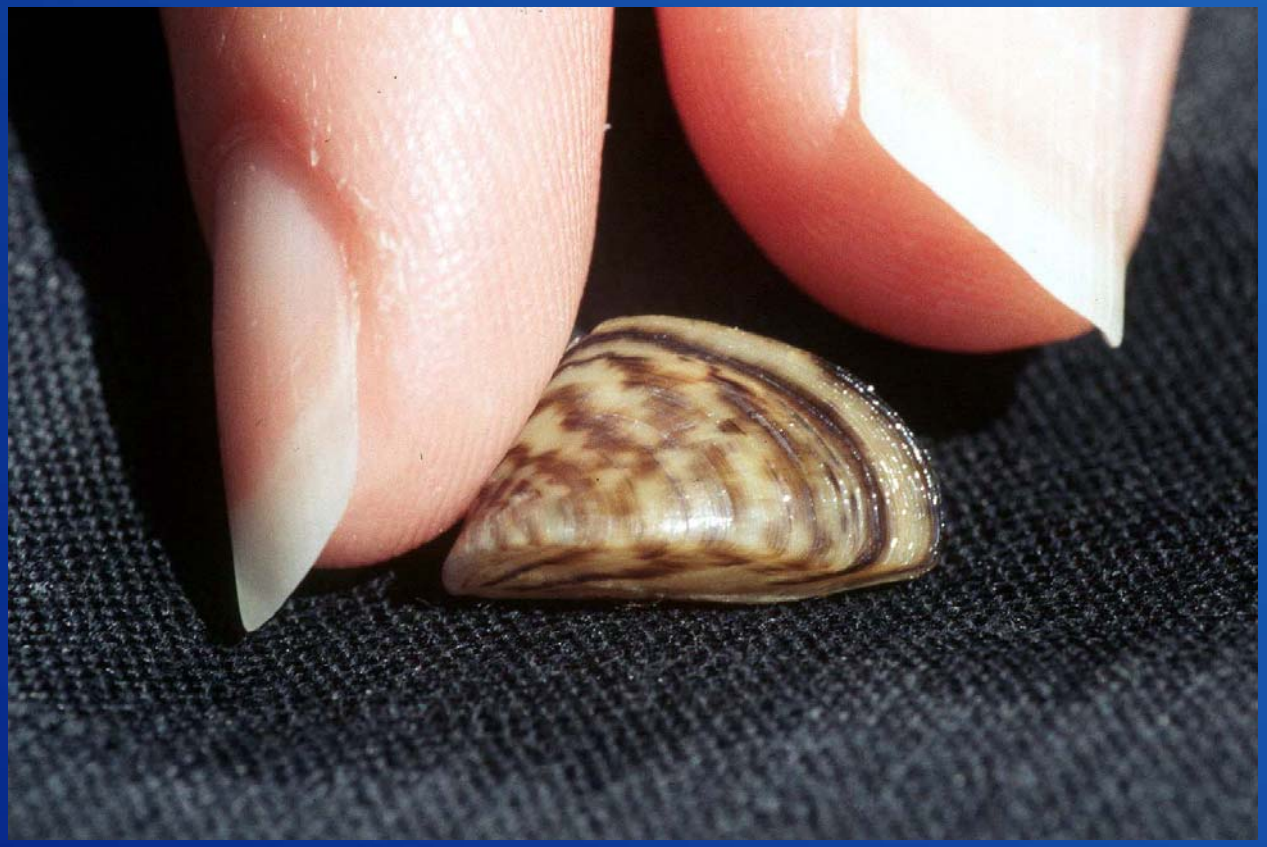
Aquatic Invasive Mussel Species



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Dreissenid mussels

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What are Quagga Mussels?

- Quagga mussels are native to the Dneiper River drainage of Ukraine in Eastern Europe. They were accidentally introduced into U.S. waters around 1986 through ballast water discharge from ocean-going ships.
- Quagga mussels were first discovered in U.S. waters in 1989. They were named after the "quagga," an extinct African relative of the zebra.

