

Chapter 7

Environment – Preventing Aquatic Invasive Species in Saskatchewan

1.0 MAIN POINTS

The introduction of aquatic invasive species is one of the most significant threats to biodiversity in Saskatchewan waters. If introduced, aquatic invasive species (e.g., zebra mussels) could also have costly consequences (millions of dollars) for remediation of water treatment plants, power plants, and dams in Saskatchewan.

The Ministry of Environment (Environment) is responsible for preventing the introduction or spread of aquatic invasive species in our province. Prevention is the most cost-effective way to deal with potential threats. For the period of February 1, 2015 to January 31, 2016, the Ministry had effective processes to prevent the entry and spread of aquatic invasive species, except it needs to:

- › Collaborate with partners, such as SaskPower and the Water Security Agency, to develop a long-term multi-agency aquatic invasive species strategy. Such collaboration would assist in leveraging additional resources to protect provincial infrastructure and Saskatchewan waters.
- › Assess the effectiveness of its public education and awareness campaign to promote prevention activities (such as boat cleaning), and enlist the public's co-operation in preventing the spread of aquatic invasive species. This assessment would allow the Ministry to determine if it has targeted its efforts on worthwhile activities.
- › Formalize its risk-based detection strategies for aquatic invasive species (i.e., frequently inspect high-risk watercraft and sample high-risk Saskatchewan waters) so that aquatic invasive species would not go undetected and be addressed before becoming established.
- › Complete and test a rapid response plan to reduce the impact and spread of aquatic invasive species.

2.0 INTRODUCTION

Environment is responsible for enforcing conservation standards to protect fish and wildlife. Environment is to:

Coordinate, develop, promote and enforce policies and programs of the Government of Saskatchewan relating to the conservation, preservation, management, protection and development of fish, wildlife, air, water, resource lands and other renewable resources in Saskatchewan.¹

¹ *The Ministry of Environment Regulations, 2007.*



Aquatic invasive species are a significant threat to the existing environment that supports Saskatchewan fish and wildlife. Invasive alien species² are thought to be the cause of over 70% of the extinction of native freshwater species.³

The Fisheries Act (Saskatchewan), 1994 and *The Fisheries Regulations* assign responsibilities related to aquatic invasive species to Environment. In addition, in June 2015, the Department of Fisheries and Oceans Canada implemented new federal regulations, *Aquatic Invasive Species Regulations*, to manage and control aquatic invasive species in Canada. The federal regulations assign responsibility to the Saskatchewan Minister of Environment “to prevent the introduction or spread of, or to control or eradicate” aquatic invasive species set out in the federal regulations.

We audited Environment’s processes to prevent the entry and spread of aquatic invasive species (other than aquatic invasive plants) in Saskatchewan.

2.1 Aquatic Invasive Species Threats

Saskatchewan possesses numerous rivers, streams, and water systems; and approximately 100,000 lakes. Saskatchewan lakes have a variety of fish species that provide recreational and economic opportunities. Fishing brings approximately \$6 million of licensing revenue⁴ to the provincial government each year.

If aquatic invasive species become established and spread in Saskatchewan lakes, they can significantly threaten lakes’ biodiversity and impact the economy by:

- ▶ Affecting local fishing by causing a reduction in, or extinction of populations of native fish
- ▶ Competing with native species for food and space (i.e., reducing species of algae and microscopic aquatic animals that are important for the food chain)
- ▶ Degrading water quality by introducing disease
- ▶ Altering water-based infrastructure (e.g., pipes, dams) and increasing maintenance costs
- ▶ Reducing recreational opportunities and tourism⁵

Zebra mussels, an aggressive aquatic invasive species, are a prevalent risk for Saskatchewan given their introduction and spread in Lake Winnipeg in the fall of 2013, and in the Red River in the spring of 2015. Zebra mussels damage water infrastructures including power plants, and industrial, municipal and hydroelectric water intakes and outfalls. They attach themselves to man-made structures (particularly pipelines) impeding water movement through hydroelectric turbines, and intake structures for drinking water and irrigation systems. They can cause a decline in water flow and plant efficiency.

