

Section 13.1 Ecologists Study Relationships

KEY CONCEPT

Ecology is the study of the relationships among organisms and their environment.



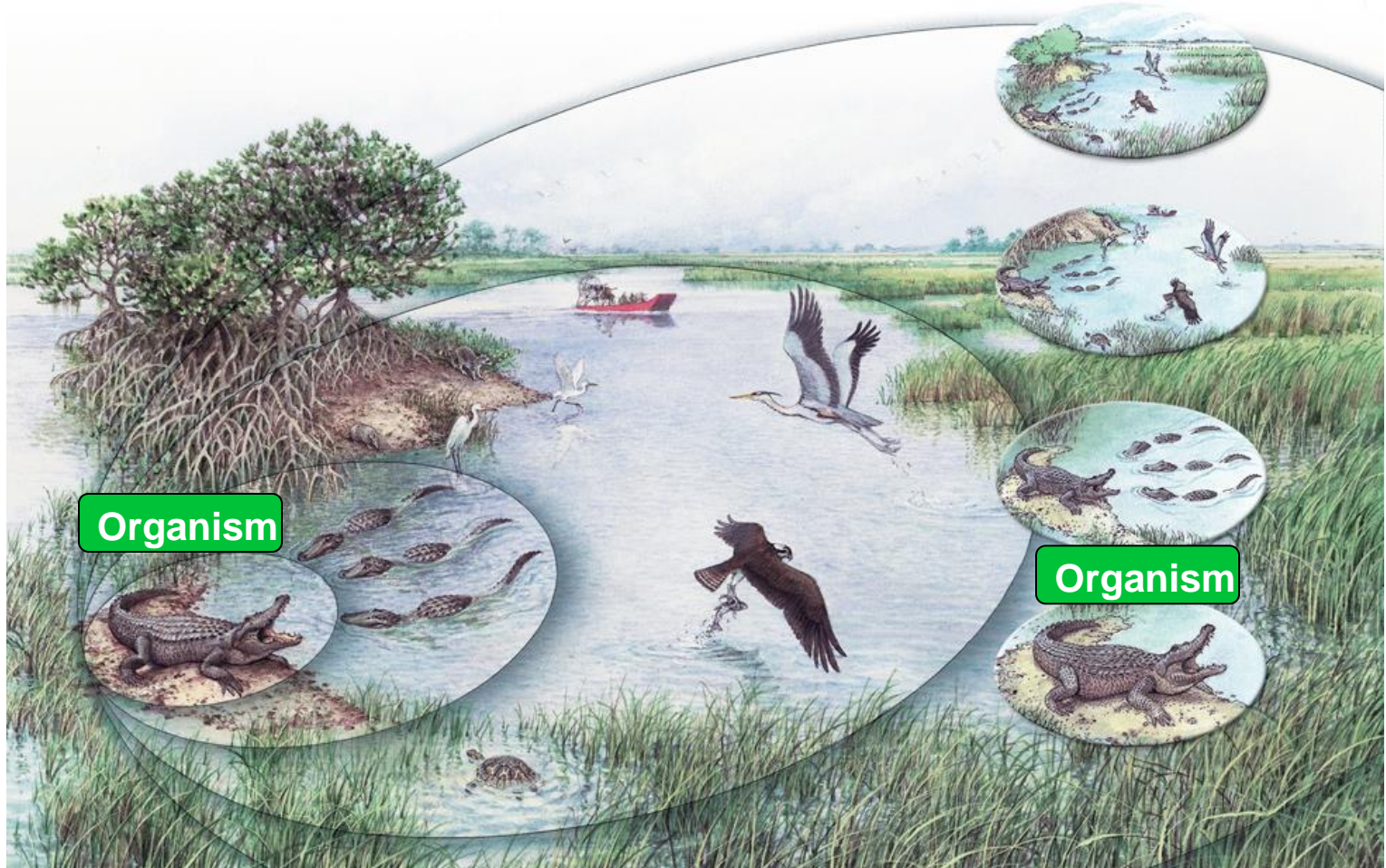
▶ **Ecologists study environments at different levels of organization.**

- **Ecology** is the study of the interactions among living things, and between living things and their surroundings.



