

Dreissenid Mussels in the Western United States

**2013 NORTHWEST HYDRO OPERATORS FORUM
Bellevue, WA**

May 7, 2013



**Stephen Phillips,
Pacific States Marine Fisheries Commission
Portland, Oregon**



Authorized by Congress in 1947, the Pacific States Marine Fisheries Commission (PSMFC) is one of three interstate commissions dedicated to resolving fishery issues.

Member States: California, Oregon, Washington, Idaho, and Alaska

Aquatic Invasive Species Program Since 1999

Main Species of Concern: Zebra and Quagga Mussels

Bonneville Power Administration key partner



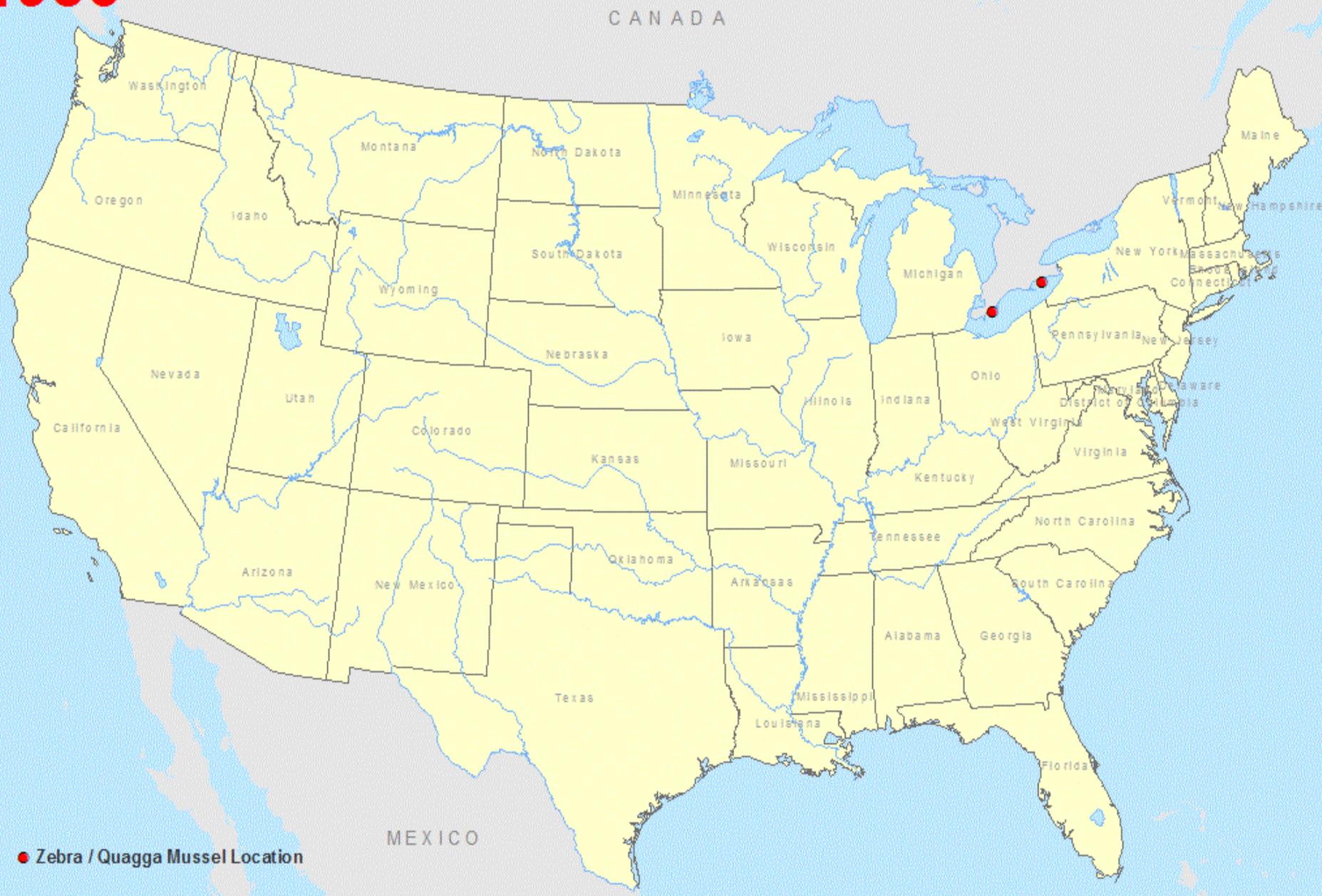
ZEBRA/QUAGGA MUSSEL (AKA Dreissenids) FACTS