² Alien species are plants, animals and microorganisms from one part of the world that are transported beyond their natural range and become established in a new area. They are sometimes also called “exotic,” “introduced,” “non-native,” “non-indigenous” or “invasive” species (www.env.gov.bc.ca/wld/alliensp/) (25 February 2016).

³ Heywood. V. H., *Global Biodiversity Assessment*, (1995), p. 1140.

⁴ Based on Ministry of Environment financial records for the year ended March 31, 2015.

⁵ Canada Gazette: www.gazette.gc.ca/rp-pr/p1/2014/2014-12-06/html/reg1-eng.php (30 September 2015).

Once established, in common with some other aquatic invasive species, zebra mussels are extremely difficult and costly to control or eradicate. In the Great Lakes area, maintenance costs in water treatment plants, power plant intakes, and dams have been in the billions of dollars after the introduction of zebra mussels.⁶ Increased maintenance costs for power plants, water treatment facilities, and water delivery infrastructures are transferred to the public through increased service user fees.

At January 2016, Environment indicated it had not identified any aquatic invasive species (other than invasive plants) in Saskatchewan waters. Regardless, Environment has assessed the risk of introduction of invasive species as extremely high⁷ and therefore, must be vigilant to prevent the entry of aquatic invasive species into the province. Prevention is the most cost-effective way to deal with any potential threats. Detection, response, and the management and adaptation needed for aquatic invasive species are also critical for controlling the spread of such species.

3.0 AUDIT OBJECTIVE, SCOPE, CRITERIA, AND CONCLUSION

The objective of this audit was to assess whether the Ministry of Environment had effective processes for the 12-month period of February 1, 2015 to January 31, 2016 to prevent the entry and spread of aquatic invasive species (other than aquatic invasive plants) in Saskatchewan.

Our audit did not include aquatic invasive plants as the control of plants falls under the responsibility of the Ministry of Agriculture.

We examined Environment's plans, policies, procedures, agreements, and reports that relate to preventing the entry and spread of aquatic invasive species. We also assessed Environment's strategies for preventing aquatic invasive species, and looked at the extent of activities being undertaken for associated risks as compared to other provinces.

To conduct this audit, we followed the standards for assurance engagements published in the *CPA Canada Handbook – Assurance*. To evaluate Environment's processes, we used criteria based on our related work, reviews of literature including reports of other auditors, and consultations with management. Management agreed with the criteria (see **Figure 1**).

⁶ Office of the Auditor General of Canada, *2002 Report, Chapter 4 – Invasive Species*, p. 10.

⁷ According to the Ministry of Environment's *2015-17 Compliance Plan* (December 2015).

**Figure 1—Audit Criteria**

- 1. Assess risks and strategies for aquatic invasive species**
 - 1.1 Identify aquatic invasive species risks for Saskatchewan and key pathways of entry
 - 1.2 Confirm risks with partners (e.g., Ministry of Agriculture, Water Security Agency, SaskPower, federal government, and other provincial governments)
 - 1.3 Prioritize strategies to mitigate risks
 - 1.4 Assign responsibilities for strategies
- 2. Implement strategies**
 - 2.1 Make sure enforcement exists in legislative framework
 - 2.2 Establish education and awareness campaigns
 - 2.3 Develop mechanisms for early detection (e.g., sampling and notification process)
 - 2.4 Complete a rapid response plan (e.g., notify, contain, and eradicate)
- 3. Monitor effectiveness of strategies**
 - 3.1 Collect information related to prevention efforts
 - 3.2 Evaluate and adjust prevention efforts
 - 3.3 Report results to senior management and the public

We concluded that for the 12-month period ended January 31, 2016, the Ministry of Environment had, other than the following areas, effective processes to prevent the entry and spread of aquatic invasive species (other than aquatic invasive plants) in Saskatchewan. The Ministry of Environment needs to:

- › **Collaborate with partners to develop a long-term multi-agency aquatic invasive species strategy**
- › **Assess the effectiveness of its aquatic invasive species education and awareness campaign**
- › **Formalize risk-based strategies for inspecting watercraft and sampling Saskatchewan waters for aquatic invasive species**
- › **Complete and test a rapid response plan**

4.0 KEY FINDINGS AND RECOMMENDATIONS

In this section, we describe our key findings and recommendations related to the audit criteria in **Figure 1**.

