



Canadian Food
Inspection Agency

Agence canadienne
d'inspection des aliments



INVASIVE ALIEN SPECIES



Invasive Alien Plants in Canada

SUMMARY REPORT

This document is a summary of a more detailed technical report prepared by McClay Ecoscience (www.mcclayecoscience.com) and the staff of the Canadian Food Inspection Agency.

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Cover Photo: Leafy spurge (*Euphorbia esula*) dominating rangeland near Invermere, British Columbia. Larry Halverson, Parks Canada

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Overview

Invasive alien plants are harmful non-native plant species whose introduction or spread threatens the environment, the economy, and society, including human health. They can be introduced into Canada from other countries or continents, or from one region of Canada to another. The current threats posed by invasive alien plants are real and growing.

Why are invasive alien plants a problem? The economic cost of invasive alien plants to Canadians is enormous. Weeds in crops and pastures alone cost an estimated \$2.2 billion annually. Invasive alien plants also damage the environment by changing the diversity, structure, and function of an ecosystem. Their negative impact extends to our society, causing health problems for humans and reducing our enjoyment of natural areas.

How many invasive alien plant species are in Canada? There are an estimated 486 invasive alien plant species in Canada. Many invasive alien plant species came to Canada during the period from 1800 to 1900, with increased trade, immigration, and colonization. It is estimated that 0.58 new invasive alien plant species have become established in Canada every year in the past century.

Where are invasive alien plants located in Canada? Ontario, Quebec, and British Columbia are identified as the Canadian provinces with the highest numbers of invasive alien plant species, while Nunavut has the lowest (see Figure 1). Of Canada's 15 ecozones, the highest numbers of invasive alien plant species are found in the Mixedwood Plains, Atlantic Maritime, and Pacific Maritime ecozones, while the lowest numbers are found in the Arctic Cordillera, Northern Arctic, and Taiga Cordillera (see Figure 2).



European frog's-bit
(*Hydrocharis morsus-ranae*)

Wasył Bakowsky,
Ontario Ministry of Natural
Resources (OMNR)

Where do invasive alien plants come from? Invasive alien plants arrive in Canada through intentional and unintentional introductions. About 58% of invasive alien plant species appear to have arrived in Canada through intentional introductions from other countries. More than 80% of the invasive alien plants in Canada originated primarily from Europe, western Russia, and the Mediterranean, with the second largest group, 15%, coming from China and Japan. Future introductions of potentially invasive alien plants into Canada are likely to come from eastern Asia, southern South America, and the United States, because of their climatic similarities to Canada and current Canadian trade patterns.

What is Canada doing about invasive alien plants? In Canada, organizations responding to invasive alien plants include federal, territorial, provincial, and municipal governments, universities, colleges, botanical gardens, herbaria (collections of dried plants), non-government environmental organizations, youth groups, businesses, and First Nations groups. Responses to invasive alien plants have included surveys, mapping, management programs, monitoring, and regulations. Preventive programs are widely recognized as the most effective and cost-efficient means of control for invasive alien plants. Initiatives include *An Invasive Alien Species Strategy for Canada*, the *Action Plan for Terrestrial Plants and Plant Pests*, the Invasive Alien Species Partnership program, regulatory mechanisms, and provincial invasive plant councils.

This document is a summary of a more detailed technical report prepared in 2008.



Introduction

Invasive alien species are those harmful plants, animals, and micro-organisms whose introduction or spread threatens the environment, the economy, or society, including human health.

*Invasive Alien Species
Strategy for Canada*
(Government of Canada, 2004)



Common reed
(introduced lineage of
Phragmites australis)

Ken Allison, CFIA

Invasive plant **species**¹ present an immediate and growing threat to Canada's environment, economy, and society. They threaten croplands, rangelands, and natural areas in Canada, degrading agriculture and forest productivity, and reducing biological diversity, otherwise known as **biodiversity**. Their impacts result in significant economic losses and affect our trade relationships with foreign countries. Increasing and changing patterns of international trade and travel facilitate further incursions of invasive plant species in Canada, while global warming and other environmental factors favour their establishment and spread.

In 2005, the Government of Canada approved the implementation of key elements of *An Invasive Alien Species Strategy for Canada*. The strategy states that invasive **alien species** are those harmful plants, animals, and micro-organisms whose **introduction** or spread threaten the environment, the economy, or society, including human health. The strategy states that invasive alien species can be introduced from other countries or continents, as well as from one region of Canada to another.

This report describes the kinds of invasive plants that are found in Canada, where they occur, what effects they have on the Canadian economy, the environment, and society, and what actions are being taken to deal with them.

