

Alberta Aquatic Invasive Species Management Program

Irrigation Technical Conference

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Outline

- Aquatic Invasive Species (AIS) Overview
- Eurasian Watermilfoil (EWM)
 - Risks to Irrigation
 - Management Strategies
- Zebra & Quagga Mussels
 - Risks to Irrigation
 - Management Strategies
- Alberta AIS Management Program



Aquatic Invasive Species (AIS)

- Plant and animal species from other countries or regions that threaten our environment, economy or society.
- AIS can spread extraordinarily quickly
 - Few predators
 - Vulnerable waters
 - Will be worse for irrigation systems – branched delivery



Aquatic Invasive Species (AIS)

- Imminent threats to Alberta are:
 - Eurasian Watermilfoil (EWM)
 - Mussels
 - Zebra Mussels
 - Quagga Mussels

Eurasian Watermilfoil (EWM)



HRWC



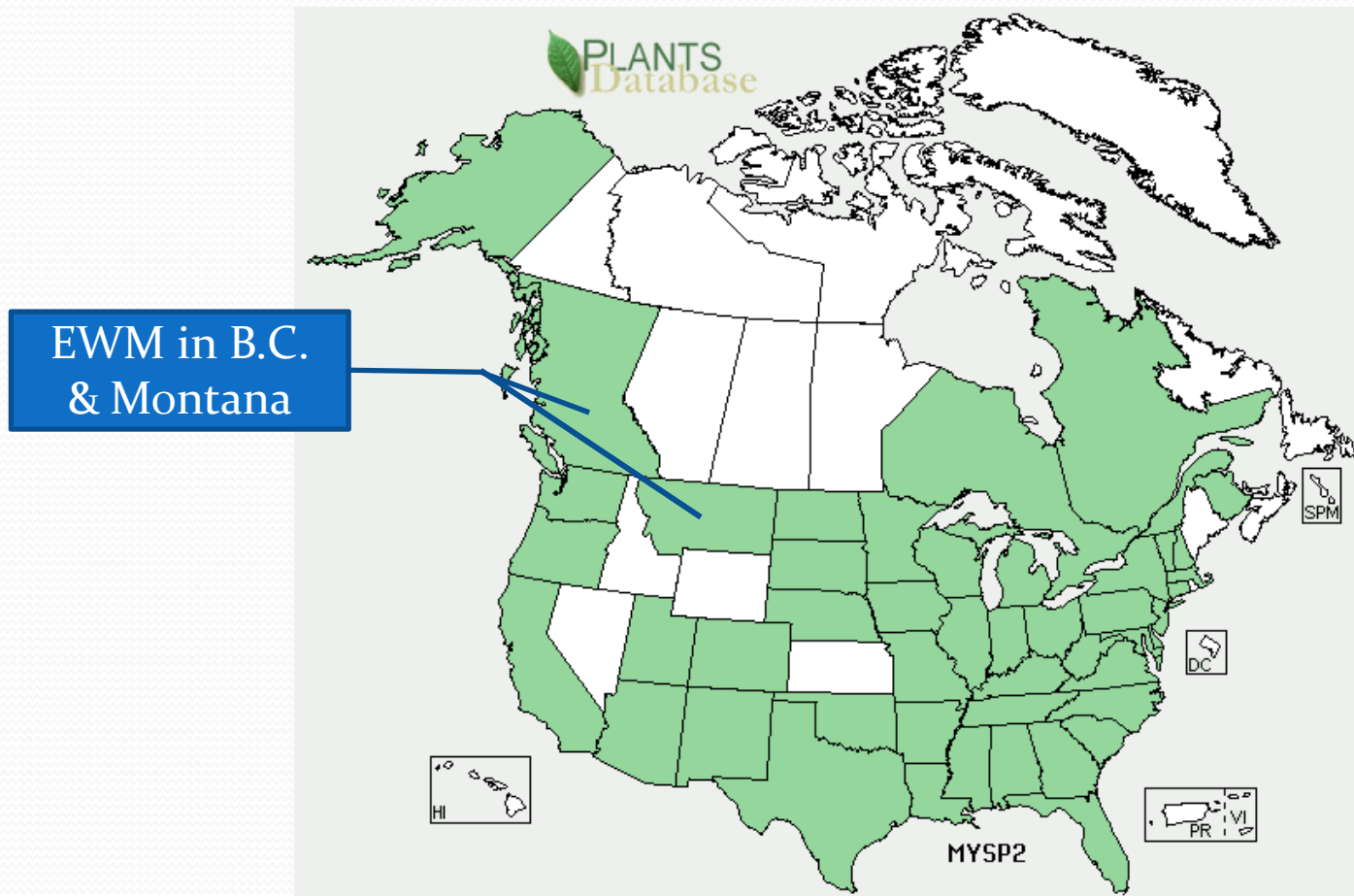
Alberta Invasive Plants Council



Eurasian Watermilfoil (EWM)

- Submersed aquatic plant native to northern Europe and Asia
- Introduced to North America in late 1800's to early 1900's
- Okanagan Lake in 1970; now in Kootenays
- Out-competes native plants
 - Reproduces from fragments and spreads rapidly
 - Starts spring growth sooner
 - Not good food source for native waterfowl or fish

Eurasian Watermilfoil Distribution



USDA



Eurasian Watermilfoil (EWM)

- Lake to lake spread on boat accessories and trailers
- Downstream spread from fragments
 - Disturbance
 - Late summer break-up



ecy.wa.gov

EWM – Risk to Irrigation Districts

- Would make aquatic weed control issues worse
- Problems similar to Coontail and Canada Waterweed in canals and reservoirs
- Major problems associated with reservoirs
 - Blocking outlets / hydro rakes
 - Loss of recreational use





EWM Management

- Prevention
 - Surveillance, public/boater education
- Bottom Coverings/Barriers
 - Emergency response to treat new populations
- Root Removal
 - Maintenance of priority areas
 - Rototill
 - Shallow water cultivation
 - Diver hand pull / dredging

EWM Management

- Harvesting
 - Cosmetic control with floating harvester machine



obwb.ca

EWM Management

- Chemical (Washington – small waterbodies)
 - Sonar[®]
 - 2,4-D
 - Triclopyr-TEA
- Biological
 - Triploid (sterile) grass carp (limited)
 - Milfoil weevil (experimental)

EWM Management

- Existing weed control programs will help
 - Magnacide H program
 - Aquatic Weed & Algae Control Structures



