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Invasive Mussel Prevention Framework for Western Canada



ACKNOWLEDGEMENTS

This Invasive Mussel Prevention Framework is the result of collaborative effort between a diverse group of contributors from agencies, organizations, businesses and other key stakeholders across Western Canada. Participation in this process does not imply endorsement of this plan or any commitment on the part of the partner organizations.

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Thank you to all contributors to the *Invasive Mussel Prevention Framework for Western Canada*. All the knowledge, perspectives, and financial support have greatly assisted the Framework's development and will additionally benefit its implementation.

Cover Photo Credit: U.S. Fish and Wildlife Service (Zebra mussels)

EXECUTIVE SUMMARY

For nearly 20 years, invasive mussels have been invading freshwater ecosystems throughout North America. Since their initial detection in the Laurentian Great Lakes in the 1980's, Dreissenid mussels have successfully spread through three Canadian provinces and thirty-three states. This invasion has generated far-ranging costs to infrastructure, biodiversity, and water quality. It is crucial that Western Canada take proactive preventative action to protect its waters from the detrimental economic, environmental and societal impacts of these species. This Framework serves to guide a collaborative and proactive approach to coordinated action against the risks of invasive mussels and promote prevention efforts as a first line of defence. The recommendations within this document build on existing provincial government plans throughout Western Canada to reflect a more cohesive and comprehensive approach.

Once introduced, invasive mussels have the capacity to rapidly spread downstream within watersheds through their free-swimming larval stage. While there may currently be risk of natural dispersal within Manitoba, the prevention of further invasive mussel invasions in Western Canada is aimed at human-assisted pathways of introduction and spread including; water-based restoration activities, recreational water activities such as boating and angling and the associated transport of watercrafts and equipment. Several key recommendations have been made for Western Canada to address these pathways, including: increasing collaborative outreach and watercraft inspection/decontamination efforts; maintaining consistent invasive mussel monitoring; supporting the containment of source populations in Manitoba, Eastern Canada and the United States; and securing the necessary resources to ensure immediate response to any potential incursions.

The following multi-year Framework is designed to reflect shared goals and priorities and to facilitate a collaborative and coordinated approach to invasive mussel prevention across Western Canada. The five focus areas of the Framework include Communication, Partnerships, Resources, Research, and Operational Programming. Within each focus area several recommendations have been identified with supportive tasks that may be undertaken by provincial and regional organizations, all levels of government, Aboriginal groups, industry and other key stakeholders. It is anticipated that organizations working on invasive mussels in Western Canada will support the principles of the Framework and further define their actions within annual operating plans.

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1. INTRODUCTION

As the threat of Dreissenid mussel introduction continues to grow, so does the importance of preventative action throughout Western Canada. The spread of zebra (*Dreissena polymorpha*) and quagga mussels (*Dreissena rostriformis bugensis*) across North America, including the zebra mussel infestation of Lake Winnipeg in recent years, has highlighted the species' incredible capacity for invasion and ability to thwart international eradication and containment efforts (Figure 1). Significant risk of invasion has been identified for Dreissenid mussels throughout Western Canada (Figures 2 and 3). Given the long term environmental and economic impacts of invasive mussels, preventing their introduction and establishment is the most cost-effective means to protect Western Canada from the detrimental effects of Dreissenid species.

