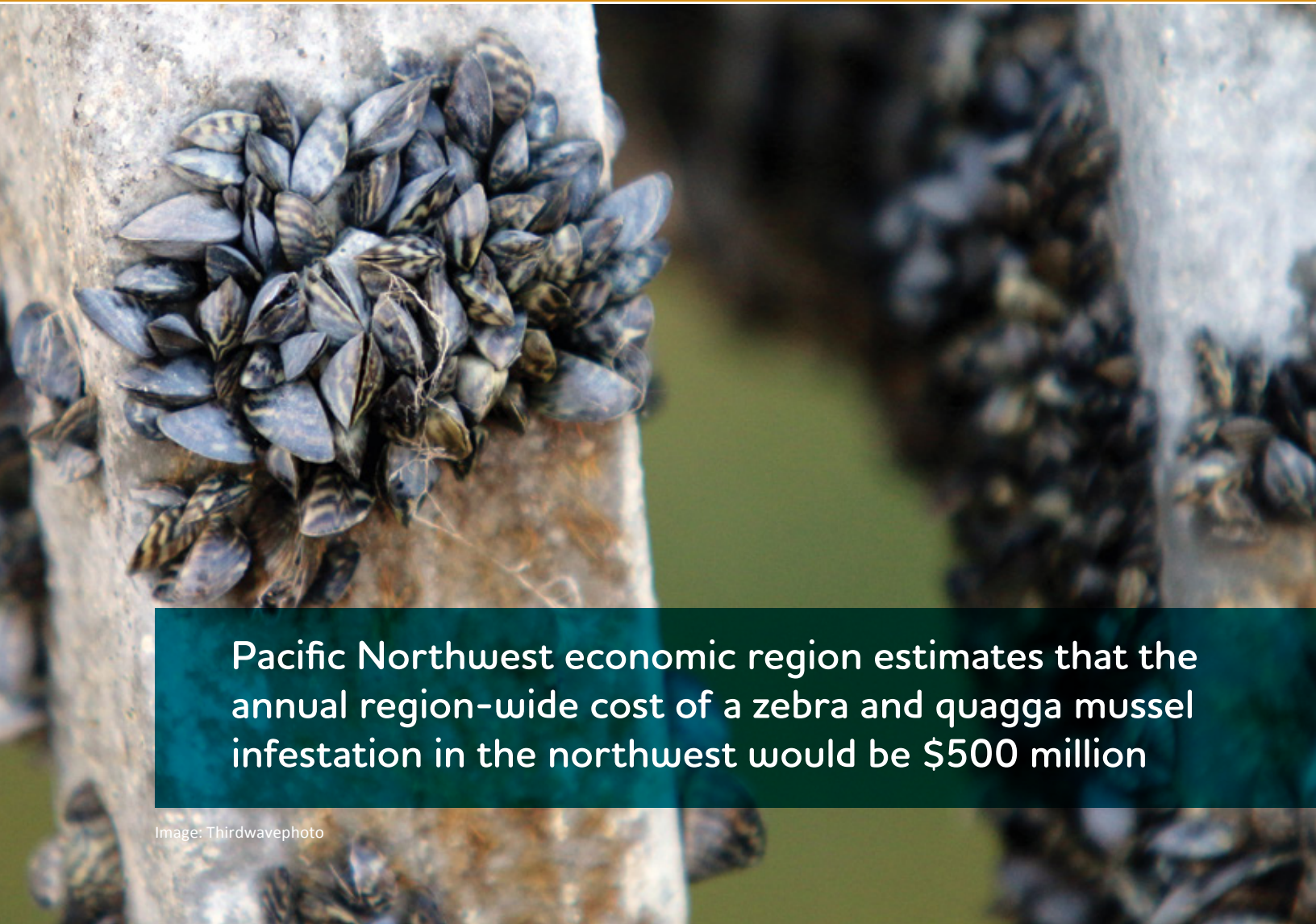


Invasive Mussel Prevention Framework for Western Canada



Pacific Northwest economic region estimates that the annual region-wide cost of a zebra and quagga mussel infestation in the northwest would be \$500 million

ACKNOWLEDGEMENTS

The Invasive Mussel Prevention Framework for Western Canada was prepared for the Pacific Northwest Economic Region (PNWER)

as a common shared call to action for Western Canada. The development of this report builds on the previous leadership and background report provided by PNWER, including the [Advancing a Regional Defense Against Invasive Mussels in the Pacific Northwest](#).

