Elementary Ecology Science Simulation

Intended Grade Levels

Academically advanced students in grades 2–3

Materials

- Ecosystem simulation (see Do section)
- Handout 1: Ecosystem Simulation Recording Sheet

Note to Families: The purpose of the simulation lesson is to help students understand the importance of balance within ecosystems and that the interactions among consumers and producers, as well as the variety of species, helps support that balance. We suggest that the following process be used:

- **Learn** more about ecosystems before conducting the simulation.
- **Do** the ecosystem simulation, using the Ecosystem Simulation Recording Sheet to guide thinking.
- **Analyze** the simulation using the Ecosystem Simulation Recording Sheet and discussion questions.
- **Extend** your child's learning by completing one or more projects in this section or visiting other websites provided for further learning.

Learn

Before exploring the simulations online, students are encouraged to explore online videos that build background understanding of ecosystems, food chains, or food webs. A number of informative videos are available through Scholastic Studyjams, Crash Course Kids (YouTube channel), and in general searches. Make sure students understand the difference between a food chain and food web, how living things are connected in the environment, and how ecosystems can be thrown out of balance by under or overpopulation of one species. For relevancy, consider having students research and map out food chains and webs in their community and/or explore the impact of a locally invasive species on producers and consumers. Note that this lesson could be accompanied by any number of read aloud texts that have an ecology focus (e.g., *The Great Kapok Tree*; *The Seed, the Storm, and the Mangrove Tangle*). Additional read-aloud suggestions can be found here: https://www.the-best-childrens-books.org/food-chains-for-kids.html.

Do

- Encourage your student(s) to select from one of the following ecosystem simulations. Note that the enclosed activity works with any of the ecosystems.
  - » Outback Ecosystem
  - » Mangrove Ecosystem
  - » Jungle Ecosystem
  - » Mountain Ecosystem

- Students will use Handout 1: Ecosystem Simulation Recording Sheet. Specific directions are included to guide students through multiple trials using the simulation. In each trial, students are asked to approach their ecosystem with different constraints or variables in mind. Reflection questions are included to guide their thinking after each trial has been completed.

Analyze

- What did you have to do to keep your ecosystem alive? What lessons did you learn about how living things interact to maintain balance?
- What interactions took place between the producers (plants) and consumers (animals) in your environment? How did you try to restore balance to your ecosystem? (Sample response: There had to be more producers and prey than consumers and predators, with balance being restored by replacing those organisms that are lower in the food web.)
- How can stability be reached in an ecosystem, based on your models? (Sample response: There need to be enough producers and consumers for animals to eat.)
- What has to be in place for an ecosystem to maintain healthy organisms? (Sample response: Balanced species populations, greater number of producers than consumers, etc.)
- How did the interactions among various animals allow for stability or change? (Sample response: If there was enough food for all of the animals, the ecosystem could remain alive and prosper; if a food source started to run out, it affected all of the other animals and changed the look of the environment [i.e., no more trees or certain animals].)
- How did the transfer of energy from one species to another affect your environment? (Sample response: They relied on each other for food or they became weak or died off.)
- Based on the models, what do you think would happen if we removed all of the producers in your ecosystem? (Sample response: There wouldn't be any food for other animals, and everything would eventually die out or move away in search of other food.)
- What would happen if we introduced too many consumers? (Sample response: They may compete for food and eventually some may starve or leave.)
- Simulations are imitations of real-life situations or processes. How did this simulation help you understand the interaction between different food webs and living things? What did this simulation not take into account in terms of ecosystems and the interaction of living organisms? (Sample response: There was no human interaction or intervention in the ecosystem; no invasive species were present; no animals died from disease; decomposers were not considered; no natural population increases occurred; and there were no abiotic interactions, such as temperature changes, water changes, etc.)
- What questions do you still have, or what new questions were created about ecosystems and the interactions of living organisms within their environment and their specific food webs?

- What did you need to consider in the simulation in order to maintain a healthy ecosystem for more than 2 days? (Sample response: More plants and herbivores than carnivores and omnivores; the flow of energy required more producers and more primary consumers than secondary consumers, etc.)

Check for Understanding:

- Ask your student to either write out a brief response or build out a diagram that explains how living things maintain balance in an ecosystem and why it is important.