1.1 Invasive Plants in Canada

There are approximately 3,858 native **vascular plant species** in Canada. (Non-vascular plant species, such as mosses and lichens, are not discussed in this report). In addition, there are 1,229 alien vascular plant species reported at present in one or more locations in the country, adding up to roughly one-quarter of the national flora. Of these alien vascular plant species, 486 are considered weedy or invasive.

Another 316 species are recorded as being native to some part of Canada but introduced into other parts and, of these, 69 are considered invasive. A few of these are regionally considered significant invaders, such as common ragweed (*Ambrosia artemisiifolia*) in Quebec, and Manitoba maple (*Acer negundo*) in Alberta and British Columbia. However, few of the plants that moved outside their native range within Canada are considered major **invasive species**. The vast majority of significant invasive plant problems arise from species that are not native to any part of Canada.

¹ **Bold** text indicates terms explained in the glossary.

About 71% of invasive plant species in Canada are forbs (herbaceous plants except for grasses), followed by graminoids (plants with a grass-like growth habit) at 13%. Five plant families account for the highest number of invasive species:

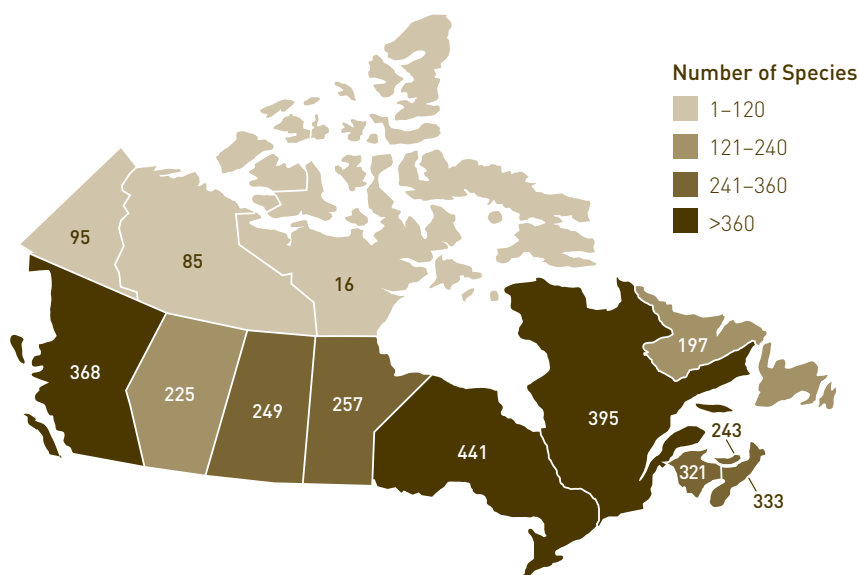
- aster family (Asteraceae): 78 species
- grass family (Poaceae): 60 species
- mustard family (Brassicaceae): 42 species
- pea or bean family (Fabaceae): 34 species
- mint family (Lamiaceae): 18 species

1.2 Where Are Invasive Plants Located in Canada?

The number of invasive plant species in Canada varies widely by province and territory. Ontario, Quebec, and British Columbia have the most, while Nunavut has the fewest (see Figure 1).

