

2002



Report of the  
**Commissioner of the  
Environment and  
Sustainable Development**  
to the House of Commons

**Chapter 4**  
Invasive Species



Office of the Auditor General of Canada

*The 2002 Report of the Commissioner of the Environment and Sustainable Development comprises 6 chapters and The Commissioner's Perspective—2002. The main table of contents is found at the end of this publication.*

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Chapter

# 4

Invasive Species

*The audit work reported in this chapter was conducted in accordance with the legislative mandate, policies, and practices of the Office of the Auditor General of Canada. These policies and practices embrace the standards recommended by the Canadian Institute of Chartered Accountants.*

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# Invasive Species

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## Main Points

**4.1** The federal government has not responded effectively to invasive species that threaten Canada's ecosystems, habitats, and other species. Ten years after the federal commitment to prevent their introduction or to control or eradicate them, the number of invasive species in Canada continues to grow. We found that neither the United Nations Convention on Biological Diversity nor the Canadian Biodiversity Strategy has triggered an identifiable change in the government's approach:

- The federal government has not identified the invasive species that threaten Canada's ecosystems or the pathways by which they arrive.
- The human and financial resources to deal with invasive species are spread across several federal departments and agencies as well as outside organizations, and they are not co-ordinated. There is no consensus on priorities and no clear understanding among federal departments or between the federal government and other jurisdictions of who will do what to respond.
- The federal government has not established the capability to gauge progress on its commitment to deal with invasive species.

**4.2** No federal department sees the big picture or has overarching authority to ensure that federal priorities are established and action is taken. There is a bias toward continuing dialogue and consensus building and a lack of practical action to prevent invasive species from harming Canada's ecosystems, habitats, or native species.

**4.3** Since invasive species frequently travel along as stowaways with people, goods, and vehicles moving between regions with different ecosystems, increases in trade and the gross national product—clearly a key economic goal—will almost certainly lead to further invasions unless the federal government takes concrete steps to prevent them. If action is not taken, costs will mount; and because invasive species are a leading cause of biodiversity loss, our storehouse of biological resources will continue to be depleted.

**4.4** Prevention is recognized by experts and the government as the best response to invasive species. Preventive measures would not be cost-free, or stop all invaders, but they are generally considered more practical than reacting to a succession of crises and repairing damage after invaders have become established. Prevention can also reduce the cost and ecological impacts of chemical controls and biodiversity loss associated with invasive species.

### Background and other observations

**4.5** Fish, plants, insects, bacteria, viruses, and other organisms found in an area beyond their native range are alien to that area. Not all alien species are harmful. Indeed, many have been introduced intentionally into Canada for the benefits they offered. But some, known as invasive species, can cause disease in native plants and animals or prey upon them; change local habitat, making it inhospitable to native species; or simply reproduce faster than native species and crowd them out by inhabiting their space and eating their food. Experts have concluded that invasive species are second only to habitat destruction as a leading cause of biodiversity loss, including local extinctions of species. Studies to date indicate that they cause billions of dollars of damage to Canada's economy every year.

**4.6** In 1992, Canada and 167 other countries signed the United Nations Convention on Biological Diversity and pledged to prevent the introduction of, or control or eradicate, alien species that threaten ecosystems, habitats, or other species. The Biodiversity Convention Office was established at Environment Canada to co-ordinate a Canadian response; it produced the Canadian Biodiversity Strategy in 1995.

**4.7** This audit focussed on the extent to which Environment Canada, on behalf of the federal government, has co-ordinated an effective national response to invasive species that threaten Canada's ecosystems, habitats, or other species. We set out to determine to what extent Canada's 1992 commitment and its 1995 strategy triggered a change in the federal government's approach to managing those species and the impact of any changes on prevailing trends.

**The departments have responded.** Environment Canada, Fisheries and Oceans Canada, and Transport Canada have accepted our recommendations. Their responses, which follow each recommendation in the chapter, indicate what the departments plan to do. The majority of their responses do not indicate when action will be taken; and in some cases the responses indicate that action is conditional on the availability of resources or on action by other departments or jurisdictions.

## Introduction

### The issue: Invasive species threaten ecosystems and the economy across Canada

**4.8** Fish, plants, insects, bacteria, viruses, and other organisms found in an area beyond their native range are alien to that area. Not all alien species cause harm; in fact, many, including a variety of plant and animal species, have been introduced intentionally to provide economic benefits.

**4.9** But some, including some that have been introduced intentionally, can cause disease in native plants and animals or prey upon them; change native habitat, making it inhospitable to native species; or simply reproduce faster than native plants and animals and crowd them out by inhabiting their space and eating their food. These are known as invasive species (see Appendix A for the definition of invasive species proposed by the Conference of the Parties to the United Nations Convention on Biological Diversity).

**4.10** Invasive species can also affect services that the native biology provides, such as soil retention, maintenance of water quality, and consumption of carbon dioxide by growing plants. And unlike most chemical pollutants that degrade over time, invasive species—which some scientists have termed biological pollution—have the potential to multiply, spread, and persist in the environment. Their impacts can ripple through the entire food chain.



This shopping cart was left in zebra-mussel-infested waters for a few months. The mussels have colonized every available surface on the cart.

Photo: James F. Lubner, University of Wisconsin, Sea Grant Institute

### A destructive force

**4.11** Experts have concluded that invasive species are second only to habitat destruction as a leading cause of biodiversity loss. Their ecological effects are often irreversible and, once established, invasive species are extremely difficult and costly to control or eradicate. An invasive species with no natural checks on its survival or its spread can quickly obliterate native ecology, eliminating natural diversity in favour of a single dominant species. The zebra mussel is perhaps the most infamous invasive species in Canada (see page 4, “The zebra mussel is a well known invader”).

**4.12** In general, invasive species tolerate a broad range of conditions, reproduce quickly, disperse widely, and resist eradication. They have adverse effects on managed agriculture crops and forests as well as on natural ecosystems across Canada.

### Regulated agriculture and forest pests can have serious ecological impacts

**4.13** Canada has long-established laws and regulations to prohibit or restrict the entry of foreign animals or plants capable of causing economic damage to agricultural crops (including livestock) or forest trees.

**4.14** The Canadian Food Inspection Agency (CFIA) has established procedures, and carries out a variety of activities, to reduce the risk of introduction into Canada of such regulated quarantine pests. The Agency also performs surveillance domestically to identify, control, or eradicate regulated pests that have gained entry to Canada.

**4.15** In 1996 we audited the CFIA's programs for protecting agriculture crops and forest trees from regulated pests. We noted that in almost all cases, import permits were required for certain goods to control the movement of foreign animals or plants that could pose a threat to human health or the

**The zebra mussel is a well known invader**

The invasion of Lake St. Clair by the zebra mussel in 1988 annihilated 13 native species in that lake and caused the near extinction of 10 species in Western Lake Erie: one of the greatest reductions of biodiversity ever witnessed in North America.

In a 30-kilometre stretch of the Rideau River, just 25 kilometres south of Parliament Hill, the density of these creatures increased from one animal per square metre to 383,000 per square metre in just three years, wiping out all native mussel species in the process.

Zebra mussels are a major fouler of industrial, municipal, and hydroelectric water intakes and outfalls. They cause a decline in water flow and plant efficiency.

Ontario Power Generation estimates that as a direct consequence of zebra mussels, its operating costs increased by between \$500,000 and \$1 million per year at its Darlington and Pickering nuclear stations, and for fossil fuel stations, about \$150,000 per year at Nanticoke, \$75,000 per year at Lambton, and \$50,000 per year at Lakeview. It has spent over \$20 million installing and maintaining chlorine applicators at its Great Lakes facilities and a few inland facilities to deter zebra mussels, and it has spent \$13 million on research to reduce or eliminate chlorine. Ongoing operating costs attributable to zebra mussels are not available for the hydraulic stations on the Great Lakes.

These costs and those confronting publicly owned water treatment facilities and other water-intensive industries could ultimately be passed on to homeowners and consumers.

Zebra mussels are also rapidly colonizing in Ontario's inland lakes. Once established there, they will clog water lines and foul piers, engines, and



Zebra mussels have the potential to severely impact native mussels by interfering with feeding, growth, respiration, and reproduction.

Photo: U.S. Environmental Protection Agency



De-fouling of water intakes and other equipment infested with zebra mussels, such as these debris racks, cost millions of dollars each year.

Photo: Paul M. Wiancko, Ontario Power Generation



Zebra mussel distribution in Ontario.

