

## Prerequisite Concepts

This unit builds on your knowledge of the hydrologic cycle.

## The Study of Ecology

In 1866, a German biologist and philosopher named Ernst Haeckel invented the term ecology. The word ecology comes from a Greek word that means house or home. At the time, the term was used to describe the observations made and the work done by scientists who studied the nature and history of plants and animals. As more scientists began to ask questions about and explore the interactions of plants and animals, the definition of ecology became broader.

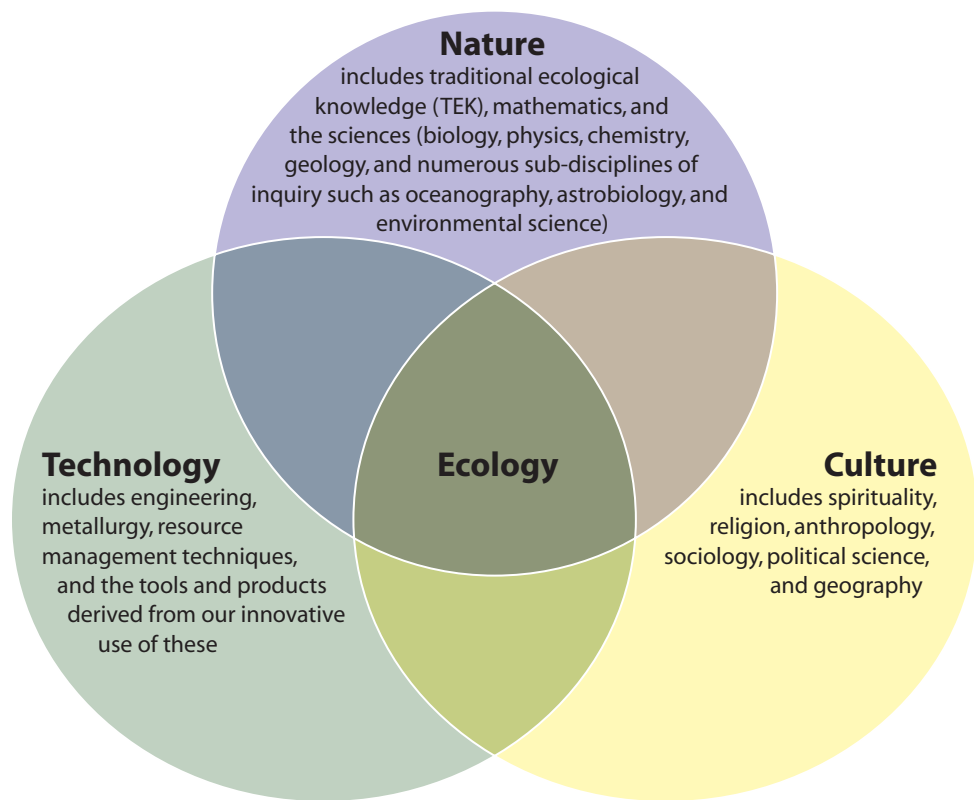
Ecology is the study of the relationships between living things (organisms) and their non-living surroundings, the environment. Ecologists may be found studying events as varied as the cellular processes of microscopic bacteria and the flow of carbon atoms from air, to land, to water throughout the entire planet. Their work

may be performed on a mountainside, in a canoe, on a park lawn, in a laboratory, and on computers.

Ecology involves observations, insights, and innovations from many areas of study, within science as well as outside it. Figure P1.1 outlines the connections between these areas of study.