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Mussel Homeland
Quagga Mussels
Zebra Mussels
Murmansk
Noril'sk
White Sea
Arkhangel'sk
SWEDEN
FINLAND
Gulf of Bothnia
Helsinki
Stockholm
St. Petersburg
Tallinn
EST.
Baltic Sea
Riga
LAT.
LITH.
Vilnius
RUSSIA
Minsk
BELARUS
POLAND
Warsaw
Łódź
Kraków
Prague
CZECH REP.
SLOVAKIA
Bratislava
Vienna
AUSTRIA
Budapest
HUNGARY
Ljubljana
SLOVENIA
Zagreb
CROATIA
Belgrade
BOS. & HER.
Sarajevo
SER. & MONT.
ITALY
Rome
Naples
ALB.
Tirana
Skopje
THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA
GREECE
Athens
Palermo
Sicily (IT.)
MALTA
Valletta
Mediterranean Sea
Crete (GR.)
Sofia
BULGARIA
ROMANIA
Bucharest
L'viv
UKRAINE
Kiev
MOLDOVA
Chisinau
Odesa
Black Sea
Sea of Azov
Istanbul
Bursa
Ankara
İzmir
TURKEY
Konya
Adana
Nicosia
CYPRUS
LEB.
Beirut
Aleppo
SYRIA
Damascus
Mosul
Kirkuk
IRAQ
Yaroslavl'
Moscow
Nizhniy Novgorod
Kazan'
Perm'
Yekaterinburg
Chelyabinsk
Ufa
Samara
Voronezh
Volgograd
Rostov
Caspian Sea
ARMENIA
Yerevan
AZERBAIJAN
Baku
Tabrīz
Tehran
Mashhad
Eşfahān
Atyraū (Atyrau)
Aral Sea
KAZAKHSTAN
Astana
Omsk
UZBEKISTAN
Tashkent
TURKMENISTAN
Ashgabat
AFGHANISTAN
Kabul

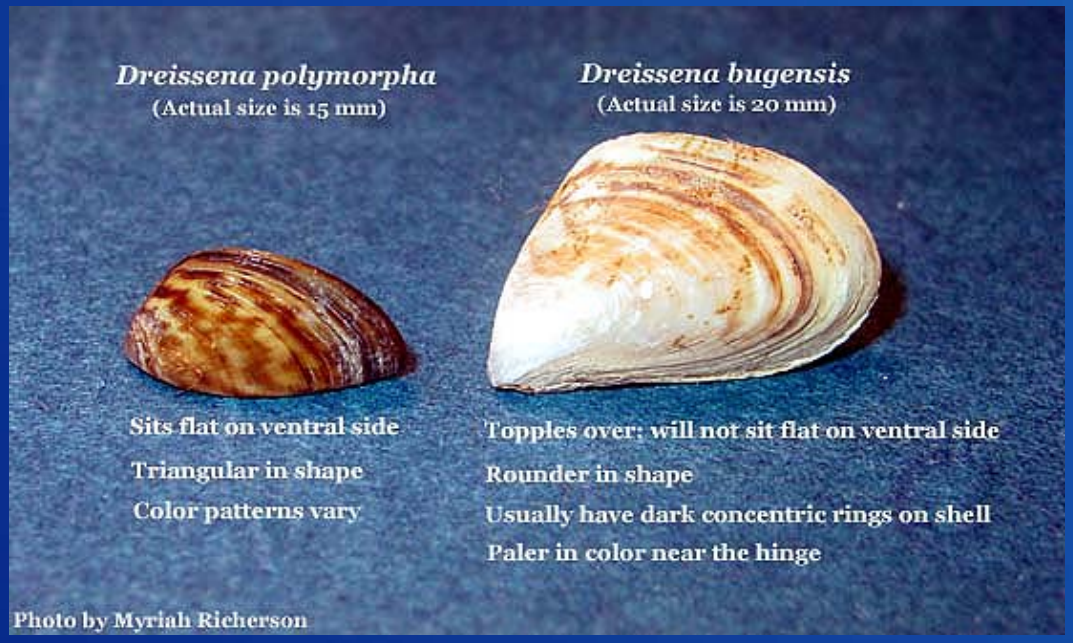
Differences between mussel species:

Zebra Mussel

- Reproduce in water temperatures 53.6 º F or greater.
- Found at depths (< 12 meters or 39.5 ft).