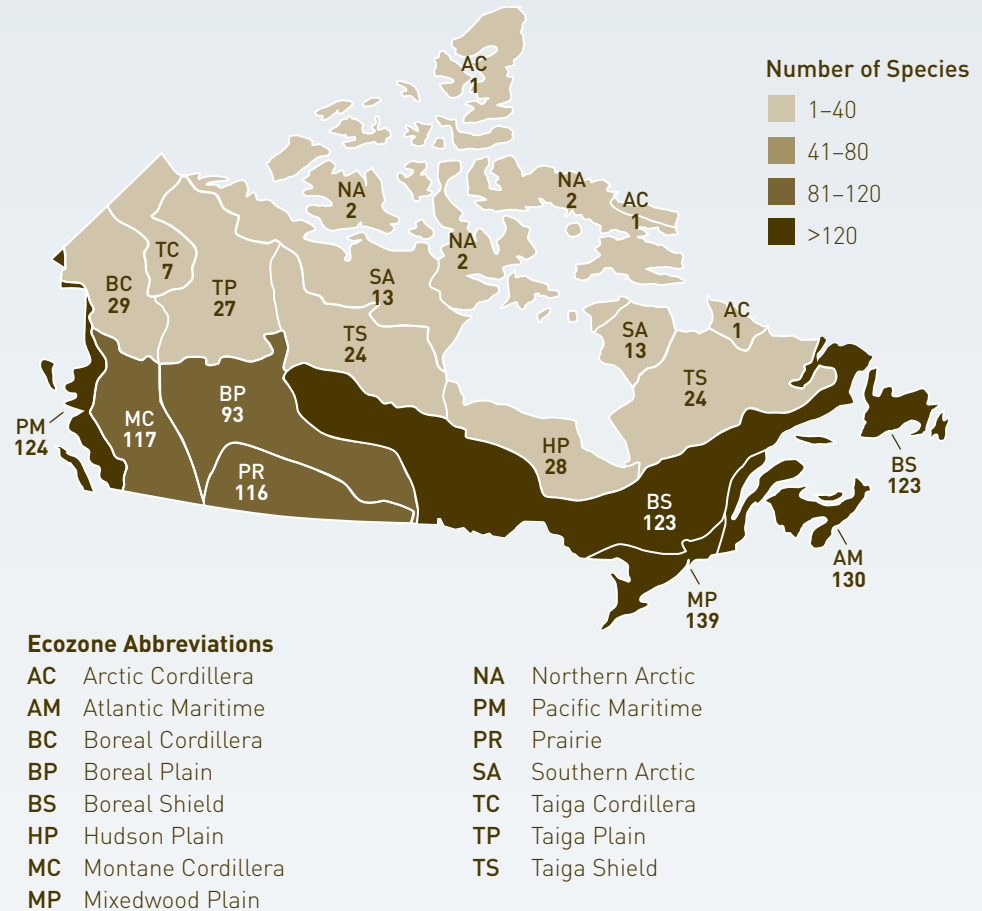
The number of species also varies by **ecozone** (see Figure 2). Of Canada's 15 ecozones, the highest numbers of invasive alien plant species are found in the Mixedwood Plains, Atlantic Maritime, and Pacific Maritime ecozones, while the lowest numbers are found in the Arctic Cordillera, Northern Arctic, and Taiga Cordillera. The limited number of alien or invasive plant species in the Arctic ecozones in Canada is due to the harshness of the climate and to the low levels of trade with potential source areas. Canadian ecozones with a similar climate to other ecozones of the world and large human populations that are involved in trade activities tend to have the highest number of invasive plant species.

Figure 1 Numbers of invasive plant species in Canada by province and territory



Note: Canada has 486 invasive alien plant species.

Figure 2 Number of invasive plant species by ecozone



Note: Based on the 162 species for which distribution maps were available.



Downy brome
(*Bromus tectorum*)

Steve Dewey,
Utah State University
www.bugwood.org

1.3 Where Do Invasive Plants Come From?

The invasive plants in Canada were introduced from many different parts of the world. Invasive plants tend to be introduced and become established in Canada from regions with which there is a great deal of trade, or from regions with a climate similar to Canada's.

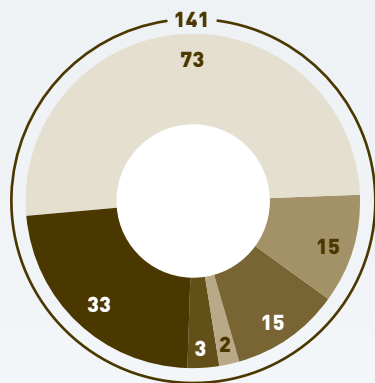
Historically, colonists from Europe brought many plants with them when they settled in Canada and, since then, there has been a great deal of trade with Europe. In addition to this, the climate of the western **Palaearctic** region, which includes Europe, western Russia, the Mediterranean, and northern Africa, is very similar to the climate in large parts of Canada. It is therefore not surprising that over 80% of the invasive alien plants in Canada originated from the western Palaearctic. The eastern Palaearctic region, mainly China and Japan, is the origin of 15% of invasive plants to Canada, the second-largest percentage. The climate in this region is also similar to Canada's.

1.4 How Are Invasive Plants Introduced into Canada?

The way a plant is introduced into a new region is called a **pathway**. In Canada, the main pathway has been deliberate introduction: of the 245 invasive alien plant species for which there is some information on the pathway of introduction, it is estimated that 141 (or 58%) were introduced intentionally (see Figure 3). These include plants introduced as agricultural crops, landscape plants, ornamentals, and plants for medicinal and research purposes. An estimated 120 (49%) were introduced unintentionally, such as weed seeds mixed in with imported soil or crop seeds. The total adds up to more than 245, and more than 100%, because some species are introduced by more than one pathway.