The development of the *Invasive Mussel Prevention Framework for Western Canada* was made possible thanks to the direction and contributions from a wide range of governments, industries and organizations from across Yukon, British Columbia, Alberta and Saskatchewan, including the PNWER Invasive Species Working Group. The original Framework was released in 2016 and is now updated in 2018, based on input from a wide range of contributors.

Thank you to all the contributors that helped shape the *Invasive Mussel Prevention Framework for Western Canada*. All the knowledge, perspectives, and financial support greatly assisted the Framework's development to ensure that it serves as a joint 'call to action' for all of us. There is no doubt that working across and beyond boundaries is key to preventing the introduction of invasive mussels to Western Canada.

Participation in the Framework development does not imply endorsement nor commitment to specific actions.

For more information or questions on this report, please contact:

Matt Morrison, Chief Executive Officer

PNWER | pnwer.org
matt.morrison@pnwer.org

Gail Wallin, Executive Director

Invasive Species Council of BC | bcinvasives.ca
gwallin@bcinvasives.ca

“The introduction and subsequent invasion of Dreissenid mussels has resulted in far-ranging costs to the infrastructure and operations of many Canadian Hydropower Association (CHA) member organizations. Further, the impact on biodiversity and water quality on the systems in which our members operate has also been significant. The CHA supports the Western Canada Invasive Mussel Prevention Framework and its stated objectives to proactively prevent and protect its waters from the detrimental economic, environmental and societal impacts of these species.”

Ed Wojczynski, Canadian Hydropower Association President

EXECUTIVE SUMMARY

The Pacific Northwest is the only region of the United States and Canada that does not have an established population of invasive mussels.

The estimated costs resulting from an invasive mussel invasion in the Pacific Northwest region is estimated to exceed **\$500 million annually**, and the ecological impacts are overwhelming¹.

The Invasive Mussel Prevention Framework for Western Canada serves as a voluntary collective call to action for governments, businesses and community organizations who are choosing to work together to prevent the introduction of invasive mussels in Western Canada. This Framework identifies some shared key priorities and actions that can help serve to guide organizational planning and initiatives.

For the purpose of this Framework, Western Canada is defined to include British Columbia, Yukon, Alberta and Saskatchewan. Across all perspectives, there is a clear desire to prevent introductions by cooperating on a defense strategy that includes intercepting infested boats from entering Western Canada. **The defense strategy includes prevention, monitoring, rapid response and management capabilities, an educated, aware and involved public, enhanced tools and resources, and improved communication and coordination.** Increased collaboration on pro-active, preventable measures across all levels of government, businesses and non-governmental organizations is clearly called for to ensure effective

prevention at the regional, provincial and territorial levels.

This Framework serves to guide a collaborative approach to coordinated action against the risks of invasive mussels, and to promote prevention efforts as a first line of defence.

In addition to the overarching goal of having invasive mussels contained at the source, this Framework identifies five key recommendations to help ensure that invasive mussels are not established in Western Canada.

1. Develop and foster **long-term, sustainable funding** solutions for invasive mussels by all parties including federal, provincial/territory and private partners to prevent the introduction of invasive mussels in Western Canada in order to avoid perpetual annual response costs.
2. Enhance the **perimeter defense system** including strengthening the capacity and communication across watercraft inspection and decontamination efforts across all borders- internationally and within Western Canada.
3. Support and **grow the involvement of key partners** in preventing the introduction of invasive mussels across Western Canada.

1. Advancing Regional Defense Against Invasive Mussels – A report prepared by the Pacific Northwest Economic Region and Pacific States Marine Fisheries Commission

EXECUTIVE SUMMARY (Cont)

- 4. Increase focus on education, awareness and consistent messaging** to ensure that governments, key stakeholders, pathway groups and industry have current information and **consistent messaging**.
- 5. Increase research** on key information needs for invasive mussels within Western Canada.

Other recommendations include:

6. Ensure all needed **treatment tools** for immediate response options for invasive mussel treatment are **registered for use** in each province and territory.
7. Facilitate, through PNWER, **consistent and comprehensive national border and cross-border training** for United States and Canada border patrol officers, equipping them with the necessary information, materials, and training to effectively prevent infested conveyances from crossing international borders.