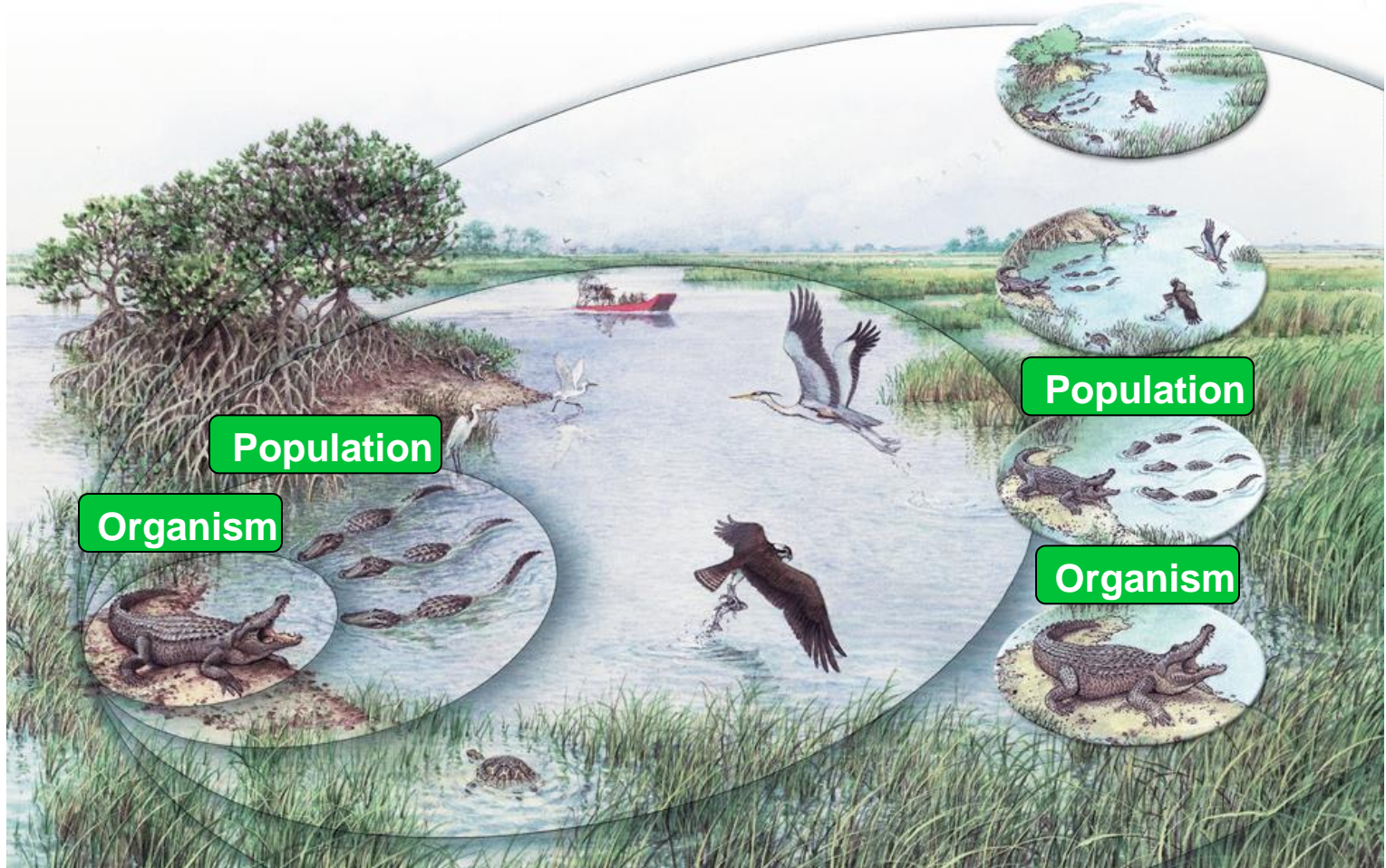
► **Ecologists study environments at different levels of organization.**

- An **organism** is an individual living thing, such as an alligator.



