

Sarah Coney

Student Corner

Aquatic Invasive Species

From pristine mountain top lakes to gently flowing brooks, North America is home to a multitude of beautiful lakes and rivers. Many people appreciate waterbodies for their recreational uses or for their picturesque views. But what happens when our love for our waters ends up irreparably harming them? One of the biggest threats North American waterbodies face is from aquatic invasive species (AIS).

For the last three years I have been working as the assistant director of the Catskill Regional Invasive Species Partnership's (CRISP) Watershed Steward Program (WSP) to help prevent the spread of AIS in NY waterways. We have a dedicated team of stewards who seek to educate the public about the threats AIS pose, and to help them clean, drain, and treat to prevent the spread of AIS. I also work with the invasive Rusty Crayfish (*Faxonius rusticus*) as part of my thesis studying American eel (*Anguilla rostrata*) and native pearly mussels. Preventing the spread of AIS and educating the public about their dangers has been a major part of my life for the last four years and it is a topic I love to talk about.

An invasive species is any non-native species that causes environmental or economic damage or are harmful to human health. Invasive species often cost millions of dollars to control or eliminate. Invasive species tend to reproduce quickly and establish populations rapidly. AIS have no controlling herbivores or predators in the native ecosystem which allows their populations to grow out of control. These introduced species will then compete with native species within the same niche for resources, often outcompeting the native species. Invasive species can lead to declines in biodiversity, alter habitats, and can even

eradicate native populations in areas where they are introduced (USDA 2019).

But how have so many of these non-native and exotic species made it to North America? AIS have been introduced through a multitude of vectors including ballast water, the aquarium trade, transient watercraft and other recreational gear. Unfortunately, more AIS are always being discovered.

The Great Lakes are a hot spot for North American introductions due to the high volume of ships moving in and out of those basins. Many larger ships use ballast water to provide stability, taking in or releasing water to adjust as the boat needs. When these ships take in water they can also take in and transport plants and animals (USDA 2019). Zebra mussels, native to the Black Sea in Eastern Europe, were brought to the Great Lakes in the 1980s through ballast (Ecochlor, n.d.). Another native to the Black Sea, the Round Goby (*Neogobius melanostomus*) was also brought into the Great Lakes through ballast water and has since become an aggressive invasive species in that system. Luckily, the threat that ballast poses to our waterbodies was recognized and the International Convention for the Control and Management of Ships' Ballast Water and Sediments was established in 2004 by the International Maritime Organization (IMO, n.d). All ships are now required to meet ship-specific ballast water and sediment standards to reduce the risk of introductions (IMO, n.d).

Posing just as much a threat, if not greater, to North American waters is the exotic pet trade. Many people delight in brightly colored foreign flowers and unique exotic pets, however, what happens when we get bored of our aquariums or they're too expensive to maintain? Unfortunately, many

people simply dump their aquariums into whatever waterbody is closest. While many species will die, those that do manage to survive in this new environment thrive. Goldfish (*Carassius auratus*) are a prime example of cute pets wreaking North American native ecosystems. Goldfish and koi are in the same genus as the invasive common carp (*Cyprinus carpio*) and same family (Cyprinidae) as Silver and Bigheaded carp (*Hypophthalmichthys molitrix* and *H. nobilis*) and can be just as destructive when released. Carp are voracious herbivores or omnivores, disturbing benthic sediments as they forage and physically altering ecosystems to which they are introduced.

Asian clams (*Corbicula fluminea*), originally brought over as a food source by Asian immigrants (USDA 2019), were quickly adopted by aquarists as excellent water filterers. However, they are simultaneous hermaphrodites (having both male and female reproductive systems) and reproduce rapidly. A single mature clam can create and fertilize thousands of eggs per day. The environmental and economic impacts of Asian clams are astonishing: they out compete native bivalves, smother the benthic habitat, and cost billions of dollars for control and damage mitigation. Many states in the U.S have banned their sale but stores still sell them under various names (golden clams, filtering clams, etc.) and online.

Animals are not the only threat stemming from pet stores; invasive plants are regularly found being sold in pets stores or online. Perhaps the most well-known plant introduced through the aquarium trades is widely spread Brazilian elodea (*Egeria densa*). Sold as a good oxygenator, it became popular in aquaria and was quickly spread

throughout North America. Brazilian elodea grows fast and creates dense mats that negatively impact the ecosystem and recreation (USDA 2019). It was further spread by motor boats, becoming tangled in props and boat trailers and hitchhiking to new waterbodies.