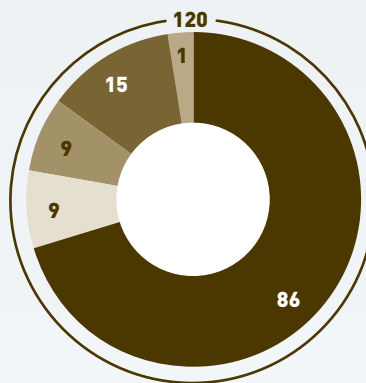
Figure 3 Suspected pathways of introduction for invasive alien plants in Canada

Total Number of invasive alien species with pathway information: **245 (out of 486)**



Intentional Introduction 141

- as agricultural crop (food, fodder, fibre) **(33)**
- as ornamental or landscaping plant **(73)**
- for soil improvement, erosion control, reclamation **(15)**
- for herbal or medicinal use **(15)**
- for research (escape from research stations, botanical gardens, arboreta, etc.) **(2)**
- unknown purpose **(3)**



Unintentional Introduction 120

- with plant products (contaminants in seed, forage, produce, wood products, garden supplies) **(86)**
- with livestock or other animals **(9)**
- in soil, sand, gravel (including ballast soil) **(9)**
- with freight, packing materials, machinery, equipment, etc. **(15)**
- through recreation/tourism (baggage, camping equipment, boats, etc.) **(1)**



Diffuse knapweed
(*Centaurea diffusa*)

Cindy Roche
www.bugwood.org



Garlic mustard
(*Alliaria petiolata*)

David Cappaert,
Michigan State University
www.bugwood.org

1.5 What Are the Likely Patterns for the Introduction of Invasive Plants to Canada in the Future?

One way to predict the origin of the next invasive species is to look at foreign trade patterns. Canada's top trading partner, the United States, is also its greatest source of plants and materials that could introduce invasives. Between 2001 and 2005, U.S. imports accounted for 67% of the total value of materials entering Canada with the potential of introducing invasive plants. Central and South America and the Caribbean together formed the second major source of such imports (16.1% of the total value), while Western Europe was the source of 6.2% of the total value of such imports. However, these trade patterns are changing quickly. Most notably, imports from eastern Asia (including China, Japan, Korea, and Mongolia) have increased rapidly, from \$197 million in 2001 to \$556 million in 2005, representing a 182% increase. By 2005, Canada's imports from East Asia had overtaken those from Western Europe.

As for the regions within Canada most likely to receive invasive plants, the most frequent import destination from 2001 to 2005 was Ontario, with Quebec and British Columbia about equal in second place. Imports to all other provinces as well as to the territories of materials that could introduce invasive plants were considerably lower.

Once introduced, plants can become established only if they can tolerate the climate in Canada. This is most likely if the climate in their home range is similar to the climate in parts of Canada. Eastern Asia and southern South America are potential source areas for future introductions of invasive plants, since they are climatically similar to areas of Canada that import large volumes of material that could contain invasive plants.

It is notable that some 2,039 alien plant species exist in the continental United States that do not occur in Canada. Of these, 615 occur in the states bordering Canada or the Great Lakes. These species have already shown that they can survive in a climate similar to Canada's and therefore represent a potential risk. Climate change may also play a role in range expansions of invasive alien plants into Canada in the future.

1.6 When Were Canada's Invasive Plants Introduced?

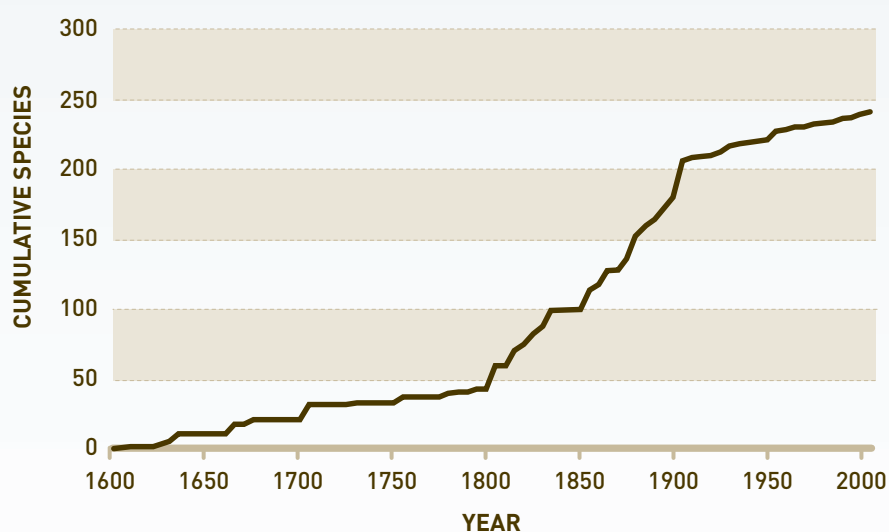
Invasive alien plants have been establishing in Canada for about 400 years, if it is assumed that introductions began with the first settlements of European colonists in the early 1600s.

