Invasive Mussel Collaborative
April 21, 2016

Zebra Mussel Control in Lake Winnipeg

Presented by: Laureen Janusz on behalf of everyone who participated in this initiative!

Manitoba Aquatic Invasive Species Program
Wildlife and Fisheries Branch
Conservation and Water Stewardship

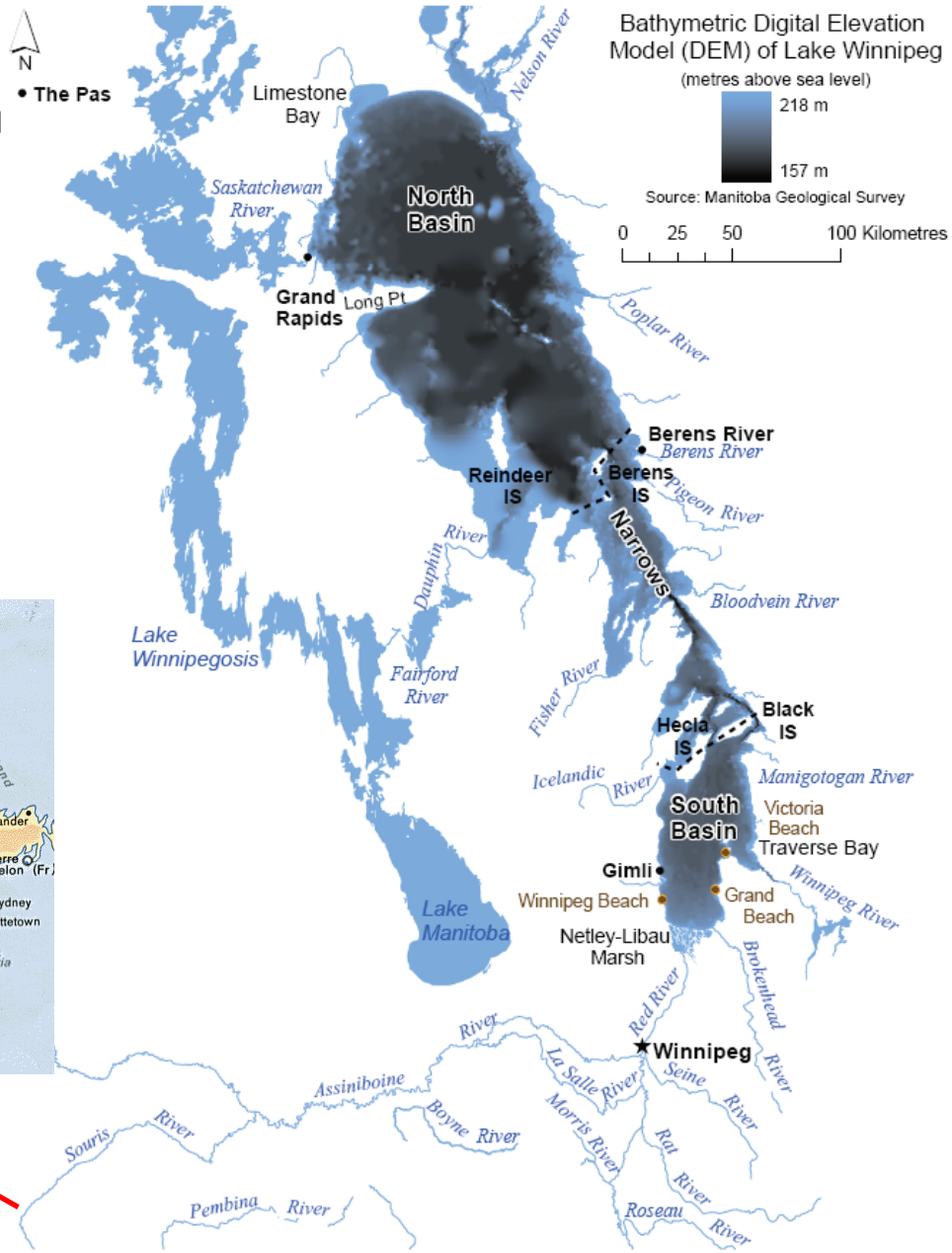
Manitoba

Presentation Road Map

- Background
  - Lake Winnipeg
  - Pre-ZMs
- Zebra Mussel Detection and Response
- Treatment Options
- Treatment – ASI Ltd.
- Post Treatment
- Going Forward

LAKE WINNIPEG

10th largest freshwater lake in the world



Lake Winnipeg

- Close proximity to large basins with many aquatic invasive species

- 120 AIS in the Mississippi Basin
- >200 AIS in the Great Lakes Basin

- Until the Zebra Mussel invasion, Manitoba had 15 aquatic invasive species: spiny waterflea and rusty crayfish among those.