Recreational boats and gear are another major vector for the transport of AIS. Boats offer all sorts of nooks and crannies in which invasive species can stow away. While some are obvious (plants entangled in a prop or on your trailer, zebra mussels attached to your hull, *etc.*) others are far less noticeable. Small bodied invertebrates are easy to miss but can have huge impacts on North American waters. Invasive bivalves start as small larvae, called veliger larvae, and are nearly impossible to see without a microscope. They can be found on watercraft hulls, in any pools of water, or even in gear that can hold water and they can persist for about a week in a wet environment. Spiny (*Bythotrephes longimanus*) and Fishhook (*Cercopagis pengoi*) waterfleas, both introduced to the Great Lakes from Eurasia, have rapidly spread throughout Northeastern North America due to their small size, which makes them very hard to spot. They pose a significant threat to native ecosystems by changing zooplankton community structure and competing with small native fish (USDA 2019). Waterfleas are hard to see on their own but tend to become stuck on lines dragged through the water (i.e., fishing lines, mooring lines, etc.) and accumulate, forming translucent blobs. Fishing line is the main culprit for transport of waterfleas, which can persist up to two weeks in a wet environment. Both species can reproduce sexually or by parthenogenesis (females can produce genetic clones) and do so rapidly.

Invasive plants have been spread efficiently by boats as well. Hydrilla (*Hydrilla verticillata*) was first introduced to Florida in the 1960s (possibly by aquarists) and has since spread rapidly (Gray 2014). While many thought hydrilla would be confined to warmer waters, a monoecious (having both male and female reproductive organs) biotype was introduced in the 1980s and has since spread rapidly north (Gray 2014). Hydrilla grows aggressively and can easily out compete native species, creating

large mats at the surface and shading out the competition. What makes Hydrilla so threatening is its ability to spread by fragmentation. Hydrilla is a fragile plant that breaks apart with the slightest disturbance, those fragments float along the current before growing roots and eventually sinking, creating a new bed of hydrilla far down stream or on the opposite side of the lake.

So, what can you do to prevent the spread of AIS? Always remember to Clean, Drain, and Treat!

Clean

Remove any visible debris (plants, mud, etc.) and either wash or treat your watercraft and gear. Washing any mud or debris off your watercraft and gear and leaving it out to dry in five full days of sun helps to prevent any AIS from hitching a ride to (or from) your favorite lake or river. Many lakes have boat washing stations on or near their launches to help prevent the spread of AIS.

Drain

Always be sure to drain any standing water in your boat. Be sure to drain your live and bait-wells, pull your bilge plug, and drain your engine of any excess water. Canoes and kayaks are just as capable of transporting AIS as motor boats and are a bigger threat than most realize. Canoes and kayaks are easy to transport and launch and can be brought to remote locations easily. Most kayaks have a dry compartment that never seems to stay dry and offers an opportunity for small AIS to leap to new waterbodies inaccessible to motorboats.

Treat

Five full days of sun is not always an option in the summer and when that happens treating with solutions is always an option. The four most commonly used solutions are: bleach, vinegar, sodium chloride (NaCl), and potassium chloride (KCl). Bleach is effective in killing AIS (except waterflea) but leaves a nauseating smell and stains easily. Vinegar is effective but takes about 15 minutes to disinfect and has a noticeable odor. NaCl is effective in killing AIS and can be bought in large quantities cheaply, however, it quickly corrodes metal. KCl is highly effective, and while slightly more

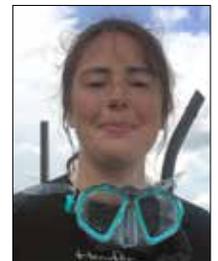
expensive than NaCl, is less corrosive to metal. Using KCl in a saturated solution (KCl + water, crystals aren't completely dissolved) to dunk gear or wipe down surfaces is a great way to prevent the spread of AIS.

Many states and providences have programs dedicated to stopping the spread of AIS. Becoming involved in your local programs can make a difference and preserve North American lakes and rivers for years to come!

References

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