Extend

- Ask your student(s) to think about animals or insects in their area or places they have visited: How do they contribute to the ecosystem in positive ways? Create a web that shows the animals' unique ecosystem. Design their food chain and food web as part of your drawing. (Students may mention bees that pollinate flowers, other insects and animals that eat mosquitos, the reintroduction of the wolf population in Yellowstone national park that controls bison herds from overpopulation, ladybugs that eat insects that kill crops, etc.)
- Research an invasive species in your county, state, or region. Create a brochure that can be shared with others that includes information on the spread of the species, how it impacts local producers, and consumers, and what is being done to stop the spread.

Additional Resources

Additional online resources for students to explore if interested include:

- Ecosystem and Food Web Games
- Invasive Species for Kids
- National Wildlife Federation - Invasive Species

Name: _____ Date: _____

Handout 1

Ecosystem Simulation Recording Sheet

Directions: Pick one of the four environments—mountain, jungle, mangroves, or outback—and open the simulation. Follow the directions provided in the simulation, completing the following trials. Then, answer the reflection questions at the end of the handout. When you have completed the handout, work with a classmate who completed a different simulation and compare your findings.

Trials

Trial 1: *The goal of the simulation is to create a healthy ecosystem that can survive for 12 days. The interaction of plants and animals requires you to understand the balance that exists between food webs and the way in which energy flows in a system. For this trial, explore what happens when you add the different living organisms, keeping in mind that you can add more than one of the same organism and that you may run out of certain living things.*
Reflection A: What did your ecosystem require to have healthy consumers?
Reflection B: What caused your ecosystem to have organisms that were 'less healthy' at the end of the day?

Handout 1, continued

Reflection C: Other observations or questions you have:

Trial 2: *During this 12-day period, select one producer (plant), one primary consumer (e.g., ant or mosquito), and one secondary consumer (hawk, heron, badger, etc.) that you consistently add each day. You are only adding these living organisms to your ecosystem, no others.*

Producer I Added: _____

Primary Consumer I Added: _____

Secondary Consumer I Added: _____

Reflection A: What needs to be in place so that organisms at all three levels of the food web survive?

Handout 1, continued

Reflection B: Did limiting your organisms to only three help or hurt your ecosystem? Why do you think that may be?

Reflection C: Is it better for ecosystems to have more or less variety of plants and animals, based on your findings?

Trial 3: *During this 12-day period, find out what happens if you add too many of one thing (i.e., consumers, producers, decomposers) and few of the other living things.*

Number of Producers I Added: _____

Number of Consumers I Added: _____

Number of Decomposers I Added: _____

(This number is the total of each added overall; not different species.)

Handout 1, continued

Reflection A: How does too many of one living thing and not enough of the other impact the ecosystem? What happens?

Reflection B: How is the flow of energy and the food chain affected when there is an overpopulation of one living thing and not enough of another? Sketch a diagram that shows the effects.

Trial 4: *Your goal in this final simulation is to keep all of your organisms in good health from start to finish. You need to create an ecosystem that keeps all required species alive for at least 3 days. This means that all living things should be added no later than Day 9. Keep track of the organisms that you add below. If you fail, and one of your plants or animals becomes "less healthy," begin the simulation again, taking into account what needed to be in place for the organism to stay healthy (e.g., the ants became less healthy because there was not enough spinifex grass for them to eat).*

Organisms I Added:

Handout 1, continued

Reflection A: What lessons did you learn when trying to maintain healthy organisms within your ecosystem?
Reflection B: Which organism or organisms were added most frequently? What does that say about ecosystems in general?
Reflection C: Is there a better order in which to add producers, consumers, and decomposers in order to maintain a healthy ecosystem? Explain.

Handout 1, continued

Reflection Questions

Directions: Answer the following questions. You can use the back of this handout or a separate sheet of paper if needed.

1. What did this simulation not take into account in terms of real-life ecosystems and the interactions of living organisms?

2. What ecological patterns did you notice across each of the simulations?

3. What were some of the cause-and-effect relationships you noticed with producers, consumers, and decomposers?

Handout 1, continued

4. How can stability be reached in an ecosystem? What has to be in place for an ecosystem to maintain healthy organisms?

5. What questions do you still have about ecosystems and the interactions of living organisms within their environment and their specific food webs?