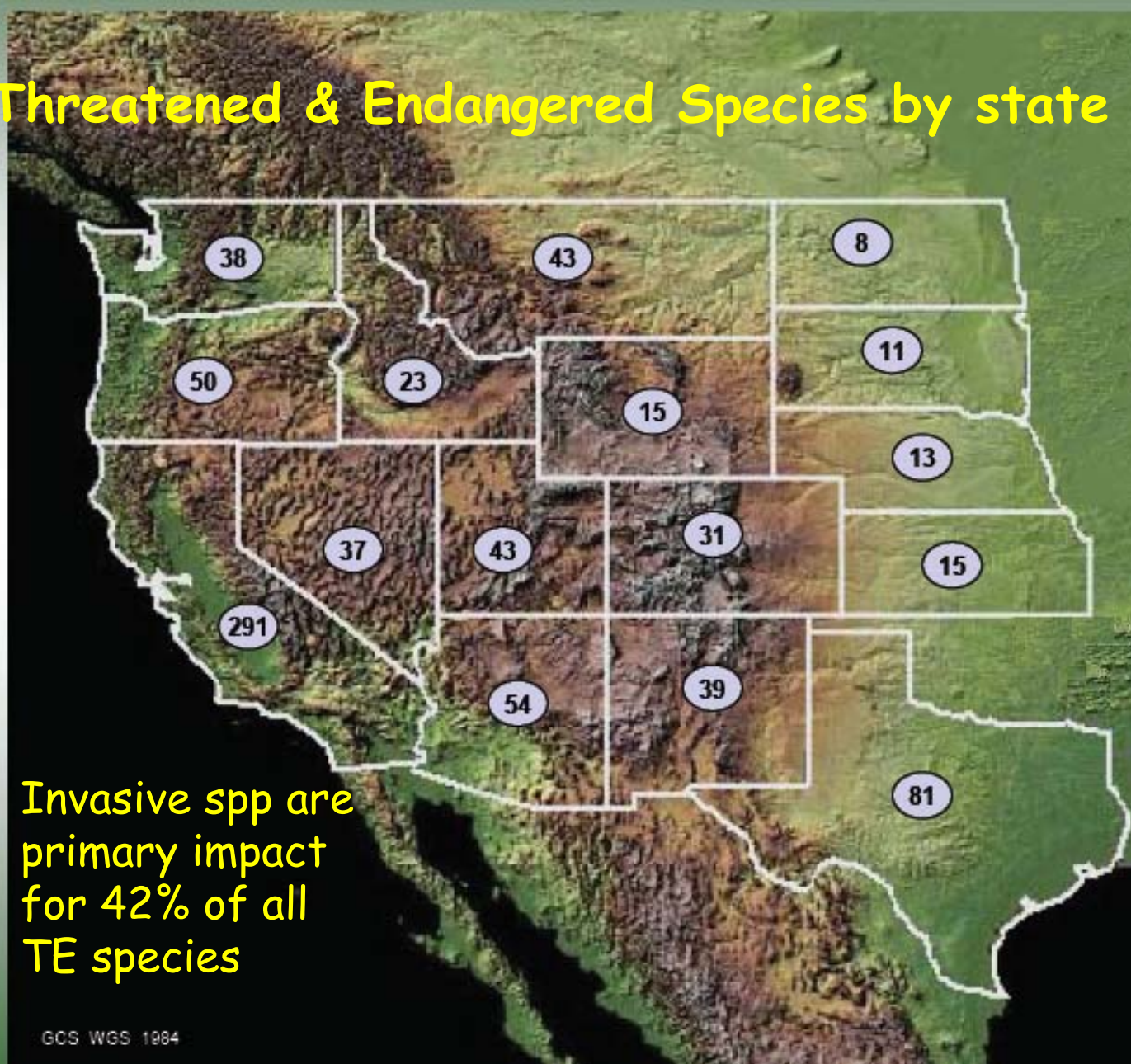


Emerging Aquatic Nuisance Species in California and the Pacific Southwest Region



Joseph Furnish, Regional Aquatic Ecologist &
Travis Coley, Regional Fisheries Program Manager,
US Forest Service
jfurnish01@fs.fed.us