Alberta Water Screens Cleaner - SMRID



Gabion Wall Infiltration System

Zebra & Quagga Mussels

Dreissena polymorpha
(Zebra mussel)
(Actual size = 15 mm)



Sits flat on ventral side
Triangular in shape
Color patterns vary

Dreissena rostriformis bugensis
(Quagga mussel)
(Actual size = 20 mm)



Will not sit flat on ventral side, topples over
Rounder in shape
Dark concentric rings on shell
Paler in color near the hinge

U.S. Geological Survey



Zebra & Quagga Mussels

- Introduced to North America in late 1980's
- Ballast Water – Eurasia to Great Lakes 1988/89
- Transported to new waters by:
 - Attachment to boats, trailers, anchors, etc.
 - Veligers in bait containers, live wells, internal ballast
- Out-compete native species
 - Prolific reproduction rate
 - Attach to hard surfaces at high densities with byssal threads
 - Highly efficient filter feeders

Quagga Mussels on Propeller



National Park Service



Quagga Mussels on Plastic Pipe



Alberta ESRD





Zebra & Quagga Mussels

- Mussels live 3-5 years
- Release 30,000-50,000 fertilized eggs / breeding cycle
- Spread by:
 - Passive drift (veligers)
 - Attachment to boats
 - Waterway transport during boat navigation
 - Overland transport on trailers
- Can remain viable for up to 30 days under cool, humid conditions