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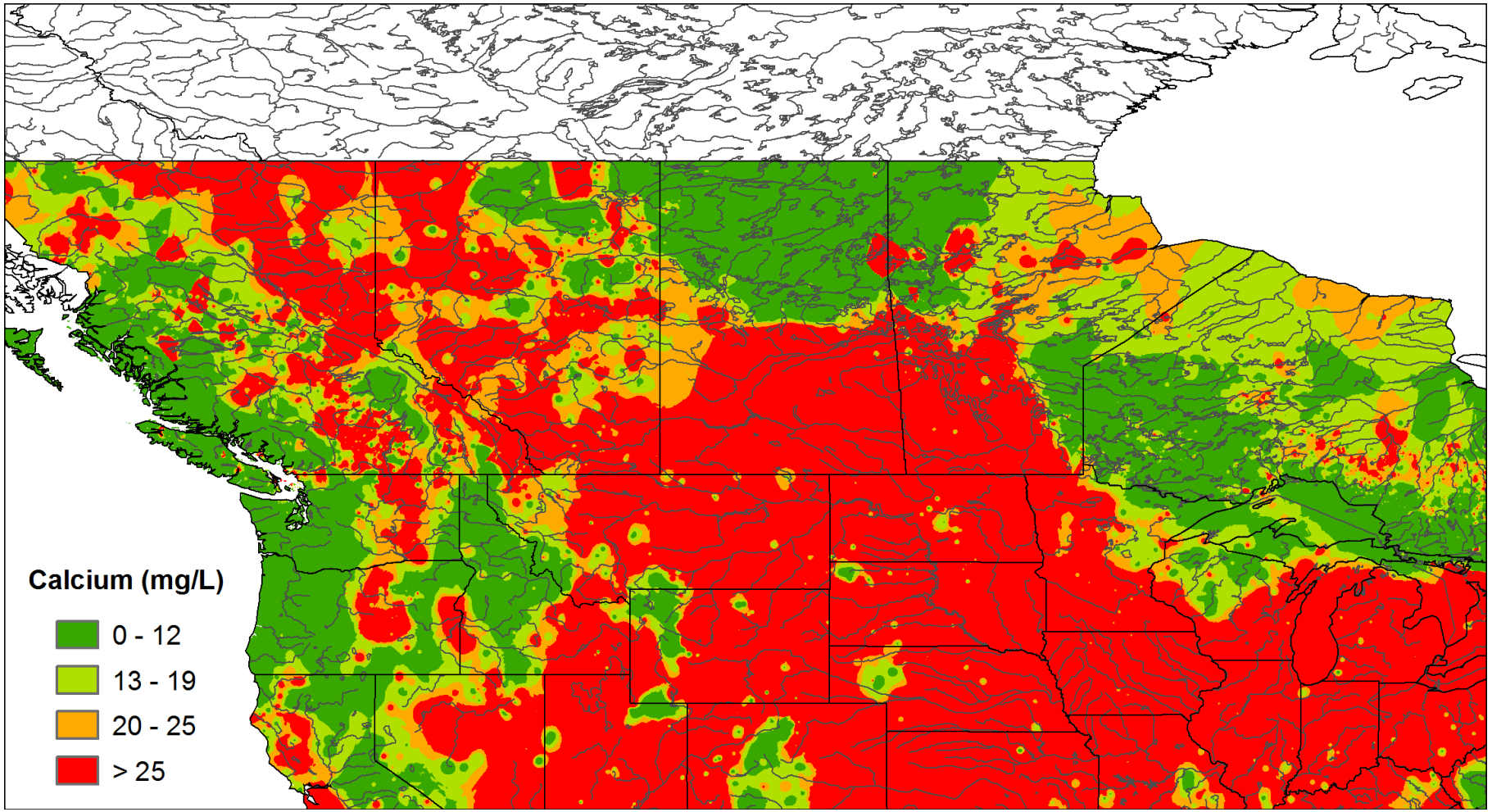
Will Zebra Mussels Survive and Thrive in Lake Winnipeg and elsewhere?



