



MISSOURI RIVER BASIN

Invasive Mussels



EDRR Pilot Project | Contractor's Report
December 2018

Note from the Executive Director

The 2016-2018 *National Invasive Species Council (NISC) Management Plan*¹ called for the Council to “promote pilot projects across a variety of U.S. ecosystems that explore innovative, multi-stakeholder approaches to the early detection of and rapid response to invasive species.” This Contractor’s Report is the output of one of three pilot projects responding to priority action 2.5.4.

Thematically, this project focuses on the institutionalization of incident response measures in the invasive species context. Specifically, it provides an overview and evaluation of the multi-stakeholder initiative established in response to the first detection of invasive Dreissenid mussels in Montana. We believe the lessons learned in Montana will be of value to other states, at a regional scale, and across taxonomic groups.

In response to NISC Management Plan priority action 2.3, we also contracted our Montana colleagues to conduct a cost-benefit analysis of their response to the invasive mussels in order to assess the potential return on investment, as well as the cost of “no action” had they failed to respond.

Questions regarding the excellent work described herein should be directed to the report authors. We are grateful for their contributions. The NISC Secretariat welcomes your input on the report’s applications and lessons learned in other incident response contexts: invasive_species@ios.doi.gov.

Protecting what matters...together, we can do this!

Sincerely,

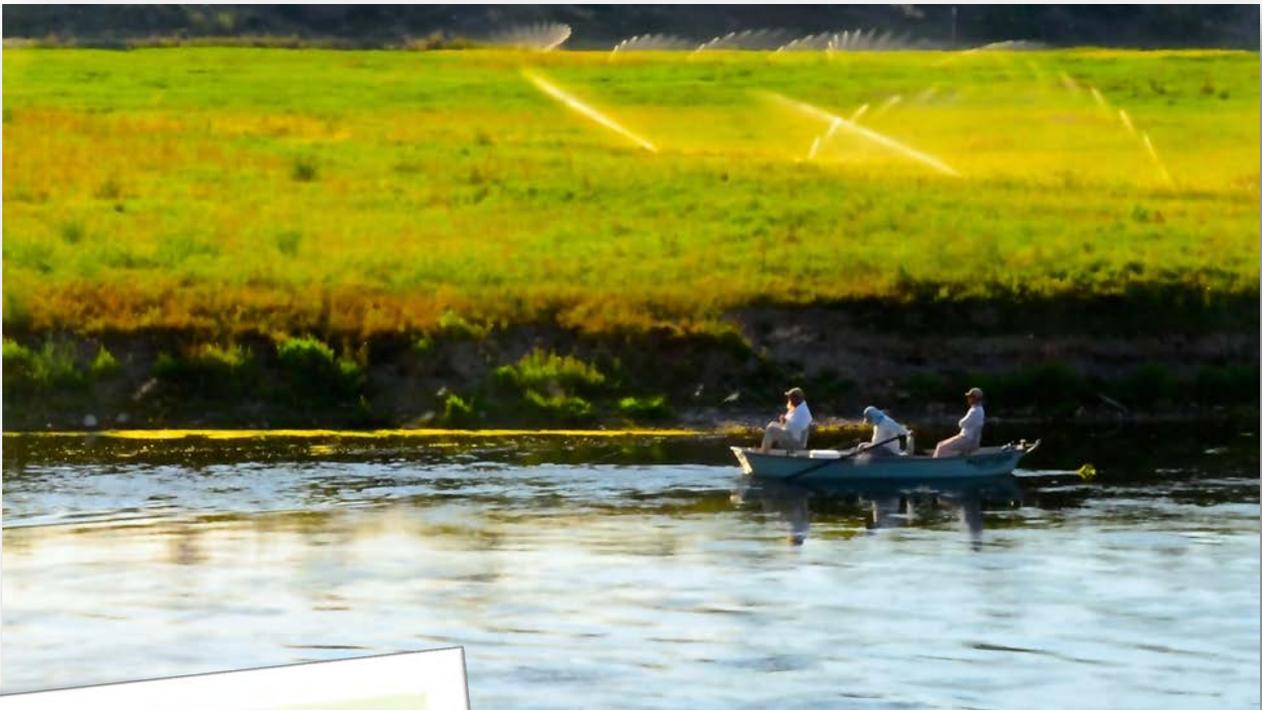


Jamie K. Reaser, PhD
Executive Director
National Invasive Species Council

¹ <https://www.doi.gov/invasivespecies/management-plan-and-executive-order>

MISSOURI RIVER BASIN INVASIVE MUSSEL PILOT

Project Deliverables



**Funded by the National Invasive
Species Council**

April 2017-September 2018

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DEPARTMENT OF NATURAL RESOURCES
AND CONSERVATION

Conservation and Resource Development Division



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September 25, 2018

Jamie Reaser
National Invasive Species Council
1849 C Street NW
Washington, DC 20240

Dear Ms. Reaser:

On behalf of the Montana Invasive Species Council, I am pleased to submit the enclosed deliverables to conclude the Missouri River Basin Pilot Project. We've also included some supplementary materials that demonstrate the successes and outcomes of the project, as well as the enhanced coordination between governmental and non-governmental organizations in Montana's fight against invasive mussels.

The EDRR project partners convened August 28, 2018, to participate in a preparedness exercise and to evaluate the past season watercraft inspection season. At that meeting, partners committed to institutionalizing the work of the project by carrying this work forward. Our next meeting will be scheduled for the fall, where we will focus on preparation for 2019.

The team considers the deliverables of the project living documents, and we plan to continually evaluate and update them as necessary. Also, the partnership agreement is still making the rounds for signatures. We will send you a fully executed agreement once it's available.

We sincerely appreciate the support of NISC, which was able to advance our coordination efforts in central and eastern Montana. Pleased don't hesitate to call me with any questions or concerns.

Best,

A handwritten signature in blue ink, appearing to read "Bryce Christiaens".

Bryce Christiaens, Chair
Montana Invasive Species Council

Montana Invasive Mussel Coordination

Strategic Plan for Early Detection Rapid Response (EDRR) Project Partners for the Missouri River Basin

Interagency partners in both early detection and rapid response in Montana include Federal, State, Tribal, Provincial, and local partners. These EDRR Partners will participate jointly and integrate their authorities and resources using Incident Command System (ICS) during dreissenid mussel detections in waterbodies with overlapping management jurisdictions. This approach of treating new detections as emergencies (with specific authorities and direction provided by agency directors and the Governor’s Office) is anticipated to bring local, state, and regional partners together with little to no advance planning.

When possible, including federal, state, regional, and local partners in advance by assisting in the development of a database of resources, infrastructure and assets; establishing and exercising lines of communication; building partnerships across shared resources and interests; and developing training opportunities to build shared rapid response skills will reduce friction in establishing future rapid response actions. This partnership will also help decrease the unknowns and response time associated with new detections. The National Invasive Species Council’s 2016 document “A National Framework for Early Detection and Rapid Response” provides suggestions for planning to include partners in this effort and the following planning actions and contacts for Montana are in alignment with the national framework.

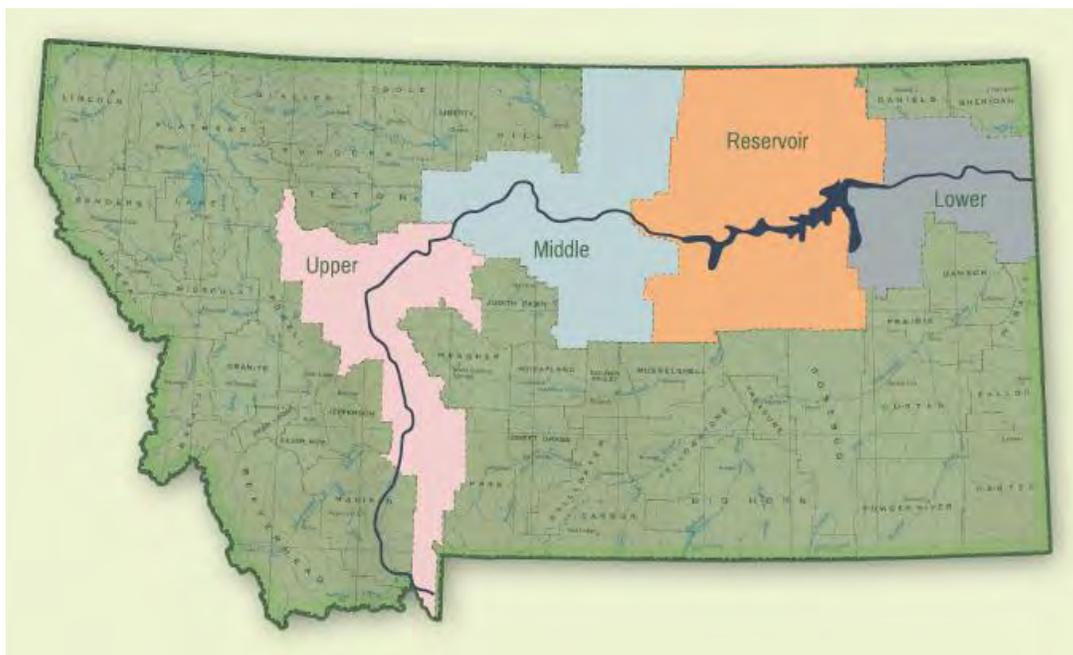


Figure 1 Missouri River Corridor in Montana

Coordination planning:

To prepare for the use of ICS in a response, the following actions will be taken to improve readiness:

- Establish lines of communication with statewide agency representatives of partners listed in this section.
- Invite and include partners in annual invasive species stakeholder events or meetings.
- Include communication with regional partners and stakeholders in the communications duties of the Montana Invasive Species Counsel (MISC) Outreach position and include updates from regional partners in MISC communications.
- Create regional, multi-agency training opportunities to practice ICS skills and reach out to local partners.
- Plan table-top and field exercises based on existing invasive species response plans and relevant local management plans that include all likely response partners including local and non-governmental participants.
- Assist with the potential development of a map-based geographic response plan to augment the statewide Mussel Rapid Response guidelines. Local partners can assist with gathering information such as property ownership, access points, infrastructure, diversions and water users. Together we can ensure the most up to date information is included in response planning.

Coordinating bodies:

MONTANA FISH, WILDLIFE & PARKS (FWP)

Montana Fish, Wildlife & Parks is the state lead for AIS. FWP's program includes: collaboration and coordination with agency partners and state and regional stakeholder groups; operation of the statewide watercraft inspection station program; providing AIS training to interested groups; conducting multi-taxa AIS surveys at hundreds of sites across the state; operation of the Montana AIS Lab; and related education & outreach.

FWP has drafted guidelines for responding to a new invasive mussel detection. The guidelines are intended to direct the process, protocols, and coordinated effort the State of Montana will employ to respond to new dreissenid mussel detections. This plan was built from direct experience and the lessons learned during Montana's first dreissenid mussel detection in 2016. It is intended to ensure an orderly, efficient, and effective response.

MONTANA INVSIVE SPECIES COUNCIL (MISC)

The Montana Invasive Species Council is a statewide partnership working to protect Montana's economy, natural resources, and public health through a coordinated approach to combat invasive species.

For the past two years, the Montana Invasive Species Council (MISC) has been working on a strategy to improve invasive species management in the state. The result of that work is the *Montana Invasive Species Strategic Framework*, which offers more than 90 coordinated actions to better protect Montana lands, waters, and public health from invasive species. The framework served as the basis for Montana's long-term plan to address invasive mussels after they were detected in two waterways last year.

MISC was renewed by the 2017 Legislature and is charged with advising the governor on a science-based, comprehensive program to identify, prevent, eliminate, reduce and mitigate the impacts of invasive species in Montana and to coordinate with public and private partners to develop and implement statewide invasive species strategic plans.

MISC members will participate in the pilot project.

UPPER COLUMBIA CONSERVATION COMMISSION (UC3)

In response to the invasive mussel detections in two Montana waterways last year, the 2017 Legislature established the Upper Columbia Conservation Commission (UC3) to enhance early detection and rapid response efforts through increased coordination with water management agencies within the Columbia River Basin in Montana, as well as provincial and state partners in the basin.

The purpose of the UC3 is to protect the aquatic environment in tributaries to the Columbia River from the threat of invasive species. Through cooperative efforts, the UC3 is tasked with creating an EDRR plan for the Upper Columbia River Basin, in addition to monitoring and education strategies. This work will be coordinated with the Missouri River EDRR pilot to ensure statewide consistency, the leveraging of resources, and to share information and best management practices.

CENTRAL AND EASTERN MONTANA MUSSEL RESPONSE TEAM (CEMMRT)

The Central and Eastern Montana Mussel Response Team formed in response to Montana's invasive mussel detections. These stakeholders include: county commissioners, town councils, conservation districts, water user associations, irrigation districts, watershed groups and concerned citizens.

On March 8, 2017, the CEMMRT met with FWP to voice concerns over how invasive mussels might affect the Missouri River Basin region and what preventative measures can be taken to contain their spread. FWP is the lead agency for managing AIS in Montana. In response to this concern FWP expressed the desire to work with stakeholders in Eastern Montana to identify and prioritize regional needs.

Subsequently, watershed and conservation district council coordinators for the Missouri, Musselshell, Milk, Yellowstone, and Big Horn Rivers coordinated efforts to establish local stakeholders for their area and solicit stakeholder input for regional needs.

The Central and Eastern Montana Mussel Response effort is coordinated by the watershed and conservation district groups serving Central and Eastern Montana. In the case of counties that lie outside the watershed group areas, efforts are being made to coordinate communication about invasive mussel response. Watershed groups have willingly taken on the role of coordination for this group because they already work with nearly every entity involved in water resource management within the basin. This group has local contacts and can work efficiently to provide education and outreach to local stakeholder groups and provide a communication link between the State of Montana and concerned stakeholders across Central and Eastern Montana.

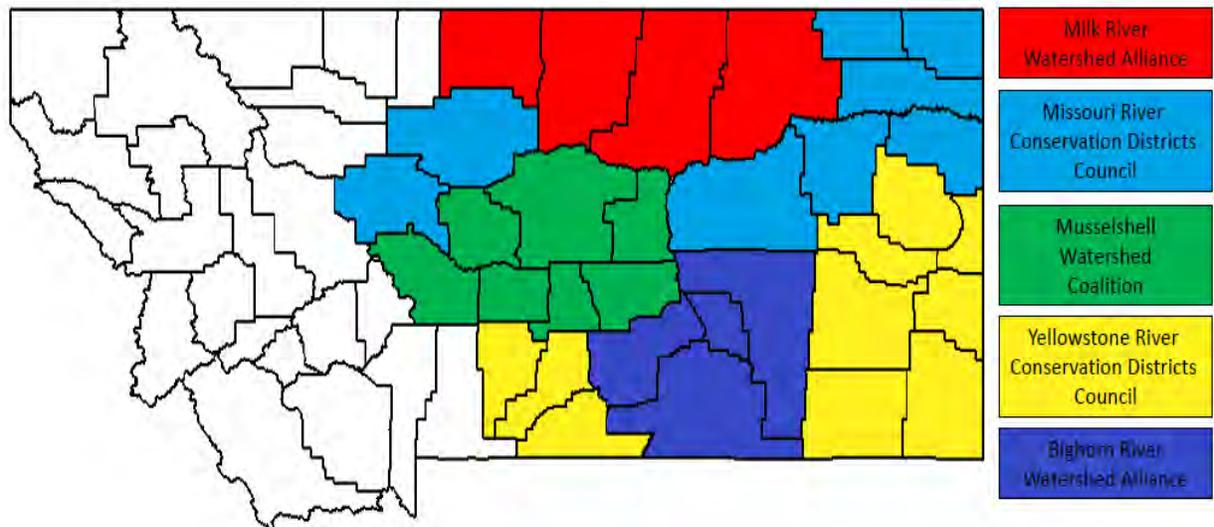


Figure 2 Organizational Structure of the CEMMRT

Musselshell Watershed Coalition (MWC) – The MWC is comprised of water-user groups, conservation districts, landowners, counties and towns, and state and federal agencies across Musselshell, Golden Valley, Wheatland, Garfield, and Petroleum Counties. The Coalition focuses on water quantity, quality, and also provides planning and outreach to the diverse entities involved.

Missouri River Conservation Districts Council (MRCDC) – The Missouri River Conservation Districts Council (MRCDC) is comprised of the 15 Conservation Districts that border or contain the mainstem of the Missouri River. The MRCDC’s purpose is to provide leadership, assistance, and guidance to conservation districts along the Missouri River Corridor and present a unified front and collective voice when addressing natural resource issues, opportunities, and challenges.

Yellowstone River Conservation Districts Council (YRDCD) - The YRDCD is made up of representatives from eleven conservation districts bordering the main stem of the Yellowstone River. The YRDCD’s purpose is to provide local leadership, assistance, and guidance for the wise use and conservation of the Yellowstone River’s natural resources.

Big Horn River Alliance – The Bighorn River Alliance (BHRA) works to preserve, protect and enhance the wild trout fisheries of the Bighorn River. Through collaborative relationships with fly-fisherman, state/federal agencies, water users and area tribes, the BHRA monitors Bighorn River health concerns and the recreational fishery.

Milk River Watershed Alliance - The Milk River Watershed Alliance is a locally led organization working together to preserve, protect and enhance natural resources within the Milk River Watershed, while maintaining the quality of life.

MONTANA TRIBAL GOVERNMENT

Membership on the Montana Invasive Species Council includes representatives from Montana tribal nations including the Blackfeet Tribe, Chippewa Cree Tribe of the Rocky Boy's Reservation, Confederated Salish & Kootenai Tribes, Crow Tribe, Fort Belknap Tribes, and Fort Peck Tribes.

MISC tribal members will participate in the pilot (see page 9 for contacts).

CASCADE CONSERVATION DISTRICT AND CITY OF GREAT FALLS

Cascade Conservation District and the City of Great Falls has taken an active role in AIS prevention, early detection, and rapid response and has increased activities since Montana's invasive mussel detections. The CD partnered with the City to host an Aquatic Invasive Species Readiness Summit in April 2017. The two entities have also been coordinating with the State on education and outreach to local communities and water users.

The City of Great Falls is particularly vulnerable and concerned about the potential economic impact to the city's public infrastructure. The Missouri River runs through Great Falls and has many access points.

Many Great Falls recreationalists play on the River in the evenings after work and then travel to Tiber Dam Reservoir (Lake Elwell) or Canyon Ferry on the weekends and then back again. On this stretch of the river there is 5 dams, municipal water systems, a refinery, irrigation diversions, head gates and canals, as well as 7+ public launch sites and numerous private launch sites to protect.

Project Activities

The rapid response partners have agreed to work with MISC and FWP on the Missouri River EDRR pilot project to prevent the spread of invasive mussels. This Missouri River EDRR project team will work collaboratively with the state to:

- 1) Convene a workshop with project partners to discuss, update, and finalize this Coordinated EDRR Invasive Mussel Plan for the Missouri River Basin. Workshop outcomes will provide

input into a watershed-specific version of the Montana Dreissenid Response Plan. The EDRR project team will invite a diverse group of stakeholders and share the plan and gain input and buy-in for basin-specific augmentations to the plan. The team is currently exploring production of an electronic geographic response plan to accompany the statewide Rapid Response Guideline and provide on the ground information for a rapid response in the event of a detection of AIS.

- 2) Produce a publically available White Paper on lessons learned from the pilot project.
 - a. Incorporate information from post-season reviews. (Being held October-January)
 - b. Incorporate response after action review information.
- 3) Provide education and outreach to water users in the Missouri River Basin through mailings, tabling at events, speaking at events and conferences, and tailor messaging and outreach to specific audiences that would be impacted by a mussel infestation in the basin, e.g. irrigators, farmers, municipalities. .
- 4) Host an invasive-mussel EDRR summit in early 2018 for central eastern Montana stakeholders, e.g. irrigators, watershed groups, etc.
- 5) Contract with the University of Montana to produce a cost-benefit analysis and economic impact report for the Missouri River Basin.

Missouri River EDRR project steering committee

Missouri River Conservation Districts Council

Rachel Frost, Coordinator
406-454-0056
mrcdc@macdnet.org

Musselshell Watershed Coalition

Laura Nowlin, Coordinator
406-429-4832
musselshellwc@gmail.com

Lower Musselshell Conservation District

Steve Tyrrel, Supervisor
406-855-7600
tyrrel@midrivers.com

Cascade Conservation District

Tenlee Atchison, Administrator
406-727-3603 x 111

tatchison@3rivers.net

Montana Fish, Wildlife & Parks

Tom Woolf, AIS Bureau Chief
406-444-1230
Thomas.woolf@mt.gov

Montana Invasive Species Council

Stephanie Hester
Dept. of Natural Resources & Conservation
406-444-0547
shester@mt.gov

Upper Columbia Conservation Commission

Kate Wilson
Dept. of Natural Resources & Conservation
406-444-2951
kate.wilson@mt.gov

Key Issues for Central and Eastern Montana:

Central and Eastern Montana is home to wide-open spaces and few people. Agriculture is the largest industry. Areas surrounding Fort Peck Lake and Big Horn Lake also have a large amount of recreation. These two industries would be significantly impacted by an invasive mussel infestation.

Potential impacts to agriculture, and specifically, irrigation, is the most prevalent concern. Additionally, many of the small towns and cities in Central and Eastern Montana already struggle to keep water systems operating. Aging infrastructure and declining populations in many areas intensify the many issues surrounding water systems and an invasive mussel infestation could significantly impact many small towns. Similarly, several Eastern Montana communities are working on rural water systems to provide clean and reliable water to their members. If an invasive mussel infestation took hold in these systems, they would no longer be viable.

Potential impacts to the recreation industry are also of high concern. Related to both agriculture and recreation are the private enterprises that supply these industries.

Key Stakeholder Groups for the Missouri River Basin:

The following is a master list of types of stakeholders that should be educated about invasive mussels and part of the effort to prevent their spread. This list was compiled by central and eastern Montana watershed group and conservation district partners.

Local Governments

City Governments
Conservation Districts
County Commissioners
Montana League of Cities and Towns
Montana Association of Counties

Agriculture/Rural Water

Montana Association of Ditches and Canals
Montana Water Resources Association
Montana Stockgrowers' Association
Montana Farm Bureau Federation
Montana Farmers Union
Irrigation Companies
Irrigators
Local Stockgrowers' Associations

Montana Section of American Water Works Association

Federal Government

Forest Service
Army Corps of Engineers
Bureau of Land Management
Bureau of Reclamation
National Park Service US
Fish and Wildlife Service
Natural Resources and Conservation Service

State Government

MSU Extension Office
State Parks Staff
Department of Environmental Quality

Tribal Governments

Crow
Northern Cheyenne
Fort Peck Tribes
Fort Belknap Tribes
Rocky's Boy Tribes

Recreation

Fishing and Hunting Organizations
Marina Operators
Recreationists
State Park Concessionaires
Montana Outfitters and Guides
Association

Local Business Owners
Trout Unlimited
Walleyes Unlimited
Montana Pike Masters

Private Landowners

Cabin Owners Associations on
Reservoirs

Other

Non-Government Organizations
Watershed Groups
Engineers
Contractor

Partners in rapid response:

FEDERAL AGENCIES

Federal agencies have a number of key roles in EDRR including responsibilities for managing Federal lands and waters, enforcing Federal laws, exercising regulatory authorities, and providing technical expertise in management, research, and information systems. The Federal government manages approximately 635 million acres in the United States, the majority of which are administered by the Bureau of Land Management, U.S. Fish and Wildlife Service (USFWS), National Park Service (NPS), U.S. Forest Service (USFS), and Department of Defense (CRS 2012). The NOAA is responsible for marine sanctuaries. The U.S. Coast Guard enforces laws protecting waters from non-native species. The Bureau of Indian Affairs (BIA) plays an important role as trustee and advisor for tribally owned lands.

Some relevant Federal regulatory authorities include the ability to prohibit the import into the United States and the interstate transport of listed invasive injurious species, approve specific pesticides and their applications, engage in emergency response actions, and manage risks associated with certain major pathways of invasive species introduction. Many Federal agencies are active in the development and application of tools for invasive species assessment, detection, reporting, species monitoring and surveillance, management, and identification. Such agencies are a key resource for the collection of data regarding invasive species ecology, impacts, and geographic distribution.

The National Invasive Species Council will establish the Early Detection and Rapid Response Task Force as a standing body to facilitate nationwide coordination among Federal agencies and non-Federal partners. Engaging this Taskforce to assist in coordination and planning should be coordinated through the Council staff. Local Federal contacts listed below should be included in response communications directly unless an alternative contact via the task force is established.

National Invasive Species Council	Jamie K. Reaser , Executive Director of the Council, jamie_reaser@ios.doi.gov , (202) 208-3100
Bureau of Land Management	Floyd Thompson , Montana State Office, Rangeland Management Specialist and Invasive Species Coordinator, fmthomps@blm.gov , (406) 896-5025
USDA Animal, Plant Health Inspection Service	Gary Adams , State Plant Health Director, Gary.D.Adams@aphis.usda.gov , (406) 657-6282
US Bureau of Reclamation	Jeffrey Baumberger , Resource Management Division Manager, jbaumberger@usbr.gov , (406)247-7314
Natural Resources Conservation Service	Monica Pokorny , Plant Materials Specialist, monica.pokorny@mt.usda.gov , (406) 587-6708
US Fish and Wildlife Service	Lindy Garner , Invasive Species Strike Team, Regional Invasive Species Coordinator, Lindy_Garner@fws.gov , (406) 727-7400, ext. 213
US Army Corps of Engineers	Patricia Gilbert , Fort Peck Project, Natural Resource Specialist, patricia.l.gilbert@usace.army.mil , (406) 526-3411, ext. 4278
US National Park Service	Steve Bekedam , Northern Rocky Mountains Exotic Plant Management Team, Program Liaison, steven_bekedam@pns.gov , (307) 344-2185

TRIBAL CONTACTS:

The Montana **Governor’s Office of Indian Affairs** maintains contact information for the 7 Indian reservations and the state-recognized Little Shell Tribe of Chippewa Indians.

Blackfeet Nation	Dona Rutherford (406) 338-7521 donar@blackfeetnation.com
Chippewa Cree Tribe	Daryl Wight II (406) 395-5705
Crow Tribe of Indians	Gail Whiteman gailwm@gmail.com (406) 638-3708
Confederated Salish & Kootenai Tribes	Dennis Clairmont dennis.clairmont@cskt.org (406) 675-2700
Fort Belknap Assiniboine & Gros Ventre Tribes	Dennis Longknife dclongknife@gmail.com (406) 353-2205

Fort Peck Assiniboine & Sioux Tribes	Laurie Shafer laurieshafer@nemont.net (406) 768-2300
Little Shell Chippewa Tribe	(406) 315-2400
Northern Cheyenne Tribe	(406) 477-6284

STATE AGENCIES:

A full list of individual contacts for dreissenid mussel notification are included in Appendix C of the Montana Dreissenid Rapid Response Plan. The following agencies have been identified as high priority contacts.

- Montana Governor’s Office
- Montana Fish Wildlife and Parks
- Montana Department of Natural Resources & Conservation
- Montana Invasive Species Council (MISC)
- Columbia River Basin (CRB) Team
- Upper Columbia Conservation Commission (UC3)
- Missouri River Basin groups
- Montana Department of Agriculture

LOCAL AGENCIES:

Directory of county offices: The **Montana Association of Counties** includes a map of Montana counties with a link from the map to information on elected officials, county seat, and other relevant information. The **Montana Association of Conservation Districts** provides contacts with landowners through their soil, water, and natural resource conservation work through 58 conservation districts in all counties and over 70 municipalities. The Conservation Districts are also implement the Streambed and Land Preservation Act or the 310 law that requires a permit from the local Conservation District before work can be done in Montana’s waterways.

Montana Association of Counties	(406) 449-4360
Montana Association of Conservation Districts	(406) 443-5711

Directory of Municipalities: The **Montana League of Cities and Towns** maintains contact information for 129 Montana municipalities. While most local municipal offices will be readily identified by local staff, all those within the economic interest area of a waterbody should be considered.

Montana League of Cities and Towns	(406) 442-8768
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NEIGHBORING STATES:

Idaho	[Update]
Wyoming	Beth Bear , Aquatic Invasive Species Coordinator, Wyoming Game & Fish Department, beth.bear@wyo.gov , 307-745-5180 Ext. 256
North Dakota	Jessica Howell , Aquatic Nuisance Species Coordinator, North Dakota Game & Fish Department, jmhowell@nd.gov , 701-368-8368
South Dakota	Mike Smith , Aquatic Invasive Species Statewide Coordinator, South Dakota Department of Game, Fish & Parks, mikejo.smith@state.sd.us , 605-223-7706
Idaho	Nic Zurfluh , Idaho State Department of Agriculture, (208) 332-8686, Nicholas.zurfluh@isda.idaho.gov
Washington	Allen Pleus , Washington Invasive Species Coordinator, Washington Department of Fish & Wildlife, (360) 902-2724, allen.pleus@dfw.wa.gov Eric Anderson (enforcement) , Washington Department of Fish & Wildlife, (360) 640-0493, Eric.Anderson@dfw.wa.gov
Oregon	Rick Boatner , AIS Coordinator, Oregon Dept. Fish & Wildlife, (503) 947-6308, Rick.J.Boatner@state.or.us

CANADIAN PROVINCES:

Saskatchewan	Ron Hlasny , Aquatic Invasive Species Ecologist, Ministry of Environment, (306) 953-2502, Ron.Hlasny@gov.sk.ca
Alberta	Tanya Rushcall (acting) , Aquatic Invasive Species Program Coordinator, Alberta Environment & Sustainable Resource Development, (780) 644-4647, Tanya.Rushcall@gov.ab.ca
British Columbia	Martina Beck , Invasive Mussel Program Coordinator, Conservation Science Section, (778) 698-4364, Martina.Beck@gov.bc.ca

REGIONAL PARTNERS

100th Meridian Initiative (CRB Team)	Stephen Phillips , Senior Program Manager, Pacific States Marine Fisheries Commission, (503) 595-3100, sphillips@psmfc.org
Pacific NorthWest Economic Region (PNWER)	Matt Morrison , The Invasive Species Working Group, (206) 443-7723, matt.morrison@pnwer.org
Regional Invasive Species Councils	Alberta-Delinda Ryerson info@abinvasives.ca
	British Columbia- Gail Wallen gwallin@bcinvasives.ca
	Idaho-Nick Zurfluh Nicholas.zurfluh@isda.idaho.gov
	Oregon-Jalene Littlejohn, j.littlejohn@samarapdx.com
	Saskatchewan- invasives@npss.sk.ca
	Washington-Justin Bush j.littlejohn@samarapdx.com

TECHNICAL PARTNERS

Technical advisors will vary by location. The following groups were identified during the fall 2016 mussel responses are intended to provide an example of the scope and type of partners to include in response planning and operations.

Montana Invasive Species Council, Science Advisory Panel	Stephanie Hester , Council Coordinator, DNRC, shester@mt.gov , (406) 444-0547
Montana Natural Heritage Program	Bryce Maxell , Montana Natural Resource Information System (406) 444-3989 bmaxell@mt.gov
Indian National Conservation Alliance	Dick Gooby , (406) 684-5199
Northwestern Energy	Andy Welch , (406) 565-7549, Andrew.welch@northwestern.org
Whitefish Lake Institute	Mike Koopal , (406) 212-0065, mike@whitefishlake.org
Flathead Biological Station	Phil Matson , (406) 249-2529, phil.matson@flbs.umt.edu
MT Assoc. of Dam and Canal Systems	Vernon Stokes , (406) 279-3315
Montana Water Resource Association	Michael Murphy , (406) 235-4555
Montana Watershed Coordination Council	Erin Farris-Olsen , Executive Director, erin@mtwatersheds.org , (406) 475-1420

PROTOCOL FOR NON-GOVERNMENTAL PARTNERS

When regional or statewide partnerships are already working together under cooperative agreements or Memoranda of Understanding those contacted to participate in a response or who volunteer their resources or services should be asked if they are currently parties to an existing agreement that would determine the terms and responsibilities for participation in a response. If there is no existing agreement, a working agreement appropriate to the scope of the partnership should be drafted to clearly define the terms, especially if financial considerations are anticipated.

January 29, 2018
Eagles Club
Lewistown,
Montana



Missouri River Invasive Mussel Coordination Workshop

***WORKSHOP CO-HOSTED BY:
THE CENTRAL & EASTERN MONTANA MUSSEL RESPONSE TEAM
AND
THE MONTANA INVASIVE SPECIES COUNCIL***

REPORT PROVIDED BY THE MONTANA INVASIVE SPECIES COUNCIL COORDINATOR (DNRC)
PHOTO CREDIT: HEADHUNTERS FLY SHOP

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AGENDA



Missouri River Basin Invasive Mussel Coordination Meeting Agenda

10 a.m. – 5 p.m.

**Eagles Club
123 W. Main St. Lewistown
January 29, 2018**

PURPOSE

Identify short-term and long-term steps we can take to leverage partnerships, strategies, and/or tools to collaboratively prevent and contain invasive mussels in the Missouri River Basin.

- 1) Establish networking, knowledge-sharing and cooperative action among project partners.
- 2) Identify gaps and areas for improvement and collectively address those issues.
- 3) Develop strategies for improving communications of plans, expectations, protocols and consistency in 2018.
- 4) Provide information to local partners on expectations in the event of a mussel detection.

OUTCOMES

- 1) Identify and document who is doing what, where, and how can we better coordinate our activities related to: monitoring, watercraft inspection, education & outreach.
- 2) Review Montana's Dreissenid Rapid Response guidelines and identify basin-specific augmentations, additions, customizations. Identify steps to compile relevant infrastructure/stakeholder contact information.
- 3) Identify strategies to increase public understanding and concern about invasive mussels with a focus on non-recreational stakeholders.
- 4) Clearly identify and document cooperative actions and roles and responsibilities to prevent the spread of invasive mussels in the Missouri River Basin.

AGENDA ITEMS

2017 After Action Input

- Feedback on 2017 season
- Review CEMMR report and status of recommendations

- Desired outcomes for 2018

Monitoring

- Share locations for statewide invasive mussel monitoring in the Missouri River Basin
- Monitoring efforts beyond state efforts
- Need for additional monitoring networks in central/eastern Montana, e.g ditch riders, sprayers
- Monitoring protocols

Watercraft Inspection/Decontamination

- Overview of 2018 plan
- Discussion

Rapid Response and Preparedness

- Overview of statewide RR guidelines and roles & responsibilities for response
- Geodatabase presentation (BNSF presentation)
- Steps to compile information for geodatabase
- Other RR customizations for Missouri River Basin

Education & Outreach

- FWP/DNRC plans
- Partner plans and activities
- Non-recreational E&O

Other

- Economic impact analysis
- Available resources and funding
- Communication protocols

ACTION ITEMS/OUTCOMES

<i>ACTION ITEM</i>	Lead	Timeline	Outcome & Evaluation	Notes
<u>COORDINATION</u>				
<i>Update Strategic Plan for Coordination with outcomes and information from workshop</i>	MISC	May 1, 2018	Strategic Plan	In progress
<i>Address gap at Bighorn Lake</i>	FWP	April 1, 2018 for start of season		Work with National Park Service on staffing. Gap a concern from Crow Tribe
<i>BOR financial support for AIS Program</i>	FWP(Tom W.)/BOR (Pete S.)	Dependent upon Congress		Staff to track progress.
<i>Communicate results of eDNA science advisory panel outcomes and incorporate into response and notification plans</i>	MISC/FWP	Workshop April 17-18, 2018		Purpose: understand how to use eDNA as a tool for EDRR of invasive mussels
<i>Incorporate Ft. Peck Vulnerability Assessments into Economic Impact Study</i>	Kate Wilson (DNRC/UC3)	Due June 2018		Economic impact study for cost to state if invasive mussels become established in Montana is underway. Working with socio-economist from UM-Flathead Lake Bio Station
<i>AIS Cohort development at orientation training</i>	Montana Watershed Coordination Council (MWCC)	February 16, 2018		Training to take place in Bozeman at the end of the BSWC Education and Outreach Training. MWCC will

ACTION ITEM	Lead	Timeline	Outcome & Evaluation	Notes
				update training activities throughout the year.
<u>COORDINATION (Continued)</u>				
<i>Centralize survey and detection information and create predictive distribution models for 22 aquatic invasive species.</i>	Montana Natural Heritage Program	July 1, 2017 – June 30, 2018		Funded via an AIS grant for three components: Invasive Species Filed Guide, Invasive species accounts and distributions, and centralized survey and detection information with predictive modeling.
<i>Aquatic Invasive Species Planning</i>	Glacier Conservation District			Funded via 2017 AIS Grant.
<i>Broadwater County Coordination and draft AIS Plan</i>	Broadwater Conservation District	Draft AIS Management Plan for Broadwater County by May 31, 2018, coordination for the duration of the grant.		Broadwater CD will provide coordination and planning for the duration of the grant for all partners within the district.
<i>Musselshell Watershed Long-Range Mussel Response Planning</i>	Musselshell Watershed Coalition (MWC)	2018		The long-range planning will be completed by a Big Sky Watershed Corps member with direction and input from MWC.
<u>EARLY DETECTION MONITORING</u>				
<i>Provide localized training for monitoring</i>	FWP	Spring 2018		FWP to coordinate with interested parties

ACTION ITEM	Lead	Timeline	Outcome & Evaluation	Notes
<i>Expand AIS monitoring network on eastside of divide</i>	All	Ongoing		Provide outreach to watershed groups and others on opportunity
<u>EARLY DETECTION MONITORING (Continued)</u>				
<i>Fort Peck Dam & power plant monitoring program.</i>	Corps of Engineers	Facilities assessment completed May 2017.	Monitoring actions in place.	Both settlement plates, a bio box at the power plant and water quality monitoring station, shoreline surveys, and plankton tows will be increased to every 4 weeks when conditions indicate.
<i>Create early detection program for irrigation/infrastructure monitoring</i>	MRCDC			
<i>Review FWP 2018 monitoring plan for gaps</i>	All	Provide feedback ASAP		
<i>Musselshell Watershed Long-Range Invasive Mussel Prevention Planning</i>	Petroleum County Conservation District	Due November 2, 2018		Outcome will be Musselshell Watershed Invasive Mussel Prevention Long-Range Plan developed over 2-5 coordination meetings.
<i>Flathead Lake shoreline and boat sampling</i>	Flathead Lake Biological Station	Due November 2, 2018		Sampling in both the north and south sections of the lake with three rounds of sampling in spring, summer, and fall. Results will be published in the CMP AIS database.
<i>Identify and contact Yellowstone River basin irrigation districts and water users.</i>	Rosebud County Conservation District	(3 months from contract start for CD, 6 months for irrigators)	Contact 17 local Conservation Districts in 17 counties, and hundreds of local irrigators with AIS Mussel materials.	This task will require identifying irrigation districts who use irrigation waters from the Yellowstone River and may be at risk from mussel damage to infrastructure.

ACTION ITEM	Lead	Timeline	Outcome & Evaluation	Notes
<i>Early detection and monitoring at Toston Reservoir</i>	Broadwater Conservation District	Survey data by August 31, 2018		Increased monitoring at Toston Reservoir including plankton tow, AIS plant species map.
<u>WATERCRAFT INSPECTION</u>				
<i>Stream Team creation and organization</i>	Cascade Conservation District/ North Central Missouri River Collaborative Working Group	Ongoing		The project includes 3 proposed teams: Mighty Mo Fleet Keepers for local businesses, Eyes on the River for citizen science, and Water's Edge Ambassadors for water front land owners.
<i>Provide stakeholder input to the Environmental Quality Council (legislative interim committee) at the January meeting.</i>	MISC/UC3/FWP Testimony from stakeholders	Reported to Environmental Quality Council (EQC) Jan. 18 Provided recommendation to Governor's Office Feb. 9 Next EQC March 21-22		Issue: current penalty for not stopping at a watercraft inspection station is \$85. In progress
<i>Provide localized training for watercraft inspections</i>	FWP	Prior to 2018 season opening		Tom to provide training dates to Missouri River Invasive Mussel Team
<i>Operate the Flowing Wells watercraft inspection station</i>	Garfield Conservation District/ FWP	Open		Garfield CD and FWP finalizing MOU to operate station
<i>Engage local law enforcement</i>	Missouri River partners	Ongoing		Outreach to local law enforcement
<i>Develop list of volunteer watercraft inspectors to fill in when staffing issues/high-traffic times</i>	Big Sky Watershed Corp.	Ongoing		BSWC work in local communities to identify and develop volunteer inspector program

<i>ACTION ITEM</i>	Lead	Timeline	Outcome & Evaluation	Notes
<i>Fort Peck watercraft inspectors and stations</i>	COE & BOR (Patricia G.)	May 1, 2018		Add inspection at: Crooked Creek, possibly Elk Creek, Rock Creek, install boat cleaning stations at 5 sites that currently have fish cleaning stations, and Clean Drain Dry signs.
<u>WATERCRAFT INSPECTION (Continued)</u>				
<i>Invite state park employees to watercraft inspection trainings</i>	FWP	Spring 2018		State parks employees can help provide support for inspections
<i>Staff Broadus Station with roving crews.</i>	FWP (Tom W., Landon)	Spring 2018		At this time, a roving crew and potentially a camera will be used to monitor the site.
<i>Blackfeet inspection stations: Browning, Seville, Birch Creek, and Babb (Proposed).</i>	Blackfeet Nation	First station 2015, new station proposed for 2018.	Number of boater contacts, interceptions.	Highway 2 West at Browning was established in 2015, Highway 2 East at Seville in 2016, Highway 89 North at Birch Creek in 2017. Babb mandatory inspection station was proposed for 2018.
<i>At the Water's Edge watercraft inspection and volunteer recruiting event</i>	Cascade Conservation District/ North Central Missouri River Collaborative Working Group	July 11, 2018		A community event that will offer free boat inspections, free decontamination, give aways, lessons, and introductions/information about the partnership.

<i>ACTION ITEM</i>	Lead	Timeline	Outcome & Evaluation	Notes
<i>Broadwater Conservation District portable and educational watercraft cleaning station.</i>	Broadwater Conservation District	Wash station complete by August 1, 2018		The portable watercraft cleaning station will be used at high use boat launches and events.
<u>RAPID RESPONSE</u>				
<i>Develop Missouri River partner notification list for rapid response plan</i>	All	June 1, 2018		Update and use information from Missouri River Strategic Plan for Coordination
<i>Review and provide input into Montana Dreissenid Mussel Rapid Response Guidelines</i>	All	Ongoing		
<i>Develop pilot for geographic GIS-based response plans</i>	MISC	Sept. 30, 2018		Develop infrastructure and pilot geo-database with Tiber, Canyon Ferry, Ft. Peck
<i>Coordinate the Central and Eastern Montana Mussel Response (CEMMR) Team</i>	Petroleum County Conservation District	November 2017 – August 2018 or grant period.		Coordinate partners and assist in drafting the response plan in collaboration with the CEMMR.
<i>Rapid response planning for Fort Peck.</i>	Corps of Engineers			Develop response plans specific to the Fort Peck Project area for irrigation, municipal waterm Fort Peck State Fish Hatchery and other resources.

ACTION ITEM	Lead	Timeline	Outcome & Evaluation	Notes
<u>EDUCATION & OUTREACH</u>				
<i>MT Association of Counties—get on Sept. agenda</i>	MISC	September 16-20, 2018		Abstract submitted. Awaiting response. Tabling = \$500
<i>FWP Out-of-state AIS marketing plan</i>	Liz Lodman (FWP) and Kate Wilson (DNRC)			
<i>Incorporate comments into Irrigator rack card.</i>	Liz Lodman (FWP)	ASAP		
<u>EDUCATION & OUTREACH (Continued)</u>				
<i>Add AIS CDD to 310 permit requirements</i>	FWC (Tom/Bob Flesher)	In process		Language approved. In process
<i>Distribute AIS fire protocols to local fire fighters</i>	All	Ongoing		Kate to send protocols
<i>Purchase mussel-encrusted displays for distribution</i>	Liz Lodman (FWP)			
<i>Build inventory of existing E&O resources & assess gaps in materials and messaging</i>	Liz Lodman (FWP) and Kate Wilson (DNRC)			FWP is redesigning website to include a resource page for downloading materials.
<i>Workshop on how to deliver invasive species education</i>	DNRC (Liz/Kate)			
<i>Distribution of flyers and email updates via NRCS field offices.</i>	Monica Pokorny USDA – NRCS	Ongoing since 2017		NRCS to send flyers to all field offices, and provides updates via NRCS internal newsletter. In 2018, NRCS will keep producers (irrigation users) informed of AIS issues.

ACTION ITEM	Lead	Timeline	Outcome & Evaluation	Notes
<i>Irrigators' workshop for the Missouri, Sun, Yellowstone, and Musselshell Rivers.</i>	Petroleum County Conservation District	August 2018	Attendance lists of the workshops.	Irrigators from Idaho will travel to Montana to deliver a series of workshops to local irrigation districts. The Idaho delegation will describe the prevention measures, monitoring, and outreach that they adopted in their districts.
<u>EDUCATION & OUTREACH (Continued)</u>				
<i>Attend events across the Musselshell Watershed including fishing events, agriculture, and schools.</i>	Petroleum County Conservation District	Due November 2, 2018		Will attend both events and classroom presentations. Events include: Blackfeet Community College March 22, Walleyes Banquet April 7, Boys & Girls Club Malta May 8, Valley County CD Outdoor Classroom May 17, Catfish Classic (CleanDrainDry) June 1-3.
<i>Distribute materials and publish media about AIS related to the CEMMR.</i>	Petroleum County Conservation District	Due November 2, 2018		Distribute AIS materials and agriculture targeted materials as appropriate. Publish social media posts about AIS.
<i>Train Flathead Lake Biological Station students and interns and present at outreach events.</i>	Flathead Lake Biological Station	Due November 2, 2018		Materials and events to be coordinated with UC3 for participation and materials.
<i>Gallatin River Resident and Youth Education</i>	Gallatin River Task Force	Due November 2, 2018		Group to conduct 7-9 outreach events and provide photos of events, updates on group website.
<i>Gallatin River AIS outreach to recreationists and tourists</i>	Gallatin River Task Force	Due November 2, 2018		Outreach to raft and fly-fishing guides and survey of recreationists.

ACTION ITEM	Lead	Timeline	Outcome & Evaluation	Notes
<i>Milk River public event participation and local organization outreach</i>	Milk River Watershed Alliance	Due November 2, 2018		Attend 5-7 events and provide classroom presentations throughout the Milk River Watershed.
<u>EDUCATION & OUTREACH (Continued)</u>				
<i>AIS outreach and decontamination kits for anglers, boaters, and water users.</i>	Rosebud County Conservation District	(1 year from contract date)	Produce and distribute kits that contain chamois, sponges, and brushes to carry out described decontamination actions. Evaluation will include number of kits distributed, feedback on utility of the kit, and behavioral changes documented in target groups.	Produce kits that include AIS education, decontamination tools, and maps of inspection stations.
<i>AIS mini-displays for local businesses to promote CLEAN, DRAIN, DRY</i>	Rosebud County Conservation District	(1 year from contract date)	Develop and distribute posters. Measure will be	Develop mini-displays that promote CLEAN, DRAIN, DRY for local businesses that cater to recreationists and agriculture.

ACTION ITEM	Lead	Timeline	Outcome & Evaluation	Notes
<i>Develop an AIS display and support materials with FWP and DNRC targeting agriculture, municipal, and construction water users.</i>	Petroleum County Conservation District	November 2018	the number of laminated posters delivered and visibly displayed in businesses across Montana. Completed display, booth space purchased at conventions, number of contacts made and handouts distributed.	The display and staff will attend the Montana Farm Bureau – November 2018, Montana Association of Conservation Districts – November 2018, Montana Stockgrowers – December 2018, and Montana Association of Counties – December 2018.
<u>EDUCATION & OUTREACH (Continued)</u>				
<i>Display and support materials with FWP and DNRC to reach agriculture, municipal, and construction water users.</i>	Rosebud County Conservation District	(1 year from contract date)	Completed display, booth space purchased at conventions, number of contacts made and handouts distributed at conventions and annual meetings.	A display and materials will be developed to target meetings including the Montana Stockgrowers, Montana Farm Bureau, Montana Association of Conservation Districts, and Montana Association of Counties.
<i>Coordinate the Central and Eastern Montana Mussel Response (CEMMR) team outreach activities.</i>	Rosebud County Conservation District	(1 year from contract date)	Final report on all outreach, meetings, and AIS events	Development of educational materials, communications with stakeholders, coordination of educational events with the AIS

ACTION ITEM	Lead	Timeline	Outcome & Evaluation	Notes
			within the CEMMR including comments for improving the Aquatic Invasive Species Program and outreach to stakeholders.	Bureau, and continued education efforts across the region.
<i>Cascade Conservation District River Clean Up 2018</i>	Cascade Conservation District/ North Central Missouri River Collaborative Working Group	August 11, 2018	Contact 52 private landowners and ranches in target area, 3 government agencies.	River clean up from Pelican Point to Cascade that will include AIS awareness through invitation letters to landowners & partner agencies along the reach, advertising among the fishing community, a booth at the town of Craig's Caddis Festival, and presence at the town of Cascade's 4 th of July Parade (float)

EDUCATION & OUTREACH (Continued)

Creation of an Invasive Species Filed Guide with website framework to invasive species information to the Environmental Summary report

	Montana Natural Heritage Program	July 2, 2017 – September 30, 2017		Funded via an AIS grant for three components: Invasive Species Filed Guide, Invasive species accounts and distributions, and centralized survey and detection information with predictive modeling.
<i>Development of 22 Aquatic Invasive Species accounts</i>	Montana Natural Heritage Program	July 1, 2017 – March 30, 2018		Funded via an AIS grant for three components: Invasive Species Filed Guide, Invasive species accounts

ACTION ITEM	Lead	Timeline	Outcome & Evaluation	Notes
<i>Broadwater Conservation District and Montana Weed Control Association design and build an outreach trailer.</i>				and distributions, and centralized survey and detection information with predictive modeling.
	Broadwater Conservation District	Trailer complete January 31, 2019		Design and build an educational trailer with electrical hook ups that will be used at events relating to invasive species.
<i>Broadwater County outreach materials and events</i>	Broadwater Conservation District	Materials and messages by June 31, 2018		The coordination will create an AIS themed package for use with the trailer (see Broadwater Outreach Trailer) along with identifying events where the portable wash station (see Broadwater watercraft cleaning station) will be used. A EWM pull/Mussel education event is planned.

EDUCATION & OUTREACH (Continued)

<i>Musselshell Watershed Educational Content.</i>	Musselshell Watershed Coalition			Creation Musselshell Watershed information on water resources and mussels. The Clean Drain Dry message will be incorporated. Clean Drain Dry signs have already been installed at 6 sites.
<i>Pondera County community signs, outreach and workshops</i>	Pondera County Conservation District	Completed, final report March 5, 2018	County-wide mailings to 400 households of producers, adds in local newspapers to 1500	County wide outreach to producers and community members through mailings, posters, displays, media, presence at public meetings, and all-ages educational workshops. An informational kiosk was installed at Lake Francis. The project is waiting

ACTION ITEM	Lead	Timeline	Outcome & Evaluation	Notes
			subscribers, 3500-4000 individuals at the Community Meeting, 12 public workshops.	for highway signage to be delivered.
<i>Musselshell Watershed Education and Partner Outreach</i>	Musselshell Watershed Coalition (MWC)	Completed		The MWC mailed and delivered the Mussel Response Rack Card to partners and distributed a presentation. In addition, 3 schools and 12 partners were visited and provided with education about invasive mussels and prevention actions.
<i>Pondera County Fisherman Friend Program</i>	Pondera County Conservation District	Initiated		Contacts with Walleyes Unlimited, Trout Unlimited, Town of Valier, and FWP have been made.

EDUCATION & OUTREACH (Continued)

Planning and evaluation for Fort Peck resources.

Corps of Engineers				A Hazard Analysis and Critical Control Point planning (HACCP) plan will be developed for the Interpretive center as water comes in from the penstocks. Other resources in the area will identify and reduce risks including forage fish currently sourced from the Yellowstone River, and assessment of the irrigation and municipal water intake locations.
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WORKSHOP SUMMARY

The Montana Invasive Species Council (MISC) in coordination with Montana Fish, Wildlife & Parks (FWP), the Eastern Central Missouri River Mussel Response Team (CEMRMRT), Cascade Conservation District, and other Missouri River stakeholders and partners is implementing a pilot project for enhanced coordination of invasive mussel prevention and containment in the Missouri River Basin. The project is being funded by the National Invasive Species Council.

Since Montana's invasive mussel detections in October 2016, partners in the Missouri River basin have been engaged in Montana's mussel response and implementation. The Central Eastern Montana Mussel Response Team (CEMMRT) provided feedback and recommendations¹ to the state that has helped ground-truth the state's program and provide solutions for local gaps and needs. Partners have also been a conduit for getting education and outreach about the state effort and the threat out to local communities and key stakeholder groups that would be most impacted by establishment of invasive mussels. The Cascade Conservation District spearheaded an Invasive Mussel Summit in 2016 to provide information and education to stakeholders from The City of Great Falls and the surrounding area.

MISC and FWP worked with these partners and others to initiate the Missouri River Basin Invasive Mussel Pilot Project. The first output of the group was drafting a *Strategic Plan for Invasive Mussel Coordination in the Missouri River Basin*. The coordination plan will be updated with outcomes and new partners, as a result of the workshop. The plan outlines:

- Roles and responsibilities of Missouri River invasive mussel partners
- Key issues in the basin re: invasive mussels
- Key stakeholders in the basin
- Federal, state, tribal, and local contacts
- Regional, provincial, and neighboring states contacts
- Technical partners

On January 29, 2018, MISC and the CEMMRT hosted a workshop in Lewistown for project partners to convene and identify short-term and long-term steps we can take to leverage partnerships, strategies, and/or tools to collaboratively prevent and contain invasive mussels in the Missouri River Basin.

The four main desired outcomes for the meeting, which were largely accomplished include:

- ✓ Identify and document who is doing what, where, and how can we better coordinate our activities related to: monitoring, watercraft inspection, education & outreach.
- ✓ Review Montana's Dreissenid Rapid Response guidelines and identify basin-specific augmentations, additions, customizations. Identify steps to compile relevant infrastructure/stakeholder contact information.
- ✓ Identify strategies to increase public understanding and concern about invasive mussels with a focus on non-recreational stakeholders.

¹ Central Eastern Montana Mussel Response Team Recommendations report: <http://missouririvercouncil.info/wp-content/uploads/2017/03/CEMTMusselResponseReporttoFWP.pdf>

- ✓ Clearly identify and document cooperative actions and roles and responsibilities to prevent the spread of invasive mussels in the Missouri River Basin.

This report provides an overview of the meeting, as well as specific actions related to: 2018 FWP program plans; early detection monitoring; watercraft inspection; response and preparedness; education & outreach; and other related topics. Several gaps were identified and those are also documented in the report.

2017 After Action Input and 2018 Desired Outcomes

After opening the meeting, reviewing the day's agenda, and introductions, the workshop kicked off with the first topic, which included a review of the 2017 season, review of the CEMMRT recommendations report, and ensuing discussion about desired outcomes for 2018. Tom Woolf, FWP AIS Bureau Chief, began by presenting FWP's 2017 AIS program results.

2017 FWP AIS Program Results

Monitoring/surveying

- ✓ Monitoring efforts significantly expanded in 2016-17. Statewide over 1,500 plankton tow samples taken from over 240 waterbodies were collected and analyzed for z/q mussel larvae.
- ✓ Artificial substrates, divers, snorkelers, sniffer dog, and visual searches deployed at Tiber and Canyon Ferry for adult searches
- ✓ No veligers or adults detected in MT 2017. Does not mean they are not still out there. No new AIS detections state wide (multi taxa).

Watercraft inspection

- ✓ 35 watercraft inspection stations operated utilizing over 200 seasonal staff
- ✓ 5 regional supervisory hired to oversee station operations
- ✓ Over 85,000 inspections at state-operated watercraft
- ✓ 17 mussel-fouled watercrafts intercepted (all originated from out-of-state)
- ✓ Over 80 citations and nearly 300 written warnings were issued related to AIS violations

Education & Outreach

- ✓ Clean, Drain, Dry campaign – billboards, ads, messaged at watercraft inspection stations
- ✓ Installed Mussel Alert signage statewide in coordination with partners
- ✓ Partnered with the Department of Commerce to hire marketing/PR firm to develop AIS marketing plan to target out-of-state boaters

CEMMRT Recommendations Report

The Central and Eastern Montana Mussel Response Team gathered information from stakeholders across the region through an email survey, in-person and telephone discussion, and through follow-up from the March 8, 2017, meeting with FWP. The following opportunities were identified as actions that have considerable impact to invasive mussel prevention in the short-term. The group reviewed and discussed the status of the recommendations.

Check the box prior to license purchase - Require verification (a check box or something similar) that a purchaser has read the information about mussels and agrees to comply with the inspection and decontamination requirements for boats in Montana waters before being allowed to purchase a fishing license. This should apply to all fishing license purchases, online as well as at license providers.

- ✓ FWP added the check box to fishing licenses

Attitude of Wardens and check-station workers - The effectiveness of the check stations and decontamination efforts are dependent on the cooperative participation by Montana's public and out-of-state visiting recreationists. Public perception that wardens are using inspection stations as a way to find any violation of the law and enforcing punitive action will discourage the voluntary cooperation this effort is dependent upon.

- ✓ FWP will have enhanced training for the 2018 season to address

Gather information for future guidance of plan - Wardens can greatly improve the effectiveness of the state's plan by gathering information on visitor's route and destination to help guide future check station locations.

- ✓ FWP gathers route information through the watercraft inspection surveys.

Outreach to water users - Education and outreach materials for irrigators, rural water system users, and the fracking industry is imperative and needs to be developed and distributed.

- ✓ The CEMRMRT worked collaboratively to develop materials in 2017 and continue to work together to improve materials for the 2018 season.

Sign revisions – Signage needs to have more aggressive language that warns of consequences along with contact information, or a scannable QR/barcode, that provides readers with a place to find check- station or decontamination unit locations.

- ✓ FWP plans to improve highway signage and is implementing an AIS passport for watercraft inspection in 2018. The passport includes maps and contact information for stations and the program has an online component to direct users to watercraft inspection stations

Bighorn Lake Inspection Station – Bighorn Lake and Bighorn River cannot be left unprotected. In addition to inspecting boats launching at Bighorn Lake, a station in this area can also check traffic traveling from the south into Montana.

