Aquatic Invasive Species

- Identified by Chief of the Forest Service as one of four threats to Forests and grasslands
- Several pests are within transport distance of Sierra National Forest waters

New Zealand mudsnail

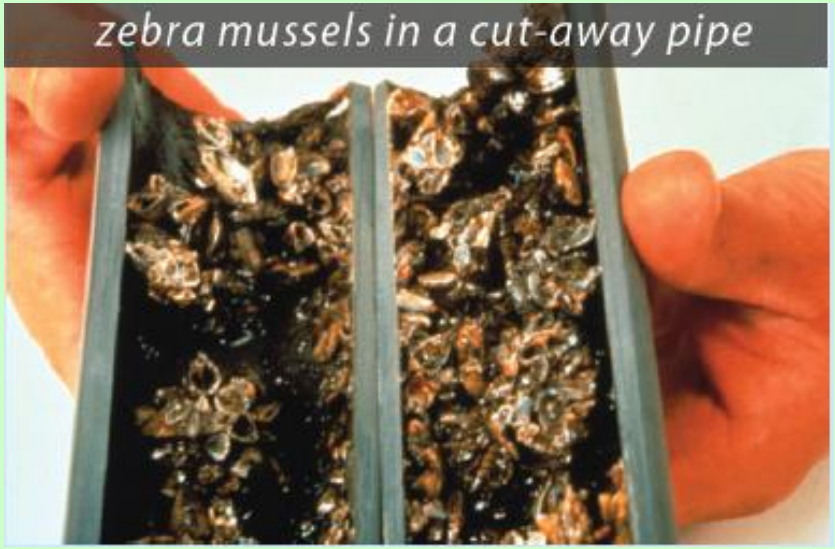
Whirling disease

Didymo or “rock snot”

Zebra or quagga mussels

Zebra or guagga mussels

Zebra/Quagga Mussels occlude pipes in municipal and industrial raw-water systems, requiring millions of dollars annually to treat. Zebra Mussel densities have been reported to be over 700,000 individuals per square meter in some facilities in the Great Lakes area. They produce microscopic larvae that float freely in the water column, and thus can pass by screens. Estimated that zebra mussels in the Great Lakes area cost the power industry $3.1 billion in the 1993-1999 period, with an economic impact on industries, businesses, and communities of more than $5 billion.