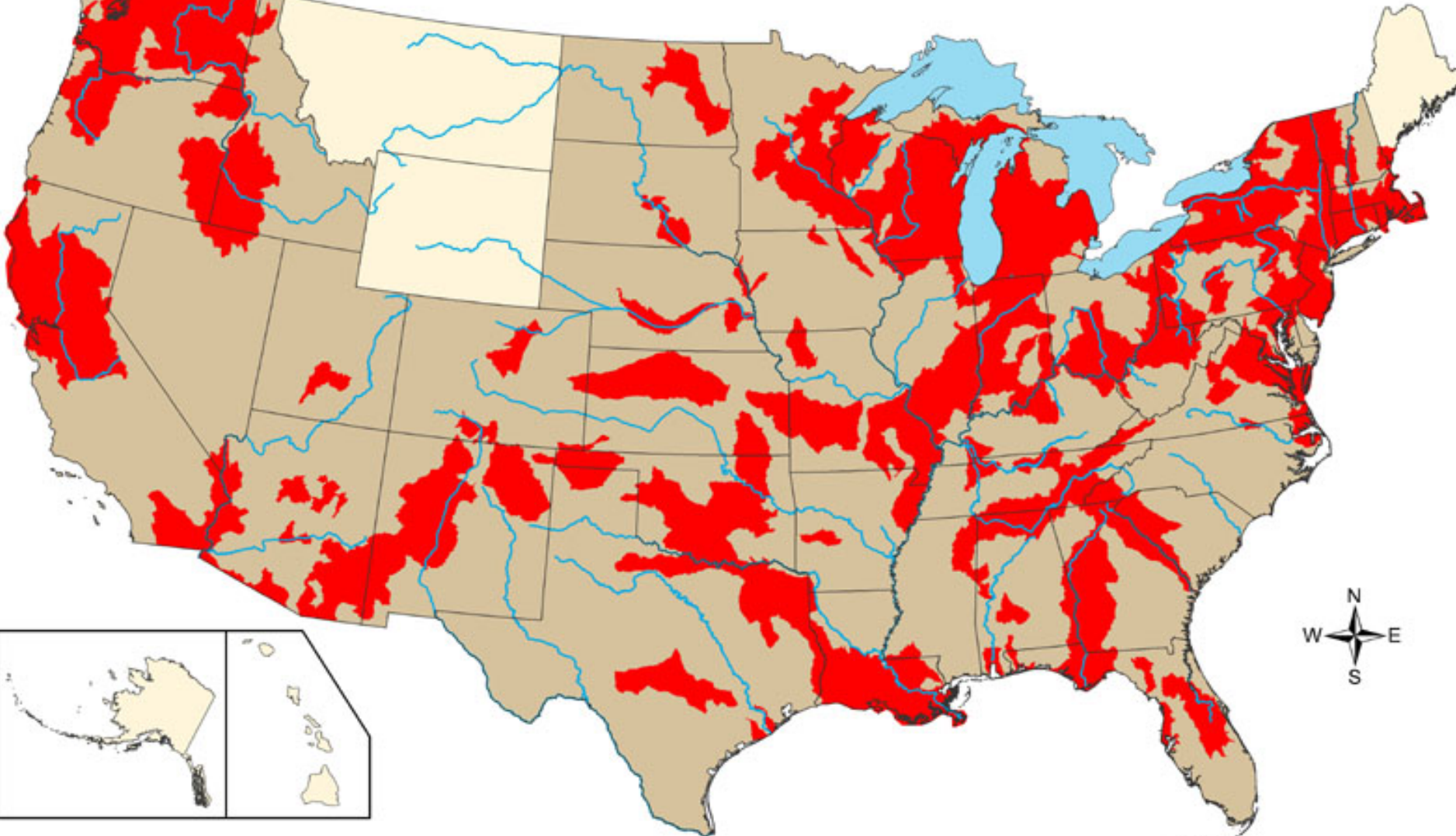
Number of Threatened & Endangered Species by state



USFS Pacific Southwest Region includes California, Hawaii & US Trust Territories (western Pacific Ocean)

Some Major Aquatic Invasive Species

- Zebra Mussel- colonizes all hard surfaces
- New Zealand mudsnail
- Whirling Disease- causes fish deformities, death
- *Ceratomyxa*- major mortality of salmon in Klamath River, polychaete intermediate host
- Chytrid fungus- amphibian deformities, mortality
- Northern pike- threatens Lake Davis, Sac Delta
- Coqui frog in Hawaii- nuisance call
- Water fern, Eurasian water milfoil - clogs lakes



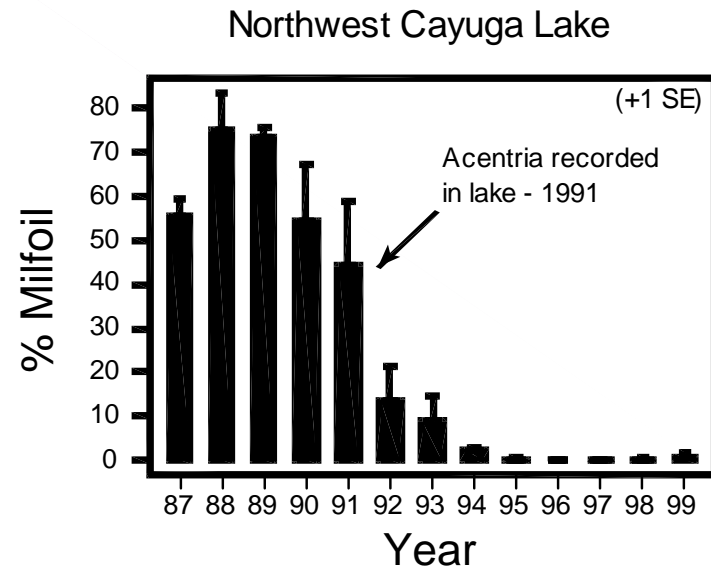
Myriophyllum spicatum Eurasian water milfoil