- ✓ Working with the state park to provide inspections in 2018

Penalties – The penalty for not complying with AIS rules needs to be a strong deterrent. The fines for noncompliance need to be increased and the option of quarantining offenders' boats should be exercised.

- ✓ Working through the legislative interim Environmental Quality Council to increase penalties in the 2019 legislative session and a recommendation was forwarded to the Governor's Office.

The CEMMRT also reported out on their 2017 AIS activities:

- ✓ Survey distributed to stakeholders about invasive mussel information needs, resource needs, and local resources available
- ✓ Summary of survey prepared for and given to Montana Mussel Response Team



Figure 1 Big Sky Watershed Corps at the Agriculture Summit, Great Falls, 2017

- ✓ Contact information for agricultural groups passed to Mussel Response Team
- ✓ Collaboratively developed invasive mussel presentation for school groups
- ✓ Radio station interviews, e.g. Billings
- ✓ Distribution of Mussel Response Team rack cards
- ✓ Outreach to individual stakeholders through face-to-face meetings (conservation districts, water user associations, county/city governments)
- ✓ Collaboration with the BLM on strategic placement of Clean, Drain, Dry signage
- ✓ Series of stakeholder meetings in Malta, Fort Peck, Jordon and Circle
- ✓ Development of invasive mussel information sheet for irrigators
- ✓ Development of slides for FWP PowerPoints on how agriculture and construction can contribute to keeping our waters mussel free
- ✓ Work with FWP and DNRC to engage irrigators, local citizens, and rural water authorities on AIS issues
- ✓ Provide feedback to FWP on watercraft inspection program and statin locations
- ✓ Provided free signs to conservation districts for local reservoirs, city boat docks, etc.
- ✓ Hosted information boot on invasive mussels at the Agriculture Summit in Great Falls
- ✓ Participated in Cascade County Mussel Summit
- ✓ Secured funding to continue CEMMRT

Discussion Points

- Blackfeet AIS program- Jay Monroe described the Blackfeet’s AIS efforts. Dona took over July 1st of this year. Worked hand in hand with AIS program since 2015. Last fall when found out Tiber was positive, first thought all waters on the reservation needed to be closed. Blackfeet Environmental office staff were only doing water quality monitoring – not AIS. Dona started collecting samples as soon as ice was off the lakes. Worked with FLBS to have sample analyzed using eDNA analysis. USFWS fisheries biologists helped take samples. 4 lakes on reservation where motorized boats allowed – took 20 samples at each one. Results back from spring

samples – no positives. Also put artificial substrates in all 4 lakes. Working closely with FWP on AIS prevention.

- Army Corp (ACOE) has conducted vulnerability assessments for Ft. Peck. Has 19 boat ramps. Helps coordinate with other agencies and provides E&O to the public on invasive mussels
- Great Falls concerns: dams, refineries, water treatment plant. Irrigators in the Sun River watershed are not concerned.
- Need a wider message beyond recreational boaters.
- State/partner communications: Goals is for local partners to get input from constituents to take back to FWP and DNRC. FWP and DNRC provide information and address local concerns through invasive mussel coordination.
- Bureau of Reclamation (BOR)—hoping to support state program, waiting on budget resolution in Congress
- Bureau of Land Management (BLM)—want to get more involved supporting effort
- eDNA for early detection. Tom explained eDNA is not a reliable tool for invasive mussel early detection. MISC is forming a scientific advisory panel to understand how FWP can incorporate it as a tool into its monitoring program.
- Need to include native mussels and Pearl Shell on outreach materials for identification purposes
- Fishing derbies--Tom explained that through the permitting process, derby organizers are responsible for enforcement of inspections. But acknowledged there is not a good mechanism to know if organizers are fulfilling this requirement
 - Catfish derbies are expanding in the lower Yellowstone

Outcomes

- Clarified state agency roles & responsibilities for AIS management
- Revisited and addressed CEMMRT recommendations
- Gathered information on other 2017 AIS activities in basin

Gaps

- Mechanism to ensure derby organizers are promoting and implementing clean, drain, dry at tournaments
 - Possible solution: have 3rd party partner reach out to organizers to reinforce message
- Coverage for Missouri River boat ramps in and around Great Falls. 7 public boat ramps, 100s of private ramps.

Early Detection Monitoring

The monitoring portion of the meeting included an overview of the state's AIS monitoring program and efforts by partners. Unlike the Westside of the divide there is very little monitoring for AIS by partners in the Missouri River Basin beyond FWP's AIS monitoring. The monitoring discussion focused on ways to expand monitoring efforts in the Missouri River basin.

Tom Woolf from FWP provided an overview of statewide AIS monitoring program and 2018 locations. See Appendix B for a list of 2018 monitoring locations. Tom announced that an electronic data collection app for monitoring/reporting will be available for partners in 2018. FWP verifies data and then posts on MT Natural Heritage Program natural resource database. Partners will receive follow up info on samples sent to FWP lab – received, analyzed, results.

Tom stressed that coordinating sampling efforts results in maximize early detection and that communicating new detections to FWP is critical in responding. FWP provide plankton samples for FWP for free (microscopy analysis).

Discussion Points

- Blackfoot monitoring efforts- will coordinate plans with FWP. Has four waters opened to motorized boaters.
- Monitoring locations based on mussel invasion potential: made by ICS to highlight risk. Social pressure (angling, proximity to infested waters, recreation, etc.) + habitat suitability (most of MT waterbodies high risk). 147 samples 10 events, 128 at Tiber 15 events. 83 from flathead, 11 events. Survey locations state-wide. Set up phased monitoring in the future so can focus on high priority waters.
- Tiber/Canyon Ferry Status: 5 years of sampling at Tiber (positive) – can delist. 3 years of sampling at CF (suspect) – can delist. Colorado example – this has happened a fair amount of times. Was mussel free this summer, but tested positive after 4 years, couldn't be delisted. Monitoring not cut and dry – many things we don't know about it yet. Trying to use best tools out there to do the best we can.
 - Tiber: 16 days on water May-Oct. 128 plankton samples. 66 eDNA samples sent to 3 different labs. 194 total samples. Mussel sniffing dogs, FWS dive team, snorkel surveys, 24 substrates – no detections. Much of Tiber is mud/muck, but some areas with rocks – where dogs focused efforts.
 - Canyon Ferry: 10 days, 147 samples. Snorkel, dive, 10 substrates, dogs – no detections. No hard/fast rule about containment at CF given 'suspect' and validity of sample. Bring up through UC3. Containment waterbody through RULE for 3 years. A lot of resources going into containment at Canyon Ferry.
- Opportunity: we all have the same goal. Maximize ability to see them early on, before they spread. All AIS, not just mussels. Goal – if something slips by it, we find it early and eradicate it if possible. Contain it if not.

Outcomes

- Expand AIS monitoring on the Eastside of the divide
 - Explore tiered model to engage partners in monitoring efforts. E.g. Gold (FWP trained/uses FWP protocols) Bronze (citizen scientist-uses artificial substrate to monitor for adult mussels)
 - Identify and train new partners to help with state monitoring efforts
 - Watershed groups
 - Guides/outfitters
- Consider creating dock owner monitoring kits and distribute
- Create early detection program for irrigation/infrastructure monitoring (pumps, intakes, equipment prevention)
 - Training ditch riders, weed applicators
 - Develop toolkit/package
- Review FWP monitoring plans for gaps and high-priority waters that need enhanced monitoring
- FWP to provide watercraft monitoring training for local partners

Gaps

- Lack of partner monitoring efforts East of divide
- Lack of data sharing—where monitoring/who/when
- Monitoring in Sun River reservoir
- No AIS monitoring on Crowe reservation lands

Watercraft Inspection/Decontamination

Tom provide an overview of the watercraft inspection program for 2018, which includes several enhancements:

- Changes for 2018: move several stations. Get shelters/storage on site. Reader boards (electric signs) will help improve compliance. Use of MDT message boards on highways at sites near inspection stations. Partner contracted stations: looking to partners around the state to see if there is interest in managing. Conservation Districts, Tribes, other partners. Focus on high risk locations. Station changes: Culbertson – move to Nashua. Duck Valley to Flowing Wells if possible. Subject to change but moving towards.
- Hiring/Training: Localized training and hiring (starting in March). Pull people in a local community and set up small group trainings. FWP participation in partner training (and vice versa). FWP to share manual and training materials. Get protocols as synchronized as possible. Share materials and improve consistency (for state, for public).
- Protocols: definitions of ‘decontamination’ and ‘high risk.’ These words were issues. Not going to use decon for CDD anymore. Hot wash vs. decontamination (assumption of ‘spotless’ wash). Decontamination will be restricted to boats that are intercepted with mussels on them. ‘Hot wash’ for all other situations (e.g. high risk and not CDD). What is a high-risk boat? Can we get on the same page with what that means? All approach the same way. Fouled boat protocol, communication to partners. Improve partnership so expectations are clear.
- Station operations: staggered openings depending on level of risk and traffic (late march to mid-May). Hours variable. Station challenges: remote locations, challenges finding and keeping good staff. Starting to hire soon for lead worker positions (at each station), help with supervision and oversight. Could use help finding good people to staff the remote locations. Now have benefit of time and quality control.
- Data collection: Colorado app on digital tablet for entering watercraft inspection data. Drop down menu for quality control. Electronic forms help with spelling errors and entry. 5 western states are currently using. If we can adopt in MT, can make available for all partners. Would be able to look up boat by HULL number that can show any partner with app exactly what/where boat was inspected. Passport to expedite inspections for low risk frequent boaters. Hopeful will have draft to share next week. One high risk form: last year there were many ‘fail’ forms that we used. Now just use one. Address high risk in just one form – will have available soon to share. Hopefully we can get agreement to use that form or something similar. Standardize what we are all doing and what the public sees. Data app needs approval from state (security, etc.), hopefully will have answer in next couple weeks.
- Seals: conveys that boat hasn’t launched since inspection. Tool for communicating between inspection stations. Local boater program now ‘certified boater program.’ New outreach material development for user groups around the state – CDs want to take message to constituents and have requested assistance developing materials. Working closely with DNRC

and other partners as we move forward. New Public Info Officer. PR/Marketing firm campaign to target out of state boaters. Change message to positive spin – ‘do your part to protect our waters’ as proactive call to action.

- Violations: knowingly can be high fines and even a felony. But hard to prove ‘knowingly.’ Wardens and state police have helped with quarantine of vessels. Can quarantine for up to 30 days.
- Cooperation: Many changes happening. FWP needs input and feedback. Improve communication: open and consistent. AIS Team: Zach, Russ, Craig, Sarah, Jayden, Landon, Stacy, Jori, Jessi, Gail. Engage and work cooperatively with everyone throughout the state

Discussion Points

- Blackfoot Nation, Jay Monroe (AIS Inspections Lead) Operated 3 stations in 2017, 18 employees last season. Cutbank/Seville, Hwy 89/Birch Creek, Hwy 2/Browning. Roving – game wardens are trained to inspect watercraft, a lot of enforcement coordination. They would periodically inspect boats, and also ensure that boats are stopping at stations. Planning on same stations for 2018.
- Discussion about difficulties in staffing watercraft inspection stations.
 - Steve Wanderaas has been on a road show to visit with CDs about operating watercraft inspection stations. Model is successful in Idaho
 - Local engagement and staffing resources
 - BSWC members can recruit volunteer inspectors
- Marina operators—discussed idea of training marina operators
 - Patricia to ask operators at Crooked Creek. Would help with fishing tournament traffic
 - Hell Creek is state park—work with FWP
- Big Horn Canyon NRA-

Outcomes

- Pursue inadequate penalties. Work with the administration and legislature to increase penalty for driving by watercraft inspection station
- Understanding gained about FWP 2018 WIS location plans
 - Discussed WIS logistics and gaps re: locations, hours, staffing
 - FWP to provide watercraft inspection training for local partners
- Figure out solutions to track/monitor boat traffic at “gap locations” to see if inspections warranted
 - Look into using game cameras
- Big Sky Watershed Corps. to build volunteer base to call upon to staff stations
 - Community engagement, should leave to better staffing in future
- Exploring RV/Campos/nomad approach to hiring (e.g. Camp site hosts)
- Garfield CD to run Flowing Wells site
- Explore marina operators as watercraft inspectors at Ft. Peck
 - Crooked Creek, Elk Creek, Rock Creek
- Train state park employees to do inspections. If boat fails, send to closest decontamination station
- Engage local law enforcement. Target areas with inspection stations.
- Figure out solution for Broadus location
- Work with NPS on inspection support through Big Horn Canyon, Yellowtail Dam (east and south not covered)

Gaps

- Long-term funding mechanisms
- Ensuring compliance at fishing tournaments
- Difficulties hiring and keeping quality staff
- Training and equipment for volunteers/community groups to participate in watercraft inspection

Rapid Response and Preparedness

Copies of Montana's Dreissenid Mussel Rapid Response Guidelines were provided, and Tom Wolf, FWP gave an overview of the contents and what local partners can expect in the event of a new detection. He explained that the state (FWP) will take the lead on any invasive mussel response working in coordination with local partners. FWP staff is currently being trained in the Incident Command System (ICS) to prepare. The state is also planning rapid response exercises to test and improve response planning and preparedness efforts.

For response, Missouri River partners can help by participating in the continual improvement of the guidelines and by helping to develop Missouri River customizations to the plan, e.g. notification lists, geodatabase.

Next, Nic Winslow from Burlington Northern Santa Fe (BNSF) presented on how BNSF conducts emergency response and preparedness for train derailments. In particular, Nic focused on the GIS map-based tools that BNSF uses called Geographic Response Plans (GRPs).

GRPs provide a clear and comprehensive oil/hazardous materials emergency response plan for a specific body of water. The GRP includes maps of the emergency response strategies of how the spill is to be contained, in the quickest most efficient way, while minimizing the impact to the water body. GRPs also identify environmentally sensitive areas.

A GRP is developed to:

- Prioritize zones of response based on site specific social, cultural, environmental, microeconomic, and macroeconomic potential impacts.
- Understand unique site logistic constrains and topographic challenges.
- Identify solutions to site specific problems.
- Determine man power requirements.
- Define emergency response tasks, their execution priority, and location to successfully contain and clean the spill.

Nic stressed the importance of exercising the plans. BNSF has generously agreed to provide technical assistance and relevant data layers to help Montana develop geo-database tools for invasive mussel response.

Discussion Points

- BNSF tools good applicability to invasive mussel response. Not the boom strategies but other aspects of the tool could be applied to invasive mussel response planning. Boom strategies could be employed for control
- Need to separate the response from the biological issues
- Public information officer in incident is responsible for consistency in messaging and coordinates the regulatory authorities, agencies, legislators, counties, city commissioners, etc. Also informs the public
- BOR: called downstream partners during the MT Mussel Response
- Consensus to develop geodatabase tools. Start with pilot at high-priority waterbodies. E.g. Tiber, Canyon Ferry, Ft. Peck

Outcomes

- Add Missouri River partners to rapid response notification list
- Developed common understanding about response guidelines and roles and responsibilities
- Develop geographic GIS-based response plans for high-priority waterbodies as pilot
- Prioritize waterbodies by risk (calcium, boat traffic, access, usage)
- Provide input on rapid response guidelines

Gaps

- Viable treatment options for large waterbodies

Education and Outreach

Liz Lodman (FWP) and Kate Wilson (DNRC/UC3) have been working collaboratively on AIS education and outreach efforts. They provided an overview of FWP/DNRC plans for AIS outreach and education for 2018. FWP would like partners to work with the state on messaging and materials so there is consistency and impact across the state.

Highlights include:

- Updated CDD logo and graphic identity—moving from “Mussel Alert” to “Protect our Waters”
- Partnership with the Department of Commerce to work with marketing/PR firm to develop AIS marketing plan to target out-of-state boaters
- Updated materials available to partners—rack card, utility mailer, advertisement. Drafts of the materials targeting irrigators were provided. These materials will be provided in a customizable format, so org. logos can be added. (see Appendix D)
- Targeting new and diverse audiences
- Developing training with ISAN on how to teach about invasive species

Stephanie announced that DNRC has an AIS grant program and that applications are due March 15, 2018. The program can be used to implement many of the priorities coming out of today’s workshop.

Discussion Points

- Liz is new FWP Public Info Officer working on outreach strategy. Started with plan developed by Mussel Response Team, expanding on it. Looking at developing new materials, working on development of materials to target other stakeholders. FWP asking for feedback and

consistency – are there additional materials that others need? Positive messages – be part of solution, focus on personal responsibility.

- Way to 'regionalize' passport idea? Currently have contract with design firm and will have to start with 'one size fits all' approach, but can modify in future if there are ideas for improvement. Passport contains info on partner stations rules. Each stamp will be different for each station – with changeable date. Passport for LOW RISK, FREQUENT BOATERS.
- Evaluation: part of ad firm project. Survey last spring demonstrated that younger demographic hasn't been reached very well; will repeat (UM study).
- Participants provided feedback on irrigator rack card, utility mailer, advertisement
 - Too much text. Recommend less text, more pictures
 - "Protect our Waters" implies irrigators (and others) are not currently doing that. Sends wrong message. Suggestion: Protecting your equipment, protects our waters"
 - Please provide images
 - Simplify message to apply to all-invasives
 - Utility mailer can target those that wouldn't attend public meetings or see materials elsewhere.
- 310 application (Montana Streambed and Land Preservation Act)
 - FWP/DNRC working with DNRC's Conservation Districts Bureau to insert language into the application about CDD requirements as a condition of the permit
 - Target all contractors
 - Add AIS info. to 310 website
- AIS fire protocols
 - Decon needed for buckets, foot valves, and hoses
 - Need help distributing protocols to local fire fighters
- Sea Planes—state is working with the National Sea Plane pilot association on best management practices
- Conservation Districts: Other audiences besides boaters that need to be engaged in program (e.g. irrigators, farmers, municipalities, etc.), have requested help from DNRC & FWP to create.
- New audiences
 - Waterfowl hunters
 - Walleyes Unlimited (other fishing organizations)

Outcomes

- State to provide marketing resources/expertise. Partners to distribute. Funds available through AIS grant program.
- Additional targeted irrigation outreach (by irrigation type). Focus on financial impacts with real dollar amounts.
- Additional materials for other target groups. Need to develop list of priorities
 - E.g. AIS outreach to water users, mailing?
- Adding 310 permit CDD condition
- Secure AIS guidebooks for distribution throughout Missouri River Basin (e.g. CMP, GYCC AIS booklets)
- Associated outreach with substrate program (see monitoring)

- Display for local businesses
- Big Sky Watershed corp. members to focus on education and outreach
- Work with ISAN on youth activities and training on how to deliver invasive species education (stopais.org)
- Explore video targeting contractors—30 second teaser plus fuller feature
- Enhance social media presence
- Engage local law enforcement

Gaps

- Complete list of possible sources/vectors and action plans to address vectors
 - Industrial
 - Contractors (310)
 - Seaplanes
- Need increased presence at tradeshow and events—Great Rocky Sport Show, Magy/Mase
 - Need display material for sport shows, agricultural shows
 - List of agriculture/outdoor/boat shows (FWP partners with US Coast Guard auxiliary at boat shows)
- Videos to target water users (beyond boaters)—municipal, irrigators, etc.
- Repository for resource materials
- Canned AIS PowerPoint for partners

Next steps

Outcomes and action items from the workshop are incorporated in this report. Partners will use this report to track progress on AIS activities throughout 2018. The group will reconvene in the fall to revisit the report and actions and discuss outcomes, successes and challenges.

Stephanie Hester will remain the main-point-of contact on the project, and she will send out periodic updates on the project until the group reconvenes. Contact information:

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 Department of Natural Resources and Conservation
 P.O. Box 201601
 Helena, MT 59620-1601
 406.444.0547
shester@mt.gov

The workshop provided an excellent opportunity to bring federal and state agencies, Tribes and partners together to discuss goals, issues and outcomes needed to enhance protections in Montana and the entire Columbia Basin to prevent the introduction and spread of aquatic invasive species.

APPENDIX A: Workshop Attendees

Name	Organization
Andrew Horvath	Big Sky Watershed Corp.
Carrie Hess	Petroleum Conservation District
Casey Gallagher	Milk River Watershed Alliance
Colin McLure	Big Sky Watershed Corp.
Dan Rostad	Yellowstone River Conservation District Council
Diane Black	McCone Conservation District
Dona Rutherford	Blackfeet Nation
Emily Standley	Fergus/Petroleum County Extension
Gary Bertellotti	MT Fish, Wildlife & Parks
Gayla Wortman Oehmcke	Cascade Conservation District
John Chase	Cascade Conservation District
Kate Wilson	MT Dept. Natural Resources and Conservation
Laura Nowlin	Musselshell Watershed Coalition
Leah Elwell	Invasive Species Action Network
Liz Lodman	MT Fish, Wildlife & Parks
Michael Ruggles	MT Fish, Wildlife & Parks
Nic Winslow	Burlington Northern Railroad
Patricia Gilbert	Army Corp of Engineers
Peter Stevenson	Bureau of Land Management
Rachel Frost	Missouri River Conservation District Council
Sarah Swanson	Milk River Watershed Alliance
Stephanie Hester	Montana Invasive Species Council
Steve Smith	Bureau of Land Management
Steve Wanderaas	Montana Invasive Species Council
Steven Tyrrel	Montana Invasive Species Council
Tenlee Atchison	Cascade Conservation District
Thomas Woolf	MT Fish, Wildlife & Parks
Wyatt Jay Moore	Blackfeet Tribe

APPENDIX B: 2018 Monitoring Locations

Area	Water	# Samples per event	Frequency of events	Total Samples	Other Entity Sampling
Central	Ackley Lake	1	1	1	
Central	Bailey Reservoir (S of Kremlin - Hill Co)	2	1	2	
Central	Bair Reservoir	5	1	5	
Central	Bean Lake	2	1	2	
Central	Beaver Creek Reservoir	2	2	4	
Central	Beaverhead River	3	2	6	
Central	Big Casino Creek Reservoir (S of Lewistown)	2	1	2	
Central	Big Hole River	2	1	2	
Central	Big Hole River	2	1	2	
Central	Big Hole River	2	1	2	
Central	Big Lake Creek (SW of Wisdom)	1	1	1	
Central	Blacktail Meadows Kids Pond (Dillon)	1	1	1	
Central	Bonanza Reservoir (W of Martinsdale)	1	1	1	
Central	Boulder River	2	2	4	
Central	Brownes Lake (NW of Dillon)	1	1	1	
Central	Bynum Reservoir	2	2	4	
Central	Canyon Ferry Lake	10	4	40	BOR
Central	Carters Pond	1	1	1	
Central	Clark Canyon Reservoir	5	2	10	BOR
Central	Cliff Lake	1	1	1	
Central	Crazy Mountain Ranch Reservoir (N of Livingston)	1	1	1	
Central	Dailey Lake	2	2	4	
Central	Darlington Ditch	1	1	1	
Central	Dawson Pond #1 (SW of G Falls)	1	1	1	
Central	Dawson Pond #2 (SW of G Falls)	1	1	1	
Central	Deadman Lake (SW Corner)	1	1	1	
Central	Dearborn River	2	1	2	
Central	Delmoe Lake	1	1	1	
Central	Dunkirk Reservoir (N of Dunkirk; E of Shelby)	1	1	1	
Central	East Fork Reservoir (S of Lewistown)	2	1	2	
Central	East Gallatin River	2	2	4	GYCC Grant
Central	East Rosebud Lake	1	1	1	Additional GYCC request
Central	Elk Lake	1	1	1	
Central	Emerald Lake (SW of Roscoe near W. Rosebud)	1	1	1	GYCC Grant
Central	Ennis Lake	2	2	4	
Central	Eureka Reservoir	1	1	1	

Central	Eyraud Lakes	0	0	1	
Central	Fairy Lake (N of Bozeman)	1	1	1	
Central	Forest Lake (S of White Sulphur off 294)	1	1	1	
Central	Freezeout Lake	1	1	1	
Central	Fresno Reservoir	10	3	30	BOR
Central	Gallatin River	2	1	2	
Central	Gallatin River	2	1	2	
Central	Gallatin River	2	1	2	
Central	Gardner River (Near Gardiner)	1	1	1	
Central	Gibson Reservoir	2	2	4	
Central	Glen Lake (S of Bozeman)	1	1	1	
Central	Hansen Reservoir (Off Big Spring Creek near Lewistown)	1	1	1	
Central	Harkness Lakes (SW Corner)	1	1	1	
Central	Harkness Lakes (SW Corner)	1	1	1	
Central	Hauser Reservoir	10	3	30	
Central	Hebgen Lake	5	2	10	
Central	Helena Valley Regulating Reservoir	3	3	9	BOR
Central	Holgate Reservoir (Near Denton)	1	1	1	
Central	Holter Reservoir	10	3	30	
Central	Hundred Dollar Bill Pond (N of Martinsdale)	1	1	1	
Central	Hyalite Creek	1	1	1	
Central	Hyalite Reservoir	3	2	6	GYCC Grant
Central	Indian Road Pond (N of Townsend)	1	1	1	
Central	Jefferson River	2	1	2	
Central	Judith River	2	2	2	
Central	Kolar Reservoir 1 (N of Geyser)	1	2	2	
Central	Kolar Reservoir 2 (N of Geyser)	1	2	2	
Central	Lake Frances	10	2	20	
Central	Lake Helena	5	3	15	
Central	Lake Shel-oolle (Near Shelby)	1	1	1	
Central	Lake Sutherlin	3	2	6	
Central	Largent Bend Pond # 3 (W of Vaughn)	1	1	1	
Central	Lima Reservoir	1	1	1	
Central	Little Boulder River (SW of boulder)	1	1	1	
Central	Little Prickly Pear Creek	1	1	1	
Central	Madison River	2	2	2	
Central	Madison River	2	2	2	
Central	Madison River	1	1	1	
Central	Marias River	5	2	10	
Central	Marias River	5	2	10	
Central	Marias River	3	2	6	

Central	Martinsdale Reservoir	2	2	4	
Central	Middle Fork Judith River	1	1	1	
Central	Mission Lake	1	1	1	
Central	Missouri River	5	3	15	
Central	Missouri River	5	2	10	
Central	Missouri River	3	3	9	
Central	Missouri River	2	2	4	
Central	Missouri River	2	2	4	
Central	Missouri River	2	2	4	
Central	Missouri River	2	2	4	
Central	Missouri River	1	1	1	
Central	Morrison Lake (SW of Clark Canyon Reservoir)	1	1	1	
Central	Nelsons Spring Creek	1	1	1	
Central	Newlan Reservoir	3	2	6	
Central	Nilan Reservoir	1	1	1	
Central	North Fork Big Hole River	1	1	1	
Central	North Fork Musselshell River	1	1	1	
Central	Number One, Pond	1	1	1	
Central	Number Three, Pond	1	1	1	
Central	Number Two, Pond	1	1	1	
Central	Ostle Reservoir	1	1	1	
Central	Pelican Point #1	2	1	2	
Central	Pelican Point #2	1	1	1	
Central	Peterson Reservoir (Near Judith Gap)	1	1	1	
Central	Pishkun Reservoir	2	1	2	
Central	Priest Butte Lake	1	1	1	
Central	Quake Lake	1	1	1	GYCC Grant
Central	Rainbow Dam Reservoir	2	1	2	
Central	Red Rock Lake, Upper	1	1	1	
Central	Red Rock River	1	1	1	
Central	Rock Creek	1	1	1	GYCC Grant
Central	Rock Creek	1	1	1	GYCC Grant
Central	Rostad Reservoir (off 294 SE of White Sulphur Springs)	1	1	1	
Central	Ruby River	2	2	4	GYCC Grant
Central	Ruby River	1	1	1	
Central	Ruby River Reservoir	3	2	6	
Central	Shields River	2	2	4	GYCC Grant
Central	Smith River	2	2	2	
Central	Smith River	1	1	1	
Central	Smith River	1	1	1	

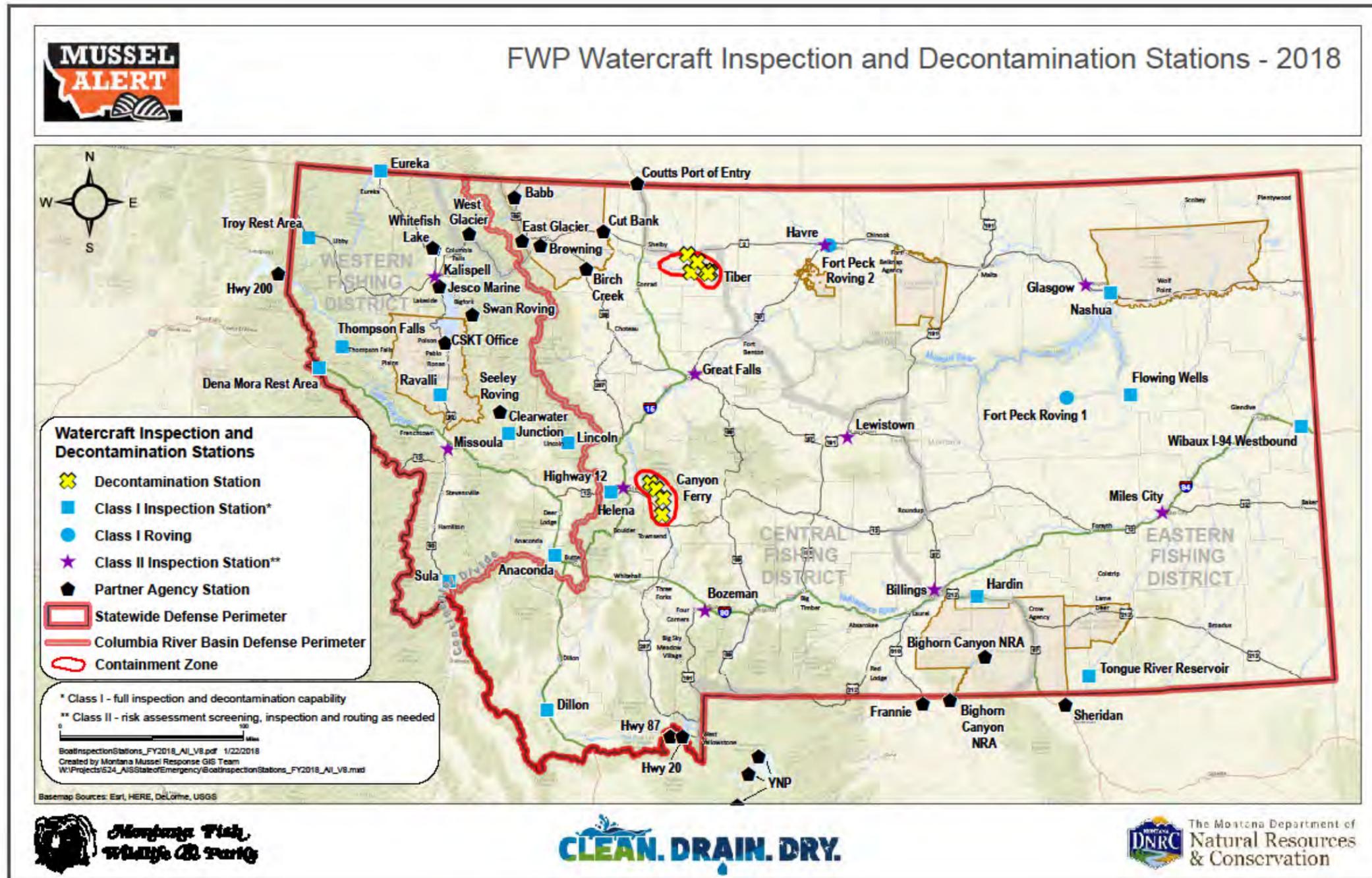
Central	South Fork Dry Fork Marias River (NW of Pendroy)	1	1	1	
Central	South Fork Madison River	1	1	1	GYCC Grant
Central	South Fork Musselshell River	1	1	1	
Central	Spring Meadow Lake	2	2	4	
Central	Sun River	2	1	2	
Central	Sun River	2	1	2	
Central	Swift Reservoir	2	1	2	
Central	Tenmile Creek	1	1	1	
Central	Teton River	1	1	1	
Central	Three Forks Pond	1	1	2	
Central	Three Forks Pond East	1	1	1	
Central	Tiber Reservoir	15	6	90	
Central	Tunnel Lake (W of Piskun on Pishkun Rd)	1	1	1	
Central	Twin Lakes (SW of Wisdom)	1	1	1	
Central	Upper Carters Pond	1	1	1	
Central	Upper Holter Lake	2	2	4	
Central	Wade Lake	3	1	3	
Central	Wayne Edsall Pond	1	1	1	
Central	West Fork Gallatin River	2	2	4	
Central	West Rosebud Creek	1	1	1	GYCC Grant
Central	West Rosebud Lake (SW of Rosebud Ck) (GYCC)			1	GYCC Grant
Central	Willow Creek Reservoir (Augusta)	2	1	2	
Central	Willow Creek Reservoir (harrison)	2	1	2	
Central	Wise River	1	1	1	
Central	Wood Lake	1	1	1	
Central	Yellowstone River	2	2	4	
Central	Yellowstone River	2	2	4	
Central	Yellowstone River	2	2	4	
Central	Yellowstone River	2	2	4	
Central	Yellowstone River	1	1	1	
Central	Yellowstone River	1	1	1	
East	Anderson Reservoir (NW of Harlowtown)	1	1	1	
East	Anderson Reservoir (S of Chinook - Blaine Co)	1	1	1	
East	April Reservoir (N of Zurich; N of Fort Belknap)	1	1	1	
East	Bearpaw Lake	0	0	1	
East	Big Reservoir (N of Forsyth)	1	1	1	
East	Bighorn Lake	10	2	20	
East	Bighorn River	3	2	6	
East	Bighorn River	3	2	6	
East	Bison Bone Reservoir (S of Malta - Phillips Co)	1	1	1	
East	Boulder River (SW Big Timber)	1	1	1	

East	Boxelder Lake (In Plentywood)	3	1	3	
East	Br 047 Reservoir	0	0	1	
East	Broadview Pond (In Broadview)	1	1	1	
East	Brush Lake	2	1	2	
East	Buer Pond (N of Scobey)	2	1	2	
East	Buffalo Wallow Reservoir (NE of Lewistown - Fergus Co)	1	1	1	
East	Castle Rock Reservoir	2	2	4	
East	Choteau Reservoir (N of Chinook - Blaine Co)	1	1	1	
East	Clarks Fork Yellowstone River	1	1	2	
East	Clarks Fork Yellowstone River	1	1	2	
East	Compton Reservoir (N of Malta - Phillips Co)	1	1	1	
East	Cooney Reservoir	3	2	6	
East	Cow Creek Reservoir (Blaine Co)	3	1	3	
East	Deadmans Basin Reservoir	5	2	10	
East	Don Reservoir (N of Chinook)	1	1	1	
East	Drag Creek Reservoir (Near Crooked Creek)	1	1	1	
East	Dry Fork Reservoir (N of Chinook - Blaine Co)	3	1	3	
East	Elmo, Lake	2	2	4	
East	Ester Lake (SW of Malta - Phillips Co)	1	1	1	
East	Flathead Lake	25	3	75	CSKT, WLI, FLBS
East	Flynn Pond (Near Chinook)	1	1	1	
East	Forsman Reservoir (N of Glasgow)	1	1	1	
East	Fort Peck Dredge Cuts	4	2	8	
East	Fort Peck Lake	13	4	52	USACE?
East	Fort Peck Trout Pond	2	2	4	
East	Gartside Reservoir	1	2	2	
East	Glasgow Base Pond (N of Glasgow)	1	1	1	
East	Grant Reservoir (N of Miles City)	1	1	1	
East	Gullwing Reservoir (SW of Malta)	1	1	1	
East	Holland Reservoir	0	0	1	SVCs, WLI
East	Homestead Reservoir (N of Terry)	1	1	1	
East	Johnson Reservoir (N of Lindsey; NW of Glendive)	1	1	1	
East	Johnson Reservoir (S of Culbertson)	1	1	1	
East	Judith River	1	1	1	
East	Karsten Coulee Reservoir (SW of Malta)	1	1	1	
East	Lake Baker	1	1	1	
East	Lake Josephine (billings)	2	1	2	
East	Laurel Pond (Laurel)	2	1	1	
East	Little Warm Reservoir (SW of Malta)	1	1	1	
East	Lower Glaston Lake (N of Big Timber)	1	2	2	

East	Maier Reservoir (NW of Baker)	1	1	1
East	Medicine Lake	2	2	4
East	Meyers Pond (NW of Ekalaka)	1	1	1
East	Miles City Hatchery Pond	1	1	1
East	Milk River	2	2	4
East	Milk River	2	2	4
East	Milk River	2	2	4
East	Milk River	2	2	4
East	Milk River	2	2	4
East	Missouri River	5	2	10
East	Missouri River	3	3	9
East	Missouri River	2	2	4
East	Musselshell River	2	2	4
East	Musselshell River	2	2	4
East	Musselshell River	2	2	4
East	Nelson Dredge	2	2	4
East	Nelson Reservoir	5	3	15 BOR
East	North Polly Reservoir (NE of Chinook)	1	1	1
East	O'juel Lake (N of Glasgow)	1	1	1
East	Olson Pond	0	0	1
East	Paulo Reservoir (W of Glasgow)	1	1	1
East	Payola Reservoir (N of Winnett)	1	1	1
East	Petrolia Reservoir	2	2	4
East	Powder River	1	1	1
East	Raymond Dam (N of Plentywood)	1	1	1
East	Redwater River (W of Glendive)	1	1	1
East	Reser Reservoir (NW of Chinook)	1	1	1
East	Ruby Reservoir (S of Hinsdale)	1	1	1
East	Sagebrush Reservoir (SW of Malta)	1	1	1
East	South Sandstone Reservoir	2	2	4
East	Spotted Eagle Lake (In Miles City)	2	2	4
East	Stillwater River	2	2	4
East	Taint Reservoir (SW of Malta)	1	1	1
East	Tongue River	1	1	1
East	Tongue River Reservoir	4	3	12
East	Troika Reservoir	1	1	1
East	Valley Reservoir (SW of Glasgow; SE of Malta)	1	1	1
East	Wapiti Reservoir (SW of Malta)	1	1	1
East	West Boulder River (S of Sweetgrass on 298)	1	1	1
East	Winter Harbor Pond (Below Ft peck Dam)	2	1	2
East	Yellow Water Reservoir (E of Lewistown)	1	1	1

East	Yellowstone River	2	2	4	
East	Yellowstone River	2	2	4	
East	Yellowstone River	2	2	4	
East	Yellowstone River	2	2	4	
East	Yellowstone River	2	2	4	
East	Yellowstone River	2	2	4	
East	Yellowstone River	1	1	1	
East	Yellowstone River	1	1	1	
East	Yellowtail Afterbay Reservoir	3	2	6	BOR

APPENDIX C: 2018 Watercraft Inspection and Decontamination Station Map



Appendix D: Invasive Mussel Irrigator Materials

CLEAN. DRAIN. DRY.

Montana's waters are at risk from Aquatic invasive species.

Don't move construction or irrigation equipment unless it's **CLEAN, DRAINED AND DRY**

▶ Clean equipment by removing water, plants and mud.
▶ Drain water from every compartment.
▶ Dry before moving equipment to another waterbody.

DRAFT

HELP STOP THE SPREAD OF INVASIVE SPECIES

CleanDrainDryMT.com
 f Protect Our Waters Montana
 ☎ 406.444.2440

Montana Fish, Wildlife & Parks
 DNRC

CLEAN. DRAIN. DRY.

PROTECT OUR WATERS

HELP STOP THE SPREAD OF INVASIVE SPECIES

DRAFT

Aquatic invasive species, such as zebra & quagga mussels, pose huge risks to Montana waters and our way of life.

IMPACTS INCLUDE:

- ▶ Increased utility bills: mussels clog public water systems, intakes and dams.
- ▶ Increased costs to agriculture: mussels choke off irrigation systems and degrade water supplies which impacts crop and livestock production.
- ▶ Loss of recreational opportunities: mussels attach to and damage boats, harm fisheries, and can decrease access to waterbodies.
- ▶ Degrade habitat and water quality: mussels can cause algae blooms and impact native species.

WHAT YOU CAN DO:

- ▶ If you work or play on the water, Clean, Drain & Dry your boat and equipment after every use.
- ▶ All watercraft must stop at inspection stations. All watercraft, including non-motorized and commercially hauled must stop for an inspection. Be sure to tell out-of-state visitors their boat must be inspected when entering Montana.

IF YOU SEE SOMETHING, SAY SOMETHING: an attached mussel is an invasive mussel. Montana's native mussels do not attach to underwater surfaces.

CleanDrainDryMT.com
 f Protect Our Waters Montana
 ☎ 406.444.2440

Montana Fish, Wildlife & Parks
 DNRC

Appendix E: Workshop Press Release

Agencies, watershed groups and tribal reps take aim at mussel protections in Missouri Basin

LEWISTOWN, Mont. – Armed with a grant from the National Invasive Species Council, a broad coalition of Montana agencies, watershed groups and Tribal representatives convened a workshop Jan. 29, 2018, in Lewistown to map out plans for improving the state’s ability to prevent and manage invasive mussels in the Missouri River Basin.

“While a good deal of the AIS prevention efforts to date have been focused west of the Continental Divide, we’re obviously just as concerned about introductions to the east,” said Steve Wanderaas, Supervisor at the McCone County Conservation District and vice chair of the Montana Invasive Species Council. “This is a dynamic group of partners committed to ensuring an introduction doesn’t happen on our watch.”

The workshop was sponsored by the Montana Invasive Species Council and is part of a larger pilot project in the Missouri Basin to learn from the 2016 detections of mussel larvae in Tiber and Canyon Ferry reservoirs.

“The goals include improving coordination between the state and its partners, developing a strategic plan, assessing the economic impacts of a mussel infestation, and augmenting the state’s Early Detection and Rapid Response Guidelines with measures specific to the Missouri Basin,” said Wanderaas.

The pilot project, to be led by the Montana Invasive Species Council, includes a wide range of partners: Montana Fish, Wildlife and Parks, the Missouri River Conservation Districts Council, Musselshell Water Coalition, the Milk River Watershed Alliance, the Cascade Conservation District, the Blackfeet Nation, the Lower Musselshell Conservation District, Petroleum County Conservation District, the Bighorn River Alliance, Big Sky Watershed Corps members, and federal agencies in the basin.

In response to mussel detections in two eastern reservoirs last year, the Central and Eastern Montana Mussel Response Team was formed to assess the risk of invasive mussels to eastern waterways, and to provide recommendations to the state on better protecting the basin. The Missouri River pilot project will build on these efforts to strengthen protections and enhance collaboration between partners.

“The Missouri River Basin is a major economic driver in the state of Montana, including hydropower, irrigation and providing countless recreational opportunities for residents and visitors,” said Missouri River Conservation Districts Council Coordinator Rachel Frost. “An infestation has the potential to threaten our waters, communities, and very way of life – we are here to do everything we can to protect our freshwater resources for present and future generations.”

For more information on the Montana Invasive Species Council, visit: <http://dnrc.mt.gov/divisions/cardd/montana-invasive-species-program/misc>. To see the Central and Eastern Montana Mussel Response Team recommendations, see: <http://missouririvercouncil.info/wp-content/uploads/2017/03/CEMTMusselResponseReporttoFWP.pdf>.

APPENDIX F: RESOURCES

Blackfeet Nation's AIS Program: <http://blackfeetfishandwildlife.net/>

Confederated Salish & Kootenai Tribes AIS Program: <http://csktnomussels.org/>

Fish Wildlife & Parks AIS Program: <http://fwp.mt.gov/fishAndWildlife/species/ais/> and <http://musselresponse.mt.gov/>

Glacier National Park's AIS Program: <https://www.nps.gov/glac/planyourvisit/ais.htm>

Missouri River Conservation Districts Council: <http://missouririvercouncil.info/>

Missouri River Mussel Response Team Recommendations Report: <http://missouririvercouncil.info/wp-content/uploads/2017/03/CEMTMusselResponseReporttoFWP.pdf>

Montana Invasive Species Council: <http://dnrc.mt.gov/divisions/cardd/montana-invasive-species-program/misc>

Montana Public Radio 'SubSurface' podcasts: <http://mtpr.org/programs/subsurface-resisting-montanas-underwater-invaders>

Province of Alberta's AIS Program: <http://aep.alberta.ca/fish-wildlife/invasive-species/aquatic-invasive-species/default.aspx>

Upper Columbia Conservation Commission: <http://dnrc.mt.gov/divisions/cardd/montana-invasive-species-program/uc3>

Waterton National Park's AIS Rules: <https://www.pc.gc.ca/en/pn-np/ab/waterton/info/index/plans/reglements-regulations/envahissantes-invasive>

Western AIS Information (Pacific States Marine Fisheries Commission): <http://www.westernais.org/>

MONTANA PROTOCOL FOR RESPONSE TO EARLY DETECTION OF DREISSENID MUSSELS

1

VERIFY

PURPOSE: Confirm suspected identification of the Dreissenid species.
LEAD: FWP

2

INITIAL NOTIFICATION

PURPOSE: Ensure that all parties that have jurisdiction in response decisions are informed of a suspect or positive identification within 48 hours.
LEAD: FWP

3

ACTIVATE MUSSEL RESPONSE INCIDENT COMMAND TEAM

PURPOSE: Activate the Mussel Response Incident Command Team to lay the ground work for coordination, communication and on the ground response.
LEAD: FWP, response team

4

BASIN INTERAGENCY RESPONSE PLAN

PURPOSE: Activate a response that promotes information sharing, ensures efficient resource management, and supports on-scene management.
LEAD: Response team and CRB MAC Group

5

DEFINE EXTENT OF INFESTATION (MAY OCCUR CONCURRENTLY WITH OBJECTIVES 6 AND 7).

PURPOSE: Establish physical range of infestation.
LEAD: Response team

6

ESTABLISH EXTERNAL COMMUNICATIONS SYSTEM

PURPOSE: Ensure consistent and effective communication to external stakeholders, including the media and public.
LEAD: FWP, response team

7

PREVENT FURTHER SPREAD

PURPOSE: Minimize spread along all pathways.
LEAD: FWP, response team

8

INITIATE AVAILABLE/RELEVANT CONTROL MEASURES

PURPOSE: Proceed with either Early Detection / Rapid Response (EDRR) eradication efforts or containment / mitigation activities.
LEAD ENTITY: FWP, response team

9

RESPONSE CONCLUSION IF ICS IS INITIATED

PURPOSE: Establish continuity with local managers to transition from a response scenario to ongoing monitoring and management.
LEAD: Response team

A supplement to the Montana Dreissenid Mussel Rapid Response Guidelines and the Columbia River Basin Rapid Response Plan



Zebra and Quagga mussels can have major impacts on recreation, such as encrusting watercraft

SOURCE: Quagga mussels on boat propeller from National Park Service

TYPES OF MUSSELS



Quagga



Zebra

The State of Montana's

DREISSENID

Mussel

RAPID RESPONSE

GUIDELINES

Updated: 9/4/2018

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State of Montana Statement of Commitment and Adoption

Montana is a headwater state for three water basins and is on the last line of defense to block dreissenids (invasive mussels) from spreading to the west side of the Continental Divide and into the Columbia River Basin. Montana's invasive mussel rapid response efforts in 2016 and 2017 and the recent legislative actions to enhance invasive species management demonstrate Montana's commitment to the protection of the waters of the state and the region.

For every year the spread of the mussels is delayed, the state realizes cost savings from not having to manage additional infested waterbodies. Delaying the spread also allows time for treatment technology to advance, improving the chances for the development of effective control technologies for dreissenid mussels.

The rapid response guidelines herein are intended to direct the process, protocols, and coordinated effort the State of Montana will employ to respond to new dreissenid mussel detections. These guidelines were built from best management practices and the direct experience and the lessons learned during Montana's first dreissenid mussel detection in 2016. It is intended to ensure an orderly, efficient, and effective response.

While response activities are site specific, a response to a detection of mussels must be undertaken immediately. We adopt these guidelines and direct agency staff to follow these protocols in responding to dreissenid mussel detections in the State of Montana.

Signed:

Martha Williams, Director
Fish, Wildlife and Parks

John E. Tubbs, Director
Department of Natural
Resources and Conservation

The State of Montana's Dreissenid Rapid Response Guidelines

Introduction and Purpose

These Dreissenid Rapid Response Guidelines (guidelines) and supplementary documents identify the State of Montana's role, response procedures, and operational needs in the event dreissenid mussels are verified in waterbodies in the state (beyond where currently confirmed). These guidelines provide guidance and instruction for a variety of responses from an emergency declaration for a large high-risk waterbody to responses for isolated, lower risk waters. The guidelines address rapid response activities. Longer-term shifts in management towards suppression, local exclusion, and adaptation are not considered here.

The purpose of the guidelines is to guide the State of Montana's response to the detection of dreissenid mussels in a new waterbody in order to define the scope of mussel distribution, reduce the risk of further spread to other waterbodies, and where feasible, eradicate them from the waterbody. Actions identified herein will ensure:

- A well-coordinated rapid response
- Data and information are collected and presented in an organized way for informed decision making
- The extent of dreissenid mussels is determined
- All control options are considered and implemented, if feasible
- The further spread of invasive mussels is prevented
- Decisions are made in a transparent manner.
- Coordinated and timely reporting, outreach and education to stakeholders and public
- Economic and ecological damage from incident are mitigated

Coordination and Alignment

These guidelines are a supplement to the **Montana Aquatic Invasive Species Plan**.

The rapid response guidelines align with the Montana Invasive Species Strategic Framework and the **Columbia River Basin Interagency Invasive Species Response Plan: Zebra Mussels and Other Dreissenid Species**. Montana is a signatory to this plan. (http://www.100thmeridian.org/Columbia_RBT.asp)

Support for these guidelines and measures for improved early detection and rapid response for invasive mussels was provided by the legislature in 2017 through HB 622.

1. Verification

PURPOSE: Confirm suspected identification of the Dreissenid species.

LEAD: Montana Fish, Wildlife & Parks (FWP)

STEPS:

1. Send suspect samples for independent verification.
2. As soon as feasible, collect and analyze additional samples from the waterbody with a suspect mussel identification. Ensure a rapid turnaround time for sample analysis.
3. Assemble and prepare data for initial report if verification identifies the waterbody as suspect.

Detection

FWP has established both a monitoring program for Montana's waters and watercraft inspection stations program as part of a broader perimeter defense system to reduce the spread of mussels into the state. Maps, monitoring reports, and monitoring protocols are posted to the agency website:

<http://fwp.mt.gov/fishAndWildlife/species/ais>

In addition to the state's early detection monitoring program, reports of suspected aquatic invasive species sightings from external sources are evaluated by FWP staff. Reports can be submitted to a web form

<http://fwp.mt.gov/doingBusiness/contactUs/aisSighting>

phone calls to the local FWP offices, or TipMONT 800-TIP-MONT (800)-847-6668.

Verification

Definitions from the **Western Regional Panel's 2014 meetings** developed standard definitions and criteria that are used here:

- Verification – the scientifically based process to confirm the presence of Aquatic Invasive Species (AIS).
- Detection, detect or detected – the verified presence of AIS.
- Minimum to verify detection: 2 independent results from the same sample, using scientifically accepted techniques.

When a sample or report of a dreissenid mussel detection is received by FWP, verification proceeds through established protocols. Official verification for the presence of dreissenid mussels in a waterbody is under the jurisdiction of the State of Montana. Following additional sampling, or re-testing existing samples, a waterbody will be identified as "Suspect" for dreissenid mussels if:

Dreissenid mussel veligers are found and confirmed utilizing **BOTH** of the following methods:

- Microscopy identification of a sample from a qualified expert and concurrence from a second qualified expert. (Montana FWP Aquatic Invasive Species Laboratory, Bodega Labs, Northwest Biological Services, EcoAnalysts Labs, Bureau of Reclamation (BOR), Portland State University (PSU) or other qualified lab) **AND**
- PCR (genetic) identification of a sample by a qualified expert and concurrence from a second qualified expert: (Bodega Labs, Pieces Labs, USGS, BOR or other qualified lab).

Additional **laboratories around the west** have been identified by the Western Regional Panel and are included in the Columbia River Basin Plan if needed.

A waterbody will be considered "Positive" for dreissenid mussels if specimens are verified through the above protocol during two separate sampling events **OR** if live adult mussels are found.

NOTE: The State of Montana does not use eDNA as a primary early detection method for dreissenid mussels and eDNA results are currently not used to determine dreissenid status for waterbody classification.

Waterbody definitions:

- Status Unknown – Waters that have not been monitored.
- Undetected/Negative - sampling/testing is ongoing and nothing has been detected, or nothing has been detected within the time frames for de-listing.
- Inconclusive (temporary status) - Water body has not met the minimum criteria for detection.
- **Suspect – Water body that has met the minimum criteria for detection (MANAGEMENT TRIGGER)**
- Positive – Multiple (2 or more) subsequent sampling events that meet the minimum criteria for detection.
- Infested – A water body that has an established (recruiting or reproducing) population consisting of multiple age classes of dreissenid mussels.

A sample is considered "inconclusive" if it fails to meet minimum criteria for detection. FWP will communicate internally and as necessary with outside labs and experts to evaluate additional samples for inconclusive sites. Once a waterbody is declared

“suspect” the Director of FWP will be briefed immediately and notification outside the agency will proceed as described in the next section on notification.

Delisting “Suspect” and “Positive” waterbodies follows standards established by the Western Regional Panel for Aquatic Invasive Species. “Suspect” waters can be delisted following 3 years of intensive sampling with no verified detections. “Positive” waters can be delisted following 5 years of no verified detections.

Investigate and report

Following the identification of a suspect waterbody the following steps are taken by FWP staff:

- Proceed with notification.
- Deploy field crews to take additional water samples
- Prepare for emergency closure
- Deploy visual inspections for adult mussels: scuba, snorkel, sniffer dogs
- Take additional veliger samples and inspect shoreline/hard substrate
- Prepare data and assemble an initial report on the specifics of the detection including a draft press release and talking points for the notifications.
- Prepare for containment efforts.

2. Notification

PURPOSE: Ensure that all parties that have jurisdiction in response decisions are informed of a suspect or positive identification within 24 hours. Notification of all parties will occur as soon as possible following a suspect detection.

LEAD: Montana Fish, Wildlife & Parks (FWP)

STEPS:

1. Notification of Governor’s Office, FWP, DNRC
 - If initiating the incident command system (ICS) is determined to be necessary, an incident command (IC) is designated
2. Initial notification
3. Public notification

Leadership notification

TIER 1: Within 24 hours of official State verification (confirmation of a suspect or positive detection by the procedures identified in the previous section) of dreissenid mussels in a new waterbody, FWP will notify other parties as follows in this section. If

Incident Command is initiated for the response during this process, communication responsibilities including notification are transferred to the Joint Information Center (JIC). The initial report will be the basis of the press release; the draft press release should be prepared along with the briefing for the leadership notifications.

Following a "Suspect" or "Positive" identification of dreissenid mussels in the waters of Montana, FWP will conduct the following notifications. All communications outside the agency will be at the direction of the FWP Director's Office:

Leadership notification:

- FWP Director
 - FWP Invasive Species Program and Management Staff
 - FWP legal counsel
- Department of Natural Resource Conservation (DNRC)
- Governor's Office

Determination made on establishing Incident Command:

On notification of a new mussel detection, the Director of FWP or their designee(s) approves initiating IC. Joint command will be established for a response involving a waterbody where there are multiple jurisdictions. Response team contacts will be identified. The process for setting up IC and initial tasks for the Incident Commander follow in section 3.

Initial Notifications

TIER 2: Those entities that are directly impacted and/or entities with jurisdiction (Counties, State agencies, Federal agencies, Tribes, power companies, irrigation districts, etc.) will be notified immediately once outside communication is authorized by the Director's Office. State leaders including legislators (House and Senate Leadership) will be contacted at this time.

DIRECTLY IMPACTED PARTIES

- Legislators (House and Senate Leadership)
- State agencies
- Impacted counties, local government and sheriff's office
- Federal agencies including United States Fish and Wildlife Service (USFWS), Bureau of Reclamation (BOR), United States Army Corps of Engineers (USACE), US Forest Service and National Park Service (NPS).
- Tribes in the affected watershed
- Power companies
- Relevant water delivery agency (irrigation districts and canal companies)

TIER 3: Given the potential for regional spread, agencies handling preliminary reports of dreissenid introductions need to consider the importance of alerting all vulnerable jurisdictions including those outside of the Columbia River Basin (e.g., other Western states) and all other parties with jurisdiction in response decisions. During the first Montana dreissenid rapid response in fall 2016, a stakeholder list by user type was developed and is maintained by FWP.

Unless unique law enforcement or other conditions warrant extreme caution, the Columbia River Basin plan recommends that an initial alert message be communicated via email (and phone if possible) as soon as possible to all state invasive species coordinators in the West.

REGIONAL AND STATEWIDE PARTNERS

- Columbia River Basin Rapid Response Team
- Downstream hydropower facilities
- All Tribes in the state
- Western Aquatic Invasive Species Coordinators

Public Notification

Following the initial notifications, notification will be made to the public. FWP, or the JIC if established, will notify the public using a press release and briefing. The press release should go out as soon as possible following the personal calls and emails to known stakeholders.

3. Activate Mussel Response Incident Command Team

PURPOSE: If determined necessary by the FWP Director, activate the Mussel Response Incident Command Team (Response Team) to lay the ground work for coordination, communication, and on the ground response.

LEAD: FWP, Response Team

STEPS:

1. Depending on location of the incident, the western, central, or eastern Incident Command Team will be activated. Helena Multi Agency Command (MAC) Team will also be activated.
 - Each area team has designated team members and roles.
 - Incident Command Team members will include staff from FWP, DNRC, and other relevant agency staff.
2. Develop cooperative agreements, if needed, with cooperating agencies, tribes and other water / land management entities.

If determined necessary by the Director, FWP will initiate the Incident Command System upon official verification of a suspect detection of dreissenid mussels. The scope, scale and function of the ICS shall be determined based on the circumstances of the detection. FWP may request assistance from other governmental and tribal partners.

A rapid response may have several possible outcomes, such as quarantining the area, containing the dreissenid mussels to a given area, suppressing population densities to reduce the rate of spread or prohibiting high-risk transport vectors. Based on the evolving situation for new detections, the Incident Commander will set the objectives for each response.