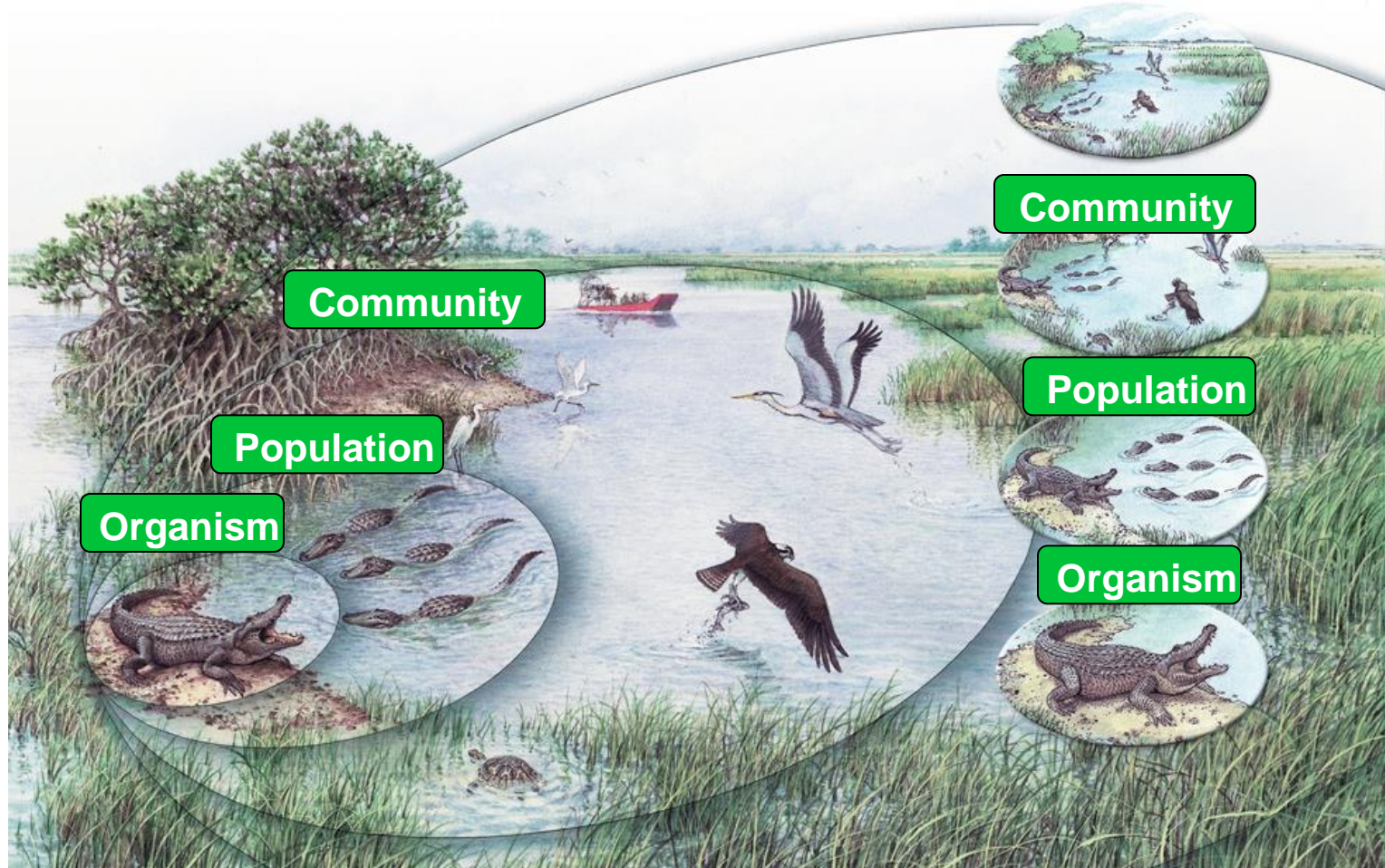
▶ **Ecologists study environments at different levels of organization.**

- A **population** is a group of the same species that lives in one area.



