ISAN
INVASIVE SPECIES ACTION NETWORK

Teachers Guide and Overview for Aquatic Invasive Species

Introduction

Aquatic Invasive Species (AIS) pose a significant threat to Montana's aquatic resources and ecosystems. AIS impacts are far reaching and cause significant ecological and economic damage. Once established in an aquatic environment AIS are impossible to control or eradicate so preventing introduction must be our top priority. This puts the responsibility on all of us to be aware of AIS, to learn what we can do to stop AIS introductions and to be responsible stewards of our waters.

Since AIS are impossible to eradicate once they are established prevention is key to keeping these harmful invaders out of Montana waters. Therefore, teaching that inspecting, cleaning and drying our watercraft and fishing gear is the cornerstone of preventing AIS introductions.

AIS Overview

AIS are non native plants, animals and microbes that are typically accidentally introduced by some form of human activity. Many but not all AIS come from Eurasia, and all are reliant on humans for spread. Most AIS reach North America as hitchhikers in the ballast water of ocean going ships and are released when ships discharge their ballast water at their destination. Most AIS introductions occur in the Great Lakes and major ports like San Francisco Bay. After introduction, AIS populations expand rapidly due to a lack of natural enemies in their new environment. They are then spread to inland waters by recreational activities.

Once established introduced species can outcompete native species, disrupt food webs and cause environmental degradation as well as significant economic impacts. In the Great Lakes, where many AIS introductions have occurred, as much as 1 billion dollars a year are spent on AIS mitigation by municipalities and industry.

Many different AIS can harm aquatic resources. A few that are of primary concern in Montana are zebra mussels, quagga mussels, didymo, VHS, and Eurasian water milfoil. The mussels have not yet been found in Montana, but didymo and Eurasian milfoil have been found in different places across the state. It is paramount to keep established AIS introductions contained, and keep the mussels from getting here at all.

The importance and urgency of the AIS issue is very apparent in our state. Montana currently has an aggressive AIS program that includes roadside and boat launch inspections to look for AIS hitchhikers on boats, a statewide monitoring program looking for AIS and a comprehensive education campaign.

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What Are Some AIS?

There are many AIS that threaten and impact Montana in a host of different ways. One problem with AIS is that they can be anything, a plant, an animal or a microbe, or disease. Each of these types of AIS has different impacts. In this guide we provide a brief description of a few of the species we are concerned about.

Zebra and Quagga Mussels

Since the discovery of zebra and quagga mussels in the Great Lakes in 1988 they have spread widely east of the 100th meridian causing irreversible damage to aquatic habitats. These small clam-like animals will attach to any hard surface and form dense colonies soon after introduction. They are filter feeders and when they reach high densities they can rob the water of essential nutrients that form the building blocks of the food chain. Zebra and quagga mussel infestations lead directly to displacement of native species, disruption of entire food webs/nutrient cycles, and environmental degradation. Mussels not only spread by adults hitchhiking on boats but also via mussel larvae called veligers. Veligers are extremely small and drift on water currents until they attach on a hard surface. A female mussel can produce up to 1 million eggs per year that develop into veligers and eventually adults.

Zebra and quagga mussels also have profound economic impacts. Agriculture, hydropower and municipalities suffer direct impact from clogged pipes, intake screens and other structures. The cost associated with cleaning up these mussels is very high. Additionally, degraded environments lead to less fishing and other recreational uses, resulting to less tourism dollars.

Didymosphenia geminata

Didymosphenia geminata (known as didymo or "rock snot") is a single celled algae that reproduces rapidly and blankets stream bottoms. It can lead to shifts in the macroinvertebrate populations and is suspected to cause declines in fish populations. Didymo is native to some northern waters where it is considered a nuisance (but not necessarily invasive) species. Didymo hitchhikes easily on angler wading gear and, in many instances, anglers are the primary method in which it is spread. Didymo is a global problem and is especially severe in New Zealand where it spread rapidly across the country causing significant damage to the tourism industry and suspected to harm fish populations.

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Viral Hemorrhagic Septicemia

Viral Hemorrhagic Septicemia (VHS) is a virus that attacks a wide range of fish species and has decimated fish stocks in the Great Lakes and Europe. VHS kills fish by causing extreme internal bleeding. There is no known cure for VHS and the virus can be transmitted in one drop of water where it can live up to two weeks. Infected fish shed the VHS virus into the water where it infects new fish. Movement of VHS from one water body to another is linked to live wells, bilge water, and bait buckets.

Eurasian Water Milfoil

Eurasian water milfoil competes aggressively to displace and reduce native aquatic plant populations. It prefers lakes but can also live in slow moving rivers. It forms dense canopies that shade other plants. It can clog water intakes and irrigation canals. It can also have impacts on fishing and boating. Spread occurs through fragments that attach to boats or boat trailers.

What can we do?

Once AIS are introduced they cannot be controlled so prevention is key. An informed, vigilant public that knows how to prevent spread is necessary as we work toward halting AIS spread. Education programs that focus on stopping AIS spread help to protect our waters and promote stewardship. The lesson plans and activities that follow provide you with classroom tools for teaching about invasives.

