

Aquatic Invasion! - Stream Side Science

Summary

In this exercise, students will learn the definition of invasive species. They will choose a specific aquatic invasive species, investigate its distribution, life history, reasons it is considered invasive, the effects it has on a given ecosystem, and possible solutions of management practices to control the species or its impacts. They will create an "unwanted" poster that engages local citizens and helps them understand the importance of controlling the organism.

Time Frame

3 class periods of 60 minutes each

Materials

- Computer with internet access
- Poster paper
- Miscellaneous art supplies
- [Group presentation worksheet](#) (pdf)
- Waders
- Plastic pan
- Kick net
- [Invasive species pictures](#) (pdf)

Background for Teachers

Purpose

To understand the properties of invasive species and learn more about aquatic invasive species and their effect on aquatic ecosystems. Through creation of an "unwanted" poster, students will also learn how to present technical information and messages to the public.

Background

Invasive species are non-native (or alien) to the ecosystem under consideration whose introduction causes or is likely to cause economic or environmental harm or harm to human health. Not all non-native species are invasive, since many non-native species are not able to spread or reproduce in natural habitats. Invasive species may prey upon, displace or otherwise harm native species. They may also alter ecosystem processes, transport disease, or cause illnesses in animals and humans. Invasives can affect the commercial, agricultural, aquacultural, or recreational activities dependent on such waters, resulting in severe economic impacts. Control of invasives can be extremely difficult once they are established.

Many natural barriers exist which help isolate species and prevent their introduction into new regions. Invasive species must overcome barriers in the environment that would otherwise prevent their spread. These barriers are:

- Geographical barriers
 - such as a mountain range, ocean or river that prevents easy movement from one area to another and separates different habitats.
- Survival and establishment barriers
 - are environmental features that prevent an introduced species from thriving. These might include soil moisture or pH for plant species, water temperature or salinity for aquatic species. 117
- Dispersal and spread barriers
 - are natural or constructed blockades such as a wall of vegetation on land or a barrier of electricity in water. These are made to prevent rapid dispersal and spread from the site of establishment.

Human activities are often the culprit in introducing and perpetuating the spread of invasive species. Here are some examples of human activities which have served as pathways for spreading invasive species:

- Illegal fish stocking:
Illegally introducing a non-native fish into a water body.
- Legal stocking:
legally introducing a non-native fish into a water body, usually for recreational fishing, or for population controls on other fish.
- Ships and boats:
Ballast water used to stabilize ships often uptakes organisms and carries them from one place to another. Organisms can also be transported by attaching to the ship itself, this is called hull fouling.
- Ornamental plants:
Some ornamental plants can spread into the wild and become invasive.
- Pet trade:
Intentionally or accidentally releasing pets into their non-native habitat.
- Wood:
Insects can get into wood, shipping palettes, and crates that are shipped around the world.

Proper retiring of classroom animals

- Give the animal to another responsible teacher
- Return it to the place where it was purchased (perhaps make prior arrangements to do so)
- Keep it as a classroom pet
- Donate it to your local natural history museum, zoo, or aquarium (check before you acquire the animal)
- Humane euthanasia (contact your local veterinarian for advice)

For more information, see [Living With Wildlife](#).

- Agriculture:
Invasive pests and diseases can be transported across US borders through the commercial or personal transport of agricultural items, such as fruit, vegetables, and plants.
- Improperly cleaned equipment:
Fieldwork and recreational activities can unintentionally spread invasive species on the equipment that is used.

For more information on aquatic invasive species please call the Division of Wildlife Resources at (801) 538-4700, email larrydalton@utah.gov, or see:

- [Invasive Mussels](#)
- [Invasive Species Definition Clarification and Guidance White Paper](#) (pdf)
- [Prevention - How You Can Help](#)
- [Utah Weed Control Association](#)
- [Aquatic Nuisance Species](#)

Instructional Procedures

Classroom Activity:

Part 1

Define the term aquatic invasive species. Aquatic invasive species are water-associated non-native species that threaten the diversity or abundance of native species. Talk about why invasive species are a threat to native species in a given ecosystem.

Give students examples of invasive species. Examples can be found in the Resource pages of

this lesson.

