

Whirling Disease

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Department



•Arizona's Aquatic Invasive Species (AIS) Interdiction Act

•A.R.S 17-255.02 -Except as authorized by the commission, a person shall not: Possess, import, ship or transport into or within this state, or cause to be imported, shipped or transported into or within this state, an aquatic invasive species.

- Lacey Act
- National Invasive Species Act
- Non-indigenous Aquatic Nuisance Prevention and Control Act
- Asian Carp Prevention and Control
- Clean Boating Act of 2008
- Water Resources Development Act of 2007
- Great Lakes Fish and Wildlife Restoration Act of 2006
- Salt Cedar and Russian Olive Control Demonstration Act
- Public Lands Corps Healthy Forests Restoration Act
- National Plan for Control and Management of Sudden Oak Death
- Noxious Weed Control and Eradication Act
- Brown Tree Snake Control and Eradication Act
- Nutria Eradication and Control Act
- Public Health Security and Bioterrorism Preparedness and Response Act of 2002
- Farm Security and Rural Investment Act of 2002
- Plant Protection Act
- Water Resources Development Act
- Agreement on the Application of Sanitary and Phytosanitary Measures
- North American Agreement on Environmental Cooperation
- Federal Plant Pest Act
- Alien Species Prevention and Enforcement Act (1992)
- Hawaii Tropical Forest Recovery Act (1992)
- Wild Bird Conservation Act (1992)
- Federal Noxious Weed Act (1974)
- Endangered Species Act (1973)
- Coastal Zone Management Act (1972)
- National Environmental Policy Act (1970)
- Federal Insecticide, Fungicide, and Rodenticide Act (1947)
- Organic Act (1944)

Invasive Species (Laws and Regulations)

ARIZONA'S 10 MOST UNWANTED AQUATIC INVASIVE SPECIES

<p>QUAGGA AND ZEBRA MUSSELS Origin – Eastern Europe and Ukraine Prolific propagator. Removes food resources from water column, clogs pipes and water conveyance infrastructure, damages boat motors and marinas. Management/eradication costs can be enormous for power and water supply agencies. Dispersal by boats and equipment, pipes, canals, live wells.</p>  <p><i>Dreissena bugensis</i></p>	<p>RUSTY CRAYFISH Origin – Ohio River Basin Used as bait, aquatic weed control, and as a human food source. Aggressive species that deprives native fish of their prey and cover. Invasion has led to severe impacts on native species in the western United States. Voracious appetite for larval fish, plants and insects; cannibalistic tendencies. Dispersal by bait buckets and aquarium discard.</p>  <p><i>Decapoda rustica</i></p>
<p>HYDRILLA Origin – Eurasia, Africa and Australia Illegally released into Florida waters in the 1950's "invisible menace" until it fills a lake or river by "tapping out" at the surface. Can grow an inch a day and will shade-out and outcompete native aquatic plants. Clogs irrigation/flood-control canals, will greatly slow water movement and seriously interfere with boating, swimming and fishing. Dispersal to new waters mainly as free-floating fragments or hanging on boats/trailers.</p>  <p><i>Hydrilla verticillata</i></p>	<p>NEW ZEALAND MUDSNAIL Origin – New Zealand Out-competes native Arizona snails for available food resources/territory. Very prolific and spreads quickly by floating and attaching to vegetation to rapidly increase its range. Dispersal by boaters and anglers' trailers, boating gear, fishing equipment, etc.)</p>  <p><i>Potamoxygas antipodorum</i></p>
<p>ASIAN CARP Origin – Eurasia and China Includes bighead, black silver carp. Introduced into U.S. for algae control and as a food fish. Currently established in the Mississippi drainage. Large bodied fish (60lbs) that cause jumping-fish hazards to anglers and boaters. Adults outcompete juvenile sportfish for planktonic food. Dispersal by bait buckets and unintentional illegal commercial transport and stocking.</p>  <p><i>Hypophthalmichthys spp.; Mylopharyngodon piceus</i></p>	<p>GIANT SALVINIA Origin – South America Pervasive aquatic fern that can greatly alter aquatic ecosystems. Forms very thick surface mats and completely blocks light, and oxygen penetration, impedes water flow, clogs water conveyance, and eliminates all other plant/fish species. Dispersal by boats, equipment, and natural downstream flow.</p>  <p><i>Salvinia molesta</i></p>
<p>RED CLAW CRAYFISH Origin – Northern Australia Used for commercial farming as a human food source and aquarium trade. Successful invader having impacts on fishes, aquatic species, aquatic habitats and native amphibians; cannibalistic tendencies. Very prolific, highly tolerant to environmental changes, and has a wide range of dietary requirements. Dispersal by bait bucket dumping and illegal stocking.</p>  <p><i>Cherax quadricarinatus</i></p>	<p>AMERICAN BULLFROG Origin – Central and Eastern United States Accidentally introduced into the West during trout stocking, aquarium trade, and pest control. Competes with and preys on all aquatic life, including native species. Responsible for the disappearance of many amphibians and fish species, including a long list of endangered species. Current year-round hunting season on bullfrog in Arizona. Self dispersal through species movement and human interaction.</p>  <p><i>Rana catesbeiana</i></p>
<p>NORTHERN SNAKEHEAD Origin – China and Korea Fish market industry; human food source. Voracious predators that prey on native species and are exceptionally successful in competing with other fish for food and habitat. Ability to reproduce five times a year and very aggressive at protecting their young. Could severely impact sport fish populations, but not yet found in Arizona. Dispersal by illegal dumping of live fish and waste eggs.</p>  <p><i>Channa argus</i></p>	<p>DIDYMO (ROCK SPOT) Origin – Northern Europe and Northern North America (Vancouver Island) Affects stream habitats and sources of food for fish and makes recreational activities unpleasant. Creates dense algal blooms that block sunlight and disrupt ecological processes causing a decline in native plant and animal life. Dispersal by watercraft, fishing gear, boating equipment and waders.</p>  <p><i>Didymopanax geminata</i></p>