Across Western Canada there is a dedicated passion by leaders, individuals, industries, governments and community groups to protect Western Canada from the long-term impacts created by invasive mussels. Success requires an effective perimeter defense, awareness and support at the policy level, necessary resources and cooperation at all levels to harmonize approaches to ensure effective use of capacity and investments. The *Invasive Mussel Prevention Framework for Western Canada* aims to reflect this collaborative call for action at all levels and across all jurisdictions.

This Framework recognizes the leadership of provincial and territorial governments with the [Inter-Provincial Territorial Agreement for Co-ordinated Regional Defense Against Invasive Species](#) (2016) which also reflects a collaborative and coordinated approach to invasive mussel prevention across Western Canada.

What are invasive mussels and where did they come from?

The invasive freshwater mussels described in this Framework are the Zebra mussel (*Dreissena polymorpha*) and the Quagga mussel (*D. rostriformis bugensis*). Both of these invasive mussels are from the Family Dreissenidae, Subfamily Dreisseninae, Genus *Congeria*, Genus *Dreissena*. These invasive mussels are native to the Ponto-Caspian Region of Eastern Europe and were first introduced to North America in the Laurentian Great Lakes in the mid 1980's through the release of ship's ballast water.²

2. [Department of Fisheries and Oceans Canada](#)

CONTENTS

Acknowledgements	2
Executive summary	3
Background	6
Purpose and Scope	7
Key Partners Involved in Invasive Mussel Prevention Efforts	8
Invasive Mussel Prevention Framework	9
Recommendation One: Develop long term sustainable funding	10
Recommendation Two: Enhance the perimeter defense system.....	11
Recommendation Three: Grow the support of key partners	12
Recommendation Four: Increase focus on education, awareness & consistent messaging	13
Recommendation Five: Increase research	14
Appendix 1. Links to Key Documents	15
Appendix 2. Provincial Invasive Species Council Actions	16
Appendix 3. Provincial Invasive Species Councils	17
Appendix 4. Invasive Mussel Current Distributions and Probability of Invasion	18

BACKGROUND

For two decades, invasive mussels have been invading freshwater ecosystems across North America. These invasions have generated significant costs to infrastructure, biodiversity, and water quality.

The prevention of further invasive mussel spread in Western Canada is aimed at human-assisted pathways of introduction and spread. These pathways include water-based restoration activities, recreational water activities such as boating and angling, and the associated transport of watercraft and equipment. The spread of invasive freshwater mussels across North America, including the infestation of Lake Winnipeg in 2013, has highlighted their capacity for invasion (Appendix 4) and the threat to Western Canada. Significant risk of invasion has been identified for invasive mussels throughout Western Canada (Appendix 4). Given the long term environmental and economic impacts of invasive mussels, mitigating further spread has been identified as the most cost-effective means to protect Western Canada.

For over a decade, invasive mussels have been of growing interest to PNWER due to the large economic and environmental impact to the region. Annual workshops and leadership meetings have been held to build collective and coordinated actions for industries and governments across the Pacific Northwest. An Invasive Species Working Group was established, with elected leaders, academics, government and industry staff and others to build collective actions to help

prevent invasive mussels from successfully entering the Pacific Northwest.

In 2016, the governments of the four western provinces and Yukon signed the [Inter-Provincial-Territorial Agreement for Coordinated Regional Defense Against Invasive Species](#). This Agreement enables increased coordination among jurisdictions to share resources and coordinate planning for both prevention and response to invasive mussels. This Agreement is supported by Director level committees along with an active working group from each province and Yukon. Some of the key actions have included working towards consistent messaging (Clean, Drain, Dry), along with working on early detection processes.

Since the start of 2017, the Canadian Border Services Agency (CBSA) has referred 81 high-risk water craft to the [Saskatchewan](#) Ministry of Environment. Strong communication between the CBSA and the Western Canadian provinces has led to hundreds of high-risk boats being referred to both the BC and Alberta provincial governments.

PURPOSE AND SCOPE

This Invasive Mussel Prevention Framework for Western Canada serves as a collective call to action for governments, businesses and community organizations.

For the purpose of this Framework, Western Canada is defined to include **British Columbia, Yukon, Alberta, and Saskatchewan**. Across all perspectives, there is a clear call to prevent introductions by cooperating on a prevention framework that identifies collective priorities to mitigate the risks of invasive mussels from entering Western Canada. The mitigation framework includes prevention, monitoring, rapid response and management capabilities, an educated, aware and involved public and key stakeholders, enhanced tools and resources and improved communication and coordination.