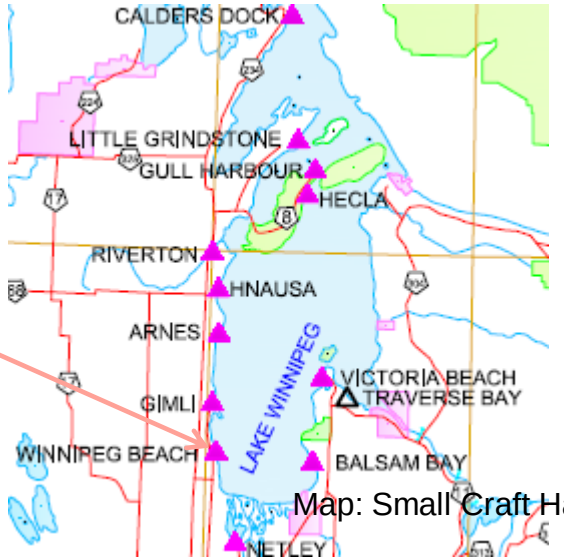
Pre Zebra Mussels

Manitoba's Aquatic Invasive Species Program focused on:

- Prevention and education....primarily:
  - A thirteen year watercraft inspection program at the International border crossing at Emerson.
  - Education and outreach during the summer targeting high boating traffic areas and events (presentations, derbies, etc.).
  - Participated on a number of national and inter-jurisdictional AIS committees.
- Resources:
  - one full time AIS person and during the summer two summer students to assist with the program.
  - An annual budget of ~$40,000 which came from a Department Fund and was directed primarily at operating the watercraft inspection program with some monitoring for zebra mussel veligers.
  - Applied to and received money from various funds (e.g. FEI)
  - In July 2013, our AIS specialist was on maternity leave and the position was not back filled.

Zebra Mussel Reported

- October 11th suspect mussel received.
- Mussel was confirmed to be a zebra mussel.