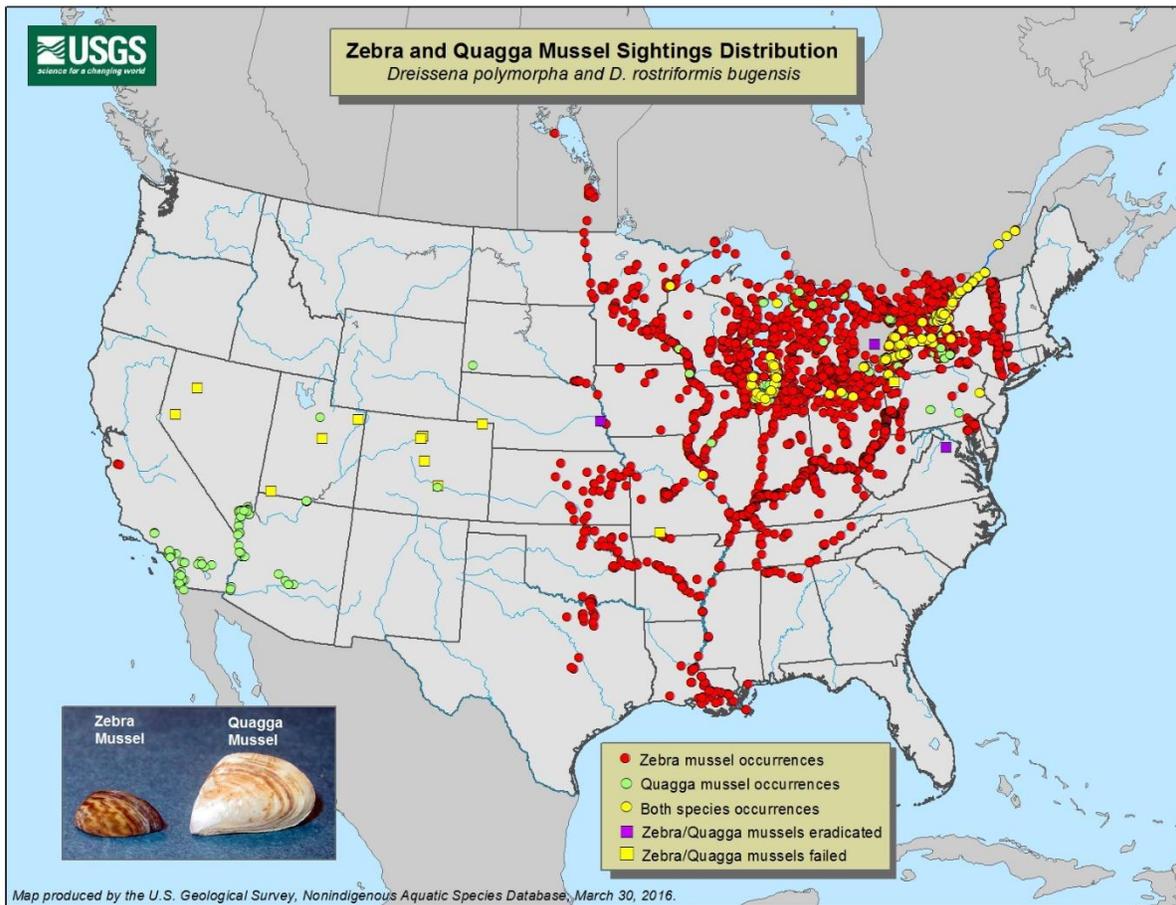


Figure 1. The current distribution of zebra and quagga mussels in North America as of March 30, 2016 (Source: USGS NAS)