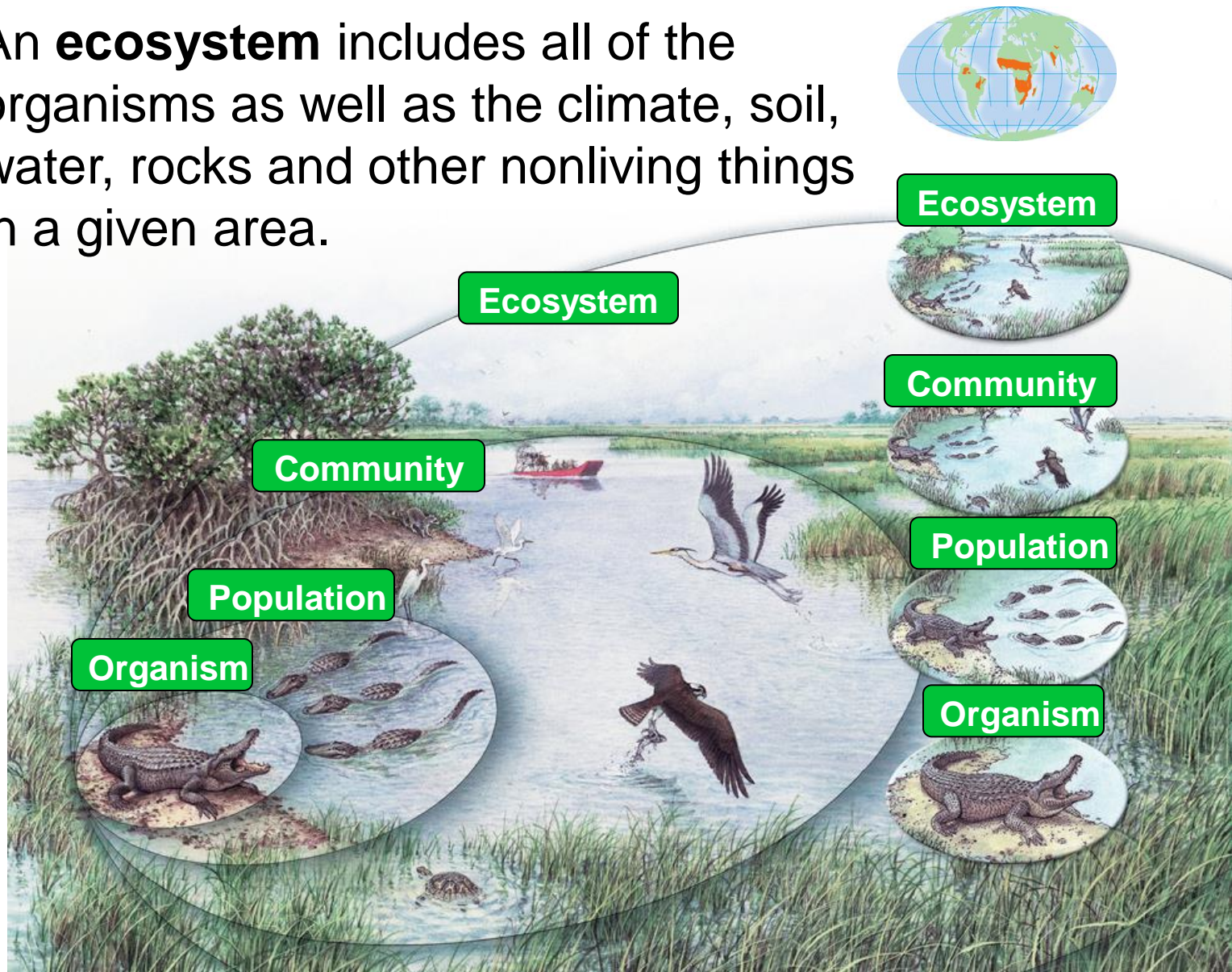
► **Ecologists study environments at different levels of organization.**

- A **community** is a group of different species that live together in one area.