Quagga Mussel

- Reproduce year round, 48 º F or greater.
- Found at various depths as long as oxygen is present.



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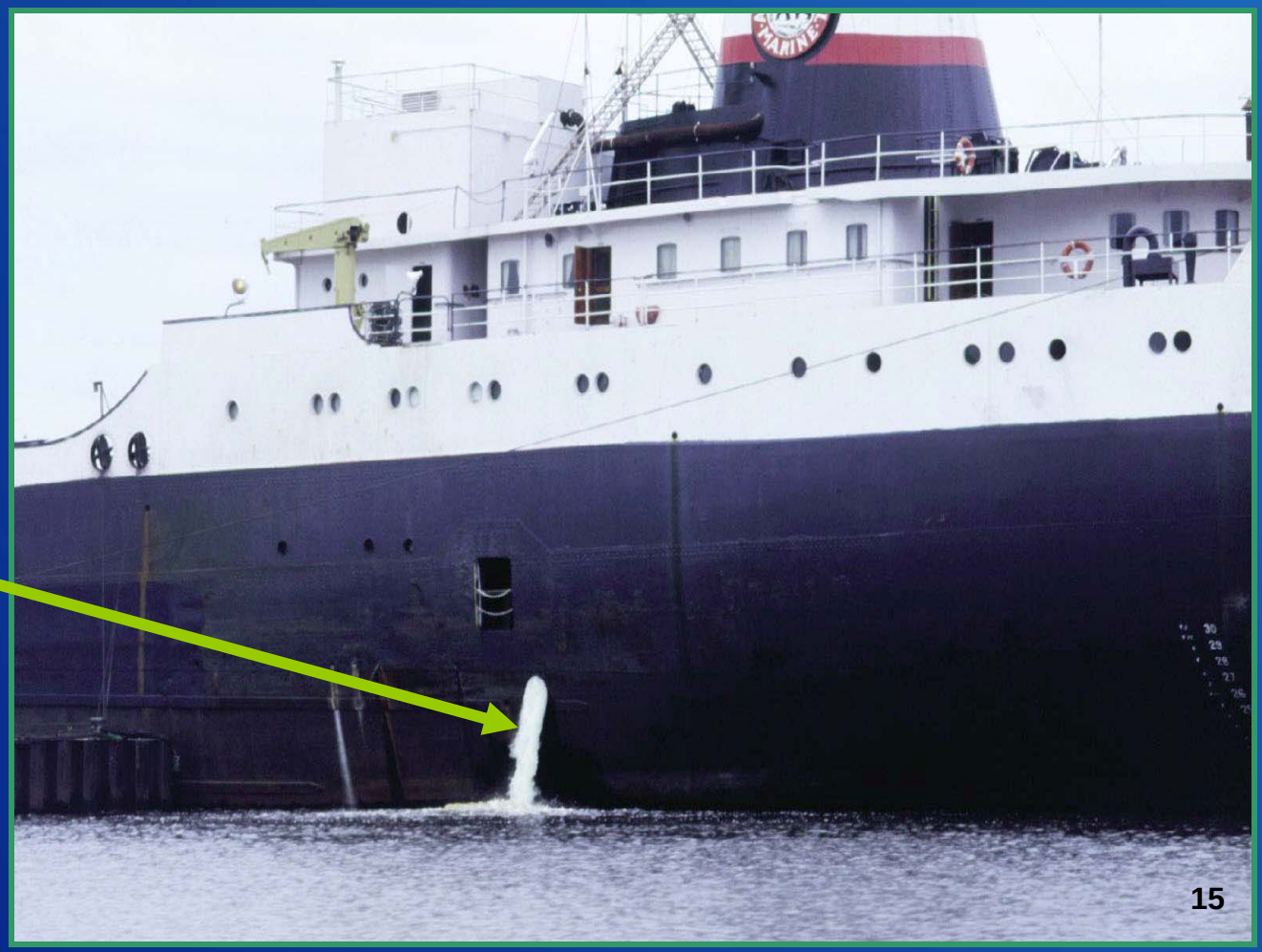
Ballast Water Exchange – Great Lakes zebra/quagga invasion begins in the 1980's