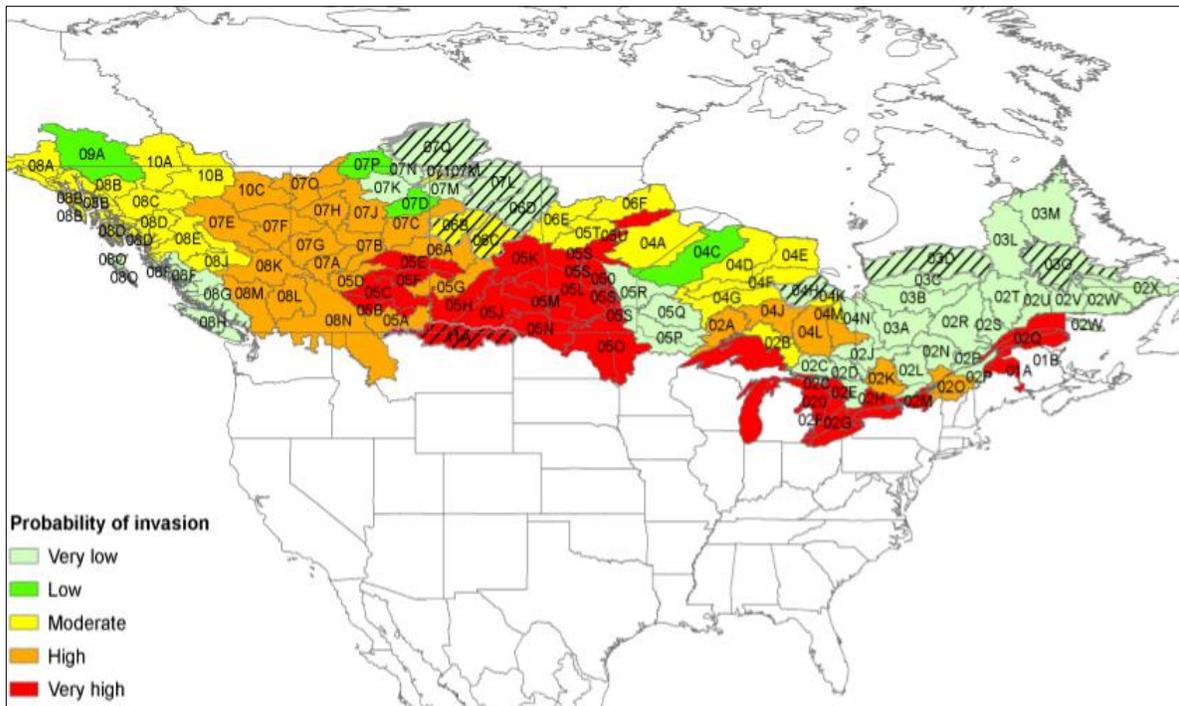


Figure 2. Probability of zebra mussel invasion of Canadian freshwater sub-drainages based on probability of survival and arrival. Hatched watersheds had <5 sampling sites; therefore, a higher level of uncertainty associated with the corresponding invasion probability. (Source: DFO's Risk Assessment for Three Dreissenid Mussels in Canadian Freshwater Ecosystems, 2012)

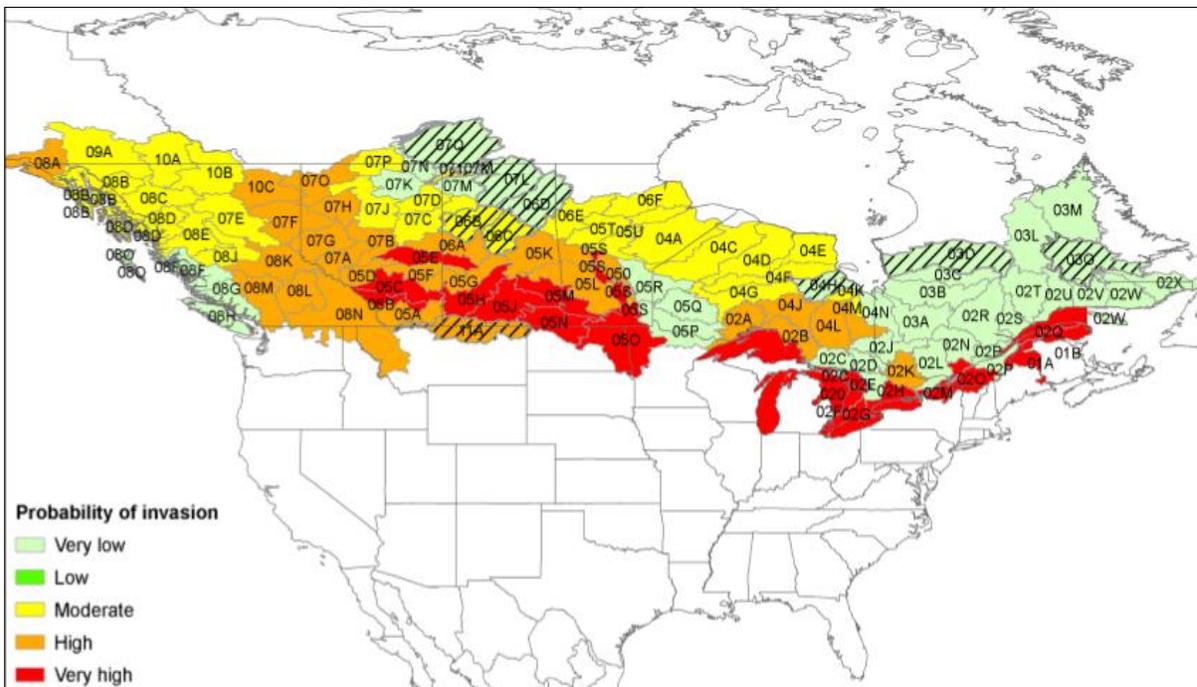


Figure 3. Probability of quagga mussel invasion of Canadian freshwater sub-drainages based on probability of survival and arrival. Hatched watersheds had <5 sampling sites; therefore, a higher level of uncertainty associated with the corresponding invasion probability. (Source: DFO's Risk Assessment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

