

Earth Science

Chapter 2 – Earth as a System

Section 3 – Ecology

E.Q.: *What are the factors that control the balance of an ecosystem and how does energy transfer in organisms?*

SES1. Students will investigate the composition and formation of Earth systems, including the Earth's relationship to the solar system.

e. Identify the transformations and major reservoirs that make up the rock cycle, hydrologic cycle, carbon cycle, and other important geochemical cycles.

SES6. Students will explain how life on Earth responds to and shapes Earth systems.

c. Explain how geological and ecological processes interact through time to cycle matter and energy, and how human activity alters the rates of these processes (e.g., fossil fuel formation and combustion).

Objectives

- **Define *ecosystem*.**
- **Identify three factors that control the balance of an ecosystem.**
- **Summarize how energy is transferred through an ecosystem.**
- **Describe one way that ecosystems respond to environmental change.**

Ecosystems

- ***Ecology*** is the study of the complex relationships between living things and their nonliving, or abiotic environment.
- **ecosystem** a community of organisms and their abiotic environment
- An ecosystem may be as large as an ocean or as small as a rotting log. The largest ecosystem is the entire biosphere.
- Organisms that make their own food are called ***producers***. Most producers use energy from the sun to produce their own food.
- ***Consumers*** are organisms that get their energy by eating other organisms. Consumers may get energy by eating producers or by eating other consumers.
- Some consumers get energy by breaking down dead organisms. These consumers are called ***decomposers***.
- To remain healthy, an ecosystem needs to have a balance of producers, consumers, and decomposers.

Balancing Forces in Ecosystems

- Because amounts of matter and energy in an ecosystem are limited, the population growth within the ecosystem is limited, too.
- **carrying capacity** the largest population that an environment can support at any given time
- Carrying capacity depends on available resources and on how easily matter and energy cycle between life-forms and the environment in the ecosystem.

Ecological Responses to Change

- In general, ecosystems react to changes in ways that maintain or restore balance to the ecosystem.
- Environmental change in the form of a sudden disturbance can damage and disrupt ecosystems.

However, over time, organisms will migrate back into damaged areas in predictable patterns.

- Ecosystems are resilient and tend to restore a community of organisms to its original state unless the physical environment is permanently altered.

Reading Check

Explain the relationship between carrying capacity and the amount of matter and energy in an ecosystem.

The amount of matter and energy in an ecosystem can supply a population of a given size. This maximum population is the carrying capacity of the ecosystem.

