

Build A Bottle Ecosystem!

Grades: K - 6

Time: 1 hour to assemble

Lesson summary:

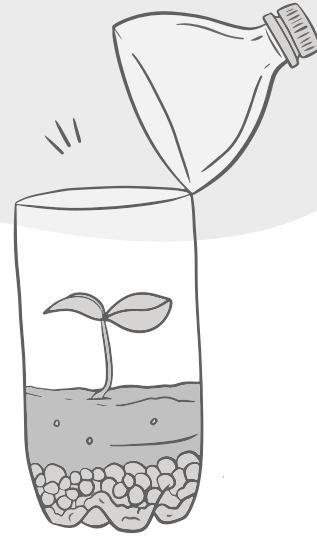
Discover how ecosystems work.

What's the big idea? ??

- What's an ecosystem?
- What role do plants and water play in ecosystems? Learn how ecosystems work by making a bottle ecosystem.

Outcomes or purpose:

- Students will learn about ecosystems by building a bottle ecosystem and observing what happens.



Teacher background:

An ecosystem is a community of living organisms (plants, animals and microbes) in a particular area. Ecosystems also contain non-living components like rocks and landscape, and are affected by sun, weather, temperature, humidity and water. Everything in an ecosystem is linked by nutrient cycles and energy flows.

The whole Earth is a series of connected ecosystems. Ecosystems can be very large or very small! Examples of large ecosystems include prairie grasslands, boreal forests and aspen parkland, such as those found in the Canadian prairie provinces; taiga and tundra ecosystems in the arctic; and marine ecosystems near the ocean. These large ecosystems contain many small ecosystems such as rivers, ponds and sloughs, or even smaller ecosystems like the place underneath a rock or inside a decaying tree trunk. If you have a LGT vermi-composter, indoor garden or an aquarium in your class, they are little ecosystems too.

Every factor in an ecosystem depends on every other factor, either directly or indirectly. Ecosystems have specific needs to function properly and small changes can upset the entire system. For example, a change in temperature in an ecosystem will often affect what plants can grow there. Living creatures that depend on those plants for food and shelter have to adapt to the changes, move to another ecosystem, or they die out. This is why human interference, as a result of pollution, the introduction of invasive species, deforestation and over-hunting, can harm more than just one species.

Build A Bottle Ecosystem!

A bottle ecosystem is very tiny but can teach us things about how ecosystems work. All ecosystems need light, water and soil. The main living things in a bottle ecosystem are plants and the microorganisms in the soil. Even though your bottle ecosystem is sealed up, the plants and microbes inside it can survive because everything in the ecosystem works together.

Plants play an important role in ecosystems, and especially in the water cycle. In every ecosystem all over the world, water is always moving between lakes, rivers, oceans, the atmosphere and the land. As water moves, it can be a liquid (water), a gas (vapour) or solid (snow and ice).

Water moves through **four stages**:

1.

Evaporation. When the sun heats up the surface of the Earth, the temperature warms up. Warm temperatures cause some of the water from rivers, lakes and oceans to turn into a gas called vapour. Plants also put water vapour into the atmosphere through their leaves in a process called transpiration.

2.

Condensation. As water vapour rises, it cools and turns back into a liquid. Clouds are made up of very tiny water droplets.

3.

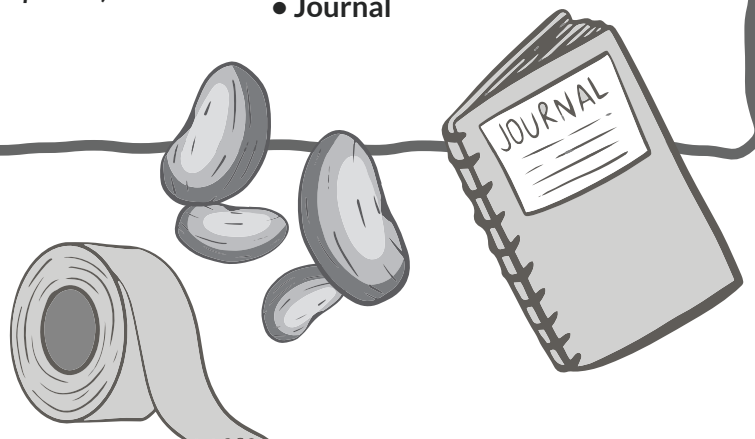
Precipitation. When conditions are right, clouds release the water to the earth in the form of rain or snow, also called precipitation.

4.

Collection. Once rain or snow falls back to the Earth, water eventually makes its way back to bodies of water like rivers, lakes and oceans. Some of that water also soaks into the ground where it is taken up by plants. Eventually water either evaporates or is transpired back into the air by plants and the cycle starts all over again.

Materials needed:

- 4 L Pop bottle with lid
- Potting soil (about 2 cups)
- Optional: moss (gathered from outdoors or purchased from a pet store)
- Scissors
- Seeds (bean, cat grass, radish, johnny-jump-ups etc.)
- Journal
- Tape
- Water
- Rocks, pebbles or broken clay peices



Build A Bottle Ecosystem!

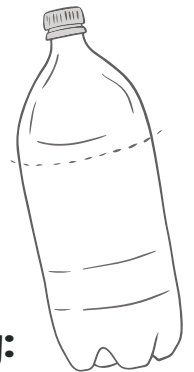
Step by step instructions:

1. Remove the label from the pop bottle. Cut the bottle about $\frac{3}{4}$ of the way around about 10 cm from the top. This acts as a hinge so that you can open and close the bottle. Screw the lid on the bottle.
2. Open the top of the pop bottle and place a 5 cm layer of rocks, pebbles or broken clay pieces into the bottom.
3. Next, add potting soil until it is about $\frac{1}{4}$ full.
4. Soak larger seeds for a few hours before planting them. Make a small hole in the soil and put a seed into the hole. If you are using a smaller type of seed, such as cat grass or radish, simply put the seeds on the top of the soil and sprinkle a bit of soil over the seeds. If you have moss, simply press it on to the soil. Tamp soil down over the seeds. Sprinkle about a $\frac{1}{2}$ of a cup of water onto the soil.

Discussion questions

- Observe your plants: are they green and growing? Are they getting enough moisture? Why do you think that is?
- Observe the water cycle in your bottle ecosystem. Describe the elements of the water cycle in your journal.

5. If you like, add other things in your bottle like small pebbles or even twigs for decoration.
6. Close the top of the pop bottle back so that it looks like a pop bottle again. Place tape over the cut part of the bottle to seal it. Keep the bottle near a window in bright, but not direct sunlight. Rotate the bottle ecosystem regularly so that plants get an even amount of light.



Expand the learning:

Try using one or two seedlings instead of seeds in your bottle ecosystem.

Try using garden soil instead of potting soil in your garden ecosystem. Garden soil is made up of sand, silt and clay and many microorganisms. It is likely to contain seeds - mostly weed seeds. It may even contain small insects or molds. Write your observations in your journal.

Once your plants are actively growing, do some other experiments to find out how other things can affect your bottle ecosystem:

- How does light impact your ecosystem? What happens if it gets less light or more light? What happens if the direction of the light changes.
- How does temperature affect your ecosystem? What happens if you put it in the fridge or warm it with a blow dryer?

Compare your bottle ecosystem to an aquarium ecosystem. How are they the same? How are they different?