Ask the students if they can think of any local examples of aquatic invasive species. Ask them if they can think of any possible ways those invasive species were introduced to an ecosystem. Be sure to inform them of the human activities which often introduce aquatic invasive species to an ecosystem.

Part 2

Explain to the students that they will be researching and presenting on a specific aquatic invasive species within Utah.

Separate the students into small groups of three or four. Assign each group a specific aquatic invasive species that is affecting the state. A list of aquatic invasive species in Utah can be found in the Resource section of this lesson.

Have students use the Internet to research their assigned invasive species. From their research, students will fill out the accompanying worksheet found in the Resources section of this lesson. Be sure they list the reference.

Each group will then make a creative, informative poster of their invasive species using the information from their research worksheet (see the Resource section of this lesson for an example). This can be done on the computer or with art supplies.

After the posters are completed, each group will use their posters as a visual in a presentation on their aquatic invasive species. Additionally, the posters can be displayed within the school or community in order to educate others on aquatic invasive species within Utah.

Field Activity:

- As with any field trip, exercise appropriate safety precautions. See [Appendix B](#) in this manual for more information on safety in the field.
- This is an excellent opportunity to teach the students the responsibility of field work and even recreation. Use Best Management Practices (BMP) discussed in the further discussion questions. Take a field trip to a local, safe, accessible water body. It could be a river, pond, lake, reservoir, or stream.

Hold a discussion about invasive species. Perhaps start by asking the students what activities take place at the field trip location. Then focus on how these activities may facilitate the spread of invasive species if the proper precautions are not taken.

Have the students look at pictures of different invasive species located within Utah. Talk about the environments where these species live. Ask the students which of the species they know are located, or have potential to be located, within the field trip location.

Ask the students how they think the invasive species could have gotten there.

Have the students sample the water body for using the sampling equipment. It is likely that the students will not find an invasive species; however, this is an opportunity to train them to use BMPs in their fieldwork.

Further Discussion:

1. What are the characteristics of an environment that is vulnerable to invasive species?
 - *A lack of biotic constraints , such as natural predators or disease, which the invading organism had in its native environment. Natural predators help control populations of their prey. Since an invasive species often has no natural predator in its non-native environment, its population rapidly increases. With a large population, it is easy for an invasive species to outpace native species.*
 - *Vacant niches that can be exploited by invasive species. A niche is the relational position of a species within an ecosystem, or how a species responds to its environment, resources, and predators in order to survive and reproduce. When conditions of a niche change and its inhabitant leaves or becomes vulnerable, it is easy for a new species to take over that*

niche. A disturbance by fire, construction, agriculture, etc., prior to the invasion. These ecological disturbances cause a disruption in an ecosystem's natural function and structure. A disrupted ecosystem is vulnerable to an invasive species' establishment.

- A disturbance by fire, construction, agriculture, etc., prior to the invasion. These ecological disturbances cause a disruption in an ecosystem's natural function and structure. A disrupted ecosystem is vulnerable to an invasive species' establishment.
- Areas that are located near potential sources of invasive species are more likely to be invaded. Since people transport many nonnative species, urban areas and their surroundings typically have more invasive species than remote areas.

New species often find their way into new ecosystems, but not all become nuisance species. In order for a non-native species to become an invasive species, it must harm and negatively impact its new environment. This harm must outweigh any beneficial impact.

2. What can be done to control aquatic invasive species?

- Mechanical Control removes an invasive species by hand or with a machine. The process is often very labor intensive and needs multiple efforts. In Utah Lake, the Common Carp is being removed through boats, large nets, and hand labor to capture and remove about five million pounds of fish annually over a six year period. Trapping, electricity, trawling, or baiting may also be used.
- Chemical Control uses chemical applications to control invasive species. The chemical Rotenone is often used to treat water bodies infested with invasive fish species. However, chemicals like Rotenone, such as pesticides, herbicides, or other piscicides, are often not target-specific and can harm water resources as well as other plants and animals besides invasive species.
- Biological Control involves the release of a new species in the environment to control an invasive species. A biological control agent, the Saltcedar Leaf beetle *Diorhabda elongata*, has been released in nine western states including Utah in order to control 122 tamarisk populations.