- range established
- states with records
- states without records



Biological Control of Eurasian Milfoil

- pyralid aquatic moth, *Acentria ephemerella*, accidentally introduced to North America in 1927.
- All of life cycle but 1-2 day nuptial flight is spent under water. Many females are apterous.
- Milfoil reduced from 70-80% to <10% of total macrophyte biomass over a period of six years in Cayuga Lake, NY



ZEBRA MUSSEL

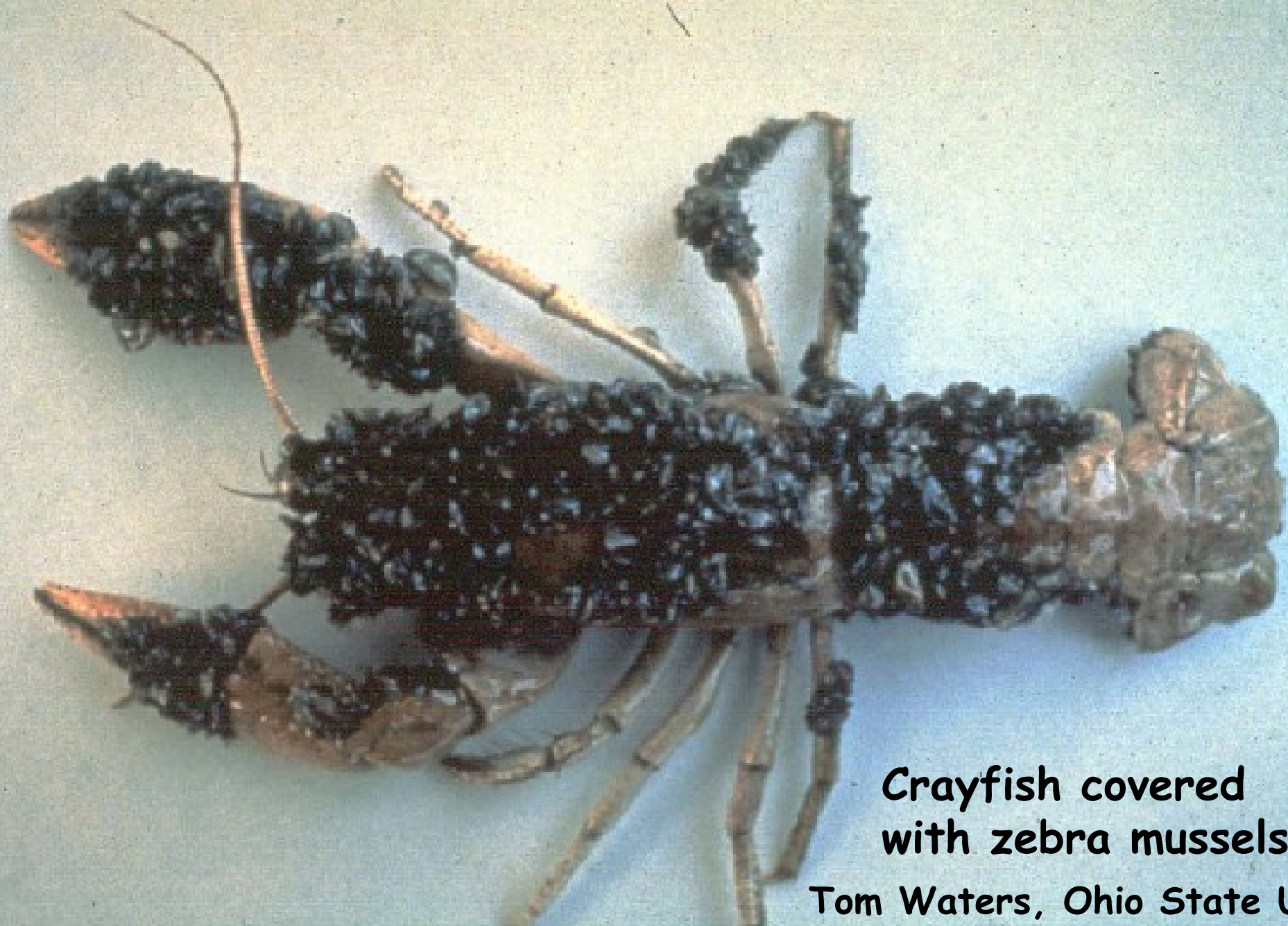
Dreissena polymorpha (Pallas 1771)