PURPOSE

This Framework serves to guide a collaborative and proactive approach to coordinated action against the risks of invasive mussels. It compliments existing early detection and rapid response plans throughout Western Canada to promote prevention efforts as a first line of defence. These efforts will require the cooperation of multiple jurisdictions and stakeholders across provincial and national borders.

SCOPE

For the purposes of this Framework, “Western Canada” refers to the provinces of British Columbia, Alberta, Saskatchewan, and Manitoba as well as Yukon Territory and the Northwest Territories. This Framework provides the foundation to develop specific preventative actions against Dreissenid mussels across these areas.

2. ROLES AND RESPONSIBILITIES

To illustrate the context within which this Framework is nested, the following table summarizes key roles in invasive mussel prevention across Western Canada and related responsible participants.

Table 1. Roles of principal agencies and participants in invasive mussel prevention across Western Canada.

Role	Responsible Participants
Regulatory	Federal Government - Fisheries and Oceans Canada (DFO), Canada Border Services Agency (CBSA), Pest Management Regulatory Agency (PMRA), Provincial and Territorial Ministries
Enforcement	Federal Government, Provincial and Territorial Enforcement Agencies
Communication	Federal Government, Provincial and Territorial Ministries, Non-government organizations, Local government, Cross-jurisdictional Advisory Groups, Trans-boundary Agencies (e.g. Pacific NorthWest Economic Region; 100 th Meridian Initiative), Local Stewardship Groups
Funding Support	Federal Government, Provincial and Territorial Ministries, Industry Stakeholders (e.g. Hydropower Companies, Agricultural Irrigation), Non-government Organizations
Monitoring	Provincial and Territorial Ministries, Non-government Organizations, Aboriginal Groups, Municipal Water Supplies, Industry Stakeholders, Local Stewardship Groups
Prevention	All parties , including Vector-related Groups (e.g. commercial boat haulers, boat brokers, marina associations) and General public

3. INVASIVE MUSSEL PREVENTION FRAMEWORK

The following Framework is designed to reflect shared goals and priorities and to facilitate a collaborative and coordinated approach to invasive mussel prevention across Western Canada. The five areas of focus for the Invasive Mussel Prevention Framework are; Communication, Partnerships, Resources, Research, and Operational Programming (Figure 4). Within each focus area, several recommended objectives have been identified with supportive activities that may be undertaken by provincial and regional organizations, all levels of government, Aboriginal groups, industry and other key stakeholders. It is anticipated that organizations working on invasive mussels in Western Canada will support the principles of the Framework and further define their actions within annual operating plans.

