

---

# STOPPING THE SPREAD OF NEW ZEALAND MUDSNAILS

---

**AN ANGLERS GUIDEBOOK  
TO IDENTIFICATION  
& DECONTAMINATION**



# INTRODUCTION

The New Zealand mudsnail (NZMS) (*Potamopyrgus antipodarum*) is an aquatic invasive species that has appeared in Great Lakes streams only recently. Native to streams and lakes of New Zealand, they have spread across the globe, establishing populations throughout five continents. In North America, NZMS were first discovered in the Idaho's Snake River in 1987. Since, they have been rapidly expanding their range across the American West and into the eastern part of the country. One type of NZMS has been found in the Great Lakes (proper) for more than two decades, but in 2015 a new type (linked to western US rivers) was detected in Michigan inland streams and rivers.

**MUDSNAILS ARE ESTABLISHED IN FOUR OF THE GREAT LAKES, AND FIVE RIVERS IN MICHIGAN.**



**MUDSNAILS CAN BE SPREAD BY ATTACHING TO BOATING AND FISHING EQUIPMENT. WITHOUT NATURAL PARASITES AND WITH FEW PREDATORS, MUDSNAILS ARE INVADING TROUT STREAMS ACROSS THE STATE.**

This new invasion is of great concern given the impacts they have had in some western rivers. NZMS have been found to achieve extremely high densities in the rivers they colonize and coupled with rapid growth rates, they can utilize a significant percentage of available food resources. This can have consequences to the overall river ecosystem including insect and fish communities. NZMS appear to provide very little nutritional value to trout (with evidence of NZMS remaining alive while passing through the digestive system of trout that consumed them).

New Zealand mudsnails occupy a wide range of habitats, anywhere from freshwater streams and lakes to brackish waters such as estuaries. They can also tolerate many environmental stressors such as desiccation. Studies have shown NZMS can survive in damp and non-freezing conditions for up to 50 days, making them easy to transport to new locations. Their relatively small size (averaging about 1/8 of an inch at adulthood), and cryptic coloration (light-dark brown in color), NZMS can be difficult to detect and easily overlooked in rivers.

# ANATOMY OF A MUDSNAIL



- Cone-shaped shell
- 5-6 whorls
- Opening on right side (with shell pointed up)
- Individuals found in Michigan are light to dark brown
- The snails measure 1/8" – about the size of a grain of rice

Female NZMS can produce hundreds of clonal offspring asexually—without male counterparts—in a single year. This means that a single individual mudsnail can start a new population in uninvaded waters. Yes, this means that just one NZMS, the size of a grain of rice, left undetected on a wading boot, could be introduced into another trout stream and lead to a colonization of NZMS sufficient to impact the health of that entire fishery.

## PHYSICAL DECONTAMINATION TECHNIQUES

Decontamination practices are essential, because NZMS and other aquatic invasive species (such as Didymo Rocksnot) can be present on your gear without you seeing them, and because introducing them into another stream could be the demise of it. If you want to help protect our trout streams, the following information will help you adopt routine decontamination practices.

- 1. Clean all gear before leaving your fishing site by scrubbing gear with a stiff bristled brush and rinsing with water, preferably high-pressure. This is often the simplest and most effective for prevention.**
- 2. Inspect your gear before it is packed for transport. Visible traces of sand, mud, gravel, and plant fragments are signs that your gear has not been properly cleaned and mudsnails may be still be present.**
- 3. Use dedicated equipment for watersheds that have New Zealand mudsnails, including: boots, waders, nets and other equipment that comes in contact with the water.**

In addition to cleaning and inspecting your gear, use one of the following decontamination methods to stop the spread.

- 4. Freeze your gear for a minimum of 8 hours to kill all mudsnails. Freezer temperatures should be at 26°F (-3°C) or below. Richards (2004)**
- 5. Soak gear in a bath of hot water at least 120°F (40°C) for 2 hours. This method is not advised for Gortex. Richards (2004)**
- 6. Dry your gear before reuse. Minimum air exposure time of 53 hours for effective decontamination for equipment and boats. Alonso (2012)**

# CHEMICAL DECONTAMINATION TECHNIQUES

Common disinfecting cleaners containing quaternary ammonium compounds (QACs) are effective for killing mudsnails. Commercial disinfectant solutions containing quaternary ammonium compounds, for example Formula 409® Cleaner Degreaser Disinfectant, have been proven effective for killing mudsnails. Diluted concentrations of Formula 409® have inconsistent results, but at 100% concentration Formula 409® has been consistently effective at killing mudsnails. The compounds Quat 128® and Sparquat 256® are commercial disinfectants with an active ingredient similar to that of Formula 409® Cleaner Degreaser Disinfectant, which has proven effective for killing mudsnails and other aquatic invasive species.

Typically, soaking gear in solutions of these chemicals is recommended. For example, use of Virkon Aquatic is recommended at 30 minutes with 20 g/L concentration, then rinsed. Store and dispose of solution and rinse water properly. Virkon Aquatic has the benefit of having been tested as effective at killing NZMS as well as other invasives such as Didymo rocksnot, however, you must order it online at this time, in 10 lb containers (so anglers may consider placing an order and sharing it among family or friends who fish).

Researchers at Oakland University in Michigan, recently tested the efficacy of liberally spraying Formula 409 on NZMS infected surfaces, leaving it for 20 minutes and then rinsing. This method was found to be 100% effective in the laboratory tests. Geist et al. (unpublished). This method therefore represents a readily available product, applied in a feasible manner. This method should be considered when switching between rivers during the same day or trip, or after fishing infected areas or other high transmission risk scenarios. Mud and debris can interfere with effectiveness of chemical disinfectants so cleaning is again recommended before chemical application. Gear should be rinsed after treatment, away from waterbodies. De Stasio et al. (2019)

## SCENARIOS: Building A Toolkit That Works For You

In combination, the decontamination techniques of “clean, rinse & inspect”, drying, freezing, hot water soak, and chemical disinfectants offer a “toolkit” that can be used singly or in combination, to offer a means of all anglers readily decontaminating their gear and helping to prevent the spread of NZMS into new rivers. To illustrate but a few examples of how they can be used, we offer a few examples of common fishing scenarios and how one might use the toolkit of decontamination techniques.