- ❑ Zebra /Quagga Mussels were introduced into the Great Lakes in the **1980's** by means of contaminated ballast water from Europe and in **2007** were discovered in Lake Mead
- ❑ Only uninfested states are MT, OR, ID, WA, WY, and AK
- ❑ Can live out of water for up to two weeks – move by attaching to watercraft/equipment (adults) or by contaminated water (larvae or veligers)
- ❑ Significant Biofouler: Mussels will colonize the interior parts of equipment and conveyances using raw water - turbine cooling lines, pumps, irrigation pipes, trash racks, fish screens, fish ladders
- ❑ The flows have to be continuously over 4.5 to 6ft/s for settlement **NOT** to occur.
- ❑ Forms thick mats up to 750,000 per square meter (Lake Mead 50,000+)
- ❑ Filters enormous amounts of algae, disrupting the food chain, impacting water quality (e.g. increase in blue green algae blooms {cyanobacteria}, linked to Lake Huron salmon crash)
- ❑ No natural predators of consequence in North America
- ❑ Calcium is a limiting factor (Dr. Mark Sytsma)

ZEBRA/QUAGGA MUSSEL FACTS

- ❑ **ERADICATION:** No ecologically friendly way to eradicate
- ❑ **CONTROL:** Commonly used chemical treatments for control (chlorine, copper sulphate) used in infested systems raise concerns about the toxicity to other aquatic organisms (e.g. salmon and steelhead)
- ❑ **BIOCONTROL:** there is some research with Zequanox (*pseudomonas*, bacteria), promising, (used by Ontario Power, Canada)
- ❑ **PHYSICAL TREATMENTS:** Current physical treatments include UV and filtration, mechanical removal
- ❑ **Lake Mead NRA is the primary source for the NW— current LM quagga mussel population is 1.5 trillion adults; 320 trillion larvae (veligers)**
- ❑ **Now within 150 miles of Columbia River Basin [Rye Patch Reservoir, Nevada]**
- ❑ **Mussel contaminated watercraft are continually being intercepted in the Northwest**
- ❑ **Over 350 contaminated watercraft were intercepted in 2012 in the Western US @ state watercraft inspection stations**