YOU CAN HELP STOP THESE INVADERS!

Hunters, anglers and outdoor recreationists can do their part. **STOP AQUATIC HITCHHIKERS** by cleaning, draining and drying your watercraft and fishing equipment. **DON'T RELEASE PETS** into the wild.

For more information visit www.azgfd.gov/ais and www.az.gov/invasivespecies.

DON'T TRANSPORT LIVE FISH or other aquatic species for release elsewhere. **DON'T PLANT A PEST:** clean your vehicle and hunting/fishing equipment of plant parts/seeds and use native plants for landscaping.

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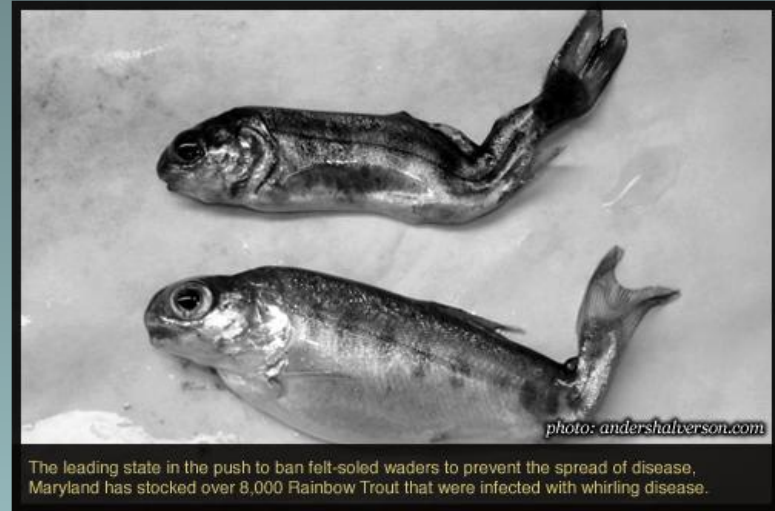


Lees Ferry Invasive Species

NZ mudsnail



Whirling Disease



The leading state in the push to ban felt-soled waders to prevent the spread of disease, Maryland has stocked over 8,000 Rainbow Trout that were infected with whirling disease.

Didymosphenia geminata
(rock snot)



Life Cycle

Myxobolus cerebralis
TAMs



TAMs attach to trout fry

infected trout



WATER

Life Cycle of *Myxobolus cerebralis*

T. tubifex release
TAMs into water



infected
Tubifex tubifex

Decaying trout return
myxospores to sediment



Myxobolus cerebralis
myxospores

T. tubifex ingests myxospores

SEDIMENT

Impacts

- Affects only certain trout species (primarily rainbow and cutthroat)
- Trout become resistant after 4-8 months
- Spore are very resistant
- Not harmful to humans, trout in WD infected waters are ok to eat



Environmental Factors

- TAM production greatest 10-15°C.
- >20-25°C TAM production may cease
- Fine sediments associated with increased risk of WD infection

Detection of the whirling disease parasite in the United States (1956-2007)