**#1 The Home River:**

If an angler primarily fishes one stream or section of stream (e.g., you own a cabin on a trout stream), consider leaving a pair of waders designated for use only there. This will primarily preclude the need to treat this set of equipment. Occasional trips to fish somewhere else, can be done in a different set of equipment. This is even more important if your primary fishing location is on an infected stream.

**#2 The Occasional Angler:**

Most of us do not make it out nearly as often as we'd like, and while that is a regret, it can also reduce the burden of decontamination. After a trip, consider putting a small label of some type on your waders, and note the date of the last use. Hang the waders up to dry, and do not leave them wet and packed tightly into a wader or gear bag. Upon your next trip, you can see if the gear has had sufficient time to dry out and kill NZMS, and if so, no additional decontamination is needed.

**#3 The Expensive Wader Owner:**

While most breathable waders have a limited lifespan, even under normal use, there are valid concerns about long term repeated use of chemicals on waders. If you are a frequent angler and or you fish waters that are infected or are high risk of infestation, consider the following. Separate wading boots are tougher and more durable and can stand up to higher pressure rinsing and chemical treatment. However, if you are concerned about those expensive breathable waders, consider things like more diligent scrubbing, rinsing and inspection and freezing the waders overnight.

**#4 The Traveling “Long Weekend” Angler:**

Maybe its trout opener and you plan to hole hope between many favorite trout streams in one weekend. Or perhaps you are headed for a weekend of steelhead angling in West Michigan and will likely try out several different close rivers during the trip. In this scenario, you pose a high risk of spreading NZMS.

# SCENARIOS:

## Building A Toolkit That Works For You (Continued)

**First**, fish rivers that are not known to be infected first and save the known infected rivers for last. The list of known infected rivers will change through time, and rivers can be infected but not yet detected. But, to the extent practicable, fishing infected streams last can reduce risk of spreading NZMS.

**Second**, build a travelling decontamination kit for the back of your car. Buy a plastic tub with tight lid, big enough to fit your waders, boots and gear (have a spray bottle of 409 and small plastic bucket or gallon of water, and a scrub brush in it). Upon leaving one location, clean, rinse and inspect your waders by the river, then in the parking lot give your waders and boots a liberal spray of 409 cleaner over all the exposed surfaces, roll the top of the waders to seal the insides, and place them in your tub. When you get to your next spot, in the parking lot (away from the river), use the gallon of water, or the small plastic bucket and river water, to rinse your gear off.

**There are many basic tools to decontaminate your fishing gear effectively. In every scenario cleaning rinsing and inspecting is the first line of defense. After that, consider your fishing behavior and apply either drying, freezing, hot water soaks, or chemical decontamination techniques as appropriate for the situation.**

Anglers are the most likely means of NZMS being distributed to more trout streams. With probable negative impacts of NZMS and no known treatment to remove them once infested, anglers are also the most likely means to stop their spread. Your efforts towards this could literally save your favorite places.





# SUMMARY

New Zealand Mudsnaills (NZMS) are easily transported by fishing equipment. Once introduced to new waters, there is no treatment available, and impacts to fisheries can be significant. Anglers decontaminating their gear is our best line of defense against the spread of NZMS and other aquatic invasive species.

**INSPECT** your gear and remove attached plants, animals and mud. **CLEAN** your waders and boots with a brush to help remove hard-to-see invasive species like New Zealand mudsnails. **DRAIN** all of the water from your equipment. **DRY** your equipment for as long as possible. **DISPOSE** of unwanted bait in the trash and transport fish caught for eating or taxidermy on ice.

Assess Risk. When and where will you fish next?

**Lower Risk:** If you've finished fishing for the day and your next trip is more than five days away, inspecting, scrubbing and air-drying gear greatly reduces the risk of transporting invasive species.

**Higher Risk:** If you are fishing in multiple bodies of water on the same day or plan to fish again in less than five days, consider taking extra steps to stop invasive species:

1. Consider fishing in locations without known invasive species first and fishing in locations with invasive species last (nas.er.usgs.gov can help you determine where invasive species occur).
2. Consider using different waders on new bodies of water, freezing your gear or using a chemical treatment on your gear before visiting a new stream.



**Scan here for a live, interactive map that shows NZMS detection in Michigan and Great Lakes.**



## WHO ARE WE?

Founded in Michigan in 1959, Trout Unlimited today is a national non-profit organization with 300,000 members and supporters dedicated to conserving, protecting and restoring North America's coldwater fisheries and their watersheds. Our staff and volunteers work from coast to coast to protect, reconnect, restore and sustain trout and salmon habitat on behalf of today's anglers and coming generations of sportsmen and women who value the connection between healthy, intact habitat and angling opportunity.

## ACKNOWLEDGEMENTS

This guidebook was prepared by Michigan Trout Unlimited, in partnership with Oakland University, and made possible by the generous support of the C.S. Mott Foundation and the Joyce Foundation

The following individuals helped in preparation of the guidebook: Taylor Ridderbusch, Jeremy Geist, Scott Tieggs and Bryan Burroughs.

Reviews of the guidebook were provided by numerous staff at the Michigan Departments of Natural Resources and Environment, Great Lakes and Energy.



**TheJoyceFoundation**