Balancing Forces in Ecosystems, continued

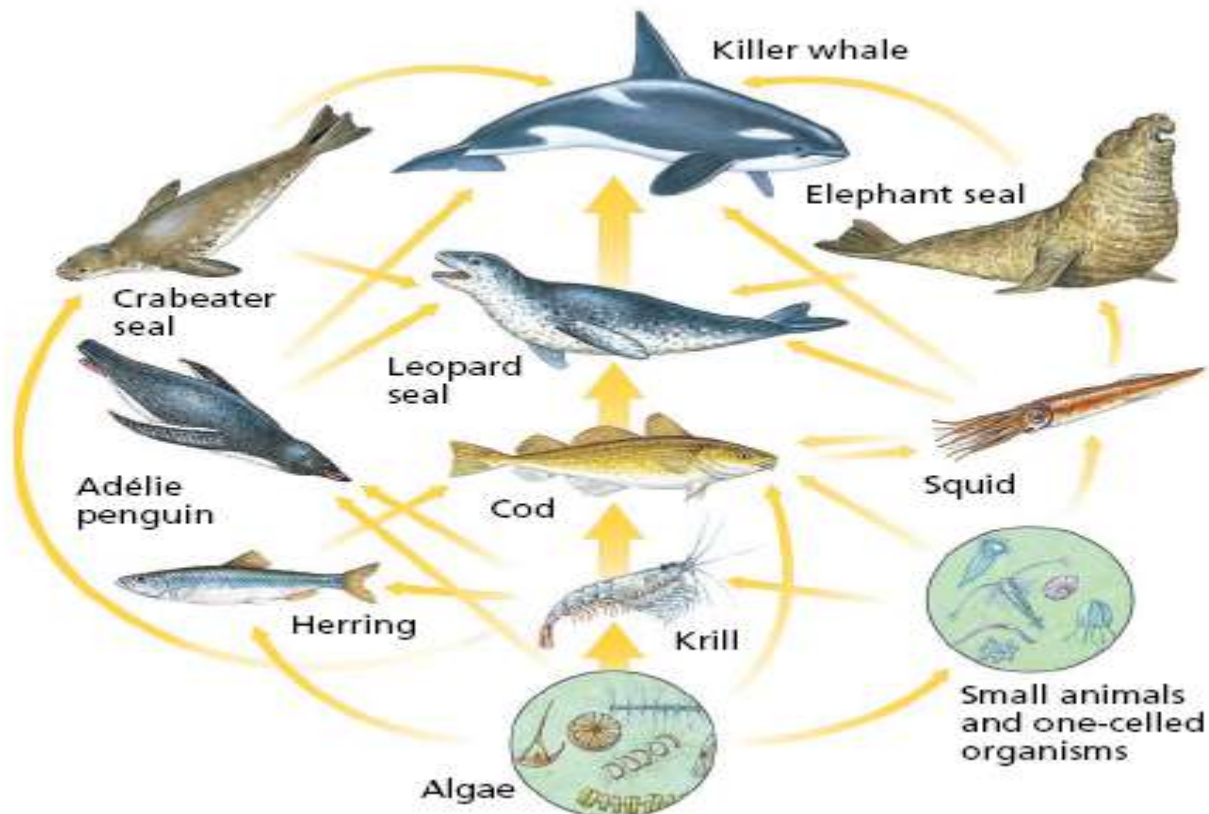
Energy Transfer

- The ultimate source of energy for almost every ecosystem is the sun.
- Producers, such as plants, capture solar energy by a chemical process called *photosynthesis*. This captured energy then flows through the ecosystem from the producers, to the consumers, and finally to the decomposers.
- As matter and energy cycle through an ecosystem, chemical elements are combined and recombined. Each chemical change results in either the temporary storage of energy or the loss of energy.
- An energy pyramid is one way to see how energy is lost as it moves through the ecosystem.
- Producers form the base of the pyramid. Consumers that eat the producers are the next level of the pyramid. Animals that eat those consumers form the upper levels of the pyramid.
- As you move up the pyramid, more energy is lost at each level. Therefore, the least amount of energy is available to organisms at the top of the pyramid.

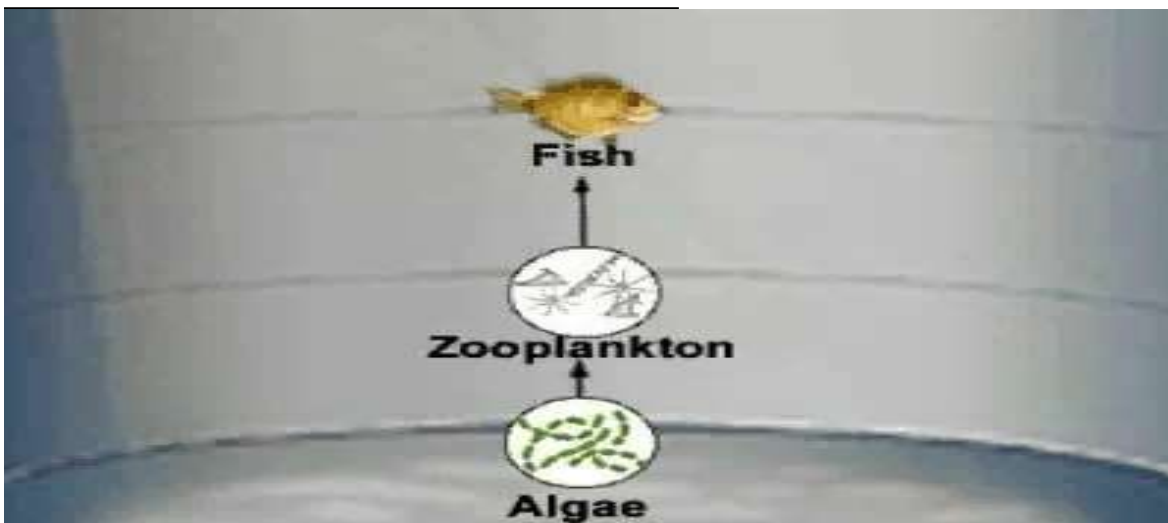
Food Chains and Food Webs

- The sequence in which organisms consume other organisms can be represented by a food chain or by a food web.
- food web a diagram that shows the feeding relationships among organisms in an ecosystem

The figure below illustrates a food web.



Food Chains and Food Webs



Human Stewardship of the Environment

- All of Earth's systems are interconnected, and changes in one system may affect the operation of other systems.
- Ecological balances can be disrupted by human activities, such as overconsumption of resources and pollution.
- To help ensure the ongoing health and productivity of the Earth system, many people work to use Earth's resources wisely.

Concentration of Plant Life on Earth