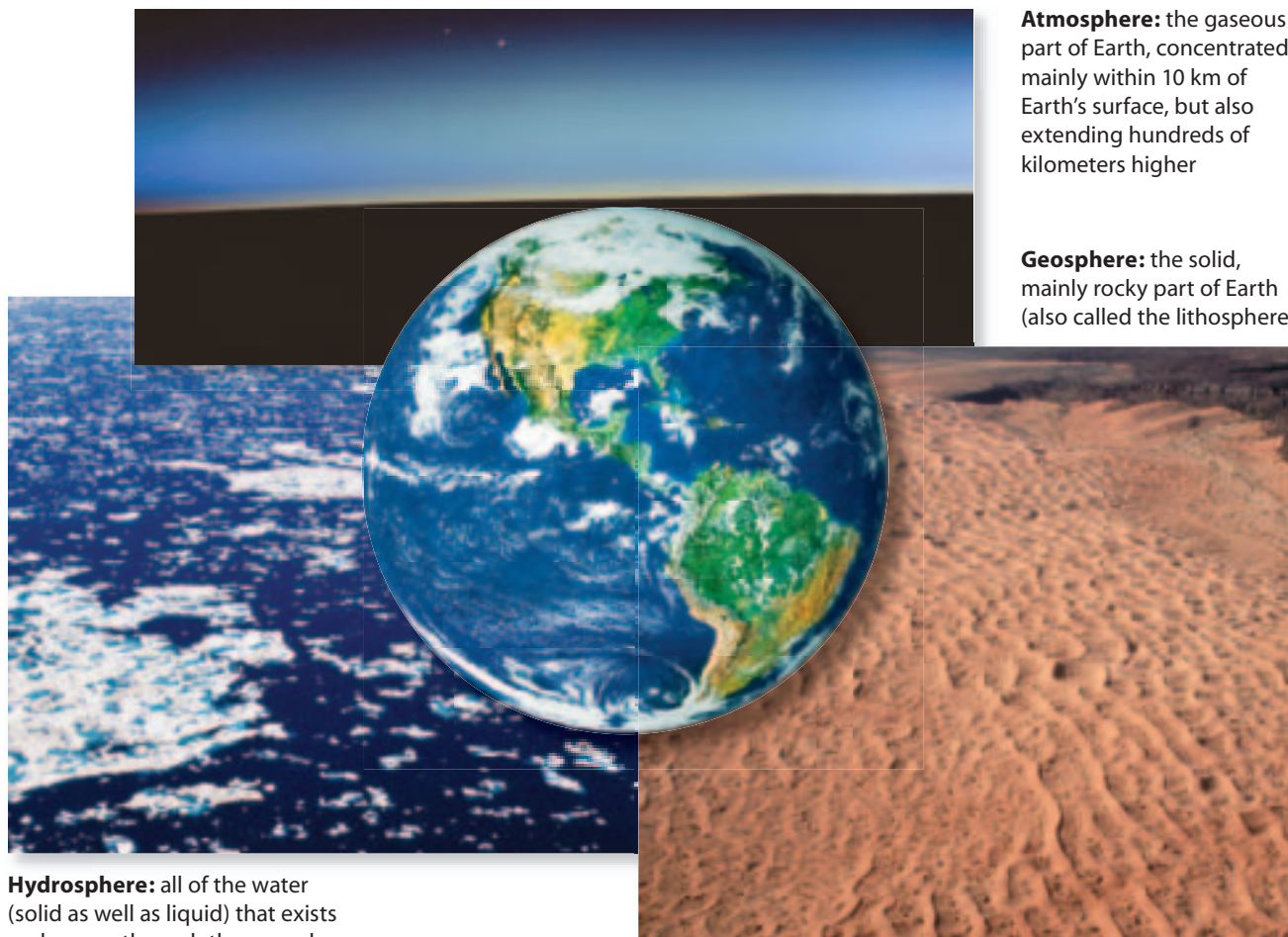
## The Biosphere— Earth's Life System

A system is an object or a group of objects that a scientist chooses to study. Everything other than the system is referred to as the surroundings. Systems are separated from their surroundings by a boundary, which may be real or arbitrary. For example, a pond has a distinct boundary that separates the pond from its surroundings. A grassland, on the other hand, may gradually merge with a neighbouring forested region.



**Figure P1.1** Ecology links natural, cultural, and technological dimensions of inquiry. Many areas within and outside of science contribute to our understanding, use, and management of the environment.

**Biosphere:** all of the areas on Earth that are inhabited by and that support life



**Atmosphere:** the gaseous part of Earth, concentrated mainly within 10 km of Earth's surface, but also extending hundreds of kilometers higher

**Geosphere:** the solid, mainly rocky part of Earth (also called the lithosphere)

**Hydrosphere:** all of the water (solid as well as liquid) that exists and moves through the geosphere

In such a case, the boundary of the grassland would be identified by an observer whose boundary might differ from that of another observer.

Systems may be classified into two types according to their interactions with their surroundings.

- An open system is one that allows energy and matter to cross the system's boundary—to enter and leave it.
- A closed system is one that allows only energy (but not matter) to cross the boundary.

In terms of matter, Earth is essentially a closed system. All the matter that is already here remains here. In

terms of energy, Earth is an open system. The Sun's energy enters the atmosphere, where some of it is reflected back into space and some is absorbed by the atmosphere. The remaining energy passes on to Earth's liquid and solid surfaces, where some is reflected and some is absorbed. Eventually and ultimately, all of the energy absorbed by the atmosphere and the surface is radiated back into space as heat.

In Unit 1, you will investigate the interactions of matter and energy with the components of the biosphere—the thin layer of air, land, and water on and in which all life on Earth is found.

**Figure P1.2** Organisms may be found on land, in water, several kilometres into the atmosphere, and several metres into the soil. All organisms and their non-living environment make up the biosphere.