**INVADERS!** (AQUATIC INVASIVE SPECIES)

**Summary:**

In this activity, your students will learn what makes a species invasive, how they interact with native species, how detrimental they can be to a native ecosystem and how they can help stop the spread of invasive species. They will also learn about the different types of aquatic invasive species in our region.

**Vocabulary Words:**

* Invasive species – not native to an area and whose introduction has a negative economic, human health or ecological impact
* Aquatic invasive species – invasive species that lives in water
  + Zebra mussels, silver carp, rusty crayfish, Eurasian milfoil, curly leaf pondweed

**Preparation**:

1. Setup the AIS banner (NOTE: Velcro on the top and bottom of top layer)
2. Invasive species samples
3. Laminated invasive species pictures
4. Crumple sheets of newspaper or scrap paper to make at least 200 balls distributed among 3 ‘food movers’
5. Mark a circle 20 ft in diameter (give or take, depending upon space available) with tape, chalk, string, or rope. (the students will be walking in and out so make sure it won’t be tripped over)
6. In this circle, randomly place two hula hoops. Within each of the two hula hoops, stick a small piece of masking tape.
7. Identification tags: Invasive species (I), native species (N), food movers (FM), scavenger (S), and walleye

**Warm-up:**

1. Ask students to list the organisms (plant or animal) that live in the river and surrounding lakes. Keep adding to the list; hopefully some AIS will be listed (zebra mussels, purple loosestrife, silver carp, etc.), or help them along if needed.
2. Tell the story of the AIS poster. The top layer represents a healthy waterway before invasive species. It has many different species of fish, plants, bugs, mussels, etc. and there is light penetrating to the bottom and many species flying above the waters (dragonflies, bugs, etc.). Note that they are smiling. Ask the students if they think the waterway will look the same once invasive species have moved in. Slowly take one section off at a time. Do they notice a difference? Help them along if needed – point out the darker waters, less species of plants and fish, only a few bugs flying above water, etc.
3. Discuss why we consider them *invasive* species using the AIS poster and discuss how these species got here.
   * A species in considered invasive if it is not native to an area, and whose introduction has a negative economic, human health or ecological impact.
   * In this activity we will be discussing aquatic invasive species, but keep in mind that there are invasive species on land as well: buckthorn, purple loosestrife, emerald ash borer, etc.
   * These species got here by many different factors that could have been avoided:
     + ‘hitchhiking’ by plants and animals on boat hulls, fishing gear and trailers
     + ‘hitchhiking’ by invasive plants and animals that may be attached to noninvasive plant and animals ordered from nurseries, landscaping companies, etc. or in the media they are shipped in
     + Releasing of aquarium contents and aquatic pets
     + Mishandling of non-native species by research or educational facilities
     + Transporting non-native species through aquaculture, live bait and seafood industries
     + Intentionally introducing non-native species for food sources or to control other populations discharging of ballast water from commercial tankers on trans-oceanic voyagers (large commercial ships take in water from port to balance the ship during voyage. That water is usually discharged when they arrive at their destination, and sometimes that water is carrying non-native/invasive species)
4. Show the AIS samples and pictures while discussing some facts about them.
   * There are over 6500 invasive species in USA!!! Some facts about local AIS:

* **Zebra Mussels (zm)** 
  + Attach to any hard object: show picture of zm and hand out samples and point out how it attaches to *anything*: tennis shoe, shopping cart, boat propeller, intake pipe, water buoy, other aquatic species (native mussel sample, not on picture)
  + ZM are an invasive species that takes away from native species’ habitats.
  + Adults are less than 2” long (babies are almost impossible to see with human eye)
  + An adult zm can filter up to 1 liter of water per day to consume phytoplankton in the water; this takes away from native mussel food groups
  + Native mussels are sensitive to their environment because they filter oxygen and particles (phytoplankton too) from the water to feed.
  + In MN, 25 of 48 mussel species are endangered/ND only found in Red River near Wahpeton
  + Initially introduced into US waters by ships that travel the oceans. First found in Duluth, MN 1989. Now inhabits many lakes and rivers of MN and other states along the Great Lakes and the Mississippi River
  + From 70,000-700,000 zm in 1 yd2
  + Can attach to native mussels suffocating them
  + Affect other species – i.e. walleye moving into deeper waters (they like the dark bottom) and being replaced by more undesirable species
* **Carp (silver, bighead)** show picture of Carps
  + Silver-up to 60 lbs/bighead-up to 110 lbs
  + Eat huge amounts of plankton and detritus, taking away food from native species
  + Silver jump out of water when disturbed (i.e. boat motors) and have been known to injury boaters, water skiers, etc.
* **Rusty Crayfish** show picture of rusty crayfish noting the ‘rusty’ spots on the side
  + Very aggressive towards native crayfish displacing them from their habitat and pushing them into predator waters
  + Reduces fish populations – they feed on fish eggs
  + Grow larger, therefore eat more aquatic vegetation leaving less for native species
* **Curly leaf Pond Weed** show samples
  + Forms a dense mat that may interfere with boating, recreation, etc.
  + Displaces native vegetation
  + Reproduces from stem fragmentation
  + Dies early in season leaving piles on shores, increasing phosphorus = algal blooms
* **Eurasian Watermilfoil** show samples and refer back to banner
  + Reproduces from stem fragmentation
  + Forms dense mats in water that may interfere with boating, recreation, etc.
  + May alter ecosystem by displacing native vegetation