There is enough information available to determine the approximate date of first introduction for 285 invasive alien species. The cumulative number of these species recorded over time is shown in Figure 4, which shows roughly three phases:

1. 1600 to 1800: A period of relatively slow accumulation of new invasive alien species.
2. 1800 to 1900: A period of more rapid accumulation, because of the faster pace of trade, immigration, and colonization, as well as increased study of the North American flora, which boosted awareness and recording of new species.
3. 1900 onward: A period of slower, linear accumulation.

Most invasive alien plant species came to Canada from 1800 to 1900. It seems that the pace of introductions during the past century has slowed to approximately 0.58 species per year. This may be a result of increased regulatory controls on the importation of goods that are contaminated with alien plant seeds or it may be a result of a delay between time of introduction and the development of major impacts (often referred to as lag time). But even a few species can have a great impact in our present environment because we now occupy and cultivate very large areas of land and the movement of people and goods between regions has vastly increased. It is also important to realize that many of the alien plants that have been present in Canada for decades or centuries are still increasing in number and expanding their ranges, and they can represent new problems locally.

Figure 4 Cumulative number of invasive alien plant species introduced into Canada from 1600 to 2005, for which dates of introduction can be estimated





Impacts of Invasive Plants

Economic sectors in Canada affected by invasive plants

- Animal production
- Arts, entertainment, and recreation
 - Construction
- Crop production
- Forestry and logging
 - Hunting, fishing, and trapping
- Mining and oil and gas extraction
- Private households
- Public administration
 - Transportation
 - Utilities

It is estimated that invasive plants cost the Canadian agricultural community approximately \$2.2 billion each year.

2.1 Economic Impacts

Invasive plants can cause enormous economic damage over a broad range of economic sectors. The most obvious economic impacts are direct, quantifiable costs such as losses in potential agricultural output or costs of herbicides. Additional costs related to indirect effects or less tangible values, such as ecosystem services (e.g., water purification, soil stability, and **carbon sequestration**), are more difficult to quantify. Few studies have attempted to quantify the economic impacts of invasive plant species in Canada.

The sectors most directly affected by invasive plants, and for which impacts are best known, are crop and animal production. In many areas the range and abundance of cropland weeds is known from surveys, while impacts have been estimated through experimental studies on weed-crop competition. Besides causing yield loss and boosting herbicide costs, invasive plants can also endanger the health of livestock, reduce animals' weight gain, and diminish the growth of edible vegetation on rangelands.

Nationwide, annual costs of invasive plants to the agricultural community are estimated at \$2.2 billion, on an agricultural land base that produces \$15 billion of plant products. These losses are attributed to weed damage (\$1.3 billion) and weed control (\$0.3 billion) in crops, as well as weed damage (\$0.1 billion) and weed control (\$0.5 billion) in pastures.

Costs have been estimated for some of the most economically damaging invasive plants in Canada, including Canada thistle, leafy spurge, knapweeds, and purple loosestrife. In the Prairie provinces, for example, canola yield losses and treatment costs for Canada thistle (*Cirsium arvense*) are estimated at \$320 million per year. In Manitoba, leafy spurge (*Euphorbia esula*) infests 340,000 acres of land, costing an estimated \$19 million per year in protection of grazing land, public land, and right-of-ways. There are many other invasive plants across Canada for which the total costs in damage and control measures either have not been calculated or are fragmented within and across several economic sectors. Furthermore, costs associated with invasive plants in Canada are expected to increase in the future.

2.2 Environmental Impacts

Invasive plants impact many aspects of ecosystem diversity, structure, and function. They can compete with and, in some cases, displace native plant species, potentially changing the plant composition of an ecosystem and endangering species of concern. Forty-four **species at risk** have been identified for which invasive plants appear to be factors in their at-risk status. The species at risk include plants, birds, amphibians, insects, and one reptile.

In terms of structure, thick stands of invasive plants can add or subtract one or more canopy layers of a natural ecosystem and change the dynamic in which plants, animals, and micro-organisms use those layers, ultimately changing **habitat** for wildlife. Glossy buckthorn (*Frangula alnus*), for instance, can rapidly form dense, even-aged thickets that create a continuous canopy and shade the undergrowth, thus imposing a radically different environment on native wildlife.

Invasive plants can also have adverse effects on the natural functioning of ecosystems, such as the productivity of plants, animals, and micro-organisms; water levels and characteristics; soil erosion; and natural fire cycles. Crested wheatgrass (*Agropyron cristatum*) is one of many invasive plant species that can alter ecosystem functioning. This species has been suspected of reducing the carbon-sequestering capacity of prairie grasslands, implying a possible role for this species in global climate change.

