ANS, Just Deal with It!

Activity

Students research various ANS control methods and decide the best means of controlling a specific ANS.

Grade level: 9-12
Subjects: Environmental science, biology, social studies
Setting: Classroom
Duration: 1-3 class periods
Key Terms: Aquatic nuisance species, eradication, invasive, native, non-native, nuisance

Objectives

- Students will research four methods used to deal with ANS invasions.
- Students will identify pros and cons associated with each control method.
- Students will examine the environmental/economic/social costs associated with controlling ANS.

Materials

- Internet
- *ANS Pros and Cons Worksheet*
- ANS Scenario sheet
- Scenario supplemental questions

Background

Every organism, whether it is a plant, animal or fungus, is considered a **native** species somewhere in the world. **Non-native** species are those species that have moved outside their natural range into an area where they would not normally be found. Those non-native species that cause harm to their new environment once they become established and spread quickly from their point of introduction are called **invasive** or **nuisance** species. **Aquatic nuisance species** (often referred to by the acronym ANS) are non-native aquatic species that pose a significant ecological or economic threat to aquatic ecosystems. Invasive species (including ANS) threaten the diversity and abundance of native species through competition for resources, predation, parasitism, interbreeding with native populations, transmitting diseases, or causing physical or chemical changes to the invaded habitat. How did the first invasive plants and animals get to the United States? With the beginning of European settlement, many new species were brought over intentionally for food or agricultural crops, while others were introduced accidentally – brought in as stowaways on the ships that brought people and their supplies. Since the 1900's increased travel and global trade has led to a dramatic increase in

the number of invasive species introduced to the United States. Today, there are many different pathways through which ANS are intentionally or unintentionally introduced (see "Global Invaders" activity). No matter how they get here, once an ANS is introduced and becomes established in a new ecosystem, it is very costly and difficult to control or eradicate them.

In rare cases if the ANS population is small or isolated, it may be possible to eliminate or reduce their numbers using **mechanical**, **chemical**, or **biological** control treatments. Unfortunately for many species, there are NO methods for controlling or eradicating an ANS once it infests a water body. Often the best most cost effective way to control ANS is to **prevent** them from being introduced in the first place.

- **Mechanical control**: Involves removing the species either by hand or with a machine. This method is practical only for small populations and for targeting a specific species. Mechanical control is labor intensive, often requiring multiple efforts to ensure proper control. For plant species, mechanical control methods include hand pulling, mowing, burning, dredging, underwater rototilling or putting down bottom barriers. For animal species, mechanical control methods include trapping, harvesting, or using barriers or traps to prevent their spread.
- **Chemical control**: Involves using chemical compounds to control the species. While this method is useful for both small and large areas, it is not target-specific and may contaminate nearby land and water resources, threatening the health of native plants, animals and humans in the area. Chemicals used to control plant and animal ANS include herbicides, pesticides, insecticides, and fungicides.
- **Biological control**: Involves the purposeful use of a specific species (usually a predator, parasite or pathogen) to reduce the population of an aquatic nuisance species. It is a chemical-free method and can be environmentally friendly. However, without proper research and planning, the introduced control species can potentially become an invasive species itself, or harm (prey upon, out-compete) native plants and animals as well. Conversely, biological controls may have difficulty surviving in their new environment and are unable to control the nuisance species.
- **Prevention**: Numerous government agencies are involved in efforts to prevent the introduction and spread of invasive species (e.g., private boat inspections, port inspections, education and outreach programs) and many laws and regulations have been developed to combat the problem (e.g. Nonindigenous Aquatic Nuisance Prevention and Control Act, National Invasive Species Act, Lacey Act). The public can participate by educating themselves on invasive species and by taking simple steps to control the spread of species in their community (see "Global Invaders" and "Prevent the Pathway" activities).

Preparation

- Make a copy of the *Pros and Cons*, Scenario and *Supplemental Question Worksheets* for each student.
- Review how ANS are spread from one water resource to another, the impacts of ANS on native wildlife and water resources and steps each person can take to help prevent the spread of ANS.

Directions

Class Period 1

- As a class, discuss the four different control methods (i.e., mechanical, chemical, biological and prevention), giving specific examples of treatments that can be used to combat the spread of ANS.
- Divide the class into small groups, and have students research each control method using the internet and the resources provided.
- As a group (or independently), students will create a list of pros and cons for each control method and record them on the *Pros and Cons Worksheet*.
- Remind students to think about how each method may impact the aquatic environment, human health and/or the economy.

Class Period 2/3

- Divide the class into small groups and give each student an "ANS Scenario" and *Supplemental Question Worksheet*.
- Assign each group one of the four control methods and explain that they will now be an advocate of this method (even if they don't necessarily agree that it is the best method for this particular ANS).
- After reading the scenario sheet, students use their list of pros and cons, and internet resources to answer the questions on the *Scenario Questions Worksheet*.
- When finished, each group will present their answers to the rest of the class.
- Following the presentations, the entire class will "debate" which of the four control methods would be the most effective way to control or eradicate the ANS without causing harm to the aquatic environment.
- Discuss the following:
    - If you didn't have to worry about the environment, which control method would be best to combat hydrilla in Lake Allard?
    - Which control methods (in general) seem to have the greatest impact on the environment, the aesthetics of a water body, human health, or the local economy?
    - Which have the least impact? Are they as effective?
    - Do you think complete eradication of hydrilla is possible? Why or why not?
    - What are the pros and cons of taking action to combat the spread of ANS when you are uncertain about the effects of that action?