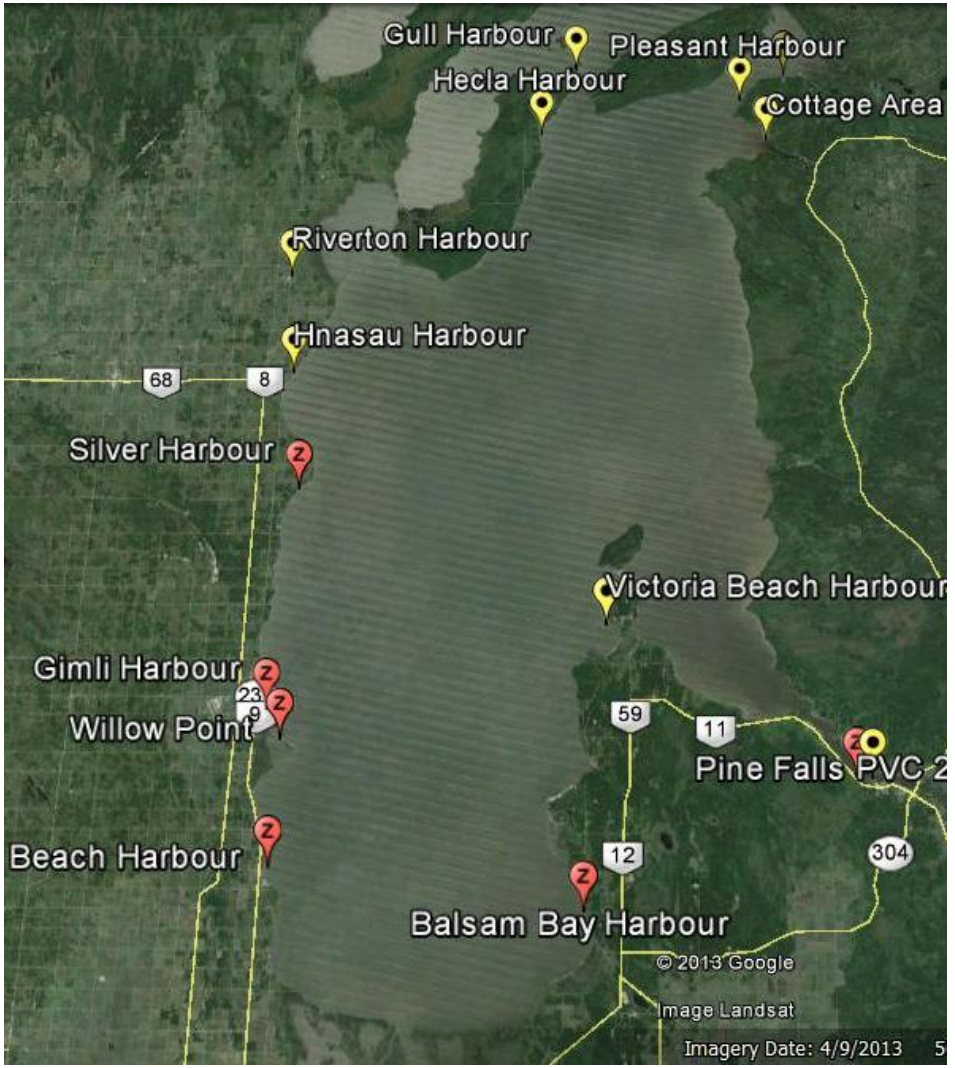


Map: Small Craft Harbours

- Mussel was attached to a recreational water craft moored at Boundary Creek Marina located in the south basin of Lake Winnipeg on the west side
- The underside of docks were inspected and additional zebra mussels were found.

How did we respond?

- Department implemented Locke et al.'s Rapid Response Framework.
- A Science Advisory Committee comprised of government and external experts was established.
- Results from data collected in the fall determined this was an early stage of infestation largely contained to four harbours: Gimli Harbour, Boundary Creek Marina/Winnipeg Beach Harbour and Balsam Bay Harbour.



Treatment Options Considered for Lake Winnipeg

- No Action
- Physical Treatments: hand picking; re-suspending sediments; de-watering the harbours
- Biological Treatments: Zequanox
- Chemical Treatments: Reducing pH; Copper Sulphate; Chlorine; Potash

Fisheries and Oceans Canada / Pêches et Océans Canada
Science / Sciences

Central and Arctic Region

Canadian Science Advisory Secretariat
Science Response 2014/nnn

LAKE WINNIPEG ZEBRA MUSSEL TREATMENT

Context

The Zebra Mussel (*Dreissena polymorpha*), a native of the Black and Caspian seas area of eastern Europe, has a long history of invasion in freshwaters of both Europe and eastern North America. This species was introduced to the Laurentian Great Lakes in the mid-1980s as a result of ballast water discharge from ships. The mussel has rapidly dispersed throughout the Great Lakes region into river systems and smaller lakes and reservoirs. The species has had a large economic and ecological impact where it has become established resulting in severe negative impacts on food webs and nutrient processing. Zebra Mussel was first discovered in the Red River basin in the United States in about 2009. In October 2013, the species was first reported in Lake Winnipeg, Manitoba.

Recommended Treatment - Potash

WHY?

- Economic, ecological and social cost of doing nothing – not an option.
- Potash selected for a number of reasons:
  - Known to be 100% effective.
  - Considered the most environmentally benign option – potassium at concentrations of 100ppm K+ toxic to mussels but not finfish or any other aquatic organisms/wildlife. No human health risk.
  - Had been used successfully elsewhere (Virginia).
  - Affordable and logistically achievable within the tight timeframe.
- Objective of the treatment: at minimum, apply downward pressure on the Zebra Mussel population and reduce the spread of Zebra Mussels from the harbours.

HOW?

- Apply muriate of potash (Potassium Chloride) at a concentration of 100 ppm K+ between ice break up and before water temps reach 10^0C.

WHO?

- ASI Group Ltd - Ontario

So many things needed to be completed before treatment and the 2014 open water season - many things were happening concurrently!

Internal approval Regulatory Approvals Stakeholder Consultation

- Determine if potash could even be used and if so what approval was required. Hurdle: no product registered in Canada for open water use.
- Determine what other approvals were necessary, submit applications, prepare advertisements and signage.
- Prepare and advance internal documents requesting approval and funding to treat – along with other program components.
- Determine who we needed to consult with.
- Consult with stakeholders – tricky to be transparent when no internal approval or regulatory approvals in place.
- Prepare contract and work with consultant.
- Prepare Ministerial and public communication materials.
- Develop containment and monitoring plan and implement.