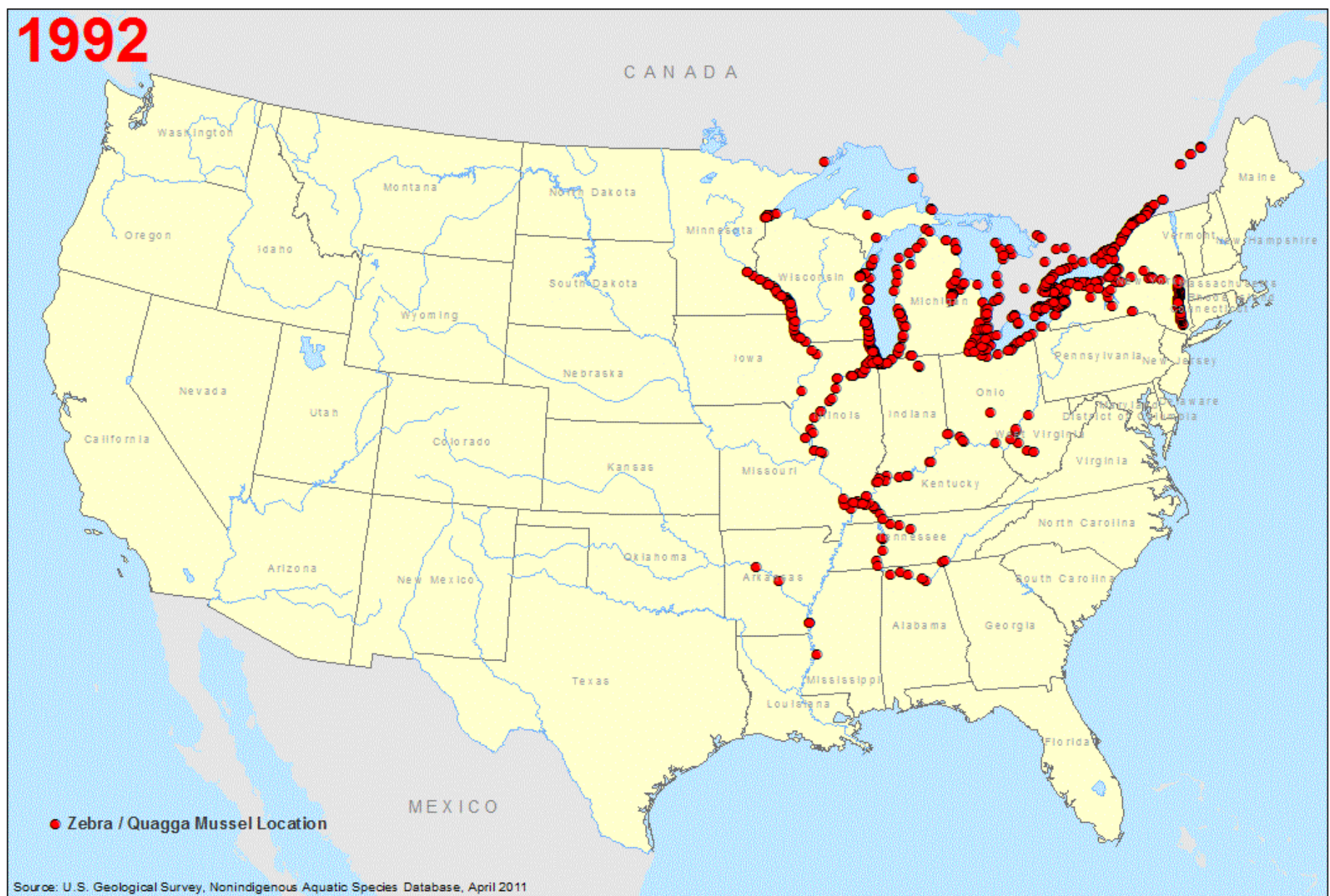
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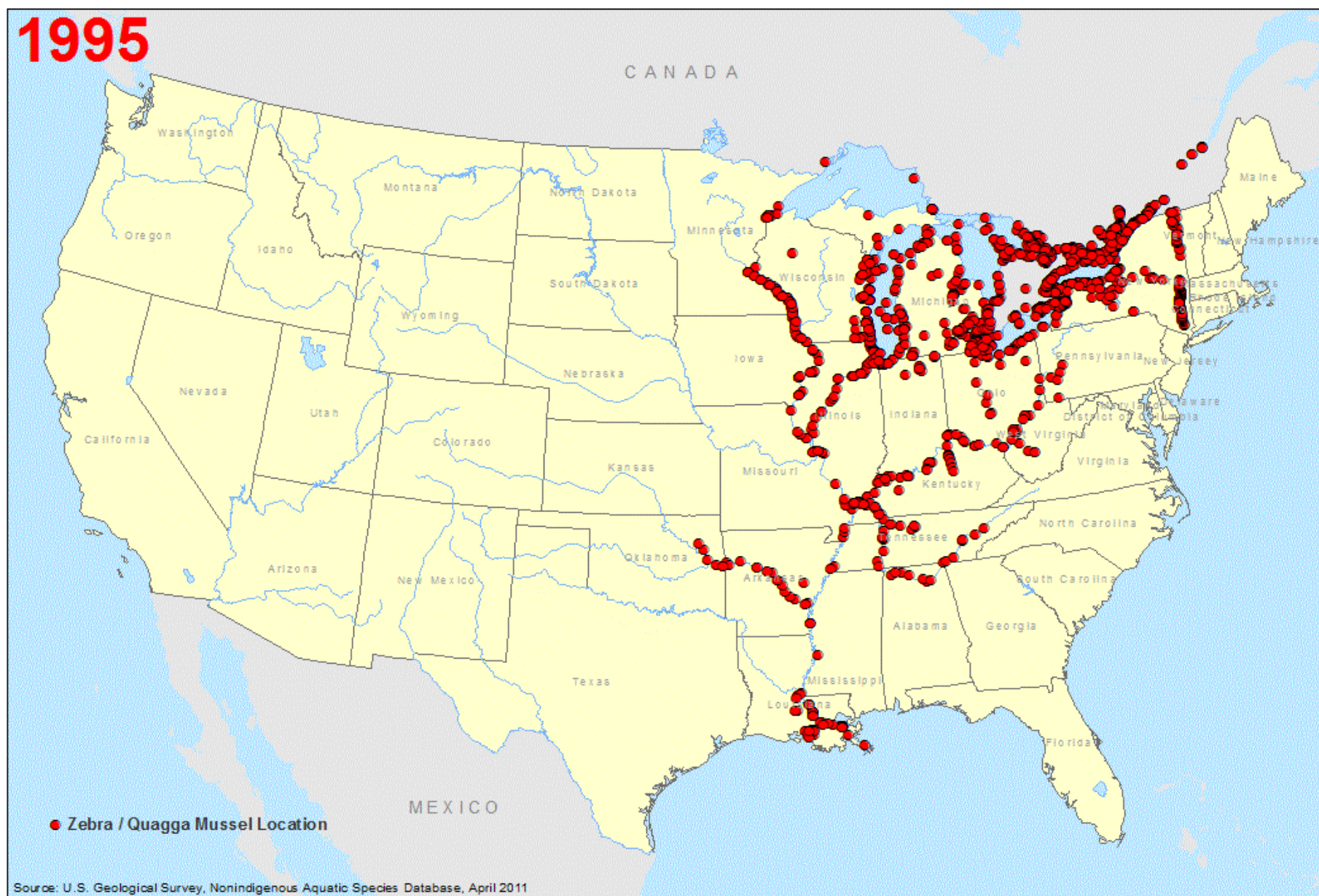
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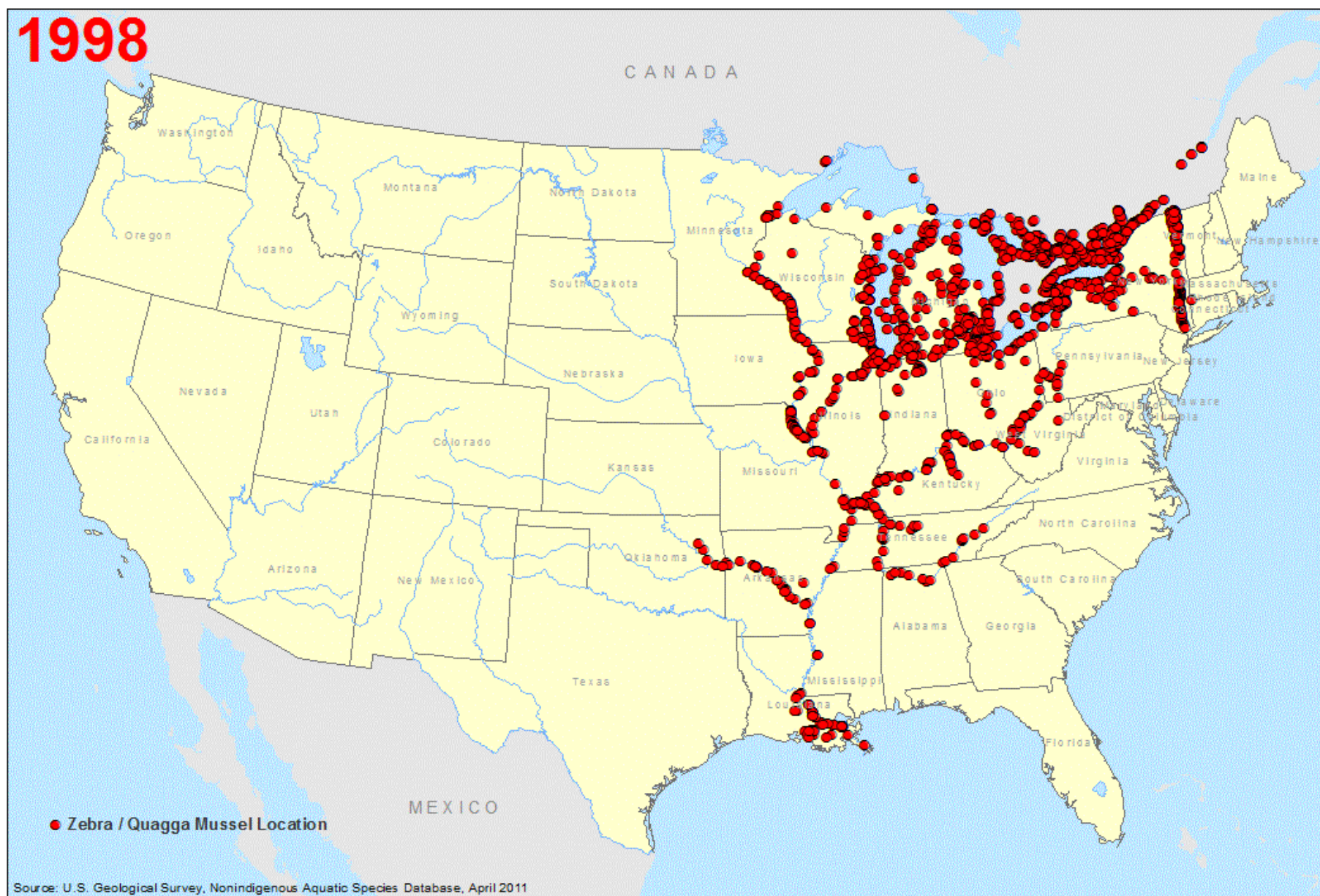