Evaluation

- Have students write a short essay or paragraph that explores why they think ANS control is important (or not) and discuss why ANS control and/or eradication is often challenging or controversial.

Extensions

- Have students research how another state is dealing with hydrilla and write a short essay about the pros and cons of this effort, as well as who supports and who opposes the effort and why.

Source

This activity is an adaption of the SD We Have a Problem! Dealing with ANS, lesson developed by Andrea Frey for the South Dakota Department of Game, Fish and Parks, "Aquatic Nuisance Species Teaching Curriculum for south Dakota".

References

- www.plrcd.org/lakeasyst/guidebook/aquatic.pdf - Document describes various control measures including pros and cons of each.
- www.invasivespeciesinfo.gov/toolkit/control.shtml - National Invasive Species Information Center, outlines control methods for invasive species.
- http://glmris.anl.gov/documents/interim/anscontrol/index.cfm - Great Lakes and Mississippi River Interbasin Study, PDF fact sheets for 27 different ANS control measures.
- http://plants.ifas.ufl.edu/manage/control-methods/introduction - University of Florida Center for Aquatic and Invasive Plants. Nice general outline of control methods.
- http://www.invasivespeciesinfo.gov/toolkit/prevention.shtml - National Invasive Species Information Center, provides general resources for prevention of invasive species.
- http://www.invasivespeciesinfo.gov/aquatics/prevention.shtml - National Invasive Species Information Center, contains information on the prevention of aquatic nuisance species.

Washington State Science & Environmental Science Standards:

9-11 LS2B – Living organisms have the capacity to produce very large populations. Population density is the number of individuals of a particular population living in a given amount of space.

9-11 LS2C – Population growth is limited by the availability of matter and energy found in resources, the size of the environment, and the presence of competing and/or predatory organisms.

9-11 LS2E – Interrelationships of organisms may generate ecosystems that are stable for hundreds or thousands of years. Biodiversity refers to the different kinds of organisms in specific ecosystems or on the planet as a whole.

ESE Standard 1 - Students develop knowledge of the interconnections and interdependency of ecological, social, and economic systems. They demonstrate understanding of how the health of these systems determines the sustainability of natural and human communities at local, regional, national, and global levels.

ESE Standard 2; The Natural and Built Environment – Students engage in inquiry and systems thinking and use information gained through learning experiences in, about, and for the environment to understand the structure, components, and processes of natural and human-built environments.

ANS, Just Deal with It! *Scenario*

Lake Allard is a large lake on the outskirts of Fern Washington. The lake is home to a number of native fish (including trophy size rainbow trout), aquatic plant and animal species including beaver and migrating waterfowl. Lake Allard is a popular tourist destination with swimming, recreational boating, fishing and crayfish harvesting. The lake is also the source of drinking water for half the population of Fern due to its pristine water quality. Most year-round residents of Fern live along the shore of the lake, lately they have begun to notice a strange submerged aquatic plant with bright green leaves growing in different areas along the shore that they never noticed before. One of the residents contacted an aquatic plant specialist who identified the plant as hydrilla – an invasive aquatic plant originally from Asia that was first brought to the United States intentionally to sell as an aquarium plant. Hydrilla is best known for its tendency to completely take over a water body. Dense infestations of hydrilla can shade or crowd out all other native aquatic plants, alter water chemistry, increase water temperatures and affect the diversity and abundance of fish populations. Thick mats of vegetation can impede navigation, and reduce recreational boating, fishing and swimming opportunities. Hydrilla was likely introduced to Lake Allard by a careless pet owner who dumped their aquarium into the lake, or by a recreational boater who transported a small fragment of hydrilla on his boat or boat trailer from another contaminated water body. At its current rate of growth, residents are worried Lake Allard will be full of hydrilla by next summer. This could be devastating to a community which relies heavily on the income made from tourism. Members of the community decide to have an emergency meeting to discuss what they should do about the hydrilla infestation before it gets even more out of hand.

What course of action should the community take to eradicate or control the spread of hydrilla in Lake Allard?

Leaves of hydrilla. Photo Credit: Center for Aquatic and Invasive Plants, University of Florida, IFAS

Severe hydrilla infestation. Photo Credit: Center for Aquatic and Invasive Plants, University of Florida, IFAS

ANS Scenario *Supplemental Questions*

Name: _____

1. What is your control method? _____

2. Which treatment do you propose to eradicate hydrilla in Lake Allard? _____
   _____
   _____
   _____

3. What are the benefits of this treatment method? _____
   _____
   _____
   _____

4. Did you consider any other treatment(s)? If so, which treatments did you consider?
   _____
   _____
   _____
   _____

5. What are some obstacles to your proposed treatment?_____
   _____
   _____
   _____

6. How will you overcome these obstacles?_____
   _____
   _____
   _____

7. What are the major costs (economic, environmental, etc.) of your chosen treatment? (not a specific dollar amount, just an understanding of the potential impacts)
   _____
   _____
   _____
   _____
   _____

ANS, Just Deal with It! *Control Pros and Cons*

Name: _____

MECHANICAL CONTROL	
Pros	**Cons**
1	1
2	2
3	3
4	4
5	5
CHEMICAL CONTROL	
Pros	**Cons**
1	1
2	2
3	3
4	4
5	5
BIOLOGICAL CONTROL	
Pros	**Cons**
1	1
2	2
3	3
4	4
5	5
PREVENTION	
Pros	**Cons**
1	1
2	2
3	3
4	4
5	5