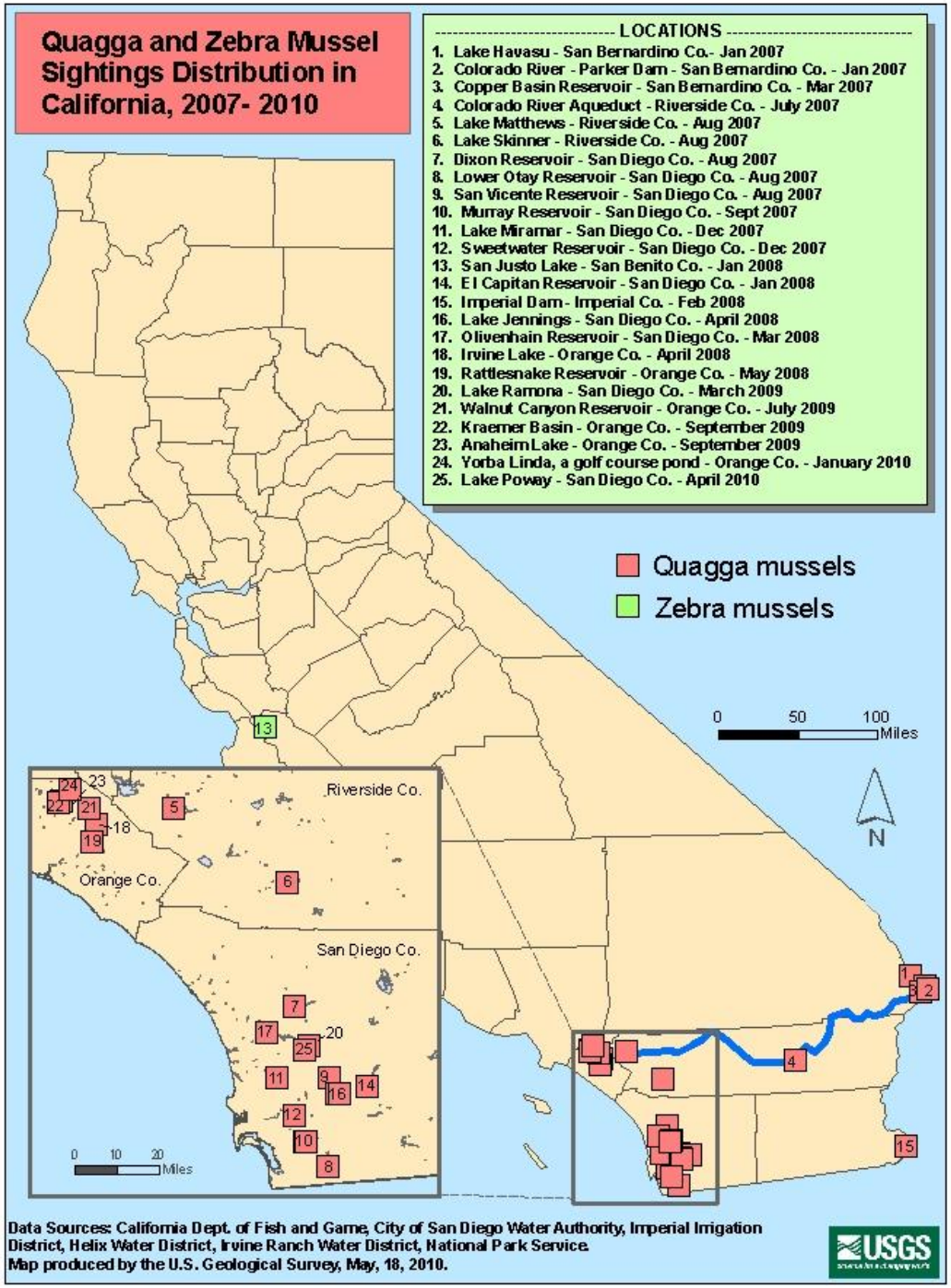
In California, spread of the mussels threatens water delivery systems, hydroelectric facilities, agriculture, recreational boating and fishing, and the environment in general.

Quagga Mussel
Dreissena bugensis

- Shell: D-shaped and triangular; thin, fragile; smooth or shallowly ridged; solid light to dark brown or dark concentric rings; paler near hinge
- Attaches to hard and soft surfaces

Zebra Mussel
Dreissena polymorpha

- Shell: D-shaped and triangular; thin and fragile to thick and sturdy; smooth or shallowly ridged; solid light to dark brown or striped
- Attaches to hard surfaces


Quagga and Zebra Mussel Sightings Distribution in California, 2007- 2010
LOCATIONS
1. Lake Havasu - San Bernardino Co.- Jan 2007
2. Colorado River - Parker Dam - San Bernardino Co. - Jan 2007
3. Copper Basin Reservoir - San Bernardino Co. - Mar 2007
4. Colorado River Aqueduct - Riverside Co. - July 2007
5. Lake Matthews - Riverside Co. - Aug 2007
6. Lake Skinner - Riverside Co. - Aug 2007
7. Dixon Reservoir - San Diego Co. - Aug 2007
8. Lower Otay Reservoir - San Diego Co. - Aug 2007
9. San Vicente Reservoir - San Diego Co. - Aug 2007
10. Murray Reservoir - San Diego Co. - Sept 2007
11. Lake Miramar - San Diego Co. - Dec 2007
12. Sweetwater Reservoir - San Diego Co. - Dec 2007
13. San Justo Lake - San Benito Co. - Jan 2008
14. El Capitan Reservoir - San Diego Co. - Jan 2008
15. Imperial Dam - Imperial Co. - Feb 2008
16. Lake Jennings - San Diego Co. - April 2008
17. Olivenhain Reservoir - San Diego Co. - Mar 2008
18. Irvine Lake - Orange Co. - April 2008
19. Rattlesnake Reservoir - Orange Co. - May 2008
20. Lake Ramona - San Diego Co. - March 2009
21. Walnut Canyon Reservoir - Orange Co. - July 2009
22. Kraemer Basin - Orange Co. - September 2009
23. Anaheim Lake - Orange Co. - September 2009
24. Yorba Linda, a golf course pond - Orange Co. - January 2010
25. Lake Poway - San Diego Co. - April 2010
Quagga mussels
Zebra mussels
0 50 100 Miles
N
Riverside Co.
Orange Co.
San Diego Co.
0 10 20 Miles
Data Sources: California Dept. of Fish and Game, City of San Diego Water Authority, Imperial Irrigation District, Helix Water District, Irvine Ranch Water District, National Park Service.
Map produced by the U.S. Geological Survey, May, 18, 2010.
USGS