Source: Ontario Federation of Anglers and Hunters and the Ontario Ministry of Natural Resources

boats. They are also suspected of imparting offensive tastes and odours to drinking water. As many as 160,000 Ontario cottagers could ultimately pay significant costs to counteract problems caused by zebra mussels.

Finally, through their filtering activity, zebra mussels take in hazardous compounds such as polychlorinated biphenyls (PCBs). Fish and waterfowl that eat the mussels carry those poisons into the food chain. This invader has the potential to spread elsewhere in Canada.

economy. Usually, further diagnostic testing and health certification were required, and attestation by the government of the country of origin that the requirements set out in the import permit had been met. To provide additional assurances, imported goods were subject to possible inspection and quarantine upon arriving in Canada at land, sea, air, and mail ports of entry.

**Did you know?**

Number of alien agriculture and forest pests known to be in Canada: **94**

Number of invasive species that threaten Canada's ecosystems: **unknown**



Once a tree in a row is infected, Dutch elm disease can move through connected root systems to kill the entire row.

Photo: Dr. R. Jay Stipes, Virginia Polytechnic Institute and State University

**4.16** We noted that the Canadian Food Inspection Agency had an internationally recognized risk assessment process and had allocated resources to complete scientific risk assessments of more than 350 specific commodities, diseases, and pests.

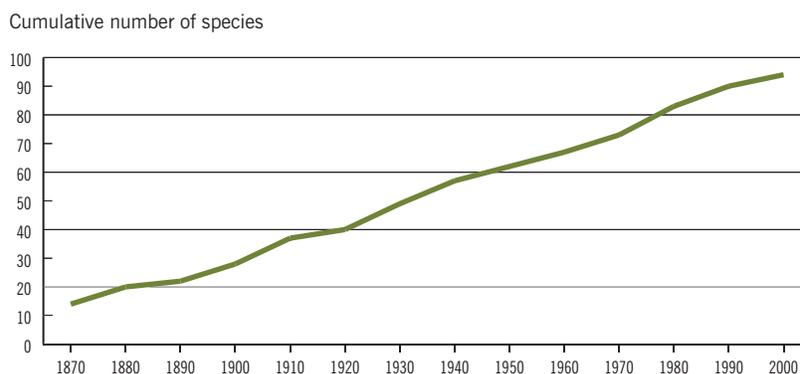
**4.17** However, we also noted that the changing global economy had stepped up the pressures on the federal government to allow additional imports, increasing the risks to Canada. In the 1990s alone, imported cargo unloaded in Canadian ports increased by almost 40 percent. The number of countries exporting products to Canada also increased.

**4.18** While inspection rates are higher for regulated commodities and for shipments from certain countries of origin, on average Canada can manage to inspect only 1 percent to 2 percent of incoming shipments. Based on its inspections and on samples submitted to its labs for evaluation, the CFIA reported 1,074 interceptions of alien pests in 2000.

**4.19** Despite continuing efforts to protect agriculture crops and forest trees, invasive pests gained access to Canada in the past, sometimes with devastating ecological impacts. Chestnut blight and Dutch elm disease are two examples. Dutch elm disease killed 600,000 elm trees in Quebec, and, in one year alone, killed 80 percent of Toronto's 35,000 elm trees.

**4.20** Both invaders were so destructive that the American chestnut and the elm are no longer significant parts of the forest ecosystems of southeastern Canada. Dutch elm disease is still moving west in Canada, placing up to 700,000 trees at risk. Exhibit 4.1 shows the cumulative number of alien agricultural and forest pests known to have been introduced into Canada to date.

**Exhibit 4.1 Alien agricultural and forest pests introduced in Canada (1870–2000)**



Source: Based on data provided by the Canadian Food Inspection Agency

**4.21** More recently, the Asian long-horned beetle and the brown spruce longhorn beetle from Europe have been discovered in Canada (see page 7, “Two alien beetles are clear and present dangers”). The former eats hardwood trees and the latter softwood trees; maple and spruce are favoured. Should current surveillance and control efforts fail, these two beetles have the potential to seriously harm forest ecosystems across Canada as well as the lumber, pulp and paper, maple syrup, nursery, commercial fruit, and tourism industries.

### **Invasive species jeopardize trade relationships**

**4.22** Invasive species can seriously damage or destroy native commercial species or make them unacceptable for export. Infection or infestation of commercially exported species can cause trading partners to impose restrictions on Canadian goods, with potentially enormous costs to the economy. Canada’s heavy reliance on exports of natural resources and agricultural products makes it vulnerable to trade disputes and their consequences (see page 7, “Canada is vulnerable to trade disputes”).

**4.23** In its 1999 report, *Safeguarding American Plant Resources*, the National Plant Board of the United States expressed concern about Canada as a documented source of invasive species and recommended stronger restrictions on imports from Canada.

### **Many unregulated invaders also cause harm**

**4.24** In addition to the invasive species regulated as quarantine pests, there are many others that also threaten Canada’s ecosystems, species, and habitats. While the total number of unregulated invaders is not known, examples include purple loosestrife, which threatens natural wetland ecosystems, especially in Quebec, Ontario, and Manitoba; European frog-bit, which clogs lakes and rivers in eastern Canada; and Scotch broom and gorse, which hinder the regeneration of commercial tree species such as the Douglas fir and have encroached on British Columbia’s Garry oak ecosystems, where many species of plants and animals are at risk of extinction.

### **Aquatic invaders are a particular problem**

**4.25** Unregulated invasive species also cause harm to Canada’s aquatic ecosystems and impose tangible costs on many industries that depend on water, including fishing, power generation, and water treatment. Ship ballast water is widely recognized as the predominant source of unintentional introductions of aquatic invasive species (see page 8, “Ballast water is a major pathway for aquatic invaders”).

**4.26** Scientists estimate that there are about 160 aquatic invasive species in the Great Lakes; there are more on Canada’s east and west coasts. And the impacts are devastating. Green crab and codium are two examples of invasive species with the potential to cause harm on Canada’s coasts (see page 9, “The green crab is eating its way up Canada’s coasts”).

#### **Did you know?**

Number of aquatic invaders thought to be in the Great Lakes: **160**

Two alien beetles are clear and present dangers

In the summer of 2000, Point Pleasant Park in Halifax was infested with brown spruce longhorn beetles from Europe. By March 2002, more than 2,600 spruce trees in the park had been destroyed by authorities to control the bug, and another 1,600 outside the park boundaries. At present, the only control action thought to be effective is to quarantine infested or potentially infested areas and burn the trees.

Should quarantine and control efforts fail, the brown spruce longhorn beetle



Point Pleasant Park in Halifax with container port nearby.  
Photo: Canadian Food Inspection Agency



Spruce trees killed by the brown spruce longhorn beetle in Point Pleasant Park, Nova Scotia.  
Photo: Canadian Food Inspection Agency

could spread throughout most of the softwood forests of Canada. Softwood is an extremely important and valuable source of lumber and pulp wood. In 1997 (the most recent year for which reliable data are available), sales of softwood lumber totalled more than \$13 billion.

The Asian long-horned beetle has been intercepted by authorities in Vancouver and southern Ontario. While authorities believe that efforts to prevent that bug from becoming established in Canada

have been successful, the Asian long-horned beetle poses a serious threat to Canada. The larvae of the Asian long-horned beetle tunnel under tree bark and bore into healthy hardwood trees, where they feed on living tissue and eventually kill the tree by disrupting the flow of



Asian long-horned beetle larvae are wood borers and a serious threat to hardwoods such as Canadian maples.  
Photo: Kenneth R. Law

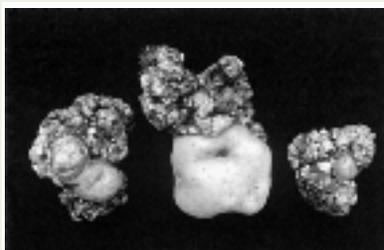
water and nutrients. In Ontario and Quebec, more than 50 sawmills process hardwood, which is in high demand today for flooring, furniture, and cabinetry. Sales of hardwood totalled more than \$480 million in 1997. The maple tree, which scientists have identified as the preferred diet of the Asian long-horned beetle, is a staple of the hardwood lumber industry. Maple syrup and sugar products were valued at more than \$130 million annually in 1997.

Canada is vulnerable to trade disputes

On 31 October 2000, the U.S. Department of Agriculture imposed a prohibition on all imports of Prince Edward Island potatoes because of potato wart. Potato wart is primarily a soil-borne disease, and spores of the fungus can remain viable in contaminated soil for many years. Diseased potatoes are deformed and unmarketable.