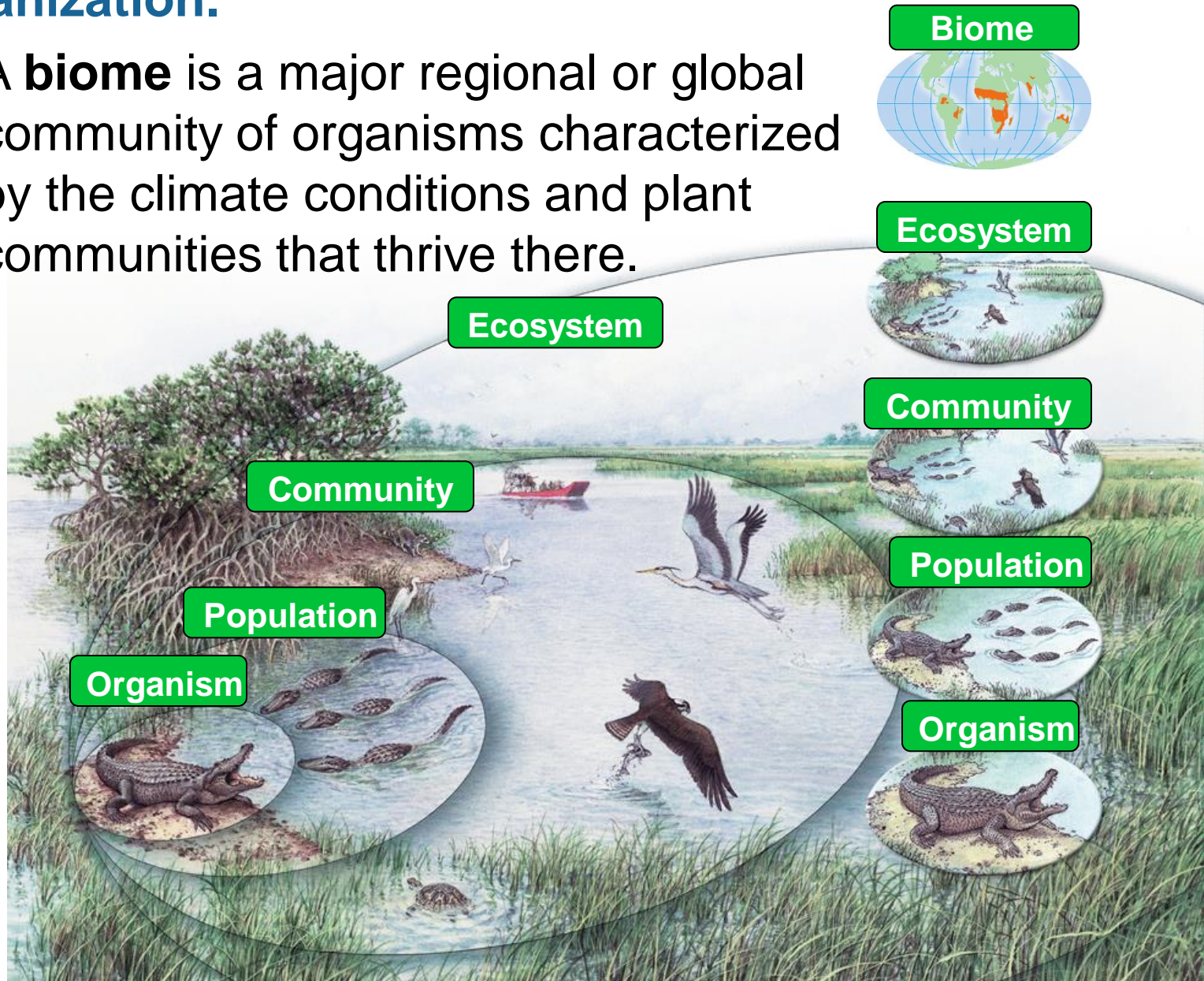
▶ Ecologists study environments at different levels of organization.

- An **ecosystem** includes all of the organisms as well as the climate, soil, water, rocks and other nonliving things in a given area.



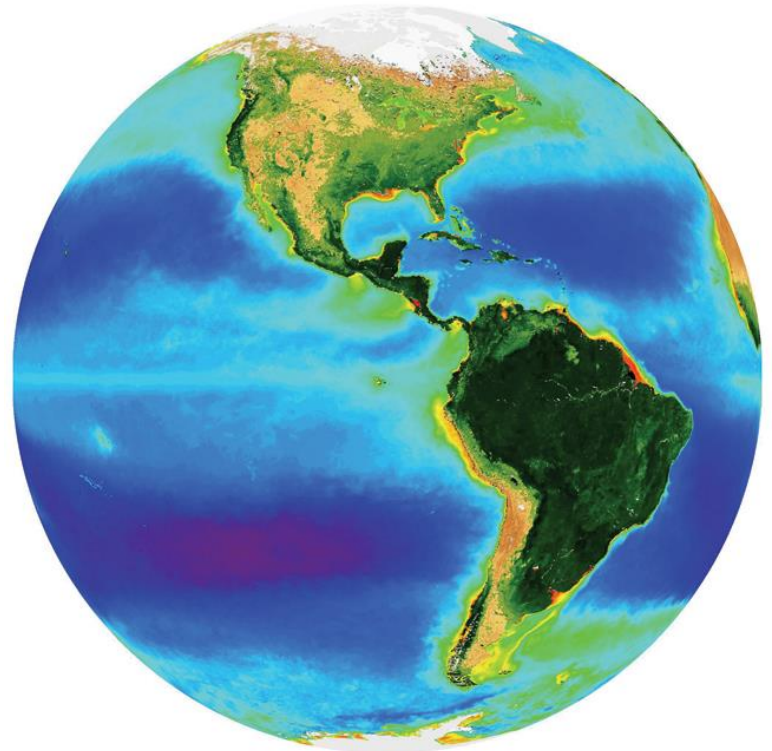
▶ Ecologists study environments at different levels of organization.