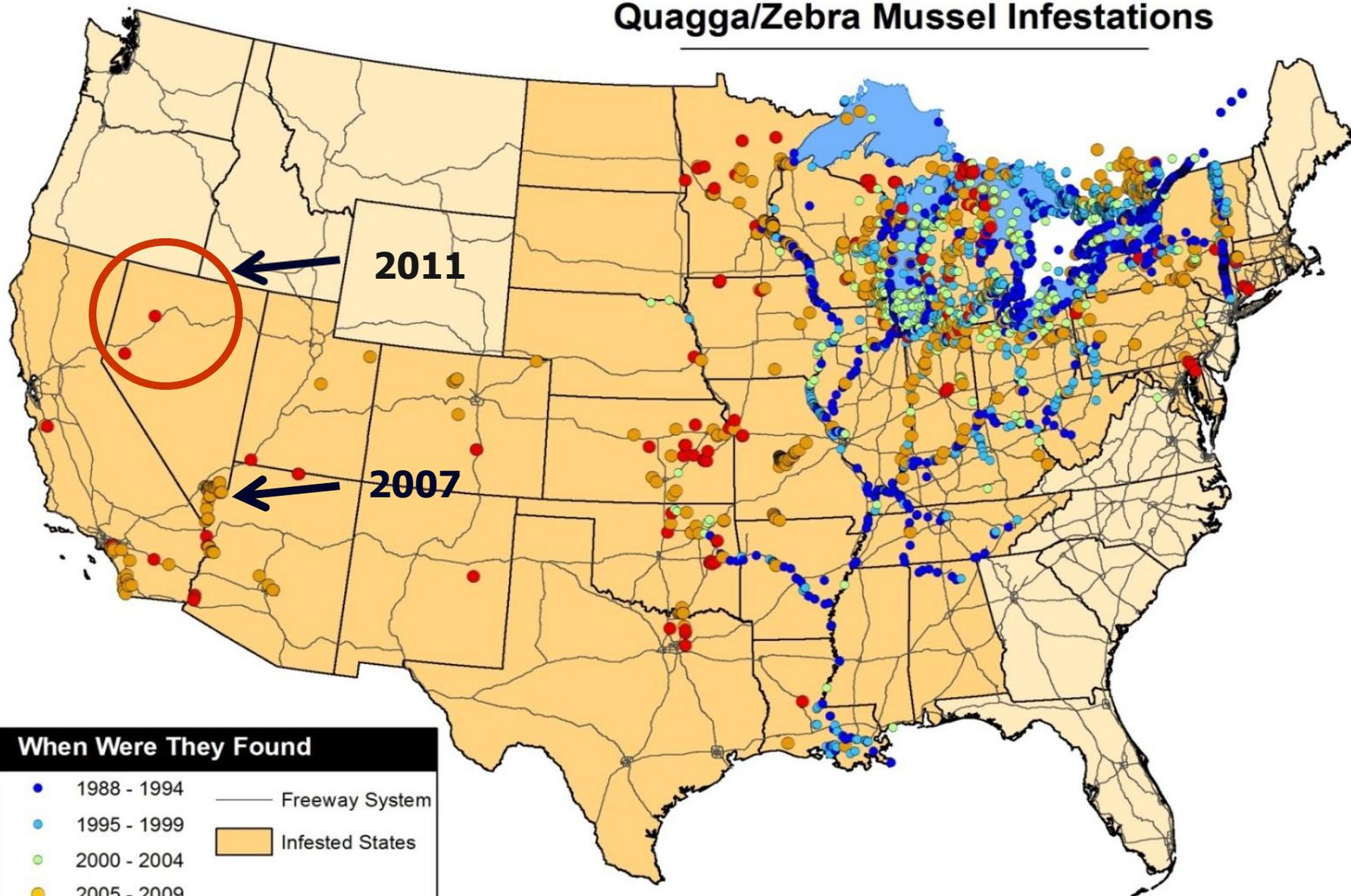
1986



● Zebra / Quagga Mussel Location

Source: U.S. Geological Survey, Nonindigenous Aquatic Species Database, April 2011

Quagga/Zebra Mussel Infestations



Examples of Quagga Mussel Fouling



Intake Trash Racks, Davis Dam

(source: BOR, Nibling)



Trashracks – Hoover Dam



Water Intake, Davis Dam

**Cooler Unit,
Ontario Hydro**



Trash Rack – Parker Dam, Colorado River after seven months in water



Photo Credit: BOR



The movement of trailered watercraft from infested dreissenid waterbodies is the pathway of highest risk into uninfested waters of the West.

Prevention \$\$\$\$\$\$\$\$: Most western US states focus effort on watercraft interception stations; either at a waterbody (UT,CA) or at borders (CA, OR,ID,MT, WY)

Cost: WA OR ID MT combined spend \$ 2 million/yr on watercraft interception ..mostly funded by boater fees