3. There are specific procedures to protect against introduction of aquatic invasives:

- Assume every water body is contaminated and that boats and equipment should always be considered contaminated
- Eliminate water from all equipment before transporting anywhere
- Remove all visible mud, plants, and fish/animals
- Keep one set of equipment for use only on infested waters
- Decontaminate equipment following each use, whenever possible, by cleaning and drying anything that came in contact with the water
- Keep boat and equipment clean between trips and let dry for as long as possible
- Do not release or put plants, fish or animals into a body of water unless they came out of that body of water
- Report the finding of an aquatic invasive species to the Utah Division of Wildlife Resources at 801-538-4700

4. Why are the definitions of invasive species sometimes unclear?

Some non-native species are considered harmful, and therefore, invasive by some sectors of our society while others consider them beneficial. This discontinuity is reflective of the different value systems operating in our free society, and contributes to the complexity of defining the term invasive species. ([Invasive Species Definition Clarification and Guidance White Paper](#))

(pdf))

5. How do aquatic invasive species affect water quality?

Aquatic invasive species affect water quality through small changes in the ecosystem. These small changes have a significant, negative impact over time. One example of this is the Common Carp. This is a fish which feeds by browsing through underwater vegetation. This feeding uproots plants which muddies the water and destroys the food and cover needed by other fish. Another example of this is the Water Hyacinth. This is a plant which blocks light for photosynthesis, which greatly reduces oxygen levels in the water. This reduction in oxygen in turn reduces other underwater life such as fish and other plants, thus depleting biological diversity which alters an ecosystem's animal community. (For more information, see: [Impacts](#))

6. What are a few impacts of aquatic invasive species? How will invasive species affect water resources and what are the associated effects?

Invasive aquatic plants and animals destroy habitats in coastal waterways and interrupt the flow of water in inland desert irrigation canals. They clog storm canals leading to the flooding of homes and displace native species in our nation's wetlands. Furthermore, they compete with native species for resources, often leading to a decline in the population of native species. One example of this is seen in the competition between the native Cutthroat Trout and the nonnative Brown Trout in many rivers within Utah. Both are competing for the same food source, which is causing a decline in the native Cutthroat Trout population.

7. Invasive species have a place in their native habitat. When introduced to a new habitat, they are only doing what every other organism does: taking advantage of opportunities to survive and perpetuate their species. How does this viewpoint affect human responsibility for invasive species control?

Most invasive insects, marine invertebrates, and microorganisms are accidentally introduced. For this reason, most countries have many restrictions and regulations in place detailing how imported and exported products will be monitored.

8. What can you do to prevent the spread of invasive species?

- *Inspect your boat and equipment (e.g., waders, ect). Remove any plants or animals.*
- *Drain water from the motor, livewell, bilge, or transom well.*
- *Never release or transport live aquatic species from one water body into another.*
- *Never dump aquarium plants or pets out in lakes or streams.*

9. What are our future management, policy, and societal needs to lessen or adapt to the effects of invasive species as they alter aquatic ecosystems?

"The best way to limit impacts of nonnative species is to prevent them from invading and becoming established in a new area. If this fails, eradication may still be possible, but generally only if the species is identified and treated quickly. Once established, efforts to restrict spread to uninfested areas can limit further damage. Controlling population sizes in heavily invaded areas can also reduce deleterious effects, but is unlikely to lead to eradication. Last, maintaining healthy natural communities, either by limiting human disturbance, or restoring of previously impacted areas, can limit opportunities for exotics to take hold." ([Invasion](#) (pdf))

Extensions

Write to a government agency or political leader with concerns and recommendations for aquatic invasive species.

Have students create an outreach campaign for the community based on their posters of the

aquatic invasive species. This can include tips and suggestions for the prevention of introduction and spreading of aquatic invasive species.

Have a guest speaker from an agency implementing invasive species action plans or with knowledge and experience on invasive species come speak to the class.

Bibliography

Lesson plan authors: Andree Walker and Nancy Mesner (Utah State University Water Quality Extension)

This curriculum was made possible through funding from the Environmental Protection Agency, the United States Department of Agriculture, Cooperative State Research, Education, and Extension Service, the Utah Division of Wildlife Resources, and Utah State University Extension.

Additional resources can be found on the [USU Stream Side Science 9th Grade Curriculum web page](#).

Authors

[Ellen Bailey](#)

[Andree Walker](#)