Image: Megan Eplett



Image: Government of Alberta

One female invasive mussel can produce up to 1 million eggs per year

Alberta monitors over 70 lakes and reservoirs annually for invasive mussels

KEY PARTNERS INVOLVED IN INVASIVE MUSSEL PREVENTION EFFORTS

In Western Canada, the prevention of invasive mussels requires a collaborative effort incorporating regulations, enforcement, prevention, detection, communication, funding support, monitoring and outreach.

The following agencies include some of the players that have a role in prevention efforts across Western Canada.

- Federal Government
 - > Department of Fisheries and Oceans
 - > Canada Border Services Agency
 - > Pest Management Regulatory Agency
 - > Canadian Food Inspection Agency
 - > Environment and Climate Change Canada.
- Provincial and Territorial Governments.
- Industries (e.g. Hydropower companies, agricultural irrigation, municipal infrastructure, boating groups, marinas).
- Indigenous Governments and Organizations.
- Local Governments.
- Cross-jurisdictional (e.g. International Joint Commission, Columbia River Treaty, Canadian Council on Invasive Species).
- Trans-boundary Agencies (e.g. Pacific Northwest Economic Region, 100th Meridian Initiative, Pacific States Marine Fisheries Commission).
- Invasive species councils (national, provincial, and regional).



Image: Government of Alberta

Hilo, Seuss and Diesel joined the **Alberta** Public Service in 2015 after successful training and certification to the standards developed by the California Department of Fish and Wildlife for invasive mussel detection. They have inspected over 2300 boats! **British Columbia** now has two trained detection dogs - Kilo and Major.

INVASIVE MUSSEL PREVENTION FRAMEWORK

This Framework reflects the shared goals and priorities across governments, non-government organizations, businesses and other key stakeholders in Western Canada to prevent the introduction and spread of invasive mussels.

Overarching Goal:

In addition to the ultimate goal of **containing invasive mussels at the source**, whether that is Manitoba, the Great Lakes or from the United States, this Framework identifies five key recommendations for Western Canada.

There is a clear call by all parties in Western Canada, and across the Pacific Northwest to restrict the movement of infested boats from areas with established populations of invasive mussels.

The Invasive Mussel Prevention Framework identifies five priority recommendations:

1. Develop and foster **long-term, sustainable funding** solutions for invasive mussels by all parties including federal, provincial/territory and private partners to prevent the introduction of invasive mussels in Western Canada in order to avoid perpetual annual response costs.
2. Enhance the **perimeter defense system** including strengthening the capacity and communication across watercraft inspection and decontamination efforts across all borders- internationally and within Western Canada.
3. Support and **grow the involvement of key partners** in preventing the introduction of invasive mussels across Western Canada.
4. **Increase focus on education, awareness and consistent messaging** to ensure that governments, key stakeholders, pathway groups, industry and stewardship groups have the current information.
5. **Increase research** on key research needs for invasive mussels within Western Canada.



Image: Phoenix, Arizona

UNDER REVIEW:
The Government of Yukon has recently proposed a regulatory change to add Yukon to the list of jurisdictions under the Federal Aquatic Invasive Species Regulations that prohibit zebra and quagga mussels.

RECOMMENDATION ONE: DEVELOP LONG TERM SUSTAINABLE FUNDING

1. Increase and stabilize investments by all parties including federal, provincial/territory and private partners to prevent the introduction of invasive mussels in Western Canada and avoid perpetual annual response costs.

2. Establish a collective financial goal to more effectively leverage existing funding based on shared priorities.

Financial and resource investments for invasive mussels have seen positive growth since 2016; however, more growth is needed in both level and range of partners. All research demonstrates that investing in prevention is financially wise due to the significant economic costs that would occur if established. PNWER estimates that the region-wide cost of a mussel infestation in the Pacific Northwest would be \$500 million annually.