Zebra mussels attached to a freshwater mussel, Lake Erie



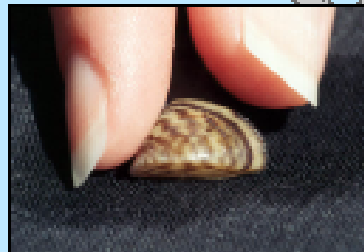
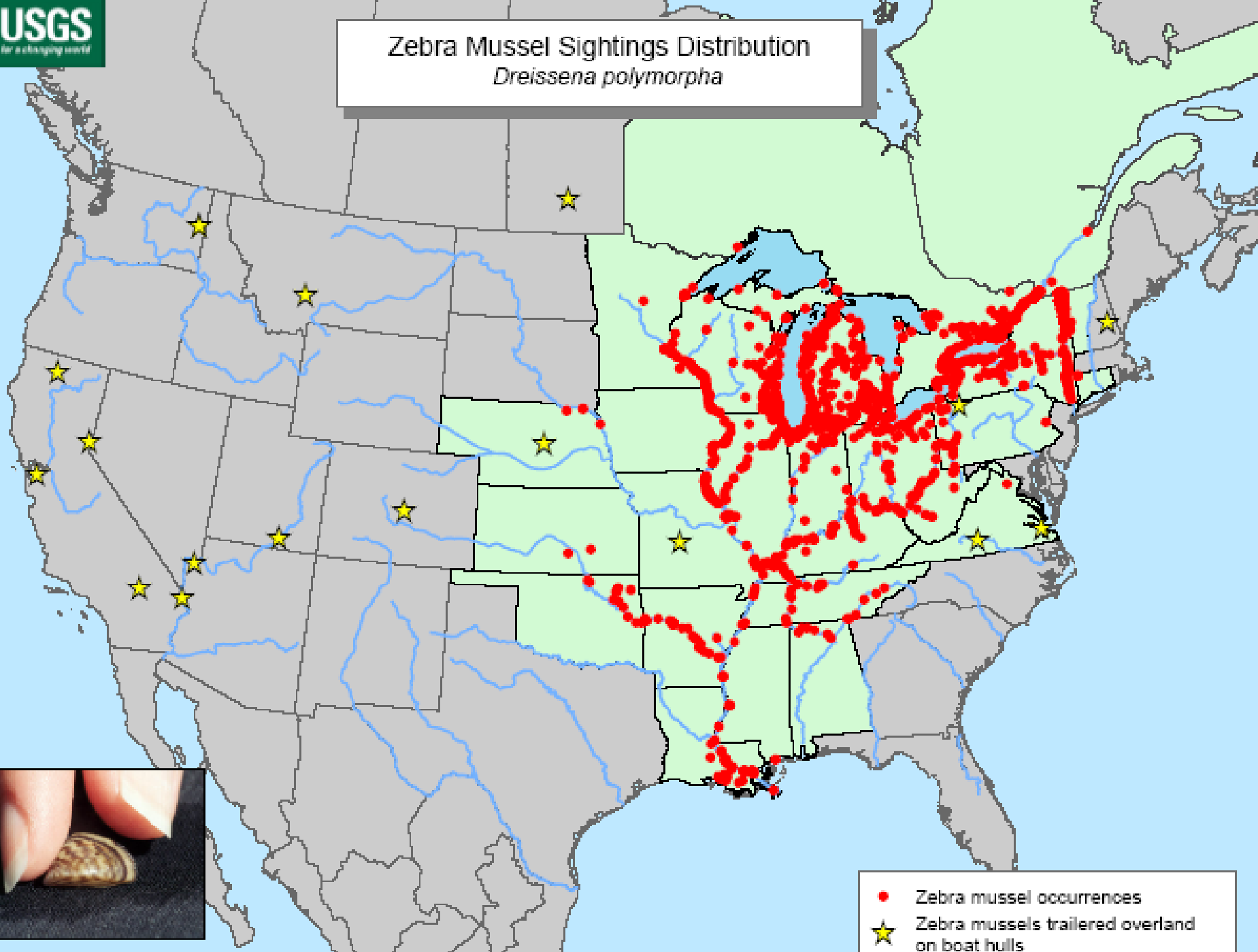
Zebra mussels infesting an outboard motor