- A **biome** is a major regional or global community of organisms characterized by the climate conditions and plant communities that thrive there.



▶ **Ecologists study environments at different levels of organization.**

- The **biosphere** is the sum of all biomes on earth. It includes all living organisms on earth, together with the dead organic matter produced by them.



Section 13.2 Biotic and Abiotic Factors

KEY CONCEPT

Every ecosystem includes both living and nonliving factors.



▶ **An ecosystem includes both biotic and abiotic factors.**

- **Biotic factors** are living things.
 - plants
 - animals
 - fungi
 - bacteria



▶ **An ecosystem includes both biotic and abiotic factors.**

- **Abiotic factors** are nonliving things.
 - moisture
 - temperature
 - wind
 - sunlight
 - soil



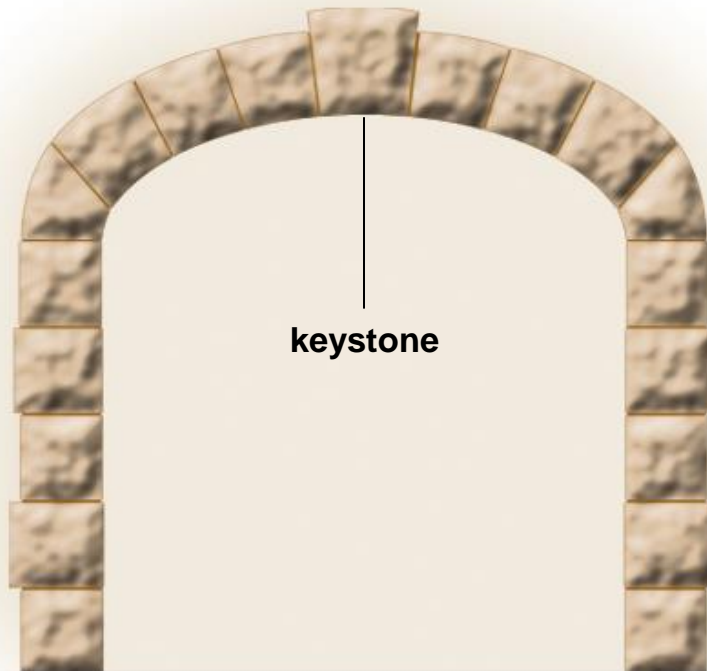
▶ **Changing one factor in an ecosystem can affect many other factors.**

- **Biodiversity** is the assortment, or variety, of living things in an ecosystem.
- Rain forests have more biodiversity than other locations in the world, but are threatened by human activities.