Remember that teaching students to be clean is the cornerstone of preventing the spread of AIS. Simply inspecting, cleaning, and drying your boat/watercraft and fishing gear after each use goes a long way. Inspect gear for mud, plants and debris picked up in the water. Clean off any and all mud or plants that are found. Lastly, dry your gear thoroughly. By doing these three easy steps we can drastically cut back on AIS spread. Please help us protect Montana's waters by teaching students and encouraging them to share their knowledge of the AIS issue with their friends, family and peers.

Other Considerations for Teaching About Invasives

As a teacher, you need to be sure you are not spreading AIS through common classroom activities. Many AIS introductions are linked to dumping aquarium contents into lakes or rivers. Aquarium fish, plants, mollusks, and water can be invasive, or hold invasives so proper disposal is very important. Never allow your students to bring captured fish or other aquatic creatures into your classroom. This is especially important to emphasize to all students that they should never capture something somewhere else and bring it home. Too often these species end up getting dumped in a local water.

Be careful when acquiring live specimens from biological supply companies. Try to stay away from exotics and properly dispose of the specimens when finished with them.

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Avoid buying exotic fish, plants, mollusks, or other species to lessen the chance of AIS introductions.

Teach students the importance of not moving water or species from place to place. It is illegal to move aquatic species from one water body to another. The water that fish are transported in may also hold AIS.

Noxious weeds are also an invasive species concern and have significant impacts on our terrestrial environments. These weeds can also have direct impacts on fish and aquatic resources including, loss of spawning habitat, loss of native vegetation, increased sediment load, loss of overhead cover, and increased water run off. Although, weeds are not the focus of the information in this guide, we encourage you to learn how to teach about weeds by visiting any of these links and incorporating the Weed Game activity included in this guide into your teaching.

http://www.mtweed.org/index.php
http://mtwow.org/
http://www.weedawareness.org/
http://missoulaeduplace.org/weeds_curriculum.shtml

Incorporating AIS Messages

An AIS message can be inserted easily during angling and aquatic education programs. A brief mention of what AIS are, the problems they cause, and how to stop their spread (Inspect/Clean/Dry) takes just a few minutes and is a great way to increase awareness. What follows are a few suggestions of where to insert an AIS message and the importance in inspecting cleaning and drying.

Fishing Program: AIS can have catastrophic impacts on fisheries. Talk with students about healthy fish populations and their benefits. Make inspection, cleaning and drying a part of every fishing outing. After the fishing activity is complete have everybody clean and dry their gear.

Aquatic Macroinvertebrate Program: Aquatic macroinvertebrates are essential to healthy food webs. AIS can have direct impacts on aquatic macroinvertebrate populations. Discuss food webs and food web disruption and ecological impacts via AIS introductions.

Fly Tying Program: An AIS message can be inserted at the beginning of the lesson when student attention is greatest. A simple mention of AIS, what they are, and the problems they cause. Also, be sure to mention inspect/clean/dry.

Helpful Links

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There is a wealth of information available about AIS and the more you learn about the problem the better teacher you will be. Here are some helpful links for learning more about AIS.
http://www.cleanangling.org/
http://www.stopans.org/
http://www.invasivespeciesinfo.gov/
http://fwp.mt.gov/fishing/guide/ANS/default.html

The Center for Aquatic Nuisance Species is available to help with any type of question.
info@stopans.org 406-222-7270

If you would like assistance in planning or implementing a classroom activity please feel free to contact the Invasive Species Action Network (406- 222-7270) or your regional Montana Fish Wildlife and Parks office.

Activities

The following are some activities and lesson plans that can help you teach about AIS. They offer fun and easy ways to get youth involved in clean angling practices for invasive species prevention. These activities are appropriate for teachers to use in a classroom setting, but all of these activities could also be used by clubs and other community groups too.

Invader Inspectors Activity

The Invasive Species Action Network developed this activity as an informational and entertaining activity to learn how youth can be involved in preventing the spread of invasive species through their activities. Youth are charged with searching for invasive species on boots, boats and other equipment.
http://www.cleanangling.org/Inspector_Kit.htm

South Dakota Game, Fish and Parks Aquatic Invasive Species Curriculum

Aquatic invasive species (AIS) education has benefits for everyone, the education of our youth on AIS issues is critical to the effective stewardship of our aquatic environment and resources into the future. The South Dakota Department of Game Fish and Parks offers an AIS teaching curriculum to compliment state teaching standards for grades 4-12. http://gfp.sd.gov/outdoor-learning/docs/edResources/SDANSLessonPlansG4-12.pdf

Bridger-Teton National Forest Activity – Invasive Species/Clogged Pipes

This activity uses simple kitchen supplies to teach youth about the damage invasive quagga and zebra mussels can cause to industrial, agricultural, municipal pipe transport systems. http://www.stopans.org/ANS_Jello_Activity.pdf