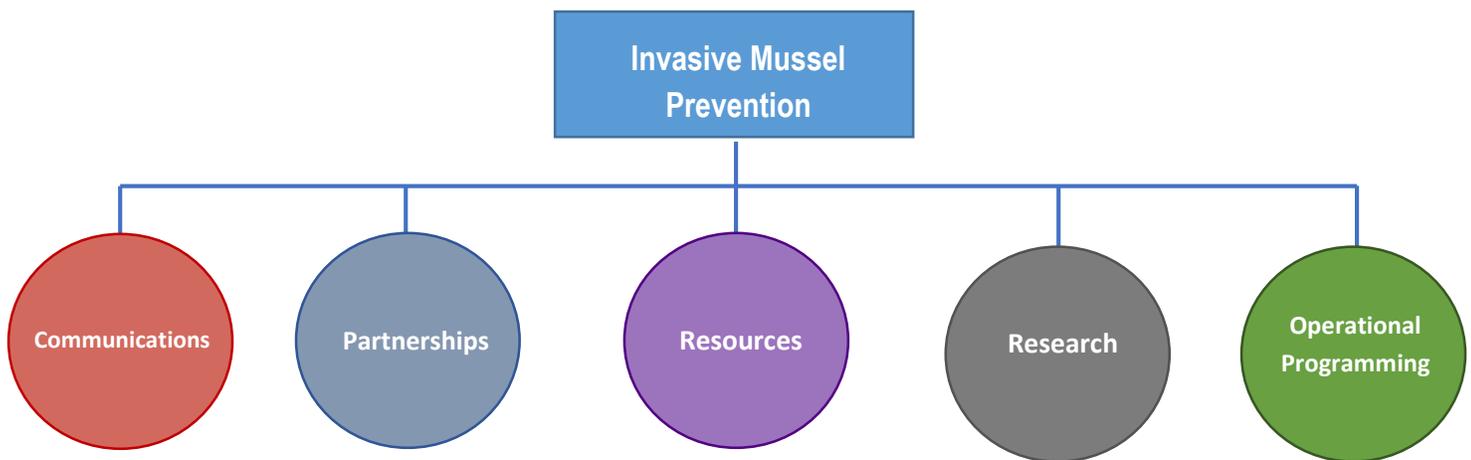


Figure 4. Diagram of the five focus areas of the Invasive Mussel Prevention Framework for Western Canada.

COMMUNICATION

Western Canada

1.1 Ensure consistent sharing of information on threats and impacts of invasive mussels

- Establish regular, updated provincial/territorial status reports on aquatic invasive species, including invasive mussels, across Western Canada
- House invasive mussel outreach info/links on a central website hub (i.e. Canadian Council on Invasive Species). Ensure existing real-time invasive mussel status databases are known to all parties.
- Create an invasive mussel listserv for Western Canada
- Hold quarterly conference calls between Western Canadian provinces/territories and Northwestern United States (U.S.) on invasive mussel prevention that highlight program progress, challenges, and successes. Ensure calls are open to all parties.
- Revisit this Framework annually to check-in with previous year's activities and modify based on any emerging issues

1.2 Increase external communication base to reach more interest groups and foster partnership development while maintaining consistent messaging

- Utilize mass media tools to spread *Clean Drain Dry* and aquatic invasive species (AIS) prevention messaging e.g. television, social media, customs notices
- Encourage the inclusion of AIS information in nationwide pleasure craft operator courses

Provinces and Territories

1.3 Develop AIS communication plans within each province/territory to ensure coordinated and consistent messaging on the threats and impacts of invasive mussels

1.4 Increase external communication base to reach more interest groups and foster partnership development while maintaining consistent messaging

- Ensure AIS information is included in provincial freshwater fishing regulations
- Increase outreach to freshwater stewardship groups e.g. Living Lakes, lake societies
- Increase resources and programs for youth e.g. Scouts Canada and Girl Guides of Canada
- Increase invasive mussel profile at major events e.g. boat shows, rod & gun clubs, Cabella's/Bass Pro

1.5 Develop positive messaging for partnering on mussel prevention

- Develop messaging targeted to potential vector-related partners (e.g. commercial haulers) that focuses on streamlining watercraft inspection processes
- Regularly celebrate program successes

PARTNERSHIPS

Western Canada

2.1 Finalize a formal invasive mussel prevention agreement between governments in Western Canada

- Ensure that all provinces and territories have equal opportunity to engage and participate in development
- Encourage Fisheries and Oceans Canada to take a more active role

2.2 Build connections with 'vector-related' groups across Western Canada and/or the Pacific NorthWest Economic Region to support compliance with CDD message

- Develop effective collaboration with “vector-related” groups e.g. 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
- Encourage all vector-related groups to adhere to 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 5)

2.3 Work with Aboriginal leadership as key partners in preventing the spread of invasive mussels

- Seek input and ensure sharing of prevention resources with key Aboriginal groups across Western Canada

Provinces and Territories

2.4 Build new and strengthen existing connections with prevention partner groups

- Collaborate with existing and new partners e.g., Ducks Unlimited, rod and gun clubs, foreshore residents, non-government organizations, local stewardship groups, College of Applied Biology
- Ensure strong engagement with enforcement agencies e.g. ECMP, CBSA, Fisheries Officers, and provincial enforcement agencies
- Identify existing protocols and/or information currently available to partners
- Develop a standardized invasive mussel information package; Ensure information is publicly available
- Seek input on level of partner involvement in prevention efforts (monitoring, reporting, etc.)

