McGraw-Hill Ryerson

BC Science Connections 9

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Unit 4: Earth's spheres are interconnected

Topic 4.1: How do the ideas of connection and sustainability help us think about Earth's spheres?

- We are all connected.
- Sustainability ensures balanced, healthy systems now as well as in the future.
- Being a scientifically literate citizen matters to you both locally and globally.

Concept 1: We are all connected.

The idea of interconnectedness is at the heart of what it is to be First Peoples

- Similar ideas has been developing among other societies since the modern environmental movement (1970)

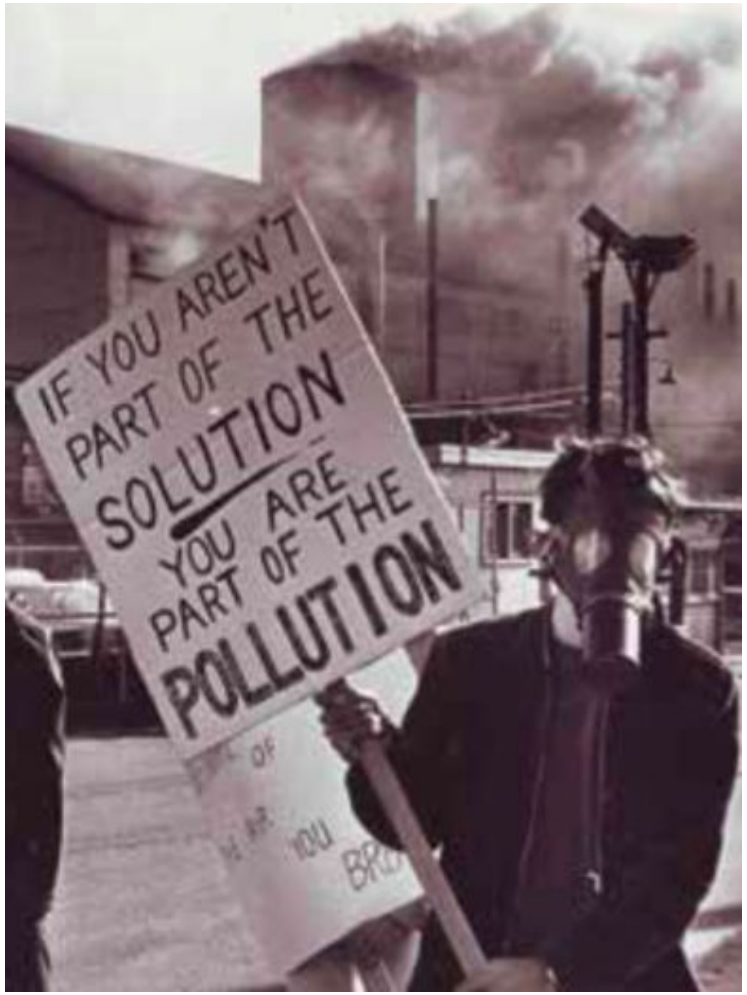

Figure 4.1: The birth of the modern environmental movement is considered to be the first Earth Day on April 22, 1970.

Sheila Watt-Cloutier: Inuit Leader and Environmental Activist

Canadian Inuit leader Sheila Watt-Cloutier made a petition before the U.S. Senate in 2004 about the threat of climate change on Inuit and the Arctic environment:

Figure 4.2

"Use what is happening in the Arctic—the Inuit story—as a vehicle to reconnect us all, so that we may understand that the planet and its people are one. The Inuit hunter who falls through the depleting and unpredictable sea ice is connected to the cars we drive, the industries we rely upon, and the disposable world we have become."

Biotic and Abiotic Parts of the Environment

- **Biotic parts**: Living parts of an environment
- **Abiotic parts**: Non-living parts of an environment

- Biotic and abiotic parts of the environment are connected through the ways in which they interact with one another