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Mussel Distribution 1988

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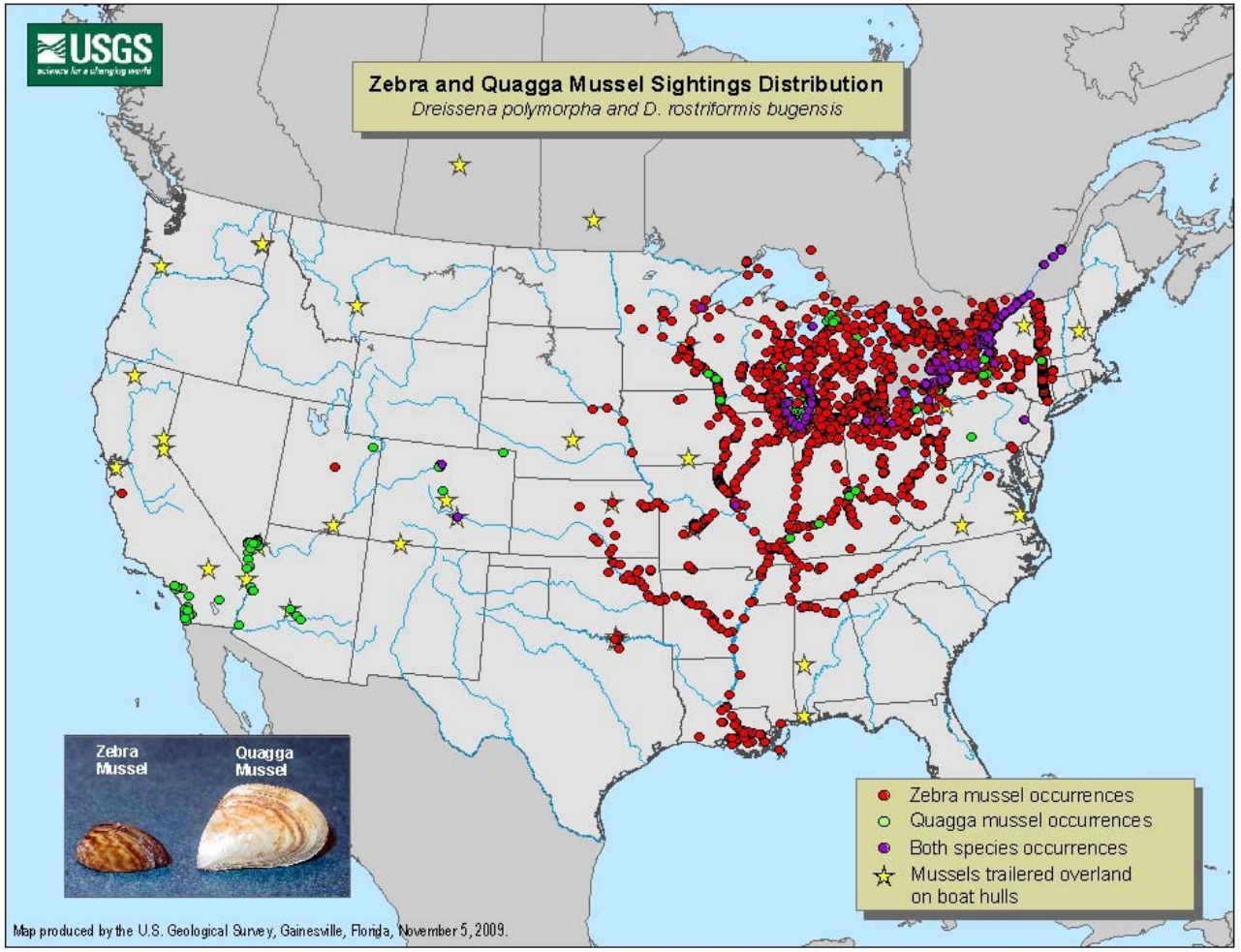
Invasive Mussel Map 2009



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Prolific!!!

- During optimal growing conditions one adult female may release 1,000,000 eggs. Fertilized eggs quickly mature as a planktonic veliger.
- Microscopic planktonic veligers drift in water currents for 20+ days before settling & attaching to hard substrate.

