

Monitoring Ecosystems

Real World Ecosystems
Backgrounder
Grade Level: 5-8



Have you ever tried to balance on something? Everything is fine until you put one foot wrong and lose your balance and fall. The Earth's **atmosphere** (the mixture of gases (air) that surrounds the Earth) is the same. Everything needs to be carefully balanced all the time in order for all our systems to work properly. Observing the biosphere bottle will let you explore how tricky it is to keep things in balance.



Photo: D Mussell, GreenLearning

The biosphere bottle is an example of a closed **environment** (the physical, chemical, and biotic conditions surrounding an organism). Virtually nothing gets in and nothing gets out. It is a lot like a model of the Earth and the way it exists in its own

biosphere. The biosphere is the part of the Earth in which living species are found. Most organisms are found within a few metres of the Earth's surface, either in the soil, water or atmosphere. Everything needed by the bottle is already inside it once the lid is snapped into place. The biosphere bottle has its own **climate** (The long-term average of existing weather conditions) its own water and **water cycle**. It also has its own **carbon cycle** and nitrogen cycles. When you ring the soil and plants into your bottle it also brings in a lot of little **microorganisms** (any organism of microscopic size). So once the bottle is set up, it is ready to run itself!

Water cycle

The Earth recycles water. Water enters the atmosphere as vapour from bodies of water, from the soil, and from the bodies of organisms, both plant and animal. Water vapour in the atmosphere condenses and forms clouds. The water droplets return to the Earth as rain, snow, sleet, or hail and are used again by plants and animals and the cycle continues.

Carbon cycle

Carbon is a part of carbohydrates, proteins, and fats. Green plants get carbon from the carbon dioxide in the atmosphere. Through photosynthesis, the carbon is incorporated into carbohydrates and transferred to animals when the plants are eaten. Carbon is returned to the atmosphere through animal respiration and through decomposition when the plants or animals die.

The Biosphere

Where is the Earth's biosphere? It extends from a few kilometres up into the atmosphere to deep-sea vents in the depths of the oceans.

In 1961, a Soviet scientist by the name of Shepelev was apparently the first to survive a short while in a closed biosphere when he sealed himself in a steel cylinder with nothing but eight gallons of algae.

Biosphere II, the biodome in Arizona, contained five **biomes** – a rainforest, desert, savannah, marsh (consists of plants and animals usually found in a basin of shallow water fed by underground water) and ocean. A biome is a self-sustaining community of living organisms.

Key Points to Remember

- Both the Earth's atmosphere and the biosphere bottle are essentially a closed system. There is only the transfer of solar and infrared energy.
- In both the Earth's atmosphere and the biosphere bottle there is a limited amount of matter. All of the carbon, water, nitrogen, oxygen and other things essential to life must be re-used and recycled.
- Both systems have a delicate balance between the energy entering the energy leaving (equilibrium).
- If the balance, or equilibrium is disturbed, such as increased light, the system will have to adjust to a new energy balance and temperature.
- Living things are essential in both the biosphere bottle and the Earth.

Think About...

- Discuss what might happen if one or more of the growing conditions inside the bottle were changed. For example, what if a lot of water were to be added? What if the bottle were kept in direct sunlight? How would the bottle be affected?