A State UNDER SIEGE

Aquatic nuisance species are poised to invade Montana from every direction. What the state is doing to keep them at bay.

BY BERNIE KUNTZ AND TOM DICKSON

It was a scene Jay Stafford hopes to never see again. In early June 2002, the Colorado Department of Wildlife fisheries biologist was called out to Prewitt Reservoir, a popular 2,500-acre fishing lake in that state's northeastern region. Anglers were reporting dead walleyes, sauger, and other fish washing up on shore.

"By the time I got there, it appeared to be a complete fish kill," says Stafford. "There were windrows of dead fish as far as the eye could see, 20 to 30 feet wide."

The culprit was a deadly organism called golden algae. First identified in Israel, it showed up in 2000 in Texas, where it has damaged fisheries throughout the state. In Iowa, where it has since spread, golden algae has wiped out entire fish populations. The algae secretes a potent neurotoxin that quickly enters the bloodstream of fish to cause asphyxiation. No one is sure how it spreads, though boat bilges, bait buckets, livewells, and bird plumage are all suspects.

Golden algae is one of several dozen dangerous aquatic nuisance species now threatening western states. From Washington to New Mexico, federal, state, and local fisheries officials are scrambling to prevent these biological pollutants—already rampant in much of the South, East, and Midwest—from reaching or further infesting western waters. The biggest threats to Montana are the zebra mussel, now causing millions of dollars of damage each year in other states; the New Zealand mudsnail, which blankets riverbeds and threatens trout fisheries; and Eurasian watermilfoil, which covers shallow bays and lakes with thick vegetation mats, rendering them unfit for swimming and boating.

Just as alarming as their threat to industry and recreation, these harmful foreign organisms permanently damage natural areas by displacing native species and lessening biological diversity. Large ecosystems may be permanently altered by a single species. Some may even suffer what scientists are calling an "invasional meltdown," in which each successive invader appears to make success by another all the more likely.

As the world shrinks and more and more people travel, aquatic nuisance species come along for the ride, clinging to boats, propellers, and wading boots and surviving for weeks in bait buckets and livewells. With the Lewis and Clark Expedition bicentennial fast approaching, officials in Montana and elsewhere in the West are taking steps to ensure the influx of tourists retracing the explorers' steps don't unwittingly transport foreign plants and animals into waters here.

BALLAST BORNE

Aquatic nuisance species are nonnative plants or animals that take over lakes and rivers and damage ecosystems, recreation, and the commercial use of waters. Many reach North America

LIQUID CLOGGER: Hydrilla, an exotic plant spreading west from southern states, clogs irrigation ditches and swimming and boating areas.

USDA APHIS NORTH CAROLINA ARCHIVES

Montana's least wanted

Biological pollutants can devastate fish populations, ruin swimming and boating areas, damage industrial and recreational equipment, and irrevocably harm natural ecosystems.

Here are the top seven aquatic nuisance species that state officials and conservationists fear will either enter the state or spread widely within Montana's borders:

WHIRLING DISEASE

WHIRLING DISEASE FOUNDATION

Problem: Reduces trout populations.

ID: Yearling trout with bent spines.

ZEBRA MUSSEL

USGS

Problem: Clogs water pipes, disrupts lake ecosystems, ruins boat engines.

ID: A small D-shaped clam with dark "zebra" stripes. Attaches to underwater surfaces.

NEW ZEALAND MUDSNAIL

MINNESOTA SEA GRANT

Problem: Covers stream and river. bottoms, crowding out aquatic insects.

ID: A tiny water snail ranging in size from a grain of sand to ⅛ inch long.

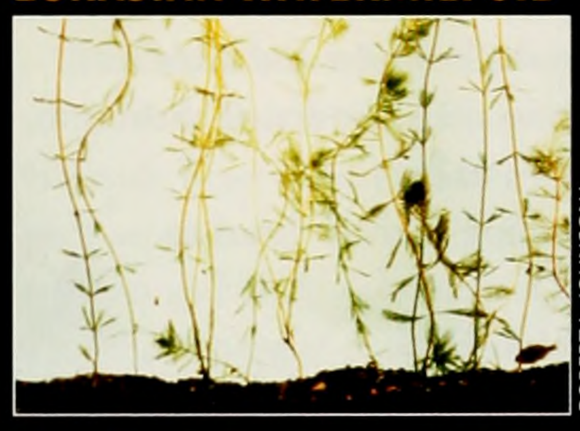
HYDRILLA

USDA ARS ARCHIVES

Problem: Clogs irrigation canals, interferes with swimming and boating.