HOW MUSSELS MOVE BETWEEN WATERBODIES ON WATERCRAFT/EQUIPMENT



Ballast Tank

Watercraft Inspection Stations



Samuels, Idaho



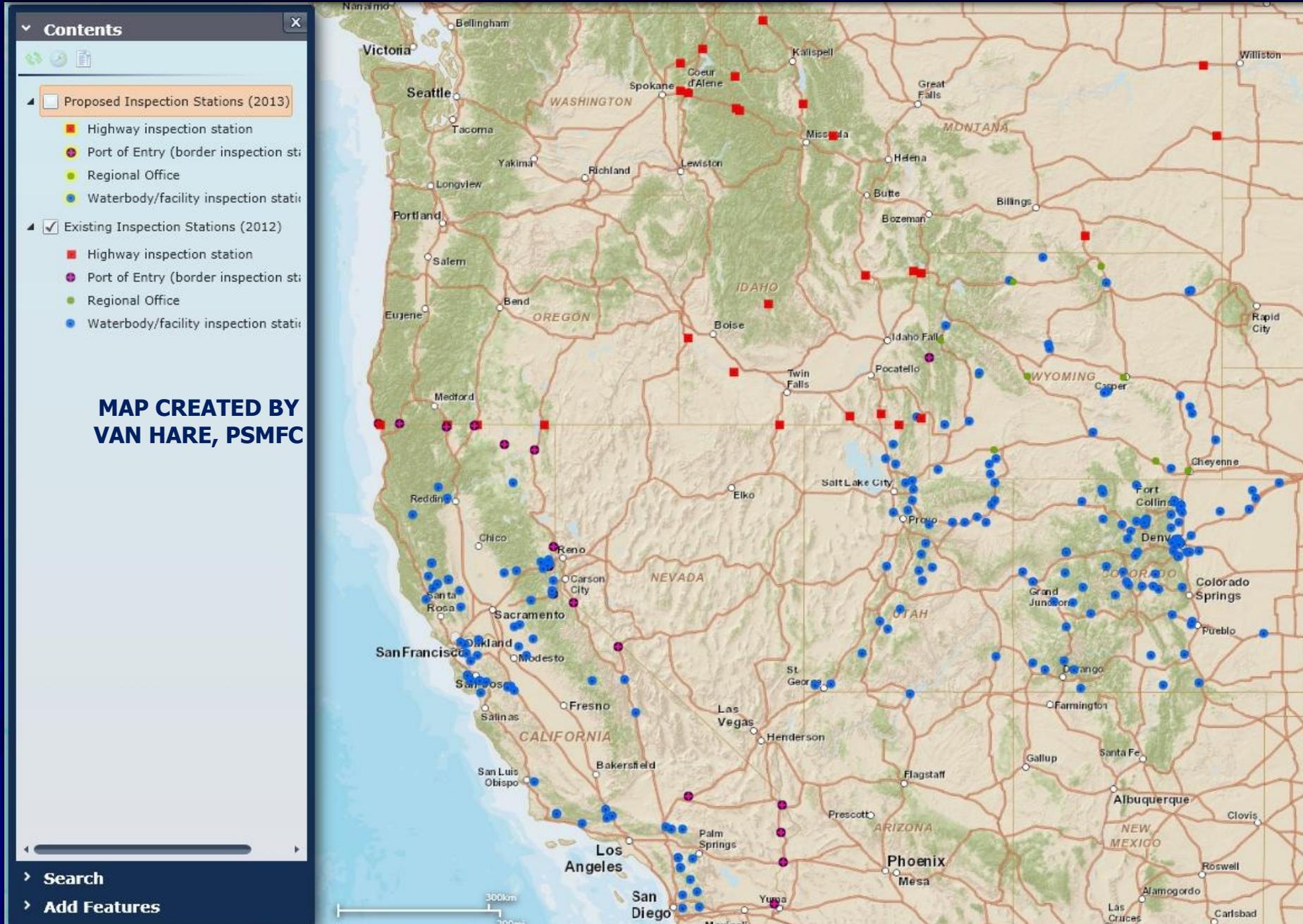
Ridgefield, Washington