Further actions **could** include:

- Develop a collaborative invasive mussel financial plan for Western Canada and/or within each jurisdiction that recognizes the needs for shared contributions to an effective prevention program. All levels of government, private industry and key partners to contribute to building and supporting the invasive mussel financial plan.
- Call for increased investments by federal government to at least match provincial contributions for prevention and response
- Consider a Western Canada Emergency Mussel Fund that can be immediately accessed, across provinces, if a potential detection exists
- Identify potential new funding sources, including coordinated financial requests for funding

In 2017, **BC** inspected 35,000 boats, 25 of which were infested with invasive mussels and issued 59 tickets for failing to stop at inspection stations.

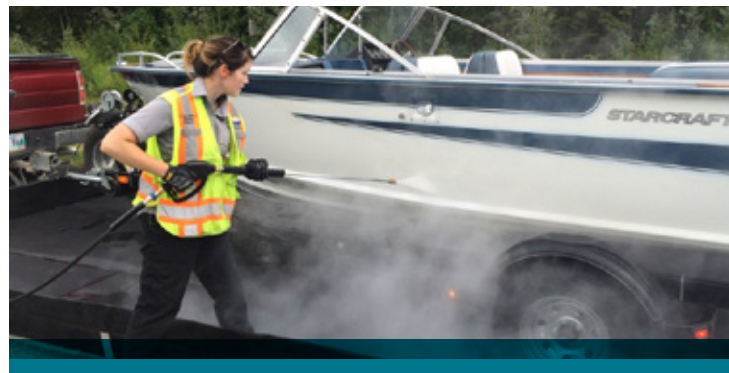


Image: Government of British Columbia

In 2017, **Alberta** inspected 35,391 boats, 19 of which were infested with invasive mussels.

RECOMMENDATION TWO: ENHANCE THE PERIMETER DEFENCE SYSTEM

Watercraft Inspection Stations: strengthen and ensure a strong defense system for watercraft inspection stations and decontamination stations that are linked across Western Canada and Northwest United States.

Since the initial 2016 Framework there has been an increase in the number and hours of inspection stations in Western Canada. There has been live time information exchange through the Watercraft Inspection and Detection (WID) Station Planning Application. Two provinces have implemented the use of inspection dogs in addition to trained professional teams at key border crossing. A 'passport' system was implemented in BC and Alberta.

Further actions **could** include:

- Consider watercraft inspection certification system to minimize impact on commercial haulers and expedite the inspection process.
- Review cross-jurisdictional training tools and when possible promote a consistent standard for mussel veliger monitoring and analysis within and across provinces and territories.
- Expand monitoring at key water bodies, among industry and others to include aquatic invasive species and develop a standardized training program for participating partners.
- Identify available funding for sample analysis.
- Establish and strengthen existing Rapid

Response Plans within each province/territory and ensure legislative tools, established protocols and resources are ready and available for immediate response. Ensure federal engagement and ability to respond through recognized environmental emergencies based on invasive mussel incursions.

- Be prepared. Ensure federal registration (permitting and labeling) of invasive mussel pesticide tools for use in open water.



Image: Government of Alberta

Manitoba's watercraft inspection program began in 2000. They currently have five decontamination units

RECOMMENDATION THREE: GROW THE SUPPORT OF KEY PARTNERS

Support key partners and grow the number of key partners in preventing the spread of invasive mussels across Western Canada.

Preventing the introduction and spread of invasive mussels cannot be done by any one organization or government. There is a clear need for ‘all hands on deck’ from those with regulatory powers to those that are influencers along with those that would bear the impact of an introduction. As with most invasive species prevention, a collaborative approach is the most effective. With the growing understanding of the devastating impacts of invasive mussels to Canada’s freshwater systems, the potential immense financial impact along with direct social impact to communities and recreational uses, there is an opportunity to strengthen existing partnerships and to bring more key partners to the table.

Further actions **could** include:

- Continue the collaboration guided by the [Inter-Provincial Territorial Agreement for Co-ordinated Regional Defense Against Invasive Species](#) and share accomplishments.
- Expand connections and involvement with key pathway-related groups across Western Canada and/or the Pacific Northwest Economic Region. By providing tools and resources tailored to key groups, they can become part of the prevention. Some partners could be marina associations, boat repair businesses, boat haulers, trucking associations, yacht clubs, boat brokers, commercial transport operators, fire fighters, float plane operators, aquaculture industry, and insurance agencies.
- Increase awareness and implementation of standardized decontamination protocols such as the Uniform Minimum Protocols and Standards for Watercraft Interception Programs for Dreissenid Mussels, the standard protocol used across the Western U.S. (see Appendix 1)
- Involve and support Indigenous leaders in engaging in the prevention efforts
- Identify key industry partners and associations (e.g. hydropower, log transport, pulp mills, irrigation) and seek input on prevention involvement; emphasis on organizations with infrastructure implications.
- Collaborate with existing and new partners (e.g., Ducks Unlimited, fishing and wildlife clubs, foreshore residents, non-government organizations, local stewardship groups, professional biologists) and identify existing protocols and/or information, monitoring and reporting tools currently available to partners.
- Ensure strong engagement with enforcement agencies (e.g. Canadian Border Services Agency, Fisheries Officers, and provincial enforcement agencies & officers).
- Support strong engagement with local governments and strengthen partnerships with Federation of Canadian Municipalities (FCM) and municipal organizations in each province/territory. Collaboratively build the tools and resources for prevention.

RECOMMENDATION FOUR: INCREASE FOCUS ON EDUCATION, AWARENESS & CONSISTENT MESSAGING

Increase focus on public education and awareness to ensure that all levels of governments, key industries such as irrigation associations, hydro and utility groups, and key stakeholders such as youth organizations, lakeshore stewardship groups, pathway groups, and invasive species organizations have the most current information, consistent messaging and necessary resources.

With the growing interest and need for support from all parties, there is a clear need for access to consistent and accurate information. Across Western Canada, provincial/territory governments, industry, Indigenous communities, local government and non-government partners are willing to step up and take a role to protect their local waters. Access to current information, best practices and protocols are some of the resources of interest.

Further actions **could** include:

- Provide accessible information on threats, impacts and ongoing status report on invasive mussels in Western Canada.
- Provide easy access to current Western Canada invasive mussel information through a central website hub including links to real-time invasive mussel status databases.
- Create a dissemination process for information such as an invasive mussel listserv for Western Canada; regular webinars or conference calls for Western Canada and

Northwestern United States stakeholders to share invasive mussel prevention highlights, challenges and successes.

- Strengthen, implement and support applicable tools and practices for key interest groups such as boat haulers, boaters, marina's and the media. Consider participation at major relevant events.
- Support the inclusion of AIS information in nationwide pleasure craft operator courses and provincial freshwater fishing regulations.
- Support increased involvement of freshwater stewardship groups, lakeshore groups, boat shows, youth organizations and outdoor groups.
- Increase involvement and information for key industries including irrigation, utilities and hydro.

The annual cost to control invasive mussels in water intake pipes in the Great Lakes is \$250 million. The total annual management costs are almost \$500 million.³

3. [Zebra mussels cost Canadians billions each year; cost to Manitobans still unknown](#)

RECOMMENDATION FIVE: INCREASE RESEARCH

Increase research on impacts and response to invasive mussels for Western Canada.

For prevention and response there is a clear need to have the required tools and knowledge on hand to make informed decisions. Across stakeholders, there is recognition that further information is needed that would enable an emergency response to invasive mussels in Western Canada.

Further Actions **could** include:

- Develop a clear list of top research priority needs with input from all key stakeholders.
- Ensure effective extension of research to all interested parties.
- Some current research topics include, but are not limited to, the following:
 - Treatment methods for invasive mussel eradication e.g. potash, ZEQUANOX®
 - Impacts of invasive mussels on native fish
 - Impacts of invasive mussels on species at risk
 - Impacts of salinity on invasive mussels
 - Upstream impacts of invasive mussels from ports and ballast water.

“Collaborative prevention efforts are key to ensuring that invasive mussels do not invade Western Canada. The Ktunaxa Nation Fisheries Stewardship and Protection Unit Fishery Guardians (formerly Canadian Columbia Inter-tribal Fisheries Commission) have been trained on inspection and decontamination of invasive mussels and are working with the BC Conservation Officer Service, the Department of Fisheries and Oceans Fishery Officers, industry and other organizations to help prevent the introduction of invasive mussels in Ktunaxa Amakis (Kootenay Region). The potentially devastating effects of an invasion would impact us all.”