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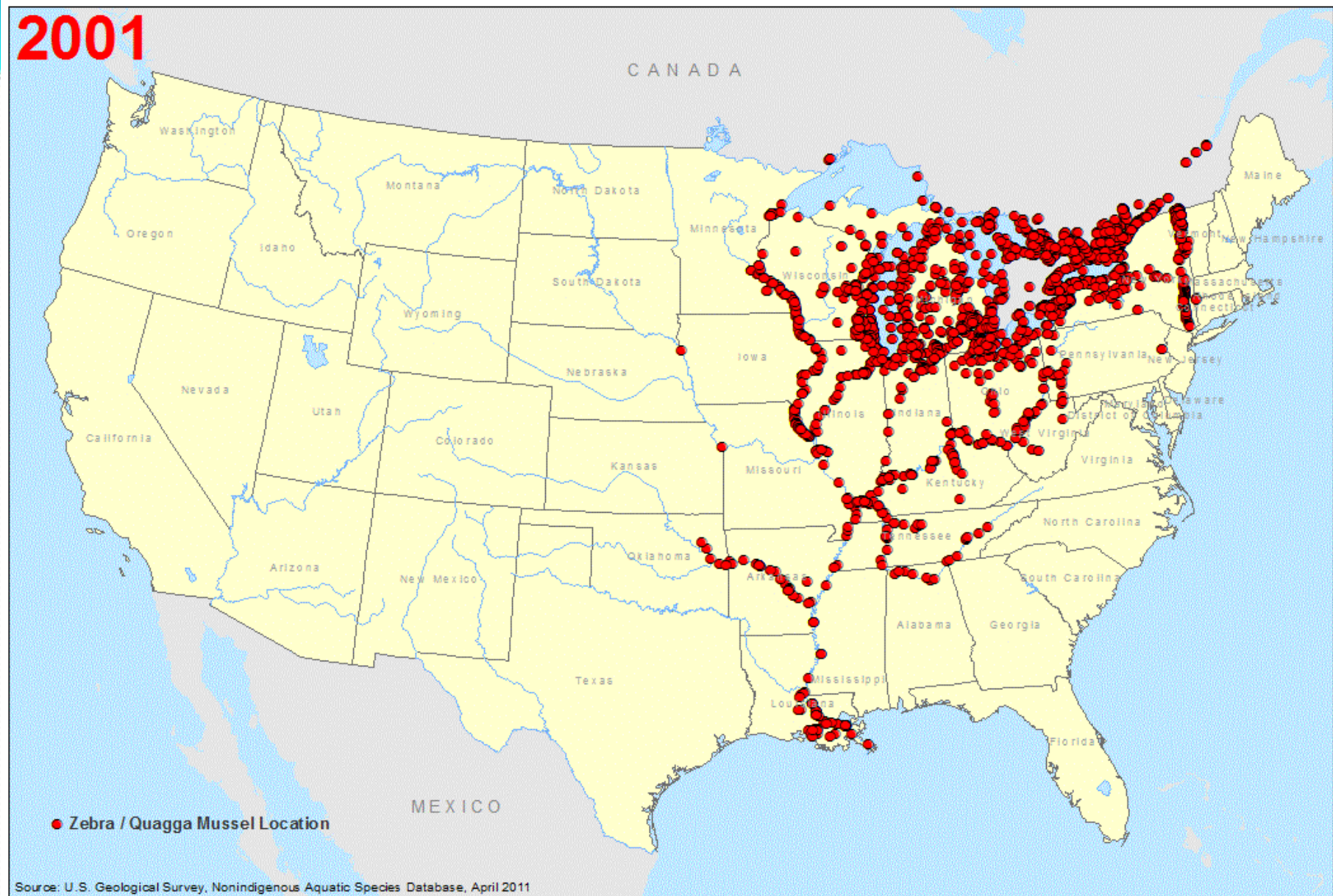
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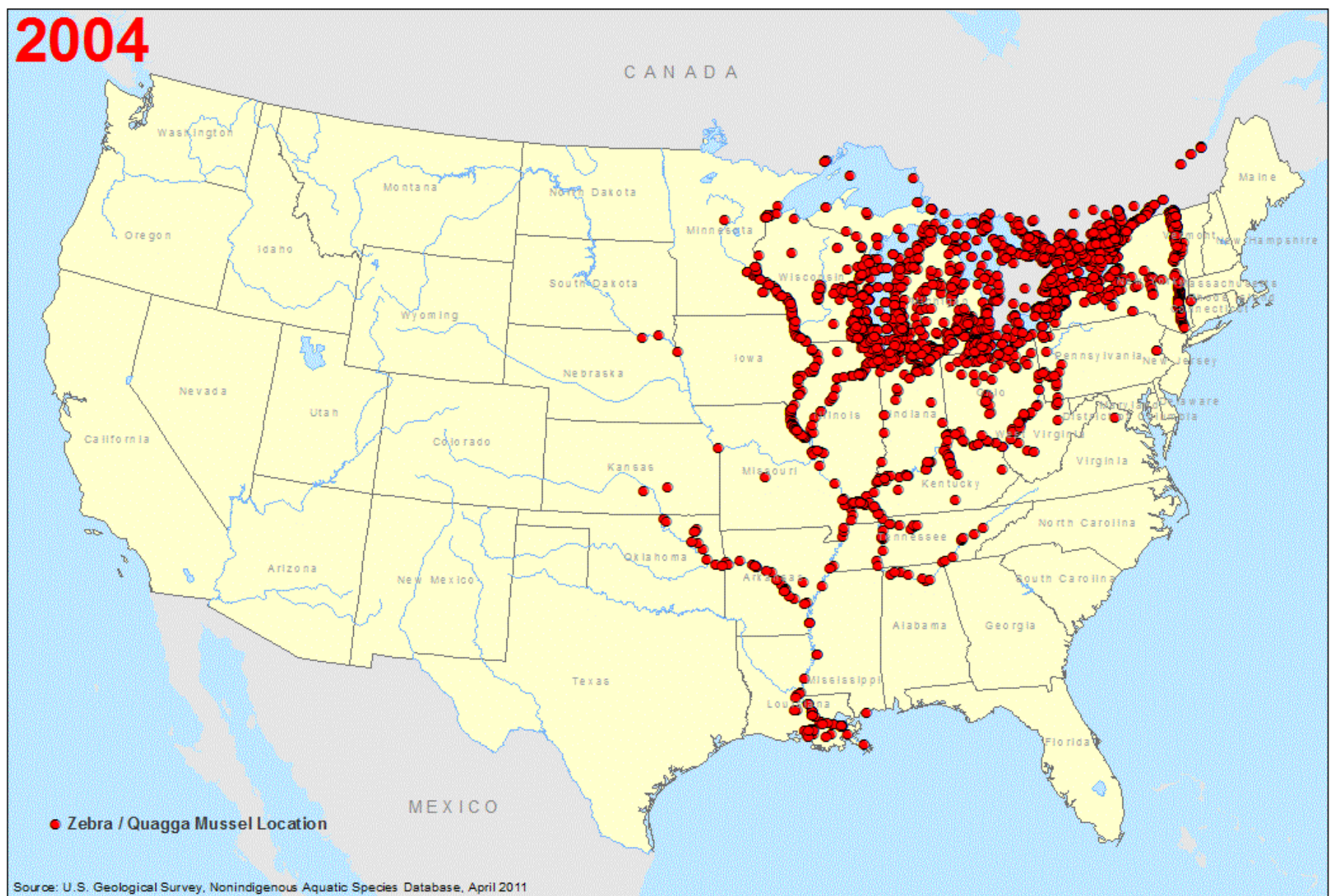