4.1 Risks of Aquatic Invasive Species Identified

Environment is responsible for the “establishment, development, maintenance and enhancement of any fish populations” and is to “control importation and stocking of fish” under *The Fisheries Regulations*. These provincial regulations list 19 species of fish that are prohibited from importation, possession, or transportation into the province (see **Figure 2**).

Environment updated the provincial regulations, including the list of prohibited species of fish, in February 2015. All prohibited species listed in the provincial regulations are species identified by Environment that pose a risk of spread within North America. In addition, Saskatchewan’s regulations include all the federally-identified species in the

Aquatic Invasive Species Regulations that came into force in June 2015.⁸ **Figure 2** lists prohibited aquatic species in federal and provincial regulations.

Figure 2—List of Prohibited Aquatic Invasive Species^A in Federal and Provincial Legislation

Federal Regulations	
Bighead carp	Silver carp
Black carp	Zebra mussel
Grass carp	Quagga mussel
Saskatchewan Regulations	
Bighead carp	Channeled applesnail
Black carp	Asian clam
Grass carp	Asian tapeworm
Silver carp	Conrad's false mussel
Zebra mussel	Spiny water flea
Quagga mussel	New Zealand mud snail
Northern snakehead	Rusty crayfish
Round goby	Faucet snail
Chinese mitten crab	Freshwater jellyfish
Fishhook water flea	

Source: *Aquatic Invasive Species Regulations* (Canada) and *The Fisheries Regulations* (Saskatchewan).

^A Listing does not include aquatic invasive plants.

Environment determined the following main ways of entry for aquatic invasive species into provincial waters:

- ▶ Watercraft (recreational and commercial) and related gear (e.g., fishing equipment, wakeboards, and water skis). For example, juvenile and adult mussels can attach themselves to boats, hulls, and engines, and survive up to one month out of water. Veligers (larva) can be found in water in live wells and bait buckets
- ▶ Other watercraft vehicles (e.g., float planes, firefighting aircraft)
- ▶ Aquarium trade: owners may intentionally release, into open waters, species who have outgrown aquariums or are no longer wanted. To reduce this risk, Environment does not allow the sale of certain species (like northern snakehead fish) in any Saskatchewan stores
- ▶ Use of live bait: the public and commercial fishing uses live organisms (including worms, leeches, and aquatic insects) to catch fish. Use of live bait can create a pathway for introduction of bait fish and other organisms, such as parasites, into Saskatchewan waterways

Environment has identified zebra and quagga mussels as the most significant threat to Saskatchewan waters. It assesses the potential for zebra and quagga mussels to invade Saskatchewan waters as high. The main path of transfer to Saskatchewan is recreational boats, and watercrafts that have been in mussel-infested waters. Because invasive mussels can be found in Lake Winnipeg, as well as Ontario and Quebec, and in the

⁸ The Ministry of Environment participated in the National Aquatic Invasive Species Committee along with other provinces and stakeholders. The Committee used these consultations to develop the federal list of aquatic invasive species included in the 2015 federal regulations.



Mississippi River systems in the United States, the highest risk paths for mussels to enter Saskatchewan are along its southern and southeastern borders.

After mussels, Environment's next major concern is other aquatic invasive species, such as the Asian tapeworm and the rusty crayfish, that can be found in Manitoba, and can also enter water bodies by boats.