In addition to the numerous options that can be considered as part of any rapid response, there are key steps integral to any such effort, including: (1) responding to and minimizing impacts of dreissenid mussels including containment / quarantine; (2) providing timely and accurate information to managers, stakeholders and the general public; (3) providing for the safety of the public as well as all personnel involved at any stage of a response; and (4) coordinating with neighboring and regional jurisdictions on immediate response and long-term management, as appropriate. Developing a shared understanding of these important steps prior to a response is critical to effective containment efforts, and greatly enhances the ability of jurisdictions to coordinate and cooperate.

PROCEDURE FOR ESTABLISHING INCIDENT COMMAND TEAM

1. FWP Director activates Incident Command
 - FWP Director is briefed on the mussel detection and reviews the initial report available information. Based on the circumstances of the detection,

approval of activating the response team is given (section 2 of the guidelines).

2. FWP identifies candidates appropriate to the situation from the pre-identified list of staff.
 - State agencies and local entities with jurisdiction in the incident area will identify staff willing to serve as Incident Commanders and response team staff. AIS staff with scientific and operational knowledge of AIS will also be included.
 - Joint command will be established for a response involving a waterbody where there are multiple jurisdictions including waters with joint tribal or federal management.
 - The Incident Commander nominates and requests Command General Staff to fill out the leadership team.
 - Incident Commander and initial leadership team receives briefing from FWP staff on the status of the detection, current actions, and communication needs.
3. The Incident Commander appoints a response team appropriate to the scope of the anticipated response.
 - Incident Commander appoints the Command General Staff from list of pre-approved department employees and/or qualified employees from other agencies per established cooperative agreements.
 - Incident Commander initiates communications team and regional partners. Engages the Columbia River Basis Interagency Response network as appropriate (section 4).
 - Establish Joint Information Center (section 6): prepare second press release.
 - Initial tasks include establishing initial containment, drafting a response plan, drafting a communications plan, and setting up an operations base.

The coordination structure described in these guidelines are designed to comply with the requirements of the National Incident Management System (NIMS). This structure focuses on interagency decision-making and communication.

4. Activate Appropriate Organizational Elements of the Columbia River Basin (CRB) Interagency Response Plan

PURPOSE: To coordinate a rapid, effective, and efficient interagency response in the CRB in order to delineate, contain, and when feasible, eradicate dreissenid mussel populations if they are introduced in CRB waters. Montana is a signatory to the plan and has agreed to implement these guidelines as appropriate, consistent with Montana's laws, policies, and authorities in the event that zebra mussels or other dreissenid species are detected in Columbia River Basin waters

LEAD: Response team and CRB MAC Group

STEPS:

1. Make initial notifications.
2. Activate appropriate organizational elements of the **CRB Interagency Response Plan**.
3. Proceed following elements of the CRB Plan.

The 100th Meridian Initiative's Columbia River Basin Team is responsible for activating and implementing the management structures necessary to respond to and support efforts to contain and control dreissenid mussels. Because CRB member agencies do not share a standard organizational structure on a day-to-day basis, the Team has adopted the ICS organizational structure as its emergency response structure. The organizational elements are divided into two groups: coordination (policy and communication) and incident management (tactical). The structure is designed to be flexible. Only those elements needed to respond to and support a given situation will be activated. Note that personnel of 100th Meridian Initiative Columbia River Basin Team member agencies may be assigned to any or all of the described organizational elements, depending on their organizational role, expertise, and management requirements of the specific situation.

Contact with the Columbia River Basin (CRB) Team is via US Fish and Wildlife 877-STOP-ANS hotline. http://www.100thmeridian.org/Columbia_RBT.asp

5. Define Extent of Dreissenid Distribution

PURPOSE: Establish physical range of dreissenid mussel distribution.

LEAD: FWP, Response team

STEPS:

1. Lead responder assesses the current situation status to determine probable scope and impact of dreissenid mussel distribution.
2. Lead responder determines quarantine measures.

Following the return of a positive sample, FWP shall conduct an initial assessment of the affected waterbody and prepare a report for review by the agency directors and the Incident Commander similar to the leadership briefing described in Section 2. The Incident Commander, in cooperation with participating agency staff, will direct further assessment of the waterbody to gauge the scope and scale of the incident and to identify resource needs. The response team reviews the current situation status to determine probable scope and impact of dreissenid mussels. The early goal will be to contain the invasive mussels and prevent further spread.

The following sampling efforts and tasks should be considered:

1. Intensive plankton tow sampling for microscopy analysis for dreissenid veliger identification.
 - Sampling in the area where mussels were detected.
 - Sampling downstream of the mussel detected area.
 - Sampling upstream of the mussel detected area.
2. Obtain necessary permission from property owners to survey infrastructure.
3. Check existing substrate samplers for mussel adults region-wide including:
 - Water delivery agencies and companies
 - Utility companies with hydro power infrastructure
4. Check exposed infrastructure for adults, utilizing divers, snorkeling, ROV's, or other appropriate methods belonging to the following entities:
 - BOR/Corps of Engineers
 - USFWS
 - Hydropower infrastructure
 - Relevant water delivery companies and agencies (irrigation districts, canal companies, etc.)
 - Local/regional law enforcement agencies
5. Conduct shoreline surveys, wading and searching rocks and bottom substrates for adult mussels. In exposed shoreline areas, explore deploying mussel sniffing dogs to facilitate adult mussel detection.

6. Explore removing existing infrastructure from the water for enhanced adult mussel survey (moored boats, docks, buoys).
7. Explore collection of eDNA samples in the suspected mussel area, upstream and downstream.

6. Establish External Communications System

PURPOSE: Ensure consistent and effective communication to external stakeholders, including the media and public.

LEAD: Response team

STEPS:

1. Issue press releases using pre-approved templates.
2. Coordinate with interagency public information officers ("PIOs").
3. Establish point of contact ("POC") for media.
4. Prepare for daily briefings to facilitate information sharing.

The response team is responsible for communicating **early and often** with the public and stakeholders during the response. The external communications plan is the responsibility of the response team or PIO and should be commensurate with the scope and scale of the incident. If ICS is established, the IC will provide instruction on approval process for communications, and all communications will be coordinated with the Governor's Office. A segmented stakeholder list for external communications was developed for the 2016 mussel response and is maintained by FWP's AIS program. Local stakeholder groups like the Central and Eastern Montana Invasive Species Team (CEMIST) and the Upper Columbia Conservation Commission (UC3) will also be utilized to help inform local stakeholders.

The following list includes key activities that were undertaken during the fall 2016 response and should be considered by the response team:

1. Issue press release using pre-approved template.
2. Coordinate with interagency public information officers ("PIOs"). Establish Joint Information Center if ICS is established.
3. Establish ONE public information officer as the main point of contact for all incoming and outgoing communications.
4. Prepare response daily briefings to facilitate information sharing.
5. Establish online communication resources:
 - gov delivery,
 - <http://musselresponse.mt.gov/>,
 - <https://www.facebook.com/MTMusselResponse/>
6. Establish dedicated response phone line.

7. Consider weekly teleconferences for stakeholder briefings.
8. Prepare response communication plan, talking points, incident timeline, and FAQs.
9. Issue press releases for major milestones and response activities.

7. Prevent Further Spread

PURPOSE: Minimize spread along all pathways.

LEAD: Response team

STEPS:

1. Initiate mandatory inspections, decontaminations or closures.
2. Utilizing existing GIS database, inventory boat launches in affected area (including those upstream and downstream, regardless of state boundaries).
3. Identify government or private entities with management authority over potential pathways.
4. Contact management authorities and advise of potential mandatory inspections or closures.

Emergency closure

Preventing spread of an introduction is crucial to the success of a response. The initial goal will be to identify response alternatives to contain the population as quickly as possible. The use of a quarantine or temporary closure of the mussel detected waterbody to watercraft, withdrawals for irrigation or allocation, or diverting flow may be necessary until other techniques can be implemented to manage the pathways. The duration of the closure will last until a prevention / containment plan is implemented for the water body. If closure is untenable, watercraft inspection teams must be on hand for inspection and, if necessary, decontamination.

FWP has the authority to adopt an emergency rule closing the waterbody to all surface occupation or use. Emergency rulemaking authority is to be used carefully and must involve the FWP Legal Unit at the beginning of the process.

Ensure that an emergency declaration is forwarded to impacted County Emergency Manager(s) and Federal partners. Consider:

- Current priorities
- Impact on commercial and recreational activities.
- Existing boater movement data to determine water bodies at risk for spread
- Inventory impacted infrastructure and resources

Brief regional partners on closure actions and ensure that all county, state and federal agencies impacted by the dreissenid detection are notified (review section 2). This is a time to actively coordinate and engage stakeholders.

Containment actions to be considered

- Quarantine dreissenid detected waterbodies as needed to prevent spread by watercraft.
- Close boat ramps and access points and/or decontaminate watercraft.
- Identify dispersal vectors (including movement by humans, fish and wildlife, water traffic, water flow, and other processes). Assume measures are needed to prevent release of veligers as well as movement of adult mussels.
- Assess the likely movement of boats and other watercraft that recently used the mussel detected water body to identify inspection needs in other water bodies.
- Develop and implement **Hazard Analysis and Critical Control Point (HACCP)** plans to ensure that response personnel do not further spread the original introduction. The **five steps to implement HACCP** planning to control a pathway from spreading dreissenid mussels and other AIS are available on line and should be assigned to the plans section.
- Quarantine operations (e.g., hatcheries, aquaculture) that are likely to spread the species outside the affected watershed(s).
- Consider and implement any needed prevention of overland or aerial transport to other water bodies.
- Stop or slow water release to potentially uninfested sites.
- Consider special management measures for operations of locks and commercial vessel traffic, if appropriate.
- Draw water from below thermocline.
- Install physical barriers, if appropriate.
- Stop all sanctioned water related events on the waterbody until appropriate containment protocols can be established.

Watercraft inspection and decontamination stations

- Establish wash and inspection requirements on boats and equipment (following WRP Uniform Minimum Protocols (UMPs), and provide for associated logistical support (e.g., decontamination kits).
- Initiate a post haul-out inspection of boats and equipment in the waterbody where mussels were detected.
- Coordinate with land management authority to implement mandatory inspection and decontamination of boats upon entry and exit of water body.

- Utilize watercraft inspection system to track compliance for new waterbody inspection regulations.
- Ensure decontamination units are available at water body.

Additional Resources

Based on the current situation status, it is important to assess what resources may be needed for the response e.g., staffing, operations budget, and equipment. If additional staff are needed, the first step should be to deploy employees preapproved for rapid response efforts. It is important to communicate with the FWP Chief of Administration regarding additional fiscal resources that may be needed for the response.

MONTANA:

Montana Invasive Species Council

The 2017 legislature directed the Montana Invasive Species Council to identify and form an independent scientific advisory panel. Once assembled, that panel will be available for technical consultation.

Upper Columbia Conservation Commission (UC3)

The 2017 legislature created the UC3 to protect the aquatic environment from the threat of AIS in the upper Columbia River Basin. This group encourages cooperation and coordination for AIS monitoring and education and is a resource for AIS information in the Columbia River Basin portion of Montana.

REGIONAL:

Columbia River Basin (CRB) Interagency Rapid Response Team (IRRT) team

The Columbia River Basin (CRB) **Interagency Rapid Response Team (IRRT)** team includes interagency personnel that may be assigned to provide on scene technical support or incident management support at the request of FWP and the approval of the CRB Multiagency Coordination (MAC) Group. They also can assist in confirming the presence and determining the scope of the dreissenid mussel distribution, as well as identifying and implementing appropriate containment, control, and eradication efforts. Team members will be selected based on the technical and management needs of the specific situation. This team is contacted by the CRB Notification Coordinator (USFWS) at the initiation of the response when informed by the Montana Invasive Species Coordinator.

8. Activate Available/Relevant Control Measures

PURPOSE: Proceed with either Early Detection Rapid Response (EDRR) eradication efforts or containment and mitigation activities.

LEAD: Response team

STEPS:

1. Convene an expert panel for consultation on treatment & containment options.
 2. Response team identifies steps to implement preferred control or eradication actions.
 3. Initiate control or eradication action.
 4. Team to present alternative control strategies based on situation review and identify targets for incident conclusion.
-
1. **Convene an expert panel for consultation on treatment & containment options. See the "Additional Resources" listed under Section 7.**
 - Evaluate management options given the nature of the population (veligers only, adults and veligers, isolated population vs. widespread population, etc.).
 - Evaluate complicating factors involved with treatment in the waterbody (water movement, subsurface flow, water volume, ESA species, water use).
 - Evaluate feasibility and effectiveness of eradication methods for the dreissenid detected location. These methods include:
 - Waterbody drawdown.
 - Chemical treatment.
(option examples, see Appendix D for a complete list)
 - ♦ Chem One (copper sulfate crystals)
 - ♦ EarthTec (copper sulfate pentahydrate)
 - ♦ Hydrothol 191 (endothall-amine)
 - ♦ Natrix (copper carbonate)
 - ♦ Potassium chloride (potash)
 - ♦ Other effective products
 - If eradication is recommended, evaluate feasibility and probability of success of control tools
 - Capacity and timing for drawdown.
 - Evaluate and assess water movement and subsurface flow in the treatment area.
 - Calculate area for chemical treatment (acre feet) to determine the amount of chemical required.
 - Determine availability and lead time required to obtain the amount of chemical needed for treatment.

- Determine availability and lead time for silt curtains to contain/restrict water movement in treatment areas.
 - ♦ Identify construction contractors, USACE, BOR to carry out control actions.

2. Response team identifies steps to implement preferred eradication or control actions

- Preferred action(s) are fully documented.
- Engage regulatory authorities to obtain permitting and regulatory approval for eradication action. (EPA, USFWS, DEQ)
- If needed, draft MOUs or cooperative agreements with entities participating in eradication.
- Engage stakeholders on details and impacts of eradication action.
- Identify and contract with a pesticide applicator to conduct treatment, following applicable purchasing and contracting laws. Determine the lead time needed to mobilize the contractor in order to conduct the application.

3. Initiate eradication or control action.

- Evaluate in-water target concentration rates following treatment.
- Evaluate treatment efficacy and continue monitoring for evidence of surviving mussels.

4. Team to present alternative control strategies based on situation review and identify targets for incident conclusion. Proceed to Section 9 for incident conclusion.

9. Response conclusion if ICS is initiated

PURPOSE: Establish continuity with local managers to transition from a response scenario to ongoing monitoring and management

LEAD: Response team

STEPS:

1. Plans Chief prepares a transition plan to step down from ICS.
2. Incident Commander and leadership team meet with the FWP AIS Bureau Chief to review plan.
3. A transition date, revised schedule of activities and press release are drafted.
4. The Incident Commander requests and establishes a review team for an after action report.

The decision to transition back to local managers from an ICS structured rapid response will depend on many factors from the size and location of the waterbody involved, locally available resources, and the time of year. The final duties of the Incident Commander include reviewing the incident with the Planning Section Chief to determine if objectives for the response have been met. If this is the case, a transition plan should be developed and final report on the status of the response prepared.

The Incident Commander will meet with local managers and agency leadership including the Fish, Wildlife & Parks, Aquatic Invasive Species Bureau Chief to review the final report on the incident status and transition plan. Outcomes of this meeting should include a transition date for operations and communications functions. Once these tasks have been agreed to, a final press release should be prepared and released by the Public Information Officer assigned to the response as the final press communication by the ISC team.

Once the transition has been successfully completed, the Incident Commander will document all significant actions & information on Unit Log (**ICS214**). They will forward copies of all documentation to the Planning Coordinator and the FWP AIS Bureau Chief and request an after action review.

The task list for the final phase of the response for the Incident Commander includes:

- Assess incident plan objectives and prepare to transition to ongoing management as objectives are met.
- Ensure post action review is conducted, and lessons learned are captured and incorporated into training and guidelines revisions and updates. (After action report.)
 - Conduct a follow-up evaluation of response organizations and other interest groups to identify opportunities for improving rapid response

capacity. Disseminate “lessons learned” to other interested organizations (e.g., regional ANS panels).

- Revise the Rapid Response Guidelines and associated documents/guidelines based on evaluation and long-term monitoring results.
- As resources allow, develop and implement a research plan that evaluates the associated ecological and economic impacts of the invasion, the effectiveness of management interventions, and negative consequences of management interventions (beyond that required by permits).
- Determine the need for long-term funding for the current management effort and seek this funding as warranted.
- Document all significant actions, information on Unit Log ([ICS214](#)). Forward copies of all documentation to the Planning Coordinator and the FWP AIS Bureau Chief.

Montana Dreissenid Rapid Response Plan Appendices

The purpose of these documents is to provide detailed information to assist those responding to a new mussel detection. The intent is that these documents will be revised and updated as necessary.

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Appendix A: Missouri River Containment and Quarantine Plan

Introduction and Purpose

Montana's Dreissenid Mussel Rapid Response Guidelines outline the process of how the state of Montana would respond to a detection of dreissenid mussels in a new waterbody. The Missouri River Containment and Quarantine Plan (MRCQP) provides additional containment and quarantine information relating to waters of the Missouri River Basin. The Dreissenid Mussel Rapid Response Guidelines and MRCQP fulfill requirements outlined in MCA 80-7-1025.

Existing Efforts

The positive detection of dreissenid mussel veligers in Tiber and the suspect detection in Canyon Ferry Reservoir in late 2016 led to new rules to address the movement and introduction of AIS in the Missouri Basin and the state. ARM Rule 12.5.706(b)(c) requires all watercraft entering the state and all watercraft crossing west over the Continental Divide to be inspected for AIS prior to launching. ARM Rule 12.5.707(a) requires all watercraft exiting Tiber and Canyon Ferry Reservoirs to also be inspected and, if directed by the department, decontaminated.

To address this issue, watercraft inspection stations have been established on major routes of travel near the state border and along the Continental Divide. Stations typically operate during daylight hours during the boating season. In the event a boat enters the state when stations are closed, boaters are still required to seek out an inspection. To help accommodate this, all FWP offices provide inspections as well as at other high use locations. FWP provides updated information on watercraft inspection station locations and hours of operation at www.CleanDrainDryMT.com.

At Tiber and Canyon Ferry Reservoirs watercraft inspection stations were established at boat ramps to ensure all exiting watercraft are clean drained and dry. Exiting watercraft receive an inspection to ensure the boat is clean of any plants, animals or debris and all residual water in the motor, live wells and bilge is drained. Watercraft that are more complex with inboard motors or ballast tanks receive a hot water wash to ensure any hidden standing water is free of viable AIS.

A Certified Boater Program (CBP) was put into place at Tiber and Canyon Ferry for boaters that primarily use those waterbodies. This program helps address public access concerns while still ensuring exiting vessels are cleaned, drained and dry. Inspectors can not staff every ramp on those waters and the CBP provides a mechanism to allow

boaters to use ramps where inspectors are not present. The Certified Boater must take and pass a test illustrating they understand the issue and the requirements for watercraft exiting Tiber and Canyon Ferry. They then receive decals for their boat and trailer that indicates they are part of the CBP and allows them to use CBP only boat ramps. Boaters in the program must always clean drain and dry their boats and equipment upon exit and stop at any inspection stations they encounter. CBP boaters are not required to be inspected upon exit unless they plan to launch in a different waterbody. If a CBP boater plans to launch in a different waterbody they must be inspected and, if necessary, decontaminated.

Additional containment restrictions exist on Tiber due to the positive its mussel positive status. On Tiber Reservoir, gated barriers were installed at lower use boat ramps where staff are not available to inspect exiting watercraft. These gates are secured with a combination lock. CBP boaters receive the code, allowing only CBP participants to launch and exit at those locations. For non CBP boaters, the Marina and VFW launches have established watercraft inspection stations.

The CBP program is established under the authority of ARM Rule 12.5.707.1(a)(i). In the event of further dreissenid detections in Tiber and Canyon Ferry, this program will be modified accordingly to continue to ensure boats are not transporting dreissenid mussels.

In the event dreissenid mussels are detected in a new location, a response would follow similar containment efforts to what was put in place for Tiber and Canyon Ferry.

Future Actions

In the event of a new dreissenid mussels detection in waters of the Missouri Basin, FWP will respond following the Dreissenid Mussel Rapid Response Guidelines. Response will follow implementation similar to the Tiber and Canyon Ferry response including:

- Waterbody closure until such time as mandatory exit inspection can be implemented.
- Enact emergency rule to require inspections for all exiting watercraft.
- Establish mandatory watercraft inspection stations to ensure all exiting watercraft are clean drained and dry.

Specific tools and resources that will be utilized for a response in the Missouri River Basin include:

- AIS Geodatabase (Appendix B): In cooperation with DNRC and the Montana Heritage Program, a state-wide geodatabase was developed to facilitate the identification of impacted infrastructure, resources and stakeholders at or around any given waterbody in the state. The Geodatabase will be utilized to identify boat access, infrastructure, sensitive species, stakeholders and other information pertinent to enacting waterbody quarantine / containment / treatment. Waterbody-specific resource inventory summaries are under

development by the Heritage Program to help compile information for high priority waterbodies.

- Central and Eastern Montana Invasive Species Team (CEMIST): This is a stakeholder group consisting of conservation and watershed district representatives and other stakeholders in eastern Montana that are interested in the AIS issue. This group will be engaged to assist with communication and coordination with local community stakeholders in the event of a mussel detection.

Appendix B: AIS Web-based Response Tools

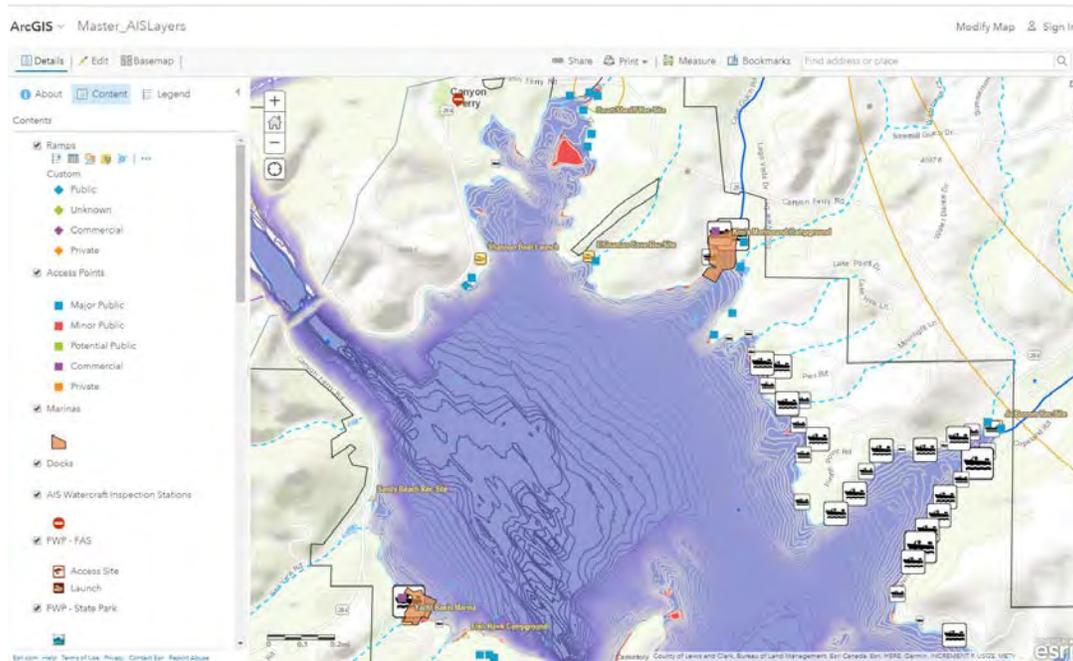
ArcGIS Online Map-based Tool

1. ArcGIS Online map tool with AIS Response GIS Layers
<https://arcg.is/1Kijb4>
2. Web map tool with AIS Response GIS Layers:
<https://umontana.maps.arcgis.com/apps/View/index.html?appid=642764efd9d04a4c98c51b266fa0d7fa>
3. Google Site for Montana Mussel Response Incident Command Support Tool
<https://sites.google.com/view/mt-mussel-response-tool>
4. Story Map for Montana Aquatic Invasive Species Geographic Response Plan Mapper
<https://umontana.maps.arcgis.com/apps/MapSeries/index.html?appid=9a6ce272bafd4b758ec5e0f49b130c0f>

An ArcGIS Online map-based infrastructure for invasive species rapid response planning has been developed that allows key agency personnel to: (1) prioritize zones of response based on site specific social, cultural, environmental, microeconomic, and macroeconomic potential impacts; (2) understand unique site logistic constraints and topographic challenges; (3) identify solutions to site specific problems; (4) determine man power requirements; and (5) define emergency response tasks, their execution priority, and location to successfully respond to invasive species detections.

Both an ArcGIS Online map tool <https://arcg.is/1Kijb4> and a Webmap Application tool <https://umontana.maps.arcgis.com/apps/View/index.html?appid=642764efd9d04a4c98c51b266fa0d7fa> were developed that include the following layers (see map image below): (1) Ramps (public, commercial, private, unknown); (2) Access Points (Major Public, Minor Public, Potential Public, Commercial, Private); (3) Marinas; (4) AIS Watercraft Inspection Stations; (5) FWP Fishing Access Sites; (6) FWP State Parks; (7) FWP Wildlife Management Areas; (8) BLM Recreation Sites; (9) BOR Recreation Sites; (10) USFS Recreation Sites; (11) MDT County Bridges; (12) Other Access points; (13) Bathymetry; (14) Shallow Water Zones (<20 ft); (15) Dams, including power generation capacity; (16) Public Water Supply Intakes; (17) Surface Water Points of Diversion; (18) Rivers and other National Hydrography Dataset attributes; (19) Perennial, Intermittent, and Ephemeral Streams, Canals, and Connecting Ditches; (20) Pipelines and Underground Conduit; (21) Lakes, Ponds, and Reservoirs; (22) 10-digit Hydrologic Unit Code Watershed Boundaries; (23) Animal and Plant Species of Concern Occurrences; (24) Aquatic Invasive Species Survey Locations including non-detections, Positive Detections, Suspect Detections, or Inconclusive Results; (25) Aquatic Invasive Species

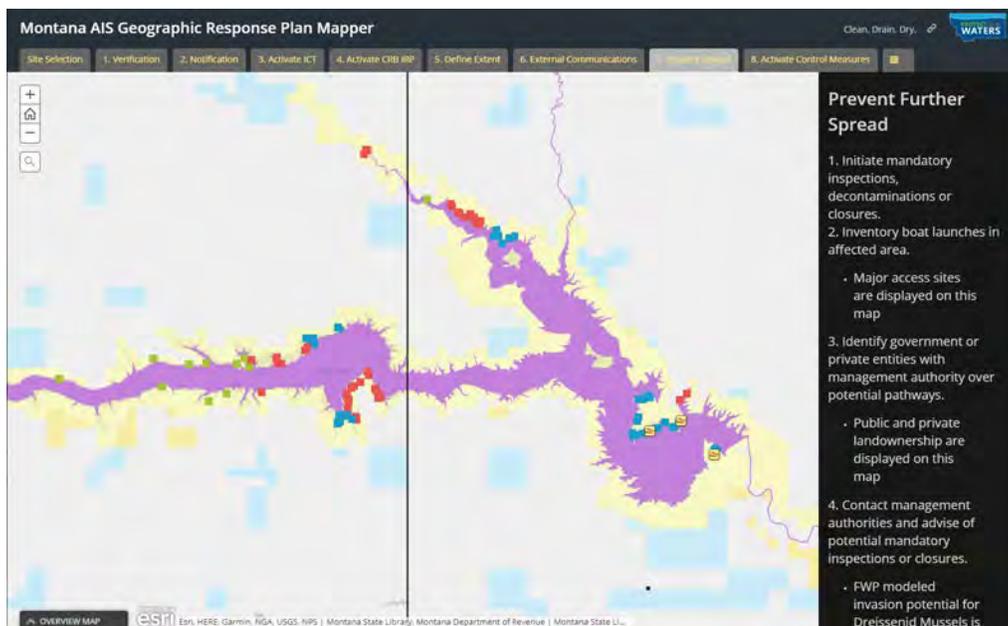
Detections, including Zebra/Quagga Mussels, New Zealand Mudsnail, Curly-Leaf Pondweed, Eurasian Watermilfoil, Flowering Rush, and Fragrant Waterlily; (26) FWP Aquatic Invasive Species Responsibility Areas; (27) FWP Administrative Regions; (28) Incorporated Towns; (29) Tribal Reservations; (30) Counties; (31) Federal Agency Ownership Boundaries; (32) DNRC Trust Lands Unit Offices; (33) DNRC Water Resource Division Regional Offices; (34) Transportation Framework Layers; (35) NAIP imagery for 2013 and 2015; and (36) Topographic Base Maps.



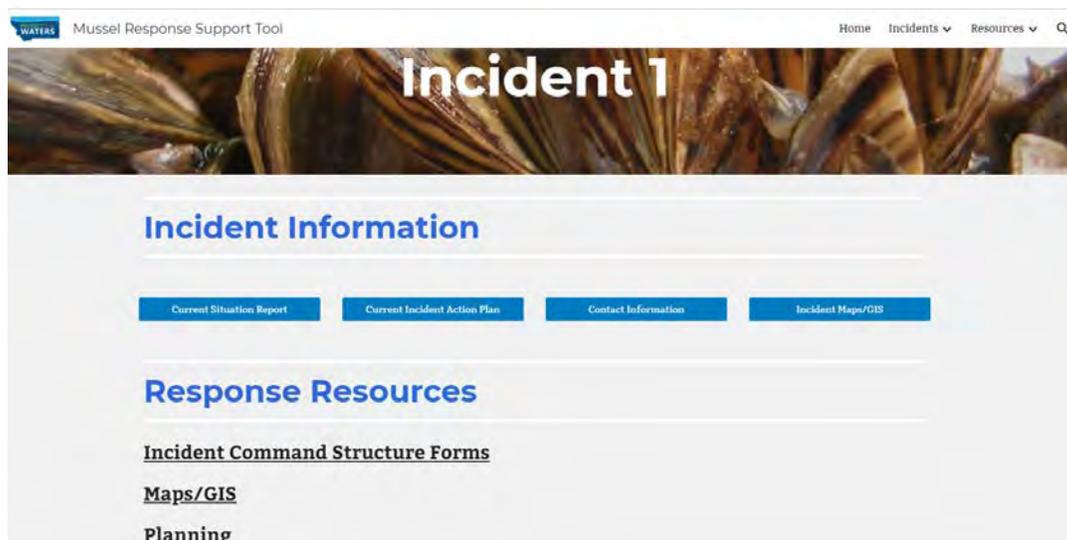
A Montana Aquatic Invasive Species Geographic Response Plan Mapper (see following image)

<https://umontana.maps.arcgis.com/apps/MapSeries/index.html?appid=9a6ce272bfd4b758ec5e0f49b130c0f> was developed as a web-based map to provide localized rapid

response plans for Tiber Reservoir, Canyon Ferry Reservoir, Fort Peck Reservoir, Flathead Lake and other water bodies where mussels might be detected that can be delivered as web-based maps on agency websites for the general public. This tool provides map layers and other specific information for the 9 steps outlined in the Montana Protocol for Response to Early Detection of Dreissenid Mussels including, Verify, Initial Notification, Activate Mussel Response Incident Command Team, Basin Interagency Response Plan, Define Extent of Infestation, Establish External Communications System, Prevent Further Spread, Initiate Available/Relevant Control Measures, and Response Conclusion if ICS is Initiated.



This tool, was used during the Rapid Response Exercise for Mussels that was held in Kalispell on September 11-13, 2018. During that exercise, it became clear that a web-based tool to support the Incident Command Structure would also be of value. Thus, a Montana Mussel Response Incident Command Support Tool <https://sites.google.com/view/mt-mussel-response-tool> was created that provides a vision for how multiple incidents could be managed from the same website simultaneously (see image below). This site provides a common mobile compatible web platform with the latest Situation Reports, Incident Action Plans, Contact Information, Incident Maps and other GIS Resources, Incident Command Structure Forms, and resources and checklists for planning, operations, logistics, finance and administration, safety, and communications.



Appendix C: Dreissenid biology and background information

Background - Aquatic Invasive Species

Section 1 of the Montana Constitution states that “each person shall maintain and improve a clean and healthful environment in Montana for present and future generations,” and that “the legislature shall provide adequate remedies for the protection of the environmental life support system from degradation and provide adequate remedies to prevent unreasonable depletion and degradation of natural resources.”

There are more than 28,000 farms and ranches spanning almost 60 million acres in Montana¹ and they generate more than \$5.2 billion in products and services. Forests cover about 22.5 million acres of Montana, or about one-fourth of the state’s land mass²; these working lands generate more than \$25 million annually to educate Montana children through Montana State Trust Lands. Montana’s outdoor recreation generates \$5.8 billion in consumer spending, 64,000 Montana jobs, \$1.5 billion in wages and salaries, and almost \$403 million in state and local tax revenue annually.³ The threats from aquatic invasive species in and adjacent to the waters on these lands have significant consequences for the suite of services Montana’s ecosystems provide for its citizens and the nation.

Aquatic invasive species (AIS) are non-native species that threaten the diversity or abundance of native species, the ecological stability of infested waters, human health and safety, or commercial, agricultural, or recreational activities dependent on these waters. Invasive species are any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem and causes harm to the economy, environment or human health⁴.

Montana’s experience with a dreissenid introduction in the northwestern portion of the state in 2016 as well as multi-year efforts addressing the introduction and spread of other AIS, such as Eurasian watermilfoil (*Myriophyllum spicatum*), curlyleaf pondweed (*Potamogeton crispus*), flowering rush (*Butomus umbellatus*), Phragmites (*Phragmites australis*) and New Zealand mudsnails (*Potamopyrgus antipodarum*), contributed significantly to the approach outlined for dreissenid mussels.

The most cost effective and ecologically sound approach to manage AIS is to prevent their introduction. When prevention efforts fail and aquatic invasive species are introduced, systematic efforts to eradicate, or contain, aquatic invasive species, while infestations are localized,⁵ are integral. These types of efforts, called rapid response, should occur quickly—before the species becomes established—and generally require a

significant amount of resources, coordination, cooperation, analysis, and persistence to be effective.

The response to dreissenid mussels is a regional effort and Montana has been a participant in preparing for the detection of mussels through both planning and table top exercises including the Rapid Response Exercise held in the fall of 2011 in Libby, MT. This two day exercise tested Montana's implementation of the Columbia River Basin Interagency Invasive Species Rapid Response Plan (CRB Plan). The exercise scenario included a confirmed finding of dreissenid larvae in **Lake Koocanusa and the after action report** describes the outcomes.

Dreissenids – The Threat to Montana

Zebra mussels (*Dreissena polymorpha*) and quagga mussels (*Dreissena rostriformis bugensis*), also known as dreissenids, were introduced to the Great Lakes in the 19980s, and have since spread throughout much of North America, with the exception of the Pacific Northwest and southeastern United States. Prior to 2016, dreissenids had not been detected in Washington, Oregon, Idaho, Montana, British Columbia, and Alberta. Coordinated prevention efforts among these and other states and provinces have occurred to protect the perimeter of the Pacific Northwest through coordinated watercraft inspection stations and development of a regional perimeter defense framework.

In November 2016, Montana Governor Steve Bullock issued an executive order declaring a statewide natural resource emergency for Montana water bodies as a result of a detection of dreissenid larvae from water samples taken from Tiber Reservoir, as well as suspected detections of dreissenids at Canyon Ferry Reservoir and the Milk and Missouri rivers. These detections represent a breach to that perimeter, and precipitated the necessary emergency declaration.

Dreissenid Biology

Zebra and quagga mussels are closely related filter-feeding freshwater mussels in the genus *Dreissena*. These bivalves produce free-swimming planktonic larvae that eventually settle out of the water column and attach to hard surfaces using byssal threads.

Dreissenid mussels are introduced into new water bodies through both natural and human-mediated transport. Natural dispersal occurs through larval drift, or by the transport of adults attached to any hard surface. Human-mediated dispersal occurs through the movement of larvae in the ballast water tanks of vessels, via internal water stored in engine compartments of trailered boats, or via the movement of adults attached to the hulls of conveyances. Also, mussels may be introduced to new water bodies in contaminated bait livewells and fishery stocking programs.^{6,7}

Adult mussels may survive out of water up to five days in dry environments and for several weeks in wet areas and compartments of boats, motors, trailers, and other conveyances, making overland transport by recreational boaters a high-risk pathway for the introduction of zebra and quagga mussels into Montana waters.^{8,9}

Many factors contribute to the risk of dreissenid introduction and establishment, including environmental parameters (e.g., dissolved calcium, pH), and the extent and types of public usage (e.g., total day use, presence of boat ramps and marinas, proximity to transportation corridors, motorized boating, fishing). Boat transport from contaminated waters is the most likely pathway of introduction to new water bodies.^{10, 11, 12, 13} Once introduced, pH and calcium concentrations are likely to determine the success of establishment. These factors are considered critical environmental parameters for dreissenid mussel survival and growth.^{14, 15}

Once established, dreissenid mussels can dramatically alter the ecology of a water body, aquatic life, and associated native fish and wildlife populations. As filter feeders, they remove phytoplankton and other particles from the water column, reducing the availability of important food resources to other species.¹⁶ Native mussels are significantly threatened by the presence of invasive mussels. By attaching themselves to the surfaces of other bivalves, dreissenid mussels can starve freshwater mussels and drive indigenous populations to local extinction. Dreissenid mussels can also reduce dissolved oxygen through respiration¹⁷—which affects the ability of other species to survive in those water bodies—and dissolved calcium carbonate concentrations through shell building¹⁸—which causes a water body to become more alkaline, stressing aquatic organisms that require a certain pH range for optimal growth and survival.¹⁹

Dreissenid mussels can cause substantial economic damage by infesting municipal, industrial, and agricultural water systems, attaching themselves to the hard substrates of pipes, dams, and diversion pathways. This restricts the flow of water through the systems impacting component service life, system performance, and maintenance activities. The annual cost to power plants and municipal drinking water systems in North America has been estimated at \$267 million to \$1 billion dollars.^{20, 21} Once dreissenids become established in river systems, there is extensive maintenance to infrastructure. The one-time cost to install mussel treatment systems in the Columbia River Basin was estimated at more than \$23 million dollars and annual costs were estimated at \$1.5 million.²² This cost estimate does not include the ecological costs associated with dreissenid establishment. In 2016, the PNWER estimated the cost of an introduction of dreissenids to the Pacific Northwest would be more than \$500,000,000 annually.²³

Recreation is significantly affected by the presence of dreissenids in a water body through colonization on docks, breakwalls, buoys, boats, and beaches.²⁴ Sharp-edged mussels on unprotected feet affect beach users and swimmers. Boaters must spend time and money inspecting and decontaminating boats that have been in waters infested with dreissenids. Scuba divers, whose industry benefits from observing underwater features, from shipwrecks in the Great Lakes to underwater landscapes all types of water bodies,

are affected as the hard surfaces of these features become obscured²⁵. Some agencies have restricted access to entire water bodies or sections of beaches because of harmful algal blooms and cyanobacteria caused by dreissenids; this has resulted in lost recreational opportunities and income.

For additional facts about aquatic invasive mussels and other invasive species, please look at the MISAC website at dnrc.mt.gov/divisions/cardd/MISAC

¹<http://www.farmflavor.com/montana-agriculture/>

² <http://www.montanaforests.com/forests/>

³ https://outdoorindustry.org/images/ore_reports/MT-montana-outdoorrecreationeconomy-01a.pdf

⁴ National Invasive Species Council. 2006. Invasive species definition and clarification guidance white paper. Definitions Subcommittee of the Invasive Species Advisory Committee.

<http://www.invasivespeciesinfo.gov/docs/council/isacdef.pdf>, accessed on January 8, 2016)

⁵ National Invasive Species Council.

⁶ Johnson L.E, A. Ricciardi, and J.T. Carlton. 2001. Overland dispersal of aquatic invasive species: a risk assessment of transient recreational boating. *Ecological Applications* **11**(6):1789–1799.

⁷ Karatayev, A. Y., D.K. Padilla, D. Minchin, D. Boltovskoy, and L.E. Burlakova. 2007. Changes in global economies and trade: the potential spread of exotic freshwater bivalves. *Biological Invasions* **9**:161–180.

⁸ Johnson L.E, A. Ricciardi, and J.T. Carlton. 2001. Overland dispersal of aquatic invasive species: a risk assessment of transient recreational boating. *Ecological Applications* **11**(6): 1789–1799.

⁹ Timar, L., and D.J. Phaneuf, 2009. Modeling the human-induced spread of an aquatic invasive: The case of the zebra mussel. *Ecological Economics* **68**(12):3060–3071.

¹⁰ Lucy, A., J. Buchan, and D.K. Padilla, 1999. Estimating the Probability of Long Distance Overland Dispersal of Invading Aquatic Species. *Ecological Applications* **9**(1):254–265.

¹¹ Frischer, M.E., B.R. McGrath, A.S. Hansen, P.A. Vescio, J.A. Wyllie, J. Wimbush and S.A. Nierzwicki-Bauer, 2005. Introduction Pathways, Differential Survival of Adult and Larval Zebra Mussels (*Dreissena polymorpha*), and Possible Management Strategies, in an Adirondack Lake, Lake George, NY. *Lake and Reservoir Management* **21**(4):391–402.

¹² Johnson L.E, A. Ricciardi, and J.T. Carlton. 2001. Overland dispersal of aquatic invasive species: a risk assessment of transient recreational boating. *Ecological Applications* **11**(6): 1789–1799.

¹³ Karatayev, A. Y., D.K. Padilla, D. Minchin, D. Boltovskoy, and L.E. Burlakova. 2007. Changes in global economies and trade: the potential spread of exotic freshwater bivalves. *Biological Invasions* **9**:161–180.

¹⁴ Hincks, S.S. and G.L. Mackie. 1997. Effects of pH, calcium, alkalinity, hardness, and chlorophyll on the survival, growth, and reproductive success of zebra mussel (*Dreissena polymorpha*) in Ontario lakes. *Can. J. Fish. Aquat. Sci.* **54**:2049–2057.

¹⁵ McMahon, R.F., 1996. The Physiological Ecology of the Zebra Mussel, *Dreissena polymorpha*, In *North America and Europe. Amer. Zool.* **36**:339–363.

¹⁶ Sousa, R., J.L. Gutiérrez, and D.C. Aldridge, 2009. Non-indigenous invasive bivalves as ecosystem engineers. *Biological Invasions* **11**(10):2367–2385.

¹⁷ Strayer, D.L., 2009. Twenty years of zebra mussels: lessons from the mollusk that made headlines. *Front Ecol. Environ.* **7**(3): 135–141.

¹⁸ Ibid.

¹⁹ <http://www.uri.edu/ce/wq/ww/Publications/pH&alkalinity.pdf>

²⁰ Connelly N., C.R. O'Neill, B.A. Knuth, and T.L. Brown. 2007. Economic Impacts of Zebra Mussels on Drinking Water Treatment and Electric Power Generation Facilities. *Environmental Management* **40**(1): 105–112.

²¹ Pimentel, D., 2005. Aquatic Nuisance Species in the New York State Canal and Hudson River Systems and the Great Lakes Basin: An Economic and Environmental Assessment. *Environmental Management* **35**(5):692–701.

²² Independent Economic Analysis Board. 2010. Economic Risk Associated with the Potential Establishment of Zebra and Quagga Mussels in the Columbia River Basin. Task Number 159. Document IEAB 2010-1. 79pp. (See next citation, also).

²³ <http://www.createstrat.com/media/advancing-a-regional-defense-against-dreissenids-in-the-pacific-northwestfinal.pdf>

²⁴ Benson, A.J., M.M. Richerson, E. Maynard, J. Larson, A. Fusaro, A.K. Bogdanoff, and M. Neilson. 2017. *Dreissena rostriformis bugensis*. USGS Nonindigenous Aquatic Species Database, Gainesville, FL. <https://nas.er.usgs.gov/queries/factsheet.aspx?speciesid=95>. Revision Date: 1/7/2016.

²⁵ http://www.protectyourwaters.net/hitchhikers/mollusks_zebra_mussel.php

Appendix D: Notification Contacts and Scripts

Waterbody suspect or positive for dreissenids notification list

Tier 1: Leadership Notification

These individuals will be notified within 2 days of a confirmed sample:

Organization	Name/position Office	Phone	Cell phone	Email
Montana Governor's Office	Natural Resource Advisor			
Montana Fish Wildlife and Parks	Director			
FWP Invasive Species Program	Bureau Chief			
FWP legal counsel	Beck Docktor			
Montana Department of Natural Resource Conservation	Director			

Tier 2: Initial Notification

Once the Directors and Governor's office have been briefed and approval to communicate outside the agencies involved, include the following individuals and agencies in the initial notification:

Organization	Name/position Office	Phone	Cell phone	Email
Legislators (House and Senate Leadership)				
State Agencies				
MDA				
DEQ				
MDT				
[Impacted counties, local county government and sheriff's office]				
Federal Agencies				
USDA Animal, Plant Health Inspection Service	Gary Adams , State Plant Health Director	(406) 657-6282		Gary.D.Adams@aphis.usda.gov
Bureau of Land Management	Floyd Thompson , Montana State Office, Rangeland Management Specialist and Invasive Species Coordinator	(406) 896-5025		fthompso@blm.gov
US Bureau of Reclamation	Jeffrey Baumberger , Resource Management Division Manager	(406)247-7314		jbaumberger@usbr.gov
Natural Resources Conservation Service	Monica Pokorny , Plant Materials Specialist	(406) 587-6708		monica.pokorny@mt.usda.gov

Organization	Name/position Office	Phone	Cell phone	Email
US Fish and Wildlife Service	Lindy Garner , Invasive Species Strike Team, Regional Invasive Species Coordinator	(406) 727-7400, ext. 213		Lindy_Garner@fws.gov
US Army Corps of Engineers	Patricia Gilbert , Fort Peck Project, Natural Resource Specialist	(406) 526-3411, ext. 4278		patricia.l.gilbert@usace.army.mil
US National Park Service	Steve Bekedam , Northern Rocky Mountains Exotic Plant Management Team, Program Liaison	(307) 344-2185		steven_bekedam@pns.gov
Tribes in the affected watershed				
Power companies				
Relevant water delivery agency (irrigation districts and canal companies)				

Depending on the location and risk level of the affected waterbody additional parties will be notified. At a minimum local, state, federal, and regional stakeholders will be notified. Additional secondary notifications will be identified by the response team. See Appendix C for additional information about interagency coordination.

INITIAL NOTIFICATION SCRIPT

Prior to the first press release, key stakeholders should be notified.

A call list was created during the response to the fall 2016 mussel detections. This list is held by Tom Woolf, Department of Fish, Wildlife & Parks, Aquatic Invasive Species Section Chief and was compiled initially by Tom Boos, FWP and Stephanie Hester, Department of Natural Resources and Conservation, Montana Invasive Species Council Coordinator. This contact was current at that time but should be updated when the list of Incident Command leadership staff is updated or twice per year, whichever is more frequent.

The following is a guide for a call or voicemail to those on the notification lists:

Voice Message:

{Personalize greeting} I have some information that is going public later today, and as a key stakeholder I wanted to make sure you were aware of it beforehand.

1. Montana FWP in coordination with the [*other agency partners*] has found evidence of zebra or quagga mussels in [*location*], both waterbodies of the [*Columbia or Missouri*] River Watershed.
2. As a result, agencies have begun working together to develop a collaborative strategy to address further detection, containment and control.
3. I'm calling you in advance of the public announcement because you are engaged in the issue and we need your help in the solution.
4. Later today, a press release will go out and more detailed information will be posted on the Montana Invasive Species Advisory Council website at <http://dnrc.mt.gov/divisions/cardd/MISAC>

Please call me back at XXXX for further details or check the MISAC website, which will be updated with the latest information as the situation evolves.”

Mussel Facts (Send **fact sheet** to caller, use as needed based on callers familiarity of issue):

- Dreissenid mussels pose an enormous ecological and financial threat (tourism, infrastructure)
- Through visual inspection, adult mussels have not been detected at either location. The agencies are planning to deploy sniffer dogs to further investigate the waterbodies. provide verification or detection of established mussels

- With coordination through [list agencies: FWP, BOR, DNRC, etc.] and the Governor's office are working collaboratively on the response
- A stakeholder meeting and rapid response exercise is being planned for November

[JIC or Lead] will serve as the main coordinating body and the latest information will be posted [location or website]

Tier 3: Regional counterparts and organizations, members of the public.

REGIONAL CONTACTS

**Columbia River Basin
(CRB) Team**

**US Fish and
Wildlife**

**877-STOP-
ANS**

**Upper Columbia conservation
commission**

Missouri River Basin groups

**Downstream hydropower
facilities**

All Tribes in the state

E-mail message to regional contacts ([See the contact list for the Columbia River Basin as updated in January 2017.](#))

“A preliminary report suggests that dreissenid mussels have been found in [*insert name of water body or other location*]. We are still investigating this report, and will communicate updates via [*insert name of listserv, website, etc.*]. Until then, we encourage other jurisdictions to treat this location as an elevated risk. In order to expedite the local response, we also request that you keep this information internal and wait for us to release further information to interested parties.”

PUBLIC NOTIFICATION

The primary method of public notification will be through issuing a press release.

SAMPLE INITIAL PRESS RELEASE

Contact: [Incident PIO/JIC]

Montana Fish, Wildlife and Parks (FWP) has declared _____ a “suspect location” for infestation of invasive quagga mussels. This report has been initially verified by [*agency/recognized expert*], and efforts are underway to [*describe what’s next, if anything, to confirm identification*].

This discovery is a serious environmental and economic concern for the state. Invasive quagga and zebra mussels are small nonnative freshwater mollusks that have caused major problems in the United States after their introduction in the 1980s.

Officials have not yet determined how these mussels entered _____. Recreational boats are known to be a major source of invasive mussel spread in the United States, and there are a number of past incidents where boats fouled by live invasive mussels have been intercepted prior to launching in Northwest waters.

In preparation for an introduction of invasive mussels in Montana, officials developed a rapid response plan outlining a set of actions to address the initial finding and monitor the situation long term.

Until additional surveys are conducted, the extent of the infestation is unknown. During this phase of rapid response, the Department of Fish Wildlife and Parks, has _____ (*restricted access*) to _____ (*infected location*) to help prevent further potential dispersal of the invasive mussels. The public can help by avoiding the _____ (*infected area*) and following some good general guidelines. They should clean all boats, trailers, and other equipment after leaving a lake or stream and never release any live organisms into the wild.

FWP emphasized the importance of inspecting boats. “We recognize the inconvenience to boaters and understand the need for additional sampling and identification to determine if this water body is positive for quagga mussels. Our staff will ensure that boats will go through the inspection process as efficiently as possible.”

Boaters can assist with the process by arriving at _____ (*inspection location*) with a clean, drained and dry vessel.

For more information, visit FWP’s website at <http://fwp.mt.gov/fishAndWildlife/species/ais/>

SAMPLE FOLLOW UP PRESS RELEASE

We are currently investigating reports of [name of invasive species] in the vicinity of [general location]. Experts from [FWP other lead agencies] and local agencies are responding, and we will have additional information available as we are able to confirm it. We will hold a briefing at [location] and will notify the press at least ½ hour prior to the briefing. At this time, the briefing is the only place where officials are authorized to speak about the incident and confirmed information will be available. Thank you for your assistance.

MEDIA POLICY FOR RESPONDERS

Refer absolutely all media requests to the PIO with the following statement:

“I have been directed to forward all media requests to my Public Information Officer [*Name: _____*] and their cell number is [*Cell: _____*]. You may get their voice mail but your questions are important to them so please leave a message.”

- **DO NOT:** Talk to a reporter at the scene of an accident or during your personal time.
- **DO NOT:** Run away if you are approached by a reporter while working.
- **ALWAYS:** Ask the reporter for their business card and/or write down all of their information (name, station, phone with voice mail) **BEFORE ANSWERING ANY QUESTIONS.** Pass this information on to your team leader or PIO as appropriate.
- **REMEMBER:** You are a representative of the incident and your agency

INCIDENT COMMANDERS AND LEADERSHIP TEAM MEMBERS

The Interagency Rapid Response Team consists of ICS-trained subject matter experts that can be deployed to the scene in three ways depending upon the management needs of the agency suffering from the infestation:

1. As a Unified Command incident management team providing on-scene response, management, and control of the infestation,
2. As individual ICS Command/General Staff, filling vacancies within the local Incident Management Team’s Command and General Staff including plans, operations, safety, public information, or,
3. As Technical Specialists providing technical expertise to the local Incident Management Team, or serving as Field Observers or Technical Specialists.

Identifying individuals who can serve in multiple capacities as well as finding multiple individuals for each role will allow Montana to respond to several incidents at once and relieve pressure on any one position or office.

Incident Command Team					
Position	Name	Phone	Cell phone	Email	Region
Incident Commander					
Public Information Officer					
Safety Officer					
Liaison Officer					
Operations Section Chief					
Deputy Ops Section Chief					
Detection Supervisor					

Incident Command Team

Control Supervisor

**Planning Section
Chief**

**Data Technical
Specialist**

**Data Technical
Specialist**

**GIS Technical
Specialist**

**Logistics Section
Chief**

**Support Branch
Director**

**Finance Section
Chief**

Appendix E: Response Coordination and Cooperative Agreements

This is intended as a general guide for developing the partnerships and coordination necessary to a successful response in Montana. Specific contacts for Tier 1, 2 & 3 notifications are given in Appendix B.

Interagency Coordination

Interagency partners in both early detection and rapid response in Montana include Federal, State, Tribal, and local partners. These EDRR Partners will participate jointly and integrate their authorities and resources using Incident Command System (ICS) during dreissenid mussel discoveries on waterbodies with overlapping management jurisdictions. This approach of treating new detections as new emergencies (with specific authorities and direction provided by agency directors and the Governor's Office) is anticipated to bring local, state, and regional partners together with little to no advance planning.

When possible, including federal, state, regional, and local partners in advance by establishing and exercising lines of communication, building partnerships across shared resources and interests, and developing training opportunities to build shared rapid response skills will reduce friction in establishing future rapid response actions. The National Invasive Species Council's 2016 document "A National Framework for Early Detection and Rapid Response" provides suggestions for planning to include partners in this effort and the following planning actions and contacts for Montana are in alignment with the national framework.

Coordination planning:

To prepare for the use of ICS in a response, the following actions should be taken to improve readiness:

- Establish lines of communication with statewide agency representatives of partners listed in this section.
- Invite and include partners in annual invasive species stakeholder events or meetings.
- Include communication with regional partners and stakeholders in the communications duties of the Montana Invasive Species Counsel (MISC) Outreach position and include updates from regional partners in MISC communications.
- Create regional, multi-agency training opportunities to practice ICS skills and reach out to local partners.

- Plan table-top and field exercises based on existing invasive species response plans and relevant local management plans that include all likely response partners including local and non-governmental participants.

Protocol for Including Rapid Response Partners:

The location of the next rapid response event will determine the suite of partners contacted. As this will be different depending on the watershed and type of waterbody, this section creates a protocol for identifying and including local partners in a response.

Planning: As the incident is established, the incident commander identifies a command team position tasked specifically with identifying affected entities and stakeholders in addition to those agencies and contacts identified under the initial notification list.

Area affected: The planning position assigned will determine the affected watershed and surrounding economic area. In cases where these do not perfectly overlap or there is ambiguity, erring on the side of inclusion is recommended for communications.

Local Partners: Within the identified affected zone, local municipalities, land and water management entities, local colleges or research stations, and other governmental partners (regional offices, tribal officials) should be contacted. As part of the notification process, these entities should be asked for existing regional or local partnerships that have been established and the names and contacts of key local partners especially those who are non-governmental and industry. Counties, municipalities, water management and irrigation districts, private citizens, corporations, land trusts, and other non-governmental organizations own and manage lands and waters. Academic, industry, and non-governmental organizations provide access to significant expertise on species, pathways, and detection and response methods and tools.

Working relationships: Once the contact list for the area affected has been created and broadened to include established regional partnerships and local non-governmental bodies the process of including their expertise and resources should be incorporated into the incident plan. Local municipalities may have more flexibility in incorporating non-governmental resources and otherwise, the planning position assigned should be tasked with drafting operational documents with the guidance of agency contacts responsible for the execution of Memoranda of Understanding and funding or resource agreements or Memoranda of Agreements.

Partners in rapid response:

FEDERAL AGENCIES

Federal agencies have a number of key roles in EDRR including responsibilities for managing Federal lands and waters, enforcing Federal laws, exercising regulatory authorities, and providing technical expertise in management, research, and information

systems. The Federal government manages approximately 635 million acres in the United States, the majority of which are administered by the Bureau of Land Management, U.S. Fish and Wildlife Service (USFWS), National Park Service (NPS), U.S. Forest Service (USFS), and Department of Defense (CRS 2012). The NOAA is responsible for marine sanctuaries. The U.S. Coast Guard enforces laws protecting waters from non-native species. The Bureau of Indian Affairs (BIA) plays an important role as trustee and advisor for tribally owned lands.

Some relevant Federal regulatory authorities include the ability to prohibit the import into the United States and the interstate transport of listed invasive injurious species, approve specific pesticides and their applications, engage in emergency response actions, and manage risks associated with certain major pathways of invasive species introduction. Many Federal agencies are active in the development and application of tools for invasive species assessment, detection, reporting, species monitoring and surveillance, management, and identification. Such agencies are a key resource for the collection of data regarding invasive species ecology, impacts, and geographic distribution.

The National Invasive Species Council will establish the Early Detection and Rapid Response Task Force as a standing body to facilitate nationwide coordination among Federal agencies and non-Federal partners. Engaging this Taskforce to assist in coordination and planning should be coordinated through the Council staff. Local Federal contacts listed below should be included in response communications directly unless an alternative contact via the task force is established.