Ktunaxa Nation Fisheries Stewardship and Protection Unit Fishery Guardians

APPENDIX 1 LINKS TO KEY DOCUMENTS

[A Canadian Plan to Address the Threat of Aquatic Invasive Species](#)

[Advancing a Regional Defense Against Dreissenids in the Pacific Northwest](#)

[Fisheries and Oceans Canada AIS EDRR Plan](#)

[Risk Assessment for Three Dreissenid Mussels \(*Dreissena polymorpha*, *Dreissena rostriformis bugensis*, and *Mytilopsis leucophaeata*\) in Canadian Freshwater Ecosystems.](#)

[Uniform Minimum Protocols and Standards for Watercraft Inspection and Decontamination Programs for Dreissenid Mussels in the Western United States \(UMPS III\)](#)

[Preliminary Damage Estimates for Selected Invasive Fauna in B.C.](#)

In 2016, a total of 90 decontamination orders were issued in **British Columbia**, of which 68 had quarantine periods to meet the 30 day required drying time.

“Manitoba Hydro has greatly benefited from the collaboration with our provincial government, the federal government and various industry partners. This shared experience and knowledge has been key to ensuring Manitoba Hydro’s Aquatic Invasive Species preparedness planning is adaptive based on the most current and reliable information regarding: monitoring and species distribution, mitigation strategies and infrastructure risk management.”

Manitoba Hydro

APPENDIX 2 PROVINCIAL/TERRITORIAL ACTIONS

Table 1: Summary Provincial/Territorial actions.

Provincial or Territorial Government	BC	Alberta	Yukon	Saskatchewan
Does your jurisdiction watercraft inspection program in place?	Yes	Yes	Program under review and development	Yes
Does your jurisdiction have anEDRR Plan?	Yes	Yes. Operational in draft form, not yet endorsed. Set for 2018 adoption.	No. The DFO AIS group has offered to train Yukon staff in their EDRR program	Yes. Operational in draft form only, working on implementation f or sometime in 2018.
Are there existing regulatory tools in place for ZQM?	Yes. Provincial - Controlled Alien Species Regulation (Wildlife Act)/ Federal - AIS Regulation (Fisheries Act)	Yes. Provincial - Fisheries (Alberta) Act & Fisheries (Ministerial) Regulation/ Federal - AIS Regulation (Fisheries Act)	No. There are none specific to ZQM, we are in the process of having Yukon added to the list of jurisdictions that prohibit possession, transport and release of ZQM	Yes. Provincial - Fisheries Act & Regulations/ Federal - AIS Regulation (Fisheries Act)
Does your jurisdiction have pull the plug legislation in place?	No	Yes. Fisheries (Ministerial) Regulation Section 6.1	No	Yes. Implemented in this year 2018.
Is there annual early detection monitoring for ZQM ?	Yes	Yes.	No	Yes. Both utilizing veliger and eDNA sampling by Provincial Fisheries. Also utilize the Adult Invasive Mussel Monitoring by Ministries of Agriculture, Parks, SaskPower, SaskWater & public.
Published protocol in place for ZQM early detection monitoring?	Yes. Currently being updated	No. Operational plans for monitoring but not public/ published	No	Yes. It is not within our Gov't database or url, but is published.
Are you using Clean, Drain, Dry messaging?	Yes	Yes	No. though our messaging is similar (CDC: Check, Drain, Clean)	Yes. It is one of the Government's Initiatives as of 2015, but has been in the Anglers' Guide since 2001.
List any other outreach campaigns you are using for ZQM and any relevant URLs	CDD Campaigns	CDD Your Boat, CDD Your Gear, Pull the Plug	CDC signage at boat launch, angler questionnaires, web site.	CDD is on 54 erected 6' x 12' highway signs, 350 boat launch signs, and in our educational materials.

APPENDIX 3 PROVINCIAL INVASIVE SPECIES COUNCILS

Table 2. Summary of Provincial Invasive Species Council Actions.