4.2 Long-term Strategy to Prevent Aquatic Invasive Species Required

Environment developed annual action plans to prevent entry of high-risk aquatic invasive species (e.g., zebra mussels) into Saskatchewan. Environment spent \$264,000 in 2015-16 (2014-15: \$252,000) on initiatives related to preventing entry of aquatic invasive species. Alberta and Manitoba spent \$2.1 million and \$0.5 million in 2015, respectively.

Environment has an agreement⁹ with other Canadian provinces and territories (e.g., B.C., Yukon, Manitoba and Alberta) to promote information sharing about new aquatic invasive species identified in each jurisdiction, and prevention and control activities underway in each jurisdiction.

Environment has also identified other provincial government partners (e.g., Water Security Agency, SaskPower, Ministry of Parks, Culture and Sport [Saskatchewan Parks]) key to the detection and prevention of aquatic invasive species. Environment communicated the risks of aquatic invasive species to provincial government partners through presentations, ongoing contact, and informational packages. For example, Environment and the Water Security Agency have ongoing contact to discuss sampling for aquatic invasive species.

However, Environment did not have formal agreements with those key provincial government partners that may be affected by aquatic invasive species. Nor had Environment developed a long-term comprehensive aquatic invasive species strategy. Such a strategy would provide a coordinated provincial approach aimed at preventing entry of aquatic invasive species. Engagement of partners (government and non-government agencies such as Water Security Agency, SaskPower, Watershed Associations, Saskatchewan Invasive Species Council) is necessary to build capacity and promote collaborative work on the highest priority issues. For example, Water Security Agency and SaskPower could assist in water sampling for aquatic invasive species. Agreements or formal strategies are ways to set clear roles and responsibilities of each party, and to secure their commitment.

Without a clear assignment of roles and responsibilities and commitment from key partners over the long term, Environment may not undertake and prioritize aquatic invasive species prevention efforts in the right areas. Effective use of resources is key to achieving maximum benefits. Partnerships can leverage the full value of each dollar spent, and maximize opportunities to pool expertise and resources for preventing the spread of aquatic invasive species.

⁹ As of March 31, 2016, all provinces except one have signed the agreement.

1. We recommend that the Ministry of Environment collaborate with partners to develop a long-term multi-agency aquatic invasive species strategy.

4.3 Assessment of Education and Awareness Activities Needed

Public education and awareness are effective tools in preventing aquatic invasive species from being introduced, and in the early detection and reporting of aquatic invasive species.

Environment used different mechanisms to increase awareness and educate the public about aquatic invasive species. It has made “Clean, Drain, Dry Your Boat” a continuous message conveyed to the public; this message was designed to encourage boat cleaning to reduce the spread of aquatic invasive species to Saskatchewan waters. Other types of communication to the public to increase awareness and education included:

- › Videos: Environment promoted boat cleaning through videos posted to its YouTube page, advertised on tv, used in tradeshow, and shared with the Saskatchewan Wildlife Federation
- › Poster/Lure Cards: Posters and lure cards included photos of the mussels, as well as website links and information, on how to prevent the introduction/spread of zebra and quagga mussels. Environment made cards available at tradeshow, field offices, compliance checks, border crossings, and provincial parks
- › Signage: Road signs and boat launch signs with messages to build awareness. For example, there are 20 “Clean, Dry, Drain” road signs and 50 signs at boat launches located throughout the province. Also, Environment indicated it plans to erect 10 signs on highways along the Manitoba and US borders in the spring of 2016
- › Aquatic invasive species awareness week was held for the first time from May 10-16, 2015. This was a media event designed to inform and educate the public about aquatic invasive species and where to find additional information (e.g., through news releases)
- › Direct links on Environment’s website to aquatic invasive species content
- › Advertisements (e.g., in the *2015 Angling Guide*) and invasive species workshops and presentations to other agencies (e.g., Saskatchewan Parks)

Environment last measured the effectiveness of its education and awareness activities in 2010. In 2010, Environment participated in an angler survey that included questions about aquatic invasive species. The results of the survey indicated that only about 27% of survey respondents had come across information on aquatic invasive species.