National Invasive Species Council	Jamie K. Reaser , Executive Director of the Council, Jamie_Reaser@ios.doi.gov , (202) 208-3100
Bureau of Land Management	Floyd Thompson , Montana State Office, Rangeland Management Specialist and Invasive Species Coordinator, ftompso@blm.gov , (406) 896-5025
USDA Animal, Plant Health Inspection Service	Gary Adams , State Plant Health Director, Gary.D.Adams@aphis.usda.gov , (406) 657-6282
US Bureau of Reclamation	Jeffrey Baumberger , Resource Management Division Manager, jbaumberger@usbr.gov , (406)247-7314
Natural Resources Conservation Service	Monica Pokorny , Plant Materials Specialist, monica.pokorny@mt.usda.gov , (406) 587-6708
US Fish and Wildlife Service	Lindy Garner , Invasive Species Strike Team, Regional Invasive Species Coordinator, Lindy_Garner@fws.gov , (406) 727-7400, ext. 213
US Army Corps of Engineers	Patricia Gilbert , Fort Peck Project, Natural Resource Specialist, patricia.l.gilbert@usace.army.mil , (406) 526-3411, ext. 4278

US National Park Service

Steve Bekedam, Northern Rocky Mountains Exotic
Plant Management Team, Program Liaison,
steven_bekedam@pns.gov, (307) 344-2185

TRIBAL CONTACTS:

The Montana **Governor's Office of Indian Affairs** maintains contact information for the 7 Indian reservations and the state-recognized Little Shell Tribe of Chippewa Indians.

Blackfoot Nation	(406) 338-7521
Chippewa Cree Tribe	(406) 395-5705
Crow Nation	(406) 638-3708
Confederated Salish & Kootenai Tribes	(406) 675-2700
Fort Belknap Assiniboine & Gros Ventre Tribes	(406) 353-2205
Fort Peck Assiniboine & Sioux Tribes	(406) 768-2300
Little Shell Chippewa Tribe	(406) 315-2400
Northern Cheyenne Tribe	(406) 477-6284

STATE AGENCIES:

A full list of individual contacts for dreissenid mussel notification are included in Appendix C of the Montana Dreissenid Rapid Response Plan. The following agencies have been identified as high priority contacts.

- Montana Governor's Office
- Montana Fish Wildlife and Parks
- Montana Department of Natural Resource Conservation
- Montana Invasive Species Council (MISC)
- Columbia River Basin (CRB) Team
- Upper Columbia conservation commission
- Missouri River Basin groups
- Montana Department of Agriculture

LOCAL AGENCIES:

Directory of county offices: The **Montana Association of Counties** includes a map of Montana counties with a link from the map to information on elected officials, county seat, and other relevant information. The **Montana Association of Conservation Districts** provides contacts with landowners through their soil, water, and natural resource conservation work through 58 conservation districts in all counties and over 70 municipalities. The Conservation Districts are also implement the Streambed and Land Preservation Act or the 310 law that requires a permit from the local Conservation District before work can be done in Montana's waterways.

Montana Association of Counties	(406) 449-4360
Montana Association of Conservation Districts	(406) 443-5711

Directory of Municipalities: The **Montana League of Cities and Towns** maintains contact information for 129 Montana municipalities. While most local municipal offices will be readily identified by local staff, all those within the economic interest area of a waterbody should be considered.

Montana League of Cities and Towns	(406) 442-8768
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NEIGHBORING STATES:

Idaho	[Update]
Wyoming	Beth Bear , Aquatic Invasive Species Coordinator, Wyoming Game & Fish Department, beth.bear@wyo.gov , 307-745-5180 Ext. 256
North Dakota	Jessica Howell , Aquatic Nuisance Species Coordinator, North Dakota Game & Fish Department, jmhowell@nd.gov , 701-368-8368
South Dakota	Mike Smith , Aquatic Invasive Species Statewide Coordinator, South Dakota Department of Game, Fish & Parks, mikejo.smith@state.sd.us , 605-223-7706

CANADIAN PROVINCES:

Saskatchewan	Jamie Bilash , Aquatic Invasive Species Ecologist, Ministry of Environment, (306) 933-6544
Alberta	Kate Wilson , Aquatic Invasive Species Program Coordinator, Alberta Environment & Sustainable Resource Development, (780) 427-7791

British Columbia

Martina Beck, Invasive Mussel Program Coordinator,
Conservation Science Section, (778) 698-4364

REGIONAL PARTNERS**100th Meridian Initiative**

Several “Basin Teams” operate within Montana.
Contact via website is britton@uta.edu

Pacific NorthWest Economic Region (PNWER)

The Invasive Species Working Group, Matt Morrison,
(206) 443-7723

Regional Invasive Species Councils (Idaho, Oregon, Washington, Idaho, Alberta, British Columbia).

See state and provincial contacts.

TECHNICAL PARTNERS

Who will be involved will vary by location. The following groups were identified during the fall 2016 mussel responses are intended to provide an example of the scope and type of partners to include in response planning and operations.

Montana Invasive Species Council, Science Advisory Panel

Stephanie Hester, Council Liaison, Montana Fish Wildlife and Parks, shester@mt.gov, (406) 444-0547

eDDMaps

Center for Invasive Species & Ecosystem Health,
University of Georgia, (229) 386-3298

Indian National Conservation Alliance

Dick Gooby

Northwestern Energy**Anglers Forum****Whitefish Lake Insititue****Flathead Bio Station****MT Assoc. of Dam and Canal Systems**

Vernon Stokes, (406) 279-3315

Montana Water Resource Association

Michael Murphy, (406) 235-4555

Montana Watershed Coordination Council

Erin Farris-Olsen, Executive Director,
erin@mtwatersheds.org, (406) 475-1420

PROTOCOL FOR NON-GOVERNMENTAL PARTNERS

When regional or statewide partnerships are already working together under cooperative agreements or Memoranda of Understanding those contacted to participate in a response or who volunteer their resources or services should be asked if they are currently parties to an existing agreement that would determine the terms and responsibilities for participation in a response. If there is no existing agreement, a working agreement appropriate to the scope of the partnership should be drafted to clearly define the terms, especially if financial considerations are anticipated. A template

for a Memorandum of Agreement specific to the State of Montana follows in the next section of this appendix.

Cooperative Agreements

From the Gap Analysis: A list of MOUs that are a high priority for development include Bureau of Reclamation and FWP, Missouri River Containment Plan, FWP for expedited sample processing for follow up (verification) testing with regional labs, USFWS-FWP for specialist staff including divers.

A list of current agreements will be developed and included to facilitate joint actions. From a gap analysis of the rapid response needs the following MOUs were identified: Bureau of Reclamation and FWP, Missouri River Containment Plan, FWP for expedited sample processing for follow up (verification) testing with regional labs, USFWS-FWP for specialist staff including divers.

Example: Aquatic Invasive Species Act Cooperative Agreement (Agreement DO: 083-16)
This agreement should be updated to include 2017 legislative changes and enhancements.

Appendix F: Treatment Options and Response Scenarios.

Treatment options

Controlling infestations in water distribution systems for municipal, agricultural and industrial supply enables continued operation of facilities and may contribute to reducing populations, which can also reduce the likelihood of a dreissenid mussel infestation spreading to new areas. A variety of management techniques are possible, including settlement prevention, desiccation, mechanical removal, oxidizing biocides, thermal, and biological control.

Tools for effective, cost-efficient, and ecologically sound dreissenid mussel control in the West are limited. Most containment and control technologies were developed for closed-water systems. It is very costly and difficult to prevent the spread through the large water distribution systems that exist in the West, including trans-mountain diversions that move water across the continental divide. The Quagga-Zebra Mussel Action Plan for Western U.S. Waters (2010) identified that additional tools are needed to prevent invasive mussel movement through water delivery systems and for open water systems. Containment can be difficult as the volume of water to be treated is large, the environmental impacts of the treatment must be acceptable, and the costs must not be prohibitive.

A range of options is discussed in the [Columbia River Basin Plan, Appendix D](#), page 90, and the non-chemical control options are described in more detail in the US Army Corps of Engineer's documentation and many are available here:

<https://invasivemusselcollaborative.net/management/>

The feasibility of applying a chemical control tool in a timely manner depends on both the type of waterbody where mussels are discovered, and on regulatory compliance.

Non-Chemical	Chemical	Chemical control cont.
Thermal shock	<i>[Non-oxidizing]</i>	<i>[Quaternary ammonium compounds]</i>
Freezing	Potassium salts (KCL)	Clam-Trol CT 1
Oxygen starvation	Potassium ion (KH ₂ PO ₄)	Calgon H-130
Desiccation	Potassium ion (KOH)	Macro-Trol 9210

Non-Chemical	Chemical	Chemical control cont.
Benthic mats	Chloride salts	Bulab 6002
Manual removal	Copper ions	<i>[Aromatic hydrocarbons]</i>
Predation	Copper sulfate	Mexel 432
Cavitation	<i>[Oxidizing]</i>	EVAC - endothal formulation
Low frequency sound	Chlorine	Bulab 6009
Ultra sound	Chlorine dioxide ClO ₂	
Vibration	Chloramine	
Low voltage electricity	Hydrogen peroxide	
Plasma pulse	Ozone	
Electric field pulse	Potassium permanganate	
UV radiation		
Bacterial toxin		

Response scenarios

The following cases and scenarios are based on the continued discussion of rapid response options in Appendix D of the **Columbia River Basin Plan**. These are listed here for the purpose of encouraging training exercises and other pre-planning for the described situations. Given the utility of the table of general scenarios from Messer, C. and Veldhuizen. 2005 it is replicated in this section following the list of cases, with the exception of the estuary scenario, and the addition of large and small lakes.

The following cases may be more probable based on risk factors and recent history, and should be considered both for planning purposes as well as during initial investigations of actual reports.

- Case A: Veligers found in Columbia or Missouri River systems; no adults detected
- Case B: Settled mussels found growing on moored watercraft and/or fixed structures within the Columbia or Missouri Rivers; no veligers detected (eradication might be feasible in this scenario)

- Case C: Veligers and/or settled mussels found in an isolated, non-draining water body (eradication might be feasible in this scenario)
- Case D: Reproductive mussels and veligers found in the Columbia or Missouri Rivers and/or a hydrologically connected water body (eradication would probably not be feasible in this scenario)

Customizing response scenarios for Montana is in progress and once complete will be included in this plan.

Waterbody	Isolated population	Widespread Population	Initiate Emergency Order	Explore chemical control
Pond, isolated	<ul style="list-style-type: none"> • Evaluate for natural control (e.g. Winter freeze, summer desiccation) • Chemically treat area and buffer zone • Quarantine and/or stop all recreational and commercial uses in infested area and buffer zone • Mandatory cleaning of departing vessels and equipment 	<ul style="list-style-type: none"> • Chemically treat entire waterbody • Stop water diversions, if any, and chemically treat diversion infrastructure • Mandatory cleaning of all departing vessels and equipment • Quarantine and/or stop all recreational uses 		
Pond, draining	<ul style="list-style-type: none"> • Chemically treat released water or prevent water release • Chemically treat area and buffer zone • Monitor for spread within pond and downstream • Quarantine and/or stop all recreational and commercial uses in infested area and buffer zone • Mandatory cleaning of departing vessels and equipment 	<ul style="list-style-type: none"> • Minimize or prevent water release • Chemically treat released water • Chemically treat diversion infrastructure, if any • Monitor for spread downstream • Chemically treat entire waterbody • Mandatory cleaning of all departing vessels and equipment • Quarantine and/or stop all recreational and commercial uses 		

Waterbody	Isolated population	Widespread Population	Initiate Emergency Order	Explore chemical control
Lake, small	<ul style="list-style-type: none"> • Evaluate connected waterways • Identify species of concern in the area • Evaluate for natural control (e.g. Winter freeze, summer desiccation) • Chemically treat area and buffer zone • Quarantine and/or stop all recreational and commercial uses in infested area and buffer zone • Mandatory cleaning of departing vessels and equipment 	<ul style="list-style-type: none"> • Evaluate connected waterways • Identify species of concern in the area • Chemically treat entire waterbody • Stop water diversions, if any, and chemically treat diversion infrastructure • Mandatory cleaning of all departing vessels and equipment • Quarantine and/or stop all recreational uses 		
Lake, large	<ul style="list-style-type: none"> • Reduce lake volume • Chemically treat infested area and buffer zone • Monitor for spread within reservoir and downstream • Quarantine and/or stop all recreational and commercial uses in infested area and buffer zone • Mandatory cleaning of departing vessels and equipment 	<ul style="list-style-type: none"> • Monitor for spread downstream • Chemically treat diversion infrastructure, if any • Evaluate potential for a water level drawdown to reduce the population • Evaluate ability to chemically treat entire waterbody • Prevent spread to upstream waterbodies and other watersheds • Quarantine and/or stop all recreational and commercial uses • Mandatory cleaning of all departing vessels and equipment 		

Waterbody	Isolated population	Widespread Population	Initiate Emergency Order	Explore chemical control
Small Reservoir	<ul style="list-style-type: none"> • Minimize water releases • Chemically treat released water • Chemically treat area and buffer zone • Monitor for spread within reservoir and downstream • Quarantine and/or stop all recreational and commercial uses in infested area and buffer zone • Mandatory cleaning of departing vessels and equipment 	<ul style="list-style-type: none"> • Evaluate need to reduce reservoir volume through water releases • Chemically treat released water • Chemically treat diversion infrastructure, if any • Monitor for spread downstream • Chemically treat entire waterbody • Mandatory cleaning of all departing vessels and equipment • Quarantine and/or stop all recreational and commercial uses 		
Large Reservoir	<ul style="list-style-type: none"> • Reduce reservoir volume • Chemically treat released water • Chemically treat infested area and buffer zone • Monitor for spread within reservoir and downstream • Quarantine and/or stop all recreational and commercial uses in infested area and buffer zone • Mandatory cleaning of departing vessels and equipment 	<ul style="list-style-type: none"> • Chemically treat released water • Monitor for spread downstream • Chemically treat diversion infrastructure, if any • Evaluate potential for a water level drawdown to reduce the population • Evaluate ability to chemically treat entire waterbody • Prevent spread to upstream waterbodies and other watersheds • Quarantine and/or stop all recreational and commercial uses • Mandatory cleaning of all departing vessels and equipment 		

Waterbody	Isolated population	Widespread Population	Initiate Emergency Order	Explore chemical control
River, Small Volume	<ul style="list-style-type: none"> • Minimize or stop inflow and increase upstream water diversions to reduce stream volume and flow rate • Install veliger settlement materials at downstream end of population • Create pool conditions at downstream end of population to facilitate veliger settlement (e.g., installation of temporary weir) • Treat with molluscicide • Detoxify downstream of infested area • Monitor for spread downstream • Prevent spread to upstream waterbodies and other watersheds • Quarantine and/or stop all recreational and commercial uses in infested area and buffer zone • Installation of travel barrier and mandatory cleaning station for all vessels traveling upstream via waterway • Mandatory cleaning of all departing vessels and equipment 	<ul style="list-style-type: none"> • Minimize or stop inflow and increase upstream water diversions to reduce stream volume and flow rate • Treat with molluscicide • Detoxify downstream of infested area • Monitor for spread downstream • Prevent spread to upstream waterbodies and other watersheds • Quarantine and/or stop all recreational and commercial uses • Installation of travel barrier and mandatory cleaning station for all vessels traveling upstream via waterway • Mandatory cleaning of all departing vessels and equipment 		

Waterbody	Isolated population	Widespread Population	Initiate Emergency Order	Explore chemical control
<p>River, Large Volume</p>	<ul style="list-style-type: none"> • Minimize inflow and increase upstream water diversions to reduce stream volume and flow rate • Install veliger settlement materials at downstream end of population • Create pool conditions at downstream end of population to facilitate veliger settlement (e.g., installation of temporary weir) • Treat with molluscicide • Detoxify downstream of infested area • Monitor for spread downstream • Prevent spread to upstream waterbodies and other watersheds • Quarantine and/or stop all recreational and commercial uses in infested area and buffer zone • Installation of travel barrier and mandatory cleaning station • for all vessels traveling upstream via waterway • Mandatory cleaning of all departing vessels and equipment 	<ul style="list-style-type: none"> • Prevent spread to upstream waterbodies and other watersheds • Quarantine and/or stop all recreational and commercial uses • Mandatory cleaning of all departing vessels and equipment • Installation of travel barrier and mandatory cleaning station for all vessels traveling upstream via waterway • Closure of unattended boat ramps, especially in zebra mussel-free areas • Mandatory inspection/cleaning of all vessels entering zebra mussel-free waterbodies • Evaluate ability to chemically treat 		

Waterbody	Isolated population	Widespread Population	Initiate Emergency Order	Explore chemical control
<p>Water Diversions</p>	<ul style="list-style-type: none"> • If only one facility is impacted, transfer all diversions to alternate facility(ies) • Drain and desiccate facilities, chemically treat standing water • -OR- • Isolate infested area and buffer zone with temporary barriers, chemically treat • Chemically treat removed water or quarantine and discharge the mussel-infected water to safe disposal area • Monitor for downstream spread • Mandatory cleaning of all vessels and equipment • Quarantine and/or stop all recreational and commercial uses of aqueduct • Retrofit facility(ies) to minimize impacts 	<ul style="list-style-type: none"> • If only one diversion system is impacted, transfer all diversions to other facility(ies); • Drain and desiccate facilities, chemically treat standing water • If both facilities/water transfer infrastructure are impacted: • Chemically treat water before transferring to “downstream” uses • Chemically treat water before entrance into the facilities) • Mandatory cleaning of all vessels and equipment departing facility(ies) • Quarantine and/or stop all recreational and commercial uses of contaminated facilities • Desiccate and chemically treat one facility and aqueduct at a time; continue diversions through alternate facility(ies) • Retrofit facility(ies) to minimize impact 		

Appendix G: Regulatory compliance

Pesticide Regulations Matrix

[For An Isolated Zebra Mussel Infestation In The Columbia River Basin (Montana), from the Columbia River Basin Interagency Invasive Species Response Plan: Zebra Mussels and Other *Dreissenid* Species, October 2008.]

REGULATORY REGIME	REGULATORY APPROVAL PROVISIONS	EMERGENCY PROVISIONS
<p>Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)</p> <p>Administered by US EPA. Pesticide licensing and application authority delegated to Montana Dept of Agriculture (MDA).</p> <p>Implemented under Montana Pesticide Act Title 80 Chapter 8</p>	<ul style="list-style-type: none"> • Pesticides approved for aquatic application by the MDA must also be authorized by the Montana Department of Environmental Quality under the Montana Water Quality Act. (see below). • For commercial pesticides not currently approved by MDA, a formal Section 3 application process would be required. The pesticide registrant would submit an application through the MDA. • For an emergency situation, FIFRA provides for exemptions under Sections 18 and 24. See next column. 	<ul style="list-style-type: none"> • Section 18 of FIFRA allows for emergency use exemption for a pesticide that is not already approved. The request would go through the MSDA who would evaluate the request and forward it to EPA. Requests should be submitted 100 to 120 days prior to expected use. This timeframe includes the EPA 50 day risk assessment. If approved, the approval would last for one year. • Section 18 also allows for a crisis exemption that would allow unregistered use for 15 days. The state agriculture department would notify EPA, EPA would do a cursory review, confer with the state and give crisis exemption. Use beyond the 15 days would require an emergency exemption. • Section 24 (c)) allows the states to register an additional use of a federally registered pesticide or a new use as long as there is a “special local need” and a current tolerance for the use approved by EPA. The request would go through the MDA for review and approval and then be submitted to EPA for their review.

REGULATORY REGIME	REGULATORY APPROVAL PROVISIONS	EMERGENCY PROVISIONS
<p>Endangered Species Act (ESA) administered jointly by the US Fish and Wildlife Service (USFW) and NOAA Fisheries. Montana Fish, Wildlife and Parks (MFWP) maintains a list of threatened and endangered Montana species.</p>	<ul style="list-style-type: none"> • Actions undertaken in the Columbia River Basin would likely involve a species listed under the Endangered Species Act and require a Section 7 consultation. See next column for Section 7 consultations and emergency provisions. 	<ul style="list-style-type: none"> • Section 18 or Section 24 requests would have to include an ESA Section 7 consultation with EPA and either NOAA or USFW or both depending on the species potentially impacted and the location and timing of the proposed action,. In an emergency situation, an emergency consultation under 50CFR Part 402.5 as amended in the Federal Register Vol 69 No 150 August 5, 2004 could take place while the emergency is occurring. It would involve an informal consultation and a determination by EPA and the resource agencies that the action would “not adversely affect” any listed species or critical habitat. Once the emergency is under control, the normal consultation process could occur if needed. • MFWP would have to be consulted if a state species of concern was at risk.
<p>National Environmental Policy Act (NEPA) administered by US EPA Montana Environmental Policy Act (MEPA) administered by the Montana DEQ under Title 75 Chapter 4 Rule 17 of the Montana Code</p>	<ul style="list-style-type: none"> • Any federally initiated action or action on federal lands or action using federal funds must also comply with the provisions of NEPA. An environmental assessment (EA) would be required and a finding of no significant impact (FONSI) needed before the action could take place. For an emergency situation, see next column. • Requires state agencies to review any action that will significantly affect the quality of the environment. A written 	<ul style="list-style-type: none"> • NEPA provides for an emergency action through consultation with the Council on Environmental Quality. The lead federal action agency would call CEQ, write a letter of notification, and prepare an environmental action statement. CEQ would respond in 24 hours. After the action is complete, a formal EIS or EA would have to be prepared. • Under MEPA, immediate action can be taken without an EIS if a project is

REGULATORY REGIME	REGULATORY APPROVAL PROVISIONS	EMERGENCY PROVISIONS
	<p>environmental assessment (EA) must be done to determine if an EIS is needed. The EA process usually takes 2 months. For an emergency, see next column.</p> <ul style="list-style-type: none"> • Administered by Montana DEQ, Title 75 Chapter 4 Rule 17.4 requires state agencies to integrate and review any action of state government that will significantly affect the quality of the environment. It requires a written environmental assessment (EA) to determine if an Environmental Impact Statement (EIS) is needed. All state agencies that have a role to play in a particular proposal are included as part of the MEPA process. Contact the MEPA program at 406-444-2544. • Joint Application for Proposed Work in Montana's Streams, Wetlands, Floodplains and Other Water Bodies • http://dnrc.mt.gov/licenses-and-permits/stream-permitting 	<p>undertaken to prevent or mitigate immediate threats to public health, safety, welfare or the environment. The Governor and the Environmental Quality Commission must be notified in 30 days. Rule 17.4.632.</p>
<p>Clean Water Act (CWA) administered by US EPA with authority delegated to the Montana Department of Environmental Quality to issue NPDES permits for regulating pollutants in Montana under the Montana CWA Title 75 Chapter 5.</p>	<ul style="list-style-type: none"> • No NPDES or WPCF permits are required in this situation. (see notes below) (2), however, Section 308 of the Montana CWA authorizes the MDEQ to approve the application of pesticides to surface waters to control aquatic nuisance organisms. See next column. • Section 401 of the federal CWA provides that an applicant for a federal license or permit to conduct any activity that may 	<ul style="list-style-type: none"> • MDEQ may issue a short term exemption from surface water quality standards for emergency pesticide application under Section 308 of the Montana Water Quality Act if significant risk to the public is prevented and existing and designated uses are protected. Application forms are available on line at www.deq.mt.gov/wqinfo

REGULATORY REGIME	REGULATORY APPROVAL PROVISIONS	EMERGENCY PROVISIONS
	<p>result in a discharge to waters of the State must provide the permitting agency with a water quality certification issued by the State from which the discharge originates. In the State of Montana, the Department of Environmental Quality is the designated agency for issuing certifications. For Section 10 and 404 permits water quality certification, contact DEQ at 406-444-4626.</p>	
<p>Resource Conservation and Recovery Act administered by US EPA with authority delegated to the Montana Dept of Environmental Quality under Title 75 Chap 10 Part 4</p>	<ul style="list-style-type: none"> • Pesticide waste must be managed in a non leak, closed container or tank that is appropriately labeled • Properly managed containers may be stored for up to one year • Containers must be transported to permitted hazardous waste facility following Montana and Federal Dept of Transportation regulations 	<ul style="list-style-type: none"> • Releases must be immediately contained and transferred to appropriate container. Releases over 200 #s or 25 gallons must be reported to the Montana Disaster and Emergency Services 1-406- 841-3911 and to the National Response Center 1- 800-484-8802.

Preparation for a Rapid Response— Environmental Compliance

Gap: *The lack of approved and available chemical and mechanical control tools for removing mussels in the habitats where new detections are likely will limit response options to reducing transmission from the waterbody via curtailing access, decontamination stations, or dewatering. Applications for FIFRA approval will take 15 days for a crisis exemption. As the likelihood of additional populations of mussels are anticipated, this stop gap can be avoided by planning now. A minimum of 120 days for approval of most chemical control options as a 1 year “emergency use exemption” as the next alternative makes response in the same year unlikely. Similarly, an environmental assessment to comply with NEPA requirements will take a minimum of 2 months if a more extensive document is not required. Generating compliance documents in advance for known treatments in likely target waterbodies will reduce delay. The Draft Montana Dreissenid Rapid Response Plan identifies chemical options including: copper-based algaecides, copper sulfate, copper carbonate, potassium salts, bacterial toxins, and Zequanox. Identifying necessary planning, permitting, and stockpiling will broaden the ability of responders to limit mussel establishment in Montana. Moving through the FIFRA Section 18 Emergency Exemption process in advance may reduce the lag in response time by a year or more.*

Physical control including drawdown and barrier placement are time consuming and impact the users of both small and large water infrastructure projects. The response plan should have steps and authorities identified in advance to facilitate the use of these options. This will likely involve establishing one or more Memoranda of Understanding with the Bureau of Reclamation and other water managers.

The success of any eradication effort depends on the availability of resources and tools for rapid response. A combination of pre-planning efforts and adaptability to advances in control technology and efforts by other entities will be needed. Contingency planning exercises will allow managers to determine what tools will be appropriate to which areas, if environmental compliance standards have been met, and regulatory compliance and permitting actions that are required prior, during, and following control tactic operations.

If (in accordance with integrated pest management (IPM) principles) it is determined that pesticides will be required to meet the eradication or control objectives, then applications must comply with regulatory processes. Pesticide applications to waters of the state must meet the terms and timelines identified by both the state Clean Water Act (CWA)/National Pollutant Discharge Elimination System (NPDES) pesticide general permit as well as product label directions and restrictions identified under the Federal Insecticide Fungicide Rodenticide Act (FIFRA) as administered by the Montana Department of Agriculture. The EPA can authorize, via Section 18, exemptions to registrations under emergency conditions, which are considered urgent, non-routine situations. **Four conditions must exist for an emergency to be considered:**

1. No effective, registered pesticides are available that have labeled uses for control of the pest.
2. No economically feasible alternative practices which provide adequate control are available.
3. The situation involves the introduction or dissemination of a pest new to or not previously known to be widely prevalent or distributed in the state or specific area.
4. It must be substantiated that this (new) pest or problem will cause a significant economic loss.

Emergency exemptions are applied for by state or federal agencies. In the case of Montana, the Montana Department of Agriculture is responsible for making an application request to the EPA. All Section 18 exemptions are designated for specific use, in a specific area, and for a specific amount of time, and use must be followed by submittal of a Use Report that document the use, results, economic benefits, acres treated, and benefits or comments concerning any problems surround the use of the exemption. Details on the information needed to request a Section 18 Emergency Exemption of FIFRA can be found [here](#).

If an infestation occurs in habitat that supports threatened and endangered species, NEPA and Endangered Species Act consultation will be required with appropriate state and federal agencies prior to implementing any control measures.

The following provides information about required permits and registration of pesticides likely to be used in an AIS invasive mussel rapid response scenario, including a set of recommendations to best position Montana for such an occurrence. Invasive mussels are used as the case study because it represents one of the more challenging scenarios Montana would face relative to permitting and preparation for a control action.

- Montana's Pesticide General Permit (PGP) is the wastewater discharge permitting mechanism for anyone that applies pesticides into or over state surface water. The permit is regulated under the Montana Department of Environmental Quality Montana Pollution Discharge Elimination System (MPDES) program. The application package for the 2016 PGP coverage is based on single county versus multi-county and the area of water to which the pesticides will be applied. A Notice of Intent (NOI) submittal is required before pesticide is applied to or over surface water. The NOI is a legal notification by the owner/operator to DEQ that they will comply with all terms and conditions of the PGP.
- If the application of pesticides occurs within the boundaries of Indian Lands, the owner/operator will need to comply with the requirements of the [EPA's Pesticide General Permit](#).
- The Environmental Protection Agency (EPA) authorizes Montana to administer NPDES permits through the Montana Department of Environmental Quality (DEQ).

- Options exist for how Montana could navigate through permitting requirements to respond to an introduction of AIS, from the development of a Habitat Conservation Plan or programmatic Environment Impact Statement to using existing emergency procedures, such as a Section 18 (see below). The EPA registers all pesticides under the Federal Insecticide, Fungicide, and Rodenticide Act of 1979 (FIFRA), which assures pesticides are properly labeled and will not cause harm to the environment if used in accordance with label.
- Section 3 FIFRA – EPA has reviewed and approved information and uses on product label.
- Section 24(c) FIFRA – The Montana Pesticides Act 8-8-201 (8)(a) requires that all 24(c) applications be **reviewed by three agencies**—the Department of Agriculture, the Department of Public Health and Human Services, and the Department of Fish, Wildlife, and Parks. The Department of Agriculture also requests that the US Fish and Wildlife Service and representatives from the Montana Native American Reservations review the applications. Applications are reviewed for special local needs, i.e., the existing or imminent pest problem within Montana for which there is no appropriate federally registered pesticide product available.
- Section 18 – States, or the region, may petition EPA for section 18 emergency exemption from full section 3 registration – temporarily expands the terms of the pesticide label to include additional emergency uses – users must obtain directions from lead agency. A Section 18 can be applied for regionally whereas Special Local Needs must be applied for on a state-by-state basis.

A joint programmatic opinion from NOAA and the USFWS is likely not the best approach for Montana because of the potential number of locations where an introduction of AIS may occur and the complex issues associated with numerous sensitive, threatened, and endangered species that are known to exist in and adjacent to Montana waters. To facilitate a more streamlined, realistic approach to working with key federal partners to address a dreissen introduction, the Pacific States Marine Fisheries Commission, in concert with NOAA and the USFWS, is exploring other models that have similar elements to a mussel response, e.g., oil spill response, to identify best options for how states, such as Montana, could navigate permitting requirements, especially those associated with threatened and endangered species (e.g., salmonids) to quickly respond to an introduction of AIS. Likely options would require:

- Best management practices for Montana’s water bodies, river systems, and watersheds.
- Inclusion of terrestrial species in terms of potential effects of a control action.
- Identification of pesticides that would most likely be used in a control action.
- Identification of sensitive, threatened, and endangered species in the control area (and downstream of the control area, if applicable).
- Addressing downstream habitats and how they might be affected by control actions.

- Setting goals and geographic scope to any likely control action.

The end of this section contains an example of an actual request by a state to the EPA for a FIFRA Section 18 Emergency Exemption.

Regulatory Planning Checklist

- Pesticide Registration— To discharge a pesticide to waters of the state to control invasive mussels in Montana, the pesticide product must be registered by the state (MDA), have a legal use in Montana, and be included in the states' NPDES General Permit. In addition, the applicator has to be covered under the NPDES permit.
- Montana should take steps to register new and emerging products designed to control AIS with minimal impacts to non-target species.
- Montana should refine and maintain a list of Section 3 pesticides that would most likely be used in an AIS control action. For example, potential registered Section 3 pesticides that could be used for an introduction of dreissenids include copper-based algaecides (in locations without salmonid populations), copper sulfate, copper carbonate, Endothal, potassium salts, bacterial toxins, and *Pseudomonas fluorescens* (Zequanox®).
- Montana should take steps to ensure all aspects of the NPDES permit reflect control activities most likely to occur in the event of an introduction.
- Montana should maintain an updated list of its impaired waterbodies (303d listings) and be aware of additional constraints on pesticide products that may be used if the waterbody being treated is on the list.
- State and federal authorities have described critical habitat areas or times of the year when specific pesticides cannot be applied. For example, juvenile salmon and ESA-listed species must not be present at the time of treatment with Endothal is being applied. This list of recommended treatment windows should be maintained.
- PDMP—Create and maintain an updated **Pesticide Discharge Management Plan** that includes the types of pesticides and control options that would likely occur for an AIS control action.
- Funding—Identify sources of funding to initiate control and monitoring actions in advance of an introduction.

FIFRA SECTION 18 - EMERGENCY EXEMPTION - QUARANTINE REQUEST

Zebra Mussel Treatment Plan using KCl for Christmas Lake & Lake Independence,
Minnesota

(§166.20 Application for a quarantine exemption.)

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PESTICIDE DESCRIPTION:

Potassium Chloride (KCl) is a metal halide salt also known as Muriate of Potash or Potash. This salt has an unclear mode of action but the potassium (K) is the lethal chemical for zebra mussels. Evidence suggests it kills mussels by interfering with gill respiration (Aquatic Sciences Inc. 1997).

The application shall contain a description of the pesticide(s) proposed for use under the exemption:

1. For a federally registered pesticide product: **Not applicable**
2. For any other pesticide products: **KCl**
 - A confidential statement of formula: **See Attachment 1**
 - Complete labeling to be used with exemption: **See Attachment 2 & 2.5**

DESCRIPTION OF THE PROPOSED USE:

Treatment Sites:

The proposed sites for use of KCl are Christmas Lake in the City of Shorewood, Hennepin County, Minnesota and Lake Independence near the City of Maple Plain, Hennepin County, Minnesota (see Attachments 5&6). Christmas Lake has a surface area of 267 acres and a maximum depth of 87 feet. Lake Independence has a surface area of 832 acres and a maximum depth of 58 feet. The treatment area for both lakes is approximately 40,000 square feet with an average depth of 3.5-4 feet. The treatment area in each lake is enclosed by a 10-foot tall floating curtain barrier, restricting flow and open water exchange. The barrier outlining the treatment area makes contact with the shoreline and encompasses a public boat launch ramp on each lake. The sites are currently closed off from public use. Neither lake is utilized for public drinking water. Overflow of Christmas Lake flows into Lake Minnetonka and Lake Independence flows into a series of wetlands from Pioneer Creek.

Method of Application:

The KCl will be applied in liquid form (as a mixed slurry), similar to two treatment studies conducted in Millbrook Quarry, Virginia, USA (Fernald and Waterson, 2014) and Lake Winnipeg, Manitoba, Canada (DFO 2014).

A pesticide applicator, licensed by the Minnesota Department of Agriculture, will be responsible for all applications of potash. Granular KCl will be mixed on board the applicators watercraft and agitated throughout the treatment. The pesticide will be applied to the surface water using a spray wand and allowed to mix with the water column.

Application Rate & Pesticide Quantities:

The potassium (K⁺) concentration in potash required to kill zebra mussels is 100 ppm. Fernald and Watson (2014) achieved 100% mortality between 98-115 ppm.

Following the initial dosing for each treatment area (estimated at 1700 lbs. of granular KCl), potassium (K⁺) concentrations will be measured either in the field with a potassium ion electrode or analyzed by a certified lab. The pesticide applicator may also monitor for chloride concentrations in the field (as a surrogate for potassium (K⁺)) as was the method in Sister Grove Creek in Texas (as per verbal conversation with the Texas Department of Parks and Wildlife). Follow-up applications(s) may be required to maintain 100 ppm potassium (K⁺) for a sufficient duration which will be determined by

zebra mussel bioassays in lake (caged zebra mussels within the treatment area monitored daily for mortality) and zebra mussels in aquaria lab trials.

According to a report by ASI project E9015 (1997) potassium does not require continual addition to the water column, except to account for leakage. Efficacy will be monitored with zebra mussel bioassays in lake (caged zebra mussels within the treatment area monitored daily for mortality) and zebra mussels in aquaria lab trials.

Total Amount of Pesticide Proposed for Treatments:

Total amount of pesticide proposed for each treatment area depends upon in-lake potassium (K⁺) concentration achieved for up to two weeks after the initial dosing treatment. Additional application(s) of potash may be necessary to maintain 100 ppm potassium for up to two weeks. Initial dosing of KCl for each lake is calculated to be:

1700 lbs. dry weight of KCl (equates to 900 lbs. of potassium per treatment area)

Note: the atomic mass percentage of KCl is 53% potassium and 47% chloride

Maximum Number of Applications:

The total number of applications in the initial two-week treatment period will depend on the dispersal and dissolve rates determined during and between applications as well as achieving 100% mortality in the zebra mussel bioassays. Water samples will be collected at surface and near bottom (3-4 ft.) depths every 48-96 hours and analyzed at a professional lab. Because the area is enclosed, Minnesota Department of Natural Resources does not anticipate potassium (K⁺) concentrations to dissipate quickly. Dosing will be adjusted accordingly and upon achieving 100% zebra mussel mortality the floating curtain will be removed from each lake, allowing the treated water to mix. One or more additional two-week treatment periods may be necessary within or outside the original treatment areas in 2015, 2016, and 2017, depending on the results of mussel monitoring.

Total Acreage to be Treated:

The total acreage proposed is approximately 1.84 acres (40,000 square feet or .92 acres per lake). Depending upon zebra mussel monitoring efforts in spring 2015, additional acreage may need treatment.

Total Lake Surface Area:	Christmas Lake - 267 acres
	Lake Independence - 832 acres

Applicable Restrictions and Requirements Concerning the Proposed Use Not on Label:

Although there are no immediate effects of KCl to human health and non-target species (Fernald and Watson, 2014), the Minnesota Department of Natural Resources will continue to monitor K concentrations (and other water quality parameters) in Christmas Lake and Lake Independence upon barrier removal and achieved 100% zebra mussel mortality. This monitoring will take place over the next consecutive years.

Duration of Proposed Use:

The duration of the proposed use is for 3 years (December 2014 – December 2017).

ALTERNATIVE METHODS OF CONTROL:

The application shall contain: A detailed explanation of why the pesticide(s) currently registered for the particular use proposed in the application is not available in adequate supplies and/or effective to the degree needed to control the emergency. If the applicant states that an available registered pesticide is ineffective for the given situation, the statement must be supported by field data which demonstrate ineffectiveness of registered pesticides, or, if such data are unavailable, statements by qualified agricultural experts, extension personnel, university personnel or other persons similarly qualified in the field of pest control; and A detailed explanation of why alternative practices, if available, either would not provide adequate control or would not be economically or environmentally feasible.

The following alternatives are considered less desirable because of environmental concerns, technical infeasibility, logistics, or expense. Below are the listed alternatives and a detailed explanation of why they would not be effective due to lack of 1) adequate control or 2) economic and environmental feasibility.

Chemical Control**NON-OXIDIZING MOLLUSCICIDES**

There are several commercial products in this category, including Clam-trol®, BULAB 6002, Calgon H-130M and others. These are generally labelled for closed system use, such as cooling water treatments, water treatment systems and power plant water lines. Generally, they are toxic to fish and require detoxification by use of some additional substance, such as bentonite clay, prior to discharge to open waters. Clam-trol® was examined for possible use in Iowa and was ruled out as a treatment option in Iowa Great Lakes due to, "... uncertainty of its effectiveness due to potential inadequate mixing in the water column, its short life span and the anticipated kill of most aquatic organisms in the quarry." Their restricted labelling and broader non-target toxicity makes them unsuitable for open water use such as needed in Christmas Lake and Lake Independence.

For more info see here:

http://www.iagreatlakes.com/ZQM_Eradication_Control_Options.pdf

http://www.epa.gov/pesticides/chem_search/ppls/003876-00149-20130709.pdf

OXIDIZING MOLLUSCICIDES

Copper products, such as copper sulfate are pesticides used to control snails and swimmers itch in Minnesota. In addition, chelated copper products have been used to target zebra mussels. However, attempts using copper in open water applications have

shown inconsistent results in MN resulting in non-target impacts to outlet stream invertebrate fauna, “molluscan fauna eliminated, as well as amphipods, mayflies and stoneflies, with some species of caddis flies also showing impacts”, while in Nebraska copper sulfate was unsuccessful in eradicating zebra mussels in Base Lake, and also resulted in a large fish kill (Schainost 2010). Research conducted by the U.S. Army Corps of Engineers found that adult zebra mussels require significantly higher levels of copper for mortality than veligers. Thus, high doses or repetitive copper treatments are needed, and may result in increased non-target impacts. In addition, recent treatments utilizing one copper based product (EarthTec QZ®, copper sulfate pentahydrate) have not produced the desired zebra mussel mortality as it has proven difficult to maintain adequate copper levels in open-water applications. Minnesota Department of Agriculture recently issued a section 24(c) special local need registration (SLN MN-140003) for use of EarthTec QZ in Christmas Lake and Lake Independence at a greater frequency than currently allowed by the section 3 label, in order to maintain adequate copper levels. However, based on initial laboratory trials conducted by Minnehaha Creek Watershed District, it may require repeated applications every few hours, which could be time consuming, labor intensive, and costly.

For more info see here:

http://www.iagreatlakes.com/ZQM_Eradication_Control_Options.pdf

<http://www.ianrpubs.unl.edu/epublic/live/g2173/build/#target5>

http://www.omaha.com/outdoors/invasive-zebra-mussels-confirmed-at-offutt-lake/article_e5327a2a-1507-11e4-b44a-0017a43b2370.html

BIO-PESTICIDES

Zequanox® is a highly selective biological molluscicide that has low toxicity and presents little to no risk towards non-target organisms. Upon first discovery of zebra mussels in Christmas Lake in 2014, an initial treatment of Zequanox® was applied. Water temperatures at this time are below those recommended for optimum efficacy of this control material, with the manufacturer suggesting control could fall down to 50% or lower below water temperatures of 70 degrees F. By the time a second treatment could be made in 2015 with this product, water temperatures would have permitted reproduction of zebra mussels (reported in literature to begin at water temperatures between 55 – 62 degrees F). Once reproduction has occurred, veligers can move throughout the water column, rendering treatment of the area ineffective at eliminating the zebra mussels from the lake. In addition, Zequanox® is cost prohibitive in terms of treating large, open waters compared to chemically based products (i.e. copper-based algaecides/molluscicides or KCl).

Physical/Mechanical Removal

Due to the population size found at both accesses (over 5,000 zebra mussel juveniles in Christmas Lake and approximately 2,000 zebra mussels at Lake Independence) it is unrealistic and unfeasible to remove them through physical or mechanical means. In addition, mechanical means could increase turbidity and reduce water clarity by stirring up sediment in the cordoned off area. Additionally, if mechanical means were to

stir up bottom materials, these could move from the area and potentially carry attached mussels to other areas of the lake. Currently, Christmas Lake is not impaired for nutrients or turbidity and supports some of the highest water quality in the metro area.

EFFECTIVENESS OF PROPOSED USE:

The application shall contain data, a discussion of field trials, or other evidence that provide the basis for the conclusion that the proposed pesticide treatment will be effective in dealing with the emergency.

To date there are few instances of open-water applications of potash (KCl) for zebra mussel control in lakes and rivers, although the product has been used in closed systems for decades largely for non-pesticide industrial/municipal purposes. The few examples of open-water applications cited in the literature include lake treatments in Millbrook Quarry, Virginia, and Lake Winnipeg, Manitoba, and one stream treatment in Sister Grove Creek, Texas (see details below). The lake treatments were both successful at achieving mortality in the treatment areas, but the stream treatment was not.

Millbrook Quarry, Virginia

Zebra mussels were identified in 2002 in Millbrook Quarry, Virginia, by the Virginia Department of Game and Inland Fisheries (Fernald and Watson 2014). This was the first open-water infestation to be documented in the state of Virginia. Millbrook Quarry is 12 acres and has a depth of 93 feet. The quarry was opened in 1947 and has been inactive since 1963. The quarry has been used as a training and recreational dive site since 1970.

After the zebra mussel population delineation and assessment, the decision was made to attempt to eradicate the mussels via the application of potassium under a section 18 emergency exemption authorized by EPA. Treatment was conducted by a private contractor (Aquatic Sciences LP) during a three-week period in January-February 2006. The contractor injected a solution of 74,000 gallons of potassium chloride (muriate of potash) over the three-week period, aiming for a target concentration of 100 milligrams of KCl per liter of water or 100 ppm KCl. Weekly monitoring of potassium concentrations were conducted during and post-treatment, along with monitoring of adjacent waters. Detected concentrations ranged from 98-115 ppm of potassium within the quarry, and no leaks of potassium in to surrounding waters were detected. The Virginia Department of Fish and Game concluded that the treatment was successful, and that zebra mussel mortality was 100%. Zebra mussel mortality was assessed by four methods, including collection of over 1000 mussels from rocks at sites around the quarry (no live mussels were collected), visual dive surveys of the quarry for live mussels, video surveys of the bottom via robotic camera, and bioassays of caged live zebra mussels exposed to the treated quarry water. No non-target impacts were observed on local aquatic wildlife (including crayfish, mollusks, turtles, and multiple fish species), and unrestricted use of the Quarry for diving was allowed starting on May 6, 2006.

Lake Winnipeg, Manitoba

Lake Winnipeg is a large (9,465 square miles) lake in the province of Manitoba, Canada. It has an average depth of 39 feet, and a maximum depth of 118 feet, and is used extensively for tourism/ recreation, commercial fishing, and in the generation of hydroelectric power. Zebra mussels were first identified in Lake Winnipeg in October 2013 on a private dock. Subsequent searches also identified a private individual who found five dead mussels on a piece of PVC pipe in 2011, but did not report the findings until late 2013.

The October 2013 zebra mussel finding prompted the Province of Manitoba to implement a rapid response protocol in an attempt to eradicate all known populations and suppress the spread of the existing population (Department of Fisheries and Oceans, 2014). As part of the rapid response protocol, a survey was conducted in October 2013 to determine the spatial extent and density of the zebra mussel population, and four harbors were identified as infested. Previously collected data from 2013 spiny waterflea (*Bythotrephes longimanus*) collections across the lake were also analyzed for zebra mussel veligers, and none were found in locations away from the infested harbors. Based on the successful use of liquid potash in Millbrook Quarry, the high toxicity of potash to zebra mussels and its low toxicity to most other aquatic biota, the Province of Manitoba selected potash to use for the treatment in Lake Winnipeg. In 2014, the four harbors were sealed off from the main lake for 60 days using non-permeable geotextile membranes, and treated by a private contractor (ASI Group Ltd-formerly Aquatic Sciences LP). In order to maintain KCl concentrations similar to those in Millbrook Quarry, Virginia (100 ppm), approximately 336 metric tons of 20% KCl solution was used to treat 356,000-427,000 m³ of water (Department of Fisheries and Oceans 2014). All four harbors were treated once within 28 working days. Daily water quality monitoring was conducted during the treatments, along with post-treatment monitoring to assess potassium levels. Zebra mussel mortality was assessed via bioassays of healthy adult zebra mussels exposed to treated harbor water, and via ongoing monitoring of the harbors. The Manitoba minister of Conservation and Water Stewardship described the treatments as 100% effective in the treated areas, but surveys are still taking place outside of the harbors to determine whether a zebra mussel population exists elsewhere in the lake.

Sister Grove Creek, Texas

Zebra mussels were first observed in Texas in 2009, in Lake Texoma. Zebra mussels then moved south, and in 2010 a small, low-density population was documented in a tributary of Lake Lavon, Sister Grove Creek. Lake Lavon is an important water supply source and recreation destination in north Texas, and so the Texas Commission on Environmental Quality and the Texas Parks and Wildlife Department submitted an application to treat 35 miles of Sister Grove Creek for zebra mussels. The treatment took place September-October 2010, and the entire stream length was treated using 35,000 pounds of potash under section 18 emergency exemption authorized by EPA. Conductivity was monitored during the treatments to assess whether target potassium concentrations had been achieved, and post-treatment evaluations examined zebra mussel survival in the upper and lower sections of the creek. While 100% zebra mussel

mortality was achieved in the lower section of the creek, some live mussels were found even after a second application of potash in the upper creek. The lack of mortality was attributed to the low flow and low water volumes in the upper section of the creek during the treatment periods. Monitoring of the zebra mussel populations is continuing, since treatment efforts may have set back the zebra mussel population in Sister Grove Creek enough to slow their expansion or to limit their ability to develop a viable breeding population.

DISCUSSION OF RISK INFORMATION:

The application shall address the potential risks to human health, endangered or threatened species, beneficial organisms, and the environment expected to result from the proposed use, together with references to data and other supporting information.

Human health

It is not expected that the application of potash to the proposed treatment area will have any potential risk to human health (see Attachment 3 - MSDS, Hazards Identification). The initial application(s) in 2014-2015 would occur during colder water temperatures, so any swimming or other related recreational use would not occur. For follow up treatments in the summer/late fall, no direct contact by humans would be expected. The small proposed treatment area will remain contained within the barrier until all treatments have been completed. Data from the Final Environmental Assessment from Virginia (2005) stated that toxicity levels for the potash that was applied to Millbrook Quarry were:

Acute Oral Toxicity: (mouse, rat) LD50 = 1500 – 2600 mg/kg bw.

As these levels far exceed the proposed application rates (100 ppm) it is unlikely that incidental human contact with treated waters could cause any human health risk. Potassium chloride can be prescribed in pill form to treat low levels of potassium in the body. Thus, any exposure to water or biota from the treatment area would not likely have negative impacts on human health.

Endangered or threatened species

There are no Federal listed endangered or threatened species in Lake Independence or Christmas Lake.

There are Minnesota state listed species of Special Concern in Christmas Lake. According to MN DNR's Natural Heritage Information System, there have been Least darters (*Etheostoma microperca*) observed in Christmas Lake since 1997. One individual Pugnose shiner (*Notropis anogenus*) was collected in 1941, but has not been reported since. Pugnose shiner and Least darter are listed as a Special Concern species in Minnesota but have no Federal status. Neither species should be affected by the KCl treatment.

There are no state listed rare species documented in Lake Independence.

Non-target effects

Potash has been shown in previous uses to have an extremely high level of non-target organism safety (see MSDS; Toxicological Information and Ecological Information). Toxicity data indicates that the target concentration is not lethal to non-target organisms other than freshwater mollusks (e.g., the threshold effect concentration [TEC] for potassium is 272.6 ppm for *Ceriodaphnia* and 426.7 ppm for fathead minnows; Aquatic Sciences Inc. 1997, USFWS 2005). One major group that could be impacted by potash is the molluscs, which include native unionids and gastropods as well as the target pest zebra mussels. Surveys in the proposed treatment area have documented two native mussel individuals. To the best of Minnesota DNR's knowledge, giant floater (*Pyganodon grandis*) is the only species reported in Christmas Lake. This species is common in Minnesota Lakes and prevalent outside the treatment area. No native mussel species have been reported in Lake Independence. Freshwater snails would also likely be impacted in the treatment – however, due to the small area of the treatment location, repopulation via existing snail populations within the lake and adjacent to the treatment area would likely be rapid.

COORDINATION WITH OTHER AFFECTED STATE OR FEDERAL AGENCIES:

If the proposed use of the pesticide is likely to be of concern to other Federal or State agencies, the application shall indicate that such agencies have been contacted prior to submission of the application, and any comments received from such agencies shall be submitted to EPA.

Minnesota Department of Natural Resources (DNR) has cooperated with the Minnesota Department of Agriculture in the creation of this Section 18 Quarantine request and has provided the treatment plan as well as background information on KCl. The DNR fully supports this request as a prudent control measure for localized zebra mussel infestations in Minnesota's waters. In addition, the DNR will be gathering valuable data in terms of zebra mussel eradication strategies for future localized infestations.

The Minnesota Pollution Control Agency was also contacted regarding this proposal and they submitted the following response:

*Minnesota Pollution Control Agency staff who are currently conducting a chloride TMDL study for the Minneapolis-St. Paul metropolitan area have reviewed this application and concluded that it poses no significant threat of water quality harm or ecological risk to the two lakes. We note that the chronic standard for chloride in these lakes (and in most waters of the state) is 230 mg/L, whereas the proposed treatment concentration is less than 25% of this standard (about 50 mg/L in terms of chloride).
MPCA/JBE - 10/28/2014*

ACKNOWLEDGMENT BY REGISTRANT:

The application shall contain a statement by the registrants of all pesticide products proposed for use acknowledging that a request has been made to the Agency for use of the pesticide under this section. This acknowledgment shall include a statement of

support for the requested use, including the expected availability of adequate quantities of the requested product under the use scenario proposed by the applicant(s); and the status of the registration in regard to the requested use including appropriate petition numbers, or of the registrant's intentions regarding the registration of the use.

See Attachment 3

Description of Proposed Enforcement Program:

Prior to approval, the applicant shall provide an explanation of the authority of the applicant or related State or Federal agencies for ensuring that use of the pesticide under the proposed exemption would comply with any special requirements imposed by the Agency and a description of the program and procedures for assuring such compliance.

Treatment(s) will be permitted and supervised by the Minnesota Department of Natural Resources. The Minnesota Department of Agriculture will take appropriate steps to ensure that the conditions of the exemption are met.

Information Required for a Quarantine Exemption:

An application for a quarantine exemption shall provide all of the following information concerning the nature of the emergency:

*The scientific and common name of pest: **Dreissena polymorpha, zebra mussels***

The origin of pest and the means of its introduction or spread if known:

Zebra mussels are a detrimental aquatic invasive species that have invaded North America. They were first observed in Lake St. Clair in 1986 and spread through ballast waters discharged from commercial ships. They are now widespread in areas such as the Great Lakes, the Ohio and Mississippi River drainage and lakes from Wisconsin to New England. Adult zebra mussels colonize an area quickly by attaching to hard substrates via byssus threads. At the larval stage (veliger) zebra mussels disperse throughout the water column and can spread by connected waterbodies. Areas unconnected by waterways, zebra mussels may be transported by individuals trailering boats from infested waters. For Christmas Lake and Lake Independence, the main source of spread likely originated from Lake Minnetonka (< 1 mile and 3.5 miles, respectively). Zebra mussels were discovered in Lake Minnetonka in 2010. It is one of the largest recreation and fishing lakes in the region and receives high boat traffic year-round. Zebra mussels were discovered in Lake Independence in late September 2014 and Christmas Lake in late August 2014.

The anticipated impact of not controlling the pest:

In both instances, the zebra mussels found in Christmas Lake and Lake Independence represent an isolated population with low probability of spreading lakewide based on reproductive capabilities or prevailing environmental conditions. The likelihood of eradication through chemical control is much higher compared to other lakes. However,

if no action were taken, it is likely that zebra mussels will establish a reproducing, self-sustaining population in both lakes. Either of these lakes would then serve as another source population and possibly contribute to the infestation of area lakes free from zebra mussels. Most importantly, taking no action would mean the MnDNR, UMN and other partners would lose a valuable opportunity to learn whether zebra mussel eradication/control can be achieved under this rare situation. Information gathered from this study will be beneficial for resource agencies addressing zebra mussels in the future.

Zebra mussel infestations in other Minnesota lakes have caused human health concerns through cuts on recreationists' feet, as well as scrapes on hands and other areas. In Lake Pepin (Mississippi River) people have reported serious cuts to the paws of their dogs which have gone into the water in areas of heavy mussel densities. Reports from Lake Zumbro (southern Minnesota) have included emergency room visits to have stitches put in the feet of water skiers who have jumped from the ski boat onto lake areas with zebra mussels.

Zebra mussels have been shown to have a variety of environmental and recreational impacts. Native mussels are infested by this bio-fouling invasive species and can be quickly killed. Areas of the Great Lakes showed massive declines in native mussel local populations after invasion and heavy infestation. Zebra mussels have also been correlated with blooms of toxic blue-green algae in bays within the Great Lakes. Their feeding targets green algae and they reject blue-green forms. This selective feeding removes competition in the algal community for nutrients, permitting potentially high densities of undesirable blue-green algae. Extensive filtering of suspended particulates in the lake by high densities of zebra mussels can lead to increased macrophyte growth through increased water clarity. Some contaminants are bio-accumulated by the filter-feeding behavior, and can potentially be passed on to any predators (diving ducks, fish) that eat these mussels. In some areas of the Great Lakes, zebra mussels have been implicated in a complex path that has led to large waterfowl die-offs (including loons and other important species) through botulism toxin. Researchers have also suggested that dense extensive populations of zebra mussels may interfere with the base of the food chain in lakes, competing with zooplankton for the desirable component of the algal community.

Other issues include clogging of personal water intakes, used for lawn and garden watering, as well as heavy infestations on boats and other watercraft moored in infested waters. The potential for inadvertent spread via recreational gear moved from infested waters increases with new infestations, including but not limited to private sale of docks, lifts, rafts and other recreational gear. Reports from Great Lakes areas have included alteration of algal community to favor blue-green algae, in some cases creating conditions that favor blooms that can create toxins.

REFERENCES:

Aquatic Sciences, Inc. 1997. Ontario Hydro baseline toxicity testing of potash using standard acute and chronic methods: ASI Project E9015. In *Eradication of zebra mussels at Millbrook Quarry* \Prince William County, Virginia. Proposal M20065 submitted to the Virginia Department of Game and Inland Fisheries in response to RFP 00375-352. Orchard Park, NY: Aquatic Sciences L.P.

Department of Fisheries and Oceans (DFO). 2014. Lake Winnipeg Zebra Mussel treatment. DFO Canadian Science Advisory Secretariat Science Response 2014/031.

Fernald, R.T. and Watson, B.T. 2014. Eradication of zebra mussels (*Dreissena polymorpha*) from Millbrook Quarry, Virginia: Rapid response in the real world. Pp. 195-213 in Quagga and Zebra Mussels: Biology, Impacts, and Control (Nalepa, T.F. and Schloesser, D.W. eds.). CRC Press, Boca Raton, FL. 775 pp.

U.S. Fish and Wildlife Service. 2005. Final Environmental Assessment, Millbrook Quarry Zebra Mussel and Quagga Mussel Eradication. Virginia Department of Game and Inland Fisheries, Richmond, VA. http://www.dgif.virginia.gov/wildlife/final_zm_ea.pdf

Schainoist, S. 2010. Zebra mussels in a Nebraska lake. Powerpoint presentation. Nebraska Game and Parks Commission. <http://snr.unl.edu/invasives/documents/NebraskasZebra-MusselInfestationandEradicationLakeOffutt.pdf>.

Waller, D.L., Rach, J.J., Cope, W.G., Marking, L.L., Fisher, S.W., and Dabrowka, H. 1993. Toxicity of candidate molluscicides to zebra mussels (*Dreissena polymorpha*) and selected target organisms. J. Great Lakes Res. 19: 695-702.