Oregon

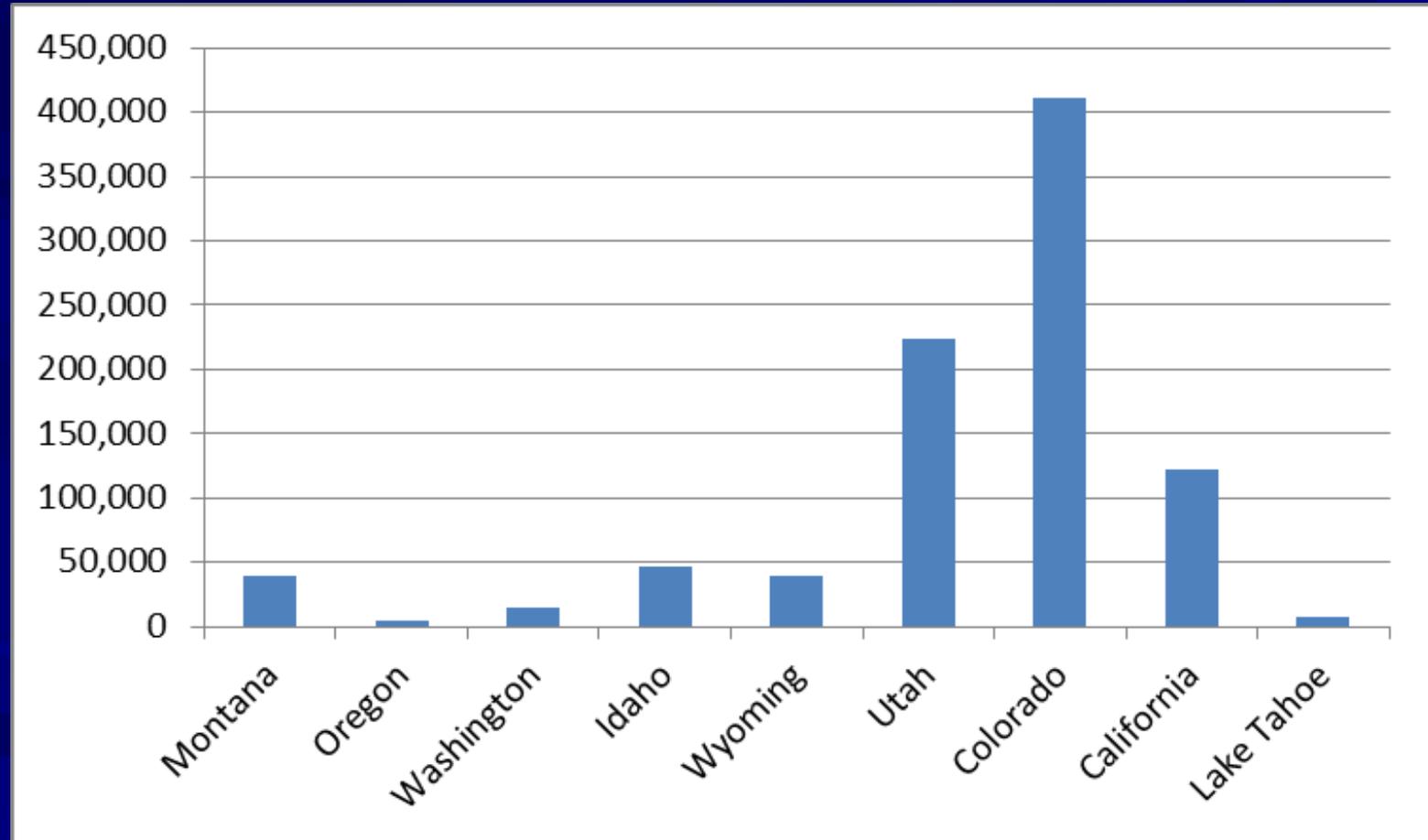


Watercraft Inspection Station Locations



2012 Watercraft Inspections by State

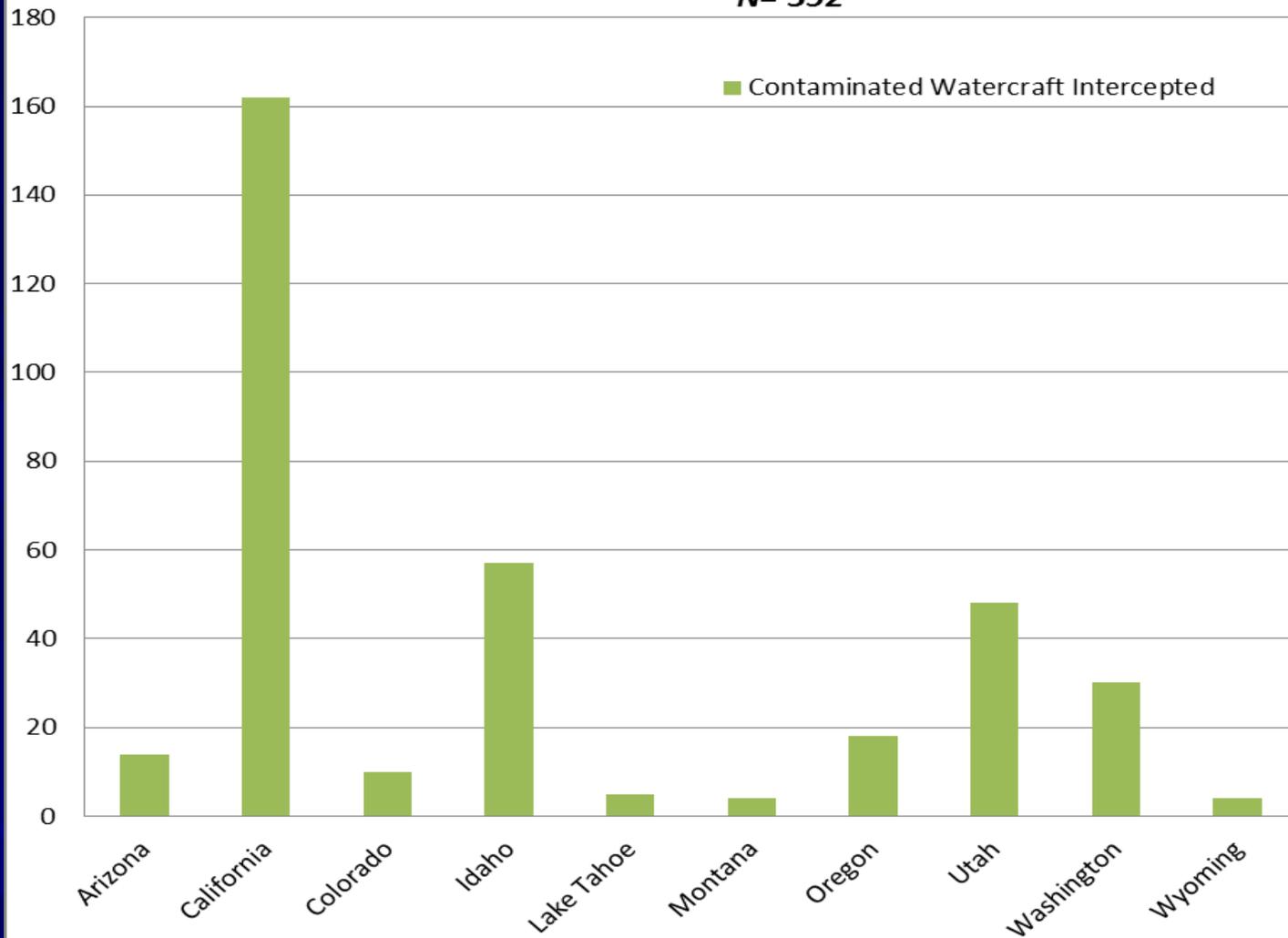
