INTRODUCED SPECIES: HARMLESS IMMIGRANTS OR ARMED INVADERS?

Lesson Plan

Subjects: Environmental science, life science, language arts/writing

Lesson Summary: Students will learn about exotic and native species, invasive and noninvasive-exotics, how species are introduced, and what can be done to alleviate the problem of invasive species.

Objectives:
The students will be able to:
  1) Define indigenous
  2) Define exotic
  3) Explain the difference between invasive and non-invasive species
  4) List ways that a species can be introduced into a new ecosystem
  5) Explain why invasive species are able to take over an ecosystem

Materials:
Each student will need the following:
  1) Computer with internet access
  2) Paper
  3) Pen or pencil
  4) Copy of the map of Florida with county outlines
  5) Copy of the introduced species database activity
  6) Copy of the introduced species writing assignment
  7) Copy of the writing instruction sheet, editing form, and FCAT rubric

Teacher Preparation:
  1) Print out a copy of the map of Florida, the introduced species database activity, and the introduced species writing assignment. Photocopy enough for everyone in your class.
  2) Make sure the computers are ready for the students so there is no lost time.
  3) Make sure there are enough copies of the three components of the writing lesson. You can print out and photocopy new ones or reuse the old ones.

Procedures:
  1) The students start by reading "Introduced Species Overview."
  2) Ask them to read the selection. (20-30 minutes)
  3) When the students have finished reading, pass out the map of Florida and the introduced species database activity and ask them to complete it. (20-30 minutes)
  4) Pass out the introduced species writing assignment and ask the students to complete it. (30 minutes)
  5) Have the students get out the writing instruction sheet, the editing form, and the FCAT rubric. Using these forms, they should edit their OWN paper. (20-30 minutes)

Total Time estimates:
Two 50-minute class periods
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A native or indigenous species is one that has its natural home in the area it lives. For example, the American Alligator is native or indigenous to Florida, but the Spectacled caimans are native to Central and Southern America. The Spectacled caimans you see in Florida are probably released pets and are non-native, exotic, or introduced species.

Thus, these terms have more to do with where the animal or plant is located at a given time rather than anything to do with characteristics of the plant or animal.

Means of Species Introduction

An exotic can reach Florida through several mechanisms: range extension, purposeful introduction, or accidental introduction.

Range Extension occurs when animals or plants travel into a new ecosystem by natural means. For example, Cattle egrets crossed the Atlantic in a storm in the 1940's and populated Trinidad. By the 1950s they had reached Florida.

Purposeful introductions happen when people intentionally introduce a species into a new environment. For example, we might plant something from another country because it is edible like oranges or kiwi; we might plant something from another state because it is pretty like sunflowers or yarrows; or we might raise exotic livestock because it is economical like ostriches.

Accidental introductions occur when humans bring an organism from one area to another without realizing it or accidentally release it from captivity. A traveler might pick up a fungus on his shoes in one part of the world and carry it to another area where it could be potentially fatal to a plant or animal. Sometimes rats or snakes get into ships or airplanes and travel across the globe to colonize a new area. Or, we may bring in a timber product that carries the eggs of a highly invasive insect with it.

Naturalized vs. Invasive Introduced Species

How a species behaves once it is introduced into an area is really important. Some introduced species have a very hard time adapting to their new surroundings and do not even survive. Out of the ones that do survive, some just fill an empty niche and have very little effect on the native environment. These are called naturalized exotics. However, other introduced species not only survive in their new environment, they thrive without natural predators and become competitors for resources. This means that they spread even more quickly than they did in their native environment. These species are known as invasive because they can out compete the native plants and animals and possibly change the ecosystem.

Planting Exotic Species

Some people would argue that you should try to make your yard as natural as possible and only grow native species. Other people like the appearance of a green, tidy, carefully tended lawn. In
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Florida, this type of lawn might contribute to ecosystem degradation if non-native plants spread seeds into natural areas. Ecosystems can also be affected by excess fertilizers which causes algae to grow in estuaries or drainage ditches. Nitrates can contaminate the groundwater, and lawn irrigation can lower the water table.

**Keeping Exotic Pets**
The U.S. Government passed the Lacy Act prohibiting the importation (without permits) of listed invasive species such as mongoose, meerkats, and giant African snails. Unfortunately, many people smuggle these animals to sell as pets. This problem is compounded when these animals are released into the wild.

**Familiar Introduced Species**
There are some plants and animals that were introduced so long ago that we think of them as natives. For example, dandelions came from Europe. Nearly all of our food crops and livestock came from plants and animals native to some other country. For instance, corn came from Mexico and oranges came from China. These plants and animals have been cultivated and domesticated for our benefit. Starlings and House sparrows are other examples of familiar introduced species.

Many of these plants and animals have become naturalized, meaning they are part of our landscape and they reproduce and thrive in the wild without our input. Others, like oranges, would not grow here without cultivation. Given limited resources for eradication, many people think we should concentrate on removing the exotics that do damage rather than the ones that are helpful or benign.

**Purposeful Introductions**
Some people think that it is a good idea to introduce a species for a reason, like a fish we know will eat mosquitoes. That is a good idea except we don't know how a newly introduced species will react outside of its natural environment. It is possible that the new fish could eat all the bothersome mosquitoes, and it could also eat something else in the ponds or lakes that we want to keep. We have tried doing such introductions before that have succeeded at their intended task, but then backfired on us completely on something else. For example, we introduced kudzu to stop erosion, melaleuca to drain wetlands, house sparrows to eat worms, but they all subsequently took over the new areas and then moved on. We had no idea of their "success" when we brought them here.

**Bibliography**
Read more about introduced species in Dan Simberloff's article "Impacts of Introduced Species in the United States".
Read more about invasive species in South Florida at the Invasive Exotic Species of the US Geological Survey.
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Database Activity

1. Go the Herpetology database [http://www.fhmnh.ufl.edu/scripts/dbs/herps_pub.asp] at the Florida Museum of Natural History. Do a common search name on the brown anole, a species invasive to Florida. Type brown anole in the "Common name" box and restrict retrieval to Florida specimens by typing Florida in the text box labeled "State or Department." Then click on "Query database."

2. For each specimen in the list, write the year that it was collected in the correct county on your map of Florida. If multiple records occur, write the year only once.

3. Look up the brown anole at http://www.enature.com to see what it looks like and to get more information about it.

4. Answer the following questions:
   a. What does it look like?
   b. What does it eat?
   c. In what kind of habitat does it live?
   d. How was it introduced?
   e. From where did it come (what country or part of the world)?
f. How does it spread?

g. Can you think of another way it might spread?
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Writing Assignment

Writing Situation:
Invasive exotic plants and animals change the makeup of ecosystems they take over, but some exotics do not invade.

Directions for Writing:
Before you begin writing, think about the following statements:
- The US government should allow every exotic plant or animal species into the country.
- The US government should allow only exotics we know are not invasive into the country.
- The US government should not allow any exotic species into the country.

Now choose the statement you most agree with and persuade the reader of your paper that your selection is the best for the U.S.