KCl Fine – Untreated

PARTICLE SIZE DISTRIBUTION — SGN = 30

Tyler Mesh	US Mesh	Opening (mm)	Typical (% Cum.)
20	20	0.841	0.2
28	30	0.600	1.8
35	40	0.420	16
65	70	0.210	72
100	100	0.149	93

PHYSICAL PROPERTIES

Typical

Bulk Density, loose	
- lb/cu foot	72
- kg/cu meter	1153
Angle of Repose (degrees)	26

CHEMICAL ANALYSIS

Component	Symbol	Typical %
Potassium Oxide Equivalent	K ₂ O	62.38
Potassium Chloride	KCl	98.74
Potassium	K	51.78
Sodium Chloride	NaCl	1.00
Moisture at 130° C	H ₂ O	0.070
Chloride	Cl	47.61
Sodium	Na	3935 PPM
Calcium	Ca	250 PPM
Magnesium	Mg	110 PPM
Bromide	Br	560 PPM
Sulfate	SO ₄	450 PPM
Water Insoluble	—	100 PPM

Product analyses are typical as tested at minesite. Handling and transportation may affect the analysis of the delivered product.

Revised 11/05

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Attachment 2: Muriate of Potash Label

MOP (Muriate of Potash)

For control of zebra mussels and quagga mussels in specific lakes in Minnesota
For use only by Minnesota Department of Natural Resources personnel and their
designees

Section 18 Emergency Exemption
EPA File Symbol: XX-XX-XX

THIS IS AN UNREGISTERED PRODUCT AND MAY BE DISTRIBUTED AND USED ONLY IN MINNESOTA.

EFFECTIVE PERIOD:

This exemption becomes effective on MM/DD/14 and expires on MM/DD/17.

ACTIVE INGREDIENT:	potassium chloride.....	99%
OTHER INGREDIENTS:	<u>1%</u>
TOTAL:	100.0%
NET CONTENTS:	55 lbs.

KEEP OUT OF REACH OF CHILDREN

CAUTION

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

CAUTION. Harmful if swallowed. Harmful if absorbed through skin. Causes moderate eye irritation. Avoid contact with skin, eyes, or clothing. Harmful if inhaled. Avoid breathing dust or spray mist. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, or using the toilet. Remove and wash contaminated clothing before reuse.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Wear long-sleeved shirt, long pants, socks, and shoes. Wear waterproof gloves. Wear protective eyewear.

FIRST AID

If swallowed:

- Call a poison control center or doctor immediately for treatment advice.
- Have person sip a glass of water if able to swallow.

- Do not induce vomiting unless told to by a poison control center or doctor.
- Do not give anything to an unconscious person.

If inhaled:

- Move person to fresh air.
- If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible.
- Call a poison control center or doctor for further treatment advice.

If on skin:

- Take off contaminated clothing.
- Rinse skin immediately with plenty of water for 15-20 minutes.
- Call a poison control center or doctor for treatment advice.

If in eyes:

- Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing.
- Call a poison control center or doctor for treatment advice.

Have the product container or label with you when calling a poison control center or doctor, or going for treatment. For medical emergencies call your poison control center at 1-800-222-1222.

ENVIRONMENTAL HAZARDS

PHYSICAL OR CHEMICAL HAZARDS

When this material is subjected to high temperatures, it may release small amounts of chloride gas.

DIRECTIONS FOR USE

This use is in connection with an emergency exemption authorized under the provisions of section 18 of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), as amended. This label must be in the possession of the user at the time of application. It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Any adverse effects resulting from the use of MOP (Muriate of Potash) under this quarantine exemption must be immediately reported to the Minnesota Department of Agriculture (651-201-6292).

- For use only by Minnesota Department of Natural Resources personnel and their designees
- For use only in Christmas Lake and Lake Independence, Hennepin County, MN
- For use in control of zebra mussels and quagga mussels
- **Application rate:** 100 ppm potassium (K⁺)

- **Method of application:** The KCl will be mixed with water at Christmas Lake and Lake Independence and applied to the surface waters of the designated treatment areas. A pesticide applicator, licensed by the Minnesota Department of Agriculture, will be responsible for all applications of potash. Granular KCl will be mixed on board the applicators watercraft and agitated throughout the treatment. The pesticide will be applied to the surface water using a spray wand and allowed to mix with the water column.
- **Application frequency:** Following the initial dosing for each treatment area (estimated at 1700 lbs. of granular KCl), xpotassium (K^+) concentrations will be measured either in the field with a potassium ion electrode or analyzed by a certified lab. The pesticide applicator may also monitor for chloride concentrations in the field (as a surrogate for potassium (K^+)). Follow-up application(s) may be required to maintain 100 ppm potassium (K^+) for a sufficient duration which will be determined by zebra mussel bioassays in lake (caged zebra mussels within the treatment area monitored daily for mortality) and zebra mussels in aquaria lab trials.
- For use only in localized areas.

STORAGE AND DISPOSAL

Do not contaminate water, food, or feed by storage and disposal.

STORAGE: Keep container closed and away from food, feedstuffs, and domestic water supplies.

PESTICIDE DISPOSAL: Any unused, unregistered product must either be returned to the manufacturer or distributor (unopened containers) or disposed of in accordance with Resource Conservation and Recovery Act regulations following the expiration of the emergency exemption.

CONTAINER DISPOSAL: Nonrefillable container. Do not reuse or refill this container. Offer for recycling, if available. If not available, then dispose of empty bag in a sanitary landfill or by incineration, or, if allowed by State or local authorities, by burning. If burned, stay out of smoke.

Batch code: 14.147

Manufactured by: Mosaic Company
Kallum Road
Belle Plaine, Saskatchewan, Canada
Telephone: 306.345.8400

Distributed by: Hawkins, Inc.
1425 Red Rock Road
St. Paul, MN 55119
Telephone: 612-225-6683

Attachment 2.5: Muriate of Potash Batch Information/Quality Certificate

Page 1 of 1

11835



SK, Belle Plaine - Mosaic
 Kallum Road
 Belle Plaine SK S0G 0G0
 Telephone: 3063458400
 Fax:

HAWKINS CHEMICAL INC.
 3100 E HENNEPIN AVE
 MINNEAPOLIS MN 55413
 UNITED STATES OF AMERICA

FAX: 6126178578

Vehicle ID: SY7410-MB
 Scale Ticket No: BP60007983
 Deliveries: 1001800321

Material: Our / Your reference
 102944 MOP, 62% WHITE FINE UNTR 55 LB BAGS /

Inspection lot 10000084998 from 06/10/2014

Quality Certificate	
Date	06/13/2014
Purchase order item/date	527149 / 05/15/2014
Delivery item/date	1001800321 000010 / 06/10/2014
Order item/date	1701420 000010 / 05/15/2014
Customer number	5007820

Characteristic	Value	Unit	Lower Limit	Upper Limit
Chemical Analysis				
NaCl	0.86	%		
KCl	98.98	%		
K2O	62.53	%		
SH2O	0.040	%		
Physical Analysis				
20 Mesh	1.00	%		
28 Mesh	3.64	%		
35 Mesh	28.71	%		
48 Mesh	64.49	%		
65 Mesh	84.07	%		
100 Mesh	94.39	%		
Lot Number 1	→ 14.147			

Additional Vehicles in this shipment:
 Additional Deliveries in this shipment:

Fai Mudry
 Quality Control Lab Supervisor
 Mosaic Potash, Belle Plaine, (306)345-8631

QA Approved
 Kc 19 Jun 14

Attachment 3: Statement from Supplier

From: [Joe Gadbois](#)
To: [Lund, Keegan \(DNR\)](#)
Subject: RE: 2 quick potash requests
Date: Thursday, November 06, 2014 11:54:19 AM
Attachments: [KCL Spec sheet.pdf](#)
[KCL C of A.pdf](#)

Hello Keegan, We can supply you with Potassium Chloride for this project. We have ample supplies on hand to meet the needs of the Christmas Lake project.(1700 lbs). We stock several times that amount. I am attaching two documents, a C of A and a Spec sheet, in the hopes that they will suffice in place of a CSF. I am waiting for an answer from our supplier on whether or not they can get us a CSF.

Joe Gadbois
Branch Manager
Hawkins Water Treatment Group
612-225-6683 Office
612-670-2717 Cell
joe.gadbois@hawkinsinc.com



HAWKINS, INC.
1425 Red Rock Road
St. Paul, MN 55119



MATERIAL SAFETY DATA SHEET

Muriate of Potash

Page 1 of 7

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name:	Muriate of Potash (MOP), all grades
Chemical Name:	Potassium Chloride
Chemical Family:	Inorganic Salt
Synonyms:	Potash; MOP; Potassium Chloride; Potassium Muriate; Potassium Monochloride
Chemical Formula:	KCl
Primary Use:	Crop nutrient; Industrial applications
Responsible Party:	Mosaic USA LLC 3033 Campus Drive Plymouth, MN 55441
Non-Emergency Technical Contact:	8:00 am - 4:00 pm Central Time, Mon - Fri: 800-323-5523

EMERGENCY OVERVIEW 24 Hour Emergency Telephone Number: For Chemical Emergencies: Spill, Leak, Fire or Accident Call CHEMTREC North America: (800) 424-9300 Others: (703) 527-3887 (collect)																					
Health Hazards:	Avoid contact with eyes, skin and clothing. Wash thoroughly after handling. Potassium chloride is generally recognized as safe (GRAS) when used in accordance with good manufacturing practice.																				
Physical Hazards:	None expected																				
Physical Form:	Solid																				
Appearance:	White to reddish-brown, crystalline or granular																				
Odor:	None																				
<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="text-align: left; border-bottom: 1px solid black;">NFPA HAZARD CLASS</th> <th colspan="2" style="text-align: left; border-bottom: 1px solid black;">HMIS HAZARD CLASS</th> </tr> </thead> <tbody> <tr> <td style="width: 25%;">Health:</td> <td style="width: 25%;">1 (Slight)</td> <td style="width: 25%;">Health:</td> <td style="width: 25%;">1 (Slight)</td> </tr> <tr> <td>Flammability:</td> <td>0 (Least)</td> <td>Flammability:</td> <td>0 (Least)</td> </tr> <tr> <td>Instability:</td> <td>0 (Least)</td> <td>Physical Hazard:</td> <td>0 (Least)</td> </tr> <tr> <td>Special Hazard:</td> <td>None</td> <td></td> <td></td> </tr> </tbody> </table>		NFPA HAZARD CLASS		HMIS HAZARD CLASS		Health:	1 (Slight)	Health:	1 (Slight)	Flammability:	0 (Least)	Flammability:	0 (Least)	Instability:	0 (Least)	Physical Hazard:	0 (Least)	Special Hazard:	None		
NFPA HAZARD CLASS		HMIS HAZARD CLASS																			
Health:	1 (Slight)	Health:	1 (Slight)																		
Flammability:	0 (Least)	Flammability:	0 (Least)																		
Instability:	0 (Least)	Physical Hazard:	0 (Least)																		
Special Hazard:	None																				

Status: Revised MSDS	Issue Date: December 1, 2006
Revised Section: 1	MSDS Number: MOS002



MATERIAL SAFETY DATA SHEET

Muriate of Potash

Page 2 of 7

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	% Weight	Exposure Guideline		
Potassium Chloride CAS No. 7447-40-7	95 - 99.5	NE	OSHA ACGIH	All All
Sodium Chloride CAS No. 7647-14-5	0.3 - 3.7	NE	OSHA ACGIH	All All
Calcium and Magnesium Chlorides and Sulfates CAS No. Various	0.2 - 1.3	NE	OSHA ACGIH	All All

NE = Not established, but the following particulate limits apply to all inert inorganic dusts.

Particulates Not Otherwise Classified (PNOC)	10 mg/m ³ 3 mg/m ³	ACGIH	TWA - Inhalable TWA - Respirable
Particulates Not Otherwise Regulated (PNOR)	15 mg/m ³ 5 mg/m ³	OSHA	TWA - Total Dust TWA - Respirable

Notes:

State, local or other agencies or advisory groups may have published more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

3. HAZARDS IDENTIFICATION

POTENTIAL HEALTH EFFECTS	
Eye:	Contact may cause mild eye irritation including stinging, watering and redness.
Skin:	Contact may cause mild irritation including redness and a burning sensation. No information available on skin absorption.
Inhalation (Breathing):	No information available.
Signs and Symptoms:	Effects of overexposure may include irritation of the nose, throat and digestive tract, nausea, vomiting, diarrhea, abdominal cramping, irregular heartbeats (arrhythmias), dehydration, and hypertension. Repeated overexposure to dusts may result in irritation of the respiratory tract, coughing and shortness of breath.
Cancer:	Inadequate data available to evaluate the cancer hazard of this material.
Target Organs:	No data available.
Developmental:	Inadequate data available for this material.
Other Comments:	None.
Pre-Existing Medical Conditions:	Conditions aggravated by exposure may include kidney disorders and high blood pressure (hypertension).

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4. FIRST AID MEASURES

Eye:	If irrigation or redness develops, move victim away from exposure and into fresh air. Flush eyes with clean water. If symptoms persist, seek medical attention.
Skin:	Cleanse affected area(s) thoroughly by washing with mild soap and water. If irritation or redness develops and persists, seek medical attention.
Inhalation (Breathing):	If respiratory symptoms develop, move victim away from source of exposure and into fresh air. If symptoms persist, seek medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.
Ingestion (Swallowing):	If large amounts are swallowed, seek emergency medical attention. If victim is drowsy or unconscious and vomiting, place on left side with the head down and do not give anything by mouth. If victim is conscious and alert and ingestion occurred within the last hour, vomiting should be induced for ingestion of large amounts (more than 5 ounces or a little more than 1/2 cup in an adult) preferably under direction from a physician or poison center. If possible, do not leave victim unattended and observe closely for adequacy of breathing.
Note to Physicians:	No information found.

5. FIRE FIGHTING MEASURES

Flammable Properties:	This product is non-flammable. Flash Point - Not applicable OSHA Flammability Class - Not applicable LEL/UEL - Not applicable Auto-ignition Temperature - Not applicable
Unusual Fire & Explosion Hazards:	No unusual fire or explosion hazards are expected. When this material is subjected to high temperatures, it may release small amounts of chloride gas.
Extinguishing Media:	Use extinguishing agent suitable for type of surrounding fire.
Fire Fighting Instructions:	Positive pressure, self contained breathing apparatus is required for all fire fighting activities involving hazardous materials. Full structural fire fighting (bunker) gear is the minimum acceptable attire. The need for proximity, entry, flashover and/or special chemical protective clothing (see Section 8) needs to be determined for each incident by a competent fire fighting safety professional. Water used for fire suppression and cooling may become contaminated. Discharge to sewer system(s) or the environment may be restricted, requiring containment and proper disposal of water (see Section 6).

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6. ACCIDENTAL RELEASE MEASURES

Muriate of Potash is a crop nutrient and plant food however, large spills can harm or kill vegetation.

- Stay upwind and away from spill (dust hazard).
- Wear appropriate protective equipment including respiratory protection as conditions warrant (see Section 8).
- Prevent spilled material from entering sewers, storm drains, other unauthorized treatment drainage systems, and natural waterways.
- Notify appropriate federal, state, and local agencies as may be required (see Section 13).
- Minimize dust generation.
- Sweep up and package appropriately for disposal.

7. HANDLING AND STORAGE

Handling:	The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits (see Sections 2 and 8). Wash thoroughly after handling. Wash contaminated clothing. Use good personal hygiene practice.
Storage:	Keep container(s) tightly closed. When possible use and store this material in cool, dry, well ventilated areas. Store only in approved containers. Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls:	If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits (see Section 2), additional ventilation or exhaust systems may be required.
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Personal Protective Equipment (PPE)

Respiratory:	A NIOSH approved air purifying respirator with a type 95 (R or P) particulate filter may be used under conditions where airborne concentrations are expected to exceed exposure limits (see Section 2). Protection provided by air purifying respirators is limited (see manufacturer's respirator selection guide). Use a positive pressure air supplied respirator if there is potential for uncontrolled release, exposure levels are not known or any other circumstances where air purifying respirators may not provide adequate protection. A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed if workplace conditions warrant a respirator.
Skin:	The use of cloth or leather work gloves is advised to prevent skin contact, possible irritation and absorption (see glove manufacturer literature for information on permeability).
Eye/Face:	Approved eye protection to safeguard against potential eye contact, irritation, or injury is recommended. Depending on conditions of use, a face shield may be necessary.
Other PPE:	A source of clean water should be available in the work area for flushing eyes and skin. Impervious clothing should be worn as needed.

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9. PHYSICAL AND CHEMICAL PROPERTIES

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm)

Flash Point:	Not applicable
Flammable/ Explosive Limits (%)	LEL/UEL - Not applicable
Auto-ignition Temperature:	Not applicable
Appearance:	White to reddish-brown, crystalline or granular
Physical State:	Solid
Odor/Taste:	None/Strong saline
Molecular Weight of Pure Material:	KCl - 74.6; NaCl - 58.5
pH:	5.4 - 10.0 in a 5% solution
Vapor Pressure MM Hg):	Approximately zero
Vapor Density (air = 1):	2.57
Boiling Point:	Sublimes at 1,500°C (2,732°F)
Freezing/Melting Point:	772 to 776°C (1423 to 1428°F)
Solubility in Water:	99.5 - 99.999%; 34.2 g/100mL at 20°C
Specific Gravity:	1.986 - 1.990
Volatility:	No data available
Bulk Density:	Loose - 64 to 75 lbs/ft ³ (1025 to 1200 kg/m ³)

10. STABILITY AND REACTIVITY

Chemical Stability:	Stable under normal conditions of storage and handling. Material is hygroscopic (May absorb moisture from air when relative humidity >72%).
Conditions to Avoid:	None known
Incompatible Materials:	Avoid contact with hot nitric acid, may cause evolution of toxic nitrosyl chloride. Contact with other strong acids may produce irritating hydrogen chloride gas. KCl may react violently with bromine trifluoride and may explode if mixed with potassium permanganate and sulfuric acid. NaCl can react with most noble metals, such as iron or steel, building materials (such as cement), bromine, or trifluoride. A potentially explosive reaction may occur if NaCl is mixed with dichloromaleic anhydride and urea. Electrolysis of mixtures containing NaCl and nitrogen compounds may form explosive nitrogen trichloride.
Corrosivity:	Similar to salt. Mildly corrosive to metals in the presence of moisture.
Hazardous Decomposition Products:	None known
Hazardous Polymerization:	Will not occur

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11. TOXICOLOGICAL INFORMATION

Potassium Chloride:	LD50 (rat, oral) = 2.6 g/kg LC50: no information available Eye (rabbit): 500 mg/24 H, mild irritant Inadequate carcinogenicity, mutagenicity, or developmental toxicity data located for potassium chloride. No target organ data located for potassium chloride.	LD50 (mouse, oral) = 1.5 g/kg
Sodium Chloride:	LD50 (rat, oral) = 3 g/kg; LC50 (rat) >42 g/m ³ / 1 hour Eye (rabbit): 100 mg/24 hour, moderate irritant Eye (rabbit): 500 mg/24 hour, mild irritant Inadequate carcinogenicity, mutagenicity, or developmental toxicity data located for sodium chloride. No target organ data located for sodium chloride.	LD50 (mouse, oral) = 4 g/kg

12. ECOLOGICAL INFORMATION

Ecotoxicity:	Dissolution of large quantities of potassium chloride and sodium chloride in water may create an elevated level of salinity that may be harmful to fresh water aquatic species and to plants that are not salt-tolerant. Potassium Chloride: Lepomis macrochirus LC50 - 2010 mg/l Physa heterostrapha LC50 - 940 mg/l Scenedesmus subspicatus EC50 - 2500 mg/l Sodium Chloride: Ceriodaphnia dubia LC50 - 280,000 - 3,540,000 ug/l Daphnia magna LC50 - 3,144,000 - 10,000,000 ug/l Daphnia pulex EC50 - 56.40 mM Pimephales promelas LD50 - 6,020,000 - 10,000,000 ug/l
BOD AND COD:	No data found

13. DISPOSAL CONSIDERATIONS

This material, if discarded as produced, is not an RCRA "listed" or "characteristic" hazardous waste. Contamination may subject it to hazardous waste regulations. Properly characterize all waste materials. Consult state and local regulations regarding the proper disposal of this material.

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14. TRANSPORT INFORMATION

Hazard Class or Division:	Not listed in the hazardous materials shipping regulation (49 CFR, Table 172.101) by the U.S. Department of Transportation, or in the Transport of Dangerous Goods (TDG) regulations in Canada.
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15. REGULATORY INFORMATION

FDA:	1. Potassium Chloride used as a dietary supplement in food for human consumption is generally recognized as safe (GRAS) when used in accordance with good manufacturing practice [21 CFR 182.5622]. 2. Substance added directly to human food affirmed as GRAS [21 CFR 184.1622].
CERCLA:	Not listed
RCRA 261.33:	Not listed
SARA Title III:	SARA 302: RQ: No; TPQ: No SARA 311/312: Acute: No; Chronic: No; Fire: No; Pressure: No; Reactivity: No - Exemptions at 40 CFR, Part 370 may apply for agricultural use, or quantities of less than 10,000 pounds on site. SARA 313 List: No
TSCA:	8 (b) Chemical Inventory: Yes; TSCA 8 (d): No
Proposition 65: (CA Health and Safety Code Section 25249.5)	Warning: This product contains substances that are known to the State of California to cause cancer and/or reproductive harm.
NTP, IARC, OSHA:	This material has not been identified as a carcinogen by NTP, IARC, or OSHA.
Canada DSL:	Yes
Canada NDSL:	No
WHMIS:	Not controlled

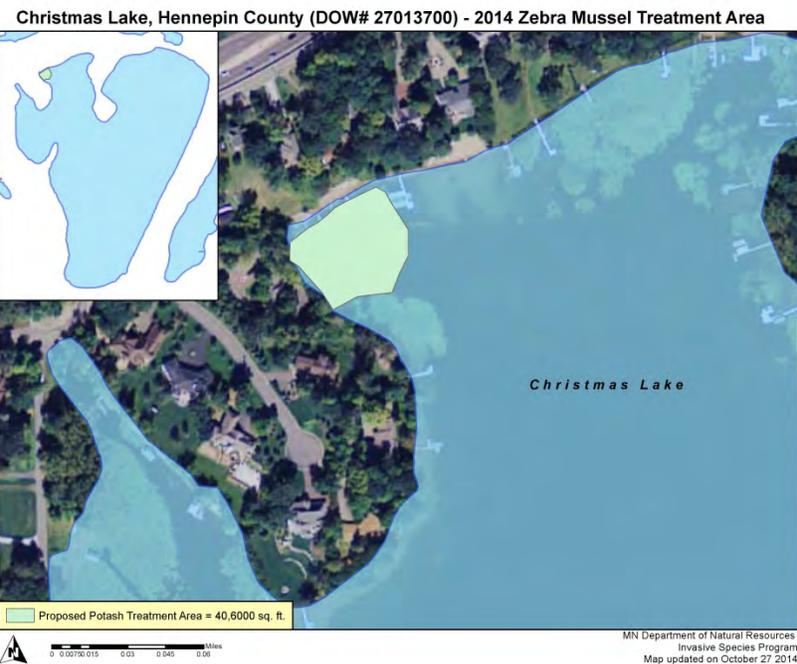
16. OTHER INFORMATION

The information in this document is believed to be correct as of the date issued. Nothing herein contained shall be deemed to be a representation or warranty with respect to the product described herein. **NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THIS INFORMATION, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE, AND ALL SUCH REPRESENTATIONS AND WARRANTIES ARE HEREBY EXPRESSLY DISCLAIMED BY MOSAIC.** This information and product are furnished on the condition that the person receiving them shall make their own determination as to suitability of the product for their particular purpose and on the condition that they assume the risk of their use thereof. The conditions and use of this product are beyond the control of Mosaic, and Mosaic disclaims any liability for loss or damage incurred in connection with the use or misuse of this substance.

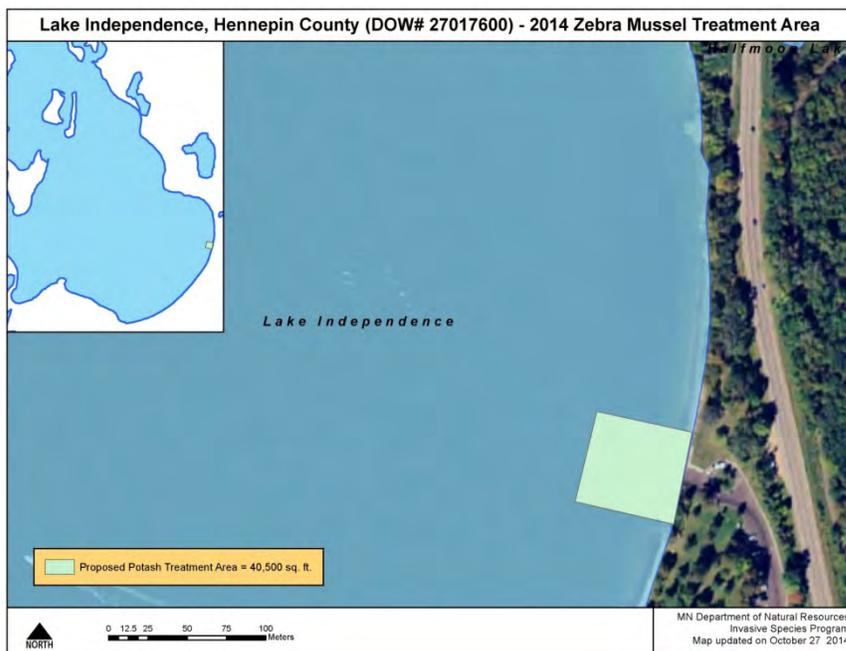
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Attachment 5: Map of Christmas Lake Proposed Treatment Area



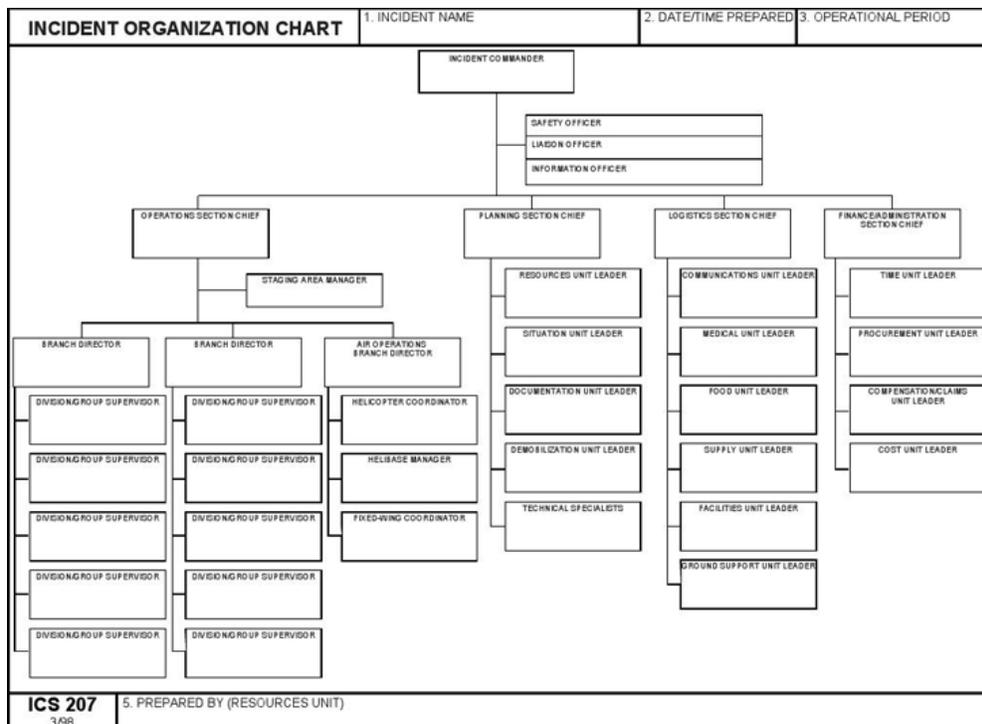
Attachment 6: Map of Lake Independence Proposed Treatment Area



Appendix H: Incident Command

ICS Structure

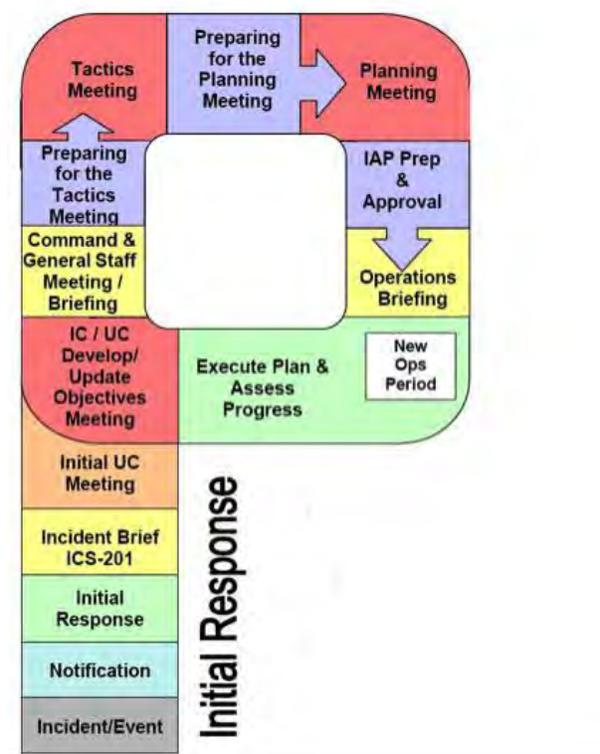
The standard ICS structure is recommended for all rapid responses but positions may be combined or collapsed depending on the scale of the operation.



ICS Form 207 is available as a *fillable form*.

Daily schedule

The purpose of the Rapid Response Plan is the Operational Planning “P” process, a visual representation of the ICS planning process that was originally developed by the US Forest Service and is now recommended by the Aquatic Nuisance Species Task Force (ANSTF). The “P” serves as a step-by-step guide to response from the onset of an incident to assessment and monitoring and the daily schedule revolves around the “P” as elements of the response are evaluated, implemented, and reevaluated. The daily schedule of these meetings and process is Form ICS 230 and is available as a [pdf](#) or [word](#) document on the USCG ICS site.



Task list for the Incident Commander

The Montana Dreissenid Rapid Response plan is written for managers responsible for initiating and managing a response either as the Incident Commander or a member of the leadership team. The following checklist is specific to Montana and is based on the Columbia River Basin Multiagency Coordination Group (CRB MAC) Chair's checklist. The checklists for all other positions are included in the **Columbia River Basin Interagency Invasive Species Response Plan: Zebra Mussels and Other Dreissenid Species**, under that plan's Appendix B-Rapid Response Checklists.

The following checklist is a guideline for IC and they should use their experience to augment the list as necessary. Note that some of the activities are one-time actions; others are ongoing or repetitive for the duration of the emergency.

- Activate appropriate members of the Montana Invasive Species Council, Upper Columbia conservation commission, Missouri River Basin groups, Columbia Basin Commission, and advisory panels to review regulatory, scientific, and policy options for the response. Enlist stakeholders to assist with delineation.
- Obtain initial briefing from FWP staff on detection, location, risk assessment.
- Assess infestation situation.
 - Review the current situation status. Ensure that all County, State and Federal agencies impacted by the infestation are notified (review "Notification" list).
 - Determine probable scope and impact of infestation.
 - Determine the need for/status for emergency declaration (**Appendix E**) and request emergency declaration as necessary. Ensure declaration is forwarded to impacted County Emergency Manager(s) and Federal partners.
 - Determine impact on commercial and recreational activities.
 - Determine current priorities
- Ensure appropriate staffing pattern has been established.
- Brief Agency leadership and regional partners
 - Authorize release of information to the media. Activate Joint Information Center (JIC) as required.
 - Identify priorities, strategic considerations, and fiscal and policy directives for the management of the infestation.
 - Determine the time and location of first interagency meeting.
 - Define what agency contacts will be delegated and which will be retained. For example, routine updates may be assigned to the staff, but policy-level communication may be retained by the Incident Commander.
- Establish Internal Communications System:
 - Develop a communications plan
 - Set a schedule to brief the Governor's office

- Establish contacts with the agency Directors offices and receive authorization to brief legislative branch, Federal partner, and other non-executive branch authorities.
- Brief stakeholders and regional partners.
- Establish External Communications System:
 - Include in the communications plan
 - Notify impacted County Commissioners and other elected officials of infestation, and keep them informed as to incident status and activities. Include in meetings as appropriate.
 - Brief legislative branch, Federal partner, and other non-executive branch authorities as authorized.
- Direct the call back of off-duty personnel as needed (keep in mind the possible need to staff additional shifts). Assess staffing needs for:
 - Rapid Response Team
 - Joint Information Center
 - Establish what resources will be procured, managed and allocated (**Appendix H**).
- Determine information needs and inform staff of requirements.
- Prioritize incidents daily, when new incidents occur, or if there is a major change in existing incidents. The following rankings may be used to prioritize incidents:
 - 1st Priority-Infestations which can be contained and eradicated.
 - 2nd Priority-Infestations which present a threat to essential infrastructure.
 - 3rd Priority-Infestations which present a threat to commercial or subsistence activity.
 - 4th Priority-Infestations which present a threat to recreational activity.
 - 5th Priority-Infestations that present a threat to imperiled species or another significant ecological value.
- Obtain and organize resources. (Reoccurring)
 - Allocate scarce/limited resource to incidents based on priorities.
 - Establish parameters for resource requests and releases.
- Review requests for critical resources. (Reoccurring)
- Approve assignment of rapid response team upon request from impacted jurisdiction.
- Confirm who has ordering authority within the organization and in impacted jurisdictions.
- Define those orders which require authorization.
- Establish level of planning to be accomplished.
 - Contingency Planning & assignment of responsible parties
 - Formal Meetings

- Establish parameters for tactical response.
 - List alternative management plans and identify those which require authorization. Coordinate authorization with responsible agency administrators.
 - Review and approve proposed management plan(s).
 - Authorize implementation of approved management plan(s).
- Ensure staff coordination.
 - Periodically check progress on assigned tasks of agency and rapid response personnel. Confirm additional assignments with interagency liaison. (Reoccurring)
 - Approve necessary changes to strategic goals and action plans.
- Ensure Inter-jurisdictional coordination.
 - Ensure that all press releases are coordinated with other impacted jurisdictions and agencies.
 - Ensure that agency Incident Management Teams are sharing information and coordinating activities as appropriate.
 - Ensure that situation status is being shared with cooperating and assisting agencies.
 - Ensure that logistical support requests are being handled efficiently.
- Facilitate meetings. Ensure documentation of decisions and actions taken

Appendix I: Glossary & Acronyms

For a more complete dictionary of ICS terms the [FEMA library](#) has a guide.

The Western Regional Panel definitions are available in the revised [Building Consensus in the West](#) document.

Accidental introduction: an introduction of nonindigenous aquatic species that occurs as the result of activities other than the purposeful or intentional introduction of the species involved, such as the transport of nonindigenous species in ballast water or in water used to transport fish, mollusks, or crustaceans for aquaculture or other purposes

Agency Administrator: state agency leader with authority over approving staff and resource allocation, policy decisions

Agency Representative: staff person with specified delegated authority to represent the agency administrator

AIS: Aquatic Invasive Species

APHIS: Animal & Plant Health Inspection Service (USDA)

Aquatic invasive species (AIS): a plant or animal species that threatens the diversity or abundance of native species, the ecological stability of infested waters, or commercial, agricultural, aquacultural, or recreational activities dependent on such waters. (Note: for the purposes of the State management plans, reference to an aquatic nuisance species will imply that the species is nonindigenous.) In the past, it was common to use the term Aquatic Nuisance Species (ANS) and this language is still present in some documents and organizations and should be considered synonymous.

Biocontrol: The use of living organisms, such as predators, parasites, and pathogens, to control pest insects, weeds, or diseases.

BOR: Bureau of Reclamation

BP: Department of Immigration and Naturalization Border Patrol

BPA: Bonneville Power Administration

CG: Coast Guard

COE: Corps of Engineers

Control: eradicating, suppressing, reducing, or managing invasive species populations, preventing spread of invasive species from areas where they are present, and taking steps such as restoration of native species and habitats to reduce the effects of invasive species and to prevent further invasions

CRANSI: Columbia River Aquatic Nonindigenous Species Initiative

CSKT: Confederated Salish-Kootenai Tribe

DEQ: Montana Department of Environmental Quality

Decontamination: A treatment with the intent to kill, destroy, and remove aquatic invasive species, to the extent technically and measurably possible.

Detect or detected: the verified presence of AIS

DOC: Montana Department of Commerce

DOT: Montana Department of Transportation

Ecological integrity: the extent to which an ecosystem has been altered by human behavior; an ecosystem with minimal impact from human activity has a high level of integrity; an ecosystem that has been substantially altered by human activity has a low level of integrity. Term may arise during planning for control option deployment

Eradicate: the act or process of eliminating an aquatic nuisance species

Exotic: (same as nonindigenous) any species or other variable biological material that enters an ecosystem beyond its historic range, including such organisms transferred from one country to another

Fed: all federal agencies

FS: USDA Forest Service

FWP: Montana Department of Fish, Wildlife and Parks

FWS: U.S. Fish and Wildlife Service

Gov: Governor

Inconclusive: temporary status for a waterbody has not met the minimum criteria for detection, but has had one positive test result

Infested: management area that has an established population of invasive species

Intentional introduction: all or part of the process by which a nonindigenous species is purposefully introduced into a new area

Invasive: a species that takes over a new habitat where it was not previously found, often to the detriment of species which were there before.

ISC & ISCoord: Invasive Species Council and Invasive Species Coordinator

Lead Agency: agency responsible for implementing an action utilizing either their own or delegated authorities and resources

Leg: Montana Legislature

MAC: Multiagency Coordination

MCES: Montana Cooperative Extension Services

MDA: Montana Department of Agriculture

MHP: Montana Highway Patrol

MNPS: Montana Native Plant Society

MSU: Montana State University

Nonindigenous species: any species or other variable biological material that enters an ecosystem beyond its historic range, including such organisms transferred from one country to another.

NPS: National Park Service

NRIS: Natural Resources Information Service

Pathogen: a microbe or other microorganism that causes disease.

Pioneer infestation: a small ANS colony that has spread to a new area from an established colony.

Positive: Multiple (2 or more) subsequent sampling events that meet the minimum criteria for detection.

Priority species: an ANS that is considered to be a significant threat to Montana waters and is recommended for immediate or continued management action to minimize or eliminate their impact.

Private: private utility companies (term used in the Columbia River Basin plans)

PSMFC: Pacific States Marine Fisheries Commission

Stacked Jurisdiction: When more than one entity has management authority over a resource and decision making is shared.

State: all state agencies

Status Unknown: waters that have not been monitored.

Suspect: Water body that has met the minimum criteria for detection.

UM: University of Montana

Undetected/Negative: sampling/testing is ongoing and nothing has been detected, or nothing has been detected within the time frames for de-listing.

Unified Command: an authority structure in which the role of incident commander is shared by two or more individuals, each already having authority in a different responding agency

Verification: the scientifically-based process to confirm the presence of Aquatic Invasive Species (AIS)

Watershed: an entire drainage basin including all living and nonliving components

Appendix J: Resources

Identifying the resources needed for proposed action is an action specific to each response and the Incident Commander is responsible for identifying the scope and duration of the resources needed. Many of the elements will be similar between responses and can be identified as part of the planning process and are included here.

Personnel

- List the names and contact information for the agency personnel responsible for implementing the following response actions (Appendix C)
- Estimated time frame to complete the response (from start to finish) for staff planning purposes
- Obtain relevant permits and regulatory approvals for staff overtime and duties.
- Identify specialists, for example, the USFWS team of scientific divers.

Funding

Describe the estimated level of funding needed to implement the response, including the sources of the funding and individuals responsible for securing the funding.

- Accurately track and document costs of the response and share with management authorities and the public.
- Communicate financial responsibility to all incident responders.
- Be aware of the need to reimburse or cover overtime pay.

Adding resources

During a response, if the scale of the operation increases beyond local capacity to supply staff and materials the process for acquiring additional resources should be identified in standing MOUs and the IC should have access to agency leadership to escalate the response as authorized.

Equipment

A catalogue of equipment that is specific to AIS response including boats, benthic mats, booms, weirs, pesticide delivery systems etc. should be compiled in a catalogue and referenced here. In addition, table top exercises should focus on locating, transporting, and deploying specialized equipment to identify gaps in capacity.

Appendix K: Emergency Declaration

Not every rapid response will include an emergency declaration. Whether or not this should be pursued will be assessed by agency directors and the Governor's Office following the notification of a new mussel location.

The following is the 2016 Executive Order related to the first dreissenid mussel response in Montana.

BEFORE THE DEPARTMENT OF FISH, WILDLIFE AND PARKS OF THE STATE OF MONTANA

In the matter of the adoption of
temporary emergency rules closing the
Tiber Reservoir and Canyon Ferry
Reservoir

NOTICE OF ADOPTION OF TEMPORARY
EMERGENCY RULES

TO: All Concerned Persons

5. The Department of Fish, Wildlife and Parks (department) has determined the following reasons justify the adoption of a temporary emergency rule:
 - a. On November 30, 2016, Governor Bullock issued Executive Order No. 18-2016 proclaiming an invasive species emergency.
 - b. The executive order states invasive aquatic species comprise a grave threat to the waters and economic resources within the State of Montana, and such introduced species are best controlled when experts take management measures quickly after their introduction is discovered.
 - c. In the executive order, Governor Bullock developed an incident management organization to manage the State of Montana's response to this invasive species emergency.
 - d. The incident management organization has requested an immediate temporary emergency closure for Tiber Reservoir and Canyon Ferry Reservoir in order to limit the launch or removal of any boat, dock, or other structure that could potentially transport invasive aquatic mussels.
 - e. Therefore, as this situation constitutes an imminent peril to public welfare, the department adopts the following temporary emergency rule. The emergency rule will be sent as a press release to newspapers throughout the state. Also, signs informing the public of the closure will be posted at access points. The rule will be sent to interested parties, and published as a temporary emergency rule in Issue No. 24 of the 2016 Montana Administrative Register.
6. The department will make reasonable accommodations for persons with disabilities

who wish to participate in the rulemaking process and need an alternative accessible format of the notice. If you require an accommodation, contact the department no later than 5:00 p.m. on January 6, 2017, to advise us of the nature of the accommodation that you need. Please contact Kaedy Gangstad, Fish, Wildlife and Parks, 1420 East Sixth Avenue, P.O. Box 200701, Helena, MT 59620-0701; telephone (406) 444-4594; or e-mail kgangstad@mt.gov.

7. The temporary emergency rule is effective December 1, 2016 when this rule notice is filed with the Secretary of State.
8. The text of the temporary emergency rules provide as follows:

RULE I TIBER RESERVOIR TEMPORARY EMERGENCY CLOSURE

1. The Tiber Reservoir is closed:
 - a. in its entirety;
 - b. to the launch or removal of any boat, dock or other structure that could potentially transport invasive aquatic mussels.
2. No boat, dock, or other structure should be removed from the immediate area without contacting the Mussel Incident Hotline at (406) 444-2440 or musselresponse@mt.gov.
3. This rule is effective until ice over, but not for a period longer than 120 days. Signs restricting use of the Tiber Reservoir will be removed when the rule is no longer effective. Status of the closure will be updated on the department's web site at fwp.mt.gov.

AUTH: 80-7-1007, MCA
IMP: 0-7-1007, 80-7-1013, MCA

RULE II CANYON FERRY RESERVOIR TEMPORARY EMERGENCY CLOSURE

1. The Canyon Ferry Reservoir is closed:
 - a. in its entirety;
 - b. to the launch or removal of any boat, dock or other structure that could potentially transport invasive aquatic mussels.
2. No boat, dock, or other structure should be removed from the immediate area without contacting the Mussel Incident Hotline at (406) 444-2440 or musselresponse@mt.gov.
3. This rule is effective until ice over, but not for a period longer than 120 days. Signs restricting use of the Canyon Ferry Reservoir will be removed when the rule is no longer effective. Status of the closure will be updated on the department's web site at fwp.mt.gov.

AUTH: 80-7-1007, MCA
IMP: 0-7-1007, 80-7-1013, MCA

4. The rationale for the temporary emergency rule is as set forth in paragraph 1.
5. Concerned persons are encouraged to submit their comments to the department. They should submit their comments along with their names and addresses to Bruce Rich, Department of Fish, Wildlife and Parks, P.O. Box 200701, Helena, MT 59620-0701 or e-mail fwpfsh@mt.gov. Any comments must be received no later than January 20, 2017.
6. The department maintains a list of interested persons who wish to receive notice of rulemaking actions proposed by the department or commission. Persons who wish to have their name added to the list shall make written request that includes the name and mailing address of the person to receive the notice and specifies the subject or subjects about which the person wishes to receive notice. Such written request may be mailed or delivered to Fish, Wildlife and Parks, Legal Unit, P.O. Box 200701, 1420 East Sixth Avenue, Helena, MT 59620-0701, or may be made by completing the request form at any rules hearing held by the department.
7. The bill sponsor contact requirements of 2-4-302, MCA, do not apply.

/s/ Paul Sihler

Paul Sihler

Acting Director

Department of Fish, Wildlife and Parks

/s/ Rebecca Dockter

Rebecca Dockter

Rule Reviewer

Certified to the Secretary of State December 1, 2016

DEPARTMENT OF NATURAL RESOURCES
AND CONSERVATION



STEVE BULLOCK, GOVERNOR

1539 ELEVENTH AVENUE

STATE OF MONTANA

DIRECTOR'S OFFICE (406) 444-2074
FAX: (406) 444-2684

PO BOX 201601
HELENA, MONTANA 59620-1601

February 2, 2018

To: John Tubbs, Director, DNRC
Martha Williams, Director, FWP
Ben Thomas, Director, MDA
Mike Tooley, Director, MDT

Fr: Stephanie Hester, Montana Invasive Species Council Coordinator (MISC)

Re: Updated AIS Interagency Agreement

Since 2012, the Departments have entered into cooperative agreements to enhance coordination among the agencies for management of aquatic invasive species (AIS). The purpose of the agreement is to:

- Clarifies authorities and agency roles & responsibilities
- Adds program enhancements included in HB 622 and SB 363
- Provides a mechanism to transfer funds among agencies
- Reestablishes the interagency AIS working group
- Outlines notification process for new detections---3 working days
- Satisfies SB 363 reporting requirement

The updated agreement has been drafted and reviewed by your program staff and is ready for adoption by the directors. For specific questions on the development and content of this document, please contact the following staff.

DNRC and MISC, Stephanie Hester, 444-0547, shester@mt.gov
FWP, Tom Woolf, 444-1230, Thomas.woolf@mt.gov
MDA, Dave Burch, 444-3140, dburch@mt.gov
MDT, Mike Miller, 444-6991, mikmiller@mt.gov

Date sent

2-7-18
3-1-18
3-2-18
3-13-18

We will circulate the agreement in the order above—DNRC, FWP, MDA, MDT. Once you've reviewed and signed, please pass it along to the next agency on the list. Once MDT completes the signatory process, please return to Stephanie Hester at DNRC for distribution of the fully executed agreement to all parties.

Thank you in advance.

**Montana Department of Fish, Wildlife & Parks,
Montana Department of Agriculture,
Montana Department of Transportation,
Montana Department of Natural Resources and Conservation**

**Aquatic Invasive Species Act Cooperative Agreement
Agreement #18-622**

Aquatic invasive species (AIS) have the potential to damage the economy, environment, recreational opportunities, and human health of Montana. The Montana Aquatic Invasive Species Act (Act) was passed by the 2009 Montana Legislature and was revised in the 2011 and 2017 legislative sessions. Montana must take concerted actions to prevent, detect, control, and manage AIS. The best strategy for preventing the introduction, importation, and infestation of invasive species is through coordinated education, prevention, detection, and management activities. The Act recognizes that the Department of Agriculture (MDA), the Department of Fish, Wildlife & Parks (FWP), the Department of Transportation (MDT), and the Department of Natural Resources and Conservation (DNRC) share concerns and responsibilities over AIS and seeks to provide collaboration between these state agencies whenever possible. MDA, FWP, MDT, and DNRC are referred to collectively in this agreement as “the Departments.”

The Act supports and enhances the AIS efforts of the Departments and seeks to ensure coordination of department roles/responsibilities when there may be overlapping jurisdiction. The Act recognizes that the Departments may share concerns and responsibilities over some AIS and seeks to provide collaboration and coordination among them whenever possible. To achieve this objective, the Act directs the Departments to develop cooperative agreements that further clarify agency roles/responsibilities if there are questions about which department has lead jurisdiction or when there is overlapping interest in a specific AIS. Cooperative agreements may also be used to transfer funding among the Departments for implementing AIS priority activities with funding authorized through the Act.

House Bill (HB) 622 (MCA §§ 2-15-3309 and 2-15-3310), passed in the 2017 legislative session, revised the Act by providing capacity, funding, additional authorities, and rulemaking authority for increased protection and coordination of invasive species management in Montana. Elements in HB 622 enhance AIS prevention, early detection, and education.

Measures included in HB 622 include:

- Codifies the Montana Invasive Species Advisory Council (MISC), formerly established through Executive Order. The purpose of the MISC is to advise the Governor on a science-based, comprehensive program to identify, prevent, eliminate, reduce, and mitigate the impacts of invasive species in Montana and to coordinate with public and private partners to develop and implement statewide invasive species strategic plans;
- Establishes the Upper Columbia Conservation Commission (UC₃). The purpose of the UC₃ is to protect the aquatic environment in tributaries to the Columbia River from the threat of AIS. Through cooperative efforts, the UC₃ is tasked with monitoring the condition of aquatic resources in the tributaries to the Columbia river by providing coordination, education, and detection efforts;
- Directs FWP to develop and operate a containment and quarantine plan for the Missouri River system;

- Increases authority for designating and administering invasive species management areas and for inspection and decontamination in order to prevent and control infestation or spread of invasive species;
- Defines penalties for violating the Act; and
- Establishes a statewide invasive species management area with mandatory inspection for vessels entering the state and a mandatory decontamination of any vessel or equipment in *Dreissenid* mussel infested waters.

PURPOSE and GOALS:

The primary purpose of this agreement is to establish a mechanism for Montana to take concerted action to prevent, detect, and manage AIS. It also serves as a mechanism for the Departments to transfer financial resources from one department to another.

This agreement clarifies each agency’s specific responsibilities and roles relative to management of AIS in Montana, to communicate those responsibilities to other interested agencies/organizations, and to use limited funding for maximum effectiveness. Another important purpose of this agreement is to clarify how the Act fits into the existing authorities of the Departments.

The Departments seek to:

- Establish an AIS interagency working group to be convened, as needed, to coordinate AIS prevention, detection, and management efforts among the Departments;
- Enhance department and public program cooperation;
- Seek and distribute additional funding to support AIS programs;
- Improve efficiency and consistency;
- Increase public, industry, and other government agency awareness and participation;
- Increase coordination with the public, stakeholders, bordering states and provinces;
- Increase speed and availability of data and information sharing among the Departments and other agencies;
- Collaborate to prevent the introduction and spread of AIS; and
- Collaborate on emergency responses, including requests for a declaration of an AIS emergency from the Governor.
- Coordinate on AIS program reporting and outreach efforts.

REGULATORY AUTHORITIES:

While each department will use its existing authority and jurisdiction to address issues, each department recognizes that other departments and agencies beyond this agreement may also have interests, concerns, and a role or responsibility.

FWP Authorities:

FWP directs and houses the AIS Program for the state of Montana and has the lead authority over all invasive aquatic animal, aquatic animal pathogens, and aquatic plant species. FWP is tasked with all aspects associated with AIS and is responsible for implementing the Montana Aquatic Nuisance Species Management Plan (ANS Plan). This plan outlines six objectives, including: 1. Coordinate and implement the Comprehensive Management Plan; 2. Prevent the introduction of AIS into Montana (watercraft inspection); 3. Detect, monitor and eradicate pioneering AIS (survey); 4. Where feasible, control and eradicate established AIS that have significant impacts (treat); 5. Inform the public, policy makers, natural resource workers, private industry, and user groups about the risks and impacts of AIS

(education); 6. Increase and disseminate knowledge of AIS in Montana through compiling data and conducting research. FWP also coordinates the AIS interagency working group.

MDA Authorities:

MDA, along with the counties, has authority over all state and county listed noxious weeds. The Department houses the Noxious Weed Program within the Agriculture Sciences Division, with responsibilities for terrestrial listed noxious weeds. MDA is a resource and an advisor to the AIS interagency working group and serves on the Montana Invasive Species Council. MDA may provide grants through the Noxious Weed Trust Fund Grant Program for aquatic listed noxious weeds if no other funding source is available. The county weed districts have authority to manage noxious weeds at the local level. MDA also has the authority to regulate all pesticides and pesticide applicators, including aquatic pesticides.

MDT Authorities:

MDT cooperates with the agencies to utilize MDT facilities as locations for AIS inspection stations. MDT also helps facilitate the safe and effective implementation of AIS inspection stations, proper use of signage at non-MDT facilities, and accommodates on-site storage of inspection station equipment, where possible. MDT also provides information regarding any commercial motor vehicle carrying marine equipment fouled with AIS. MDT includes special permit conditions for commercial motor vehicles carrying oversized marine vessels and equipment.

DNRC Authorities:

DNRC has authority over public land and water resources in the state. When these resources are impacted in an invasive species management area, DNRC coordinates with FWP on prevention and control measures. DNRC is directed under MCA §§ 2-15-3309 and 2-15-3310 (HB 622 (2017)) to administratively support the Montana Invasive Species Council and the Upper Columbia Conservation Commission, both of which involve AIS coordination responsibilities. DNRC is a resource and advisor to the AIS interagency working group. DNRC also administers the AIS grant program that supports AIS related prevention, treatment and outreach activities, in coordination with FWP and MDA.

JOINT DEPARTMENTAL COMMITMENTS:

Montana Aquatic Nuisance Management Plan

FWP has prepared an executive level ANS Management Plan, which includes prevention, detection, control, and emergency response. The existing ANS Plan needs to be updated, and FWP will work with the other departments to prepare a revised plan that is in alignment with current statute and the Montana Invasive Species Strategic Framework.

Participation on the AIS Interagency Working Group

The Departments agree to coordinate on AIS activities through participation in the AIS interagency working group.

Participation on the Montana Invasive Species Council

The Departments agree to actively participate on the MISC and provide information, updates, notification of detections, and other resources as needed to the MISC Coordinator.

Participation on the Upper Columbia Conservation Commission

The Departments agree to actively participate on the UC₃ and provide information, updates, notification of detections, and other resources as needed to the UC₃ Coordinator.

Implementation of the Montana Invasive Species Framework

The Departments agree to lead and/or assist with (as appropriate for each task) the implementation of the Montana Invasive Species Framework as it relates to AIS, and to report back to MISC regularly on progress.

Invasive Species Notification

Each department agrees to notify the other departments within three business days of the confirmation of a new AIS population within the jurisdiction of the other agencies. The primary representatives are: the State Noxious Weed Coordinator at MDA, the AIS Bureau Chief at FWP, the Invasive Species Program Managers at DNRC, and the Maintenance Weed Coordinator at MDT. Each department will treat the notification as preliminary and confidential until otherwise notified that the information may be released. The agency with primary jurisdiction will be the lead in public notification and dissemination of information.

Public Education and Awareness

The Departments will jointly develop and implement an invasive species public education and awareness strategy. The FWP AIS Program in coordination with the FWP Communications and Education Division, serves as the lead for development and implementation of AIS-related public awareness campaigns. Because public education and awareness is an on-going element of AIS, the Departments will meet periodically to coordinate current and future needs and modify the strategy as needed.

AIS education campaign development and communications should be coordinated with FWP through the MISC Education and Outreach Committee. While FWP is the lead on AIS communications, all Departments shall assist in the dissemination of public messaging about AIS as the campaign and materials are developed.

Aquatic Invasive Species List(s)

The Departments maintain lists of AIS and their priority classes (if applicable) within their jurisdiction and identify other departments and other public agencies with overlapping jurisdiction or interests in each species. These lists will be shared whenever updated or changed. See Appendix A for list of species.

Invasive Species Management Areas

The Act established a statewide invasive species management area for the purpose of preventing the introduction, importation, and infestation of invasive species.

Invasive Species Data Management

The Departments agree to share data pertaining to AIS and coordinate on consistent protocols and reporting mechanisms.

FWP COMMITMENTS:

- Provide statewide, regional and national coordination for Montana on AIS via the FWP AIS Bureau Chief in collaboration with MDA, MDT, and DNRC;
- Provide facilitation among the four lead AIS agencies;
- Coordinate AIS-related outreach and stakeholder engagement;
- Operate the statewide early detection and surveillance monitoring program for quagga/zebra mussels and other AIS;
- Continue to operate the AIS lab for early detection;
- Conduct mandatory boat inspections at selected border stations, internal highway sites, and at high profile waters to check for the movement of AIS and to educate the public about the threat posed by AIS;
- Expand the watercraft inspection station program as funding becomes available;
- Continue to implement FWP actions under the Montana AIS Management Plan. The FWP AIS Program will lead the coordination and preparation of plan updates and annual progress reports. Annual progress reports will be prepared, disseminated, and made available to the general public and to local, state, and federal decision makers;
- Revise and update the ANS Plan as needed in collaboration with MDA, MDT, and DNRC, other state, federal, tribal, and local agencies, and interested parties;
- Provide statewide, regional, and national coordination for Montana on aquatic plants (including those listed as state noxious weeds) and aquatic invertebrates. Coordination will be through the designated FWP representative; and
- Act as the aquatic plant expert for county weed districts and other partners on projects that include aquatic noxious weeds and assist with facilitation, implementation and obtaining funding.

MDA COMMITMENTS:

- Provide statewide, regional and national coordination for Montana on noxious weeds. Coordination will be through the designated MDA representative;
- Coordinate with county weed districts and other partners to provide updated information and data on invasive plant/insect issues as they arise;
- Coordinate and meet with other departments, agencies, organizations, and other interested parties to facilitate communication, public input, and information exchange;
- Conduct education and awareness outreach on invasive species to groups traditionally associated with MDA, including irrigators and agriculture-based organizations; and
- Share information related to travel, public outreach, and planned invasive species activities.