$N = \sim 910,000$





Contaminated Dreissenid Watercraft Intercepted by State 2012

N= 352

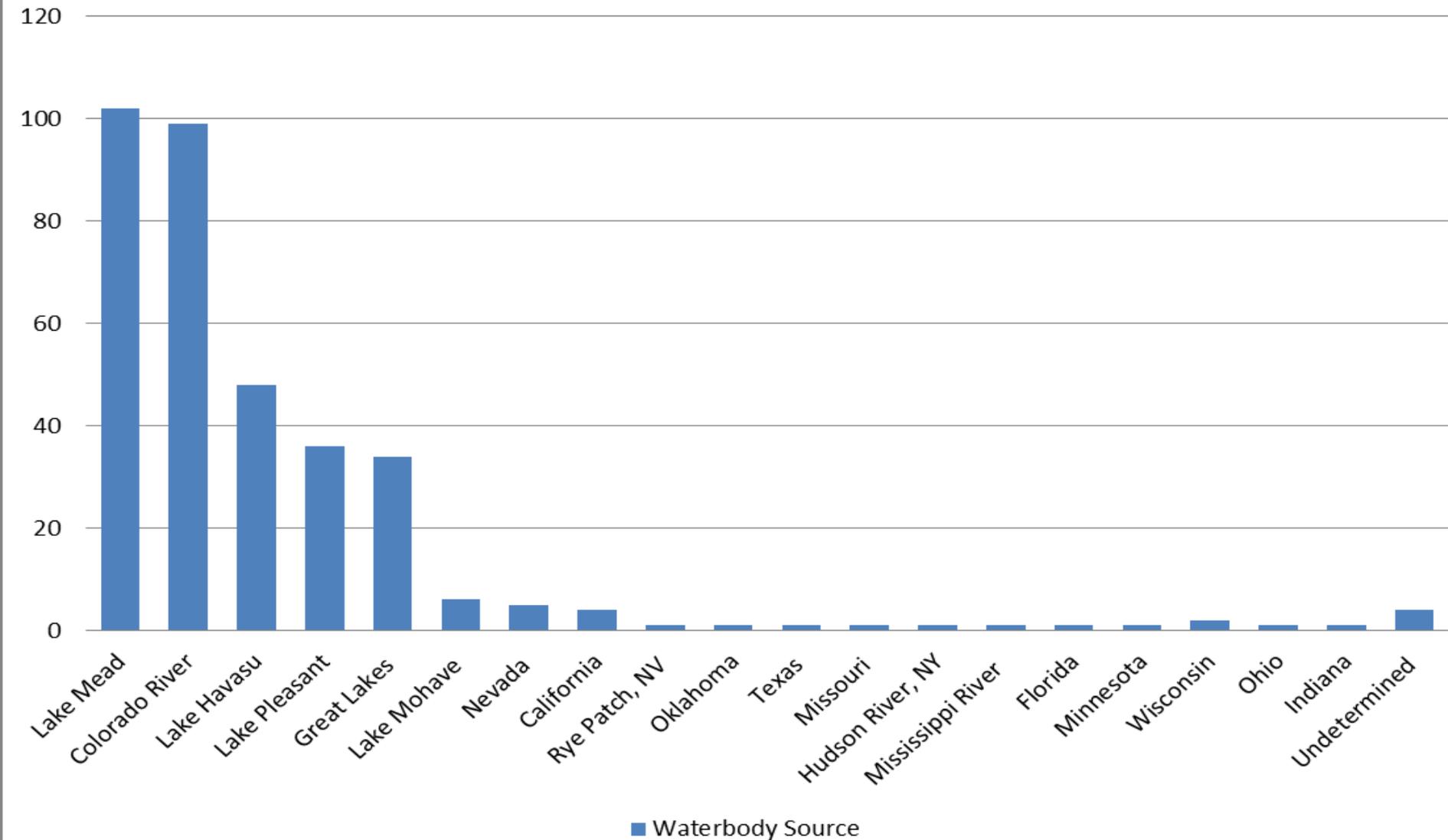




Intercepted Dreissenid Contaminated Watercraft by Source 2012