**Crayfish covered
with zebra mussels**
Tom Waters, Ohio State U

Zebra Mussel Sightings Distribution

Dreissena polymorpha

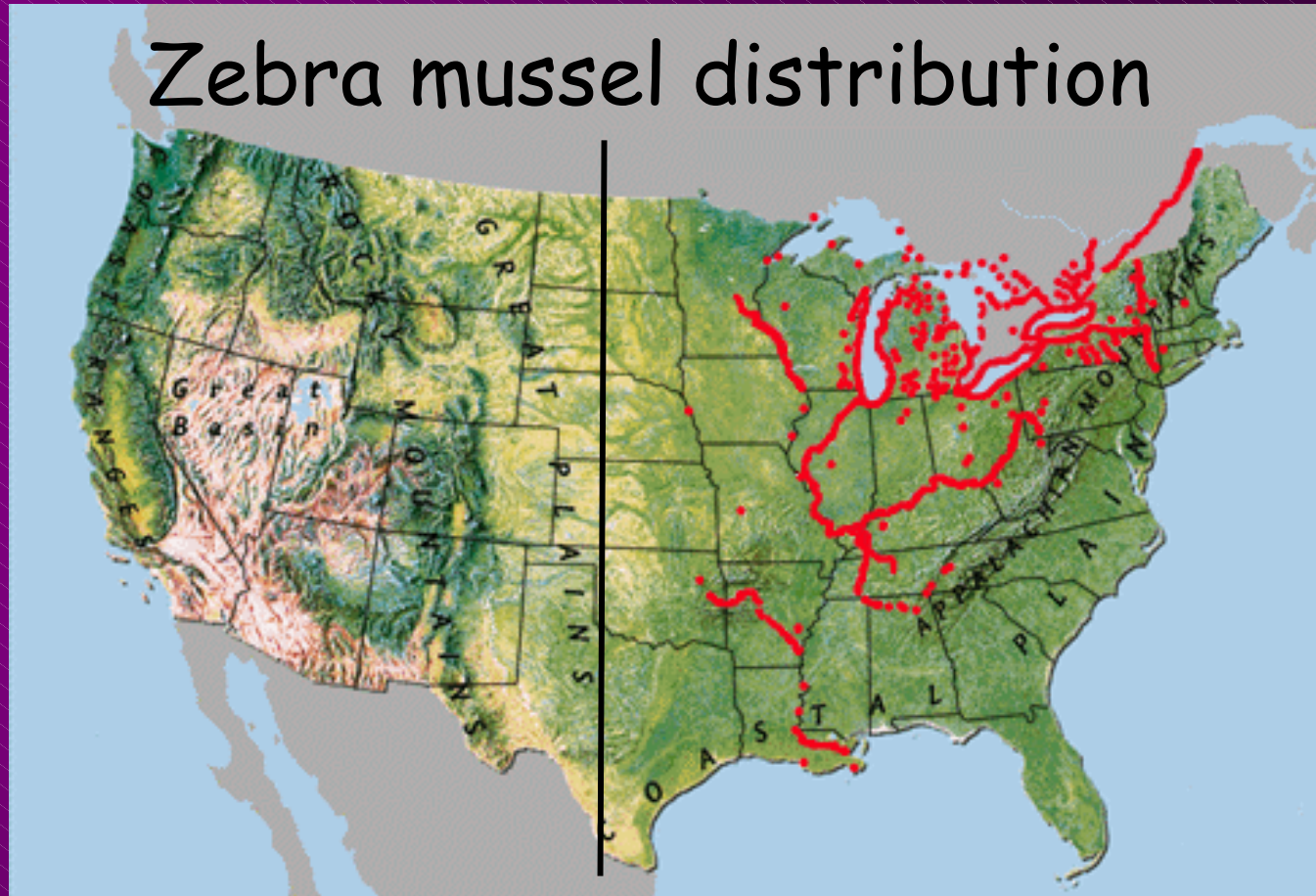


- Zebra mussel occurrences
- ★ Zebra mussels trailed overland on boat hulls

State Dept of
Agriculture
Inspectors
have already
intercepted
infected
trailers 19
times at the CA
border!

Estimated \$5
billion in annual
impacts!

Zebra mussel distribution



<http://100thmeridian.org>



Egg mass

Pomacea canaliculata Lamarck

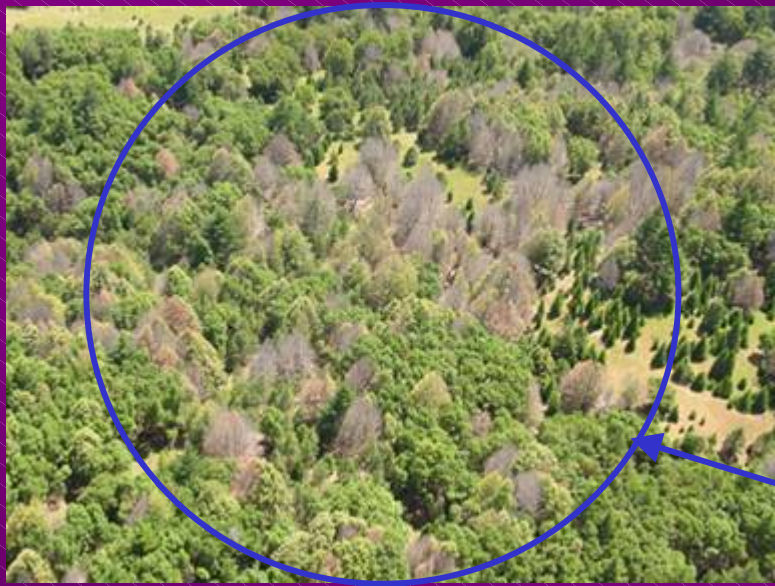
Introduced from Brazil & Argentina to CA, TX, FL