Summary of Internal, Regulatory and other requirements

May 21, 2014 - Treatment started

Approvals	Initiated Discussion or Submitted Application	Direction/Permit Issued
Internal	December 2013	March 4, 2014
Federal		
Health Canada - PMRA	Nov 2013 Application submitted Feb 24, 2014	Research Authorization Permit Issued March 22/14. Amended May 2/14.
Environment Canada	Nov 2013	Deferred to DFO Fisheries Protection Program with respect to the "deposition of a deleterious substance".
DFO - FPP	Nov 2013 Formal Request for Review: March 6/14	March – "Fisheries Act authorization is not required given that serious harm to fish can be avoided by following standard measures."
DFO - SCH	SCH submitted request to DFO Science to provide advice on MB request to close harbours and treat. Ongoing. MB submitted a formal request to DFO to close the harbours May 14/14	Cdn Science Advisory Secretariat Science Response April 25 May 21 – Licence Agreement from DFO for MB to occupy SCHs to conduct treatment.
DFO – SAR	Application submitted April 11/14	May 1, 2014
Transport Canada – Navigation Waters Act	April 24, 2014	May 20, 2014
Provincial		
Environment Act		given the type of project works no licence required
Pest Management Branch	Submitted application April 25/14	Pesticide Use Permit issued May 15/14
Wildlife & Fisheries Branch	Application for Live Fish Handling Permit received April 28/14	Live Fish Handling Permit issued May 17/14
Committees		
DFO & MB	Committee formed April 11 to provide a mechanism for collaboration between all programs within perspective agencies.	Provided a coordinated front – facilitated approvals needed through DFO, etc.
Implementation Committee	Formed April 11/14, comprised of commercial fishers, recreational stakeholders, municipal gov't.	Open House and Planned Stakeholder meetings (provide info, identify concerns, seek resolution & meet some permit requirements).

Potash Treatment

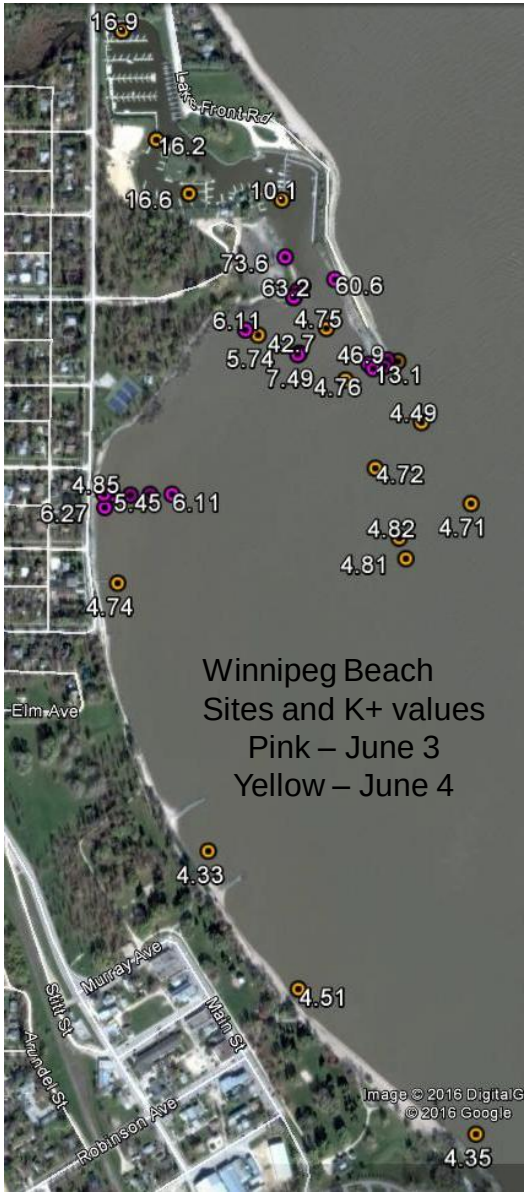
Post Treatment Potassium Monitoring

Intent:

- Delineate the potassium plume following barrier removal and monitor the time it took to reach background concentrations.
  - Proposed to take water samples within the harbour and along a transect/grid outside of each harbour opening.
- To extent possible determine if any freshwater bivalves were affected within the plume.

Post Treatment K+ Monitoring

- K+ concentrations dropped quickly outside the harbour.
- Length of time for concentrations within the harbour to drop depended on the sampling location.
- One dead native mussel noted along the shore immediately outside of the barrier at Winnipeg Beach.