MDT COMMITMENTS:

- Cooperate with the other departments to utilize MDT facilities as locations for AIS inspection stations;
- As requested help identify locations for AIS inspection stations along MDT state maintained highways;
- Provide guidance and direction for the proper use of traffic control signage, and invasive species signage following the Manual on Uniform Traffic Control Devices (MUTCD). When requested by FWP, MDT will install permanent traffic control signs for AIS inspection stations along state maintained highways;

- Look to identify and report any commercial motor vehicle carrying marine equipment fouled with aquatic invasive species. MDT will also have special permit conditions for commercial motor vehicles carrying oversized marine vessels and equipment; and
- Share AIS monitoring data.

DNRC COMMITMENTS:

- As directed by MISC and UC₃, provide policy level guidance, planning, and coordination for invasive species related issues;
- Continue supporting local efforts to control and manage AIS as funding is available;
- Include the AIS interagency team in the AIS grant review and ranking process;
- Provide staff to support MISC and the UC₃;
- Serve as an interagency liaison on invasive species efforts and matters to ensure coordination and collaboration with MISC and UC₃;
- Participate in FWP AIS activities and assist with AIS Program efforts as needed;
- Facilitate the development of an annual report on Invasive Species Programs in Montana (multi-taxa) as a deliverable for MISC, requiring coordination with all agencies that manage invasive species in the state;
- Coordinate and meet with other departments, agencies, organizations and other interested parties to facilitate communication, public input, and information exchange;
- Coordinate with agencies and others on invasive species education and outreach strategies; and
- Provide up to \$60,000 to implement the Missouri River System AIS pilot project.

PROJECTS (FY18-19)

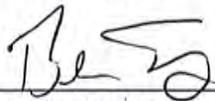
- Continued implementation of the Invasive Species Strategic Framework through the ongoing efforts of the MISC;
- With FWP as the lead, the Departments will collaborate on the revision of the Montana Aquatic Nuisance Species Management Plan based on statute, rule, and the MISC Framework;
- Participation in AIS program after-season reviews and planning for the upcoming season;
- With FWP as the lead, the Departments will continue to update, refine, and test (via rapid response exercises) the Montana Dreissenid Rapid Response Guidelines;
- Develop basin-specific tailored augmentations to Rapid Response Guidelines to ensure blueprint is in place for infrastructure, water resources, users, and stakeholders specific to the basin in the event of a detection (Upper Columbia, Missouri River);
- Issue contract for an economic analysis for state-wide invasive mussel impact to Montana;
- With FWP as the lead, develop and implement the Missouri River System pilot to include the invasive mussel containment and quarantine plan;
- Establishment of the UC₃ focused on AIS coordination and management in the Montana portion of the Upper Columbia watershed;
- Participation in invasive species tabletop and field rapid response exercises;
- Development of cooperative agreements with Montana tribes and other stakeholders on the management of AIS in the event of a detection;
- Invasive species law review and jurisdictional scan to inform 2018 Invasive Species Summit;
- 2018 Invasive Species Summit (MISC hosts) with a legislation and policy focus (fall 2018);
- Development and implementation of MISC and UC₃ education and outreach strategies;
- Development of data management tools and central reporting repository for invasive species;

- The FWP AIS Bureau Chief aids facilitation among the Departments and stakeholders and works to ensure that the AIS Program is running as smoothly and efficiently as possible and is housed within FWP.
- Revise the list of projects in this agreement at the end of FY19.

TERMS OF COOPERATIVE AGREEMENT:

This cooperative agreement shall be effective upon the last signature date. This agreement may be modified only in writing by mutual agreement of all department directors. This agreement will remain in effect through June 30, 2019 unless terminated in writing by signature of any department director.

Signature Approvals:



 Director, Montana Department of Agriculture

1-2-19

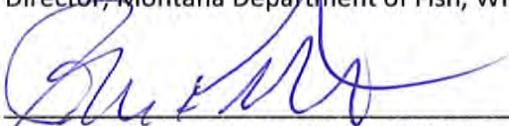
 Date



 Director, Montana Department of Fish, Wildlife & Parks

Feb. 23, 2018

 Date



 Director, Montana Department of Natural Resources and Conservation

Feb 6, 2018

 Date



 Director, Montana Department of Transportation

March 13, 2018

 Date

APPENDIX A

The Noxious Weed List includes aquatic invasive plants, which are in bold. The second list includes other invasive species under the authority of FWP.

*Indicates present in Montana

1. Montana Noxious Weed List

Effective: July 2015

PRIORITY 1A These weeds are not present or have a very limited presence in Montana. Management criteria will require eradication if detected, education, and prevention:

- (a) Yellow starthistle (*Centaurea solstitialis*)
- (b) Dyer's woad (*Isatis tinctoria*)
- (c) Common Reed (*Phragmites australis* ssp. *australis*)

PRIORITY 1B These weeds have limited presence in Montana. Management criteria will require eradication or containment and education:

- (a) Knotweed complex (*Polygonum cuspidatum*, *P. sachalinense*, *P. × bohemicum*, *Fallopia japonica*, *F. sachalinensis*, *F. × bohemica*, *Reynoutria japonica*, *R. sachalinensis*, and *R. × bohemica*)
- (b) Purple loosestrife (*Lythrum salicaria*)
- (c) Rush skeletonweed (*Chondrilla juncea*)
- (d) Scotch broom (*Cytisus scoparius*)

PRIORITY 2A These weeds are common in isolated areas of Montana. Management criteria will require eradication or containment where less abundant. Management shall be prioritized by local weed districts:

- (a) Tansy ragwort (*Senecio jacobaea*, *Jacobaea vulgaris*)
- (b) Meadow hawkweed complex (*Hieracium caespitosum*, *H. praealtum*, *H. floridundum*, and *Pilosella caespitosa*)
- (c) Orange hawkweed (*Hieracium aurantiacum*, *Pilosella aurantiaca*)
- (d) Tall buttercup (*Ranunculus acris*)
- (e) Perennial pepperweed (*Lepidium latifolium*)
- (f) Yellowflag iris (*Iris pseudacorus*)
- (g) Blueweed (*Echium vulgare*)
- (h) Eurasian watermilfoil* (*Myriophyllum spicatum*)**
- (i) Flowering rush* (*Butomus umbellatus*)**

PRIORITY 2B These weeds are abundant in Montana and widespread in many counties. Management criteria will require eradication or containment where less abundant. Management shall be prioritized by local weed districts:

- (a) Canada thistle (*Cirsium arvense*)
- (b) Field bindweed (*Convolvulus arvensis*)
- (c) Leafy spurge (*Euphorbia esula*)
- (d) Whitetop (*Cardaria draba*, *Lepidium draba*)
- (e) Russian knapweed (*Acroptilon repens*, *Rhaponticum repens*)
- (f) Spotted knapweed (*Centaurea stoebe*, *C. maculosa*)
- (g) Diffuse knapweed (*Centaurea diffusa*)
- (h) Dalmatian toadflax (*Linaria dalmatica*)
- (i) St. Johnswort (*Hypericum perforatum*)

- (j) Sulfur cinquefoil (*Potentilla recta*)
- (k) Common tansy (*Tanacetum vulgare*)
- (l) Oxeye daisy (*Leucanthemum vulgare*)
- (m) Houndstongue (*Cynoglossum officinale*)
- (n) Yellow toadflax (*Linaria vulgaris*)
- (o) Saltcedar (*Tamarix spp.*)
- (p) Curlyleaf pondweed* (*Potamogeton crispus*)**
- (q) Hoary alyssum (*Berteroa incana*)

Priority 3 Regulated Plants: (NOT MONTANA LISTED NOXIOUS WEEDS)

These regulated plants have the potential to have significant negative impacts. The plant may not be intentionally spread or sold other than as a contaminant in agricultural products. The state recommends research, education and prevention to minimize the spread of the regulated plant.

- (a) Cheatgrass (*Bromus tectorum*)
- (b) Hydrilla (*Hydrilla verticillata*)**
- (c) Russian olive (*Elaeagnus angustifolia*)
- (d) Brazilian waterweed (*Egeria densa*)**
- (e) Parrot feather watermilfoil (*Myriophyllum aquaticum* or *M. brasiliense*)**

2. Aquatic Invasive Species under the authority of FWP

This list is dynamic and is subject to change as knowledge of individual species increases.

*Indicates present in Montana

Aquatic Invasive Plants

- a) Fragrant waterlily* (*Nymphaea odorata*)
- b) Starry stonewort (*Nitellopsis obtuse*)
- c) Yellow floating heart (*Nymphoides peltata*)
- d) Variable-leaf milfoil (*Myriophyllum heterophyllum*)
- e) Fanwort (*Cabomba caroliniana*)
- f) Common water hyacinth (*Eichhornia crassipes*)
- g) Brittleleaf naiad (*Najas minor*)

Aquatic Invasive Animals

- a) Quagga mussel (*Dreissena rostriformis bugensis*)
- b) Zebra mussel (*Dreissena polymorpha*)
- c) New Zealand mudsnail* (*Potamopyrgus antipodarum*)
- d) Asian clam (*Corbicula fluminea*)
- e) Chinese mysterysnail (*Cipangopaludina chinensis*, *Cipangopaludina chinensis malleata*)
- f) Faucet snail* (*Bithynia tentaculata*)
- g) Red-rim melania* (*Melanoides tuberculata*)
- h) Fishhook waterflea (*Cercopagis pengoi*)
- i) Spiny waterflea (*Bythotrephes longimanus*)
- j) American bullfrog* (*Lithobates catesbeianus*)
- k) Rusty crayfish (*Orconectes rusticus*)
- l) Virile crayfish (*Orconectes virilis*)
- m) Red swamp crayfish (*Procambarus clarkia*)

Invasive Fish

- a) Bighead carp (*Hypophthalmichthys nobilis*)
- b) Black carp (*Mylopharyngodon piceus*)
- c) Silver carp (*Hypophthalmichthys molitrix*)
- d) Grass carp (*Ctenopharyngodon idella*)
- e) Tench (*Tinca tinca*)
- f) Ruffe (*Gymnocephalus cernua*)
- g) Round goby (*Neogobius melanostomus*)
- h) Zander (*Sander lucioperca*)
- i) Northern snakehead (*Channa argus*)

Aquatic Pathogens

- a) Chytrid Fungus (*Batrachochytrium dendrobatidis*)
- b) Proliferative Kidney Disease (PKX) (*Tetracapsuloides bryosalmonae*)
- c) Viral hemorrhagic septicemia (VHS) (*Oncorhynchus 2 novirhabdovirus*)
- d) Whirling disease (*Myxobolus cerebralis*)



**Central and Eastern Montana
Invasive Mussel Early Detection
and Rapid Response**

Partnership Agreement



Where we work

Central and Eastern Montana is home to wide-open spaces and few people. Agriculture is the largest industry. Areas surrounding Fort Peck Lake and Big Horn Lake also have a large amount of recreation. These two industries would be significantly impacted by an invasive mussel infestation.

Project Partners for the Missouri River Basin

Interagency partners in both early detection and rapid response (EDRR) in Montana include federal, state, tribal, and local partners. These EDRR Partners will participate jointly and integrate their authorities and resources using Incident Command System (ICS) during dreissenid mussel detections in waterbodies with overlapping management jurisdictions. This approach of treating new detections as emergencies (with specific authorities and direction provided by agency directors and the Governor's Office) is anticipated to bring local, state, and regional partners together with little to no advance planning.

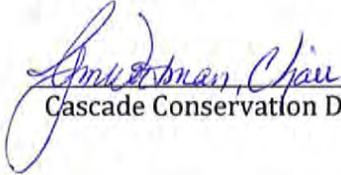
When possible, including federal, state, regional, and local partners in advance by assisting in the development of a database of resources, infrastructure and assets; establishing and exercising lines of communication; building partnerships across shared resources and interests; and developing training opportunities to build shared rapid response skills will reduce friction in establishing future rapid response actions.

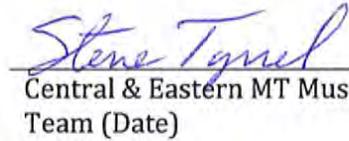
To prepare for the use of ICS in a response, the following actions will be taken to improve readiness:

- Establish lines of communication with statewide agency representatives of partners listed in the "Strategic Plan for Early Detection Rapid Response (EDRR) Project Partners for the Missouri River Basin."
- Invite and include partners in invasive species stakeholder events and meetings.
- Include communication with regional partners and stakeholders in the communications duties of the Montana Invasive Species Counsel (MISC) Outreach position and include updates from regional partners in MISC communications.
- Create regional, multi-agency training opportunities to practice ICS skills and reach out to local partners.
- Participate in table-top and field exercises based on existing invasive species response plans and relevant local management plans that include all likely response partners including local and non-governmental participants.
- Assist with the development of a map-based geographic response plan to augment the statewide Mussel Rapid Response guidelines. Local partners can assist with gathering information such as property ownership, access points, infrastructure, diversions and water users. Together we can ensure the most up to date information is included in response planning.

In the spirit of cooperation, the entities listed below agree to collaboratively partner in these and other efforts to prevent the introduction and spread of invasive mussels in the waters east of the continental divide in Montana.

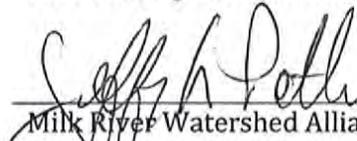
We agree to inform, consult, coordinate and contribute to the best of our ability with each other on all related programs and activities regarding education, outreach, monitoring, and policy related to aquatic invasive species. Nothing in this Partnership Agreement shall be construed to waive the sovereign immunity of the respective jurisdictions represented in this Agreement.

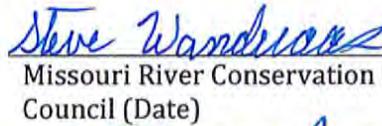
 10-15-18
Cascade Conservation District (Date)

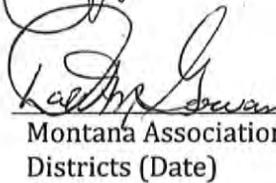
 10-9-18
Central & Eastern MT Mussel Response Team (Date)

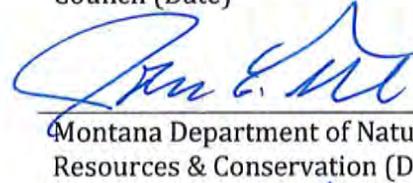
 11-14-18
Fort Belknap Indian Community (Date)

 10-4-18
Garfield Conservation District (Date)

 11-10-18
Milk River Watershed Alliance (Date)

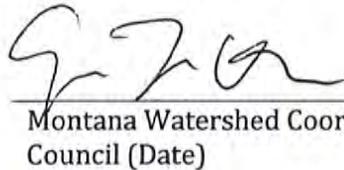
 10-4-18
Missouri River Conservation District Council (Date)

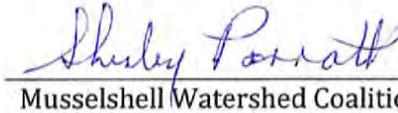
 9/27/18
Montana Association of Conservation Districts (Date)

 9/25/18
Montana Department of Natural Resources & Conservation (Date)

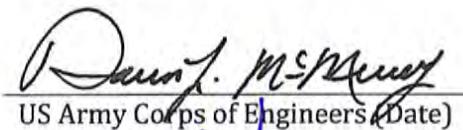
 9/27/18
Montana Fish, Wildlife & Parks (Date)

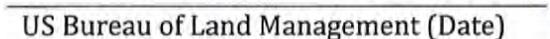
 9/24/18
Montana Invasive Species Council (Date)

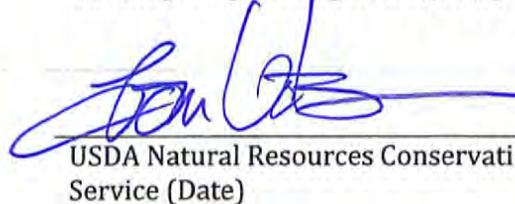
 10/12/18
Montana Watershed Coordination Council (Date)

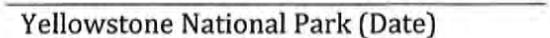
 10/9/18
Musselshell Watershed Coalition (Date)

 10/12/18
North Central Missouri River Working Group (Date)

 21 Sept 18
US Army Corps of Engineers (Date)


US Bureau of Land Management (Date)

 11/19/18
USDA Natural Resources Conservation Service (Date)


Yellowstone National Park (Date)

 26 Sept 18
Yellowstone River Conservation District Council (Date)

WHITE PAPER

Montana's Rapid Response to Dreissenid Mussels

Observations from the 2016-2017 rapid response
to dreissenid mussels in Montana





WHITE PAPER: MONTANA'S RAPID RESPONSE TO DREISENID MUSSELS

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- Steve Wanderaas, MISC Member
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EXECUTIVE SUMMARY

THE FIRST DETECTION of dreissenid mussels in Montana waters in 2016 dramatically transformed the aquatic invasive species program. For almost two decades prior to the discovery, Montana had actively participated in regional partnerships that anticipated the spread of mussels west from the Great Lakes Basin and other waters where they are widely established. Regional plans including the Columbia River Basin Interagency Invasive Species Response Plan guided Montana's response following the mussel detection. The unfolding state response required more detailed plans than the regional documents provided and highlighted the need for stepped-down planning to facilitate rapid response. The awareness that Montana was at high risk of mussels establishing in state waters was known to the natural resource agencies but general awareness and urgency was lower among stakeholders as the nearest mussel populations were still several states away. The lower population density and lack of awareness of the threat posed by mussels to the agricultural water users in the eastern and central region contributed to fewer watercraft inspection stations along the eastern perimeter of the state creating a gap in prevention efforts. Annual sampling for mussels had previously confirmed their absence. In October 2016, a mussel detection was confirmed in a sample collected in July. Pressure from local and regional partners for a comprehensive response led to the establishment of a joint command using Incident Command System. The rapid response was funded via an emergency declaration that provided an initial \$750,000 then an additional \$200,000 to support the rapid response from the Governor's emergency fund. A scaled-up management plan transitioned operations from rapid response to management and funding was allocated by the legislature during early 2017. This plan and authorization tripled the size of the existing program allowing for more watercraft inspection, monitoring, and grants to partners including tribes, watershed

Eastern Montana

coalitions and conservation districts. The new larger program is more inclusive, better funded, and has encouraged a broader adoption of incident command training, stronger interagency and non-governmental cooperation, and more inclusive communication with stakeholders.

Montana at the Headwaters

The Missouri flows east and Columbia River watersheds flow west from the Rocky Mountains at the Continental Divide and the Saint Mary River runs north and east to Hudson Bay from the Triple Divide Peak in Glacier National Park. Montana holds the headwaters for these rivers and is proud of its stewardship of the 11,000 individual waterways in Montana¹.

The communities and industry in Montana, as with much of the west, are founded on the distribution of water. In 1903, the U.S. Congress authorized construction of the Milk River Project as one of the first five reclamation projects built by the newly created Reclamation Service (now the Bureau of Reclamation) under the Reclamation Act of 1902². Since then the rivers have been managed and developed as a state and regional resource and continue to be treasured for their beauty and wildlife.

Early Detection and Rapid Response

The spread of dreissenid mussels (collectively this will refer to the zebra mussel, *Dreissena polymorpha* and quagga mussel, *Dreissena bugensis*) across the United States has been well documented and efforts to share knowledge about effective prevention tools and policies, containment practices, and detection methods have been the focus for national aquatic invasive species efforts. Montana had been monitoring for mussels and participating in regional efforts to stop the spread since 1998. On October 17, 2016 dreissenid mussel larvae were identified from Montana samples taken earlier in the year at Tiber Reservoir. Subsequently, Canyon Ferry Reservoir tested suspect for dreissenid mussel larvae.

Governor Steve Bullock issued an executive order November 30, 2016 declaring a statewide natural resource emergency for Montana water bodies due to the first detection of invasive dreissenid mussel larvae in state waters. The State of Montana's Mussel Response Team was formed to rapidly assess the extent of the mussel populations in Montana's waters. The team organized under incident command system and managed a coordinated response. As the response transitioned to management by March 2017 they developed a list of suggestions for a long-term strategy to mitigate economic and ecological damage.

1 Montana River Action. Web. 10 July 2018.

2 Montana Watercourse. *What is the History of Water Planning in Montana?* April 2015. Montana Department of Natural Resources Conservation. Web. 14 June 2018.

1997

Western Regional Panel (WRP) on Aquatic Nuisance Species

The initial, organizational meeting of the Western Regional Panel was held at Portland State University in 1997 and Montana is a part of this panel.

1999

Bonneville Power Administration (BPA), recognizing the potential impact to its operations, funded the Pacific States Marine Fisheries Commission (PSMFC) to carry out an ANS prevention program for the Columbia River Basin (CRB).

The PSMFC has also provided funding to Montana to conduct Boat User Surveys and install Traveler Information Systems (TIS) in the state. One of the goals of this regional program is to include ANS outreach and inspection in Montana, Washington, Idaho, and Wyoming.

2002

The Montana Aquatic Nuisance (ANS) Management Plan is finalized. Budget for FY03 for combined state and federal spending on AIS is \$808,500

Montana Aquatic Nuisance Species (ANS) Technical Committee, a subgroup of the Montana ANS Steering Committee produces the first statewide aquatic invasive species plan which identified dreissenid mussels as Priority Class 1 species, not currently known to be present in Montana, but have a high potential to invade.

2004

AIS Coordinator hired in Fish, Wildlife & Parks

2008

Montana is a signatory to the Columbia River Basin Interagency Invasive Species Response Plan: Zebra Mussels and Other Dreissenid Species

Montana Fish Wildlife & Parks is part of a notification structure for Dreissenid response and reporting. The plan utilizes an Incident Command Structure and is designed to initiate a coordinated response among states and agencies in the Columbia River Basin.

2010

“Inspect, Clean, Dry campaign” launched.

This campaign provides outreach to Montana boaters about the importance of cleaning their watercraft and gear. A follow-up survey in 2012 indicates that anglers and boaters are increasingly cognizant of the threat of aquatic hitchhikers and increased frequency boat- and gear-cleaning among anglers.

2011

Columbia River Basin partners Rapid Response Exercise in Libby, MT

The goals of the table-top exercise were to increase coordination between the US and Canada as per the Columbia River Response Plan, and to further develop a containment strategy for watercraft moving in and out of an infested waterbody.

2014

Montana Aquatic Invasive Species Conference hosted by Fish Wildlife and Parks

This was a two-day, panel-style conference attended by 80 AIS partners. This event generated in-depth discussions about coordination, law enforcement, outreach and education, future needs, and other critical AIS topics.

Montana Invasive Species Council, FY 15 combined state and federal AIS spending is \$2,534,993

Governor Bullock signed Executive Order No. 13-2014 creating the Montana Invasive Species Advisory Council (MISAC) on December 4, 2014. The council is comprised of twenty-one members, appointed by the governor.

2016

Invasive mussel larvae detected in Montana.

A positive sample of invasive mussel veligers at Tiber Reservoir and a suspect sample at Canyon Ferry Reservoir were identified on October 17. The first detection was from Bureau of Reclamation samples. Montana Fish Wildlife & Parks samples which also tested positive at Tiber were processed days later.

2017

Legislative approval of expanded funding for AIS to \$13.2 million.

Overall monitoring and early detection efforts increased steadily in the preceding years but nearly tripled between 2016 and 2017.

2018

The Central and Eastern Montana Mussel Response Team was formed.

Partnerships to address mussels in the eastern watersheds of Montana allow the statewide AIS program to incorporate locally unique stakeholders and increased pass-through funding from state agencies fosters active collaborations and expanded effort.

How prepared was Montana for the 2016 mussel detection?

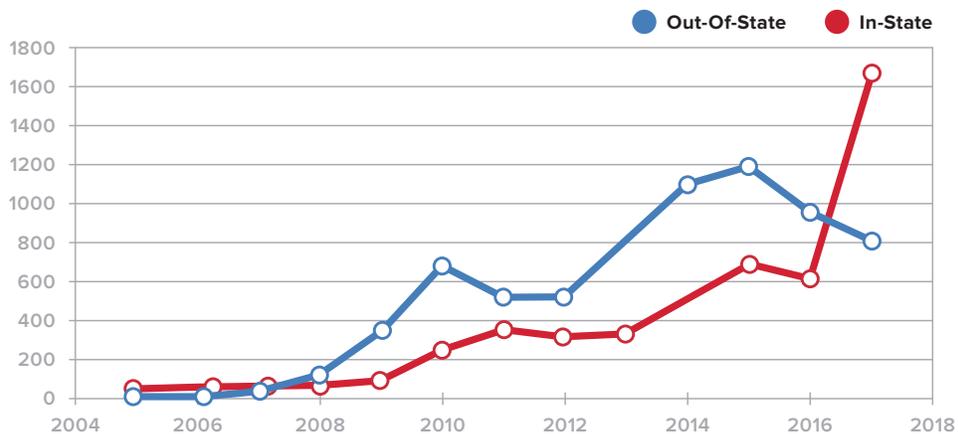
From the Montana Aquatic nuisance Species Management Plan 2002

Aquatic Nuisance Species (ANS) are a serious problem in Montana. There are currently over 70 nonindigenous aquatic species reported in the state and more are expected to arrive. Current state activities and authorities address some ANS, their prevention, and control. However, these activities are not coordinated nor comprehensively managing the impacts of ANS. The importance of Montana’s aquatic resources requires a coherent response to the threat posed by ANS. This management plan is the initial step in establishing a program in Montana to specifically address ANS issues.³

The 2002 Montana Aquatic Nuisance Species plan included an outline of the strategies and resources needed to prevent the introduction of dreissenid mussels. The Montana Fish, Wildlife & Parks (FWP) Aquatic Invasive Species Program worked to implement the Aquatic Invasive Species (formerly Aquatic Nuisance Species) Management Plan through coordination and collaboration, prevention of new AIS introductions, early detection and monitoring, control and eradication, and outreach and education.

Montana’s Aquatic Invasive Species (AIS) early detection and monitoring program was established in 2004. Montana FWP biologists prioritized monitoring and prevention for dreissenids as well as other priority aquatic invasive species including: New Zealand mudsnails, Eurasian watermilfoil, flowering rush, and curlyleaf pondweed, as well as other species not known to occur in Montana. Plankton sampling for both dreissenid and Asian clam veligers (microscopic larvae) increased each year, in part due to an increase in volunteer sampling efforts as well as increasing agency staff effort.

Figure 1: Number of plankton samples processed by year: in-state vs. out-of-state. Adapted from the original.⁴



3 Aquatic Nuisance Species Steering Committee. *Montana Aquatic Nuisance Species (ANS) Management Plan*. By the Montana Aquatic Nuisance Species (ANS) Technical Committee. 2002. *Montana Fish Wildlife & Parks AIS Resources Web*. 30 May 2018.

4 Montana Fish Wildlife and Parks. *2017 Report on Aquatic Invasive Species Monitoring*. January 2018. By Stacy Schmidt and Craig McLane. *Montana Fish Wildlife & Parks AIS Resources Web*. 26 July 2018



The populations of mussels nearest to Montana in 2016 were one state away as neighboring Idaho, Wyoming, and North Dakota did not have established mussel populations. Downstream states including far south east South Dakota and Nebraska did have established populations. Because there was a buffer, the sense of urgency among many recreational users and some managers was lower than warranted by the threat posed by the introduction of mussels. Stakeholder groups including watershed partnerships did discuss mussels, but attention was on immediate concerns including water quality and stream restoration, water quantity and drought.

Plankton samples are examined under a microscope for dreissenid veligers (microscopic larvae)

In 2016, the Montana FWP Aquatic Invasive Species program had five permanent staff conducting early detection and monitoring surveys in addition to their other duties. Seasonally, Montana FWP hired about 65 watercraft inspectors to staff 12⁵ stations located across the state. Roughly fifteen of those inspectors worked at roving locations to improve coverage and respond to boater traffic and address known gaps in coverage especially in the eastern Montana watersheds. Part of those inspectors' duties was to collect plankton samples from each location they visited. In 2016, a total of 135 waterbodies, 499 unique sites and 581 total sites were inspected in Montana.⁶ Partner agencies including the Bureau of Reclamation submitted in-state samples for testing to the FWP Aquatic Invasive Species lab in Helena as well.

On October 17, 2016 the Bureau of Reclamation identified a dreissenid veliger in Tiber Reservoir samples taken earlier in the year. Ongoing analysis through the FWP lab prioritized Tiber

5 Tom Woolf, April 18, 2018.

6 Montana Fish Wildlife and Parks. *2016 Report on Aquatic Invasive Species Monitoring*. January 2017. By Stacy Schmidt and Craig McLane 2017. *Montana Fish Wildlife & Parks AIS Resources Web*. 30 May 2018.



samples and the July 16 & 17, 2016 samples confirmed the detection. As additional high priority samples were processed, a second veliger was found in a sample on October 26 collected from Canyon Ferry near Helena on August 16. The lag in processing samples was recognized as Montana received an increasing number of samples from neighboring states as well as in-state samples. A FWP 2015-2016 annual report observed that the Aquatic Invasive Species laboratory was over its capacity to process samples in a timely manner. Steps had already been taken starting in the winter of 2015 to address the gap by adding a permanent staff member in laboratory sample processing techniques in Helena and establishing a secondary Aquatic Invasive Species lab in Kalispell, Montana.

Plankton sampling in Tiber Reservoir

Once veligers were found in the samples, the water conditions in the suspect waters were too cold to support swimming veligers, making re-sampling to confirm the positive result with plankton tows less effective. As shoreline and structure sampling in response to the veliger detections proceeded, no adult mussels were found and it was determined that mussels were likely detected early. As the late fall also coincides with a decrease in the number of water users the response initially followed an internal FWP protocol for establishing an incident command-based structure within the agency to manage the response. Additional sampling was planned and scheduled to occur as possible during the winter and as waters became ice-free again in spring.

When the Montana FWP Aquatic Invasive Species Laboratories in Helena identified the first set of samples as positive for dreissenid mussels, the recommended verification steps as agreed in the Aquatic Invasive Species Western Regional Panel's 2014 meetings was used; the samples were sent to a second lab and additional samples were collected. In table-top exercises for rapid response in Montana and regionally, the trigger to initiate action has been given as "mussels were found." The more complex reality is that an initial positive result triggered the need to follow up which takes days or weeks. When the initial results were released, the inherent delay created by the process of collection and testing created pressure to begin taking actions beyond those identified in the verification protocol.

An early challenge following the spread of the news of the detection outside of FWP was to reconcile the differing views on how to organize a response that was appropriate in scope. Existing FWP staff did not have the capacity to address all of the concerns identified by

regional partners that included the broader implications of mussels establishing adjacent to the Columbia headwaters, and the socio-economic impacts within the state. There was also frustration by stakeholders and fellow agencies about the limited nature of the response given the threat posed by mussels. Calls came for the response to be shifted away from FWP. Requests to immediately increase in-state containment efforts to keep the possible population of mussels from being transported over the Continental Divide to the Columbia River system could not be addressed with existing resources and pressure built to mobilize emergency funds. The demand to expand the program to address additional mussel containment, increase state-wide watercraft inspections, expand monitoring, and increase education would require not only more resources but the involvement of many additional partners over the course of a few weeks.

Trained mussel detector dogs used to inspect boats were tasked with shoreline searches for adult mussels during the response

Existing planning will be adapted during a response.

The understanding of what constitutes an Incident Command System response varied between agencies. In August 2016, prior to the dreissenid mussels being identified, the Montana FWP responded to a large fish kill (the Whitefish Parasite Kill) on the Yellowstone River. The Montana Invasive Species Council (MISC) followed the response and due to the number of parties impacted by closures and the federal and state jurisdictions over the area they recommended using Incident Command. The agency responded that they were using incident command to guide their response but it was internal to the agency. However, core elements of an incident response including a communications plan and an after-action report to review and evaluate the steps taken during the response were not carried out, limiting both partner engagement and the ability to learn from the response. Based on this experience there was a background of frustration and lower levels of trust for a single-agency response.

The mussels detections were officially shared by Montana FWP with the Montana Department of Natural Resources Conservation about 11 days after the initial results. At this time there were operations underway to survey the



suspect areas and take additional samples. Regional participation and good standing relationships with the Alberta Environment and Parks staff facilitated the arrival of mussel detector dogs that typically work on watercraft inspections. The dogs were able to adapt to searching docks and shorelines in Tiber Reservoir. Dive teams from the US Fish & Wildlife Service offered assistance. While the dive and dog teams were in place, boats launched at the marinas of the suspect waters raising concerns among the managers working at the sites that the level of the response was not well matched to the threat posed by a new population so close to the Columbia headwaters. There was frustration outside the agency with the channelized and closed nature of the decision-making and the perceived increased risk to other water resources in Montana from a limited response to the mussel discovery. On November 30, 2016 the Governor of Montana issued an “Executive Order Proclaiming an Invasive Species Emergency to Exist in the State of Montana” (Appendix: Montana Executive Order 18-2016) which released both emergency funds and facilitated the formation of an incident command team.

The authority for the response was transferred to the Incident Command Team away from the FWP staff who had been organizing the response in coordination with MISC. These staff that were initially leading the response and following the internal response protocol were not initially included in the command team. As the decision making for the response was shifted to a command team, there was frustration within FWP as the response was under their regulatory authority and due to the exclusion of agency staff from leadership of the response. With the political pressure growing to approach the response aggressively, the planning and training that had taken place was adapted to meet new expectations.

Initiating Incident Command System

Initiating a Joint Incident Command allowed the rapidly expanding mussel detection response to be addressed in an organized way. Staff with experience in emergency response from outside the natural resources agencies who had the skills to train others in incident response were recruited to join the team. Biologists with expertise in the region, aquatic invasions, and sampling both within the agency and from other jurisdictions who volunteered, were not always included leading to frustration among stakeholders who had pushed for greater involvement in the response when it was under a single agency’s management. Local stakeholders understood the need for outside assistance, but skepticism of outside management was widespread. A lack of familiarity with incident response including the difference between the strategic management of the incident vs. the tactics that would provide the best outcome for dreissenid containment fed this frustration.

The residents, stakeholders, and agency staff in Liberty County where Tiber Reservoir is located along with the City of Great Falls just south of the response area were engaged and invested in both the outcome and in reducing the response impacts to their resources. Neighboring regions to the west of the Divide including the Flathead Lake, the largest lake in the state, were watching closely. Areas outside the containment region recognized the increased risk to their

recourses and with the Flathead Lake partnerships advocated for additional layers of prevention including in-state watercraft inspections to prevent movement of mussels across the Continental Divide from the Missouri Basin to the Columbia. New stakeholders including the Montana Association of Ditches and Canals and the Association of Conservation Districts with their strong ties to the irrigators and agricultural operations began to follow the response as the risk of damage to their infrastructure by mussels became more broadly understood. Statewide communications tools had been used for several years but these new stakeholders who were following the response had not previously interacted with the natural resources agencies on aquatic invasive species issues. The layered and multi-channeled communications set up by the response were widely praised for making the response inclusive of diverse stakeholders.

One of the most valuable outcomes of the response for natural resources managers were connections with different sets of constituents including the irrigators. The subsequent development of extensive phone-trees for notification, expanded roles for Conservation Districts to connect with agricultural and rural water infrastructure operators has positively influenced planning for resource related emergencies on a watershed scale. The notifications and forums set up by the incident response joint communications were repeatedly identified as helpful, and a core reason given for increased trust in the command team (and incident response more generally), and Montana's ability to effectively respond to mussels.



The science advisory panel meets in support of the rapid response

While the frequent updates from the communications team received positive feedback, the rapid pace supported (and anticipated) by an Incident Command System response frustrated some of the biologists and managers interacting with the command team. A natural resources response has inherent lags in collecting information from the field about the status of the species being targeted. Examining the schedule for the incident and scaling back repeating tasks, meetings, and briefings from the prescribed schedule used in wildfires and adjusting manuals and trainings appropriately would improve future responses as increased adoption of incident command in natural resource agencies grows.

The three months of incident response operations expended the initial \$750,000 that was provided from Montana's emergency funds when the Emergency Declaration was signed. The Montana Legislature passed House Bill 4 to provide an additional \$200,000 during the winter when command team operations were still underway. The mechanisms to expend the funds included cooperating agreements and overtime approvals that required significant time from

agency fiscal staff. Integrating Montana FWP fiscal and administrative staff into the structure of the Incident Command Team was strongly recommended by those involved.

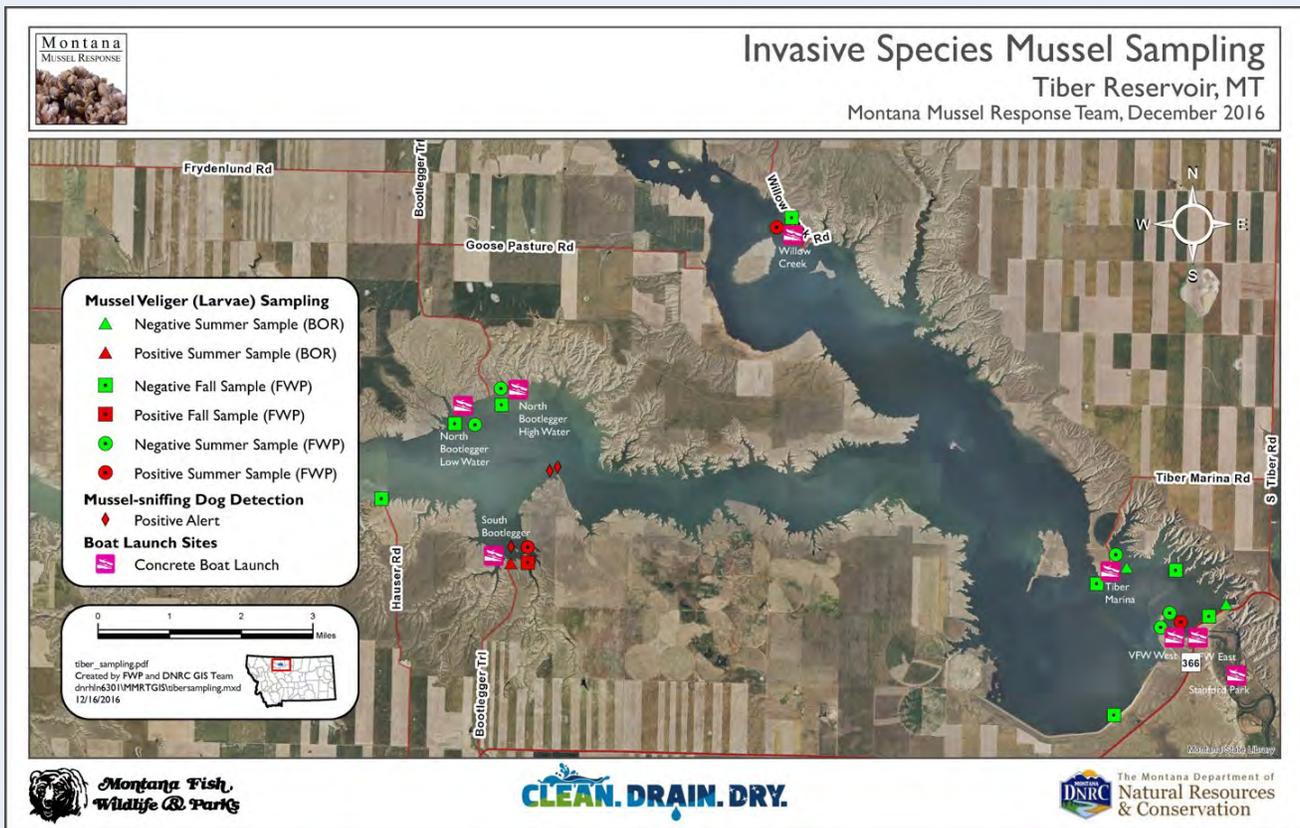
What state resources and planning were changed by the response?

Prior to the response, MISC was established by Executive Order and was re-formed under statute in early 2017. The new law additionally requires MISC to report to the Interim Committee for the Environmental Quality Council. The reporting requirement provides a forum to discuss invasive species issues with decision makers that did not previously exist. The Council can review and collect agency and stakeholder reports and keep the legislature informed about emerging threats and response outcomes.

The capacity to use Incident Command System depends on trained staff and FWP has hired a contractor to both train staff and integrate Incident Command into response pre-planning. Subsequent natural resources responses have used Incident Command System in part due to familiarity with the operations during the mussel response.

After the 2016-2017 dreissenid rapid response, FWP used Incident Command System to organize a response to a Chronic Wasting Disease detection and included a command post, press releases, pre-identified staff for an effort that unfolded quickly. The motivation for implementing incident command came partly from the increased familiarity due to the media and staff communication about the dreissenid response but also from agency leadership who had been involved in the dreissenid response and promoted Incident Command System training and rapid response planning internally to their agencies. While invasive species are not usually part of the Montana Department of Livestock's docket, another invasive species rapid response was mounted after the detection of feral hogs in northeast Montana. Incident command was used as the sightings are being investigated by US Department of Agriculture, Animal and Plant Health Inspection Service (USDA APHIS), Wildlife Services in partnership with Department of Livestock. The use of Incident Command for coordinating across multiple tiers of government and split authorities was seen as very useful. Another benefit described was encouraging staff to not get bogged down in tactics before the response strategy to the complex challenge of this feral animal had been identified.

Following the 2016 response, there have been more rapid response table top exercises including forest pests led by USDA APHIS Rapid Response Team expert Gary Adams. More are planned including tabletop response exercises for mussel detections in Flathead Lake (September 11, 2018), Fort Peck (August 28, 2018), and downstream states. The use of Incident Command System for natural resources is recognized as being different from all-hazards or emergency response training as natural resources responses are (usually) slower moving with a longer planning horizon. Creating a specialized set of training opportunities for biological responses



will improve readiness and reduce the burden on fire and other emergency staff. Montana's experience was that incident command is a fundamentally useful tool for bridging both differences in agency culture and sharing authorizes necessary for a successful response. Training is needed to both improve familiarity with the Incident Command process and identify partners in advance. MISC is currently working with the Montana Disaster and Emergency Services and other state agencies to develop an all-hazards training curriculum and identify appropriate staff to complete the training.

Dreissenid mussel plankton and shoreline sampling sites for Tiber Reservoir

The debate on whether or not Montana was using the most current and relevant science during a rapid response led to a directive in statute to create a Scientific Advisory Panel under MISC. The Panel evaluates and reports out on the best practices. One of their first products was a white paper on eDNA (environmental DNA samples) for use in identifying mussel presence in waterbodies.

MISC is evaluating the need for a generalized rapid response plan for Montana that would identify how to structure the decision making for new invasive species detection and scale the responses appropriately. Once there is an all-taxa plan in place, practicing it to build confidence and develop Incident Command skills will help identify the gaps that exist in the preparations

for new or as yet unknown invasive species. The level of invasive species awareness among many non-traditional stakeholders was increased by the mussel response setting the stage for planning to include more partners in future responses.

Adapting Incident Command System for Natural Resources

Initiating Incident Command is a political decision, so is scope.

Whether or not an invasive species is an emergency that warrants a rapid response can be anticipated for a subset of high risk, priority species. Even for these species, and most other new species detections, the scope of the response is a policy issue. This is true whether or not Incident Command System is used to manage the response. Incident Command System is a tool for organization that can support a rapidly moving response while the scale of the response is determined. One factor increasing resources prioritized for the initial response is that decision makers recognize that they are faulted for not making a robust initial response. A response which can later be scaled back is less likely to be criticized than a “wait and see” approach. As all rapid responses happen in a complex, local context of resources, priorities, environmental, and biological considerations the framework for making the decision to initiate rapid response should be flexible and clearly identify the objectives for a response.

An after action review was conducted once the rapid response phase concluded to identify areas for improvement for the next response



Integration is an art.

When invasive species experts who have not been trained in Incident Command System participate in a response there is a reasonable skepticism that the assigned command team staff from outside of the field can be effective. A dual approach that involves both on the fly incident response training for partners and stakeholders on one side, and careful selection of an Incident Commander and the Operations Chief from the discipline involved in the response on the other, shores up confidence. The trust in the effectiveness of the Incident Command tool is improved with understand-

ing of its benefits and limitations, which can come from training or better yet, practice. The use of a Technical Advisory Group to inform the Operations of an incident can be beneficial for complex situations and can be drawn from experts in the discipline on an ad hoc basis. Formation of the Technical Advisory Group also strengthens ties to key stakeholders.

Beyond response, what else can be learned from fire-based ICS planning?

The difficulty involved in identifying and assembling resources quickly was one of the first barriers identified by the incident managers working on the 2016 response. Useful new tools including a GIS based map of water access points based on an incident resources information support tool developed by railroad operators for their emergency response along their right of ways is in progress in Montana. When stepped-down state or local plans are developed based on regional documents like the Columbia River Basin Interagency Invasive Species Response Plan, including inventories based on the example of fire caches (if not the physical stockpiling of equipment) would reduce the barriers to response. While the equipment needed for a biological response will very likely be in seasonal use and not held in a dedicated facility as is the case for fires or oil spill response, listing the equipment and staff along with the regional office where the resources are located will facilitate the initiation of rapid response operations.

State transitions from rapid response to management

The Montana aquatic invasive species program operating funds before the 2016 dreissenid mussel response were about \$2.1m/biennium and expanded to \$13.2 m/biennium. As the rapid response concluded and operations shifted to longer-term management after three intensive months the state invasive species coordinator and members of the mussel response team and then Montana Invasive Species Advisory Council drafted a long term plan that identified programmatic gaps and enhancements that were needed to protect Montana's waters from mussels. This was also one of the first opportunities for the Montana Invasive Species Advisory Council to collect agency and stakeholder reports and inform the legislators serving on the Interim Committee for the Environmental Quality Council. The expanded aquatic invasive species management plan was presented to the legislature and was a comparatively large request from the agencies. The question the legislature came back with was, "Is this enough to protect Montana?" and approved the funding increase that supports all aspects of invasive species management from prevention through control. The Montana Invasive Species Advisory Council previously established by an Executive Order was re-formed under statute and became the MISC. As a follow up on to the expanded funding, an economic analysis conducted in 2018 is reviewing the threat to Montana's resources and infrastructure by invasive species and whether or not the current level of investment is adequate.

Having the 2016 mussel response occur during the Legislative Session was critical especially as Montana's legislature meets for 90 days in odd numbered years. There were only 6 months left in the fiscal biennium in which the response occurred and adequate funding was not available through the agencies with the authority to respond. Access to the Governor's emergency fund allowed 20

days of rapid response but extension would have required a legislative approval process. Because the detections occurred immediately prior to the onset of winter and during session, there was a process to authorize funding and authorities quickly that would not have been possible in other years or in a different time of year. For future rapid responses, the duration of emergency funding availability could prove to be a substantial constraint.

The broad impact of dreissenid mussels on infrastructure increased the stakeholders for aquatic invasive species management. Prior to the detection of mussels, agricultural groups including irrigators and water supply managers were not the targets of invasive species outreach and prevention messages. Both out of state and local boaters were the main audience for outreach and regulations in an effort to reduce the transport of target invasive species. As a result of the response, authorities shifted as well. Out of state boaters must be inspected which also requires more outreach and staff. New collaborators in aquatic invasive species management, especially in Eastern Montana, are now included in regional watershed management discussions and aquatic invasive species detection and prevention, facilitated by grant funded regional coordinators.

Finding out that we didn't know what we didn't know.

Including a plan to access or release data during rapid response will aid in operations. Due to the complexity of protecting individual's information while making key maps and inventories available to the response organizers requires clear policies. For example, the Department of Natural Resources Conservation maintained maps of irrigation water users but the county-based Conservation Districts that were in regular contact with these water system operators and agricultural users did not have access to the maps or know that they had been made. The distribution and use of state-held information about privately held property is sensitive but releasing the locations of key infrastructure for emergency management can be made in advance with appropriate safeguards.

Additional stakeholders were identified as the mussel response progressed. Past efforts to identify infrastructure that was vulnerable to mussels had generally identified irrigators but these water users had not been included in mussel outreach. Conservation Districts and other county level partners already working in the area provided a channel for communication between the state agencies with the materials and information and the water users. Eastern Montana cooperators identified oil and gas fracking operations as moving substantial volumes of surface water creating a possible pathway for moving mussels that had not been previously taken into account.

Communication, more communication.

The transition from rapid response to management required defining new clear goals and increasing agency capacity to meet those goals but most importantly, reassuring the coalition of partners involved and invested in the response that dreissenid management remained a priority

and would be successfully carried out as the joint command was demobilized. Communicating these goals and setting these new expectations in line with management is proceeding through stakeholder meetings, regional working groups, and updates from the agencies via mailing lists. Increased funding through Montana FWP has developed a partnership model that includes funding tribes and conservation districts to provide the man power for inspection stations and increased outreach.

Both the experience of collaborating during the response and the trust built by the higher level of communication provided by the joint communications team have strengthened ongoing partnerships. Response plans previously identified tribes, federal, regional, and local classes of contacts that should be informed but the specific “phone-trees” with positions, names, and direct contact information developed during the response are now incorporated into the stepped-down response plans that support successful local responses to invasive species.

Appendix: State of Montana, Office of the Governor, Executive Order No. 18-2016: Executive Order Proclaiming an Invasive Species Emergency to Exist in the State of Montana.

Appendix

STATE OF MONTANA
OFFICE OF THE GOVERNOR
EXECUTIVE ORDER No. 18-2016

EXECUTIVE ORDER PROCLAIMING AN INVASIVE SPECIES EMERGENCY TO
EXIST IN THE STATE OF MONTANA

WHEREAS, invasive *Dreissenid* mussel larvae, commonly referred to as zebra and quagga mussels, have been detected in bodies of water in the State of Montana;

WHEREAS, the existence and spread of invasive *Dreissenid* mussels within waters of the State of Montana poses a significant threat to the natural resources of the state;

WHEREAS, invasive aquatic species comprise a grave threat to the waters and economic resources within the State of Montana, and such introduced species are best controlled when experts take management measures quickly after their introduction is discovered;

WHEREAS, the Department of Fish Wildlife and Parks and the Department of Natural Resources and Conservation both have responsibility for control, containment, and prevention of introduction and spread of aquatic invasive species;

WHEREAS, the coordination of a rapid response effort to address this issue is of utmost importance to the State of Montana;

WHEREAS, response resources from these and other agencies are currently working on management strategies;

WHEREAS, under these conditions, the Directors of both agencies have the authority to direct the personnel within their departments to commit time, personnel, funding and resources to meet the requirements and contingencies that may arise from this emergency; and

WHEREAS, the Governor has authority under Mont. Code Ann. 80-7-1013(1) to declare an invasive species emergency and may spend funds to meet needs that arise from this emergency pursuant to Mont. Code Ann. 10-3-302 and 312, and take other necessary action.

NOW, THEREFORE, I, STEVE BULLOCK, Governor of the State of Montana, pursuant to the authority vested in me as Governor under the Constitution and the laws of the State of Montana, do hereby declare that an invasive species emergency exists, as defined in Mont. Code Ann. 80-7-1013, and direct as follows;

- 1) The Directors of the Departments of Fish, Wildlife and Parks and Natural Resources and Conservation shall develop an Incident Management Organization to manage the State of Montana's response to this Invasive Species Emergency; and

- 2) All Directors of other Departments of the State of Montana shall fully cooperate with the Incident Management Organization.

This Order is effective immediately.

GIVEN under my hand and the GREAT SEAL of the State of Montana this 30 day of November, 2016.



STEVE BULLOCK, Governor

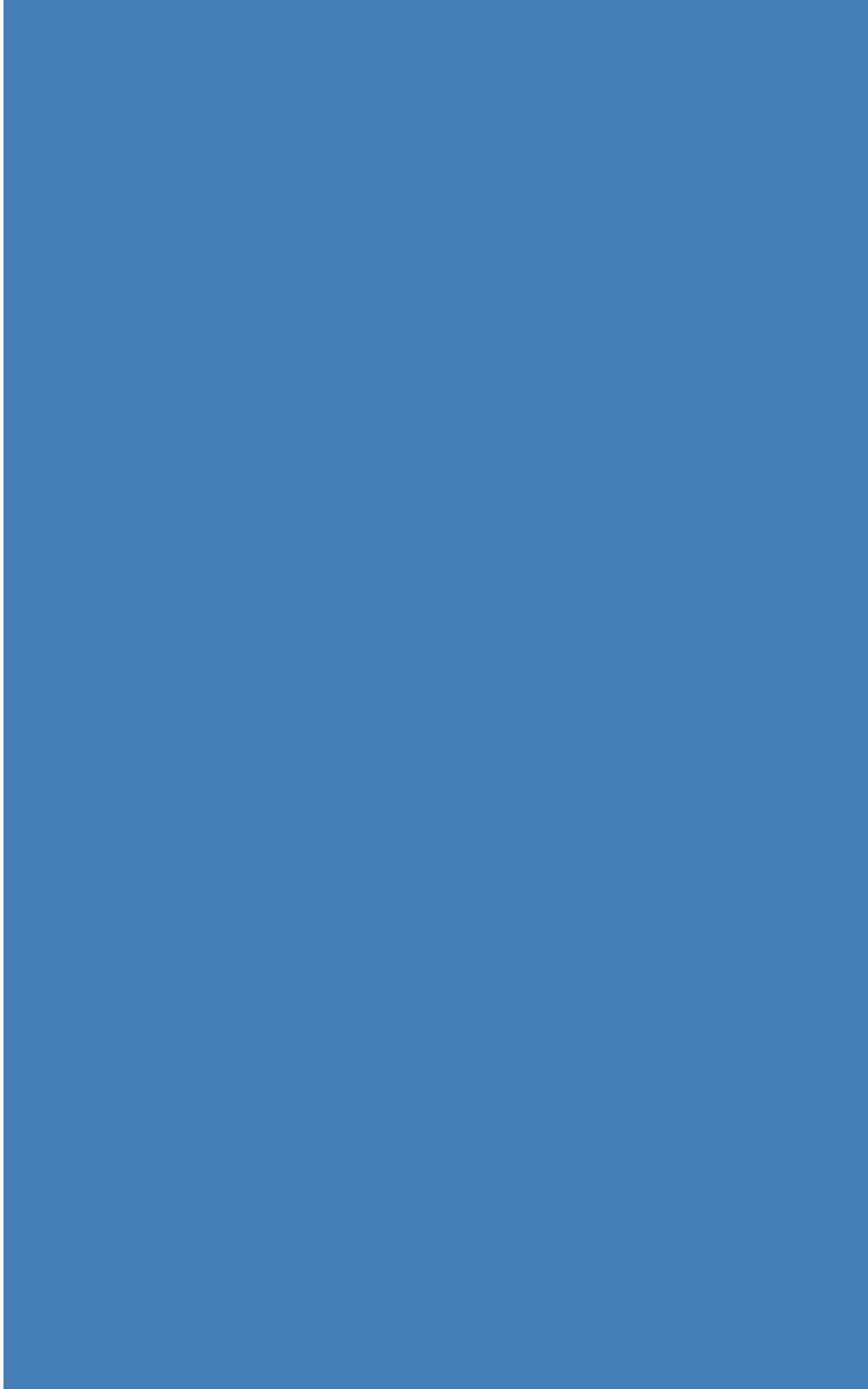
ATTEST:



LINDA MCCULLOCH, Secretary of State

For:





Missouri River System Dreissenid Early Detection and Rapid Response (EDRR) Pilot Project

Project Overview

Montana Fish, Wildlife & Parks (FWP) in coordination with the Montana Invasive Species Council (MISC) have partnered to develop planning tools for an early detection rapid response (EDRR) pilot project for non-native mussels in the Missouri River System. The intent of the pilot project is to identify, test, and evaluate effective coordination among government agencies and non-governmental stakeholders in the development and implementation of a site-specific EDRR program instituted as an emergency response measure.

Project Background

Monitoring for aquatic invasive species (AIS) in Montana has been in place since 2002 and has included an extensive education program focused on prevention and education. Until 2016, no detections of aquatic invasive mussels had occurred in Montana waterbodies.

In October 2016, the Bureau of Reclamation (BOR) notified Montana Fish, Wildlife and Parks (FWP) of suspect invasive mussel larvae (veliger) in a water sample from Tiber Reservoir. Subsequent testing of samples verified Tiber Reservoir as having invasive mussel larvae. Canyon Ferry Reservoir and the Missouri River below Toston dam had suspect sampling results and are being prioritized for additional monitoring and containment. The Milk River had an inconclusive sample result that warrants further, prioritized monitoring.

On-the-ground surveys of rocks, docks, shorelines and other surfaces involving people, dogs, snorkelers, and divers occurred during fall of 2016 and fall of 2017 and no adult mussels have been detected. Monitoring efforts in 2017 have not resulted in any new detections. This situation represents a potential for infestation, but does not guarantee that adult mussels will become established based on a variety of environmental conditions and early aggressive response efforts.

To address this situation, FWP and MISC are undertaking an EDRR pilot project for non-native mussels in the Missouri River System and are seeking local partners to help in the development and implementation of this project. The National Invasive Species Council (NISC) has provided funding to DNRC/MISC to implement the pilot project and to produce several related deliverables. As well, HB 622 directs FWP to develop a containment and quarantine plan for the Missouri River System.

Project Deliverables

While the pilot project is not limited in scope, the identified deliverables include:

- Draft a strategic plan for coordination of relevant government agencies (Federal, state, tribal, local) and non-governmental stakeholders. Note: Hereafter, these entities are collectively referred to as “EDRR project partners.” [draft strategic plan]

- Bring key representatives of EDRR project partner organizations together in a small workshop to review the draft strategic plan and take constructive steps toward integrating it into a *Coordinated EDRR Invasive Mussel Plan for the Missouri River System*. A brief summary of outcomes is to be produced within 30 days of the workshop. [workshop]
- Produce a publically available *Coordinated EDRR Invasive Mussel Plan for the Missouri River System* that: (a) clearly lays out roles and responsibilities for the EDRR project partners, (b) includes measures for activity evaluation and reporting by each project partner, and (c) has been endorsed in writing by each project partner. [coordinated mussel plan]
- Missouri River System containment and quarantine plan (HB 622)

Project Timeline

May-Sept 2017 Draft Montana Dreissenid Rapid Response Plan and solicit stakeholder/public input

Oct/Nov 2017 Draft EDRR Project Partners Strategic Plan

January 2018 EDRR Project Partners Workshop

February 2018 EDRR Project Partners Workshop outcomes due

April 2018 Missouri River Invasive Mussel Summit for irrigators and water users

Sept. 2018 NISC project deliverables are due

- Missouri River Basin Invasive Mussel Plan
- White paper
- C/b Analysis

Dec. 2018 FWP's containment and quarantine plan is due

Steering Committee Roles & Responsibilities (TBD)

MT FWP—lead agency for AIS and content of deliverables in cooperation with partners

MT DNRC/MISC—project manager, technical assistance

CEMMRT—education and outreach, technical assistance, local coordination

Cascade CD—education outreach, technical assistance, local coordination

City of Great Falls—emergency response technical assistance, resources

Montana Mussel Pilot Project

The Project

Montana is a headwater state for three river basins and is currently the last line of defense for the Northwest against the spread of invasive zebra and quagga mussels. As a result, Montana has made its mussel response and long-term EDRR efforts a priority at the highest levels.

