and endangered species and bird habitat in clearing vegetation for invasive plant management.			√
25	Launch a reporting and treatment campaign for eradication of small populations of Giant hogweed on private and public lands. Giant hogweed was not found in IAPP, in the inventory or noted by community groups working in the area. However Giant hogweed has been reported and treated on City lands by staff (personal communication Grant Parker, 2014) indicating this plant exists and can be eradicated. For the public, ID verification is important as it is easy to mistake it for its native cousin Cow parsnip. Given low levels of Giant hogweed infestation, it may be feasible to subsidize eradication efforts on private lands.	√		√
26	In partnership with GLT, provide a forum for the dissemination of information on invasive plant management. Prepare an annual report and provide it on the City website.	√		
27	On Baikie Island, the mechanical treatment has left bare, disturbed patches of ground that are being colonized by Canada thistle. In concert with Yellow flag iris control, efforts to control Canada thistle should begin immediately to control it.			√
28	With respect to Purple loosestrife in the estuary area (including Nunns Creek), the plant is already under biological control (beetles). High numbers of the biological agent were released prior to 2000 and again in 2014. While hand removals in Nunns Creek (2004) saw very little success, the bioagents have been observed in high numbers. When there is a spike in plant numbers, it is followed by an attack from the biocontrol agent. Continue to monitor success of the bioagent on Purple loosestrife.	√		

NO.	Medium Term	Prevent	EDRR	Mgt
29	The City to develop a park stewardship volunteer program with local citizens that neighbour ecologically sensitive lands and empower them by providing volunteer coordination, tools, disposal pick-up and recognition. Designate a park stewardship leader to coordinate each group per park. Engage BroomBusters in this effort. Focus management on established species where mechanical treatment is possible, see Control methods: Yellow archangel, Purple loosestrife, Scotch broom, Himalayan blackberry English ivy, Common periwinkle, St. John's wort and Canada thistle.			√
30	Encourage volunteer compliance from gardening enthusiasts, landscaping companies and nurseries to phase out the sale of invasive plants and the sharing of seeds and plant parts.	√		
31	Use information from the Strathcona Regional District, North Island Invasive Plant Partnership (NIISP) and the Coastal ISC to identify emerging invasive plants before they establish in the city.	√		
32	Monitor ecologically sensitive municipal lands every 3-5 years to assess the effectiveness of prevention actions.	√		
33	Based on site monitoring, adjust treatment plans accordingly for increased treatment efficacy. Sites found with 100% treatment efficacy (update IAPP survey record to plant not found) may no longer require treatment, however should continue to be monitored for presence/absence of priority invasive plants every 3-5 years in perpetuity.			√
34	Define the roles and responsibilities of invasive plant management within the city and in relations to key stakeholders listed previously.			√
35	Host an annual field tour and invite the public and City staff to review results of successful and unsuccessful projects.	√		√
36	Continue to support the work of the Coastal ISC as the regional node for invasive species management. Invite local stakeholder and encourage City staff to attend the Coastal ISC Annual Forum. Receive the Coastal ISC e-newsletter to stay abreast of pertinent regional and provincial invasive species information and legislation.	√	√	√

NO.	Medium Term	Prevent	EDRR	Mgt
37	Provide periodic staff training to (1) raise awareness amongst professional staff in parks, engineering, and planning who are not familiar with invasive plant issues (the scope of the problem, how to ID known invasive plants, how to report infestations and local responsible disposal options); and (2) build technical skills for park and operations staff directly involved in invasive plant management (how to ID known invasive plants, BMP for maintenance contractors, how to report invasive plants, what is IAPP and field forms and disposal options). Field tours are recommended for both groups.	√		√

8 Conclusion

Local governments play a significant role in minimizing the negative impact that invasive plants have on communities, the environment and the economy. Regulatory and non-regulatory invasive plant management options exist for formulating a successful invasive plant management program, including public outreach, prevention, incentives for landowners, identifying `alert' species new to the city, conducting inventories and data management, prioritizing and planning, treatment, disposal and monitoring.

The baseline inventory conducted in municipal environmentally sensitive areas in the city provides the beginning of an invasive plant management program for the area to be further monitored and strengthened over time. Education and outreach form an integral and cost effective part of an effective program. Coastal ISC is pleased to continue to work with the City of Campbell River and local community groups as it works to reduce the negative impacts of invasive species within its jurisdiction.