Potassium Measurements (ppm)

	Outside Harbour				Inside Harbour			
Date	n	average	min	max	n	average	min	max
June 2/14	16	26.5	3.8	73.6		>73.6		
Note: barrier failure evening before- removed.								
June 4/14	15	4.9	4.33	6.27	4.0	16.6	10.0	16.9
Aug 21/14	3	9.7	9.0	10.0	3.0	7.3	7.0	8.0
Jul 2/15						5.8		


73.6
60.6
5.87
70.5
69.2
9.02
4.75
42.7
7.49
3.8
46.9
4.64
4.35
13.1
4.76

Post Treatment Monitoring

- Increased monitoring to measure on-going effectiveness of treatment and determine whether an "in lake" population of zebra mussels exists
  - Veliger sampling summer and fall MV Namao cruise (54 stations plus new near shore stations)
  - Veliger sampling inside and outside of the "treated" harbours
  - Substrate samplers set inside "treated" harbours and other Small Craft Harbour locations - particularly where the MV Namao docks overnight.
  - navigational buoys
  - Infrastructure: St. Andrews Lock and Dam, Manitoba Hydro facilities, docks

Early to mid-July: 0 veligers in samples collected within and outside each of the treated harbours.
July 30th – veligers found in 3 samples taken from the larger south basin during MV Namao sampling.

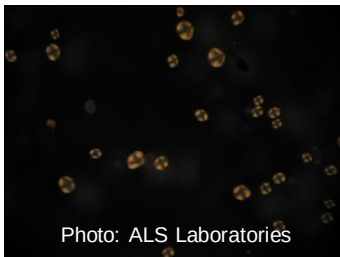
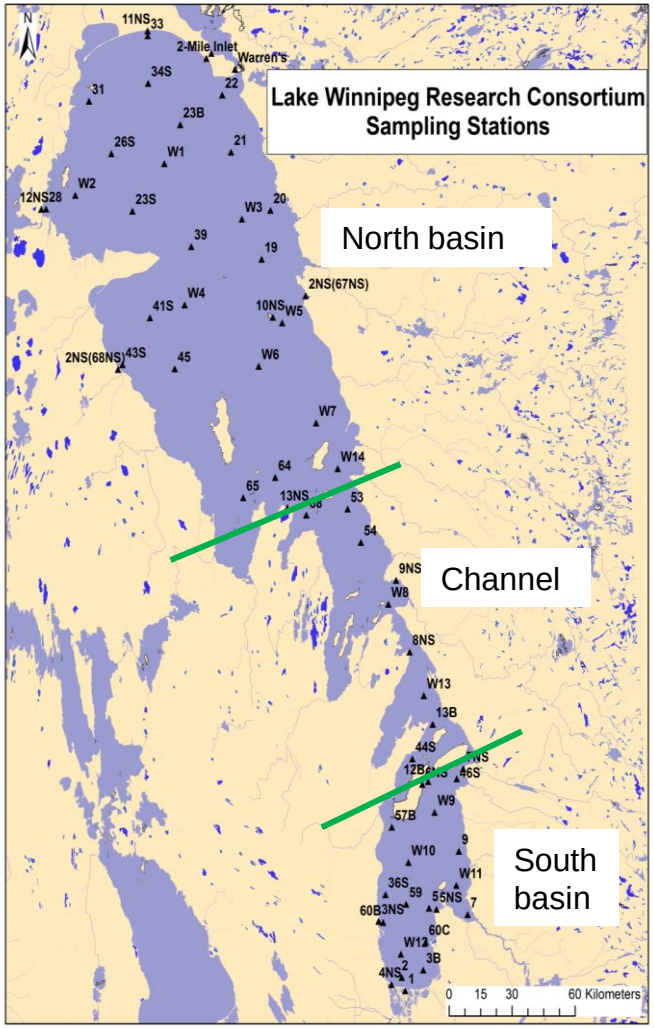


Photo: ALS Laboratories

What is the situation now?

Zebra Mussel veligers found throughout the south basin and at greater numbers; also found in the channel and two sites in the north basin.

	2014		2015	
	Summer	Fall	Summer	Fall
# of Stns w veligers	3	10	15	24
Min # of veligers	1	3	1	1
Max # of veligers	7	25	772	2620
Avg # of veligers/ stn	3	10	92.5	371.7



Lake Winnipeg Monitoring

Zebra Mussel Adult Sampling:

• Found for the first time on samplers set in the channel

• Compared to last year, densities (#/m^2) have increased substantially:

e.g. Gimli Harbour
2014 - .004/cm^2: 88/m^2;
2015 – 11.1/cm^2: 100,887/m^2

• Reported along rock groins; attached to wood, native mussels, debris and washed up along the shoreline.

• Motors and hulls of watercraft moored in harbours covered with Zebra Mussels.