2.5 Ensure strong engagement with local governments

- Strengthen partnerships with Federation of Canadian Municipalities (FCM) and provincial municipal organizations
- Identify tools for local governments and seek input on desired level of involvement

2.6 Increase number of and strengthen existing partnerships with industry partners and associations

- Identify key partners (e.g. hydropower, log transport, pulp mills, irrigation) and seek input on prevention involvement; Emphasis on organizations with infrastructure implications

RESOURCES

Western Canada

3.1 Develop clear financial plan for Western Canada

- Hold meeting between government, industry, Aboriginal groups and non-government organizations to identify shared financial needs for effective multi-jurisdictional prevention program

3.2 Build a coordinated joint request from Western Canada to federal government for increased funding and prevention tools and/or matching of provincial investment

- Consider a similar approach to the northwestern U.S. i.e. \$4 million federal appropriation for ZQM prevention through watercraft inspection
- Ensure request is shared with all prevention partners

3.3 Support development of a Western Canada emergency response fund to ensure sharing of resources in the event of an invasive mussel incursion

- Ensure federal engagement; Consider federal definition of environmental emergencies – expand scope to include invasive mussel incursions
- Develop cross-jurisdictional Memorandums of Understanding such as the Western AIS Agreement currently under development

Provinces and Territories

3.4 Develop clear financial plans with new funding sources and partners within each province/territory to build and expand on current government funding mechanisms

- Hold meeting between government, industry and non-government organizations to identify needs
- Each jurisdiction to establish outline of required funding and draft financial plan for input from other potential partners

3.5 Increase funding from private sector and foundations

- Identify potential sources for funding
- Support coordinated messaging for funding proposals and identify collaborative funding opportunities

3.6 Establish emergency resource plans within each province which identify easily accessible funding and response tools

- Hold shared rapid response exercises across governments and industries to test early detection rapid response plans.

RESEARCH

4.1 Develop joint research priority plan for Western Canada and within each province

- Consider support for increased research efforts in the following areas:
 - Treatment methods for ZQM eradication e.g. potash, ZEQUANOX®
 - Impacts of invasive mussels on fish and species at risk
 - Impacts of salinity on invasive mussels
 - Upstream impacts of invasive mussels from ports and ballast water

OPERATIONAL PROGRAMMING

Western Canada

5.1 Ensure a coordinated, collaborative approach to watercraft inspections across Western Canada and Northwest United States

- Support international joint prevention protocols that ensure a coordinated perimeter defence strategy
- Support recognition of Idaho's "passport" system to increase inspection efficiency

- Consider watercraft inspection certification system to minimize impact on commercial haulers and expedite inspection process
- Provincial/territorial governments to review cross-jurisdictional methods and training materials
- Send inspection crew leads to attend each province/territory's training workshops

5.2 Ensure federal approval (permitting and labeling) of invasive mussel pesticide tools for use in open water

- Promote business opportunities within the private sector to generate new registrants
- Ensure emergency registration of tools by Pest Management Regulatory Agency (PMRA)

Provinces and Territories

5.3 Develop a consistent and coordinated approach to mussel veliger monitoring within each province/territory that is accessible to both government and non-government organizations

- Establish consistent monitoring protocols for sample collection and analysis; Ensure information is accessible to the public and interested partner organizations
- Expand industry monitoring to include aquatic invasive species and develop a standardized training program for participating agencies
- Establish coordinated monitoring systems for specific water bodies; Identify lead monitoring agencies and roles and responsibilities of all partners involved
- Identify available funding for sample analysis

5.4 Establish and strengthen existing EDRR plans in each province/territory with identified legislative tools available for immediate response

- Each province/territory to ensure sharing of best practices and EDRR principles with neighbouring jurisdictions
- Incorporate the [incident command system \(ICS\)](#) into emergency response plans and ensure the establishment of emergency response leads with permission to contain and eradicate invasive mussel incursions