Appendix A – Coastal ISC Priority Invasive Plant List

PREVENT **These species not known to occur in region, but likely to establish if introduced. Eradicate if found.**
Common Crupina *Crupina vulgaris***
Cordgrass, Smooth *Spartina alterniflora***
Common Reed *Phragmites australis***
Giant Reed *Arundo donax***
Kudzu *Pueraria Montana***
Russian Knapweed *Acroptilon repens*
Yellow Starthistle *Centaurea solstitialis*
ERADICATE **These species are known to occur in limited distribution and low density. Eradicate if found.**
Bur Chervil *Anthriscus caucalis (N)*
Cordgrass, English *Spartina anglica***
Cordgrass, Dense-flowered *Spartina densiflora***
Cordgrass, Salt meadow *Spartina patens***
Garlic Mustard *Alliaria petiolata***
Giant Hogweed *Heracleum mantegazzianum* (T) (N)
Giant Mannagrass *Glyceria maxima***
Jimsonweed/Devil's Apple *Datura stramonium* (T)
Milk Thistle *Silybum marianum (N)*
Orange Hawkweed *Hieracium aurantiacum*
Scotch Thistle *Onopordum acanthium*
Wild Chervil *Anthriscus sylvestris*
CONTAIN **These species have established infestations in portions of the region. Contain existing infestations and prevent spread to un-infested areas.**
Butterfly Bush *Buddleja davidii*
Carpet Burweed *Soliva sessilis*
Daphne/Spurge-Laurel *Daphne laureola* (T)
Diffuse Knapweed *Centaurea diffusa (N)*
Eurasian Water-milfoil *Myriophyllum spicatum*
Garden (Yellow) Loosestrife *Lysimachia vulgaris***
Gorse *Ulex europaeus*
Knotweed, Bohemian *Fallopia x bohemica (N)*
Knotweed, Giant *Fallopia sachalinensis (N)*

Knotweed, Himalayan *Polygonum polystachum (N)*
Knotweed, Japanese *Fallopia japonica* (N)
Policemans Helmet/Himalayan Balsam *Impatiens glandulifera*
Poison Hemlock *Conium maculatum* (T)
Yellow Archangel *Lamiastrum galiobdolon*
Yellow Hawkweed *Hieracium caespitosum*
Yellow Flag Iris *Iris pseudacorus (N)*

CONTROL

Established infestations common and widespread throughout the Coastal ISC region.
Focus control in high value conservation areas.
Use biological control, if available, on a landscape scale.

Burdock Species *Arctium spp.*
Canada Thistle *Cirsium arvense* (B) (N)
Common Tansy *Tanacetum vulgare*
Dalmatian Toadflax *Linaria dalmaticab* (B) (N)
English Holly *Ilex aquifolium*
English Ivy *Hedera helix*
Hairy Cat's Ear *Hypochaeris radicata*
Himalayan Blackberry *Rubus armeniacus (discolor)*
Periwinkle Species *Vinca spp.*
Orchardgrass *Dactylis glomerata*
Purple Loosestrife *Lythrum salicaria* (B) (N)
Scotch Broom *Cytisus scoparius*
Spotted Knapweed *Centaurea maculosa* (B) (N)
St. John's Wort *Hypericum perforatum* (B)
Tansy Ragwort *Senecio jacobaea* (B) (N)

Appendix B - Greenways Land Trust Top 10 Invasive Species of Campbell River

Updated August 2013

HOLLY

- Glossy shrub, 5-18m high
- Dark green, thick, wavy leaves with sharp spines
- Small, whiteish flowers
- Reddish orange berries
- Grows from seeds
- Forms dense thickets in well drained soil
- Hogs water preventing other plants from growing




SCOTCH BROOM

- About 3m high
- Yellow pea-like flowers
- Lower leavers are stalked with 3 leaflets and upper leaves are unstalked

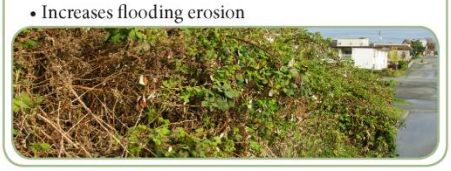
- Stem is 5 angled, ridged, woody, and brown or green
- Seeds spread though air, water, along roads
- Dry sandy soil in full sun



HIMILAYAN BLACKBERRY

- Dense shrub creates unpenatrable thickets blocking access for people and wildlife
- 3m high
- Stiff, 5-angled stems covered in large prickles

- Leaves are in groups of 5 or 3
- Flowers are small white/pink clusters that are stalked and 5 pedalled
- Spreads through root fragments and seeds transported by birds and bears
- Found in disturbed sites and take over areas
- Increases flooding erosion



TANSY RAGWORT

- Bright yellow daisy like flower
- Flower heads arranged in dense, flat topped clusters and each flower has 10-15 petal-like ray flowers
- Grow to 1.2 m high
- Purplish stems are branched near the top
- Dark green leaves are ruffled and alternate
- Reproduces through seeds
- Grows in pastures, hay fields, and disturbed areas
- Reduces production of pastures, taints honey produced be bees so it can't be sold, and causes liver damage in livestock.



MORE INFORMATION

Greenways Land Trust is a conservation organization that works to enhance recreational and ecological greenways for people and wildlife.

We have workdays throughout the year to help remove invasive species from environmentally sensitive areas.

For more informaiton on invasive species, workdays, and what Greenways does visit our website or contact us with your questions!