Potato wart was eradicated from the United States in 1992 and according to the U.S. Department of Agriculture, if the disease were to reappear it could be devastating to the U.S. potato industry because of potential losses in production and export markets.

Until October 2000, potato wart in Canada occurred only in Newfoundland. On 24 October 2000, the Canadian Food Inspection Agency confirmed the presence of potato wart in a single field in Prince Edward Island.



The fungus that causes potato wart can lie dormant in soil for up to 40 years. In 2000, potato wart virus cost P.E.I. farmers millions in lost export sales.  
Photo: Centro Internacional de la Papa

Though the U.S. ban on P.E.I. potatoes was lifted in April 2001, lost sales due to the U.S. ban were estimated at close to \$30 million. Work hours of sorters, packers, and truckers were down 64 percent from the year before. The government of Prince Edward Island established a fund of up to \$15 million to aid affected farmers.

The federal government responded by announcing up to \$12.6 million to help farmers dispose of surplus potatoes that accumulated in the wake of the import restrictions. On top of the disposal funding, the federal government pledged emergency aid of \$5.4 million to P.E.I. and an additional \$1.5 million to help provide surplus potatoes to food banks across Canada. The Minister of Agriculture also noted that up to an additional \$19 million in compensation would be provided through the Canadian Farm Income Program. Thus, total costs stemming from the six-month ban were as much as \$83.5 million.

Although there may not be a causal link to events in P.E.I., in the first two months of the prohibition period potato exports to the U.S. fell 6 percent in New Brunswick, 22 percent in Ontario and 15 percent in Quebec.

**Did you know?**

Estimated cost to the Canadian economy as a result of invasive species: **billions of dollars annually**

**The socio-economic costs of invasive species are already substantial**

**4.27** While there has never been a comprehensive assessment of the risks or the economic impacts of invasive species in Canada, several recent studies indicate that they impose a heavy hidden cost on society—as high as billions of dollars every year. For example, a recent study we obtained from officials of the Canadian Food Inspection Agency estimates that harmful invasive pests affecting agriculture crops and forest trees are costing today’s economy \$7.5 billion each year.

**4.28** That estimate does not include the costs that stem from the impacts of regulated pests on natural ecosystems or the impacts of unregulated invasive species.

**Ballast water is a major pathway for aquatic invaders**



Ballast water is a common source of unintentional introductions of aquatic invasive species.

Ships take on ballast water for stability and safety. When they do, their ballast tanks also take on a wide variety of aquatic species, including micro-organisms, algae, plants, small fish, and invertebrates. Over time, a layer of sediment accumulates in the tanks and it can also contain alien species. A recent study estimated that 3,000 species of aquatic organisms are transported around the world every day in the ballast tanks of ships.

Ballast water can transport a range of micro-algae, including toxic species that may form harmful algae blooms or “red tides.” The public health impacts of such outbreaks are well documented and include paralytic shellfish poisoning, which can cause severe illness and death in humans.

Scientific research has established that human pathogens are also transported in ship ballast water. A 1998 study that



Ballast tank sediment contains alien species that may be released into Canadian ports as foreign vessels pick up and off-load cargo.

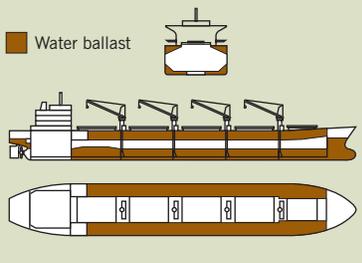
Photo: Phil Jenkins

sampled the ballast water of 28 transoceanic vessels en route to the Great Lakes found a number of known human pathogens (including salmonella, *Vibrio cholerae*, *Giardia*, and fecal coliforms such as *E. coli*) in one or more of the samples.

Ships pump out their ballast tanks in ports when they pick up cargo. In 1999, there were 201 Canadian ports reported to have handled cargo, 57 percent of it at 10 of the ports.

The introduction of invasive species through ballast water is an unintended consequence of a measure that serves a vital purpose to shipping and ship safety. However, while the *Canada Shipping Act* allows the federal government to regulate ballast water to prevent introductions of aquatic invasive species, it has not done so; nor has it assessed the potential risks that ballast water may pose to public health.

**G geared bulk carrier**



Typical location of ballast tanks on a commercial ship.

Source: Phil Jenkins

**4.29** Moreover, current estimates of the economic costs created by invasive species tend to be limited to specific pests, regions, or industries. For example, a recent estimate of damage caused by leafy spurge—an invasive plant that contains poisonous latex, which can cause contact dermatitis in humans and

**The green crab is eating its way up Canada's coasts**

The green crab, otherwise known as the cockroach of the sea, invaded the coast of North America at Cape Cod more than a century ago. By the 1950s, it had colonized in the waters of New Brunswick. It is likely that it invaded British Columbia in 1998 through warm tidal currents due to El Niño. The green crab not only preys on native crabs, clams, oysters, and mussels and occupies their habitat but also eats the same food as crabs, lobster, and many seabirds. A single green crab can eat 40 clams in a day. It also carries a parasite that is harmful to the eider duck, whose downy feathers have been prized for generations as insulation and bedding material.

The demise of the softshell clam fishery in northern New England and Nova Scotia in the mid-1950s was associated with green crab. In California the green crab was also blamed for losses of Manila clams as high as 50 percent.

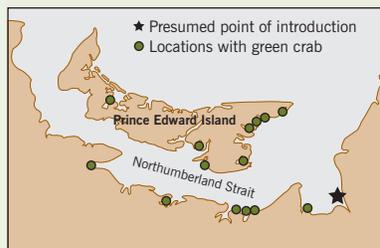
The green crab is aggressively colonizing along Canada's east coast, putting Canada's clam, mussel, and oyster industries at risk. The landed value of Atlantic clams, mussels, and oysters was about \$57 million in 2000. The landed value of Atlantic lobster, which scientists believe may also be threatened, was over \$500 million in 2000.

On the west coast, the Strait of Georgia is believed to be suitable habitat for green crab. The landed value of native clams and crab in British Columbia was approximately \$25 million in 2000. Dungeness crab is the most important commercial crab species in British Columbia. Roughly 222 fishing vessels and their crews rely on it and thousands of crab fishermen from 33 coastal First Nations communities depend on it. Recreational crabbers are estimated at between 10,000 and 20,000.



This omnivorous, aggressive and opportunistic intruder has left native populations of shellfish decimated in its wake.

Photo: Glen Jamieson, Fisheries and Oceans Canada



Source : Dr. Andrea Locke, Fisheries and Oceans Canada



Distribution of the European green crab on Canada's east and west coasts.

Source: Fisheries and Oceans Canada

**The undersea plant codium is a threat**



Codium is an invasive form of algae that can cause major devastation to local habitat, affecting native species of kelp, eelgrass, sea urchin, oysters, and lobster.

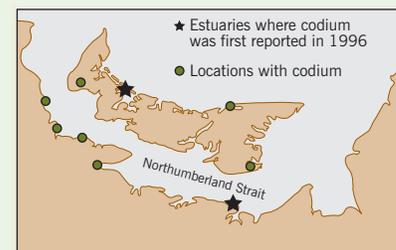
Photo: John Pearse, University of California, Santa Cruz

Scientists believe that codium smothers native mollusks, interferes with the reproductive cycle of the sea urchin, and drives out eelgrass that is habitat for eel. It also crowds out native kelp, which is prime habitat for lobster and other commercially valued species.

In Canada, codium is found along the coast of British Columbia, including the Queen Charlotte Islands and Vancouver Island. It was first reported on the east coast in Nova Scotia, in the late 1980s, and has since been discovered in the coastal waters of Prince Edward Island.

Codium is thought to have significant impacts on the lobster, oyster, kelp, and sea urchin industries and it may also affect eel.

In 2000 the value of the Atlantic sea urchin industry was more than \$7 million. Eel catches brought in about \$700,000.



Distribution of codium in the southern Gulf of St. Lawrence.

Source: Dr. Andrea Locke, Fisheries and Oceans Canada

can kill cattle if eaten in quantity—put the total cost of control in Saskatchewan at \$7 million a year.

**4.30** A study of the spread of Dutch elm disease in Manitoba estimated the total cost of research, suppression, and tree replacement at \$1.5 million a year. That study also concluded that the rate of elm tree loss in Winnipeg had increased from 2.5 percent in 1975 to 5 percent in 1996, despite all mitigation measures. The value of the 700,000 elm trees left in Canada is estimated at more than \$2.5 billion. Some of the costs associated with specific aquatic invaders are presented in the cases already cited.