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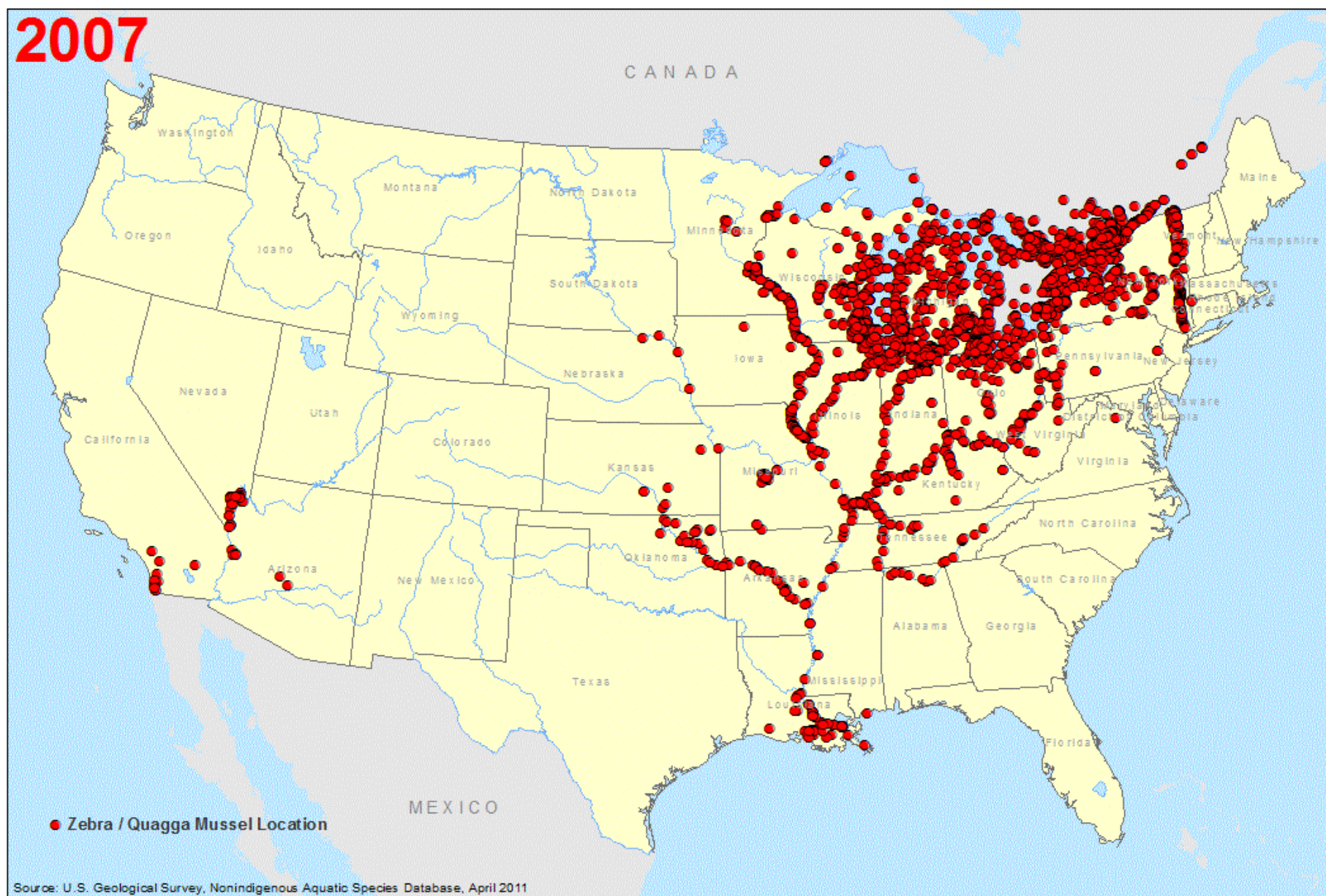
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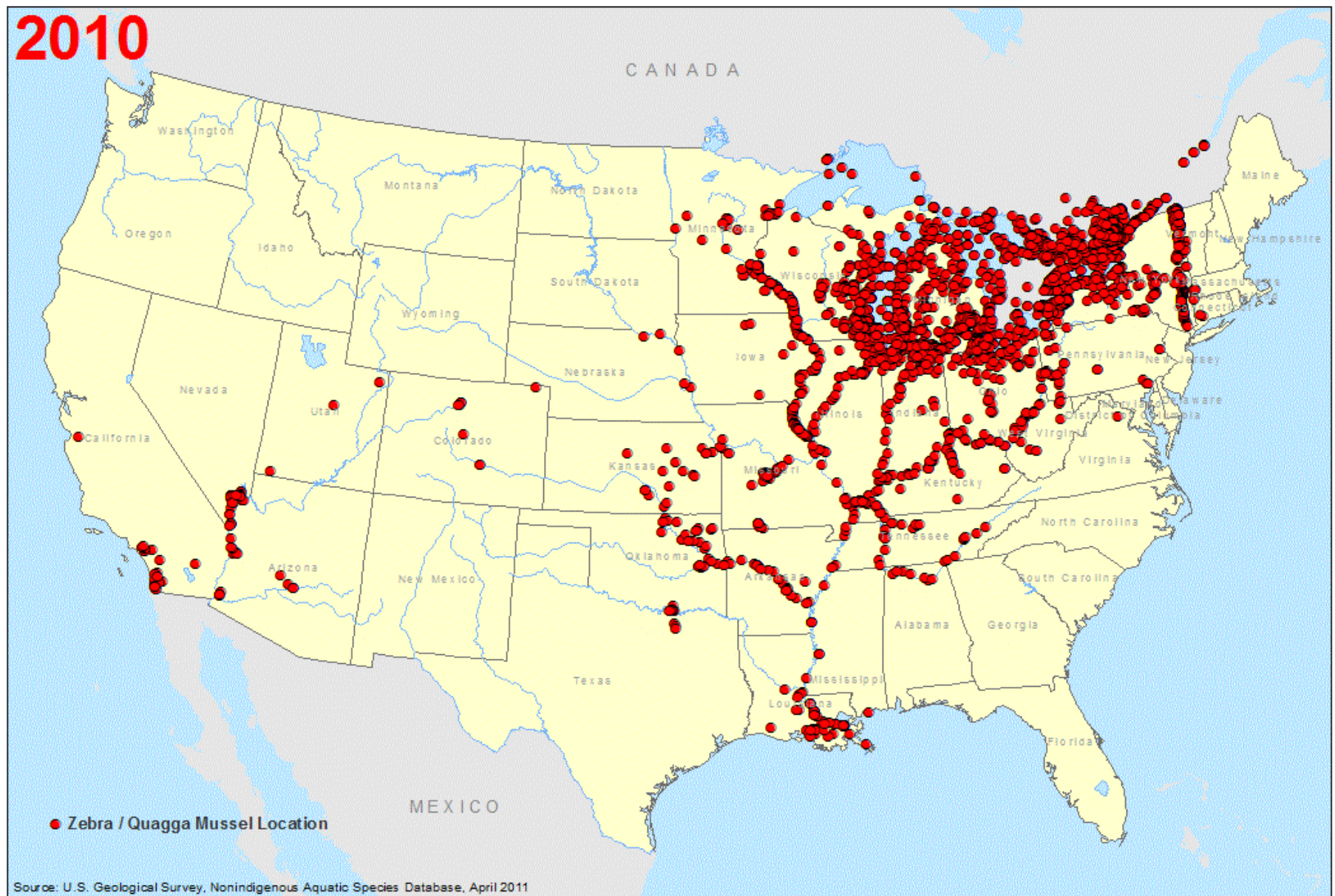
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2007