The Montana Mussel Pilot Project includes two parallel initiatives to address the unique characteristics and threats to the Upper Columbia River Basin and the Missouri River Basin. Starting in 2016, Montana initiated an Incident Command System (ICS) after mussels were detected for the first time in the state. As the response unfolded, the National Invasive Species Council joined effort by funding the Missouri River Invasive Mussel Coordination effort through September 2018. Locally, the 2017 Montana Legislature established the Upper Columbia Conservation Commission (UC3) to enhance early detection and rapid response efforts through increased coordination with water management agencies within the Columbia River Basin in Montana.

The Issue

Zebra and quagga mussels were introduced to the Great Lakes in the 1980s and have since spread throughout much of North America, with the exception of the Pacific Northwest and southeastern United States. Prior to 2016, these mussels had not been detected in Washington, Oregon, Idaho, Montana, British Columbia, and Alberta. Coordinated prevention efforts among these and surrounding states and provinces protected the perimeter of the Pacific Northwest through coordinated watercraft inspection stations and development of a regional perimeter defense framework.

In November 2016, Montana Governor Steve Bullock issued an executive order declaring a statewide natural resource emergency as a result of a detection of mussel larvae from water samples taken from Tiber Reservoir, as well as suspected detections of invasive mussels at Canyon Ferry Reservoir and the Milk and Missouri rivers.

NISC Project Deliverables: Transition to a regional response

In keeping with the *2016-2018 NISC Management Plan* Action 2.5.4, the National Invasive Species Council funding for the Missouri River Invasive Mussel Coordination effort supports the development of a statewide strategic plan with specific focus on the Missouri River Basin, workshop for all partners in the watershed and workshop report, a detailed



Montana Mussel Response

- Active regional partnerships contribute to both early detection and readiness.
- Invasive mussel larvae were detected on two separate occasions on Tiber Reservoir and once on Canyon Ferry in 2016 causing both to be identified as “positive”.
- A response organized around multiple locations, partners, and resources was launched using Incident Command principals.
- New regulations were put in place requiring inspections for all watercraft: entering the state, crossing the Continental Divide, entering Flathead Basin, and at all open inspection stations.
- No new detections in 2017, and no adults found after snorkelers, divers, etc.
- An economic analysis will look at the known costs then mussels will incur for Montana as well as value created by prevention efforts.

regionally focused mussel plan, white paper on the lessons learned, and cost-benefit analyses of mussel response to the watersheds of Montana. This partnership is providing:

Missouri River Basin strategic coordination plans (complete) A plan for coordination of relevant government agencies (Federal, state, tribal, local) and non-governmental stakeholders in Montana.

Workshop (complete): On January 29, 2018 key representatives of EDRR project partner organizations met at small workshop to review the draft strategic plan and take constructive steps toward integrate it into a *Coordinated EDRR Invasive Mussel Plan for the Tiber Reservoir*.

Statewide and basin-specific strategic plans (in process): EDRR plans will be produced for each river basin. Basin plans will include GIS-based response plans that will provide at-a-glance information for water bodies to expedite a response.

Lessons learned white paper (in process): The experience of transitioning from a mussel early detection program into a rapid response, sustaining the expanded program with the capacity to both manage infested water bodies and prevention actions statewide, is an important case study with insights for other states and regional partnerships.

Economic Study (in process): Understanding the benefits of rapid response depends on knowing the full cost of allowing mussels to spread. These analyses are to be prepared as a report to the National Invasive Species Council and as a manuscript for the *Journal of Biological Invasions*.

Missouri River Invasive Mussel Coordination Partners:

Interagency partners in both early detection and rapid response in Montana include Federal, State, Tribal, and local partners. These EDRR Partners have agreed to participate jointly and to integrate their authorities and resources using Incident Command System (ICS) during an invasive mussel discovery on a water body with overlapping management jurisdictions. This approach of treating new detections as new emergencies (with specific authorities and direction provided by agency directors and the Governor's Office) brings local, state, and regional partners together with little to no advance planning.

Army Corp of Engineers
Big Horn River Alliance
Big Sky Watershed Corp.
Blackfeet Nation
Bureau of Land Management
Burlington Northern Railroad
Cascade Conservation District
Central and Eastern Montana Mussel Response Team
Crow Tribe of Indians
Fergus/Petroleum County Extension
Fort Belknap Indian Community
Fort Peck Assiniboine & Sioux Tribes.
Invasive Species Action Network
McCone Conservation District

Milk River Watershed Alliance
Missouri River Conservation Districts Council
Montana Department of Agriculture
Montana Department of Natural Resources and Conservation
Montana Department of Transportation
Montana Fish Wildlife & Parks
Montana Invasive Species Council
MT Dept. Natural Resources and Conservation
MT Fish, Wildlife & Parks
Musselshell Watershed Coalition
National Invasive Species Council
Petroleum Conservation District
Upper Columbia Conservation Commission
Yellowstone River Conservation Districts Council

Central and Eastern Montana Mussel Response

Strategic Plan - 2018

Mission

Working together to strengthen and support invasive mussel prevention East of the Continental Divide in Montana.

Core Values

Communication, Education, Accountability, Collaboration, and Teamwork

Who We Serve

CEMMR serves the inhabitants and stakeholders east of the Continental Divide of Montana. Specifically, we serve the Missouri and Yellowstone River Watersheds and their tributaries: Madison River Watershed Group, Jefferson River Watershed Group, North Central Missouri River Work Group, Sun and Teton River Watershed, Marias River Watershed, Milk River Watershed Alliance, Musselshell Watershed Coalition, Missouri River Conservation Districts Council, Yellowstone River Conservation Districts Council, Bighorn River Alliance, Powder River, Tongue River

Our Programs and Services

CEMMR accomplishes its mission in the following ways:

- Coordinate education on invasive mussels to all water users in Central and Eastern MT
- Advocacy for resources for invasive mussels to be allocated to Central and Eastern MT
- Provide communication and outreach on invasive mussel events, news, and policy relevant to Central and Eastern MT

2018 Goals

1. Refine structure and geographic area of CEMMR to include all of MT East of the Continental Divide
2. Engage partner watersheds and encourage individual watershed planning efforts
3. Coordinate invasive mussel education East of the Divide
4. Irrigator engagement and education
5. Continue communication and productive feedback exchange with state agencies
6. Increase invasive mussel resources allocated to East of the Continental Divide
7. Participate in the Missouri River Pilot Project
8. Advocate for protection of the State's borders

2018 Specific Tasks related to Goals

1. Refine structure and geographic area of CEMMR to include all of MT East of the Continental Divide
 - a. Update stakeholder and partners lists
 - b. Develop mailchimp or similar list serve for the whole group
 - c. Monthly newsletter and season updates from FWP and Partners
 - d. Working agreement between the partners that outlines duties
 - e. Organizational documents that define structure and determine what policy we support
 - f. Update map to reflect broader geographic area

2. Engage partner watersheds and encourage individual watershed planning efforts
 - a. Summary of partner planned activities
 - b. Audiences of interest in each watershed
 - c. Water bodies that may need monitoring or signage
 - d. Interest in local substrate monitoring or volunteering
 - e. Interest in managing an inspection / decontamination station
 - f. Share FWP maps of monitoring sites and inspection stations

3. Coordinate invasive mussel education East of the Divide
 - a. Educational resource catalogue / contacts (displays, speakers, SWAG, etc.)
 - b. Identification of new educational and funding needs

4. Irrigator engagement and education
 - a. Irrigator workshops and associated publication and advertisement

5. Continue communication and productive feedback exchange with state agencies
 - a. Maintain an Invasive Mussel Activities Calendar for East of the Divide
 - b. Complete list of news media contacts
 - c. Season review meetings with FWP - move date to earlier
 - d. Regular updates on inspection sites and fouled boats

6. Increase invasive mussel resources allocated to East of the Continental Divide
 - a. Write grants to support activities when necessary
 - b. Secure and provide matching funds through partnerships
 - c. Identify gaps and advocate for additional check stations to protect our borders
 - d. Garfield CD outreach on running an AIS station / invite other CDs to attend
 - e. Learn more about liability of inspectors, etc. to facilitate more inspection stations
 - f. Volunteer engagement

7. Participate in the Missouri River Pilot Project
 - a. Provide maps, infrastructure information to the agencies upon request
 - b. Ground truth their information
 - c. Provide stakeholder feedback and involvement
 - d. Serve as a liaison between the agencies developing the plan and the folks living on the ground.

8. Advocate for protection of the State's borders
 - a. Identify gaps and advocate for additional check stations to protect our borders
 - b. Stay informed on AIS funding mechanisms in the Legislature, attend EQC meetings
 - c. Provide comments / support to long-term funding for AIS

The following is a DRAFT visual summary of the structure and roles of partners in the CEMMR – April 2018

CEMMR Members

Regional Coordinators



Carie Hess -
Upper Missouri
Regional
Coordinator

Diane Black –
Lower Missouri
Regional
Coordinator

Monica Boyer
– Yellowstone
River Regional
Coordinator

Partner Watershed Coordinators



- Laura Nowlin – Musselshell Watershed Coalition
- Sara Swanson (Casey Gallagher) – Milk River Watershed Alliance
- Anne Marie Emery – Big Horn River Alliance
- Gail Cicon – Marias River
- Vacant – Sun /Teton River
- Tenlee Atchison – North Central Missouri River Work Group
- Jen Downing- Missouri Headwaters Partnership
- Tongue / Powder Rivers
- Ethan Kunard – Madison
- David Stout – Ruby Valley
- Gallatin River

Statewide Partners



- MT FWP - Tom Woolf, Regional Directors ,
- Liz Lodman
- DNRC Invasive Species- Kate Wilson / Stephanie Hester
- DNRC Water Resources – Paul Azevedo/ Kevin Smith
- Montana Watershed Coordination Council - Erin Ferris-Olsen
- Montana Association of Conservation Districts - Ann McCauley
- MT Water Resources Assoc. – Mike Murphy
- Walleyes Unlimited

Liaisons / Members at large



- Rachel Frost – MRCDC
- Steve Tyrrel
- Steve Wanderaas
- Dan Rostad - YRCDC
- Garfield CD – Flowing Wells Inspection Station
- Municipal and industrial water users
- Irrigators

BSWC Members



- PCCD – Colin McClure, Andrew Horvath
- MRWA – Casey Gallagher
- YRCDC – Aaron Kolb
- Gallatin River Task Force – Jack Murray

CEMMR Advisory Committee

Rachel Frost, Steve Tyrrel, Steve Wanderaas, Dan Rostad, Laura Nowlin, Regional Coordinators (Boyer, Hess, and Black), Tenlee Atchison, Tom Woolf, Barb Beck, Stephanie Hester

The following is a DRAFT visual summary of the structure and roles of partners in the CEMMR – April 2018

CEMMR Roles & Responsibilities

Regional Coordinators



1. Develop and maintain stakeholder lists
2. Coordinate outreach amongst stakeholders and partner watershed groups
3. Monthly newsletter to full group
4. Encourage & assist individual watershed planning efforts
5. Maintain education/outreach resource catalogue
6. Coordinate attendance at events

Partner Watershed Coordinators



- Summary of planned activities
- Identify AIS Champions in the watershed
- Water bodies that may need monitoring or signage
- Gauge interest in local substrate monitoring or volunteering
- Gauge interest in managing inspection / decontamination stations
- Share FWP maps of monitoring sites and inspection stations

Partners



- MT FWP – regulation and statewide AIS program coordination
- Liz Lodman – FWP Outreach / graphic artist
- Kate Wilson – outreach for DNRC
- Erin Ferris-Olsen – funding / outreach
- Kate Arpin (SWCDM) – List serve assistance
- MT Water Resources Assoc. – outreach to members
- Walleyes Unlimited – outreach to members

Liaisons / Members at large



- Rachel Frost – Helena Liaison
- Steve Tyrrel – CD & MISC
- Steve Wanderaas – CD, MISC
- Dan Rostad – YRCDC, legislative liaison
- Garfield CD – Flowing Wells Inspection Station
- Municipal and industrial water users - outreach
- Irrigators – prevention education

BSWC Members



- local / regional education and outreach;
- Help with inspection station staffing
- Volunteer coordination

CEMMR Advisory Committee

Public Comment Recommendations for the full group
Develop policy, structure, and organization guidelines

Advocate for state border protection, gap analysis, & AIS funding in the Legislature

CEMMR Team Successes

- Survey distributed to stakeholders about invasive mussel information needs, resource needs, and local resources available
- Summary of survey prepared for and given to Mussel Response Team
- Contact information for agricultural groups passed to Mussel Response Team
- Collaboratively developed invasive mussel presentation for school groups
- Billings radio station interview
- Distribution of Mussel Response Team rack cards
- Outreach to individual stakeholders through face-to-face meetings (conservation districts, water user associations, county/city governments)
- Collaboration with the BLM on strategic placement of Clean, Drain, Dry signs
- Series of stakeholder meetings in Lewistown, Malta, Fort Peck, Jordan, and Circle.
- Development of information sheet on invasive mussels for irrigators
- Development of slides for FWP powerpoints on how agriculture and construction can contribute to keeping our waters mussel free
- Work with MT FWP and DNRC to engage irrigators, local citizens, and rural water authorities on AIS issues
- Provide feedback to FWP on inspection station locations
- Provided free signs to Conservation Districts for local reservoirs, city boats docks, etc.
- Hosted informational booth on invasive mussels at the Ag Summit in Great Falls.
- Participated in the Cascade County Mussel Summit
- Participated in MT PBS Mussel Response story
- Secured funding to continue CEMMR



Missouri River Basin Invasive Mussel Coordination Meeting Agenda

**Ft. Peck Interpretive Center
Yellowstone Road
August 28, 2018
10 a.m. – 3 p.m.**

AGENDA ITEMS

10:00-10:10	Welcome	Stephanie/Rachel
10:10-10:30	Overview of Montana Invasive Mussel Rapid Response Guidelines	Tom Woolf
10:30-12:00	Preparedness exercise	Leah Elwell/Stephanie
12:00-12:30	Break for lunch (provided)	
12:30-2:00	Round robin updates on activities and progress on invasive mussel prevention and management	All
2:00-3:30	Review of pilot deliverables <ul style="list-style-type: none">• Produce a publicly available <i>Coordinated EDRR Invasive Mussel Plan for the Missouri River System</i>• Missouri River System containment and quarantine plan (HB 622)• White paper on lessons learned from response and pilot project• Economic impact of invasive mussels if established in Montana	Stephanie
3:30-3:40	Partnership agreement signing	All
3:40-4:00	Announcements, wrap up and next steps	Stephanie



Preparedness

EXPLORING STAKEHOLDER INVOLVEMENT IN DREISSENID RESPONSE

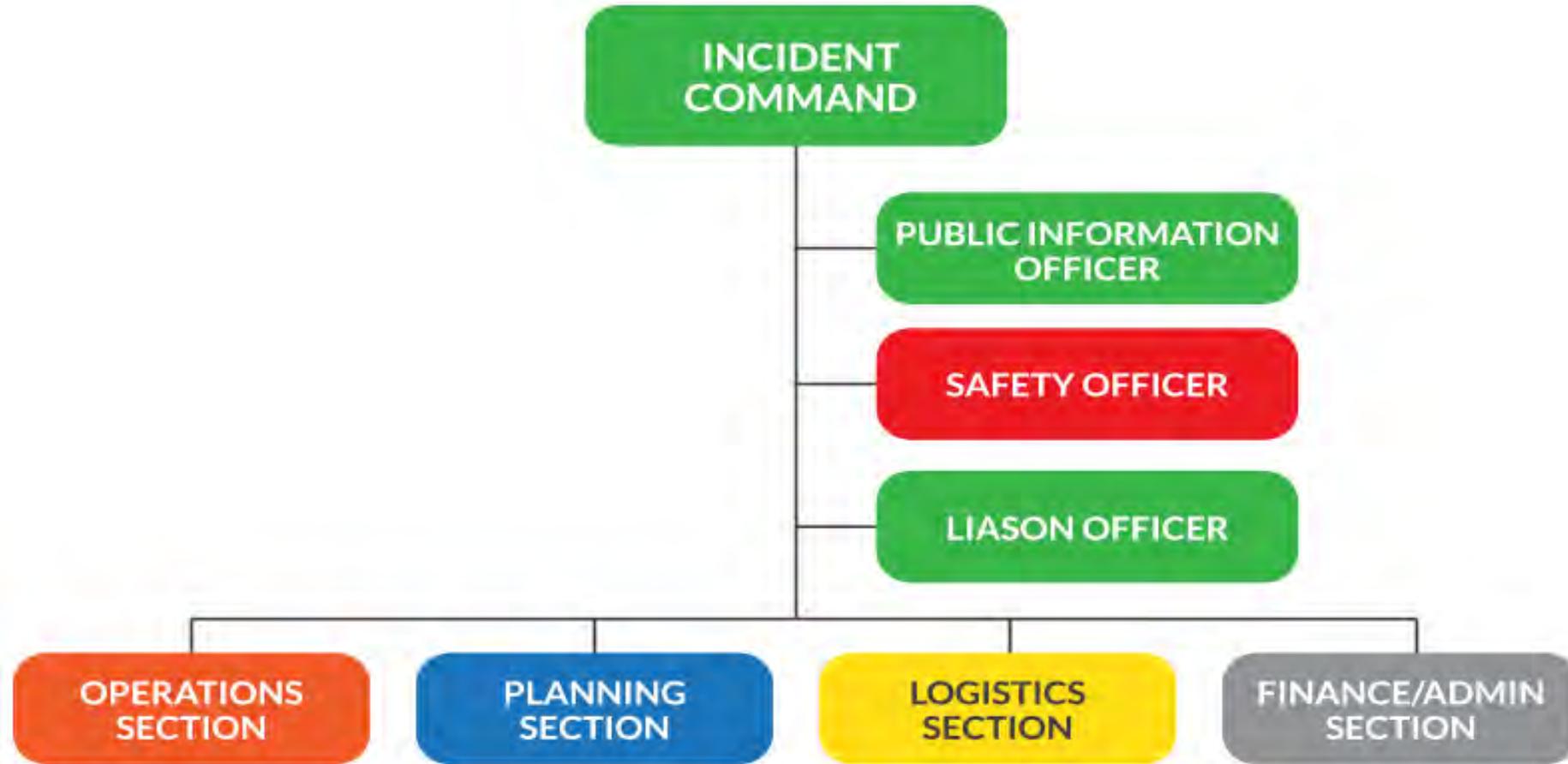
Purpose

- appropriate roles and responsibilities
- jurisdictional considerations

Objectives

- Familiarize participants with the Incident Command System (ICS)
- Familiarize participants with the Montana Rapid Response Guidelines
- Use scenario-based discussion to clarify potential participation in response
- Identify potential actions for stakeholders

Basics of Incident Command System



Overview of MT Rapid Response Guidelines

- Verification
- Notification
- Activation of ICS team
- Activate CRB
- Define Extent
- Establish External Communication System
- Prevent Further Spread
- Activate Control Measures
- Response Conclusion

Scenario Driven Discussions



Fort Peck



photo by: Crooked Creek Marina

September

A fisherman is accessing Crooked Creek at Fort Peck with their boat and thinks they see a mussel attached to the boat ramp. They call 1-800-TIPMont.

Next steps for notification, identification, jurisdiction and possible actions

Discussion Questions

1. Which jurisdiction is responsible for the initial response and assessment?
2. What authorities are relevant to the scenario described and how do they overlap?
3. At this point in the response, who must be notified? How will they be notified?
4. How will existing emergency response plans be applied to the situation described?
5. If the ICS was used for the response, when and how would it occur?
6. Will a delegation of authority be required to initiate onsite management activities?
7. What jurisdictions will be included in the incident command structure? In the case of Unified Command structure, describe the transition from Incident Command to Unified Command.

Seeley Lake



Photo by: Seeley Lake Chamber of Commerce

Big Horn Canyon



Photo by: National Park Service

Stakeholder Involvement





Missouri River Basin Invasive Mussel Coordination Meeting Minutes

Ft. Peck Interpretive Center
Yellowstone Road
August 28, 2018
10 a.m. – 3 p.m.

AGENDA ITEMS

Overview of Montana Invasive Mussel Rapid Response Guidelines

- Tom Woolf provided an overview of the Mussel Rapid Response Guidelines and the Tiber Containment and Quarantine plan
- Points of discussion
 - Equipment inspections
 - FWP is increasing capacity for inspecting equipment
 - 310 permits include new language about inspection and decontamination of equipment
 - **ACTION:** FWP and CD partners to communicate with CDs about new 310 language
 - FWP working with irrigators and irrigation districts to assess how much equipment is being moved in Montana re: pumps, docks, pipes, etc.
 - **ACTION:** FWP/CEMMRT to survey irrigators to assess how much equipment is coming from out-of-state
 - The CEMMRT is hosting an Irrigators Conference October 22-24 in Billings. Discussion about producing a custom booth for irrigators.
 - Discussion about including invasive mussel irrigator messaging in irrigation district mailers, as well as sending clips of Larry's (ID) upcoming talk at irrigator Conference
 - **ACTION:** outreach to farm option websites—Big Iron, eBay, others
 - Discussion about funding for invasive species rapid response
 - Used funds from Montana's Environmental Contingency Fund during 2016 response
 - Discussed the need for dedicated funding for invasive species response
 - **ACTION:** SH to check environmental contingency fund balance

Preparedness exercise

- Leah Elwell and Stephanie provided an overview of preparedness and rapid response with the following intended outcomes:
 - Familiarize participants with the Incident Command System (ICS)
 - Familiarize participants with Montana Rapid Response Guidelines
 - Use scenario-based discussion to clarify potential participation in response and to explore jurisdictional considerations of a response
- **ACTION:** SH to send ICS 100 link: <https://training.fema.gov/is/courseoverview.aspx?code=IS-100.c>
- **ACTION:** ACOE and FWP further discuss response plan for Ft. Peck. Patricia is ICS trained
- **ACTION:** Tenlee to reach out to District Administrators re: response to improve coordination with CDs and develop phone tree

Round robin updates on activities and progress on invasive mussel prevention and management

Montana Invasive Species Council/DNRC

- MISC's big project for 2018 is the Invasive Species law review. Listening sessions around the state are gathering input into the gaps found during the phase 1 analysis. The last listing session is scheduled for Sept. 11 in Kalispell

- There is also the option to take an online survey that is based on identified gaps:
<https://www.surveymonkey.com/r/MISCsurvey2018>
- The Summit, which will further focus on the law review will take place in Helena November 15-16
- There is approximately \$180,000 of remaining AIS grant funds to allocate. DRNC will be opening up a cycle mid-September with an application deadline of Dec. 3, 2018
- **ACTION:** SH to send link to MISC Voices of Montana segment with Steve Wanderaas and Jorri Dyer (in progress)

Montana Watershed Coordination Council (MWCC)

- DNRC, Garfield CD, and MWCC are planning year 2 of utilizing Big Sky Corp members to implement AIS work.
- MWCC received 7 AIS-related applications for the next round of BSWC members

Fish, Wildlife & Parks

Education & Outreach

- The Clean, Drain, Dry website has new AIS videos posted: <http://cleandraindry.mt.gov/Resources>. Includes five videos produced through the Clearwater Resource Council, funded by AIS grant money
- Website also includes: plans, reports, downloads, customizable outreach materials, media
- New study reports 80% of Montanans have heard of the invasive mussel issue
- **ACTION:** FWP and CEMMRT to develop custom displays for irrigator/agriculture stakeholders
 - SH to send Liz ag. Images from DNRC collection
- Rack cards are being updated for next season
- Passport is being redesigned for next season
- FWP and UC3 hosted three train-the-trainer AIS workshops. Participants were given AIS education trunks. Successful effort. May consider scheduling more.
- AIS newsletter-aiming for one/month. Highlights AIS in Montana including partner stories and highlights partner/state coordination
- FWP is sending out a household survey on issues that will include a section on AIS. The initial results suggest that Montanans know a lot about the mussel issue but not other invasive species
- Created a custom AIS and anglers poster. Liz got feedback from participants
- Discussion and coordination on covering events.
 - Liz provided list of upcoming events to attend and provide outreach
 - Some shows are expensive but it's worth the exposure
- **ACTION:** Liz to maintain list and coordinate coverage with partners
- **ACTION:** Liz to ensure Clean, Drain, Dry message is included in all fishing, hunting, waterfowl information/permitting
- Discussion about creating a mussel display with a screen, big and flashy. Consider partnering with ag. Industry on project

Watercraft Inspection and Monitoring

Tiber

- Installed locked gate for local boaters (based on stakeholder feedback) for better containment. Looking to enhance system next year
- Enforcement was much better this year
- BOR has provided .5million for site improvements
- Inspector hiring for next season has begun
- The site will be fully functional next season

WIS General/Monitoring

- 85,000 inspections to date, 13 mussel fouled boats (mostly coming from east)
- 1,200 samples collected, 800 analyzed- no new positive detections
- Divers at Tiber Aug. 28 to search for adults
- Will deploy dogs in fall for shoreline searches
- Taking eDNA samples for comparison w/ microscopy
- FWP wants to expand its partner monitoring network on the east side of the divide
- Moving Wibaux station based on local input
- Discussion on strengthening eastern perimeter defense

- Tom explained the AIS funding proposal: <https://leg.mt.gov/content/Committees/Interim/2017-2018/EQC/Legislation/ais-funding-proposal-for-web-june2018.pdf>
- The next Environmental Quality Council meeting is Sept. 12-13

Cascade Conservation District

- Outreach to outfitters
- Volunteer day was successful
- Finding non-motorized outreach is more difficult than motorized
- Good attendance at River Rendezvous and Rivers Edge events. Good media coverage
- Stream teams have been developed. Three levels from checking docks to full-on monitoring
- Adding AIS message to all work, e.g. landowner letters
- City and County are extremely engaged in issue
- Outreach to 4H and FFA

CEMMRT

- Board decided to expand scope to all invasives, but still focus on mussel threat. New name is CEMIST (Central Eastern Montana Invasive Species Team)
- In process of implementing CEMMRT mussel strategic plan
- Main role of group is coordinating partners and resources
- Developing resource repository so materials are readily available and deployable
- Will work with Liz on staffing events
- Will be reviewing strategic plan and redefine goals
- Team has identified regional coordinators:
 - Monica-Yellowstone
 - Dusty/Carrie/Diane-Eastern, eastern MT

Yellowstone Conservation District Coordinating Council

- In process of identifying county/municipality contacts and providing outreach
- Identifying agriculture stakeholders in area

Blackfeet

- Operated 4 stations this season
- Monitored water bodies. No new detections
- Would likely work with state on response rather than handle on own

Garfield Conservation District

- Garfield successfully operated Flowing Wells station this season.
- No staffing issues, staff may come back
- Plan to operate again in 2019

Big Sky Watershed Corp. Members

- Attended and staffed booth at Environmental Education Conference, Caddis Fly Festival (Craig), Central-eastern Montana Fair
- Produced agriculture impact information card for the Musselshell
- Finalizing Musselshell prevention plan
- Planning to provide AIS education in schools this fall
- Incorporating AIS into Rolling Rivers Trailers
- Engaging water commissioners to do inspections
- Planning Irrigation Conference in October

Review of pilot deliverables

NISC deliverables are due September 30.

1. Produce a publicly available *Coordinated EDRR Invasive Mussel Plan for the Missouri River System*

- Submitted draft plan. Final submission will include Invasive Mussel Rapid Response Guidelines, Missouri River Quarantine and Containment Plan, GIS-based response map, partnership agreement
- 2. Missouri River System containment and quarantine plan (HB 622)
 - Finalizing—out for public comment
- 3. White paper on lessons learned from response and pilot project
 - Drafted. **ACTION:** all send feedback, edits, etc.
- 4. Economic impact of invasive mussels if established in Montana
 - Draft due Sept. 13

Partnership agreement

- Have not received confirmation on all commitments, so didn't sign at meeting
- Agreement is now finalized and was sent to Patricia for Army Corp. to sign
- **ACTION:** Patricia send back to Stephanie when signed. Rachel and Stephanie to gather remaining signatures.

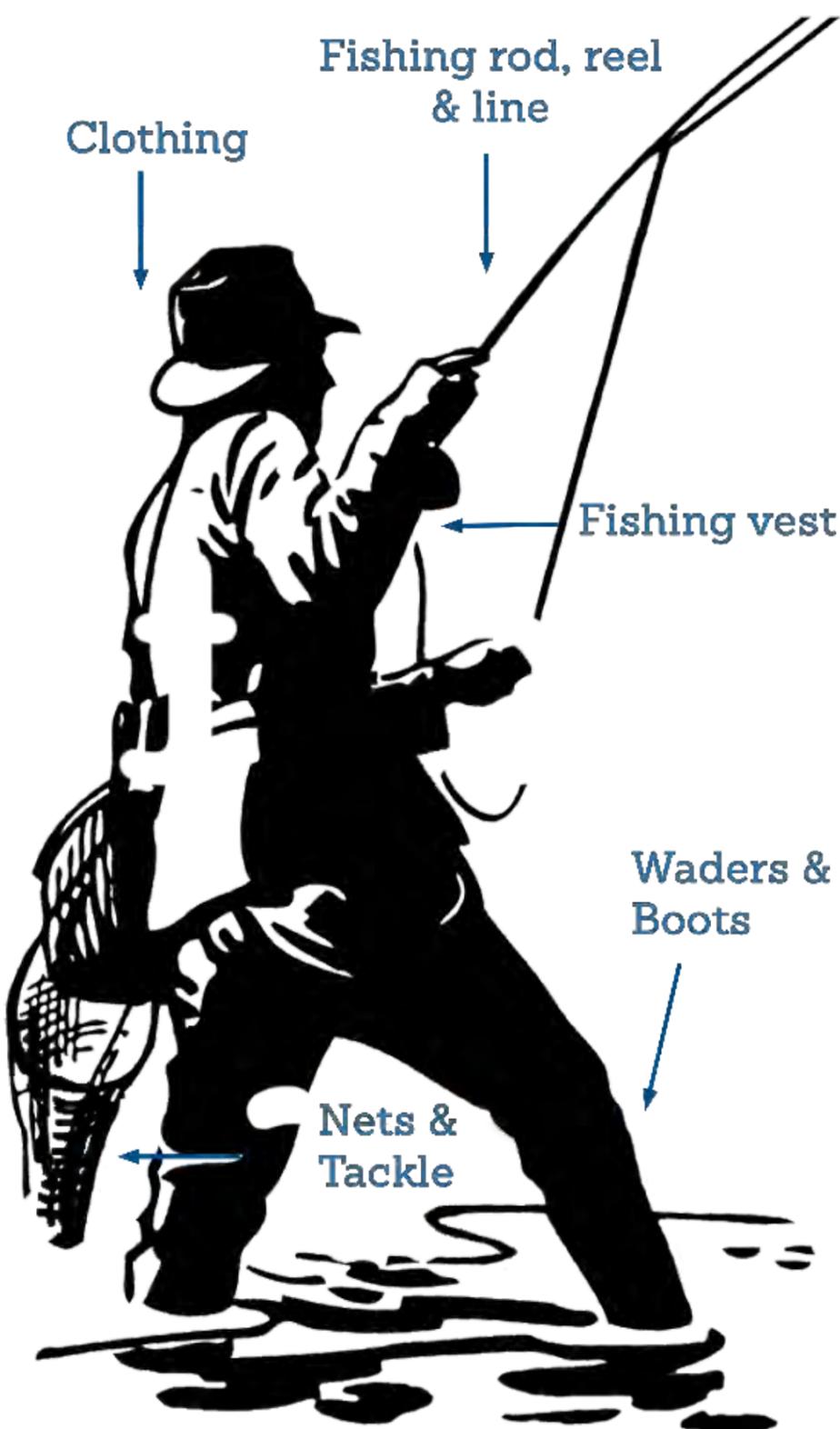
Announcements, wrap up and next steps

- **ACTION:** SH to set-up a pre-season/coordination meeting in April 2019.



Anglers Can Stop Aquatic Invasive Species

Take these simple steps every time you fish to be sure you're not moving invasive species from one waterbody to another.



CLEAN

all plants, mud and debris from fishing gear, waders and boots before leaving the water. Use a scrub brush if needed.

DRAIN

any standing water from gear. A sponge can help.

DRY

everything before using it again. Gear should be dry to the touch. When possible use different waders for different waterbodies.

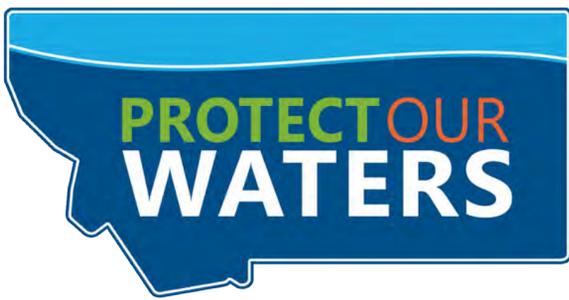
DISPOSE

of unwanted bait in the trash, not on land or in the water.

NEVER

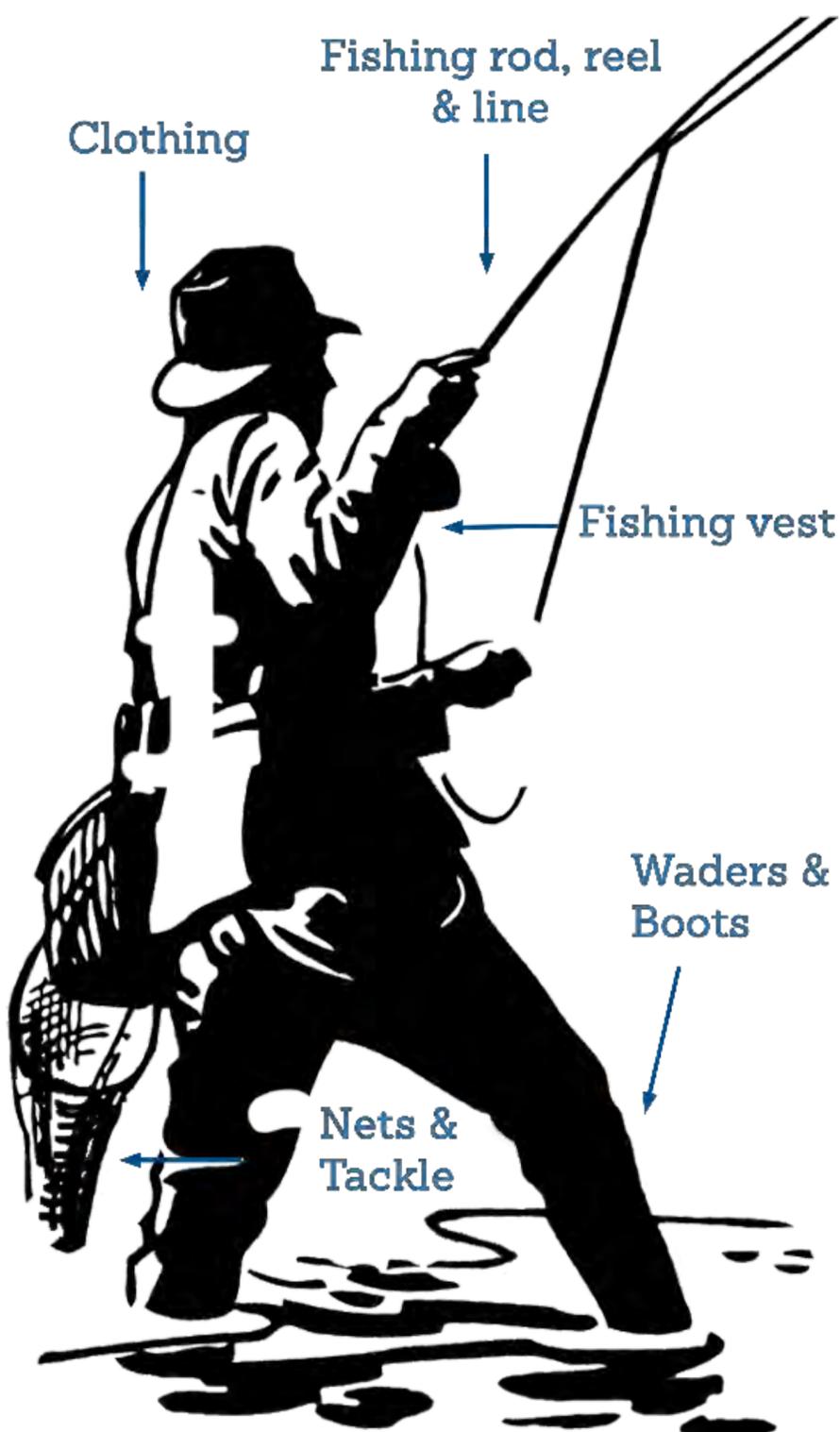
transport plants, fish or animals into a different body of water.





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DISPOSE

of unwanted bait in the trash, not on land or in the water.

NEVER

transport plants, fish or animals into a different body of water.



WHATEVER YOU FLOAT



CLEAN.

Remove all plants and mud from boat, trailer and fishing gear.

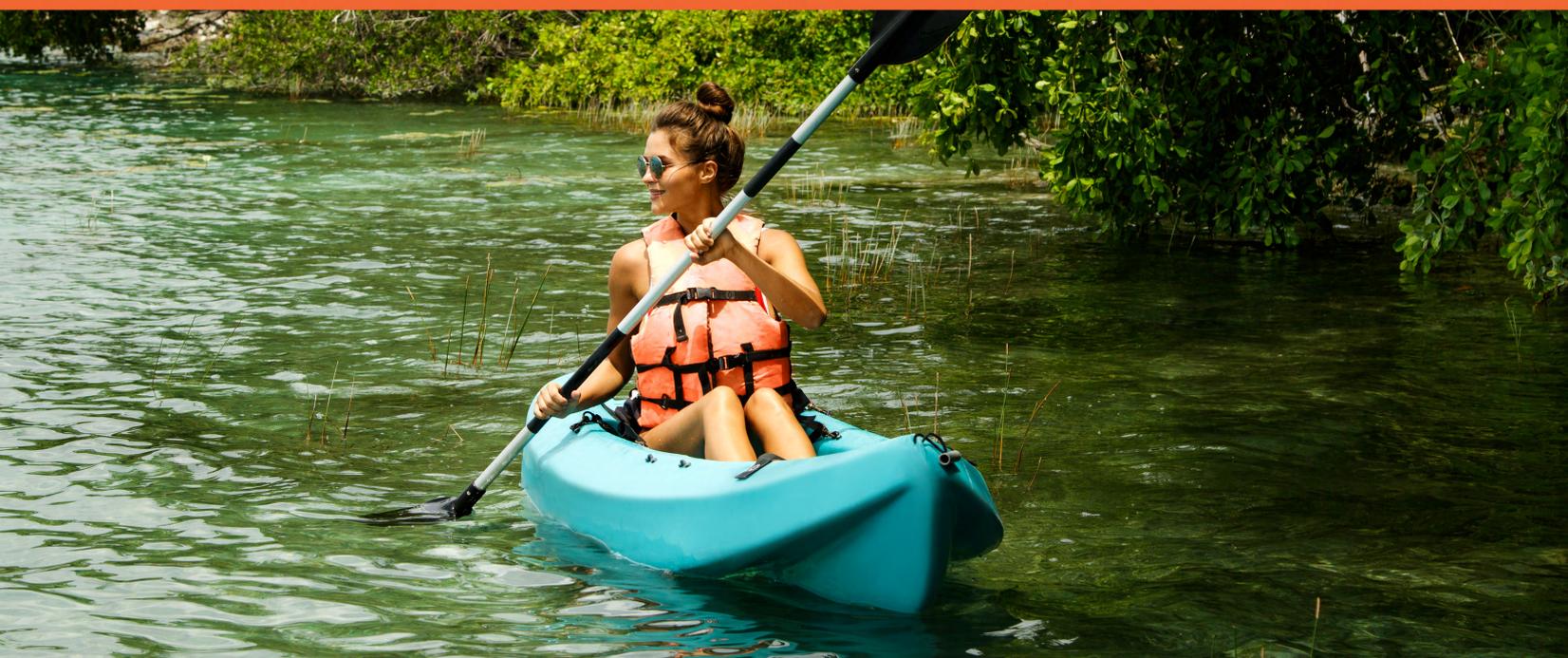
DRAIN.

Pull your drain plug. Before you leave the area eliminate all water from your boat and gear.

DRY.

Allow time for your boat and gear to dry completely before launching somewhere else.

All watercraft must stop at inspection stations



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- ▶ Stop at watercraft inspection stations.

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YOUR WATERCRAFT MUST BE INSPECTED IF:

- You encounter an open inspection station.
- You are coming into Montana from out-of-state .
- You are traveling west over the Continental Divide.
- You are launching anywhere within the Flathead Basin and your watercraft last launched on waters outside of the Flathead Basin.



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WILDLIFE & PARKS**

CLEAN. DRAIN. DRY.



HELP STOP THE SPREAD OF INVASIVE SPECIES

Clean: Remove all plants and mud from boat, trailer and fishing gear.

Drain: Pull your drain plug. Before you leave the area eliminate all water from your boat and gear.

Dry: Allow time for your boat and gear to dry completely before launching somewhere else.

All watercraft must stop at inspection stations



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Natural Resources
& Conservation



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WILDLIFE & PARKS**

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FOR IMMEDIATE RELEASE

CONTACT:

Stephanie Hester, Council Coordinator
Montana Dept. Natural Resources and Conservation
(406) 444-0547



January 24, 2019

Invasive Mussels Could Cost Montana \$234 Million Per Year

HELENA, Mont — Montana’s economy could see more than \$230 million in annual mitigation costs and lost revenue if invasive mussels become established in the state, according to a report released today by the Montana Invasive Species Council (MISC).

Commissioned by MISC and completed by the University of Montana Flathead Biological Station, the economic impact study provides “a snapshot of projected direct costs to affected stakeholders dependent on water resources,” said Bryce Christiaens, MISC chair. “It does not reflect the total economic impact to the state, which would be considerably higher.”

The report identifies three key economic sectors – recreation, infrastructure and irrigation – that face the greatest potential impacts from an established mussel infestation, accounting for 60 to 75 percent of the total potential damages statewide.

“Invasive mussels can devastate aquatic ecosystems, clog water intake pipes and delivery systems, cover boat launches and beaches, and impact any economic sector dependent on water,” Christiaens said. “They pose a major threat to Montana’s environment, economy, recreation, and human health.”

Montana Fish, Wildlife and Parks has been working to prevent the introduction of invasive mussels since 2005 through watercraft inspection, early detection monitoring and

education. Those efforts ramped up when invasive mussel larvae were detected at Tiber and Canyon Ferry reservoirs in 2016. With additional funding from the legislature, FWP was able to double their prevention efforts, triple early detection monitoring and expand education to the public. To date, no adult mussels have been found and no additional invasive mussel larvae has been detected since the initial detection in 2016.

“Eradicating invasive mussels once they establish is difficult if not impossible,” said Thomas Woolf, MT Fish Wildlife, and Parks Aquatic Invasive Species bureau chief. “Prevention is our best bet at keeping them out of our waters and avoiding the costs associated with their impacts. Research continues on methods to prevent and manage mussels, so the longer we can keep them out, the better the chances we’ll see a solution to this problem.”

The study was commissioned to provide managers and policy makers with an estimate of costs in order to inform decisions about the level of funding for state prevention and containment programs. The current level of Montana’s AIS funding, approximately \$6.5 million, is roughly three percent of the estimated \$234 million annual costs for invasive mussel mitigation and lost revenue.

The Montana Invasive Species Council is a statewide partnership working to protect Montana's economy, natural resources, and public health through a coordinated approach to combat invasive species. For more information about MISC and to access the report, visit misc.mt.gov.

#####

ESTIMATED ECONOMIC DAMAGES OF INVASIVE MUSSELS TO MONTANA

UP TO \$234 MILLION PER YEAR

In fall 2016, invasive mussel larvae were detected in Tiber Reservoir with a suspect detection in Canyon Ferry Reservoir. To date, no established adult populations have been detected. Invasive mussels are referred to as ecosystem engineers because of their profound effects on lake and river ecosystem function and structure. The potential total economic impact is in the hundreds of millions of dollars and is likely to affect agriculture, hydropower facilities, drinking water supplies, property values, and recreation.

The \$234 million per year in estimated damages reflects the direct mitigation costs and revenue lost to affected stakeholders. The indirect costs—such as ecological damages to native species, lost jobs, and the personal and cultural benefits people derive from lakes and rivers—are not included. A full-cost accounting of the direct and indirect costs would far exceed \$234 million per year.

With the imminent threat of additional invasive mussel introduction, managers and policymakers in Montana need cost estimates to inform decisions about the level of funding for prevention programs and efforts at containing existing detections. **The current level of Montana's AIS funding, approximately \$6.5 million annually, is roughly 3 percent of the estimated \$234 million annual mitigation and lost-revenue costs.**

Prevention, early detection and rapid response are considered the most cost-efficient approaches to minimizing the economic damages of invasive mussels and other aquatic invasive species. Once established, adult invasive mussels cannot be eradicated, leaving damage mitigation and control as the only feasible and more costly policy responses.



Recreation is important to Montanans' quality of life and the local economy. It's also the reason many visitors come to the state. Invasive mussels can devastate Montana's premier fisheries—impacting tourism and recreational angling—and can damage boats, motors and other recreational equipment. Additionally, infestation can make recreation difficult, as mussels can establish on docks, beachlines, boat ramps and watercraft. The direct impact of invasive mussels to recreation is estimated to be **\$122 million per year**.



Agriculture is important to Montana's economy and way of life. Montana has 2.5 million acres of irrigated land, which accounts for 96% of surface water withdrawals. Invasive mussels can infest canals and pipelines, clog irrigation pumps, screens and head gates, and reduce pumping capacity. The direct impact of invasive mussels to agriculture is estimated to be **\$5.75 per acre foot or \$61 million per year**.



Infrastructure associated with hydropower, thermoelectric power, industrial, water treatment plants, mining operations, and self-supply domestic are all susceptible to mussels. Water intake structures, such as pipes and screens, can become restricted and clogged and reduce the conveyance of water and impede or shut down operations. The direct impact of invasive mussels to infrastructure is estimated to be **\$47 million per year**.



Government Revenue, especially local government, will be negatively affected by the presence of mussels. Lakefront property owners will likely see decreases in the value of their property from decreased lake aesthetics associated with mussels on the order of **half a billion dollars**. Revenue from property taxes will decline in direct proportion to declines in property values with annual losses estimated to be **\$4 million**.



In Montana, the loss to lakeshore property values is estimated to be \$497.4 million. This figure does not include the potential loss in values to irrigated farmland.



FLATHEAD LAKE
BIO STATION
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NATIONAL INVASIVE SPECIES COUNCIL
SECRETARIAT



Visit misc.mt.gov to access the full report.

ENUMERATION OF POTENTIAL ECONOMIC COSTS OF DREISSENIID MUSSELS INFESTATION IN MONTANA

JANUARY 2019

By Nanette M. Nelson, M.S., Research Economist
Flathead Lake Biological Station, University of Montana



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Executive Summary

Introduction

In fall 2016, dreissenid or invasive mussel larvae were detected in Tiber Reservoir with a suspect detection in Canyon Ferry Reservoir. Invasive mussels are referred to as ecosystem engineers because of their profound effects on lake and river ecosystem function and structure. Since their discovery in the Great Lakes in the late 1980s dreissenid mussels have caused substantial economic impacts.

With the imminent threat of additional dreissenid mussel introduction, managers and policy makers in Montana need cost estimates to inform decisions about the appropriate level of investment in prevention programs and efforts at containing existing detections. The objective of this research was to provide estimates of the potential economic damages due to dreissenid mussels.

Approach

- Identified affected stakeholders and their respective usage of the resource, whether consumptive or non-consumptive.
- Consumptive use estimates of economic damages were based on reported expenditures from facilities in locations with dreissenid mussels. Costs were converted to a per volume of water treated basis.
- Non-consumptive use estimates of economic damages were based on percent reductions in either participation rates or value, or a per unit mitigation costs.

Assumptions

- Dreissenid mussels were assumed to colonize all water bodies across Montana at their maximum potential. In other words, the probability of introduction, establishment, dispersion, and abundance were not taken into account.
- Cost estimates were based on damages that would result from established dreissenid mussel populations at infestation levels similar to conditions in the Great Lakes.

Results

The potential economic damages if dreissenid mussels were to colonize all water bodies in Montana totaled \$72.4 to \$121.9 million in mitigation costs, \$23.9 to \$112.1 million in lost revenue, and \$288.5 to \$497.4 million in property value losses (Table 1). Not including property value losses, the top three stakeholder groups facing the largest potential economic impacts from dreissenid mussel invasion were tourism, hydropower, and irrigation accounting for 60 to 75 percent of the total potential damages statewide.

The potential economic damages summarized below should be interpreted with the following information in mind. The economic impacts of dreissenid mussels were available for certain stakeholder groups while lacking for others. Mitigation costs were based on direct expenditures from facilities with dreissenid mussel infestation; thus, the mitigation cost

estimates presented herein are for specific mitigation options. The actual cost of mitigation will depend on facility size and complexity, operating conditions, and choice of mitigation strategy. Dreissenid mussel impacts to tourism, recreational fishing, and property values have yet to be explicitly quantified; therefore, cost estimates for these stakeholders were based on percent reductions in participation or using similar studies as proxies for mussel-related impacts.

Importantly, this analysis underestimates the total impacts of dreissenid mussels to society. Values not accounted for include the disruption of ecosystem functions and their attendant services that support human economic activity, as well as the benefits people derive from knowing a lake or river exists without actually using the resource.

Table 1. Summary of Potential Damage Costs for Dreissenid Mussels Statewide

Stakeholder Group	Montana	
	Lower Bound	Upper Bound
Annual Costs		
Mitigation Costs		
Irrigation	\$29,250,000	\$60,499,000
Hydropower	\$10,431,000	\$25,325,000
Recreational Boating	\$13,951,000	\$13,951,000
Thermoelectric Power	\$7,930,000	\$8,272,000
Public Supply	\$7,397,000	\$7,716,000
Self-Supply Domestic	\$550,000	\$3,004,000
Mining	\$2,170,000	\$2,264,000
Industrial	\$476,000	\$497,000
Livestock	\$93,000	\$193,000
Aquaculture	\$159,000	\$166,000
Mitigation Cost Total	\$72,407,000	\$121,887,000
Lost Revenue		
Tourism	\$17,800,000	\$89,001,000
Recreational Fishing	\$3,867,000	\$19,337,000
Property Tax Revenue	\$2,190,000	\$3,776,000
Lost Revenue Total	\$23,857,000	\$112,114,000
Total Mitigation + Lost Revenue	\$96,264,000	\$234,001,000
One-Time Investment Loss		
Private Property ¹		
Property Value Loss Total	\$288,498,000	\$497,410,000

¹ Does not include the potential loss in value to irrigated farmland.

Discussion

The current level of Montana’s AIS funding, approximately \$6.5 million, is roughly 7 percent of the lower bound estimate of \$96.3 million, the sum of potential mitigation costs and lost revenue. Prevention and early detection and rapid response are considered the most cost-efficient approaches to minimizing the economic damages of dreissenid mussels and other aquatic invasive species. Once established, adult dreissenid mussels can not be eradicated leaving damage mitigation and control as the only feasible and more costly policy responses.

1. Introduction

Invasive species cause substantial ecological and economic damage. Whereas intentional species introduction has been helpful to many sectors of the U.S. economy, some nonindigenous species have likely caused up to \$120 billion per year in environmental damage and control costs (Pimentel, Zuniga, & Morrison, 2005). National level estimates of the economic costs of invasive species are useful for drawing attention to a real threat posed by these unintentional introductions and spurring federal policy makers in to action. The creation of the interagency Invasive Species Council in February 1999 by Executive Order is one example of federal action to address the introduction of nonnative species that become invasive (Pimentel et al., 2005). However, these national level estimates are highly aggregated curtailing their use at more localized levels or for partitioning the impacts among affected users. The lack of scalability and identification of affected stakeholders minimizes the usefulness of the estimates to managers working at the regional, state, or local level.

At the same time, state and regional managers increasingly rely on studies that evaluate the economic impact of invasive species in their particular locality to justify needed funds for prevention, containment, and eradication programs (Cusack, Harte, & Chan, 2009). The difficulty with producing timely cost estimates that are useful to these managers stems from the lack of systematic accounting of damages and control costs caused by invasive species. In 1993, the U.S. Office of Technology Assessment reported on the “chronically underestimated” numbers and impacts of invasive species. Without systematic documentation estimates of economic impacts are incomplete and undervalued (U.S. Congress, 1993). The absence of precise economic accounting of even the most ecologically damaging invasive species continues to be a problem (Lovell, Stone, & Fernandez, 2006; U.S. Department of the Interior, 2016). Reliable and consistent measures of invasive species impacts are needed to better understand their effects on the U.S. economy. More importantly, standardized data collection and analysis will allow for comparability across studies increasing their value and usability among those making policy decisions (Cusack et al., 2009).

One such invasive species that has caused substantial economic impacts is the zebra mussel (*Dreissena polymorpha*). The economic damages from zebra mussels on drinking water and electric power generation facilities was estimated at \$267 million between 1989 and 2004 (Connelly, O’Neill, Knuth, & Brown, 2007). Pimentel and others (2005) estimated zebra and the related quagga mussel (*D. rostriformis bugensis*), hereafter collectively referred to as dreissenid mussels, caused \$1 billion in damages and control costs annually. Dreissenids are invasive freshwater mussels that were discovered in the Great Lakes in the late 1980s (Kelly, Lamberti, & MacIssac, 2009). Dreissenid mussels have since spread widely across North America with 32 states reporting positive detections (Benson, Raikow, Larson, Fusaro, & Bogdanoff, 2018).

The ecological effects of dreissenid mussels are considered the most far-reaching relative to other aquatic invasive species (AIS), causing local extinction of many native mollusks, changing the structure of food webs and fish assemblages, and contributing to the collapse of valuable sport fish populations (Kelly et al., 2009; Bossenbroek, Finnoff, Shogren, & Warziniack, 2009; Strayer, 2009; Pimentel et al., 2005). Once established, these mussels commonly reach densities in excess of 100,000 individuals/ft² (Higgins & Vander Zanden, 2010) clogging pipelines and water intakes and disrupting operations at hydroelectric power plants, municipal water supply facilities, conveyance systems used in irrigation, among others. Boaters too will face increased costs from mussels growing on hulls, engines, and steering components. Beaches can become unusable due to the sharp shells and pungent odors of dead mussels washing ashore. A consequence of biofouling organisms like dreissenid mussels is that the costs to mitigate are shared among the populace.

The need for up-to-date cost estimates of dreissenid mussel impacts at a scale that is useful for managers and decision-makers at the local, state or regional level led to the development of an approach to estimating costs that is scalable, general, and predictive. To demonstrate this approach this study uses Montana as a case study. Montana contains headwater streams for the Columbia and Missouri River Basins (Figure 1). In fall 2016, quagga mussel larvae (veligers) were detected in Tiber Reservoir with a suspect detection in Canyon Ferry Reservoir. These reservoirs are east of the Continental Divide and are part of the Missouri River Basin. Thus, the Columbia River Basin is the last major river basin in the continental United States that is known to be mussel-free at this time. Given adult dreissenid mussels have yet to be established in Montana, the approach used here in estimating damages is an extrapolation of the mussel mitigation and damage costs borne by others elsewhere.

With the imminent threat of additional spread of dreissenid mussels, managers and policy makers in Montana are in need of cost information that will inform the appropriate level of investment in prevention programs and efforts at containing existing detections. The objective of this research was to provide estimates of the potential economic damages due to dreissenid mussels for the state as a whole and to scale the results to the two major river basins. To meet this objective I identified affected stakeholders and their respective usage of the resource calculating estimates of the potential economic damages for each stakeholder group should dreissenid mussels successfully invade the state's waters. Estimating costs of dreissenid mussels as a function of per facility costs is common practice (U.S. Army Corps of Engineers [USACE], 2009; Marbek, 2010; Idaho Aquatic Nuisance Species Taskforce, 2009); however, here I will translate cost estimates to a per volume basis thereby standardizing damages for application at differing scales and locations.

2. Study Design

This study quantifies the magnitude of the potential economic damages due to dreissenid mussels should they invade and thrive in Montana's rivers, lakes, and reservoirs. My approach was to identify the scope of affected uses of surface waters, quantify the amount of use, and multiply by the cost. The sections following address each of these components of the study.

Economic damage estimates derived in this study were based on either 1) direct expenditures from facilities in locations infested with dreissenid mussels or 2) scenarios depicting percent reductions in either participation rates or value due to the presence of dreissenid mussels. The damage cost method, as this approach is known, measures the damage "costs avoided" due to prevention efforts and represent a lower bound estimate of the benefit of protecting Montana's surface waters from invasion by dreissenid mussels (Young & Loomis, 2014). The general premise of using the cost brought on by invasive mussels is that the affected individual or household is willing to pay up to the amount of expected damages to avoid them (Young & Loomis, 2014). Hence, the cost of damages can be used as a measure of the benefit of proposed policies to prevent or mitigate potential damages.

The expected value of economic damage arising from dreissenid mussels is a function of their introduction, establishment, dispersion, and abundance. In this analysis I assume that dreissenid mussels would grow and reproduce at their maximum potential across all waters of Montana, ignoring the probabilities of introduction and successful establishment of mussel populations after introduction. Thus, the estimates presented in this study are the cost of damages that would result from established dreissenid mussel populations throughout every water body in the state of Montana at infestation levels similar to conditions in the Great Lakes, for example.

All cost estimates are new enough to be presented in nominal dollars, which are dollars that measure prices that have not been adjusted for the effects of inflation. In other words, nominal dollars reflect the prices paid for products or services at the time of the transaction.