New Zealand mudsnails

NZMS average 1/8 inch in size but may be as small as a grain of sand. A plate covers the opening of the gray, brown or black cone-shaped shell with 5 or 6 whorls.

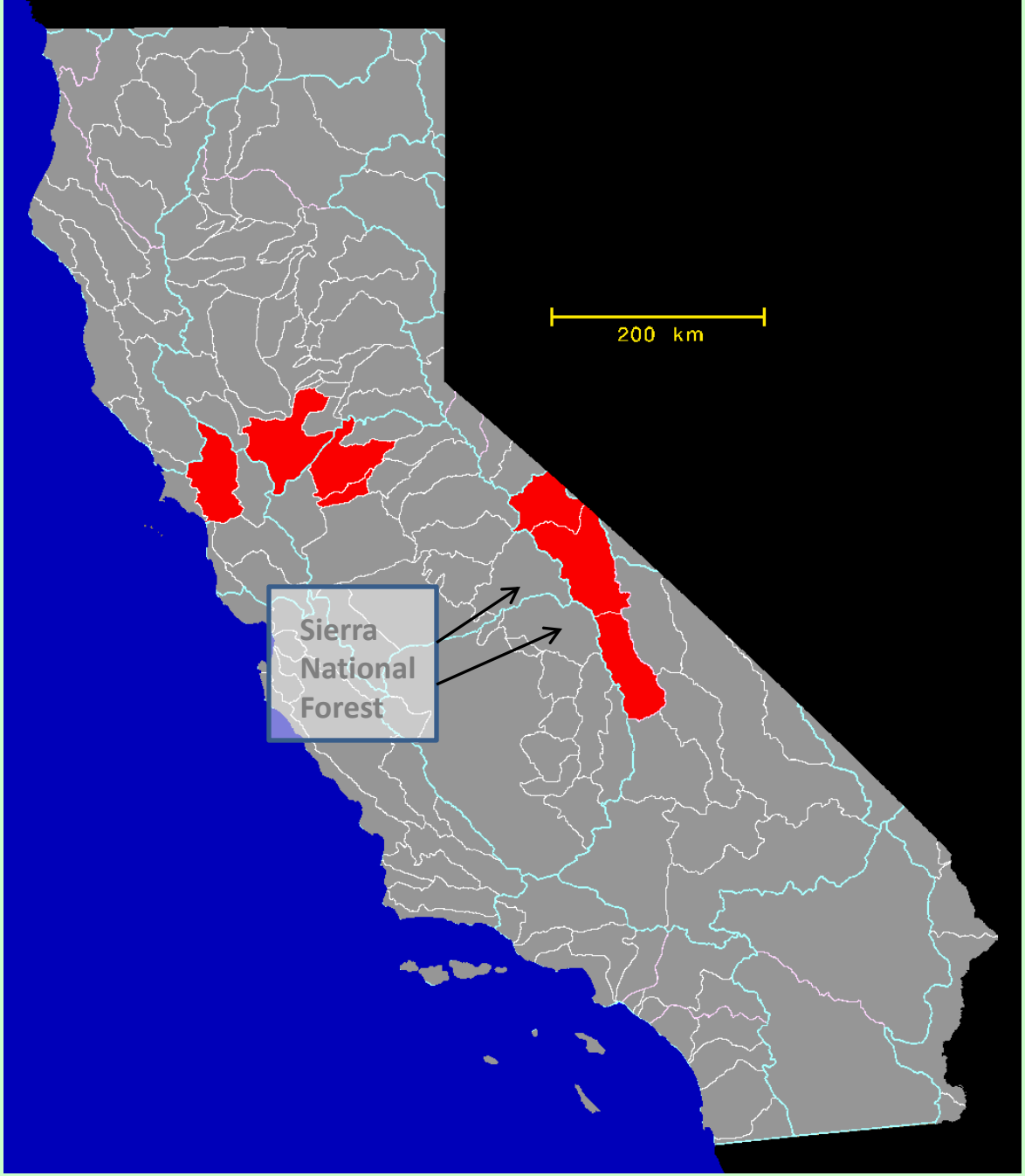
• They live in all types of waters, from silted river bottoms to clear mountain streams to estuaries.