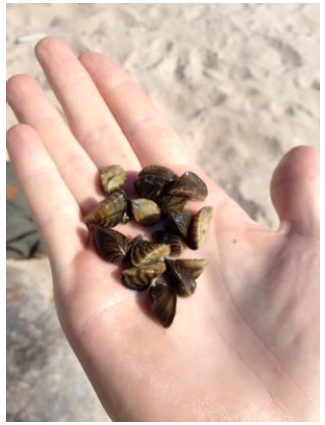


Photo courtesy of Dean Thorkelsson, Lake Agassiz Marine

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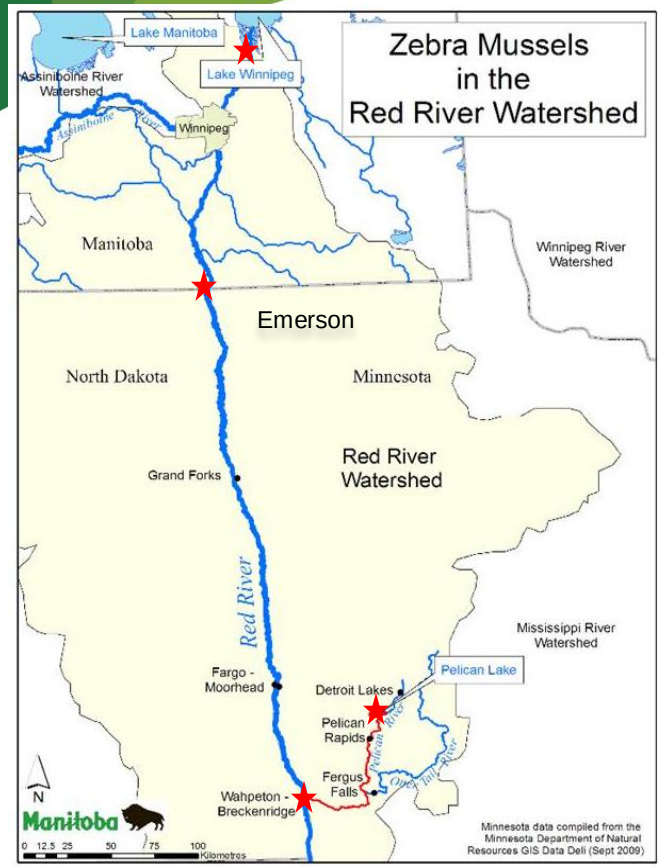

Red River watershed

Zebra Mussels detected for first time in Manitoba portion of the Red River – June 2015.

Zebra Mussels in the Red River: timeline

Location	Year
Pelican Lake, MN	2009
Wahpeton ND /Breckinridge MN	2010
Emerson MB	June 2015

Red River - Zebra Mussel Veligers (total count) Sampling Results.

	09-Jun	25-Jun	10-Jul	24-Jul	07-Aug	21-Aug	16-Sep	25-Sep
Emerson	**1220**	**712**	**9**	**0**	**2**	**2**	**2**	**4**
St. Vital Park	n/a	381	21	0	6	0	2	4
Selkirk Park	204	280	3	1	0	41	2	0