1. Review the four components of habitat with the group: food, water, cover and space. A body of water has limits on how much of each of these it can provide. The number of animals and plants that can be supported by a habitat without being detrimental is called the **carrying capacity**. If an invasive species is introduced to a lake or river with few (if any) predators, they can thrive and reproduce, creating a large population of the invader in the ecosystem. How might this impact native species in the lake or river?
2. Can they name ways these invasive species can harm? Maybe they saw something on the news, heard from parent or friend, etc.
3. Time to play a game….

**Activity:**

1. Tell the students they are all baby native species trying to find a great place to live. Tell them that the circle marks the boundary of an area of a stream, lake or river. Have the students gather inside the circle and mill around in the circle (move with the water currents) until you say stop.
2. Call out “Stop!” Some students will be inside or touching the hula hoops. Inform students that anyone not standing in a hula hoop must leave the circle. Explain that native species prefer to live in pristine areas, which are represented by the hula hoops. The person closest to the mark in the hula hoop has found the most ideal place to live. They can sit down - they can be a native plant species of a native fish protecting their home (this is the reason they do not move). Others in the hula hoop/circle do not survive (as many young species do not survive; prey, lack of food, etc). Emphasize that the right kind of habitat is essential for native species to survive
3. Identify three students as food movers for any/all species and give them the ‘FM’ tag. They should sit outside the circle facing outward. They will toss ‘food’ at random over their shoulders into the circle. The native species will try to catch the food, remaining seated. Any missed food stays where it lands.
4. Assign two students as scavengers and give them the ‘S’ tag. They pick up the food and return it to the movers (FM). They can move in and out of the circle collecting the food that is on the ground.
5. All animals live in harmony with one another, even if one is a predator of another. Select 3 or more students to be a native minnow and give them a ‘N’ tag. They are put into the circle and move around trying to catch the food *without purposefully* blocking the feeding to the native species sitting down.
6. After a couple minutes, add two students as walleye and give them the ‘walleye’ tag. Walleye are a natural predator of native minnows. They can move around the outside of the circle reaching in to eat the drum. Tagged minnows must leave the circle and give their food to the scavengers (S) to return to the movers (FM).
7. As minnows are eaten, add more (while giving them the ‘N’ tag) trying to keep at least one minnow in the circle at all times.
8. The rest of the students are invasive species – give them all ‘I’ tags: zebra mussels, Silver/Bighead Carp, Eurasian milfoil, curly leaf pondweed, or rusty crayfish. Explain that invasive species compete with native species for food and space, just like on the banner. Now add a couple invasive species. They will mill around inside the circle trying to catch the food *without purposefully* blocking the feeding to the native species sitting down or the native minnow milling about.
9. Gradually add more invasive species to compete for food and space. Many invasive species have few, if any, predators that will feed on them. This allows the invasive species population to grow until they hit the carry capacity of their food supply.
10. Continue until all of the native species are smothered with invasive species or until everyone has had a chance to get back into the game.
11. End of game.

**Wrap Up:**

After the game, discuss the following questions:

1. Point out that many species have natural predators, we just chose the native minnnow and the walleye as an example.
2. What happened to the native species as more invasive species were added to the water body? (Space became increasingly scarce while food became harder to find. Some of the native species may have even starved because they couldn’t get any food. The carrying capacity of the lake for native species decreased as more and more invasive species were introduced.)
3. Why are native species important? What is the role they play in the ecosystem? (Helps to keep a variety of species instead of just a few species. If we take away multiple native species it will greatly affect the natural food web and ecosystem.)
4. Why should angler and recreational boaters always drain the water from their boats, minnow pails, and live wells? (To prevent the spread of harmful invasive aquatic species.)
5. Remind students that invasive species can be spread by a number of ways: seed dispersal from other animals, seed dispersal from yourself (seeds may attach to clothes, etc.), some plants grow from just a broken piece of the stem, etc.
6. Some nonnative species are introduced intentionally. Some people bring them in as ornamentals in their yard, the seeds release and go down the drain into a water system (lake, river, etc). Some species are released from fisher’s bait buckets.
7. **Removal of AIS** – How can we help?
   1. Clean all equipment, boats, and trailers before leaving lake area (parking lot, designated AIS area)
   2. Remove all visible vegetation and species
   3. Remove all plugs from boats and trailers and drain **before** leaving the parking lot
   4. Empty bait bucket on land – NEVER IN WATER
   5. Wash everything with hot soapy water, preferably pressure washer and 140°
   6. Let everything dry for at least 5 days, preferably in the sun
   7. NEVER empty home aquariums into any water system (lake, river, pond, etc)