ID: A long, sinewy underwater plant with tiny white flowers that grow on long, thin stalks that poke up from the water surface.

EURASIAN WATERMILFOIL



ROBERT L. JOHNSON/ CORNELL UNIVERSITY

Problem: Floating mats displace native vegetation and interfere with boating.

ID: An aquatic plant that grows near the surface. Upper portion often turns reddish. Stems near surface form a dense mat.

ASIAN CARPS

USDA APHIS NORTH CAROLINA ARCHIVES

Problem: These four carp species (bighead, black, grass, and silver) displace native fish.

ID: Unlike common carp, these new species lack barbells.

SPINY WATER FLEA

MINNESOTA SEA GRANT

Problem: Causes declines in native zooplankton and disrupts fisheries.

ID: Tiny organisms that form gelatinous globs on fishing line knots.

from other continents in the ballast water of sea-going ships. Once here, they spread by way of recreational boats, wading boots, and the aquarium and gardening trade. With no natural predators, the newcomers often spread quickly and muscle out native fish and plant species.

Enemy number one for Montana is the zebra mussel. The striped, thumbnail-sized species was first discovered in the Great Lakes in the 1980s, having been inadvertently introduced through ballast water released there by ships returning from Europe. Zebra mussels have since spread into most eastern river systems and are moving steadily west. The aggressive mussel reduces food and oxygen for native species and completely covers native mussels, clams, and snails. In dense colonies of up to 700,000 individuals per square meter, zebra mussels also coat the hulls and engines of boats, causing internal damage and requiring costly cleanup.

Zebra mussels are a particular threat to industry. The species clogs water intake pipes and disrupts water purification and electrical plants. PPL-Montana, which owns and operates a dozen hydropower facilities in the state, is particularly concerned about the threat zebra mussels pose.

"They can cause a lot of operational problems, get into plant systems, and cause major downtime," says Frank Pickett, a PPL-Montana aquatic biologist.

Another potential threat is Eurasian watermilfoil, an aquatic plant that spreads rapidly and clogs swimming and boating areas. Milfoil forms thick underwater stands of tangled stems and vast mats of vegetation at the water surface. The species is now just a few miles from the Montana border, in Idaho's Hayden Lake. FWP fisheries staff fear what could happen if the aggressive water weed crosses the border.

"It could establish in shallow bays on Flathead Lake, the valley floor lakes in Libby, and the Thompson chain of lakes in the Flathead Valley," says John Wachsmuth, fisheries technician. "That could definitely affect property values on those lakes."

Milfoil reproduces by a process called

Bernie Kuntz is an FWP information officer at Bozeman. Tom Dickson is editor of Montana Outdoors.

fragmentation. The plants easily break into small pieces, and each piece can form roots. In one year, a single stem fragment can multiply into 250 million new plants.

Already damaging Montana waters is the New Zealand mudsnail. The mudsnail first showed up in Montana in 1995 in the Madison River, after being identified the previous year in Yellowstone National Park. In the park, the water snails have rapidly spread to the Firehole and Gibbon Rivers, and in Montana they have since been found in the Yellowstone (1996) and Missouri (2000). Pat Clancy, an FWP fisheries biologist at Ennis, says Madison River infestations upstream of Hebgen Reservoir are now as high as 300,000 individual snails per square meter.

Mudsnails pose a threat to Montana's aquatic ecosystems because they have no predators and are phenomenally productive. Like weeds in a garden, they can take over a river bottom, crowding out mayfly nymphs, caddis pupae, and other native river invertebrates. Reproduction is rapid because New Zealand mudsnails clone themselves.

"Our biggest fear," says Tina Proctor, Rocky Mountain regional ANS coordinator for the U.S. Fish and Wildlife Service, "is that the mudsnail will soon begin to affect trout and other fish species."

This tiny pest—its shell length is only ⅛ inch long—feeds mainly on algae, also the food source of mayfly nymphs and caddis pupae. But the snail's fertility allows it to outcompete the native invertebrates. In some Yellowstone National Park river sections, the mudsnail now comprises up to 90 percent of the invertebrate biomass.