For: CA,OR, ID, MT, WA, WY, UT, CO, AZ, TRPA

N = 352



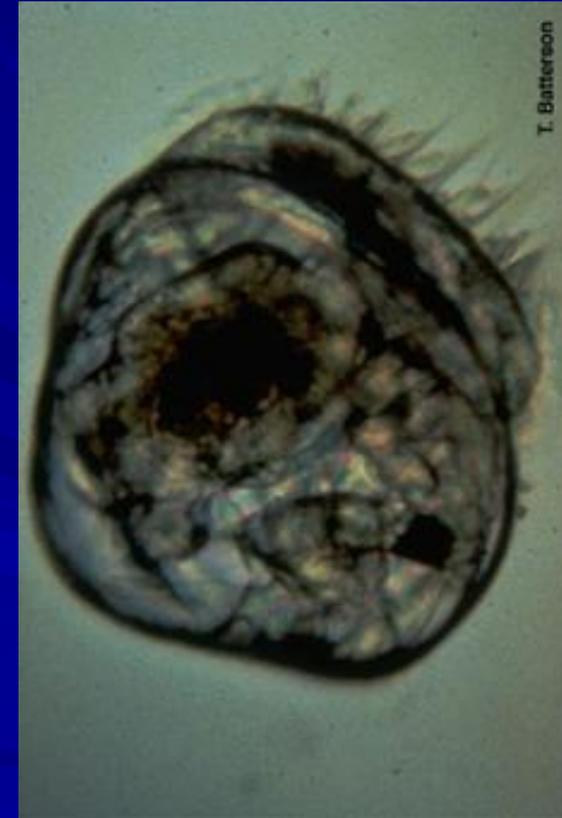
PREVENTION -- WHAT ARE WE DOING TO STOP THEM ?

Quagga/Zebra Monitoring:

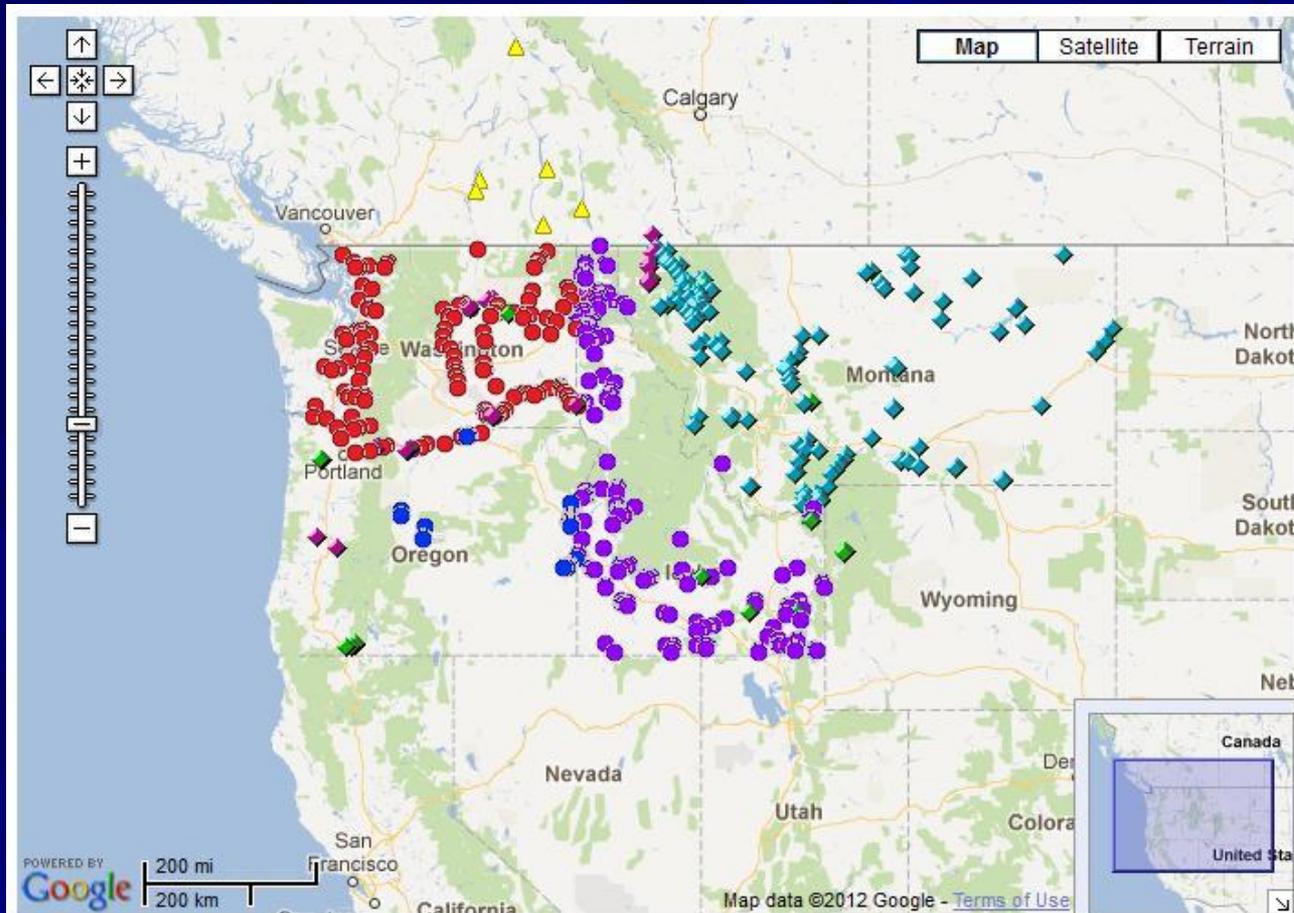
- Numerous agencies monitor for larvae (some PCR) , including all states;
- Beginning in 2010 BPA funds used to enhance sampling at USACE Projects in CRB by Portland State University
- **BPA Technology Innovation – WSU/USGS (Dr. Bollens)**
- If found: Rapid Response Plan for CRB/BC



**Dreissenid Veliger
(larvae)**



Monitoring Database -- 2012



Contributing Agencies

- ◆ BOR = Bureau of Reclamation
- IDA = Idaho Department of Agriculture
- PSU = Portland State University
- ◆ USACE = U.S. Army Corps of Engineers
- ◆ USGS = U.S. Geological Survey
- WDFW = Washington Department of Fish and Wildlife
- ◆ MFWP = Montana Fish, Wildlife, and Parks
- ▲ BCME = British Columbia Ministry of the Environment
- ODFW = Oregon Department of Fish and Wildlife

<http://crbais.psmfc.org/>
(Map: Courtesy of USGS, Gainesville)

WHAT IF WE FIND MUSSELS IN THE CRB?

Columbia River Basin Interagency Invasive Species Response Plan: Zebra Mussels and Other Dreissenid Species

Signed off by 4 states, CRITFC, NOAA, Province of BC and USFWS

The purpose of the *Plan* is to coordinate a rapid, effective, and efficient interagency response in order to delineate, contain, and when feasible, eradicate zebra, quagga, and other dreissenid mussel populations if they are introduced.

We have “activated” the Plan once (Idaho 2009, false positive); We have held five exercises of the plan in the past 5 years. Last: Prineville Reservoir, OR April 2-3, 2013

The PLAN does NOT address strategic actions needed to enhance preparedness prior to an infestation. ...need state plans and water project plans - **Vulnerability Assessments**

Bottom line - if you manage a facility that uses raw water--



Vulnerability Assessments – Industrial and municipal facilities that use raw water need to plan and prepare for a dreissenid mussels infestation...not all facilities will be at equal risk in the Columbia River basin, but you need to determine:

- **Your threat level (look at environmental variables, Calcium? PH?)**
- **Components are at risk (cooling water, fire suppression, etc)**
- **Mitigation strategy options: antifouling paint? Biocide? Pseudomonas? UV?**
- **Environmental compliance documents and permits (ESA, NPDES, FIFRA)**
- **Example -- Assessment of the Potential Impact of Invasive Mussels to John Day and The Dalles Projects on the Columbia River (USACE, RNT 2010)**

A final word on monitoring – “we” must significantly increase our sampling effort in the CRB, it provides an early warning system that will be critical is response



Thank you

sphillips@psmfc.org

503-595-3100