Does/is your Organization...	Invasive Species Council of BC (ISCBC)	Alberta Invasive Species Council (AISC)	Yukon Invasive Species Council(YISC)	Saskatchewan Invasive Species Council (SISC)
Have a mandate involving invasive mussels?	Yes. Inspiring British Columbians to take action and prevent the spread of invasive mussels.	Yes. Increasing awareness and educating Albertans about the destructive impacts of invasive species.	No. Resources are limited. Environment Yukon has been leading in any aquatic invasive species work.	Yes. Operated by provincial government
Involved in any communications/outreach materials/social media around invasive mussels?	Yes. After extensive research in 2011, we launched Clean Drain Dry behaviour change and outreach program in 2012 and has operated continuously since.	Yes. A fact sheet on website, information on social media. Email newsletter with info	Yes. Both mussels are included in our spotter's network program. Facebook postings. Factsheet on our website.	Yes. We work with the government of SK to produce and distribute fact sheets
Use Clean, Drain, Dry messaging?	Yes.	Yes	No	Yes
Have any other key initiatives with regards to invasive mussel prevention?	Yes. Invasive Wise Marina program being piloted in 2018. Working with other groups- Canadian Council for Invasive Species, PNWER, IMISWG	The AISC delivers the Early Detection Distribution Mapping System and associated cell phone app for Alberta (EDDMapS).	Yes. Our school program for grade 4 teaches simple steps to prevent the transport of IS from one lake to the other.	Yes. The Saskatchewan Aquatic Invasive Species Working Group, and the provincial AIMM program.
Partner with any other group(s), governments or stakeholders around invasive mussel prevention?	Yes. Freshwater Fisheries, Boating BC, local governments, Indigenous communities, and the Power and Sail Squadron are e.g.'s.	Yes. Working with the Government of Alberta. Additionally, we are a member of the PNWER Invasive Species Working Group.	Yes. Yukon Government, Department of Environment, DFO, Non-profit orgs: Friends of McIntyre Creek, Yukon Conservation Society	Yes. The SISC has all of the key stakeholders as its members.
What are some successes in the last 2 years with regards to invasive mussel prevention?	Pilot for Invasive Wise Marina, campaigns for CDD, provincial hub for CDD for a wide range of orgs. New BMPs for boaters.	The Government of Alberta has developed a decontamination protocol for whirling disease, which is planned to expand to all aquatic invasive species.	Awareness. The Spotter's Network and YK Environment is hosting a lot of talks on aquatic invasives.	Help maintain a provincial invasive species database and mapping system. SK MOE has mobile decontamination units.
Please list any upcoming plans you may have over the next 2-3 years with regards to invasive mussel prevention.	Boater BMP's, Invasive Wise Marinas expanding and launching, Invasive Species Action Month, Aquatic resources. CDD national campaign.	Continue to educate on the importance of preventing aquatic invasive mussels from being introduced to Alberta.	N/A	Coordinator position staffed, and continue to work with all of our partners on prevention and awareness.
Carry out early detection monitoring for invasive mussels?	Yes. Partnering with provincial government to monitor in specific areas in the province. Webinars.	Yes. The Government of Alberta has mussel and veliger monitoring programs, of which the data is uploaded to EDDMapS Alberta.	No.	Member groups participate in mussel monitoring using substrate samplers, and SK MOE collects water samples for veliger monitoring.

APPENDIX 4 INVASIVE MUSSEL CURRENT DISTRIBUTIONS AND PROBABILITY OF INVASION

Figure 1. The current distribution of zebra mussels in North America as of Feb 23, 2018
(Source: [USGS NAS](#))



Figure 2. The current distribution of quagga mussels in North America as of Feb 23, 2018
(Source: [USGS NAS](#))



Figure 3. Probability of zebra mussel invasion of Canadian freshwater sub-drainages based on probability of survival and arrival. Hatched watersheds had <5 sampling sites; therefore, a higher level of uncertainty associated with the corresponding invasion probability.
(Source: [DFO's Risk Assessment for Three Dreissenid Mussels in Canadian Freshwater Ecosystems, 2012](#))

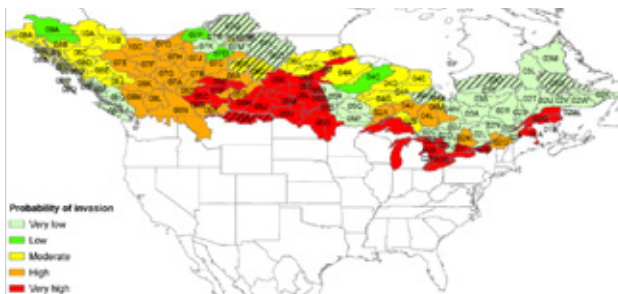


Figure 4. Probability of quagga mussel invasion of Canadian freshwater sub-drainages based on probability of survival and arrival. Hatched watersheds had <5 sampling sites; therefore, a higher level of uncertainty associated with the corresponding invasion probability.
(Source: [DFO's Risk Assessment for Three Dreissenid Mussels in Canadian Freshwater Ecosystems, 2012](#))