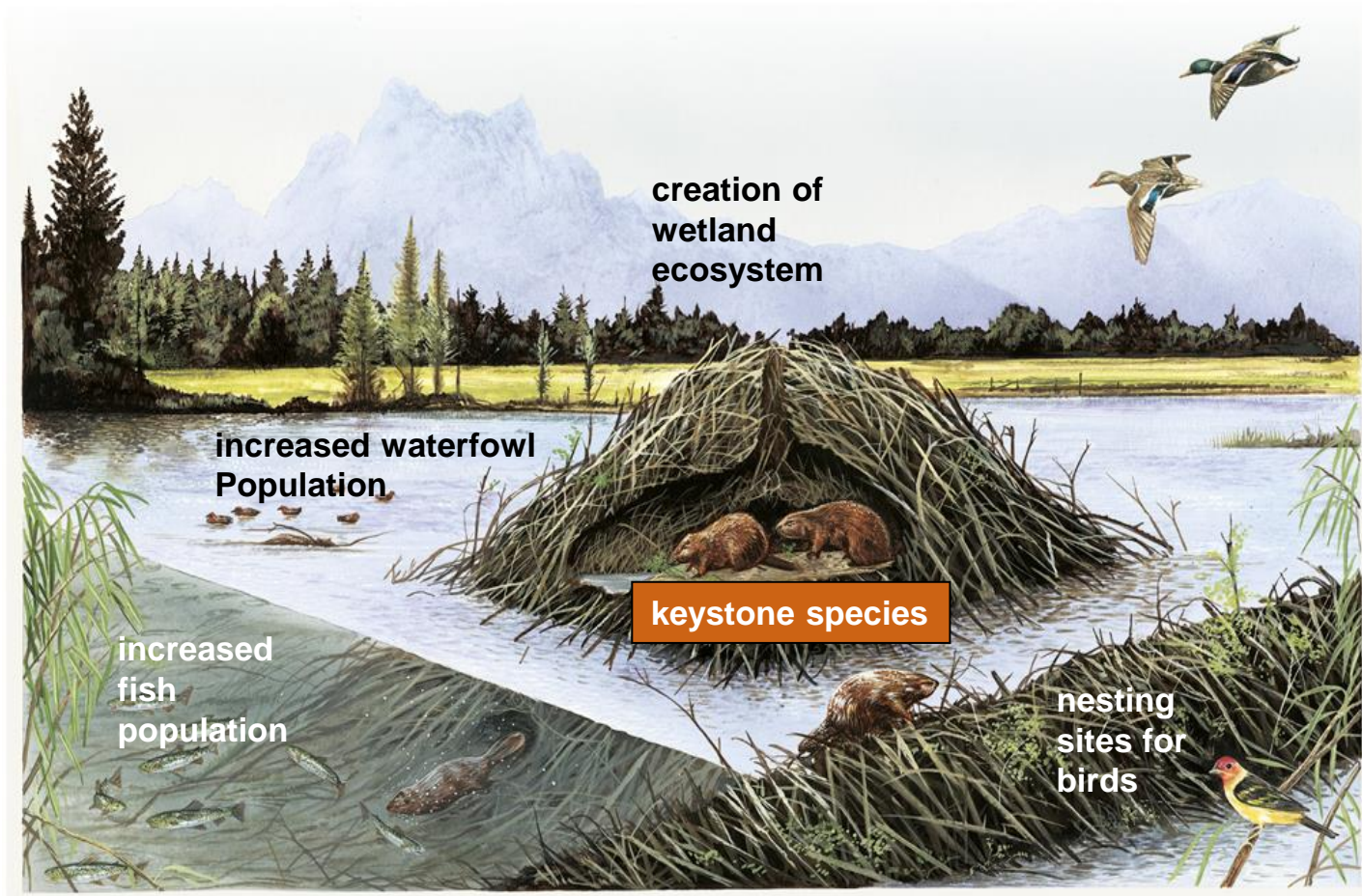


▶ **Changing one factor in an ecosystem can affect many other factors.**

- A **keystone species** is a species that has an unusually large effect on its ecosystem.



- ▶ **Changing one factor in an ecosystem can affect many other factors.**
 - Keystone species form and maintain a complex web of life.



Section 13.3 Energy in Ecosystems

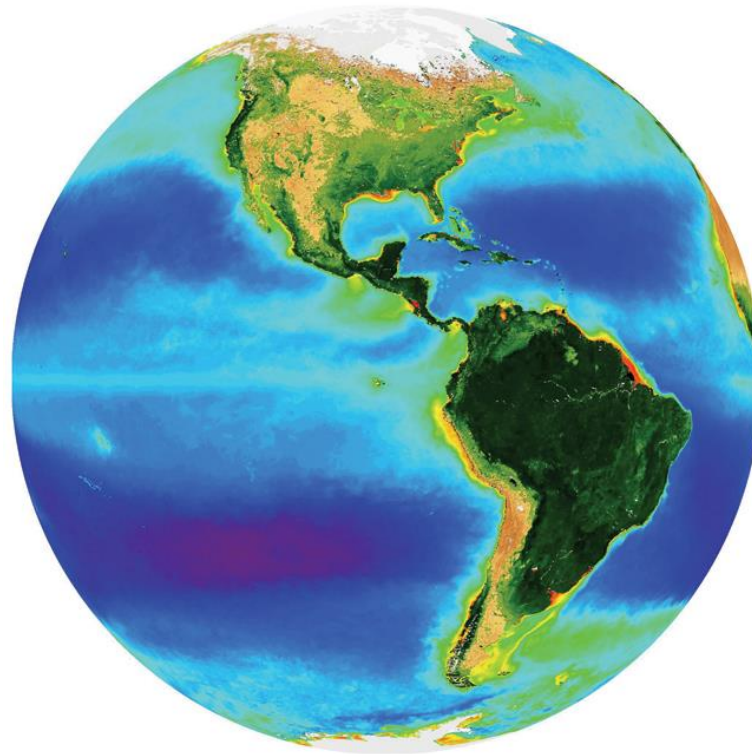
KEY CONCEPT

Life in an ecosystem requires a source of energy.