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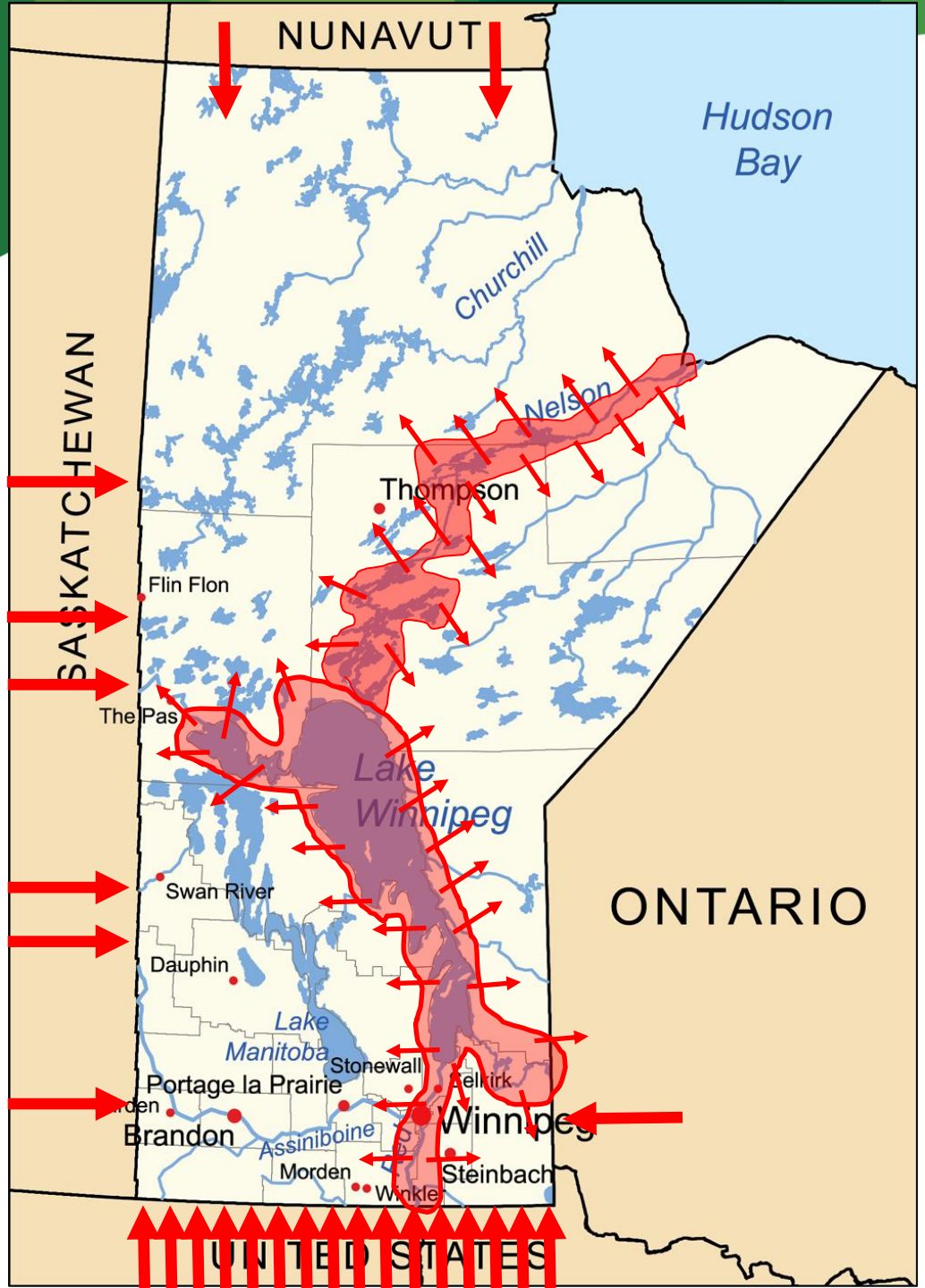
Zebra Mussels detected in Cedar Lake, fall 2015.

Zebra Mussel timeline	
Oct. 2013	South basin of Lake Winnipeg
Spring 2014	Harbour treatment
Spring 2015	South basin being invaded
June 2015	Red River
August	Channel of Lake Winnipeg
October	North basin of Lake Winnipeg
	Cedar Lake



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CONTAINMENT PLAN FOCUS
Address key vectors of concern

Priorities:

1) Prevent/slow movement from invaded water bodies in Manitoba to other water bodies
   - CWS Watercraft Inspection program, Enforcement & increased communications

2) Prevent introduction of AIS from outside province into MB
   - CWS & Canadian Border Services Agency (CBSA) & communications

3) Prevent any other movement
   - Clean, drain, dry provisions of AIS regulation
   - Communication, education, and awareness

How?

Stronger Legislation

•New provincial AIS legislation requires boaters to clean watercraft and water-related equipment; provides MB the authority to set up control stations and requires boaters to stop at them.

•Federal AIS legislation provides the authority for CBSA to administer the prohibition of ZM, QM and Asian Carp into certain parts of Canada.

Operating Watercraft Inspection Stations at “pinch points” to intercept highest volume of boater traffic.

Increased communications informing of AIS concerns, new legal requirements and actions that will prevent the spread.

AIS colleagues across Canada and the United States

Canadian Coast Guard – Gimli and Selkirk

DFO- Small Craft Harbours, Science, Dive Team, SARA, and FPP

Environment Canada

Health Canada – Pest Management Regulatory Agency

Implementation Committee (commercial fishing reps and fishers, harbour authories, yacht clubs, marina owners)

Lake Winnipeg Research Foundation

Lake Winnipeg Foundation

Manitoba Hydro

Manitoba Wildlife Federation

Mo Tipples & MACO

Provincial Departments and Branches – MIT, Central Region Operations, Eastern Region Operations, Pest Management, Water Quality, Compliance, VEMA

Science Advisory Committee

RM of Gimli and St. Clements

South Basin Mayors and Reeves

Town of Selkirk and Winnipeg Beach

Transport Canada – Navigation Waters