At January 2016, although Environment thinks public awareness has increased since 2010, it does not know because it does not collect or track data that measures such



awareness. Environment indicated that it plans to participate in an angler survey that would include information about aquatic invasive species in 2016.

Without regularly measuring results, Environment does not know if its education and awareness efforts related to aquatic invasive species were successful, or whether it targeted resources on worthwhile activities.

- 2. We recommend that the Ministry of Environment measure the effectiveness of its aquatic invasive species public education and awareness campaign regularly.**

4.4 Ongoing Inspections and Sampling for Aquatic Invasive Species Necessary

Environment used two detection mechanisms to prevent the spread of aquatic invasive species:

- › Inspections: These are used to identify the invasive species before they have entered the water by conducting inspections (e.g., when it remains on the boat or is being sold at the aquarium store). Environment expects its Conservation Officers to carry out inspections designed to deter the introduction of aquatic invasive species before they hit the water
- › Invasive mussel monitoring program: This program is an early detection monitoring program of adult mussels and veligers;¹⁰ the program is designed to detect the species introduced into provincial waters in a timely manner

Environment utilizes its Conservation Officers to enforce the legislation related to aquatic invasive species. It has empowered Conservation Officers to enforce both the provincial and federal legislation.¹¹ Where aquatic invasive species are found in the possession of a person who does not have the legal authority to possess them, or when aquatic invasive species present a risk to provincial waters, a Conservation Officer may seize, detain, or impound those invasive species plus the vehicle (e.g., watercraft) transporting the species. In 2014, there were 36 Conservation Officers trained on conducting watercraft inspections.

However, we found Conservation Officers undertook limited inspections of watercrafts for aquatic invasive species in 2015. Having Conservation Officers inspect watercraft for aquatic invasive species is still in the early stages of development for Environment. Conservation Officers conducted a few targeted inspections at fishing tournaments in 2015, and undertook two separate border inspections (with a mobile decontamination unit)¹² in September 2015. Conservation Officers did not identify any boats with issues related to aquatic invasive species at the fishing tournaments. They inspected eight boats in total at the border inspections in September 2015. Each border inspection identified one watercraft that required full decontamination.

¹⁰ Veligers are the larva for mussels.

¹¹ The Canadian Border Services Agency (CBSA) is also authorized to inspect boats at the US-Canada border for aquatic invasive species.

¹² Environment has two mobile decontamination units that provide for high-pressure, hot water boat washing.

In contrast to Alberta and Manitoba, Environment does not have a formal watercraft inspection strategy to prevent the introduction of aquatic invasive species. For example, Alberta has various watercraft inspection stations located throughout Alberta, and when open, it legally requires all watercraft owners to report to the onsite inspectors to have the watercraft and water-related equipment checked for invasive species. Manitoba has an annual inspection program. It has five decontamination units that rotate around Manitoba to high-risk and high-traffic boating areas. Temporary inspection stations act as a deterrent, and as an educational component for the travelling boater.

Also, Environment does not have an inspection strategy that is supported by a risk analysis, including identified and potential locations of aquatic invasive species and watercraft use patterns.

Such a strategy would help it determine higher risk geographical areas, and prioritize placement of its inspection programs. Summarizing inspection results would allow for assessment of the inspection program effectiveness. Without a risk-based strategy, Environment does not know if its inspection efforts are sufficient and focused in the right areas to prevent aquatic invasive species from being introduced into Saskatchewan waters.

3. We recommend that the Ministry of Environment formalize a risk-based watercraft inspection strategy related to aquatic invasive species.

Monitoring and sampling are also key to the early detection of aquatic invasive species. Environment undertook water-sampling activities related to the detection of aquatic invasive species. For example, Environment had two programs for invasive mussels monitoring, and early detection of these species: the Saskatchewan Adult Invasive Mussel Monitoring (AIMM) program, and the Saskatchewan Invasive Mussel Veliger Monitoring program.

The AIMM program, coordinated by the Fisheries Unit of Environment, is a mechanism to detect adult aquatic invasive mussels (i.e., zebra and quagga mussels) in water bodies throughout the province. Environment makes guidance publicly available online¹³ that describes how the public can sample for adult mussels in water bodies.

