12 Modeling the Introduction of a New Species

MODELING

WHAT HAPPENS WHEN a new species is introduced into an ecosystem? In this activity, you will model what happens to matter and energy in response to a new species in an ecosystem. The species can be entirely new, as in the case of the zebra mussel—or, like the wolves in Yellowstone National Park, the species may originally be native to the ecosystem and is now being reintroduced after disappearing for some time. Learn more about how these two species affected their respective ecosystems by reading the following scenarios.

Zebra Mussels

As you know by now, the zebra mussel has caused many problems in the United States since humans unintentionally introduced it in the 1980s. How can such a tiny organism, which averages around an inch long, have such a huge impact?

To answer this question, we need to look at how a zebra mussel gets its food. Like all animals, zebra mussels acquire their food by eating other organisms. They feed by filtering microscopic plants and animals out of the water. A 1-in zebra mussel can filter 1 L of water a day. A large group of zebra mussels with a mass totaling 1 kg can filter 180 L each day. That's the equivalent of a 45-kg (100-pound) person filtering 8,100 L per day. (Imagine over 4,000 2-L bottles!) Zebra mussels are so efficient at filtering out food from the environment that other animals that feed the same way can't compete with them.

Zebra mussels feeding

Wolves

Wolves are a top predator native to North America, and many could be found in Yellowstone National Park in the western part of the United States. Because wolves feed on sheep and cows in addition to native wildlife, they were hunted by people. The wolf population in Yellowstone was essentially eliminated by 1926.

In the early 1990s, scientists and wildlife managers concluded that the absence of wolves was having a negative effect on the rest of the ecosystem and the food web. In 1995, wolves were reintroduced to Yellowstone in an attempt to restore balance.

GUIDING QUESTION

How does a new species affect the flow of energy and cycling of matter through an ecosystem?

MATERIALS

For each group of four students

1 set of Food Web Cards

PROCEDURE

Part A: Constructing Your Food Web

1. Work with your group to examine the Food Web Cards.
2. As a group, choose at least four cards and construct a simple food chain. Record your food chain in your science notebook.
3. Identify the producers and consumers, and show how energy flows and matter cycles through the ecosystem.
4. Work with your group to create a food web, using all the cards in your set. Identify what happens to energy and matter for each interaction. Record your food web in your science notebook.
5. Discuss your work with another group of students with the same set of Food Web Cards. How similar or different are your ideas?
6. Look at the food webs created by groups that have a different set of Food Web Cards, and make note of any similarities and differences.

Part B: Introducing a Species to Your Food Web

7. Your teacher will give you a new species to add to your food web. Identify what type of organism it is and its role in the ecosystem.
8. Use your model to explore how this new species affects the flow of energy and cycling of matter through your ecosystem. Record your revised food web in your science notebook.
9. As instructed by your teacher, share and discuss your new model with another group.

ANALYSIS

1. Explain how the introduction of your new species affected your ecosystem.
   a. Be sure to address which interactions were affected.
   b. Describe whether the introduction was harmful or helpful to the ecosystem.
   c. Do you think the species you "introduced" is native or non-native? Describe your reasoning.
2. What would happen if ...
   a. the top predators disappeared from your ecosystem? This might happen if the predators were overhunted. How does this affect the flow of energy through your ecosystem?
   b. the producers disappeared from your ecosystem? This might happen if a disease caused the producers to die off. How does this affect the flow of energy through your ecosystem?
3. **Revisit the issue:** Return to your introduced species research project, and explain how the introduction of the species you are investigating impacts the flow of energy and cycling of matter in the ecosystem.