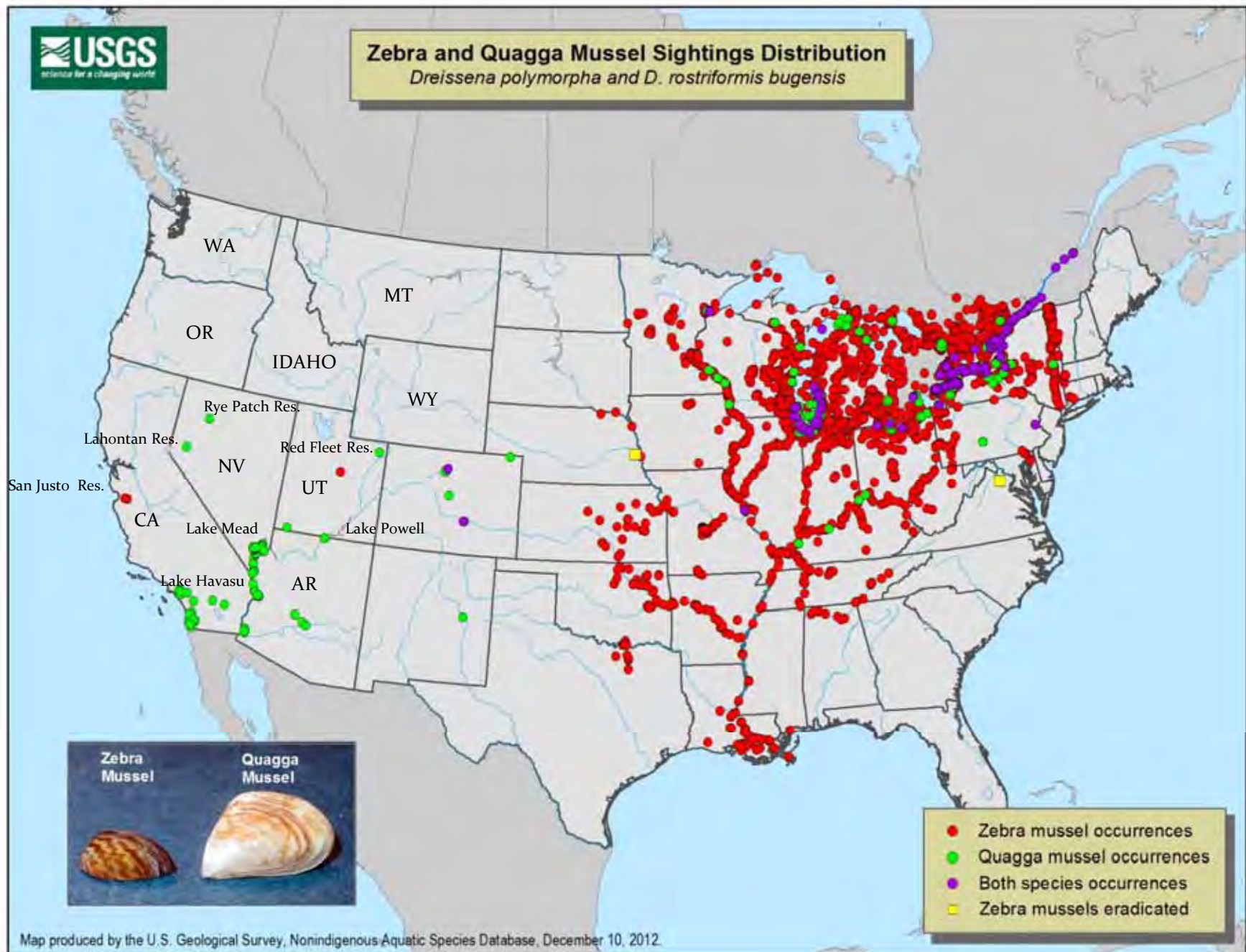
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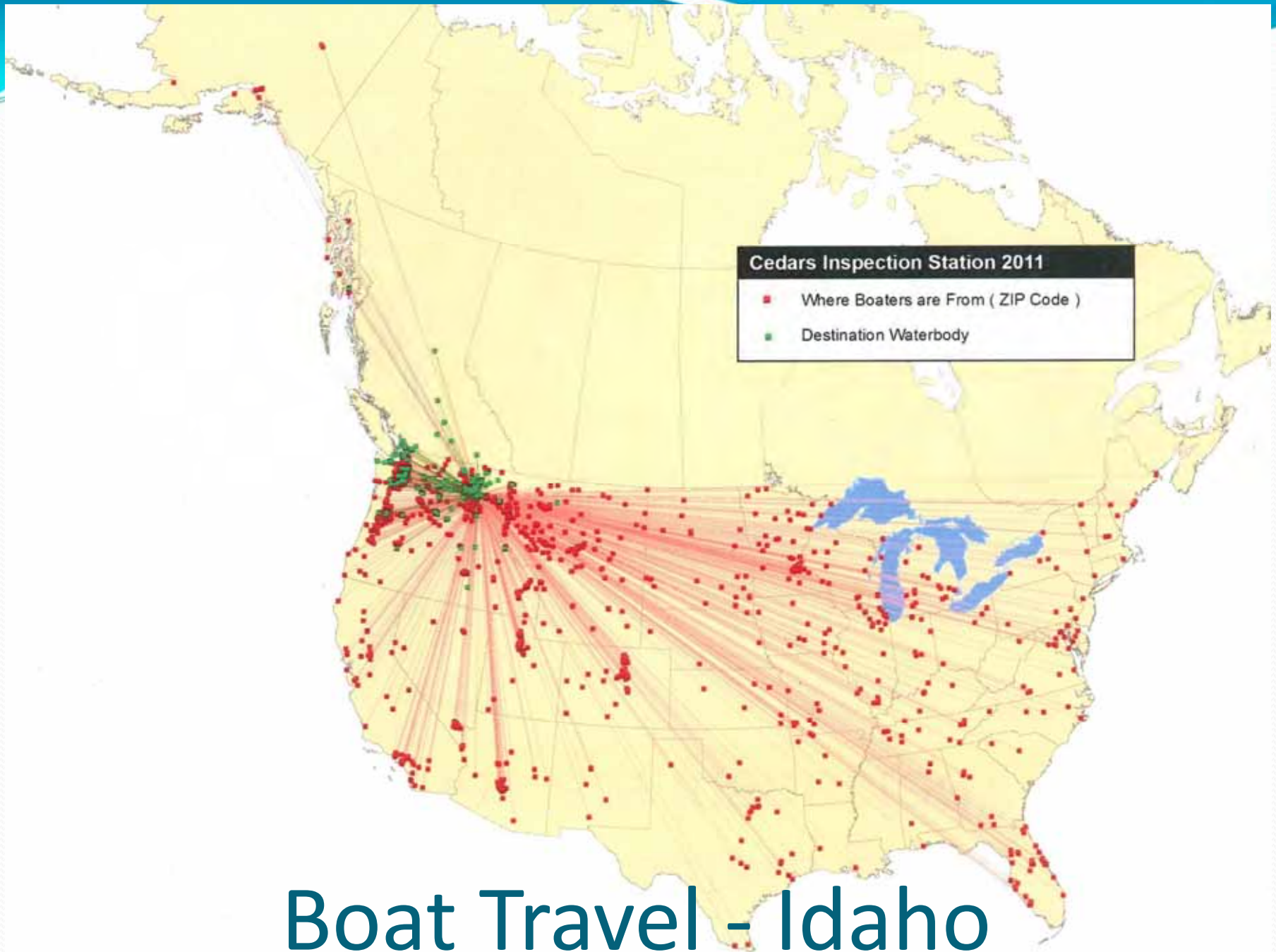