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Fast Increase in Population Density Parker Dam, Colorado River

August ’07

November ’07

3 Months

Ricardo De Leon, MWD Los Angeles

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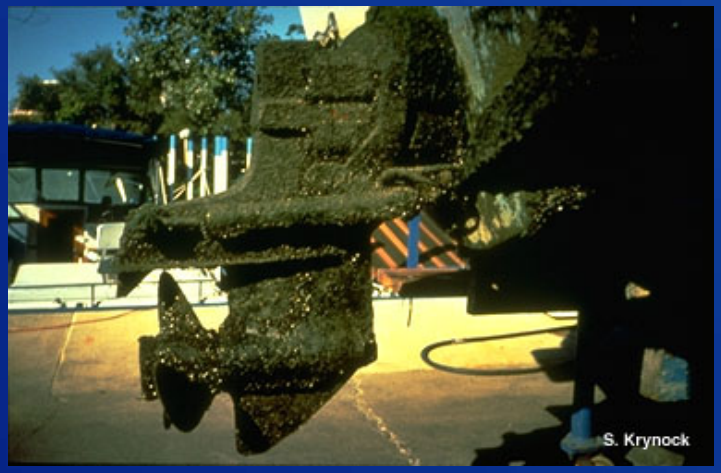
Why are Quagga Mussels a Threat?



- Due to their prolific reproduction rate and rapid growth they have seriously affected water ecosystems, native aquatic species, & public recreation.
- They are able to accumulate and choke off water supplies in pipelines from ½ in. to 20 ft. in diameter.
- Total costs in the U.S. due to this *Dreissena* mussel invasion range from $500 million to $5 billion per year.

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Why are *Dreissena* mussels considered to be a nuisance aquatic species? They get on and into everything!

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Dreissena mussels can Accelerate Corrosion of Iron and Steel Surfaces

- **Other than causing flow restrictions or blockages in pipelines, tunnels, & conduits, *Dreissena* mussels can accelerate the corrosion and pitting of iron and steel surfaces.**
- **Bacteria between the surface and mussels produces an acidic compound that increases corrosion. Note corrosion around rivet after only 1 year of mussel contact.**

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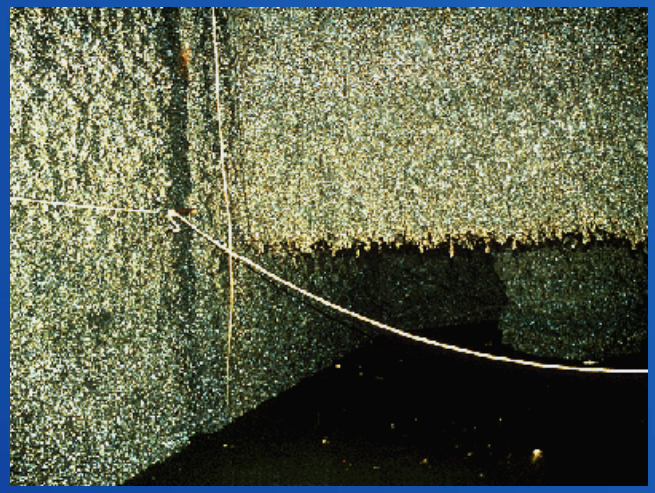
What are the Currently Effective Control Methods used for *Dreissena* mussels?

- Oxygen Deprivation
- Temperature Treatments
- Exposure and Dessication
- Ultraviolet Radiation
- Manual Scraping
- High-pressure Jetting
- Mechanical Filtration
- Passive and Barrier Filtration
- Removable Substrates
- Chemicals or Molluscicides
- Ozone
- Antifouling Coatings
- Electric Currents
- Sonic Vibration
- Natural Predators or Biological Controls



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How do Zebra and Quagga mussels Spread?