Host for rat lungworm parasite

Voracious herbivore of rice, taro, many other aquatic plants



Golden apple snail

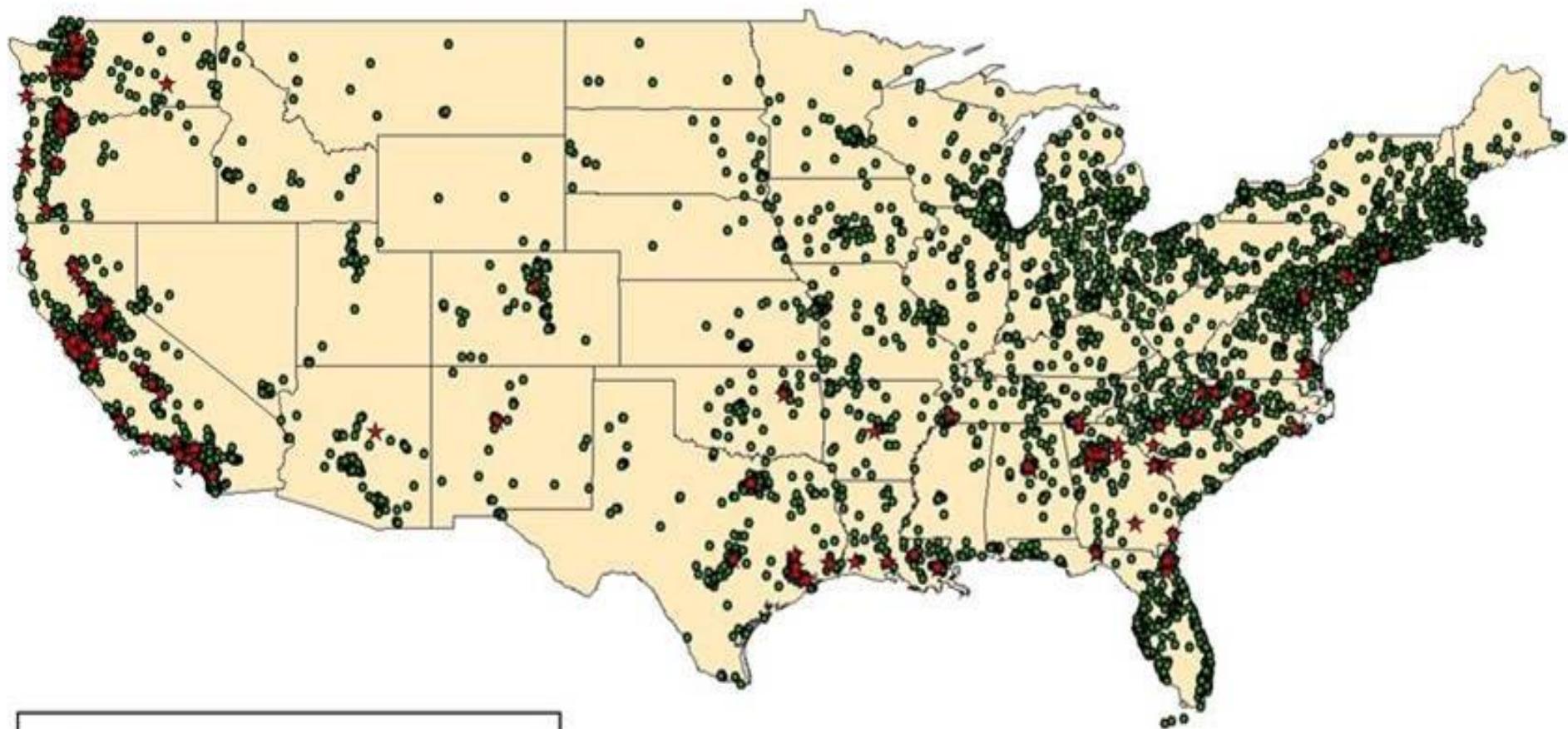


Distribution of Sudden Oak Death as of June 24, 2005



Map produced on 6/24/05 by UCB GIFF: <http://kellylab.berkeley.edu/SODmonitoring/>
 For more information about Sudden Oak Death, please visit the California Oak Mortality Task Force website at <http://www.suddenoakdeath.org/>

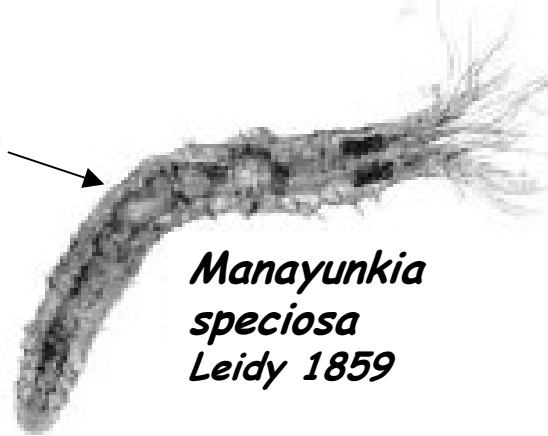
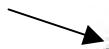
Sudden Oak Death Syndrome 2004 Trace-forwards & positive detections



Legend

- ★ Positive site
- All trace forward sites

Freshwater polychaete worm, intermediate host



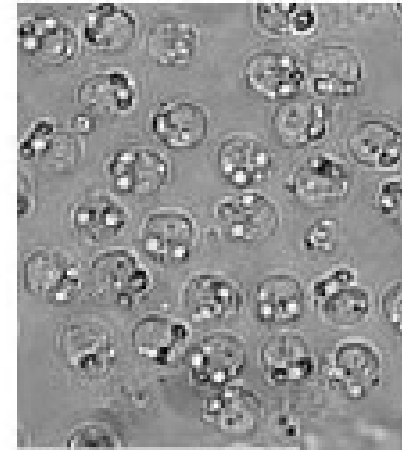
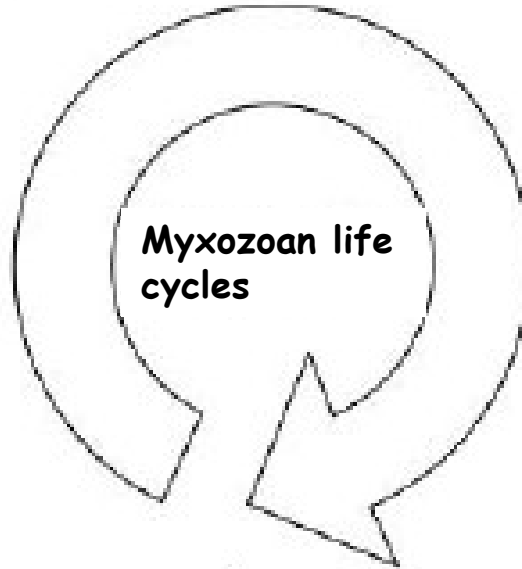
Manayunkia speciosa
Leidy 1859

Origin in eastern US?