In 2015, Environment also worked with Saskatchewan Parks staff to have them monitor for mussels when removing boat launches from Saskatchewan waters at the end of the park season. Environment advised the public that anyone who performs adult mussel sampling can enter results on iMapInvasives – an online tool available through the Saskatchewan Conservation Data Centre (www.biodiversity.sk.ca). The 2015 results of samplings (65 different samples in different water bodies in Saskatchewan) found no mussels present.

The Invasive Mussel Veliger Monitoring program monitors veliger, which is the larva for the mussels. During the summer of 2015, Environment carried out sampling for veligers on 17 bodies of water considered as high risk for invasive mussels; the samples found no veligers present. According to Environment officials, more expansive sampling would

¹³ The Saskatchewan Adult Invasive Mussel Monitoring (AIMM) protocol can be found on www.biodiversity.sk.ca (28 March 2016).



be undertaken if more resources were available (e.g., partnering with SaskPower and Water Security Agency for monitoring of veligers at dam reservoirs).

While Environment carried out veliger sampling in the 2015 season, it does not have a documented strategy requiring it to do so each year. In addition, it has not set out what types of monitoring it must undertake each year, how much sampling it should do, or where (e.g., which bodies of water are high-risk areas).

Lack of a documented strategy increases the risk of monitoring mechanisms not being sustained over time, or sufficient sampling being carried out in a systematic manner. Insufficient sampling increases the risk that aquatic invasive species entering Saskatchewan will go undetected, and not be addressed before becoming established.

4. We recommend that the Ministry of Environment establish a risk-based strategy for sampling Saskatchewan waters for aquatic invasive species.

Environment also belongs to West911, a network of western states and provinces intended to alert neighbouring jurisdictions when high-risk watercraft are being transported across state/provincial boundaries. We saw evidence of Environment being informed through this network when a boat was decontaminated by the State of Utah in 2012 that was travelling to Saskatchewan.

4.5 Rapid Response Plan Required

If invasive mussels or other aquatic invasive species are detected, Environment wants people to call the TIP¹⁴ line immediately. According to Environment, such reports would be forwarded to the local Conservation Officer for follow up as a compliance action, or to the Fish and Wildlife Branch of Environment for verification of a sighting in the environment. Environment did not receive any calls through its TIP line in relation to aquatic invasive species in 2015 (which may be indicative of insufficient public awareness – see **Recommendation 2**).

At January 2016, Environment was drafting a response plan to address the immediate threat of invasive mussels in the province.

A good rapid response plan clearly outlines roles of all parties, and designates a lead to carry out the actions specified in the plan. It would aid management in responding to the detection of aquatic invasive species in a formal and timely manner (i.e., before species become established). A good response plan can minimize the impact of, and spread of aquatic invasive species. Once completed, the plan should be tested.

¹⁴ Environment encourages the public to report any suspected sightings of aquatic invasive species to its Turn in Poachers (TIP) Line (1-800-667-7561).

5. We recommend that the Ministry of Environment complete and test a formal rapid response plan to mitigate the spread of aquatic invasive species in Saskatchewan waters.

4.6 Prevention Strategies Being Monitored

Environment monitors the delivery of its annual action plans related to aquatic invasive species. For example, Environment keeps track of the results obtained through its monitoring protocols (i.e., AIMM and the Veliger Monitoring). Environment also routinely shares the results of its samplings to its partners (e.g., SaskPower and Water Security Agency).

As noted above, Environment does not have a comprehensive aquatic invasive species strategy it can evaluate. Once devised, Environment should establish monitoring and evaluation processes to help to determine any gaps or changes required to its prevention efforts.

Environment provides numerous communications to the public regarding threats posed by aquatic invasive species as well as how the public can help in prevention efforts. However, as noted above, it does not regularly determine whether the public are sufficiently aware of these threats (see **Recommendation 2**).

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