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Invasive Species
Campbell River

the TOP 10

LAMIUM

- Trailing groundcover
- Coarsely toothed, heartshaped leaves with silvery-grey markings
- Square stems with leaves opposite
- Spreads aggressively by seeds and vegetative runners
- It likes moist shaded sites such as ravines and is well adapted to shaded open areas
- Grows over other forest dwelling plants smothering them

ENGLISH IVY

- Ground cover and climbing vine
- Leaves are dark green, white veins, waxy/leathery texture, arranged alternately. Often 5-lobed, occasionally 3-lobed, or if it is mature, unlobed
- Clusters of small, pale yellow-green flowers
- Spreads through vegetative growth and seeds
- Infests woodlands, and other upland areas where moisture is present and soil is slightly acidic
- Climbs up trees, engulfing branches, eventually killing the tree
- Weight of vines make infested trees more susceptible to blow-over and are hazardous

PERIWINKLE

- Trailing vine, forms dense mats along the forest floor

- Green, slender, woody vines grow up to 3m long
- Glossy, dark green, oval shaped leaves about 3cm long
- Violet flowers with five pinwheel-like petals in late March/April
- Spreads vegetatively through rhizomes

- Areas with moist soil and partial sun

PURPLE LOOSESTRIFE

- Thrives in moist habitats, such as ditches, ponds and wetlands
- Grows up to 3m tall
- A spike of vibrant purple flowers is found at the top of the stiff, square stems
- Flowers have 5-7 petals arranged vertically
- Leaves are short, lance-shaped and opposite
- Becomes taller and bushier as it matures over the years
- Spreads through seeds and root fragments
- Aggressively crowds out native vegetation

YELLOW FLAG IRIS

- Bright, flashy plant that can grow to 1.5m
- Long, sword-like leaves with bases that fold and meet at the stem like a fan
- Yellow iris-like flowers and green pods with brown seeds
- Grows in wet areas like ditches, irrigation canals and wetlands
- Spreads through horizontal root systems and rhizomes
- Huge impenetrable thickets

KNOTWEED

- Large, woody, bamboo-like shrub
- Grows to over 3m high
- Whitish flowers in plume-like clusters along stem and leaf joints
- Stems are reddish-brown, look like bamboo and are hollow
- Dense thickets
- Spreads quickly and aggressively
- Grows along roadsides and wetlands causing bank erosion, fire hazards, and clogs waterways lowering habitat quality

Appendix C – List of Greenways Land Trust Records Consulted

- Invasive Species Campbell River: The Top 10
- Invasive Plant Species Identified in the Beaver Lodge Forest Lands
- Invasive Plant Species in Nunns Creek
- Invasive Species Program 2013 Annual Report
- Known Knotweed Infestations Campbell River: Priority Treatments 2014
- Summary of Invasive Plant Projects for Volunteer Groups May 2014

Appendix D – Sample Invasive Species Management Budget

Task	Greenways Land Trust (GLT)	City of Campbell River	BroomBusters
Invasive Plant Removal	$5,500[31] (370 volunteer in-kind hrs)	$12,000 (Baikie Island contract work) + additional volunteer efforts through other sources (e.g. VIHA crews) Approximately 200hrs of staff time per year (variable)	10-15 volunteers work intensively over a 6 week period – total hours are unknown but he volunteer commitment has grown since 2013)[32]
Volunteer Coordination	$1,500 (10% volunteer coordinators time)	Approximately 33hrs per year is spent by the Program Coordinator working with Greenways Land Trust to organize invasive removals in some non-ESA Park	Through BroomBusters- unknown value
Tools/ Maintenance	$500	$1,000 supplied to BroomBusters in 2015 for tools and supplies	Through BroomBusters- unknown value
Invasive Plant Outreach and Coordination	$250 (10 volunteer in-kind hrs at festivals/events)	Approximately 320hrs per year is spent by the Environmental Coordinator and other staff (policy, calls, program coordination, funding, land use referrals, regulation)	Through BroomBusters- unknown value
Knotweed Chemical Control (Contractor)	$2,500[33] (TD Friends of the Environment) $750 (volunteer staff time) $647.50 (staff time)	$5,000[34] ($600 GLT administration, $4,400 contract services)	Not applicable
Yellow Flag Iris Treatments (Contractor)		$4,000[35] (removal efforts) $1,500 (disposal)over time this figure will decrease)	Not applicable
Invasive Plant Pick Up and Disposal	Provided by the City of Campbell River	$7,500[36]	Provided by the City of Campbell River
Additional resourcing recommended by the Coastal Invasive Species Committee: $15,000 annually for 3 years (2016-2018) and $10,000 annually for 2 years (2019-2020) – re-evaluate			
Additional staffing recommended by the Coastal Invasive Species Committee: 17 hrs /week ($25/hr + employee benefit package)[37]			

[32] Efforts to date have focused on visible locations such as major City entrances and road corridors; other groups, such as Rotary, occasionally help out

[33] GLT notes that funding levels and sources vary from year to year, this figure is the 2014 value and includes restoration

[34] Annual amount since 2013

[35] Removal and disposal figures will decrease as the size of the infestation is reduced

[36] Annual amount since 2013 ($2,000 labour, $1,000 materials, $4,000 tipping fees)

[37] Additional resourcing and funding would support a Campbell River invasive species coordinator that would work with all project partners to implement this report's five year implementation strategic actions.