3. Surface-Water Use Categories and Usage

Unlike previous studies that derive costs per facility, I based my economic damage estimates, in part, on the quantities of water withdrawn by category of use. I adopted this approach for two reasons. First, the water withdrawal data are readily available for all states by county and are updated every five years. Second, the data are comprehensive, simplifying the task of accounting for each stakeholder group in its entirety. Accordingly this approach distinguishes between consumptive and nonconsumptive uses of water. Water that is withdrawn from a river or lake or reservoir for a particular use, and thus not readily available for other uses, is a consumptive use. The U.S. Geological Survey (USGS) compiles water withdrawal estimates for the U.S. and individual states every five years. Withdrawals are

reported by category of use: public supply, domestic, irrigation, livestock, aquaculture, industrial, mining, and thermoelectric power. I used estimates of Montana’s average daily water withdrawal from the 2015 USGS compilation report (Dieter et al., 2018) to calculate potential economic damages from mussel infestation for all eight categories (Table 1).

Water also derives value without leaving the hydrologic system; these in place uses result in little or no physical loss and are typically called non-consumptive uses. Estimates of economic damages were based on the potential reduction in use or value of the resource from mussel-induced degradation. The economic impacts quantified in this manner were completed for recreational fishing, tourism, property values, and property tax revenue . An additional non-consumptive use category, hydroelectric power generation, was also included in the analysis with the potential economic impact being estimated on a per generator basis and from reductions in electricity generation.

Table 1. Total Average Daily Surface Water Withdrawals

Category	Withdrawal (Mgal/d)		
	Statewide	Columbia River Basin	Missouri River Basin
Irrigation	9,393	1,233	8,160
Thermoelectric	74.9	--	74.9
Public Supply	69.9	12.0	57.9
Livestock	29.9	2.2	27.7
Mining	20.5	9.0	11.5
Aquaculture	13.6	4.9	8.7
Industrial	4.5	0.5	4.0
Domestic Self-Supply	1.1	1.0	0.1

Note: Mgal/d, million gallons per day

4. Mitigation Options

Many mitigation methods and strategies are available for minimizing the impacts of dreissenid mussels. Due to physical, environmental and regulatory factors, no single method or strategy is appropriate for all situations. Furthermore, individual state agencies, tribes, industries, and municipalities may choose to employ different control methods depending on their situation and regulatory structure. Below is a brief summary of the more common control methods in use today. For an in-depth review of methods and strategies see documents prepared by the USACE (2013) and the U.S. Bureau of Reclamation (Reclamation; 2015).

The options for mitigating dreissenid mussels impacts include both chemical and physical methods. Many of these options are suitable across industries, from water treatment plants to hydroelectric facilities to irrigation systems. Physical control measures can include scraping, power washing, filtration, thermal treatment, ultra-violet light, desiccation, and

oxygen deprivation (USACE, 2013; Chakraborti, Madon, & Kaur, 2016). In addition, coatings containing copper, brass, and zinc repel mussels preventing their growth on infrastructure surfaces (USACE, 2013). Also available are environmentally-friendly coatings that lack biocides, known as foul-release coatings, which are highly effective against mussel fouling; however, foul-release coatings are susceptible to abrasion and gouging (Wells & Sytsma, 2013). Chemical treatments might include chlorine, potassium permanganate (KMnO_4), pH adjustment, copper-based aquatic herbicides, potash, and proprietary molluscicides (e.g., Zequanox), among others. The advantages of chemical control are convenience, cost-effectiveness, and whole facility protection. However, the downside is limiting the discharge of chemicals to receiving waters, which can harm aquatic ecosystems and may need special permitting to meet environmental regulations. For instance, a major concern with using chlorine is the formation of disinfection byproducts including trihalomethanes (THMs) and haloacetic acids. THMs are regulated by the Environmental Protection Agency (EPA), which may limit the use of chlorine in plants that are at or near the EPA limit (USACE, 2013; Chakraborti et al., 2016).

5. Results – Cost Calculations

5.1 Irrigation & Livestock

Regardless of the irrigation system used, all irrigators will need to manage for mussel larvae (veligers) colonizing within irrigation infrastructure. Dreissenid mussels will impact pumps, pipelines, sprinklers and emitters, gated pipe and siphon tubes, and stock watering systems (L. Pennington, personal communication, June 27, 2018). For instance, veligers drawn into pumps can settle out to interfere with the pumps operation, increasing wear on the pump impeller and prompting additional maintenance. Similar impacts are expected for ranchers relying on surface water withdrawals for livestock. However, few studies or cost data exist documenting the economic impacts of dreissenid mussels on irrigation systems because the extent of mussel infestation to date has been in agricultural regions with sufficient rainfall to support crops.

In 2015, surface water withdrawals for irrigation totaled 9,393 million gallons per day (Mgal/d) or 10.5 million acre-feet per year (acre-ft/yr; Dieter et al., 2018). The irrigation water withdrawal estimate includes irrigation of crops, golf courses, parks, nurseries, turf farms, and cemeteries as well as conveyance losses. Livestock water withdrawal equaled nearly 30 Mgal/d or 10.9 billion gallons per year and includes water used for livestock watering, feedlots, dairy operations, and other on-farm needs. To estimate the cost to irrigators and ranchers in Montana, I used rate data from the Coachella Valley Water District, an irrigation water supplier in southern California that assesses a quagga mussel mitigation surcharge. The current mitigation surcharge is \$2.78 per acre-foot but has been as high as \$5.75 per acre-foot. The current and past surcharge rates were used to calculate lower and upper bound estimates of the

potential cost to irrigators and ranchers in Montana from dreissenid mussel infestation (Tables 2 and 3).

The Coachella Valley Water District adds liquid chlorine into their canals a few miles from where the waterway begins to prevent quagga mussels from colonizing their infrastructure. Despite the differences in water conveyance systems between southern California and Montana, the rate charged by Coachella Valley Water District reflects the actual cost of using chemical control to mitigate against quagga mussel impacts. Furthermore, the management of dreissenid mussels at the point of diversion is the most suitable and likely approach to be adopted by Montana irrigators and ranchers. Other chemical controls are available to prevent dreissenid mussel colonization of irrigation infrastructure including copper-based aquatic herbicides (e.g., Natrix™), potash, and proprietary molluscicides (e.g., Zequanox™). Pilot studies testing the efficacy of these chemical treatments, however, generally found higher costs per volume of water treated than chlorine.

Two caveats regarding the potential cost to irrigators from dreissenid mussel infestation are worth further discussion. First, some fraction of Montana irrigators continue to use flood irrigation methods that rely on siphons. Irrigators with this type of system will likely use manual means – scraping, desiccation – to control mussel growth. As such, these irrigators would incur lower costs than the cost of chemical treatment. However, the proportion of irrigation water withdrawals used in these systems is unknown and thus were not separately quantified. Second, the potential costs to irrigators presented here do not include the potential impacts to property values. The value of agricultural land, in theory, should be determined solely by the expected net earnings arising from the agricultural production of the land. Conceivably, the additional cost to irrigate would reduce the price a farmer might negotiate for their arable farmland because of lower expected net earnings. Estimation of this mussel-induced impact was beyond the scope of this study.

Table 2. Potential Annual Mitigation Costs to Farmers using Sprinkler Irrigation Systems

	Annual Withdrawals (thousand acre-ft/yr) (a)	Mussel Mitigation Rate (per acre-ft) (b)	Potential Costs (a × b)
Lower Bound Estimate			
Montana	10,520	\$2.78	\$29,250,000
Columbia River Basin	1,380		\$3,840,000
Missouri River Basin	9,140		\$25,410,000
Upper Bound Estimate			
Montana	10,520	\$5.75	\$60,499,000
Columbia River Basin	1,380		\$7,942,000
Missouri River Basin	9,140		\$52,557,000

Table 3. Potential Annual Mitigation Costs to Ranchers

	Annual Withdrawals (Mgal) (a)	Mussel Mitigation Rate (b)	Costs (a × b)
Lower Bound Estimate			
Montana	10,914	\$8.53	\$93,000
Columbia River Basin	803		\$7,000
Missouri River Basin	10,111		\$86,000
Upper Bound Estimate			
Montana	10,914	\$17.65	\$193,000
Columbia River Basin	803		\$14,000
Missouri River Basin	10,111		\$178,000

5.2 Water Treatment Facilities (Public Supply)

Public water supply in Montana is comprised of 45 facilities (Dutton, personal communication, August 7, 2018). Public water supply systems, otherwise known as the city or county water department or water treatment plant, are publicly or privately owned facilities that withdraw water from rivers, lakes, or reservoirs and then deliver the treated water for domestic, commercial, and industrial purposes. In 2015, surface water withdrawals for public supply served 39 percent of Montana’s population (Dieter et al., 2018). The variation in the capacity to treat surface water among Montana’s facilities is illustrated by the average daily surface water withdrawals, which range from 0.02 Mgal/d to 21.7 Mgal/d (Dutton, personal communication, August 7, 2018). Two thirds of Montana’s water supply systems are small, less than 1 Mgal/d.

Dreissenid mussels can colonize nearly any surface where flows are less than 6.5 feet per second (O’Neill, 1993). Once attached, biofouling can clog intake pipes restricting flow and

impeding operations (Chakraborti et al., 2016). Water treatment plant infrastructure at risk from dreissenid mussel infestation includes intake structures, screens, pumps, small diameter piping and valves, and instrumentation, among others (Chakraborti et al., 2016). Control of dreissenid mussel infestations will require water treatment plants to alter their physical and chemical treatment methods (Connelly et al., 2007; Park & Hushak, 1999). These mussel mitigation measures are usually implemented at the intake structure and transmission pipe (Chakraborti et al., 2016).

In addition, water treatment plants may need to address the negative impacts dreissenid mussels can have on drinking water aesthetics. Geosmin, an odorous chemical produced by some species of algae and bacteria, impart earthy and musty odors to surface water (Colautti, Bailey, van Overdijk, Amundsen, & MacIssac, 2006). The pseudo feces produced by dreissenid mussels contain bacteria that produce geosmin; hence, sources of drinking water with mussel infestation typically require additional treatment to correct for undesirable tastes and odors.

Annual costs to water treatment plants were broken down by annual operation and maintenance (O&M) and construction (capital) costs to upgrade a facility. Hammond (2016) estimated the cost to keep a supply pipeline at a drinking water treatment plant free of zebra mussels for three chemical treatments: chlorine at \$11.83 per million gallons (Mgal), potassium permanganate at \$24.36 Mgal, and copper ions (EarthTec QZ™) at \$20.00 Mgal. The cost of chlorine and potassium permanganate were used to estimate lower and upper bound damage estimates, respectively (Table 3). Chakraborti et al. (2016) presented costs for ten drinking water facilities actively managing for dreissenid mussel infestations. This study used their estimate of \$154,670 in construction (capital) costs to upgrade a 1-Mgal/d water treatment facility to include chemical treatment for controlling dreissenid mussels plus an additional \$3,000 per facility per year for power, pumping, and additional miscellaneous costs (Chakraborti et al., 2016).

Table 4. Potential Annual Mitigation Costs for Water Treatment Facilities

	Annual Withdrawals (Mgal) (a)	Average cost of chemicals (per Mgal) (b)	Additional O&M plus capital costs (c)	Annual Costs ((a × b) + c)
Lower Bound Estimate				
Montana	25,502	\$11.83	(\$154,670 + \$3,000) * 45	\$7,397,000
Columbia River Basin	4,381		\$157,670 * 11	\$1,786,000
Missouri River Basin	21,121		\$157,670 * 34	\$5,611,000
Upper Bound Estimate				
Montana	25,502	\$24.36	\$157,670 * 45	\$7,716,000
Columbia River Basin	4,381		\$157,670 * 11	\$1,841,000
Missouri River Basin	21,121		\$157,670 * 34	\$5,876,000

5.3 Thermoelectric, Mining, Industrial & Aquaculture

While seemingly unrelated, thermoelectric, mining, industrial and aquaculture are reviewed together due to the lack of current information on the economic damages these stakeholders may face if dreissenid mussels are present in Montana. To provide the most comprehensive accounting of the potential mitigation costs in Montana, the mitigation methods used by water treatment plants were assumed to be the most similar to the mitigation options these stakeholders would likely adopt. Brief descriptions of each stakeholder group are presented below.

Thermoelectric power plants generate electricity by boiling water to create steam to spin the turbines. Fossil fuels like coal, natural gas, or oil are burned to produce the heat that boils the water. Water withdrawals are used to cool the equipment used in the production of power. Just over half (55 percent) of Montana's net electricity generation comes from five coal-fired power plants. Natural gas and petroleum coke each produce about 1.5 percent of Montana's net electricity generation (U.S. Energy Information Administration, 2018).

In mining, water is used in the extraction of coal, sand, gravel, and other ores; crude petroleum; and natural gas. The estimated value of nonfuel mineral production for Montana was \$1.31 billion in 2013 (USGS, n.d.). In 2011, there were 309 mining operations employing over 9,000 individuals (Montana Mining Association, n.d.).

The industrial consumptive use category is broad and covers water use related to the production of wood products, such as pulp and paper, oil refining, sugar beet processing, and other industrial uses. Montana has four operating oil refineries in the eastern part of the state with a crude oil processing capacity of about 205,000 barrels per day. The refinery in Great Falls receives water from the city water department whereas water withdrawals for the remaining three refineries are accounted for in this category. Montana has two sugar processing factories that processed over 1.4 million tons of sugar beets in 2014.

Montana has 16 aquaculture facilities, both private and state-owned, engaged in the production of cold- and warm-water fish species for stocking or consumption purposes. Only two of these facilities, Fort Peck State Fish Hatchery and Miles City Fish Hatchery, would face mussel mitigation costs because of their source of surface water that supports hatchery operations. The other 14 facilities obtain surface water from springs or spring creeks.

There were no recent studies on the cost to thermoelectric plants or industry from dreissenid mussels impacts. In the late 1990s, two studies published data on costs to electric utilities (electric power plants) and industry that drew water from the zebra mussel-infested Great Lakes (Hushak & Deng, 1997; Park & Hushak, 1999). However, these studies were considered outdated. Similarly, cost information on mussel mitigation for mining and aquaculture were lacking. The methods used by water treatment plants to mitigate the presence of dreissenid mussels were assumed to be the most similar to the methods that these industries would likely adopt; therefore, the per volume cost calculated for water treatment

plants – \$290 to \$303 per Mgal – were used in estimating the potential economic damages for these four industries (Tables 5 – 8).

Table 5. Potential Annual Mitigation Costs to Thermoelectric Facilities

	Annual Withdrawals (Mgal) (a)	Average cost (per Mgal) (b)	Annual Costs (a × b)
Lower Bound Estimate			
Statewide	27,339	\$290	\$7,930,000
Columbia River Basin	--		--
Missouri River Basin	27,339		\$7,930,000
Upper Bound Estimate			
Statewide	27,339	\$303	\$8,272,000
Columbia River Basin	--		--
Missouri River Basin	27,339		\$8,272,000

Table 6. Potential Annual Mitigation Costs to Mining Operations

	Annual Withdrawals (Mgal) (a)	Average cost (per Mgal) (b)	Annual Costs (a × b)
Lower Bound Estimate			
Montana	7,483	\$290	\$2,170,000
Columbia River Basin	3,285		\$953,000
Missouri River Basin	4,198		\$1,217,000
Upper Bound Estimate			
Montana	7,483	\$303	\$2,264,000
Columbia River Basin	3,285		\$994,000
Missouri River Basin	4,198		\$1,270,000

Table 7. Potential Annual Mitigation Costs to Industrial Facilities

	Annual Withdrawals (Mgal) (a)	Average cost (per Mgal) (b)	Annual Costs (a × b)
Lower Bound Estimate			
Montana	1,643	\$290	\$476,000
Columbia River Basin	183		\$53,000
Missouri River Basin	1,460		\$423,000
Upper Bound Estimate			
Montana	1,643	\$303	\$497,000
Columbia River Basin	183		\$55,000
Missouri River Basin	1,460		\$442,000

Table 8. Potential Annual Mitigation Costs to Aquaculture ¹

	Annual Withdrawals (Mgal) (a)	Average cost (per Mgal) (b)	Annual Costs (a × b)
Lower Bound Estimate			
Montana	548	\$290	\$159,000
Columbia River Basin	--		--
Missouri River Basin	548		\$159,000
Upper Bound Estimate			
Montana	548	\$303	\$166,000
Columbia River Basin	--		--
Missouri River Basin	548		\$166,000

¹ Adjusted to reflect only 2 of 16 facilities will face potential mitigation costs.

5.4 Domestic Self-Supplied

Self-supplied water use is water withdrawn from a groundwater or surface water source by an individual rather than coming from a public supply. The population of Montanans who are classified as self-supplied domestic users is roughly 304,000. Total self-supply withdrawals equaled 23.7 Mgal/d. Groundwater withdrawals accounted for 95 percent. The remaining five percent or 1.12 Mgal/d comes from surface water withdrawals (Deiter et al., 2018).

Approximately 6,000 Montanan households supply their own domestic water needs from surface water.

In general, private residence water intake systems can be considered as consisting of two parts: an onshore component that includes the pump and distribution pipes to and within the house; and an offshore component, which is the pipe from its intake in the lake or river to the pump on the shore (O’Neill, 1993). In-line filtration is an easily accomplished control option for

the onshore component of a residential water system. A filter capable of removing particles larger than 50 microns is needed in order to remove mussel veligers, which are approximately 70 µm in size (O’Neill, 1993). A whole house in-line filter rated for 50 µm can be purchased from Grainger for \$76.50. Filters are expected to last 6 months depending on the amount of silt, algae, mussel veligers, and other material passing through the system. Replacement filters cost \$15. Another option is to install an in-line chlorine injection system. The amount of chlorine added is comparable to that added to municipal drinking water for disinfection purposes while being sufficient to kill mussel veligers, juveniles and adults drawn into the system (O’Neill, 1993). The added benefit of this method is the improvement in taste and odor, which dreissenid mussels negatively affect. A chlorination system from the Clean Water Store costs approximately \$500 per household. Converting to a per volume cost, the costs per Mg of water withdrawn were \$1,345 and \$7,348 for in-line filters and a chlorine injection system, respectively (Table 9).¹

Several options are available for managing for dreissenid mussels in the offshore component including burying the intake in trenches filled with sand and gravel; using an enclosed, prefabricated sand filter; or periodic mechanical cleaning. The first two options are site specific and as such there are no published cost estimates for these options. The cost of the third option is the homeowner’s time. The cost of the offshore component of a private residence water intake was not calculated for this study.

Table 9. Potential Annual Mitigation Costs to Private Residences with Domestic Self-Supply

	Annual Withdrawals (Mgal)	Cost per Mgal treated (b)	Costs (a × b)
Lower Bound Estimate – In-line filter			
Montana	408.8	\$1,345	\$550,000
Columbia River Basin	354.1		\$476,000
Missouri River Basin	54.8		\$74,000
Upper Bound Estimate – Chlorine injection system			
Montana	408.8	\$7,348	\$3,004,000
Columbia River Basin	354.1		\$2,602,000
Missouri River Basin	54.8		\$402,000

¹ The average Montanan household uses 186.4 gallons per day (gpd) based on an amount of water withdrawn by domestic users of 78 gpd per person (Montana Department of Natural Resources & Conservation, 2014) and the average household size in Montana of 2.39 people. The amount of water withdrawn for domestic self-supply equaled 1.12 Mgal/d serving approximately 6,008 households (1,120,000 gpd /186.4 gpd). Total costs of in-line filters or chlorine injection systems for 6,008 households divided by the volume of water withdrawn equals the per volume cost of each method.

5.5 Hydroelectric Power Generation

Montana has 26 hydroelectric facilities housing 78 generators that have the capacity to produce 2,685 megawatts (MW) of power (Blend, Martin, & Driscoll, 2014). Hydroelectric generation produces 30 to 40 percent of total generation (Blend et al., 2014). The following systems and equipment at hydroelectric facilities are at risk to be adversely impacted by invasive mussels: intake structures and trash racks, penstocks, gates and valves, cooling water systems, raw water fire protection systems, service and domestic water systems, and instrumentation (Boyd, 2016).

I evaluated three methods that span the spectrum of mussel mitigation approaches. The first method, ultra-violet light, addresses mussel impacts on internal components of the hydropower facility. The second method, foul-release coating, protects external components. These first two methods are at the upper end of direct cost investments. The third method is to manage the impacts mechanically through physical removal of the mussels. Although upfront costs are less, relying solely mechanical removal will likely result in more down time and higher labor and maintenance costs, translating into greater revenue losses. Following the approach used by Phillips, Darland and Sytsma (2005) total costs were converted to a per generator cost estimate.

The capital and O&M costs associated with mitigating dreissenid mussel impacts estimated here are based, in part, on cost estimates from Davis, Parker, and Hoover Dams on the Lower Colorado River (Boyd, 2016). Quagga mussels were discovered in Lake Mead in 2007. Subsequent inspections of facilities along the lower Colorado River revealed low-density populations of quagga mussels on external infrastructure at Hoover, Davis, and Parker Dams (Boyd, 2016). Reclamation, owner and operator of the dams, installed ultra-violet (UV) light systems and duplex strainers, among other mitigation strategies, to mitigate the impacts of quagga mussels on their facilities. Reclamation's capital and maintenance costs specific to quagga mussel mitigation from 2016 to 2020 was \$3.8 million at Hoover Dam and \$1.2 million at Davis Dam not including the cost of electricity to run the UV light system (Boyd, 2016).² Distributing the sum of these costs over the four generators at Davis Dam and the 17 generators at Hoover Dam results in a mussel mitigation cost over a five-year period of \$230,558 per generator or \$46,112 per generator per year. Pucherelli and Claudi (2017) tracked power consumption for a UV system to protect the cooling water of one Davis Dam generator at a UV dose level of 40 mW-s/cm². Their estimate of the annual cost of electricity was \$3,150 to \$4,350, averaging \$3,750 per generator per year. Combining the capital, O&M, and average cost of electricity resulted in a mussel mitigation cost of \$49,862 per generator per year (Table 10).

² I elected not to use the cost data for Parker Dam because Reclamation installed self-cleaning duplex strainers at this facility, which are considerably more expensive. In addition, the report did not specify the number of duplex strainers that were installed at Hoover Dam and Davis Dam.

A management option for submerged infrastructure is to apply foul-release coatings, which inhibit mussel attachment and growth. Silicone-based foul-release coatings are considered non-toxic and are effective against macrofouling (Wells & Sytsma, 2013). The downsides of foul-release coatings are cost and susceptibility to gouging (Wells & Sytsma, 2013). Potential applications include intake screens, drains, diffuser gratings and plates, trash racks, internal surfaces of large diameter piping, and fish passage facilities (Reclamation, 2015; Wells & Sytsma, 2013). The cost estimate for applying Sher-Release/Duplex foul-release coating system was \$9.94 per square foot (Wells and Sytsma, 2013). This estimate included labor, equipment, supplies and other direct costs. The total surface area of trash racks at Davis and Hoover Dams is 209,500 square feet. At a cost of \$9.94 per square foot, the total cost to apply foul-release coating would be \$2.1 million or \$94,656 per generator unit. Assuming trash racks would be painted every five years the cost estimate for foul-release coatings is \$18,931 per generator per year (Table 11).

Mussel control can also be achieved by physically removing the mussels using mechanical means such as scraping, power washing, and cleaning. Mechanical activities are also necessary to remove mussel shell debris resulting from other control methods or natural die-off. In addition, operational activities such as drawdowns or desiccation will also reduce mussel populations. Relying solely on mechanical methods to mitigate for mussel-related impacts will likely result in additional shut downs not including the regularly scheduled shut downs for maintenance imposing costs from lost revenue generation.

The Chief Executive Officer, B. Lipscomb, of Energy Keepers, Inc., the owner/operator of Seli's Ksanka Qlispe' (SKQ) dam on the Flathead River in northwest Montana estimated two weeks per quarter or eight weeks a year for additional downtime to mechanically remove mussels in the absence of other mitigation measures (personal communication, July 3, 2018). Generating 1.1 gigawatt hours annually, SKQ has an annual revenue stream of roughly \$20 million assuming a price of \$20 per megawatt hour (MWh). The additional eight weeks of downtime equates to a 10 percent reduction in power generation or a revenue loss of \$2 million per year. A scenario-based approach was used to calculate the economic damages to hydropower as a result of additional generator downtime. The cost estimates were based on a 2 percent and 10 percent reduction in power generation with a market rate of \$20 per MWh (Table 12).

The lower bound estimate of economic damages for hydropower facilities was a combination of costs for one UV light system and duplex strainers (similar in number to Davis and Hoover dams) per generator, foul-release coatings on trash racks, and a 2 percent reduction in power generation. The upper bound estimate was the 10 percent reduction in power generation.

Table 10. Potential Annual Mitigation Costs for Hydropower Facilities Adopting UV Light Systems with Duplex Strainers

	Number of generators (a)	Annual cost per generator (b)	Costs for UV + duplex strainers
Montana	78	\$49,862	\$3,889,000
Columbia River Basin	32		\$1,596,000
Missouri River Basin	46		\$2,294,000

Table 11. Potential Annual Mitigation Costs for Hydropower Facilities Applying Foul-Release Coating

	Number of generators (a)	Annual cost per generator (b)	Costs for trash rack foul-release coating (a × b)
Montana	78	\$18,931	\$1,477,000
Columbia River Basin	32		\$606,000
Missouri River Basin	46		\$871,000

Table 12. Potential Annual Mitigation Costs for Hydropower Facilities from Additional Generator Downtime

	2011 Net electric generation (million MWh)	Reduction in energy generation (MWh) (a)	Market price (MWh) (b)	Lost Revenue (a × b)
Lower Bound Estimate – 2% reduction in generation				
Montana	12.7	253,247	\$20	\$5,065,000
Columbia River Basin	7.8	156,430		\$3,129,000
Missouri River Basin	4.8	96,817		\$1,936,000
Upper Bound Estimate – 10% reduction in generation				
Montana	12.7	1,266,236	\$20	\$25,325,000
Columbia River Basin	7.8	782,149		\$15,643,000
Missouri River Basin	4.8	484,087		\$9,682,000

5.6 Recreational Boating & Fishing

Dreissenid mussels can attach to boat motors, hulls, and trailers. The degree of fouling depends on length of time a vessel remains in infested waters and the density of the mussel population. Veligers drawn into the engine can settle in the engine cooling system, and grow into adults causing the motor to overheat. Adult mussels attached to boat hulls can increase drag, reducing fuel efficiency, and damage the boat's finish. Boat owners can avoid these damages by storing the boat out of the water and allowing the boat to completely dry between uses. Estimates of additional boat maintenance expenses resulting from AIS in Lake Tahoe ranged from \$200 to \$400 per year per boat (USACE, 2009).

Boats in Montana are seasonally moored with owners winterizing and storing their boats in the off-season. The reduced exposure to mussel infested waters and the annual cleaning of a boat’s hull and engine in preparation for winter storage should keep repair costs from dreissenid mussel damage minimal, thus the lower value of \$200 per watercraft per year was used for this analysis (Table 13). In 2018, there were 69,575 registered watercraft with a motor in Montana (Stockwell, 2018). The Montana Department of Justice, Motor Vehicle Division (n.d.) tracks vehicle registration by vehicle type by county allowing for the estimation of the percentage of boats in the Columbia and Missouri River Basins, 47 percent and 53 percent, respectively.

Table 13. Potential Annual Mitigation Costs to Recreational Boaters

	Motorized Watercraft (a)	Maintenance costs per boat (b)	Recreational boating impacts (a × b)
Montana	69,757	\$200	\$13,951,000
Columbia River Basin	32,786		\$6,557,000
Missouri River Basin	36,971		\$7,394,000

Dreissenid mussels’ impacts on the fish assemblage remains uncertain. Strayer, Hattala, and Kahne (2004) examined fish assemblages in the Hudson River after the zebra mussel invasion. The researchers found the effect depended on whether the fish feed on the edges of a lake or river (littoral species) or the fish feed heavily on food floating in the water column (open-water species). The open-water species declined, moving downriver away from the zebra mussel populations, whereas the littoral species increase shifting upriver. In a meta-analysis of existing research on the impacts from dreissenids, Higgins and Vander Zanden (2010) stated the responses of fish assemblages would depend on the extent of the ecological changes, and the ability of fishes to respond to these changes.

Lacking a clear understanding of the shift in Montana’s fish species that might occur in the presence of dreissenid mussels, and hence, the impact on recreational fishing activity, a scenario-based approach was adopted. Similar to the study on the economic impact of AIS to recreational fishing in Lake Tahoe (USACE, 2009), this study assessed the economic damages associated with reductions in fishing effort. Montana Fish Wildlife and Parks (FWP) conducts periodic surveys of angler fishing days and the amount spent while on a fishing trip. Using estimated per day expenditures for resident anglers multiplied by the number of days of fishing, total angler expenditures for 2013 amounted to approximately \$193 million (Swanson, 2016; Table 14). Non-resident spending on recreational fishing was also quantified; however, these expenditures would be captured in the tourism section so these estimates were not included here to avoid double counting. The percentage distribution of angler days between the Columbia and Missouri River Basins, 30 percent and 70 percent, respectively, was calculated

using the most recent report on angling pressure by Montana FWP with Region 1 and 2 representing the Columbia River Basin and Regions 3 through 7 representing the Missouri River Basin (Selby, Hinz, & Skaar, 2017). A proportional relationship between angler spending and days of fishing was assumed for this analysis, meaning that a given percent reduction in the number of fishing days would result in the same percent reduction in spending. A lower and upper bound estimate of economic impact was estimated using a 2 percent and 10 percent reduction in fishing days, respectively (Table 15).

Table 14. Montana Resident Angler Expenditures in 2013

	Angler Days (a)	Expenditures Per Day (b)	Total Angler Expenditures (a × b)
River/stream	1,289,336	\$80.51	\$103,804,000
Lake/reservoir	1,008,605	\$87.36	\$88,112,000
Undesignated ¹	17,356	\$83.94	\$1,457,000
Total	2,315,297	\$83.52	\$193,373,000

Note:

¹ Expenditures per day for the undesignated category is the average of river and lake daily expenditures.

Table 15. Potential Annual Loss in Revenue from Reductions in Recreational Fishing - Montana Residents

	Percent Reduction in Fishing Days		
	2%	5%	10%
Montana	\$3,867,000	\$9,669,000	\$19,337,000
Columbia River Basin	\$1,160,000	\$2,901,000	\$5,801,000
Missouri River Basin	\$2,707,000	\$6,768,000	\$13,536,000

5.7 Tourism

In 2017, 12.5 million visitors travelled to Montana spending \$3.4 billion during their stay. Every dollar spent by a non-resident tourist has both a direct and indirect effect on the local economy. The combined economic impact of non-resident expenditures in 2017 totaled \$4.7 billion (Grau, 2018). Since the focus of this study is on the impact of dreissenid mussels, tourism spending was limited to April through September, the time of year when visitors are traveling to Montana to engage in water-based activities. Non-resident visitor spending from April through September amounted to \$2.5 billion (Grau, 2018). Spending by out-of-state visitors was further refined by limiting expenditures to those tourists who were attracted to Montana for its lakes (36 percent; Institute for Tourism & Recreation Research [ITRR], 2018). Thus, water-related non-resident tourist spending amounted to \$890 million in 2017.

Expenditures were distributed between the Columbia and Missouri River Basins using the percentage of nights visitors spent in Glacier County (40 percent), a travel region comprised of

counties in northwest Montana that closely map to the counties in the Columbia River Basin (ITRR, 2018).

To date there are no studies estimating the impact of invasive mussels on tourism. Therefore, the same scenario-based approach used for recreational fishing was used to estimate the economic damages – 2 percent, 5 percent, and 10 percent reductions in visitation. Here again, tourism spending was assumed to be proportional to visitation. Table 16 shows a range of percent reductions in visitation and the corresponding reduction in spending. If visitation goes down by two percent, the most conservative scenario, the amount of money spent by non-resident visitors would decrease by \$17.8 million, a half of a percent reduction in total tourist spending in 2017. At the 10 percent reduction in visitation, tourism spending would decrease by \$89 million or 2.6 percent of total tourist spending in 2017. The 2 percent and 10 percent reductions in visitation were used for the lower and upper bound estimates, respectively.

Table 16. Potential Annual Loss in Revenue from Reduced Tourism

	Percent Reduction in Visitation		
	2%	5%	10%
Montana	\$17,800,000	\$44,500,000	\$89,001,000
Columbia River Basin	\$7,120,000	\$17,800,000	\$35,600,000
Missouri River Basin	\$10,680,000	\$26,700,000	\$53,401,000

5.8 Property Values

Dreissenid mussels are considered ecosystem engineers (Jones, Lawton, & Shachak, 1994) because of their profound effects on lake and river ecosystem function and structure (Zhu, Fitzgerald, Mayer, Rudstam, & Mills, 2006). Most of the attendant alterations to a lake ecosystem adversely affect the lake’s aesthetics, which in turn can lower surrounding property values. The invasive mussels are extremely efficient filter feeders, each adult mussel filtering about 1 liter per day of water (Snyder, Garton, & Brainard Hilgendorf, 1997), increasing water transparency and light penetration, decreasing organic matter, and increasing nitrogen and phosphorus concentrations (Zhu et al., 2006; Strayer, 2009). While increased water clarity is desirable, the increased light penetration has resulted in increased plant and algal growth in the nearshore environment (Zhu et al., 2006; Strayer et al., 2004), which is not desirable. Dreissenid mussels also preferentially feed on certain algae species while rejecting others, namely cyanobacteria (Vanderploeg et al., 2001). In low to moderate nutrient lakes, zebra mussel invasion has increased cyanobacterium biomass and microcystin concentrations (Knoll et al., 2008; Raikow, Sarnelle, Wilson, & Hamilton, 2004). As a consequence, blooms of cyanobacteria or “blue-green algae” have increased in the Great Lakes since the invasion of dreissenid mussels (Vanderploeg et al., 2001). Cyanobacterial toxins are potentially harmful to humans causing skin rashes and gastrointestinal illness (Knoll et al., 2008). Finally, the shells from dead

dreissenid mussels wash ashore, smothering beaches and potentially injuring swimmers and other water recreationalists from cuts sustained from the shells' sharp edges.

The value of lakefront property is influenced by suite of factors including how clear a lake appears. However, the increased water clarity associated with dreissenid mussels may not influence lakefront property values in Montana to the extent predicted from research on the relationship between sales price and water quality. Visual perceptions of changes in water clarity are sensitive to the initial state of the lake (Smeltzer & Heiskary, 1990). Thus, a one-meter improvement in clarity in a murky lake will result in a greater increase in sales price than an equal improvement in clarity in an already clear lake (Michael, Boyle, & Bouchard, 2000; Poor, Boyle, Taylor, & Bouchard, 2001). Lakes in Montana, on average, exhibit exceptional water clarity (Angradi, Ringold, & Hall, 2018; Bigham Stephens et al., 2015). Over three quarters (78 percent) of total lakefront property value is associated with three lakes – Flathead Lake, Whitefish Lake, and Swan Lake. These three lakes have average Secchi depths, a measure of water clarity, of about 9 meters (30 feet). This depth of clarity suggests any improvement in light transmission arising from dreissenid mussels is unlikely to be perceived by the unaided human eye. The dreissenid mussel induced improvement in water clarity and its effect on lakeshore property values is further curtailed by the potential for increased algal growth in the nearshore environment, described above, which would diminish water transparency. Excess algal growth decreases the recreational and aesthetic benefits of a lake lowering surrounding property values (Michael et al., 2000). For these reasons, the improved water clarity from dreissenid mussels will unlikely be capitalized in lakefront property values in Montana and consequently, I did not consider it in this analysis of the potential economic impacts of these invasive mussels.

The effect of dreissenid mussels on property values has not been explicitly estimated; however, the economic impacts of invasive aquatic plants, algal blooms, and degraded water quality due to excess nutrients on home sale price have been well documented (Horsch & Lewis, 2009; Zhang & Boyle, 2010; Baron, Zhang, & Irwin, 2016; Walsh, Milon, & Scrogin, 2011; Bingham, Sinha, & Lupi, 2015; Ara, Irwin, & Haab, 2006). Therefore, I use these existing studies as a proxy to estimate the potential loss in value to lakefront property due to dreissenid mussel invasion. Using estimates on the effects of algal blooms and degraded water clarity on property value is reasonable given their association with dreissenid mussel invasion as described above. The studies on invasive aquatic plants, specifically Eurasian milfoil, is more nuanced. The two invasive species have a commonality when the consequences of invasion that are particular to property value are considered. The mutual effects include the speed at which invasion spreads after introduction, the quasi-irreversible nature of invasion (at most, the invasion may be contained but never undone), and the high uncertainty on the extent of negative impacts a priori to introduction.

Based on a review of the literature, summarized below, I elected to bracket the low and high end impacts to property values using the 5.8 percent and 10 percent reductions, respectively. Results from multiple studies in multiple states (Minnesota, New Hampshire and Maine) showed a 1-meter decrease in water clarity decreased property values from 3.1 to 8.6 percent with a median value of 5.8 percent (Jakus et al., 2013). In an assessment of the economic impact of harmful algal blooms to property values on Lake Erie, Bingham et al. (2015) used a 10 percent reduction in value to shoreline properties. A study of Ohio lakes found harmful algal blooms with microcystin levels in excess of 1 µg/L, the no-drinking threshold set by the World Health Organizations, reduced lakefront property values by 22 percent (Wolf & Klaiber, 2017). In northern Wisconsin, lakefront property values decreased by 8 percent, on average, after invasion of Eurasian milfoil (Horsch & Lewis 2009). The presence of milfoil and native aquatic vegetation in Vermont lakes decreased property value ranging from 0.3 percent to 16.4 percent depending on the degree of total macrophyte (aquatic plant) coverage (Zhang and Boyle, 2010).

Using property valuation data from the Montana Cadastral, a database of assessed property values completed by county governments, the total value of private lakefront property in Montana equaled nearly \$5 billion (Montana State Library, 2018). Applying the 5.8 and 10 percent reductions to lakeshore properties in Montana would result in \$288.5 and \$497.4 million in property value impacts, respectively (Table 17). The State General Fund and county governments where the affected properties are located will also experience a decrease in property tax revenue from the lowered property values (Table 18). Property taxes are levied against the taxable portion of a property's value. In 2016, the tax rate for residential property was 1.35 percent of assessed value. The total amount of annual taxes owed on a residential property is equal to the taxable value of the property multiplied by the cumulative mills in which the property resides (Montana Department of Revenue, 2016). Predicted losses in property tax revenue from decreases in lakefront property value ranged from \$2.2 to \$3.8 million per year.

Table 17. Potential Property Value Impacts to Privately Owned Lakefront Parcels

	Assessed value of lakefront property (millions) (a)	Reduction in property value (%) (b)	Property value impacts (millions) (a × b)
Lower Bound Estimate			
Montana	\$4,974	5.8%	\$288.5
Columbia River Basin	\$4,664		\$270.5
Missouri River Basin	\$310		\$18.0
Upper Bound Estimate			
Montana	\$4,974	10%	\$497.4
Columbia River Basin	\$4,664		\$466.4
Missouri River Basin	\$310		\$31.0

Table 18. Potential Annual Loss in Property Tax Revenue

	Assessed value of lakefront property (millions)	Taxable Value ¹	Property tax revenue loss
Lower Bound Estimate – 5.8% reduction			
Montana	\$4,974	\$67,150,000	\$2,190,000
Columbia River Basin	\$4,664	\$62,967,000	\$2,055,000
Missouri River Basin	\$310	\$4,183,000	\$135,000
Upper Bound Estimate – 10% reduction			
Montana	\$4,974	\$67,150,000	\$3,776,000
Columbia River Basin	\$4,664	\$62,967,000	\$3,543,000
Missouri River Basin	\$310	\$4,183,000	\$232,000

¹ Taxable value is the portion of the property’s value subject to mill levies. The tax rate for residential property in 2016 was 1.35 percent of assessed value.

5.9 Cost Summary

The potential economic damages if dreissenid mussels were to colonize all water bodies in Montana at densities similar to Lake Erie totaled \$72.4 to \$121.9 million in mitigation costs, \$23.9 to \$112.1 million in lost revenue, and \$288.5 to \$497.4 million in diminished property value (Table 19). The range of potential economic damages for the Columbia River Basin were \$19.0 to \$35.6 million in mitigation costs, \$10.3 to \$44.9 million in lost revenue, and \$270.5 to \$466.4 million in diminished property value (Table 20). Stakeholders in the Missouri River Basin would potentially incur economic damages of \$53.4 to \$86.2 million in mitigation costs, \$13.5 to \$67.2 million in lost revenue, and \$18.0 to \$31.0 million in diminished property value (Table 20).

Not including property value losses, the top three stakeholder groups facing the largest potential economic impacts from dreissenid mussel invasion were tourism, irrigation, and hydropower accounting for 60 to 75 percent of the total potential damages statewide (similar

percentages were calculated for the two river basins). The same trio of stakeholders was evident for the two river basins with the exception of hydropower in the Missouri River Basin. Lost revenue from reduced fishing effort in the Missouri River Basin was the third largest economic impact followed by hydropower.

Tourism or more specifically, reductions in non-resident tourist spending, had the largest economic impact statewide and in both river basins. In 2017, visitors to Montana spent \$3.8 billion. Limiting visitor expenditures to those who visited Montana between May and September and indicated they visited because of Montana's lakes, total expenditures equaled \$890 million. Reductions in visitation due to the presence of dreissenid mussels resulted in potential statewide economic impacts ranging from \$17.8 to \$89.0 million compared to \$7.1 to \$35.6 million in the Columbia River Basin and \$10.7 to \$53.4 million in the Missouri River Basin.

Predicted potential cost to irrigators was among the highest due to the volume of water withdrawn by this user group. In 2017, surface water withdrawals for irrigation equaled 9,393 Mgal/d, an amount that far exceeds all other withdrawal quantities combined. Potential mitigation costs to irrigators equaled \$29.3 to \$60.5 million statewide, \$25.4 to \$52.6 million in the Missouri River Basin, and \$3.8 to \$7.9 million in the Columbia River Basin.

The potential cost of mitigation faced by hydropower facilities was third highest statewide ranging from \$10.4 to \$25.3 million per year. The lower bound cost estimates were roughly even between the two river basins at \$5 million; however, at the upper bound of cost estimates the Columbia River Basin totaled \$15.6 million compared to \$9.7 million in the Missouri River Basin. The upper bound estimate is driven entirely by additional generator downtime to physically remove dreissenid mussels. In 2011, hydropower facilities in the Columbia River Basin produced 62 percent of net electric generation from hydropower for the state.

Impacts to private property values were an order of magnitude higher than all other potential costs combined ranging from \$288.5 to \$497.4 million statewide, \$270.5 to \$466.4 million in the Columbia River Basin, and \$18.0 to \$31.0 million in the Missouri River Basin. Economic impacts were highest in the Columbia River Basin because three lakes – Flathead Lake, Whitefish Lake, and Swan Lake – all of which reside in the Columbia River Basin, make up over three quarters of total private lakefront property value.

Table 19. Summary of Potential Damage Costs for Dreissenid Mussels Statewide

Stakeholder Group	Montana	
	Lower Bound	Upper Bound
Mitigation Costs - Annual		
Irrigation	\$29,250,000	\$60,499,000
Thermoelectric Power	\$7,930,000	\$8,272,000
Public Supply	\$7,397,000	\$7,716,000
Livestock	\$93,000	\$193,000
Mining	\$2,170,000	\$2,264,000
Industrial	\$476,000	\$497,000
Aquaculture	\$159,000	\$166,000
Self-Supply Domestic	\$550,000	\$3,004,000
Hydropower	\$10,431,000	\$25,325,000
Recreational Boating	\$13,951,000	\$13,951,000
Mitigation Cost Total	\$72,407,000	\$121,887,000
Lost Revenue - Annual		
Recreational Fishing	\$3,867,000	\$19,337,000
Tourism	\$17,800,000	\$89,001,000
Property Tax Revenue	\$2,190,000	\$3,776,000
Lost Revenue Total	\$23,857,000	\$112,114,000
Private Property		
Property Value Loss Total	\$288,498,000	\$497,410,000

Table 20. Summary of Potential Damage Costs for Dreissenid Mussels by River Basin

Stakeholder Group	Columbia River Basin		Missouri River Basin	
	Lower Bound	Upper Bound	Lower Bound	Upper Bound
Mitigation Costs - Annual				
Irrigation	\$3,840,000	\$7,942,000	\$25,410,000	\$52,557,000
Thermoelectric Power	--	--	\$7,930,000	\$8,272,000
Public Supply	\$1,786,000	\$1,841,000	\$5,611,000	\$5,876,000
Livestock	\$7,000	\$14,000	\$86,000	\$178,000
Mining	\$953,000	\$994,000	\$1,217,000	\$1,270,000
Industrial	\$53,000	\$55,000	\$423,000	\$442,000
Aquaculture	--	--	\$159,000	\$166,000
Self-Supply Domestic	\$476,000	\$2,602,000	\$74,000	\$402,000
Hydropower	\$5,331,000	\$15,643,000	\$5,101,000	\$9,682,000
Recreational Boating	\$6,557,000	\$6,557,000	\$7,394,000	\$7,394,000
Mitigation Cost Total	\$19,003,000	\$35,648,000	\$53,405,000	\$86,239,000
Lost Revenue - Annual				
Recreational Fishing	\$1,160,000	\$5,801,000	\$2,707,000	\$13,536,000
Tourism	\$7,120,000	\$35,600,000	\$10,680,000	\$53,401,000
Property Tax Revenue	\$2,055,000	\$3,543,000	\$135,000	\$232,000
Lost Revenue Total	\$10,335,000	\$44,944,000	\$13,522,000	\$67,169,000
Private Property				
Property Value Loss Total	\$270,527,000	\$466,425,000	\$17,971,000	\$30,984,000

Note: River Basin totals don't add to statewide total due to rounding.

6. Discussion

6.1. Predicted Economic Damages

This study provided predictions of the potential economic impacts to various stakeholder groups in Montana, a state with a single confirmed detection of mussel veligers but, as yet, no viable adult populations. Further, these estimates were scaled to the two major river basins in the state, the Columbia and the Missouri. The predicted economic impacts presented herein consisted of mitigation costs, lost revenue, and diminished property value. The first two costs are annual while the third represents a single episode of lost value. Mitigation strategies were predicted to cost stakeholders between \$72.4 and \$121.9 million annually; potential reductions in revenue due to lower rates of participation and diminished property value ranged from \$23.9 to \$112.1 million. A similar study on the potential economic damages to Idaho, the western neighbor of Montana and also mussel-free, amounted to \$94.5 million (Idaho Aquatic Nuisance Species Taskforce, 2009). Lower bound estimates calculated for Montana were roughly equivalent and upper bound estimates were roughly double; however, Idaho's estimates did not include impacts to property tax revenue nor costs to irrigators.

Not surprisingly, the stakeholders with the largest potential economic costs were property owners with lakefront parcels amounting to \$288.5 to \$497.4 million statewide. These

losses will not only be faced by homeowners with lake front parcels but also the State's general fund and local county governments in which the properties reside due to the associated decline in property tax revenue. The predicted loss in property tax revenue ranged from \$2.2 to \$3.8 million annually. Local government and school district tax collections come almost entirely from property taxes (96.4 percent; Montana Department of Revenue, 2016), thus the impact will be substantial. The magnitude of loss is driven by the price premium for lakefront real estate especially along Flathead Lake, Whitefish Lake, and Swan Lake. The value of lakefront property at these three lakes amounted to 78 percent of the total lakefront property value statewide. Lake Tahoe, situated along the border between California and Nevada, is also mussel-free but does have other AIS including Asian clams, Eurasian watermilfoil and curly leaf pondweed. As part of the AIS Management Plan for Lake Tahoe, the impact to property values from AIS was assessed using existing literature (USACE, 2009). The studies selected to estimate losses in property value were based on the presence of Eurasian watermilfoil and water clarity as measured by Secchi depth. Property along the shores of Lake Tahoe was valued at \$4,842 million and estimated property value losses from AIS amounted to \$261.5 to \$968.5 million. Reductions in property value to lake front parcels in Montana were similarly valued at \$288.5 to \$497.4 million.

6.2 Practicality of Approach for Estimating Costs

The approach developed for and used in this study is based on the extrapolation of mussel mitigation costs experienced by stakeholders in regions currently invaded by dreissenid mussels. The framework is sufficiently general that it is reasonably straightforward to apply to other jurisdictions where dreissenid mussels are a concern. Importantly primary data collection is not required, a likely concern for managers with small budgets. A researcher could choose to apply the per volume/unit cost estimates or percent reductions in participation/value provided herein to information specific to their locality. As previously mentioned, USGS estimates surface water withdrawals for every state and by county. Data on non-consumptive uses are also publicly available. Information on hydropower facilities is available from the U.S. Energy Information Administration, for instance. Equally accessible are estimates of expenditures by fishermen and tourists, the number of boats registered in a state, and property values. The per volume/unit cost estimates can also be updated with new cost studies or expanded to include more mitigation options.

6.3 Usefulness of Results to Managers

Equipped with the evidence of costs provided herein, managers can demonstrate to decision makers the costs of *no action* highlighting the potential economic damages to a wide range of stakeholders across the state and in specific regions. Crucially this study illustrates the stakeholders who will face the greatest costs should dreissenid mussels become established. The current level of Montana's AIS funding, approximately \$6.5 million, is roughly 7 percent of

the lower bound estimate of \$96.3 million, the sum of potential mitigation costs and lost revenue. Funding for Montana's AIS program supports public education, monitoring, watercraft inspection program, and enforcement – essential elements in the fight against the continued spread of dreissenid mussels. Prevention and early detection and rapid response (EDRR) are considered the most cost-efficient approaches to minimizing the economic damages of dreissenid mussels and other AIS (Cusack et al., 2009). Once established, adult dreissenid mussels can not be eradicated leaving damage mitigation and control as the only feasible and more costly policy responses. Stable, long-term funding is essential for preventing new introductions and containing existing detections.

6.4 Embracing Total Economic Value

The potential economic damages reported on here do not include the cost of lost ecosystem function and associated services nor the values society holds for knowing an ecosystem exists (existence value) and leaving a well functioning ecosystem for future generations (bequest value), collectively known as non-use values. Nonmarket valuation studies, which measure non-use values, are resource intensive and as such have yet to be completed to explicitly measure the reduction in non-use values due to the ecological impacts of dreissenid mussels. Although, for a comprehensive accounting of losses to human welfare, nonmarket values must be incorporated (Leung et al., 2002; Larsen et al., 2001). Therefore, the potential impacts presented here and elsewhere are likely underestimates of the total economic value of the impacts caused by dreissenid mussels. In fact, in some instances, such as the invasion of the Columbia River Basin, researchers have stated that the ecological costs could be much larger than the direct costs (Independent Economic Analysis Board, 2013).

As argued by others (Leung et al., 2002; Bossenbroek et al., 2009; Strayer, 2009; Cusack et al., 2009) the economics of dreissenid mussel impacts must go beyond the financial accounting of damage and control costs and include the estimation of impacts on total economic value and the consequences to human welfare from the loss or impairment of ecosystem function and the services that benefit humans. Knowing and communicating the true economic impacts of invasion are likely key to preventing the spread of invasive mussels. Preventing dreissenid mussel introduction into the Columbia River Basin, the last major river basin in the continental U.S. that remains mussel-free, is a major priority described in the Quagga-Zebra Action Plan (2010) by the Western Regional Panel on Aquatic Nuisance Species. An assessment of the nonmarket impacts of dreissenid mussels seems overdue and quite necessary if the socially optimal level of funding for prevention programs is to be a goal.

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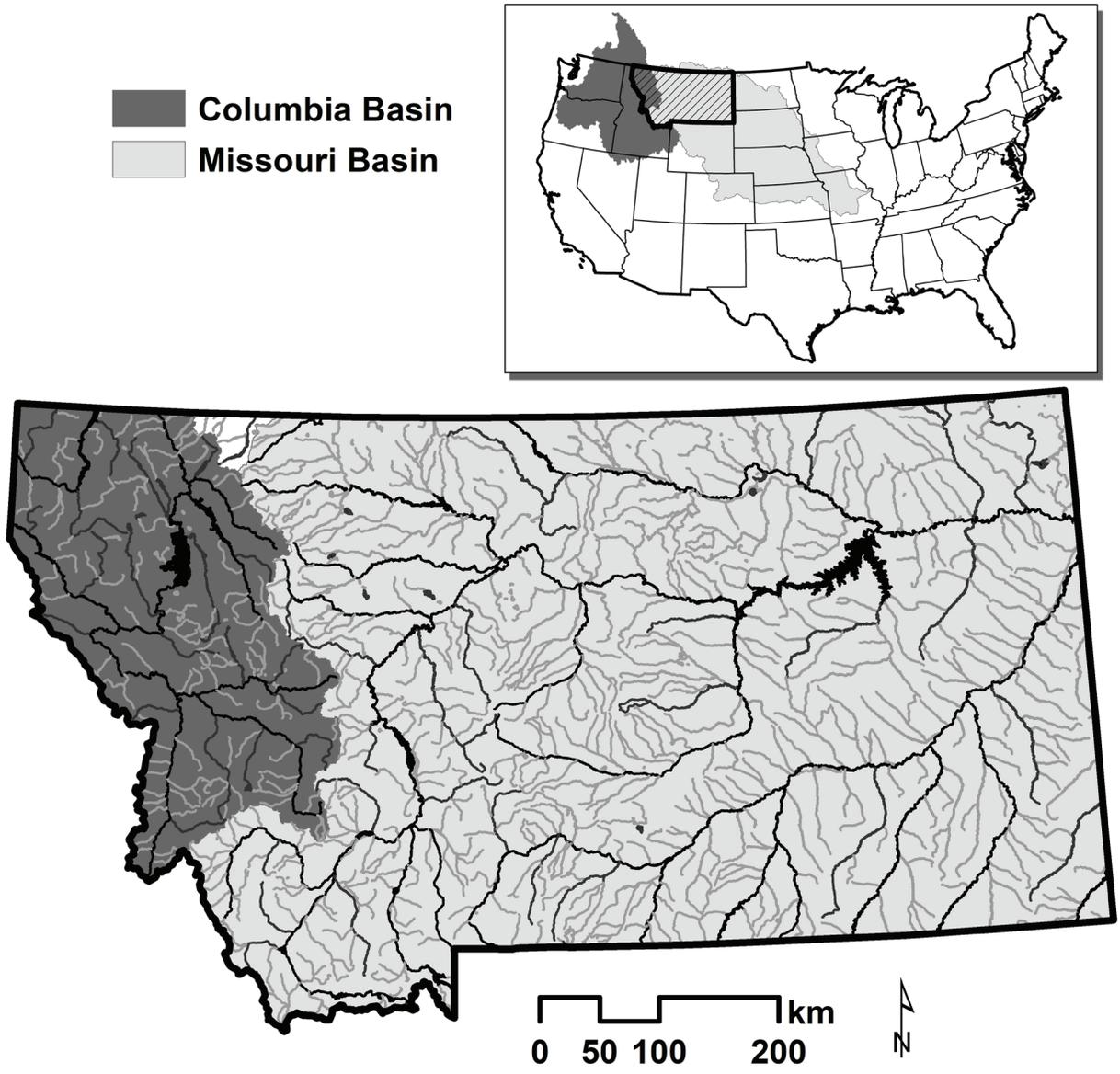
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Figure 1. Columbia and Missouri River Basins in Montana



ESTIMATED ECONOMIC DAMAGES OF INVASIVE MUSSELS TO MONTANA

UP TO \$234 MILLION PER YEAR

In fall 2016, invasive mussel larvae were detected in Tiber Reservoir with a suspect detection in Canyon Ferry Reservoir. To date, no established adult populations have been detected. Invasive mussels are referred to as ecosystem engineers because of their profound effects on lake and river ecosystem function and structure. The potential total economic impact is in the hundreds of millions of dollars and is likely to affect agriculture, hydropower facilities, drinking water supplies, property values, and recreation.

The \$234 million per year in estimated damages reflects the direct mitigation costs and revenue lost to affected stakeholders. The indirect costs—such as ecological damages to native species, lost jobs, and the personal and cultural benefits people derive from lakes and rivers—are not included. A full-cost accounting of the direct and indirect costs would far exceed \$234 million per year.

With the imminent threat of additional invasive mussel introduction, managers and policymakers in Montana need cost estimates to inform decisions about the level of funding for prevention programs and efforts at containing existing detections. **The current level of Montana's AIS funding, approximately \$6.5 million annually, is roughly 3 percent of the estimated \$234 million annual mitigation and lost-revenue costs.**

Prevention, early detection and rapid response are considered the most cost-efficient approaches to minimizing the economic damages of invasive mussels and other aquatic invasive species. Once established, adult invasive mussels cannot be eradicated, leaving damage mitigation and control as the only feasible and more costly policy responses.



Recreation is important to Montanans' quality of life and the local economy. It's also the reason many visitors come to the state. Invasive mussels can devastate Montana's premier fisheries—impacting tourism and recreational angling—and can damage boats, motors and other recreational equipment. Additionally, infestation can make recreation difficult, as mussels can establish on docks, beachlines, boat ramps and watercraft. The direct impact of invasive mussels to recreation is estimated to be **\$122 million per year**.



Agriculture is important to Montana's economy and way of life. Montana has 2.5 million acres of irrigated land, which accounts for 96% of surface water withdrawals. Invasive mussels can infest canals and pipelines, clog irrigation pumps, screens and head gates, and reduce pumping capacity. The direct impact of invasive mussels to agriculture is estimated to be **\$5.75 per acre foot or \$61 million per year**.



Infrastructure associated with hydropower, thermoelectric power, industrial, water treatment plants, mining operations, and self-supply domestic are all susceptible to mussels. Water intake structures, such as pipes and screens, can become restricted and clogged and reduce the conveyance of water and impede or shut down operations. The direct impact of invasive mussels to infrastructure is estimated to be **\$47 million per year**.



Government Revenue, especially local government, will be negatively affected by the presence of mussels. Lakefront property owners will likely see decreases in the value of their property from decreased lake aesthetics associated with mussels on the order of **half a billion dollars**. Revenue from property taxes will decline in direct proportion to declines in property values with annual losses estimated to be **\$4 million**.



In Montana, the loss to lakeshore property values is estimated to be \$497.4 million. This figure does not include the potential loss in values to irrigated farmland.



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