APPENDIX 1 – 2016 WESTERN CANADA INVASIVE MUSSEL ACTION PLAN

Theme	Action	Lead/Key Partners
Communication	Create invasive mussel listserv for Western Canada	ISCBC/CCIS
	Create central invasive mussel internet hub that links to real-time invasive mussel status databases	ISCBC/CCIS
	Create video that provides call to action for use by all partners	ISCBC
	Produce regular, updated aquatic invasive species status reports that include invasive mussels	
	Communicate with and seek input on Framework from Saskatchewan, Manitoba, Yukon Territory and Northwest Territories	AB Gov't, BC MoE, PNWER, ISCBC
	PNWER to bring draft Western Canada Invasive Mussel Prevention Framework to July meeting in Alberta for feedback	PNWER
	Invasive Mussel Leadership Forum presentations to be provided to key partner groups e.g. senior ministers, FCM, senior boards of industry	PNWER & ISCBC
	Hold quarterly invasive mussel conference calls that are open to all parties	
	Encourage inclusion of AIS information in PCOC courses	ISCBC, Prov./Terr. Gov'ts, CCIS
	Develop formal invasive mussel agreement between governments in Western Canada	Prov. and Terr. Gov'ts
Partnerships	Encourage all western provinces and territories to adhere to standardized inspection/decontamination protocols such as the <i>Uniform Minimum Protocols and Standards for Watercraft Interception Programs for Dreissenid Mussels</i> , the standard protocol used across the Northwestern U.S.	BC and AB to lead; seek input from other provinces/territories
	Seek input from Aboriginal leadership on invasive mussel prevention	
	Develop clear financial plan for Western Canada and coordinate a joint request to federal government for increased funding and prevention tools	PNWER (lead), ISCBC, Prov./Terr. Gov'ts
Finances	Encourage consideration of a Western Canada emergency response fund	
Research	Identify priority research needs	
	Ensure federal approval of necessary pesticide tools	BC and AB to lead
Operational Programming	Finalize international joint prevention protocols that support a unified and coordinated perimeter defence strategy	PNWER, US Border Services, CBSA, Prov. Gov'ts
	Ensure consistent monitoring protocols across Western Canada	Prov./Terr. Gov'ts

APPENDIX 2 - PACIFIC NORTHWEST REGIONAL DREISSENID DEFENCE REPORT

The “Advancing a Regional Defense Against Dreissenids in the Pacific Northwest” report is available for download from the Pacific NorthWest Economic Region (PNWER) website:

http://www.pnwer.org/uploads/2/3/2/9/23295822/advancing_a_regional_defense_against_dreissenids_in_the_pacific_northwestfinal.pdf

APPENDIX 3 – PROVINCIAL EDRR PLANS AND AIS SURVEY PROTOCOLS

British Columbia

British Columbia’s Zebra and Quagga Mussel EDRR Plan, general Invasive Species EDRR Plan, and Aquatic Invasive Species Survey Methods are available for download from the Inter-Ministry Invasive Species Working Group (IMISWG) website:

<https://www.for.gov.bc.ca/hra/invasive-species/edrr.htm>

Alberta

Manitoba

Saskatchewan

Yukon Territory

Northwest Territories

APPENDIX 4 - DFO AIS EDRR PLAN

The Fisheries and Oceans Canada AIS EDRR Plan and “Risk Assessment for Three Dreissenid Mussels (*Dreissena polymorpha*, *Dreissena rostriformis bugensis*, and *Mytilopsis leucophaeata*) in Canadian Freshwater Ecosystems” are available for download respectively from the DFO website:

http://www.dfo-mpo.gc.ca/csas-sccs/Publications/ResDocs-DocRech/2010/2010_114-eng.html

http://www.dfo-mpo.gc.ca/csas-sccs/Publications/ResDocs-DocRech/2012/2012_174-eng.html

APPENDIX 5: WESTERN UNITED STATES STANDARD WATERCRAFT INSPECTION/DECONTAMINATION PROTOCOLS

The “Uniform Minimum Protocols and Standards for Watercraft Inspection and Decontamination Programs for Dreissenid Mussels in the Western United States (UMPS III)” is available for download from the Pacific States Marine Fisheries Commission website:

<http://www.westernais.org/media/umps-reportv3.pdf>