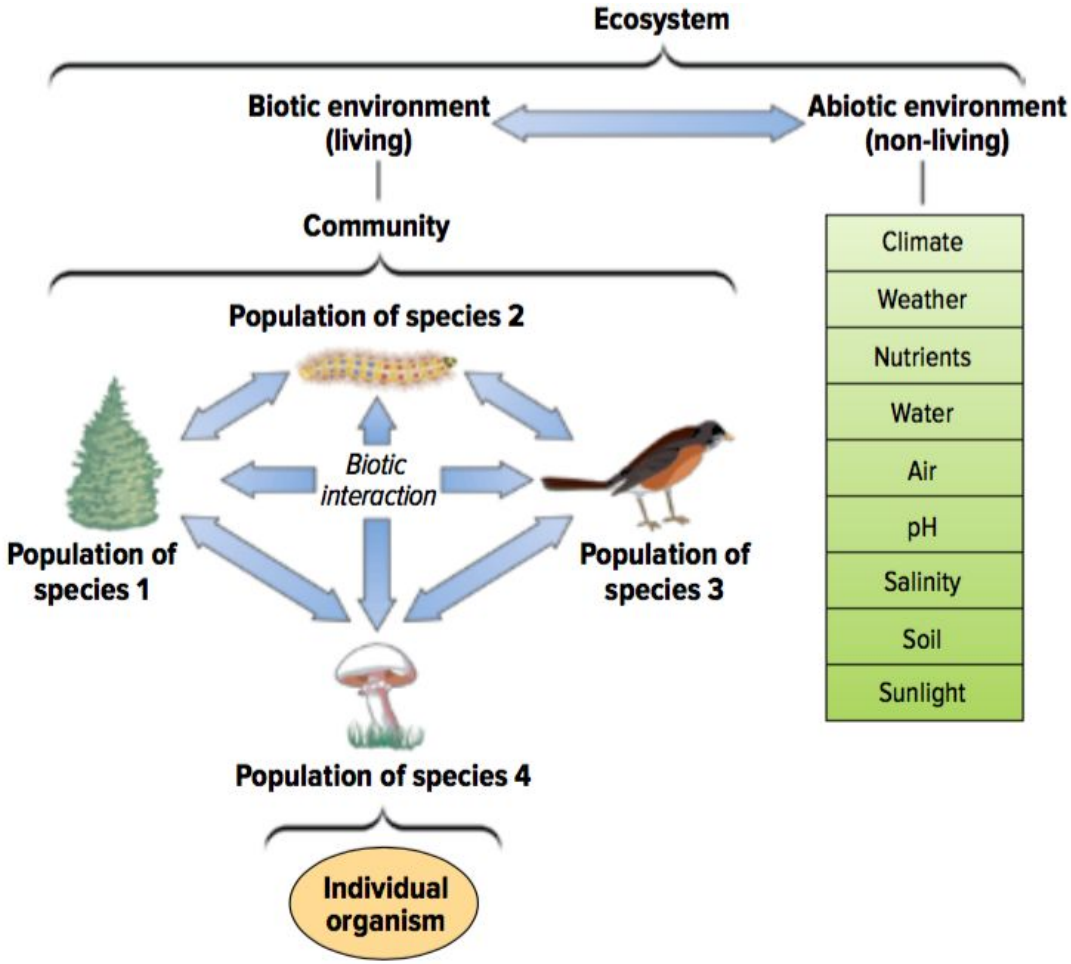

Figure 4.3

Earth's Spheres (Systems)

Natural processes move matter in cycles from the biotic and abiotic parts of the environment.

At any time, matter occupies one of Earth's four spheres (systems):

- **Atmosphere**: Gaseous part of Earth about 10 km of the surface to hundreds of kilometers higher
- **Geosphere** (lithosphere): Solid, rocky part of Earth
- **Hydrosphere**: All of the water (liquid, solid, gaseous) on and within the geosphere
- **Biosphere**: All the areas in the geosphere, atmosphere, and hydrosphere that are inhabited by and support life

Earth's Spheres are Interconnected

Earth's spheres interact with and affect each other in different ways

Example: Landslides

- Occur when soil and rock (geosphere) are saturated with rainwater (hydrosphere) and pulled downward by gravity
- Affects the biosphere (living things that live in or on the geosphere) since they can cause habitat loss

Figure 4.4

Discussion Questions

1. How are First Peoples and Western science ideas of interconnectedness different and similar?

2. Which of earth's spheres are involved when liquid water expands as it freezes in small cracks in rocks and causes mountains to crumble?

Concept 2: Sustainability ensures balanced systems now and for the future.

Ecosystems provide services that all living things depend on

- **Ecosystem services**: The benefits that organisms receive from the environment and its resources
- Examples of ecosystem services:
  - atmospheric gas supply
  - climate regulation
  - cultural benefits
  - food production
  - habitat
  - water supply

Ecosystem Services

Table 4.1 Examples of Ecosystem Services

Ecosystem Service	Example
Atmospheric gas supply	Regulation of carbon dioxide and oxygen
Climate regulation	Regulation of greenhouse gases
Cultural benefits	Aesthetic, spiritual, and educational value
Disturbance regulation	Storm protection, flood control, drought recovery, and other aspects of environmental response to disturbances
Food production	Crops, livestock, fish
Habitat (living space)	Habitat for migratory species and for locally harvested species, overwintering grounds, nurseries
Nutrient recycling	Carbon, nitrogen, and other nutrient cycles
Raw materials (natural resources)	Fossil fuels, timber, minerals
Soil erosion control	Retention of topsoil
Water supply	Supplying of water by reservoirs, watersheds, and wells

Discussion Questions

1. Pick one example of an ecosystem service from Table 4.1.

   Identify which of Earth's spheres it affects, explain how, and explain how humans benefit from the service.

Concept 3: Scientifically literate citizens are aware of bias in sources of information.

Being scientifically literate involves being able to recognize and evaluate bias in information

- **Bias**: A judgment that is based on a person's knowledge, understanding, and beliefs; a partial perspective, interferes with logic or fairness.

Example: "tar sands" vs. "oil sands"

- Which term do you think would be used by a person who is against the processing of Alberta's oil resources?

Recognizing and Understanding Bias

Example: Figure 4.5 and Figure 4.6

- The choice of photo can also indicate a bias
- Both photos show open-pit mining in Fort McMurray, AB
- What do you think and feel when you look at each photo?

Figure 4.5

Figure 4.6

Discussion Questions

1. Define bias. Why it is important to be able to recognize bias when gathering information about a topic or issue?

2. Give an example of a time when you were able to identify bias when reading about or discussing a topic or an issue.

Topic 4.1 Summary: How do the ideas of connection and sustainability help us think about Earth's spheres?

- We are all connected.
- Sustainability ensures balanced, healthy systems now as well as in the future.
- Being a scientifically literate citizen matters to you both locally and globally.