• Temperature tolerance 32 - 77°F (66°F optimum).

• Reproduce by cloning, so it only takes **ONE.**

• Densities of over **500,000 per square yard have** been reported in rivers in Yellowstone National Park.

• Can survive for **days out of water on moist gear.**

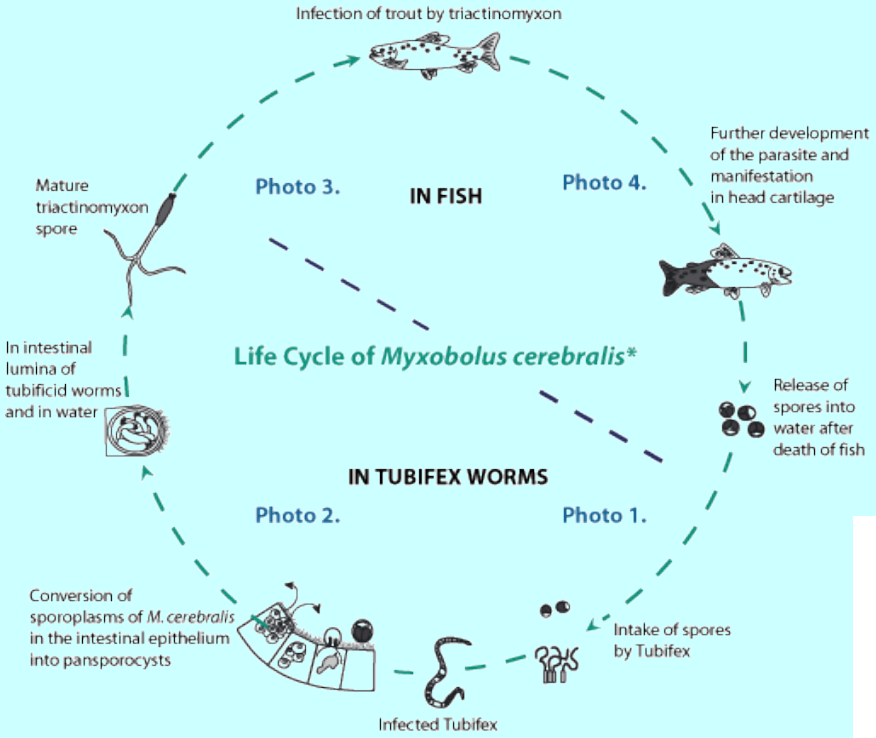


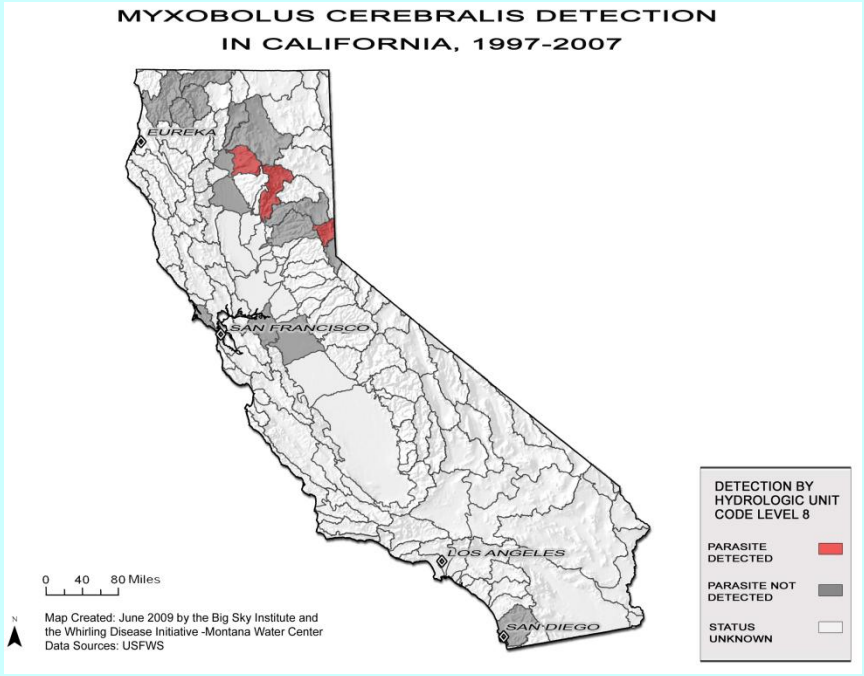
Mudsnail distribution in California (red indicates watershed occupied)

Didymo

Microscopic alga known as a diatom that's invading rivers and streams. *Didymosphenia geminata*, also known as 'rock snot' or 'didymo', can smother entire stream beds with mats as thick as eight inches and can ruin just about any river or creek.

Whirling disease





Fingerling trout with deformity.

Montana Whirling Disease Task Force.

Chytrid fungus

- Keratin is the material that makes the outside of the amphibian skin tough and resistant to injury. With chytridiomycosis, the skin becomes very thick due to change in the skin called “hyperplasia and hyperkeratosis”. These changes in the skin are deadly to amphibians because— unlike most other animals— amphibians “drink” water and absorb important salts (electrolytes) like sodium and potassium through the skin and not through the mouth. Abnormal electrolyte levels as the result of *Bd*-damaged skin cause the heart to stop beating and the death of the animal.