#### Did you know?

Number of elm trees at risk from Dutch elm disease in Canada: **700,000**

Number of trees already killed in Quebec: **600,000**

**4.31** Most estimates of economic impact are restricted to losses of output and/or costs of control. Most do not reflect the social costs that invasive species can entail, such as lowered property values or falling tourism and employment. Many Canadians own or work in industries whose prosperity depends on a healthy ecology.

**4.32** Thus, current estimates of the economic harm caused by invasive species, though large, likely underestimate the total actual costs.

#### The problem is large and getting worse

**4.33** Despite the government's long-standing commitment to deal with the problem of invasive species, their numbers have grown steadily for decades. If trends continue, costs will mount. Moreover, because invasive species are a leading cause of biodiversity loss, our storehouse of biological resources will continue to be depleted.

#### The federal role

**4.34** A goal to prevent, control, or eradicate invasive species. Canada has legislation and programs dealing with invasive species that are capable of causing economic damage to agriculture crops or forest trees or that pose a threat to animal or human health. However, those laws and programs were not intended to protect Canada's biodiversity.

**4.35** In 1991, the Biodiversity Convention Office was established at Environment Canada to co-ordinate Canada's response to the upcoming United Nations Convention on Biological Diversity. Canada and 167 other countries signed the Convention in 1992. Among other things, the federal government committed to prevent the introduction of or to control or eradicate alien species that threaten ecosystems, habitats, and other species.

**4.36** In 1995, the Biodiversity Convention Office produced the Canadian Biodiversity Strategy, which pledged the federal government to take all necessary steps to prevent the introduction of harmful alien organisms and to eliminate those already present or reduce their adverse effects to acceptable levels. The strategy presented actions for accomplishing that objective, set out as follows:

- Develop and implement effective means to identify and monitor alien organisms.

#### Did you know?

Number of nations that signed the United Nations Convention on Biological Diversity pledging to deal with alien species that threaten ecosystems, habitats, or other species: **167**

- Develop national and international databases that support the identification and anticipation of the introduction of potentially harmful alien organisms in order to develop control and prevention measures.
- Determine priorities for allocating resources to the control of harmful alien organisms based on their impact on native biodiversity and economic resources, and implementing effective control or, where possible, eradication measures.
- Identify and eliminate common sources of unintentional introductions.
- Ensure that there is adequate legislation and enforcement to control introductions or escapes of harmful alien organisms.
- Improve preventive mechanisms such as screening standards and risk assessment procedures.

**4.37** Along with Environment Canada, the lead department for the Canadian Biodiversity Strategy, two other federal departments play key roles in managing the problem of aquatic invaders. Transport Canada is responsible for regulating and controlling the management of ballast water on ships and preventing or reducing the release of foreign aquatic organisms or pathogens by ships entering Canadian waters. Fisheries and Oceans Canada is responsible for conserving and protecting fish, including their habitat and food. More specifically, it has responsibility for performing scientific research and providing scientific advice in connection with ballast water regulations and standards.

#### **Focus of the audit**

**4.38** We focussed on whether Environment Canada, as the lead federal department, has successfully co-ordinated the implementation of a coherent and comprehensive national program to protect Canada's ecosystems, habitats, and species from existing and potential invaders. We set out to determine whether Canada's 1992 commitment and its 1995 strategy had triggered a change in the federal government's approach to managing invasive species that threaten Canada's ecosystems, habitats, and other species and to determine the impact of any such change on prevailing trends.

**4.39** **We looked to existing action plans for benchmarks.** In addition to the United Nations Convention on Biological Diversity and the Canadian Biodiversity Strategy, we examined the United States Management Plan. We also reviewed the Global Strategy on Invasive Alien Species, produced in 2001 by the Global Invasive Species Program. That program was established in collaboration with many international environmental organizations, including the World Conservation Union with initial support from the United Nations Environment Program.

**4.40** The plans and strategies we reviewed propose in common a number of criteria for an effective response to invasive alien species, including

- risk assessment, to understand what species and pathways pose the greatest threats and need to be managed under the plan;
- leadership and co-ordination, to understand who will take what actions to respond to key risks; and

- monitoring, to understand whether prevention and control measures are working or whether corrective action is required.

The plans consistently refer to prevention as the principal objective.

**4.41 Thus, we focussed on three key criteria.** In our view, to assure Canadians that it is responding effectively to the problem of invasive species that threaten Canada's environment, the federal government needs to know

- what invaders pose the greatest risks to Canadian ecosystems, habitats, or species and by what major pathways they arrive;
- who is taking what action to respond to major risks; and
- how effective those actions have been at eliminating or reducing adverse effects to acceptable levels so the government can determine whether programs are working or whether corrective measures are required.

We looked at whether Environment Canada has that information or has established the basic tools it needs to acquire it.

**4.42** Since ship ballast water is the most important source of unintentional introductions of aquatic invasive species, we examined how the federal government is managing those species and that path of entry.

**4.43** We looked at whether Transport Canada has ensured that regulations and enforcement are adequate to control the introduction of alien species into Canadian waters from ship ballast.

**4.44** And we looked at how Fisheries and Oceans Canada has responded to the goal and strategies set out in the Canadian Biodiversity Strategy. Specifically, we set out to determine whether the Department has identified the alien aquatic species that pose the greatest risks to Canada, determined priorities for action based on risk, and put in place the monitoring tools it would need to know whether measures taken to prevent the introduction of those species into Canadian waters have been effective. We did not look at the Department's programs dealing with introductions of alien or genetically modified species from domestic fish stocking programs or from aquaculture operations.

**4.45** The United States General Accounting Office performed an audit dealing with invasive species in parallel with our own. Part of its report also discusses ballast water and regulation and enforcement by U.S. authorities (the report will be available at GAO-03-01 at [www.gao.gov/cgi-bin/getrpt?gao-03-01](http://www.gao.gov/cgi-bin/getrpt?gao-03-01)).

**4.46** In addition, in its 11th Biennial Report on the Great Lakes Water Quality Agreement, the International Joint Commission (IJC) raises concerns about the introduction of aquatic invaders into the Great Lakes from ship ballast water and sediment in ship ballast tanks (see [www.ijc.org](http://www.ijc.org)).

**4.47** A description of the audit performed by the U.S. General Accounting Office and the conclusions of the IJC report are provided in appendices B and C.

## Observations and Recommendations

### A gap between commitment and corrective action

**4.48** The federal government has a range of legislation and programs to safeguard agriculture crops (including livestock), forest trees, and human health from specific types of alien pests. But it has mobilized no similar level of effort to fulfil its pledge to protect Canada's ecosystems, habitats, and species from other invaders.

### Canada has yet to identify the greatest threats

**4.49** Environment Canada has not co-ordinated the federal efforts to identify present and potential invaders that threaten Canadian ecosystems and their key pathways of arrival into Canada. It has not organized a comprehensive assessment of the risks that invasive species pose to our environment and economy. Thus, the federal government has no means to determine the greatest threats to Canada's ecosystems from invasive species; to set national priorities for prevention, control, or eradication; and to allocate its scarce resources to areas of greatest risk.

**4.50** And Environment Canada lacks the information it would need on ecological and socio-economic impacts to make a strong business case for obtaining additional funds to deal with invasive species that threaten Canada's ecosystems.

### No agreement on what needs to be done and by whom

**4.51** The past decade has seen an overwhelming volume of information generated on invasive species. They have been the subject of conventions, resolutions, agreements, strategies, action plans, guidelines, studies, and codes of conduct and practice; Exhibit 4.2 lists some related to aquatic invasive species. Together, exhibits 4.1 and 4.2 show that despite decades of planning and deliberations, the number of invaders in Canada continues to grow.