"That news is particularly worrisome for those of us watching the Missouri and other rivers that already have a low diversity of aquatic insects," says Travis Horton, FWP fisheries biologist at Great Falls.

It gets worse. The little invaders provide little nutritional value for fish. By closing a "trap door" in their shell, mudsnails can pass through trout and bird digestive tracts unharmed.

Another ANS well-entrenched in many Montana waters is the invasive microscopic parasite responsible for whirling disease. The parasite primarily infects small trout soon after they hatch in a stream and consumes cartilage, causing severe deformities in the head and vertebral column. When severely infected fish try to flee predators, the spinal deformity causes them to swim in a "whirling" fashion. The mortality rate of highly infected young trout can be as high as 95 percent. This tiny parasite, which scientists have named *Myxobolus cerebralis*, was accidentally imported in the 1950s from Europe, where it is native. Within the United States, whirling disease has been transported in the mud of anglers' waders, by boats and trailers, and even in the feces of birds.

The most severe infestations in Montana were in the Madison River during the mid-1990s, causing rainbow trout populations to decline by 80 percent. It has since been discovered in more than 100 Montana wild trout rivers, including the Beaverhead, Big Hole, Blackfoot, Clark Fork, and Smith. In recent years, the disease has also severely infected a major spawning tributary of the upper Missouri.

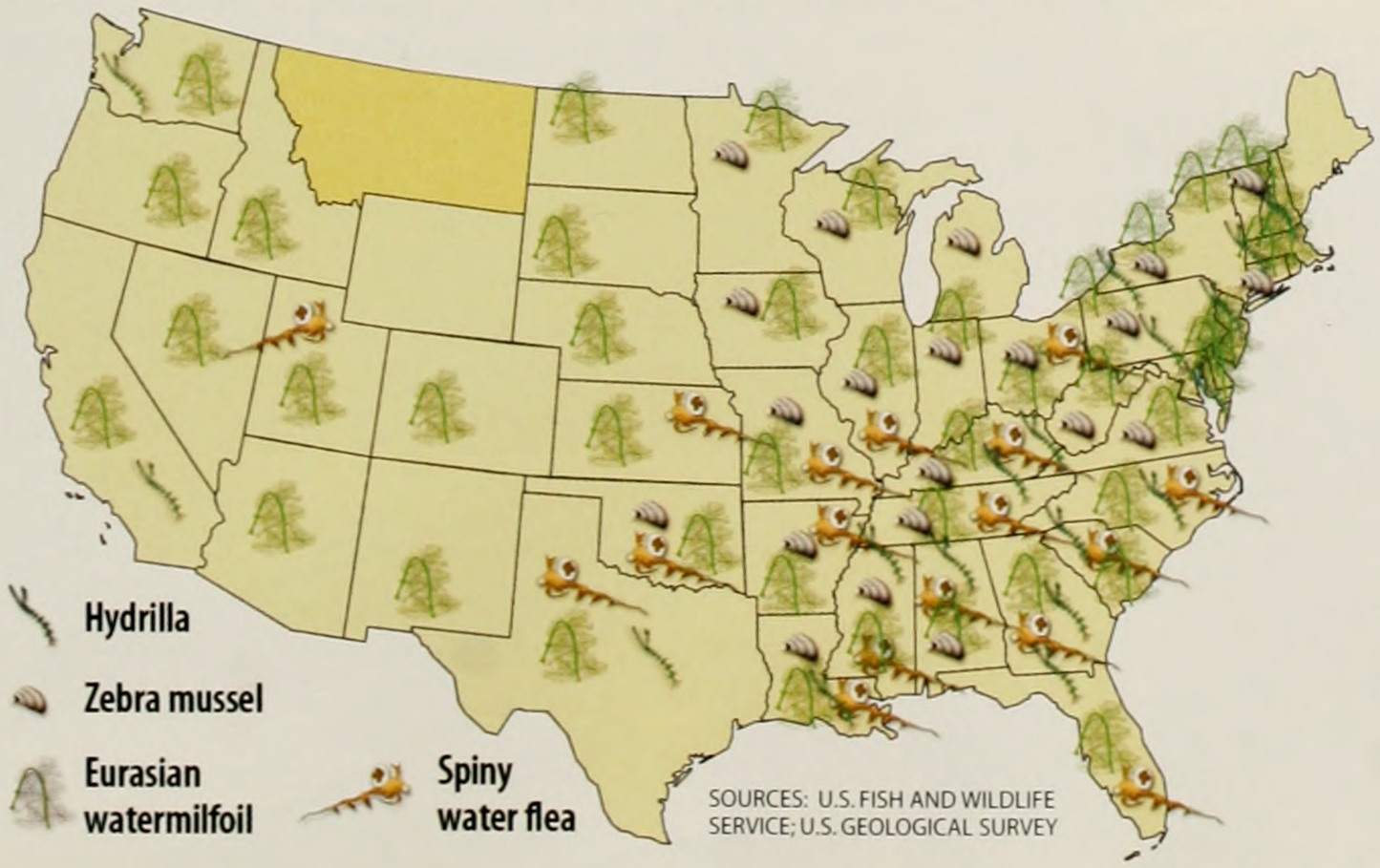
"The parasite probably never will be eradicated from our wild trout waters, and we will have to find ways to live with the disease," says Dick Vincent, who coordinates whirling disease research for FWP.