Aquatic Invasive Species

Pacific Southwest Region

What are Aquatic Invasive Species (AIS)?

Aquatic plants and animals that live and grow in water and are non-native to the ecosystem.

AIS Increase competition for food, prey on native plants and animals, transmit diseases, crossbreed with native populations, and contribute to habitat change which threatens ecosystem diversity.

Randy Westbrooks, U.S. Geological Survey, Bugwood.org

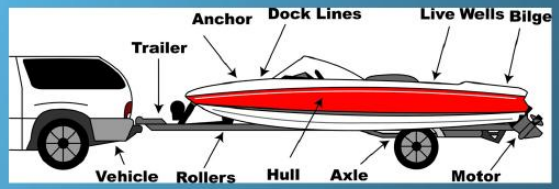
Zebra and Quagga Mussels filter vital nutrients from the water, which are needed to support native wildlife.

Mussel growth has resulted in a severe decline in native mollusk population.

Photo Courtesy of the Department of Fish and Game

How to Prevent AIS from spreading?

~Clean ~ Drain ~ Dry~



Department of Fish and Game

More information is available from:
US Forest Service: http://www.fs.fed.us/invasivespecies/index.shtml
CA Dept of Fish & Game: http://www.dfg.ca.gov/invasives/plan/
US Geological Survey: http://nas.er.usgs.gov/default.aspx
Protect Your Waters: http://www.protectyourwaters.net/