The complexity and variety of environmental impacts caused by invasive plants make their evaluation more difficult than the direct economic impacts on traditionally marketed commodities such as agricultural crops and forest products. However, the natural environment is clearly important to Canadians, who spend approximately \$11 billion on nature-related activities in a single year. Invasive plants have the potential to endanger the value of Canada's protected areas by compromising their natural integrity and diminishing their quality.



Glossy buckthorn
(*Frangula alnus*)

Ken Allison, CFIA

Forty-four species at risk have been identified for which invasive plants appear to be factors in their at-risk status.



Yellow floating heart
(*Nymphoides peltata*)

Stephen Darbyshire,
Agriculture and Agri-Food
Canada (AAFC)

2.3 Social Impacts

Social impacts of invasive plants include a diverse group of effects such as human health problems (allergies, dermatitis, etc.), interference with traditional lifestyles, and reduction or loss of tourism, employment, aesthetic values, property values, and enjoyment of natural areas in general.

Infectious zoonotic diseases (animal diseases that can be transmitted to humans), such as West Nile virus, affect both human and wildlife health, and invasive plants can provide breeding habitat for mosquitoes, which carry the disease.

Giant hogweed (*Heracleum mantegazzianum*) is an escaped garden ornamental that contains a sap that can cause serious skin inflammation. This species is widely established and spreading in southern British Columbia and Ontario.

Carpet burweed (*Soliva sessilis*) is another example of an invasive plant with social consequences. Native to South America, carpet burweed has become a serious nuisance weed on Vancouver Island and the Gulf Islands since its discovery in 1996. This tiny species has spiny seeds that cause physical discomfort when stepped on, resulting in reduced enjoyment of parks, beaches, sports fields, and golf courses. It also forms unsightly brown patches in summer, reducing the aesthetic value of parks and golf courses.

Few studies from Canada have focused on the social impacts of invasive plants and, like environmental impacts, they are often difficult to quantify.



Giant hogweed
(*Heracleum mantegazzianum*)

Donna Ellis,
University of Connecticut
www.bugwood.org

Canada's Response to Invasive Alien Plants



3.1 Canadian Programs

Whether on private or public property, on land, or in water, invasive plants are a shared responsibility for all Canadians. Organizations responding to invasive plants include federal, territorial, provincial, and municipal governments, universities, colleges, botanical gardens, herbaria (collections of dried plants), non-government environmental organizations, youth groups, businesses, and First Nations groups. In many cases, these groups have formed partnerships to respond in a number of ways to the threats of invasive plants. It is outside the scope of this summary report to provide a comprehensive account of Canada's response to invasive plants; however, a brief description follows.

Responses to invasive plants have included surveys, mapping, management programs, monitoring, and regulations. Survey efforts have focused on invasive plants in natural habitats and in agricultural crops. One of the largest survey efforts was the Prairie Weed Surveys conducted in Alberta, Saskatchewan, and Manitoba by the provincial departments of agriculture, in co-operation with the Saskatoon Research Centre of Agriculture and Agri-Food Canada.

An initial step in plant management programs is the mapping of invasive plant distributions with geographic information systems (GIS) and remote sensing technology. For example, the Invasive Alien Plant program of the British Columbia Ministry of Forests and Range includes a database that allows the entry, editing, and query of invasive plant information, including site details, invasive plant inventory information, planning, treatment methods, and monitoring data. Other examples are E-Flora BC, which is a GIS-based biogeographic atlas of the plants of British Columbia, and the Alberta Biodiversity Monitoring Program. Surveys for various invasive plants have also occurred in Yukon, the City of Calgary, Saskatchewan, Manitoba, Ontario, Quebec, and New Brunswick. Many conservation data centres across Canada also survey for invasive plants.



Crop inspection training
Art Gorda, CFIA

Provinces including Alberta, Saskatchewan and Manitoba have developed management plans to deal with specific invasive plants, such as purple loosestrife (*Lythrum salicaria*) and leafy spurge. Agencies such as the Columbia Power Corporation, Alberta Sustainable Resource Development Forestry Division, the City of Victoria, the Manitoba Weed Supervisors Association, the Ontario Ministry of Natural Resources, the New Brunswick Department of Agriculture and Aquaculture, Saskatchewan Agriculture and Food, Nova Scotia Agricultural College, the Saskatchewan Purple Loosestrife and Invasive Species Project, the Manitoba Purple Loosestrife Project, Manitoba's Leafy Spurge Stakeholders Group, and the Nature Conservancy of Canada all have worked to manage invasive plants through chemical, mechanical, cultural, or biological control programs.