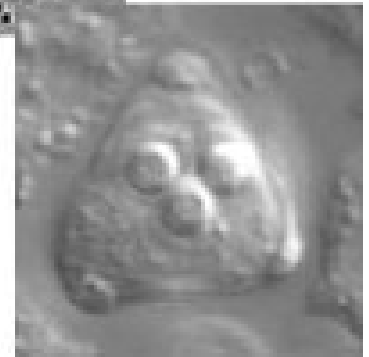
Ceratomyxa shasta myxospore



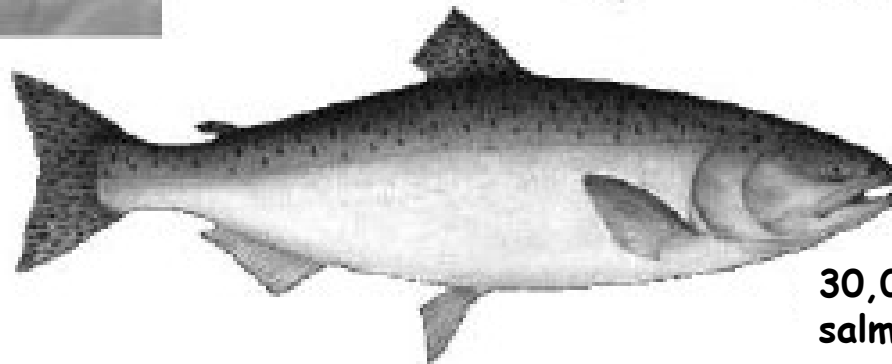
Parvicapsula minibicornis myxospore



Parvicapsula minibicornis actinospore



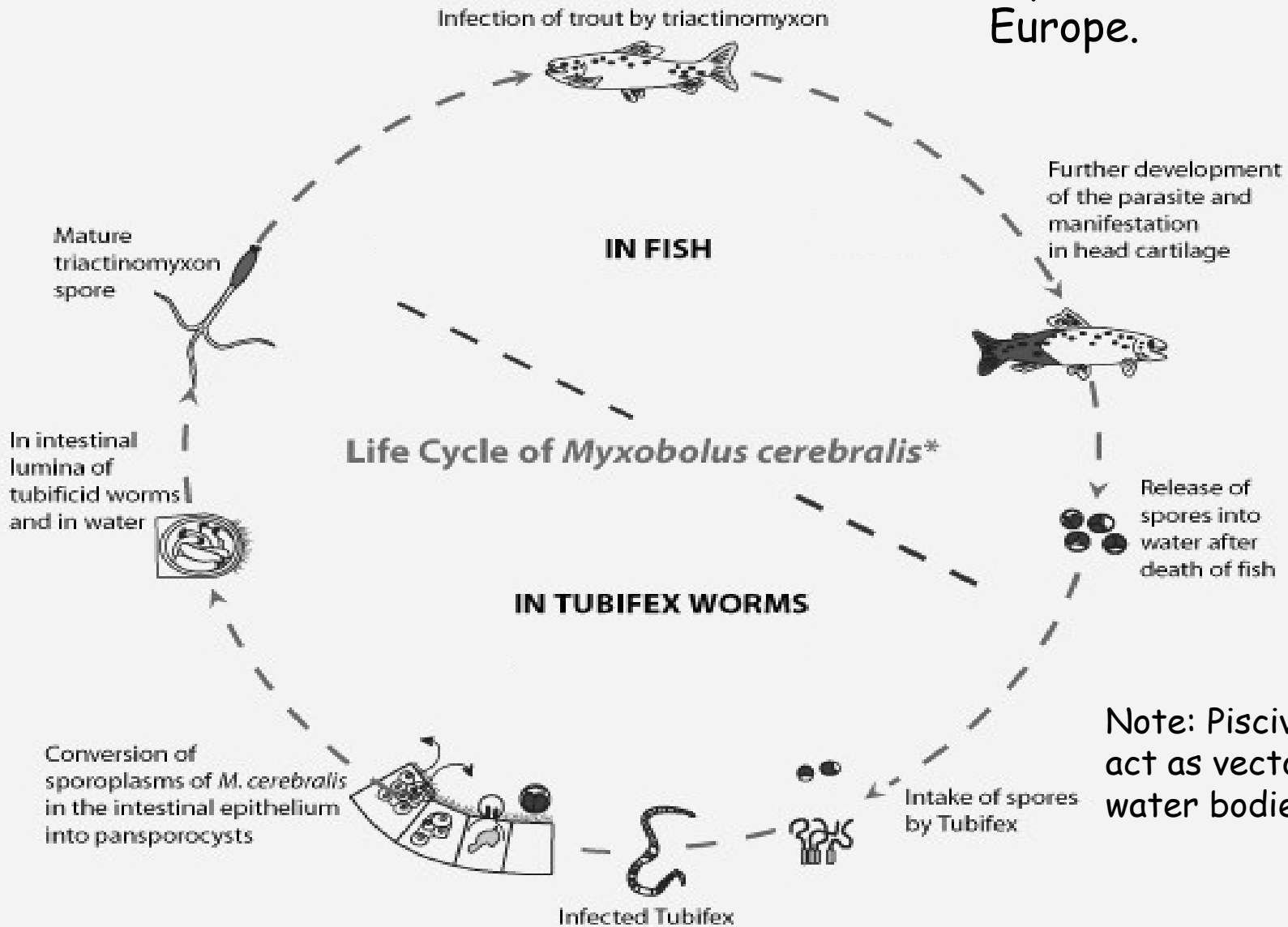
Ceratomyxa shasta actinospore



30,000 Klamath River chinook salmon lost to this disease!

Lifecycle of the whirling disease parasite

Myxozoan endemic to Europe.

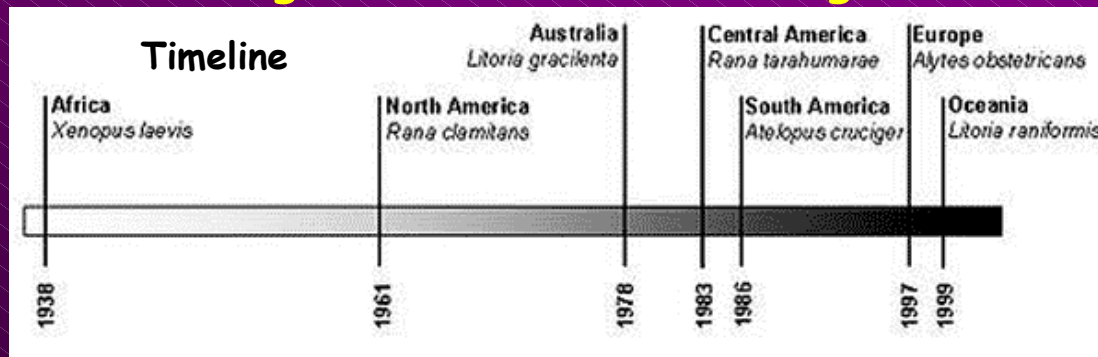


Note: Piscivorous birds act as vectors between water bodies

*Adapted from M. El Matbouli, T. Fischer Scherl, and R.W. Hoffmann. 1992. Annual Review of Fish Diseases, p. 392.

Amphibian chytrid fungus disease

- A chytrid fungus, *Batrachochytrium dendrobatidis*, causes death in post-metamorphic frogs and infects the keratinized mouthparts of tadpoles.
- Discovery of *Xenopus laevis*, African clawed frog for human pregnancy assays in 1934 resulted in world-wide distribution.
- It has been implicated in amphibian declines in Australia, the Neotropics, North America and Europe.
- Weldon and others. 2004. Origin of the amphibian chytrid fungus. *Emerging Infectious Diseases* 10(12): 2100-2105. www.cdc.gov/eid
- Has infected native frog populations, e.g. MYLF *Rana muscosa*, bullfrog *Rana catesbiana* is a carrier.
- Where infestations are known or suspected, equipment should be sterilized using bleach, avoid handling infected individuals.



National Strategy and Implementation Plan



for Invasive Species Management

1. Four Components

- Prevention