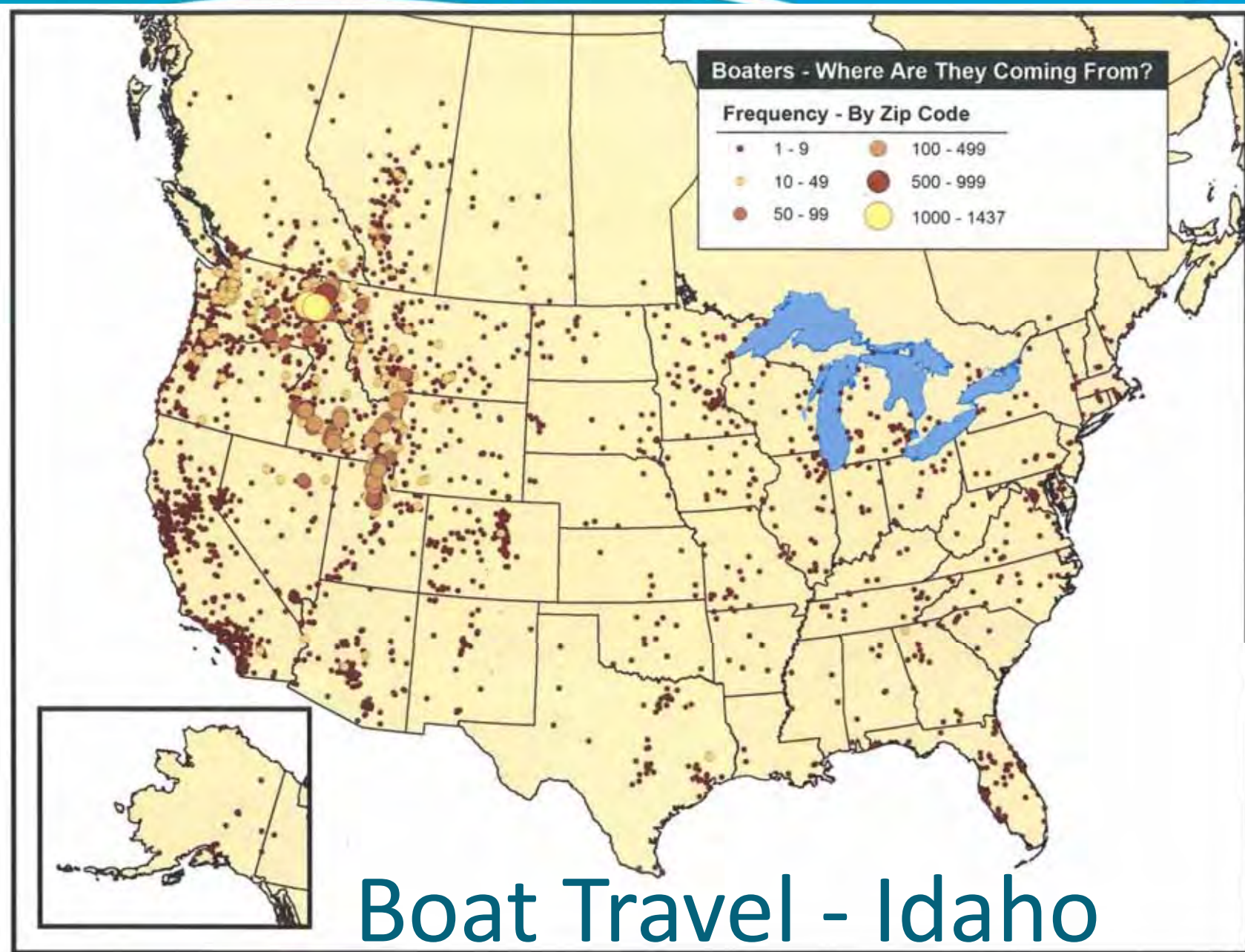
Zebra and Quagga Mussel Sightings Distribution