■ The whirling disease parasite has been detected in a hatchery or in the wild

□ The whirling disease parasite has never been detected

Lees Ferry WD History

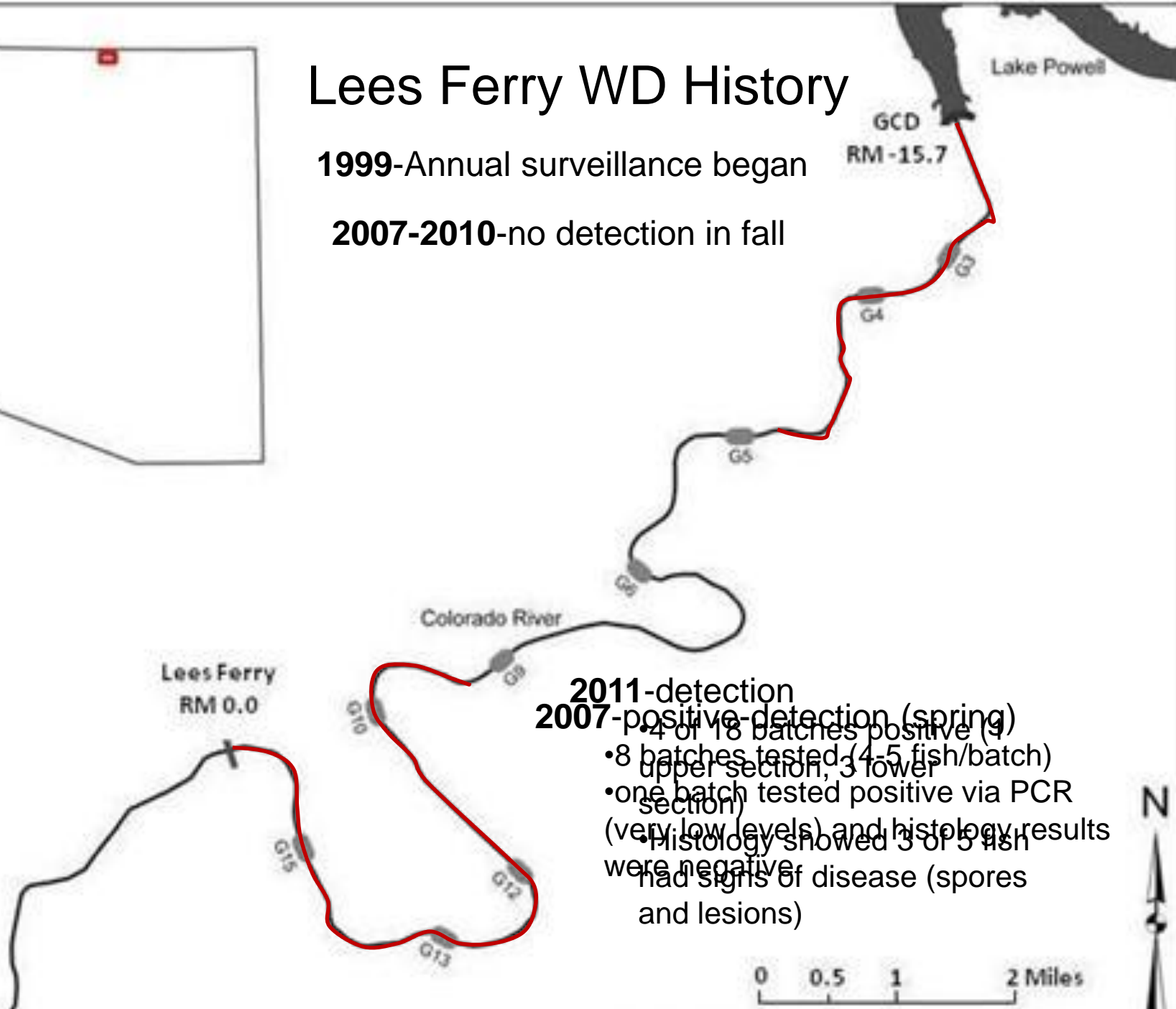
1999-Annual surveillance began

2007-2010-no detection in fall

2011-detection

2007-positive detection (spring)

- 4 of 18 batches positive (9 upper section, 3 lower section)
- 8 batches tested (4-5 fish/batch)
- one batch tested positive via PCR (very low levels) and histology results were negative
- Histology showed 3 of 5 fish had signs of disease (spores and lesions)



0 0.5 1 2 Miles

Questions?



Removal Efforts

- Removal estimate 15-60k fish
- ~70% < 6 inches
- 2003-2006 removed ~23k fish

Rainbow Trout Length Frequency