- Early Detection & Rapid Response
- Control & Management
- Rehabilitation & Restoration

- ## 2. Guiding Principles of
- a) prioritization,
 - b) collaboration &
 - c) accountability

- ## 2. Cost of impacts by invasive species in US estimated at \$138 billion/yr (Pimentel et al. BioScience 2000)

Possible Action Items

- Prepare and distribute educational materials to Forest Service specialists, partners, especially work with CDFG
- Create Best Management Practices for Invasives and Monitor Them
 - Are BMPs being implemented?
 - Are they effective when implemented?
 - What are the causes of poor implementation & effectiveness?
 - What are the effects on water quality?

Johnson Fire, Fishlake N.F., UTAH September 2002

Whirling Disease Control Actions Undertaken During the Fire



**STOP AQUATIC
HITCHHIKERS!**

- Draft from only one creek at a time per helicopter or engine
- Cleaning and disinfecting equipment (including helicopter tanks) when leaving fire
- Inventory beforehand to determine distribution of invasive species, include in fire management plans



The Aquatic Nuisance Species Task Force

<http://www.protectyourwaters.net/>

- Remove any visible mud, plants, fish, or animals before transporting equipment.
- Eliminate water from equipment before transporting.
- Clean, disinfect and dry anything that came in contact with water (boats, trailers, equipment, clothing, dogs, etc.).
- Never release plants, fish or animals into a body of water unless they came out of that body of water.