The Prairie Farm Rehabilitation Administration, Environment Canada, the Canadian Food Inspection Agency, Fisheries and Oceans Canada, Parks Canada, Natural Resources Canada, and the Canadian Forest Service have all initiated programs against invasive plants. Agriculture and Agri-Food Canada has long been involved in developing biological control programs against invasive plant species.

Invasive plant councils have been formed in British Columbia and Alberta, while Manitoba's Invasive Species Council responds to invasive plant and animal species. These councils represent multi-stakeholder partnerships to co-ordinate efforts within a province. The British Columbia Invasive Plant Council, for example, is exploring early detection and rapid response plans and has developed a British Columbia Invasive Plant Strategy.

Significant resources are allocated to the management of established invaders in Canada. Control of invasive plants in agriculture is a major cost of production. There are eradication programs for invasive plants such as marsh plume thistle (*Cirsium palustre*) and carpet burweed in British Columbia; Canada thistle in Edmonton; scentless chamomile (*Tripleurospermum perforata*) in Saskatchewan; water chestnut (*Trapa natans*) and woolly cupgrass (*Eriochloa villosa*) in Quebec; and purple loosestrife in Manitoba and Saskatchewan.



Purple loosestrife
(*Lythrum salicaria*)

Linda Wilson,
University of Idaho
www.bugwood.org

Preventive programs are widely recognized as the most effective and cost-efficient means of control for invasive plants. Strategies to prevent new introductions are at the forefront of the Government of Canada's Invasive Alien Species Strategy, the Canadian Biodiversity Strategy, and the Action Plan for Terrestrial Plants and Plant Pests. The Canadian Food Inspection Agency has developed risk assessment tools and policies to prevent new invasive plants from entering the country. New partnerships and programs against invasive plants are also being developed through Environment Canada's Invasive Alien Species Partnership Program.

3.2 *An Invasive Alien Species Strategy for Canada (2004)*

An Invasive Alien Species Strategy for Canada responds to the challenge of invasive alien species through a hierarchical approach that prioritizes: *prevention* of new invasions; *early detection* of new invaders; *rapid response* to new invaders; and *management* of established and spreading invaders (containment, eradication, and control). This strategy seeks to protect Canada's aquatic and terrestrial ecosystems, their native biological diversity, and domestic plants and animals from the risks of invasive species. The scope of this initiative is broad and inclusive. It applies to all intentional (purposeful) introductions, both authorized and unauthorized (illegal), and all unintentional (accidental) introductions. It includes those alien species that are imported and introduced from other countries, as well as those species that are native to some regions of Canada, but have been introduced by human activity into areas outside their historical distribution.

3.3 *Proposed Action Plan for Invasive Alien Terrestrial Plants and Plant Pests — Phase 1 (2004)*

This action plan addresses the increasing threat of invasive plants and plant pests in Canada, following the strategic goals of *An Invasive Alien Species Strategy for Canada*. It builds on the existing programs to address the issue of invasive plants and plant pests in a more comprehensive and co-ordinated way. The key issues of the action plan are leadership and co-ordination, legislation and regulation, science, risk analysis, education and public awareness, and international co-operation.

3.4 International Agreements and Domestic Legislation

An Invasive Alien Species Strategy for Canada (2004) recognizes the use of regulatory measures as an important component for managing the movement of invasive species both within and from outside Canada. Authority in Canada for addressing invasive plants is not restricted to one level of government. It includes federal, provincial, and local governments in addition to First Nations bands.



Giant reed
(*Arundo donax*)

Chuck Barger, Jr.,
University of Georgia
www.bugwood.org



Canada thistle
(*Cirsium arvense*)

Mary Ellen (Mel) Harte
www.bugwood.org

The two most important international agreements regarding invasive plants are the ***International Plant Protection Convention*** (IPPC) and the ***Convention on Biological Diversity*** (CBD). While the IPPC relates to plant health and seeks to secure action to prevent the spread and introduction of pests of plants and plant products, and to promote appropriate measures for their control, the CBD promotes the conservation of biological diversity, the sustainable use of its components, and the equitable sharing of the benefits arising out of the utilization of genetic resources. Together, the IPPC and CBD provide strong incentives for adhering parties to address the risks associated with invasive plants.

A number of federal acts and regulations, administered by various departments, address invasive plants, such as the:

- *Plant Protection Act* (1990),
- *Seeds Act* (1985),
- *Wild Animal and Plant Protection and Regulation of International and Inter-provincial Trade Act and Regulations* (1992),
- *Species at Risk Act* (2002),
- *Canadian Environmental Protection Act* (1999),
- *Canada National Parks Act* (2000),
- *Pest Control Products Act* (2002),
- *Customs Act* (1985), and
- *Indian Act* (1985).