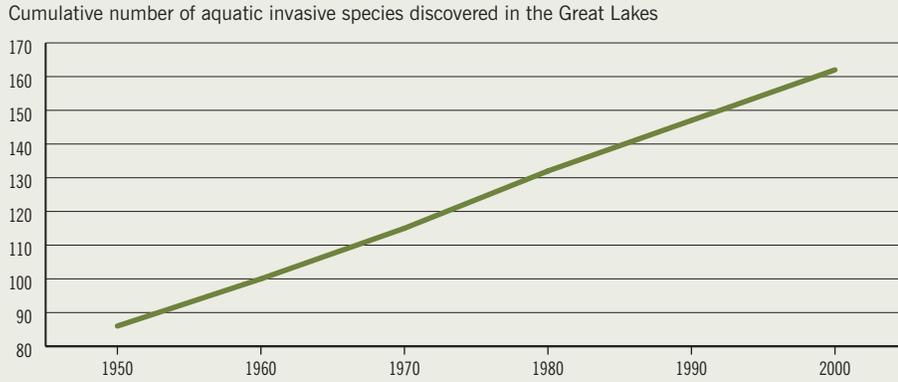
**4.52** There is still no clear understanding among federal departments or between the federal government and other jurisdictions about who will do what to respond to invasive species that threaten Canada's ecosystems.

### No capability to gauge progress

**4.53** There is no formal mechanism that federal departments or others can use to share information with Environment Canada on invasive species or on the effectiveness of measures taken to counteract them.

**4.54** Thus, Environment Canada has no basis to know who is taking what measures or to report on how effective any measures have been. The federal government cannot demonstrate that it has prevented the entry of invasive species that threaten Canada's ecosystems or even slowed their rate of entry. Prevailing trends indicate that not enough is being done.

**Exhibit 4.2** Despite decades of agreements and accords, the number of invaders in the Great Lakes continues to grow



- 1955 ■ Great Lakes Fishery Commission and its Sea Lamprey Control Program established by the Convention on Great Lakes Fisheries Between Canada and the United States of America

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- 1981 ■ Great Lakes Fishery Commission's Joint Strategic Plan for Management of Great Lakes Fisheries

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- 1987 ■ Great Lakes Water Quality Agreement amended to include research on non-native species and ballast water discharge  
 ■ World Conservation Union Position Statement on Translocation of Living Organisms

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- 1989 ■ Voluntary Guidelines for the Control of Ballast Water Discharges from Ships Proceeding to the St. Lawrence River and the Great Lakes

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- 1992 ■ United Nations Convention on Biological Diversity

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- 1993 ■ International Maritime Organization Resolution A.774(18) Guidelines for Preventing the Introduction of Unwanted Organisms and Pathogens from Ships' Ballast Water and Sediment Discharges

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- 1994 ■ The 1994 version of the Canada–Ontario Agreement Respecting the Great Lakes Basin Ecosystem—references to invasive species

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- 1995 ■ Canadian Biodiversity Strategy  
 ■ World Trade Organization Agreement on the Application of Sanitary and Phytosanitary Measures  
 ■ United Nations Food and Agricultural Organization Code of Conduct for Responsible Fisheries

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- 1997 ■ International Maritime Organization Resolution A.868(20) Guidelines for the Control and Management of Ships' Ballast Water to Minimize the Transfer of Aquatic Organisms and Pathogens

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- 1998 ■ Bill C–15 to amend the *Canada Shipping Act*, to allow for regulations relating to ballast water

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- 1999 ■ Resolution VII.14 on Invasive Species and Wetlands under the United Nations Convention on Wetlands of International Importance

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- 2000 ■ The Shipping Federation of Canada's Code of Best Practices for Ballast Water Management  
 ■ Voluntary Guidelines for the Control of Ballast Water Discharge from Ships in Waters Under Canadian Jurisdiction (update to the 1989 Voluntary Guidelines)  
 ■ Great Lakes Commission's Great Lakes Action Plan aimed at the prevention and control of aquatic invasive species  
 ■ Global Ballast Water Management Programme  
 ■ Interim Guiding Principles for the Prevention, Introduction and Mitigation of Impacts of Alien Species under the Convention on Biological Diversity  
 ■ World Conservation Union Guidelines for the Prevention of Biodiversity Loss Caused by Alien Invasive Species

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- 2001 ■ Global Invasive Species Programme's Global Strategy on Invasive Alien Species  
 ■ Great Lakes Commission's Policy Statement on Ballast Water Management

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- 2002 ■ Guiding Principles for the Prevention, Introduction and Mitigation of Impacts of Alien Species that Threaten Ecosystems, Habitats or Species, under the Conservation on Biological Diversity

■ Canadian initiatives    ■ Canada–U.S. initiatives    ■ Multilateral initiatives

**4.55** As the department with lead responsibility for co-ordinating the federal government's response to invasive species, Environment Canada needs to be in a position to lead the initiative and report Canada's progress on its commitment to prevent the introduction of or to control or eradicate invasive species.

**4.56 Recommendation.** Environment Canada should put in place a national invasive species action plan to clearly identify the invasive species that pose the greatest risks to Canada's ecosystems, habitats, and species and the main pathways by which they arrive in Canada; to set out priorities for action based on risk assessment; and to lay out results expectations, roles, responsibilities, and resource requirements.

**Environment Canada's response.** Agreed. Environment Canada recognizes the significant threat that invasive alien species pose to Canada's biodiversity, economy, and society.

Environment Canada is co-ordinating the development of a national plan to address the threat of invasive alien species on behalf of the Wildlife Ministers Council of Canada, the Canadian Council of Forest Ministers, and the Canadian Council of Fisheries and Aquaculture Ministers. The results of a multi-stakeholder national workshop on invasive alien species, held in November 2001, have formed the basis of a draft plan that was presented to a joint meeting of these councils in September 2002 and will now be further elaborated for approval of these councils in fall 2003. The plan will outline processes for the identification and assessment of invasive species and pathways of invasion, priorities for action based on risk assessment, and measures to be taken to address these priorities (including identifying results expectations, roles, responsibilities, and resource requirements). Implementation of the plan will be an ongoing challenge over the long term, both within Canada and internationally, and will require a significant investment of resources.

**4.57 Recommendation.** Environment Canada should put in place a monitoring and reporting system to track the effectiveness of measures taken relative to the results expectations set forth in the plan and report progress annually.

**Environment Canada's response.** The plan will provide for a monitoring and reporting system that would be developed in partnership with all federal departments with responsibilities related to invasive species as well as with the provinces and territories, to track the effectiveness of measures taken relative to the results expectations set forth in the plan and to report progress on a regular basis.

#### **Transport Canada is not regulating or monitoring ballast water discharges**

**4.58** Transport Canada is responsible for regulating ballast water and preventing the introduction of aquatic invasive species by ships. We therefore expected it to ensure that regulation, monitoring, and enforcement of ballast water discharges in Canadian waters are adequate. We also expected that it

would maintain records of its monitoring and enforcement activities and report on its performance.

**4.59** We found that Transport Canada does not regulate ballast water discharges; nor does it monitor or report on compliance with existing guidelines on ballast water exchange. The United States regulates ballast water discharges in the Great Lakes, and Canada relies exclusively on U.S. inspection and enforcement in that region.

**4.60** However, there is no official arrangement between Transport Canada and the U.S. authorities to co-operate on inspection or enforcement or to exchange information. While the U.S. provides compliance data to the International Joint Commission every two years, Transport Canada keeps no records on compliance levels.

**4.61** Ironically, the United States ballast water exchange regulation is based on a Canadian voluntary guideline established in 1989 to protect the Great Lakes. The assumption behind the guideline is that salt water from the deep ocean will either flush out or kill potential invaders picked up in foreign ports before they reach the Great Lakes ports. This theory has never been proved. Moreover, neither Canada's voluntary guideline nor the U.S. regulation for the Great Lakes applies to ships that declare no ballast on board (NOBOBs). Between 75 percent and 95 percent of ships entering the Great Lakes are so-called NOBOBs. The ballast tanks of those ships contain sediment that can harbour invasive alien species. Many experts are sceptical about the effectiveness of ballast water exchange as a solution to the problem of invasive species, given that the rate at which new aquatic invasive species are colonizing in the Great Lakes has not declined since 1989.

**4.62** Nevertheless, Transport Canada told us that it intends to fulfil the commitment in its sustainable development strategy to regulate ballast water exchange by making its guideline mandatory for the Great Lakes by late 2002.

**4.63** Unless the planned regulation goes beyond the existing voluntary guideline to establish requirements for NOBOBs and testing for the presence of living organisms in ballast water and ballast tank sediment against clearly defined criteria, it will likely be insufficient to protect the Great Lakes. And since the government does not intend to apply the new regulations on Canada's coasts, there will continue to be no federal requirement for ballast water management in those regions and gaps will remain in the federal government's ability to control introductions of invasive species from ship ballast.

**4.64 Recommendation.** Transport Canada should formalize arrangements with U.S. authorities for sharing current information on compliance with U.S. ballast water regulations and for co-ordinating efforts to regulate, monitor, and enforce any future Canadian ballast water regulations.