MINNESOTA SEA GRANT

MUSCLING OUT THE COMPETITION: Zebra mussels can completely cover and kill native mussels. The fast-spreading species can also cover boat hulls and engines, clog industry water intake pipes, and litter swimming beaches with their sharp shells.

Heading soon to a lake, stream, or river near you

Most aquatic nuisance species came to the East Coast or Great Lakes from Europe or Asia in the ballast water of ocean-going ships. They have since spread west, carried by boaters, anglers, and garden supply stores. So far, Montana has escaped some of the worst infestations.



MONTANA OUTDOORS

Another threat are the several species of invasive Asian carp moving ever closer to Montana waters. The bighead carp has moved up the Mississippi River into the lower Missouri River in South Dakota. Filter feeders, the aggressive and productive bigheads outcompete paddlefish and other species that live on zooplankton. Eventually, these and other carp species can completely dominate a fishery. A fish kill on the Mississippi River in 2000 showed that 97 percent of the fish biomass consisted of bigmouth, silver, and black carp.

And the list continues: The spiny waterflea, round-nosed goby, purple loosestrife, hydrilla, and dozens of other species are spreading within Montana or have the potential to cross the border and begin infestations.

Tim Gallagher, who currently leads FWP's efforts to manage aquatic nuisance species, compares the harmful water invaders to termites in a wooden house. "They are busy working away below the surface, doing their destructive thing," he says. "By the time we realize they are there, it can be too late."

WHAT'S BEING DONE

Preventing new infestations is the primary goal of a new state aquatic nuisance species state management plan. Written by an advisory committee representing anglers, industry, landowners, agencies, and other interests, the plan will help FWP and other state and federal agencies lessen the ecological, economic, and social damage of nuisance species. Having a plan in place also qualifies Montana for federal grants.

The state's top concern is to keep new species out of Montana. According to one of the nation's top experts in nuisance species control, that's a smart strategy.

"Once they get into your state, they're pretty much impossible to eliminate," says Jay Rendall, Exotic Species Control Program coordinator for the Minnesota Department of Natural Resources. "Once they're in, about all you can do is work on containment."

Which is why Montana is focusing attention on the zebra mussel, Eurasian watermilfoil, hydrilla, and a handful of other potential eco-invaders not yet detected in Treasure State waters.

The next level of concern are those species now in Montana that have a high potential to spread, such as the New Zealand mudsnail, whirling disease, and purple loosestrife. Though it's not possible to totally eradicate mudsnails and other invaders that have gained a foothold here, some species can be controlled with chemicals or by altering habitat. And biological controls have been shown to work in other states, such as beetles imported from Europe to devour invasive purple loosestrife choking Midwestern wetlands.

Though Montana's aquatic nuisance species plan is relatively new, much work has already begun. More than a dozen fed-

NZ MUDSNAIL BY FEDERATION OF FLY FISHERS/WWW.FEDFLYFISHERS.ORG

> "Our biggest fear is that the New Zealand mudsnail will soon begin to affect trout and other fish species."
>
> —Tina Proctor, *U.S. Fish and Wildlife Service*

ROBERT L. JOHNSON/CORNELL UNIVERSITY

KEEP OUT: Officials worry most about aquatic nuisance species (such as Eurasian watermilfoil, left) that haven't yet crossed Montana's borders. "It's far less expensive to prevent introductions into your state than to try to do control afterwards," warns one Minnesota expert. Case in point: whirling disease, which infects young trout (bottom) and so far has been discovered in 100 Montana waters. Visitors following the Lewis and Clark Trail (far right) in 2004-05 could accidentally carry even more nuisance species into the West from infected states.