Dreissena polymorpha and *D. rostriformis bugensis*





Boat Travel - Idaho





Mussels – Risk to Irrigation

- Reservoirs
 - Once introduced they will be a permanent maintenance issue
 - Mussel die-off with dropping levels (exposed shells, odour)
 - Continuous seeding of canals/pipelines
- Rapid Growth
 - Can infest areas that are seasonally dry
 - Can line pipe in 3 months
- Cumulative blockages
 - Magnacide H may kill mussels and veligers but shell remains
 - Next generation will attach to old shells

Mussels – Risk to Irrigation

- Infrastructure at Risk:
 - Canals
 - Structures
 - Intakes
 - Pipes
 - Pumps
 - Screens
 - Sprinkler Systems



Mussels – Risk to Irrigation cont'd

- Canals
 - Armoured and concrete-lined canals at high risk due to hard attachment
 - Difficult to clean without disturbing armour
 - Reduced capacity
- Structures
 - Gate operation
 - Capacity
 - Flow measurement
 - Accelerated deterioration of steel and concrete



Mussels – Risk to Irrigation cont'd

- Intakes
 - Will need to be physically cleaned
 - May need to remove for cleaning in front of pipelines due to shells
- Buried Pipelines (district and on-farm)
 - High coefficient of friction will reduce capacity
 - Cumulative infestation will eventually clog large pipes (up to 2/3 reduction observed for Zebra Mussels)
 - Pipe not designed for physical cleaning

Mussels – Risk to Irrigation cont'd

- Pumps/Hydro-Power
 - On-farm pump systems (damage from shells)
 - Bow Island Lateral 12, Keho-Barons, Rolling Hills, etc.
 - Hydro Plants
- Screens
 - Any screen not continuously cleaned
 - Trash racks
 - Passive canal/well screens
 - Pressure filters
- On-Farm Sprinkler Systems
 - High susceptibility to blockage due to smaller diameter



dnr.wi.gov



Mussels - Treatment

- Physical:
 - Physical cleaning/scraping – will return
 - Filter <100 µm
- Chemical:
 - Chlorine
 - Ozone
 - Potassium ions
 - Acrolein (Magnicide H) is toxic to aquatic life
 - Lowered pH
- Turbidity:
 - Some effectiveness observed



Agriculture Canada



Agriculture Canada



Mussels - Treatment

- Research into controls is ongoing by either:
 - Lethal method/dose or;
 - Thresholds on mussel reproduction
- Optimal chlorine concentrations and intervals
- pH modification
- Zequanox[®] (not for crops!)
- Dewatering / dessication
- Thermal (steam, hot water)
- Acoustical Vibration
- Electric Current
- Coatings
- CO₂ Injection
- UV
- Anoxia/Hypoxia
- Pulse Pressure Technology
- Biological (predators, parasites)

Mussels - Cost

- Pipe cleaning/replacement if infestation not identified/controlled would be 10's of millions.
- Coachella Valley Irrigation District budgeted \$3/ac-ft quagga control annual surcharge for chlorine treatments.
- Least-cost alternative is prevention.

AIS Workshop

September, 2012

Waterton Park





Alberta AIS Management Program

- Crown Manager's Partnership (CMP) AIS Risk Analysis Workshop in Sept, 2012
 - 35 attendees from ESRD, PC, CMP, CBSA, TPR, DFO, OWC, MRWC, ARD, EC, AIPC, FBC, IDA, SMRID, etc.
 - Identified threats, barriers and consequences of AIS
 - Included irrigation/agriculture
 - Idaho example presented
 - Waterton Lakes Park Staff demonstration
 - Systematic approach for Crown of the Continent Ecosystem (CCE) started



Alberta AIS Management Program

- Aquatic Invasive Species: Planning and Implementing a Program for Alberta
 - Phase 1 (spring/summer 2013):
 - Crown of the Continent Ecosystem (CCE) focus
 - AIS specialist (ESRD)
 - Communication plan (signs, ads, boat shows, stakeholders)
 - Four summer students: roadside boat inspections (Coutts, Carway, AB/BC Hwy 3)
 - Reporting / information
 - Training & education (ESRD Water Mgmt Operations, ID's)
 - Boat launch education/inspections (CO's)



Alberta AIS Management Program

- Aquatic Invasive Species: Planning and Implementing a Program for Alberta
 - Phase 2 (2014)
 - Transition to AIS program for Alberta (CMP to GoA)
 - Extend training for province-wide AIS inspection program
 - Legislation
 - Rapid response & recovery
 - Prioritize water bodies



Alberta AIS Management Program

- Aquatic Invasive Species: Planning and Implementing a Program for Alberta
 - Phase 3 (2015)
 - Long-term program review
 - Full implementation
 - Integration with other systems (permanent administration)



Alberta AIS Management Program

- Aquatic Invasive Species: Planning and Implementing a Program for Alberta
 - Four task teams operating now:
 - Inspections
 - Monitoring, Response, Recovery
 - Communications and Outreach
 - Legislation, Policy & Planning
- Information and Reporting Hotline:
 - 1-855-336-BOAT (2628)
- Official roll-out coming soon...



Irrigation Sector Response

- Irrigation Sector AIS Representatives:
 - Chris Gallagher / Ron McMullin
- Monitoring Program initiated by ARD
 - Coordination with provincial experts
 - Steering Committee
 - ARD – Brent Paterson, Andrea Kalischuk, Barry Olson, Nicole Seitz
 - ESRD – Kate Wilson
 - AIPA – Ron McMullin
 - ID's – Chris Gallagher

Questions on AIS?