- **Short Answer: Larvae flow downstream. Adults attach to recreational boats & equipment (anchors, bait buckets, etc).**
- **Larvae can also be transported in water carried by recreational boats (live wells).**
- **Boats stored at marinas are much more likely to be infested w/ Dreissena mussels than day use boats.**

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Methods of Prevention/Early Detection

- **PUBLIC EDUCATION**
- **Artificial Substrates**
- **PCR testing**
- **Trailer Inspections**
- **Decontamination**
- **Boater Surveys**
- **Boat Inspection Training**

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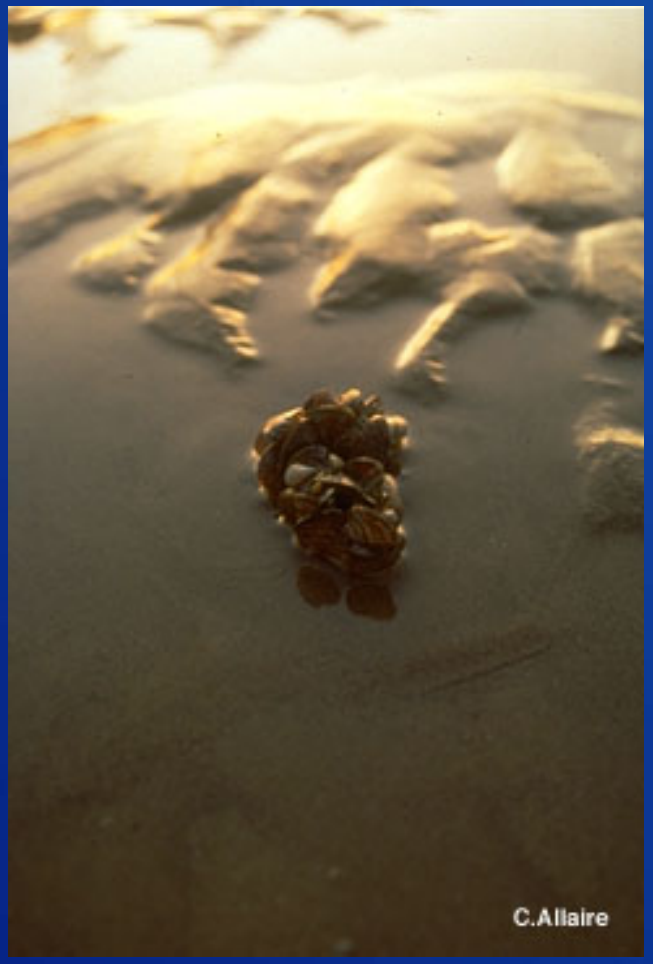
What can be done to Effectively Monitor and Control *Dreissena* mussels?



- Eradicating them from large lakes or flowing rivers is not possible using current methods and technologies.
- There are document cases of successful eradications of *Dreissena* mussels from ponds or small lakes using repeated effective control methods, but reinfestation is possible.
- Monitoring, early detection, and the use of an effective control method or multiple methods are the key to preventing problems.

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Key Points:

- **Public Education: Clean, Drain, & Dry**
- **Early Detection**
- **Containment – delay spread and reduce costs**

"An ounce of prevention is worth a pound of cure." Benjamin Franklin

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Public Information Efforts to Prevent the Spread of *Dreissena* mussels

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Stop Aquatic Hitchhikers!™
After boating, conduct these essential decontamination steps:
1. CLEAN all plants, fish, mussels and mud from boat.
2. DRAIN all ballast, motor, bilge and livewells.
3. DRY (7 days summer, 18 days spring/fall or 30 days winter) or freeze (3 days) your equipment.
OR
If your boat has been in infested waters for an extended period of time, or if you cannot perform the required steps above, you should have your boat professionally cleaned with high-pressure scalding hot water (>140 °F) before transporting to any body of water.
Invasive mussels will devastate boats, fisheries and recreation areas!
If you see these mussels, call 1-877-STOP-ANS (1-877-786-7267)

Who & What will be impacted?

- Storage reservoirs
- Surface water delivery systems
- Municipal water supplies
- Irrigated agriculture & ranching
- Hydroelectric power generation
- Water-based industry
- Water-based recreation- fishing, boating, swimming
- Native aquatic wildlife

EVERYONE

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4 Primary Targets

1) **Education/Outreach**
2) **Watercraft Inspection/Interdiction**
3) **Decontamination**
4) **Water Sampling/Monitoring**

All of which requires coordinated

COLLABORATION

and

FUNDING

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Questions?

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