**Transport Canada's response.** Transport Canada shares information with the United States Coast Guard under the aegis of the Great Lakes Water Quality Agreement. Specifically, since 1993 the U.S. Coast Guard has inspected all ships entering the Great Lakes, enforcing U.S. laws. It provides the

compliance data for the binational report to the International Joint Commission, which is prepared by Transport Canada, the Canadian Coast Guard, and the U.S. Coast Guard.

Transport Canada, specifically Headquarters and the Ontario Region, participates with the U.S. Coast Guard in Cleveland on the Working Group under the Great Lakes Waterways Management Forum with respect to information sharing.

**4.65 Recommendation.** Transport Canada should develop and implement a means to monitor, maintain records, and report on compliance with any future Canadian ballast water regulations.

**Transport Canada's response.** The current guidelines require all vessels to complete a ballast water report and submit it to the Canadian Coast Guard (ECAREG/WESTREG) for transmission to the respective Transport Canada regional office. The east coast office maintains a database on compliance. Non-compliant vessels are boarded by Transport Canada Marine Safety Inspectors and inspected at the port of call. The U.S. Coast Guard inspects all vessels at Massena, New York, before they enter the Great Lakes, in accordance with its regulations under U.S. law. Any vessel found non-compliant is not allowed to proceed.

The reporting requirement will become mandatory under the Ballast Water Regulations that are to be included under the *Canada Shipping Act*. In this context, records will be maintained and compliance will be reported through the existing formalized processes.

#### **Fisheries and Oceans Canada has not responded systematically to aquatic invaders**

**4.66** Aquatic invasive species threaten many native species of Canadian fish as well as their habitat and their food supply. Because Fisheries and Oceans Canada is responsible for protecting fish and their habitat and food, we expected that it would have identified the aquatic invaders threatening Canada, assessed the relative risks, and on the basis of those risks determined the priorities for prevention, control, and eradication. We expected that it would also have established a tracking system to monitor the effectiveness of any measures taken so it could carry out corrective action as necessary.

**4.67** In our 2001 audit report on the Great Lakes and St. Lawrence River basin, we made several observations on the management of aquatic invasive species in the Great Lakes and the role of Fisheries and Oceans Canada. We reported that the Department needed to define its roles and responsibilities for conserving and protecting the fisheries, provide better protection against harmful invasive species, and protect and manage fish habitat more effectively (2001 Report of the Commissioner of the Environment and Sustainable Development, [www.oag-bvg.gc.ca](http://www.oag-bvg.gc.ca)).

**4.68** In the current audit, we found that Fisheries and Oceans Canada has not established a co-ordinated national response to aquatic invasive species. The Department has not catalogued the aquatic invasive species threatening Canada's freshwater and marine environments or the main pathways by

which those species arrive. It has not assessed the relative risks of invasive species as a basis to establish priorities for their prevention, control, and eradication. Nor has it put in place the monitoring tools to measure and report on the effectiveness of any measures taken.

**4.69** Fisheries and Oceans Canada needs to establish the capability to demonstrate on a national basis the extent to which it has been successful in protecting Canadian fish, including their habitat and food, from aquatic invasive species.

**4.70 Recommendation.** Fisheries and Oceans Canada should develop and implement a means to identify and assess the risks of aquatic invasive species and use it as tool for setting departmental priorities and objectives for the prevention, control, or eradication of those risks.

**Fisheries and Oceans Canada's response.** Agreed. As identified in paragraph 4.56 of the chapter, Environment Canada has initiated the co-ordination of a national action plan to address invasive species in Canada. Fisheries and Oceans Canada will take the lead role with respect to the portion of the national action plan that deals with aquatic invasive species. Fisheries and Oceans will work collaboratively with other federal departments, provincial governments and stakeholders to develop a plan to address aquatic species issues in Canada, including funding for the plan.

In the context of the national action plan, Fisheries and Oceans Canada will use an integrated risk analysis framework to assist in identifying the risks to aquatic ecosystems and their resources that are posed by aquatic invasive species relative to the risks posed by other stressors. Results of the risk analysis will then be used to help set science priorities.

[Fisheries and Oceans provided an expected completion date of Fall 2003.]

**4.71 Recommendation.** Fisheries and Oceans Canada should put in place a monitoring and reporting system to track the effectiveness of measures taken toward its invasive species objectives and should report its progress annually.

**Fisheries and Oceans Canada's response.** Agreed. Fisheries and Oceans Canada will assess the relative risk of aquatic invasive species using a risk analysis framework. It will also assess its current scientific and financial capacity to address the high-priority risks identified. The implementation of a monitoring and reporting system to track the effectiveness of any future actions will be evaluated following the completion of the risk analysis and reporting requirements that may emerge from the national action plan to address invasive species.

#### **Recent planning activities may not lead to real progress**

**4.72** Environment Canada began in late 2001 to co-ordinate the development of a draft national plan to address invasive species in Canada. According to Environment Canada, that document is being elaborated for approval by late 2003. However, the 1995 Biodiversity Strategy already contains a clear goal of prevention as well as many of the key actions required to accomplish it.

**4.73** To build on the strategy, the new plan will need to clearly identify the government's priorities for prevention and the roles, responsibilities, resources, and results expected of each federal department and other participating organizations.

**4.74** However, officials of the Department noted that while Environment Canada may be co-ordinating the federal government's plan for responding to invasive species, it does not have overarching responsibility for ensuring that the plan is implemented. Thus, the new plan's success will require the commitment of each organization to act.

**4.75 Recommendation.** Environment Canada should secure the commitment of each relevant federal department to act on its contribution to implementing the plan.

**Environment Canada's response.** Environment Canada is working with the Canadian Food Inspection Agency, Fisheries and Oceans Canada, Transport Canada, other federal departments, other jurisdictions, and relevant experts to develop the plan. Participating departments and jurisdictions will be encouraged to contribute to implementation of the national plan according to the priorities set out in the plan and the resources that they have available.

#### **Real progress on controlling aquatic invaders in particular could be a long way off**

**4.76** The example of aquatic invaders suggests that getting the necessary commitment may prove difficult. Though responsible for regulating and controlling the management of ballast water on ships and preventing or reducing the release of foreign aquatic organisms or pathogens, Transport Canada told us that it is relying on Fisheries and Oceans Canada to identify criteria that could form the basis of an effective ballast water regulation.

**4.77** Fisheries and Oceans Canada told us that it is not responsible for developing science-based criteria that could form the basis of a ballast water regulation, although ballast water is the predominant source of aquatic invaders. Nor will it be taking any regulatory action, since regulating ballast water is now Transport Canada's responsibility. Yet in its 2001 sustainable development strategy, Fisheries and Oceans Canada recognized that the "unintended introduction into Canada's marine and freshwater systems of exotic plant and animal species via vessel ballast water discharges is increasingly a concern, which demands further action by [this department] and its provincial counterparts." It goes on to say "there is a growing need... to work with other departments to better understand the nature of ballast discharge and the consequences of these introductions and to take regulatory action."

**4.78** Both Transport Canada and Fisheries and Oceans Canada recognize that ballast water and sediment are major pathways for invading organisms, and both departments have participated in national and international discussions on the ballast water issue for more than a decade. Yet neither has developed or proposed a ballast water quality standard or criteria for testing ballast water for the presence of alien organisms to ensure that the risk of

unintentional introductions of alien species is eliminated or reduced to acceptable levels.

**4.79** According to officials at Transport Canada, at the current rate of progress it could be another 10 to 15 years before an internationally acceptable standard for ballast water quality is in place, and possibly another 20 years before ships worldwide could be retrofitted with the necessary technology or be replaced. Thus, 30 years or more may go by before unintentional introductions from ballast water discharges are eliminated or reduced to acceptable levels in response to the government's 1995 commitment.

**4.80** Transport Canada needs to ensure that the ballast water of ships is managed according to best management practices. Best management practices can include processes and procedures aimed at meeting specified quality criteria or ensuring compliance with regulatory standards; records required to provide objective evidence of activities performed or results achieved; training to ensure competency; and requirements for reporting. The Department also needs to set a timetable for establishing a standard for ballast water discharge quality and regulating ship ballast water so the risk of introductions of alien aquatic species into Canadian waters from that source is eliminated or reduced to an acceptable level.

**4.81 Recommendation.** Transport Canada should define best management practices for ship ballast and establish regulations requiring application of those practices on all ships entering Canadian waters.

