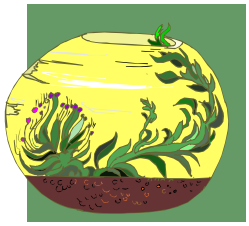
WATER WORLD



BENCHMARKS and TASKS

SC.B.1.2.1 The student knows how to trace the flow of energy in a system (e.g., as in an ecosystem).
SC.B.2.2.1 The student knows that some source of energy is needed for organisms to stay alive and grow.
SC.F.1.2.2 The student knows how all animals depend on plants.
SC.G.1.2.1 The student knows ways that plants, animals, and protists interact.
SC.G.1.2.3 The student knows that green plants use carbon dioxide, water, and sunlight energy to turn minerals and nutrients into food for growth, maintenance, and reproduction.

- The student describes an ecosystem as a community of living and nonliving organisms and their immediate surroundings (e.g., air, rocks, soil) driven by the sun's energy.
- The student recognizes that some source of energy is needed for all organisms to stay alive and grow.
- The student identifies the major source of energy of ecosystems as sunlight. Energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis. That energy then passes from organism to organism in food webs.
- The student explains how green plants use carbon dioxide, water, and sunlight energy to turn minerals and nutrients into food for growth, maintenance, and reproduction.
- The student categorizes populations of organisms by the function they serve in an ecosystem: plants and some microorganisms as *producers* that make their own food; animals, including humans, as *consumers*, which obtain food by eating other organisms; and *decomposers*, primarily bacteria and fungi, recyclers that break down dead plant and animal materials into elements that return to the soil, water, and air for use again.
- The student examines patterns of interdependency in ecological systems by analyzing relationships in food webs among producers, consumers, and decomposers and discovers that no matter how distant the relationship may seem, all things are connected.

KEY QUESTION

How do plants and fish survive in a closed aquatic ecosystem?

BACKGROUND INFORMATION

An **ecosystem** is a **community** of living and nonliving **organisms** and their immediate surroundings (e.g., air, rocks, soil) driven by the **sun's energy.** An ecosystem can be as simple as a balanced aquarium or as complex as a whole region.

In this closed ecosystem, students will find that plants and animals exist in a state of interdependence when the amount of food, water, and space is balanced in the community. The amount of oxygen in the air and water is constantly replenished by green plants (elodea), which give

off oxygen when they manufacture food for themselves through the process of **photosynthesis.** The green plants (elodea) carry out the process of photosynthesis by using sunlight, water, and carbon dioxide. The plants, the **producers,** provide animals in this ecosystem with both food and oxygen. The fish, **the consumers,** in this case are plant-eaters and are able to survive in low-oxygen conditions. The snails act as both **consumers** and **decomposers.** The animals (the fish and snail) give off carbon dioxide in this closed aquatic environment.

MATERIALS

Per class

1 resealable baggie
aquatic plant – elodea
animals (pond snail and 3 or 4 mollies)
6-8 cm of sand or gravel
few small rocks
1 large jar with lid (at least 3-4 liters

Per student

science journal

TEACHING TIPS

1. Pour tap water and let it set for three days before starting this project. In order to maintain a balanced aquatic ecosystem, use the largest jar you can find.
2. Elodea is a good plant choice because it provides animals in the ecosystem with food and oxygen. You can purchase elodea at a fish supply store, or you can often find it growing near docks in a lake.
3. The fish selected must be plant eaters, able to survive in low-oxygen conditions, and salt-tolerant. Snails in an aquatic ecosystem will act as both consumers and decomposers. If the system is balanced, an adequate amount of food will always be available for the fish.

ENGAGE

Ask:
How do you think fish in an aquatic environment can survive?
What do you think aquatic plants need in order to survive?

EXPLORE

1. Have students keep a log of dates and the process involved in setting up the aquatic ecosystem. Students should also draw a picture in their journals, describing in detail the components of the ecosystem.
2. Ask students to help you set up a small aquatic ecosystem for observation in the classroom.
3. Place gravel or sand in the bottom of a large jar.
4. Place some aquatic plants securely in the sediment. Anchor the plants at the bottom by tying them to small rocks for added weight.
5. Add the snail to the jar and then fill it three-fourths full with the aerated water, leaving the remaining space for air.
6. Place the lid securely on the jar. Place the jar near a window but not in direct sunlight or the water temperature will become too high. The aquatic ecosystem must have plenty of indirect light in order to sustain plants.
7. Wait one week until the ecosystem has adjusted to the light source. Fish can be added at this time. Place a sealed bag with water and fish into the ecosystem. Do not release the fish until

the water in the bag becomes the same temperature as the water in the ecosystem. This should take a few hours.

8. Ask students to predict how they think the plants and water will look after one week.
9. Students should keep weekly observations in their science journals.

EXPLAIN

Why is this mini-aquarium considered an ecosystem? (An ecosystem is a community of living and nonliving organisms and their immediate surroundings [e.g., air, rocks, soil] driven by the sun's energy.)

Who are the producers in the mini-aquarium? (green plants)

Who are the consumers in the mini-aquarium? (animals that eat the plants)

How are the animals in the mini-aquarium dependent on the plants? (The plants provide food and oxygen for the animals.)

How are the plants dependent on the animals in the mini-aquarium? (The animals give off carbon dioxide that is used by the plants to carry out the process of photosynthesis.)

What are the essential elements of a habitat? (e.g., food, water, oxygen, shelter, space, sunlight, appropriate temperature)

Do the plants and animals in the mini-aquarium have all the essential elements of a habitat?

EXTEND/APPLY

Use a flow map to help students trace the flow of energy in the mini-aquatic ecosystem.

EXTENSION

Help students set up and maintain a classroom terrarium that includes all of the essential elements of a habitat. Find some resources as guides for building terraria. Start small, first adding soil and some small plants from the school grounds. Add animals, such as earthworms and pillbugs, a few at a time, always adding food and water and making daily adjustments as needed.