At the provincial level, the weed acts are often the principal instruments for dealing with invasive plants. Other provincial acts regarding the protection of natural areas, provincial parks, ecological reserves, wildlife conservation, pest control, and pesticides also address invasive plants.

Selected Reading on Invasive Alien Species in Canada

The following references, consulted in the preparation of this report, provide general information on invasive alien species in Canada. The complete technical report by McClay and colleagues contains a detailed reference list that provides sources for the economic and technical information.

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Scentless chamomile
(*Tripleurospermum
perforatum*)

Ken Allison, CFIA

Glossary

Alien species Species of plant, animal, or micro-organism introduced by human action to an environment outside its natural past or present distribution.

Biodiversity Variability among living organisms from all sources including, *inter alia*, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems (*Convention on Biological Diversity*, 1992).

Carbon sequestration The storage of carbon dioxide either biologically (carbon dioxide is naturally stored in plants, soils, and in ocean life), or geologically (carbon dioxide is stored directly in rocks or underwater).

Convention on Biological Diversity A convention signed by world leaders at the 1992 Earth Summit in Rio de Janeiro. The key points of the convention are the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources.

Ecozone An area of the Earth's surface that has a common historical and evolutionary distribution pattern of plants and animals. Canada is divided into 15 terrestrial ecozones. For more information on Canada's ecozones, visit www.spaceforspecies.ca/resources/ecozone/canada/index.htm.

Ecosystem The interaction of all the living things (plants, animals, and micro-organisms) with one another and with their habitat in a particular environment.

Ecosystem diversity The variety of plants, animals, and micro-organisms that are found in an ecosystem.

Habitat Location where a plant, animal, or micro-organism naturally lives and grows.

Introduction The entry of a plant species into a country or region outside its natural range as a result of human actions. Introductions may be *intentional*, such as the importation of a plant as a new crop or ornamental, or *unintentional*, such as when seeds arrive as contaminants in imported products.

International Plant Protection Convention An international treaty to promote action to prevent the spread and introduction of pests of plants and plant products, and to promote appropriate measures for their control. It originally came into force in 1951, but has been revised.



Salt-cedar
(*Tamarix* sp.)
Steve Dewey,
Utah State University
www.bugwood.org



Tatarian honeysuckle
(*Lonicera tatarica*)

Ken Allison, CFIA

Invasive species A species of plant, animal, or micro-organism whose introduction or spread threatens the environment, the economy, or society.

Palaeartic An ecological region that includes the land masses of Europe, Asia north of the Himalaya foothills, northern Africa, and the northern and central parts of the Arabian Peninsula.

Pathway The route or mechanism by which an alien species arrives in a country or in a region.

Pest Any species, strain, or type of plant, animal, or pathogenic agent (disease-causing agent, such as a virus or bacterium) that can damage plants or plant products.

Species A classification of a plant, animal, or micro-organism within a group that has distinct characteristics and reproductive processes.

Species at risk Any species that has been endangered, threatened, or is extinct in Canada but may occur elsewhere, as well as any species that merits special concern because of environmental conditions that may harm its habitat.

Vascular plant species Plants that have internal cell systems to carry and store water and food in their roots, stems, and leaves for nourishment.



The Canadian Food Inspection Agency (CFIA)

The mandate of the Canadian Food Inspection Agency (CFIA) is to safeguard food, animals, and plants, which enhances the health and well-being of Canada's people, environment, and economy. As part of this mandate, CFIA develops and delivers programs and services designed to protect Canada's plant resource base, under the *Plant Protection Act*. As a signatory party to the *International Plant Protection Convention* (IPPC) and to the *Convention on Biological Diversity* (CBD), Canada is responsible for administering a plant health program that includes addressing the threats of invasive species. As Canada's national plant protection organization, the CFIA bears primary responsibility for delivering this program, but works in co-operation with other government departments or agencies as well as provinces and municipalities.

The Invasive Alien Plants Program at CFIA

In September 2004, the Canadian federal and provincial governments developed *An Invasive Alien Species Strategy for Canada* and proposed a more detailed *Action Plan for Invasive Alien Terrestrial Plants and Plant Pests*. To implement its part of the strategy, the CFIA created an Invasive Alien Species (IAS) Section under its Plant Products Directorate to support existing national efforts that address plant pests and pest plants and enhanced areas in other branches to address the threats of IAS. The CFIA is a science-based regulator, committed to sustaining Canada's plant resource base and protecting Canada's agricultural and forestry resource bases.

In keeping with international standards, IAS programs incorporate input from national partners and stakeholders, and are based on science advice and risk analysis outcomes. Key initiatives fall under the broad headings of leadership and co-ordination, legislation and regulation, risk management (including information management, border controls, and emergency planning), and international co-operation.