**Transport Canada's response.** Regulations will be based on best management practices. The most appropriate approach is to continue to work through the International Maritime Organization (IMO) on establishing internationally recognized and accepted ballast water management practices. The IMO requirements do not apply to the Great Lakes and St. Lawrence River systems. The proposed regulations for that area will be compatible with the existing U.S. regulations for the Great Lakes and should be implemented before IMO completes its work. For the east and west coasts, the Regulations will be further refined to be consistent with the direction of the IMO.

Transport Canada intends to include sound scientific rationale in these regulations. Transport Canada believes that it is not sufficient to rely on a given salinity as proof that ballast water exchange has been completed, nor has it necessarily been effective.

Sampling protocols will be established with advice from Fisheries and Oceans Canada, and provisions for allowing sampling will be incorporated into the regulations.

**4.82 Recommendation.** Fisheries and Oceans Canada should define criteria for ballast water discharge quality that would eliminate the risk of introductions of aquatic invasive species from ship ballast water, including sediment, or reduce it to acceptable levels; and provide those criteria to Transport Canada in support of that Department's regulatory development, inspection, and enforcement efforts.

**Fisheries and Oceans Canada's response.** Agreed. As per ministerial agreement, Fisheries and Oceans Canada will continue to work with Transport Canada to develop science-based advice for ballast water discharge quality and evaluate the effectiveness of current ballast water guidelines. Fisheries and Oceans Canada will also continue to support Transport Canada's efforts directed at the international regulation of ballast water exchange and treatment through its participation on the Marine Environmental Protection Committee of the International Maritime Organization.

**4.83 Recommendation.** Transport Canada should establish a timetable for obtaining the scientific advice it needs from Fisheries and Oceans Canada and for establishing a quality standard for ballast water discharges that will eliminate the risk of introductions from ship ballast or reduce it to acceptable levels.

**Transport Canada's response.** The provision of scientific advice to Transport Canada by Fisheries and Oceans Canada is contained in an existing memorandum of understanding. Fisheries and Oceans Canada will address the scope and implications of advice required as part of their implementation plan.

Fisheries and Oceans Canada and Transport Canada participate in U.S. Coast Guard initiatives related to the establishment of technical standards for onboard ballast water treatment. Both departments also participate on the Marine Environmental Protection Committee of the International Maritime Organization with respect to international regulation of ballast water exchange as an interim step, and ballast water treatment in the longer term.

**4.84** We note that in its most recent biennial report, the International Joint Commission recommended the development and use of standards for treatment of ballast water to eliminate introductions of organisms from ballast water and ballast tank sediment or reduce them to an acceptable level (see Appendix C and [www.ijc.org](http://www.ijc.org)).

### **Someone needs to take charge**

**4.85** The invasive species problem is frequently described as both a national and an international problem, characterized by shared jurisdictions and responsibilities and by a broad, complex range of other concerns. Indeed, our discussions with federal officials frequently turned to those complexities and constraints.

**4.86** However, within the federal government the authority and the human and financial resources to deal with invasive species are spread across several federal departments and agencies, and are not co-ordinated. Environment Canada does not have the big picture. It has yet to identify the greatest threats to Canadian ecosystems, secure agreement on what will be done by whom, or establish the capability to gauge progress. There is no national action plan to guide progress, and each organization is focussed independently on its own priorities.

**Close the door to invasive species**

**4.87** Ten years after the federal government committed to their prevention, control, or eradication, invasive species continue to be introduced into Canada. The scientific literature and the government’s own documents point out that the number of alien species entering Canada continues to increase, demonstrating that the level of effort to prevent introductions has not been adequate.

**4.88** Government policy is consistent with expert opinion that the preferred response to invasive species is to prevent them from entering the country and becoming established. The federal government committed to prevention more than 10 years ago.

**4.89** While preventive measures would not be cost-free or catch all potential invaders before they became established, prevention is generally considered less costly than controlling pests and repairing damage caused by invaders that have taken hold. Prevention can minimize the cost and ecological impacts of chemical control and biodiversity loss associated with invasive species.

**4.90** To prevent the introduction of new invasive species, authorities need to go beyond planning and take action, including the actions set forth in the Canadian Biodiversity Strategy.

**A “wait and see” approach is not the answer**

**4.91** It is critical to detect potential invaders that enter Canada and to respond rapidly before they become established. The case of the sea lamprey helps to illustrate why.

**4.92** In reaction to the sea lamprey—which attacks all species of large Great Lakes fish including lake trout, salmon, rainbow trout, whitefish, walleye, and catfish—Canada and the United States created the Great Lakes Fishery Commission. Sea lamprey research and control efforts have continued for more than 40 years.

**4.93** Today, the primary means of controlling the sea lamprey is to use a chemical discovered in 1958 called TFM. In 2001, 28 tonnes of TFM were put into streams flowing into the Great Lakes. Chemical controls including herbicides and insecticides are used across Canada to combat both native and invasive pests. While chemical controls have proved effective in reducing the immediate economic damage that pests can cause, their long-term implications for the environment and human health are uncertain.

**4.94** In our 2001 audit report on the Great Lakes and St. Lawrence River basin, we noted that while the effects of TFM are thought to disappear in three to five days, further research is needed to determine whether current levels can cause endocrine disruption or reproductive impairment in the basin’s fish.

**4.95** The financial cost of controlling sea lamprey in 2002 (not including the cost of running the Great Lakes Fishery Commission offices) was US\$14.4 million; Canada’s contribution was US\$3.9 million.



Sea lamprey on lake trout. Sea lamprey mouth (inset).

Photo: Great Lakes Fishery Commission

**Did you know?**

Number of tonnes of pesticide used to control sea lamprey in the Great Lakes in 2001: **28**

**Canada needs to practice its  
environmental principles**

**4.96** Given the impacts of invaders once they become established—the ecological and economic damage they cause, the financial cost of keeping them in check, and the possible implications of controlling them chemically—it is clear why keeping them out is the best strategy.

**4.97** Federal environmental policy has advocated the precautionary principle for years: Where there are threats of serious or irreversible damage, lack of scientific certainty is not to be used as a reason for postponing measures to prevent environmental degradation.

**4.98** Scientists believe that the ecological damage caused by invasive species is both serious and irreversible. Yet, after a decade of deliberations and resolutions, the federal government has not taken effective precautions to prevent introductions of species that threaten Canada’s environment.

**4.99** Canadian environmental policies and legislation, including the *Canadian Environmental Protection Act* (1999), identify pollution prevention as the preferred approach to ensuring a clean and healthy environment. Prevention is the first objective in the government’s commitment to deal with the problem of invasive species.

**4.100** Yet despite its 1992 and 1995 commitments to do so, the federal government has not established a comprehensive national program to identify and eliminate common sources of unintentional introductions and prevent further invasions.

**4.101** The Government of Canada has also adopted the “polluter pays” principle in its environmental policy, meaning that whoever causes environmental degradation should pay for repairing (or preventing) the damage. We know that invasive species are frequently linked to the transportation of goods and people between ecosystems with different biologies. We know the Canadian-controlled ports of entry through which cargo arrives in this country.

**4.102** Port and seaway authorities in Canada cover part of the cost of managing and maintaining their facilities by levying tolls on ships. The Canadian Food Inspection Agency also collects fees to cover the costs of protecting Canada’s agriculture crops and forest trees from invasive pests that threaten them.

**4.103** Yet no similar fees are in place to cover the cost of confronting invasive species that threaten Canada’s ecosystems, though officials frequently cite the lack of new money as a major obstacle.

**4.104** The precautionary principle, pollution prevention, and the concept of “polluter pays” have been part of Canada’s environmental policies for more than a decade. The federal government is not applying them to manage invasive species that threaten our environment.

## Conclusion

**4.105** The federal government has not taken effective action to prevent the introduction of invasive species that threaten Canada's environment or to control or eradicate them. Despite continuing dialogue and deliberation, neither the United Nations Convention on Biological Diversity nor the Canadian Biodiversity Strategy has triggered an identifiable change in the government's approach.

**4.106** In producing the 1995 Canadian Biodiversity Strategy, Environment Canada co-ordinated a written response to the United Nations Convention on behalf of the federal government. The strategy set out many of the steps needed to prevent the introduction of harmful alien organisms and to eliminate or reduce their adverse effects to acceptable levels. Unfortunately, Environment Canada has not succeeded since 1995 in co-ordinating a practical response to the problem.