WHIRLING DISEASE FOUNDATION

eral and state agencies and private nonprofits, from the U.S. Army Corps of Engineers to the Montana Native Plant Society, are coordinating knowledge and plans to help reduce the threat. One example is the development of a rapid response plan, which, like those for wildfires and earthquakes, would coordinate efforts among agencies, Indian tribes, businesses, and citizens' groups if an infestation broke out. FWP, Montana State University, and other state organizations are also now assessing the presence of aquatic nuisance species in Montana, identifying potential pathways and high-risk waters, conducting surveys, and increasing research. FWP constantly monitors fish populations, which helps biologists spot new infestations, and the agency will soon hire a full-time coordinator to manage its statewide aquatic nuisance species prevention and control activities.

Public agencies can't do it alone, however. Invasive species can arrive and spread in countless ways, from boats arriving from other states and garden centers that sell species such as purple loosestrife, to fish farms and private ponds.

"Montana only has a handful of biologists to manage this issue, and it's just not enough," says Gallagher. "We definitely need the public's help."

In an effort to involve citizens, FWP will soon begin recruiting volunteers to monitor lakes and streams for aquatic nuisance species. "We want it to be like the Adopt-a-Highway Program that keeps highways clean," Gallagher says. "Only this would be to keep Montana's waters clean."

To spread the word, FWP and other organizations have begun printing signs, posters, and brochures alerting citizens and visitors about the threat posed by biological invaders. A new sign on U.S. Highway 2 urges drivers arriving from Idaho to tune into radio station 1600, where they will hear about aquatic nuisance species and how to avoid spreading the invaders. FWP is setting up more of these traveler information systems along U.S. Highway 191 from West Yellowstone, U.S. Highway 2 on the North Dakota border, and I-94 at Wibaux.

While Montana encourages tourists to visit, some officials say they are worried about the arrival of biological invaders inadvertently carried by visitors tracing the Lewis and Clark Trail in 2004 and 2005. Tens of thousands of boaters are expected to retrace the explorers' journey west, and the fear is that many of those craft will unintentionally carry zebra mussels and other harmful exotic species.

"We are real concerned about the amount of aquatic nuisance species coming into the West from eastern states," says Proctor.

Getting travelers to change their behavior (see sidebar, right) will be key to combating the spread of aquatic nuisance species.

Bob Wiltshire, director of conservation programs for the Livingston-based Federation of Fly Fishermen, thinks it's possible. Having followed the nuisance species issue for years in Montana and other states, Wiltshire believes that once people become accustomed to removing plants and mud from their gear before leaving a lake or river, or washing equipment when they get home, it will become second nature.

"It's like with efforts to end littering," Wiltshire says. "Twenty years ago, the average angler would think nothing of leaving a worm container or fishing line on the bank, but today you almost never see that. People just don't litter much anymore, and our hope is that soon they won't spread aquatic nuisance species, either."

MONTANA OUTDOORS

MINNESOTA SEA GRANT

BLAST 'EM: The best way for boaters to avoid spreading aquatic nuisance species is to wash their equipment with hot, pressurized water after each trip.

STOPPING THE SPREAD

Don't carry aquatic hitchhikers

Always drain water from equipment (boat, motor, livewell, bilge, and transom wells) and remove all visible plants, mud, and animals from your boat, trailer, and other boating equipment before leaving any lake or river.

Clean your equipment

Clean and dry anything (boat, equipment, clothing, waders, dogs, etc.) that came into contact with water before transporting it to another lake or river. Rinse with hot tap water, spray with high-pressure water such as at a car wash, or dry for five days.

Don't biologically pollute

Never release plants, fish, or animals into a lake or river unless they came out of that same lake or river.

Keep your eyes open

Learn to recognize nuisance species. Look for them in waters where you fish, boat, or hike. If you see one, call Montana FWP at (406) 444-2449.

Spread the word (not the pest)

Start talking about aquatic nuisance species. Discuss the problem and solutions with friends and fellow members of fishing and conservation groups.