**4.107** It has not obtained the key information that it needs to effectively oversee or co-ordinate the federal government's response. It has not identified the invasive species that threaten Canada's ecosystems, habitats, and species; their most important paths of entry; or the risks they pose to Canada's environment and economy. It has not put together a national action plan or secured agreement among federal departments on who will do what to respond to major risks. Nor has it ensured that it has the tools it needs to determine whether measures that have been taken are working.

**4.108** The Department needs to get on with this basic work. Otherwise, increases in trade and in the gross national product, clearly key economic goals of the federal government, will almost certainly lead to further invasions.

**4.109** Until Environment Canada takes concrete steps to identify the invasive species that threaten Canada's ecosystems and the magnitude of the risk they pose to our environment and economy, it will find it extremely difficult to make a strong business case for the government to invest scarce resources in combatting the problem. It is clear, though, that not investing will carry a far greater cost.

## About the Audit

In 1992, Canada and 167 other countries signed the United Nations Convention on Biological Diversity and pledged to prevent the introduction of or to control or eradicate alien species that threaten ecosystems, habitats, or other species. The Canadian Biodiversity Office was established at Environment Canada to co-ordinate a Canadian response; it produced the Canadian Biodiversity Strategy in 1995.

### Objective

The objective of this audit was to determine whether the federal government has mounted an effective response to the invasive species problem since signing the Convention, and particularly since finalizing the Canadian Biodiversity Strategy. We set out to determine to what extent Canada's 1992 commitment and its 1995 strategy triggered a change in the federal government's approach to managing invasive species and the impact of any changes on prevailing trends.

### Scope and approach

In our view, to assure Canadians that it is responding effectively to the problem of invasive species that threaten Canada's environment, the federal government must know what invaders pose the greatest risks to Canadian ecosystems, habitats, and species, and the major pathways by which they arrive; who is taking what action to respond to major risks; and how effective those actions have been in eliminating or reducing adverse effects to acceptable levels so that it can determine whether programs are working or whether corrective measures are required.

Because it is the lead department for Canada's biodiversity strategy, we looked to see whether Environment Canada on behalf of the federal government has that information or has put in place the basic tools it needs to acquire it. Since ship ballast water is the most important source of unintentional introductions of aquatic invaders, we also examined how the federal government is managing those species and that particular pathway. We looked at whether Fisheries and Oceans Canada has acquired the basic information it needs to manage aquatic invaders and whether Transport Canada has ensured that there is adequate legislation and enforcement to control their introduction or escape into Canadian waters from ship ballast.

To provide context for the government's commitment and for our observations and findings, the chapter presents case examples illustrating the nature and magnitude of the risks that invasive species pose to Canada.

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For information, please contact Communications at 995-3708 or 1-888-761-5953 (toll-free).

## Appendix A “Invasive Alien” As Defined by the Conference of the Parties to the United Nations Convention on Biological Diversity

(i) “alien species” refers to a species, subspecies or lower taxon, introduced outside its normal past or present normal distribution; includes any part, gametes, seeds, eggs, or propagules of such species that might survive and subsequently reproduce; (ii) “invasive alien species” refers to an alien species whose establishment and spread threaten ecosystems, habitats or species with economic or environmental harm (for the purposes of the present guiding principles, the term “invasive alien species” shall be deemed the same as “alien invasive species” in decision V/8 of the Conference of the Parties to the Convention on Biological Diversity.); (iii) “introduction” refers to the movement, by human agency, of a species, subspecies or lower taxon (including any part, gametes, seeds, eggs, propagules that might survive and subsequently reproduce) outside of its natural range (past or present). This movement can be either within a country or between countries; (iv) “intentional introduction” refers to the purposeful movement by humans of a species outside its natural range and dispersal potential (such introductions may be authorized or unauthorized); (v) “unintentional introduction” refers to a species utilizing unwitting humans or human delivery systems as vectors to disperse and become established outside its natural range, and (vi) “establishment” refers to the process of a species in a new habitat successfully reproducing at a level sufficient to ensure continual survival without infusion of new genetic material from outside the system.

Source: Guiding Principles for the Prevention, Introduction and Mitigation of Impacts of Alien Species that Threaten Ecosystems, Habitat or Species. Report of the Sixth Meeting of the Subsidiary Body on Scientific, Technical and Technological Advice, Conference of the Parties to the Convention on Biological Diversity, April 2002

## Appendix B The United States General Accounting Office Says Greater Commitment Needed to Manage Invasive Species Effectively

In 1998, President Clinton signed an executive order intended to improve co-ordination and focus among federal agencies with programs targeted at specific aspects of the invasive species problem. The executive order, among other things, created the interagency National Invasive Species Council and charged it with developing a national management plan for addressing the problems posed by invasive species.

The United States General Accounting Office (GAO) has reported in the past on funding for invasive species activities and the effectiveness of its rapid response capability.\* Given the seriousness and complexity of the issues, in late 2001 the GAO initiated a review of the progress made under the executive order. Recognizing the international dimensions of the issue, as part of this work the GAO—in parallel with the Office of the Auditor General—undertook an evaluation of efforts to regulate discharges of ballast water in the Great Lakes, a key source of invasive species in these waters that affects both countries. More specifically, the GAO's objectives were to

- (1) assess the usefulness to decision makers of studies that have estimated the economic impact of invasive species in the United States
- (2) assess the National Invasive Species Management Plan, including the extent to which the United States government has implemented the plan
- (3) provide the views of experts on the adequacy of U.S. and Canadian federal government efforts to prevent the introduction of invasive species into the Great Lakes via the ballast water of ships
- (4) describe U.S. and Canadian co-ordination of invasive species management efforts

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\* See *Invasive Species: Federal and Selected State Funding to Address Harmful Nonnative Species*, (GAO/RCED-00-219, Aug. 2000) and *Invasive Species: Obstacles Hinder Federal Rapid Response to Growing Threat* (GAO-01-724, July 2001).

## Appendix C “Time To Act” Says the International Joint Commission

*In its 11th Biennial Report, the International Joint Commission admonished Canada and the United States to act on the problem of invasive species. Below is an excerpt.*

### Chapter 3—Great Lakes Water Quality Agreement

#### Conclusion

The introduction and spread of alien invasive species are continuing to impair the biological integrity and threaten the many water-dependent economic sectors of the Great Lakes basin. The costs for treatment and control are massive, rising, and largely borne by local communities, utilities and industry rather than those who create the problem.

Current regulations, guidelines, and practices in place are not sufficient to prevent further alien invasive species introduction and spread. Specifically, current regulations exempting ships declaring no ballast on board (NOBOB) do nothing to minimize the threat they pose. The Great Lake region’s sense of the biological and economic urgency of the problem drives the call for more federal leadership and immediate steps to prevent further introduction and spread of alien invasive species.

Immediate federal action to make mandatory ballast water management practices, including the requirement for NOBOB participation in the program, can reduce the biologic and economic threat from the introduction and spread of alien invasive species. The time to act is now.

#### Recommendations

The Governments need to take more aggressive steps to end the invasion of alien species and we urge the following:

1. Immediately make existing voluntary guidelines for ballast water management practices mandatory and provide for measures of enforcement and compliance for all ships capable of carrying ballast water, including those currently not carrying ballast water.
2. Develop uniform protocols for performance testing of ballast water:
  - a) Develop best practices and any improvements for ballast management operations.
  - b) By the end of 2003 (date certain) establish enforceable interim biological standards.
  - c) Concurrently, establish biological standards for ballast water discharges from all ships and for new technologies for ballast water treatment.
3. Ensure all ships built after a certain date have a treatment technology incorporated in their construction to be allowed entry into the Great Lakes.
4. Design and implement economic incentives to encourage shippers to continuously improve (ISO 14000) Ballast Management Practices.
5. Fund research recommended by expert regional, national and binational panels, task forces and committees, especially focused on:
  - a) research (including research for biological standards, criteria and indicators) for ballast water treatment necessary to drive technology, product development, and ship design;
  - b) research for developing alternative technologies including biocides to achieve new standards and criteria for the elimination of Alien Invasive Species in ballast water;
  - c) research and technology development to reduce entrained and accumulated sediment in ship ballast water and tanks; and,
  - d) research to develop analytical tools and procedures to permit the identification of new invasive species and to link these species to their possible points of origin and vessels of introduction.
6. Issue the Commission a reference to coordinate and harmonize binational efforts for action to stop this ongoing threat to the economy and the biological integrity of the Great Lakes.

# Report of the Commissioner of the Environment and Sustainable Development to the House of Commons—2002

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