▶ **Producers provide energy for other organisms in an ecosystem.**

- Producers get their energy from non-living resources.
- Producers are also called **autotrophs** because they make their own food.



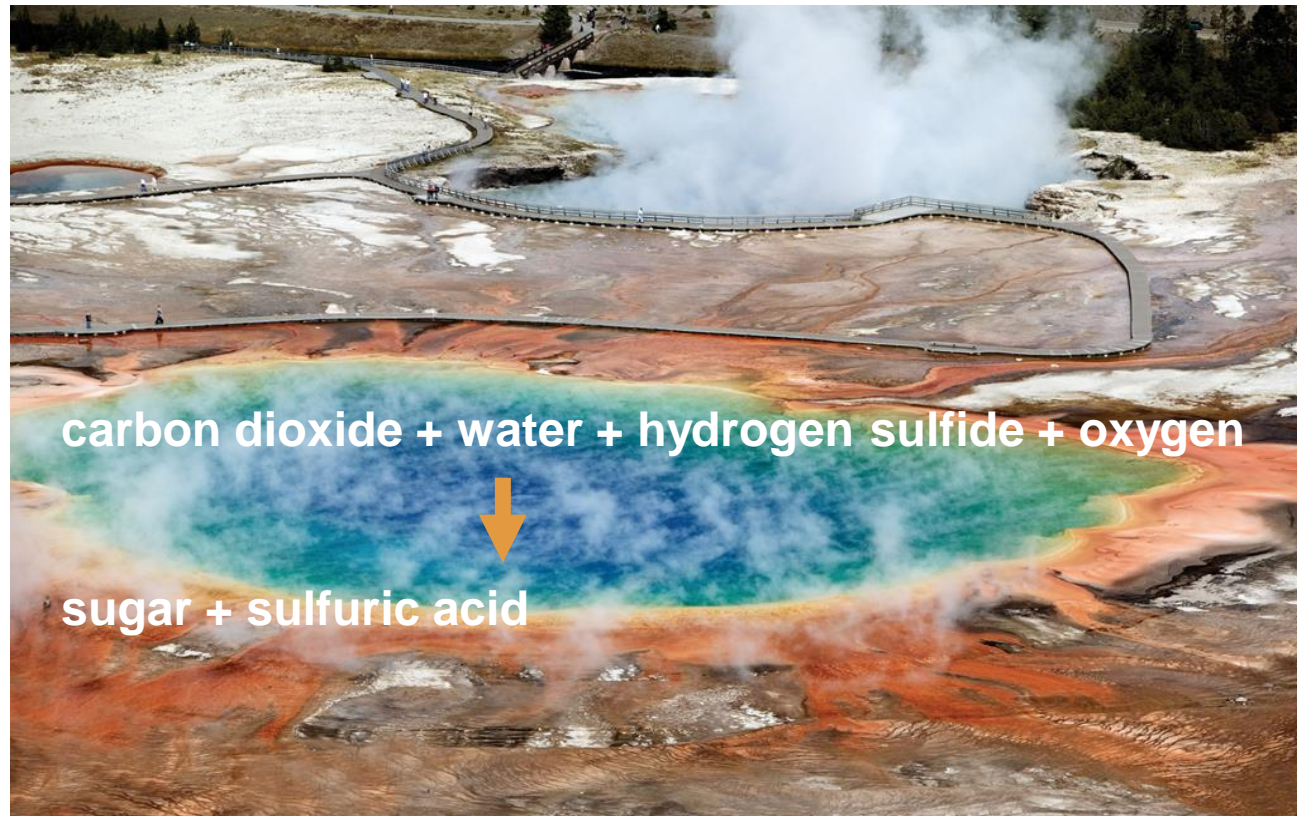
▶ **Producers provide energy for other organisms in an ecosystem.**

- Consumers are organisms that get their energy by eating other living or once-living resources.
- Consumers are also called **heterotrophs** because they feed off of different things.



▶ **Almost all producers obtain energy from sunlight.**

- Photosynthesis in most producers uses sunlight as an energy source.
- Chemosynthesis in prokaryote producers uses chemicals as an energy source.



Section 13.4 Food Chains and Food Webs

KEY CONCEPT

Food chains and food webs model the flow of energy in an ecosystem.



A food chain is a model that shows a sequence of feeding relationships.

- A food chain links species by their feeding relationships.
- A **food chain** follows the connection between one producer and a single chain of consumers within an ecosystem.

GRAMA GRASS



DESERT COTTONTAIL

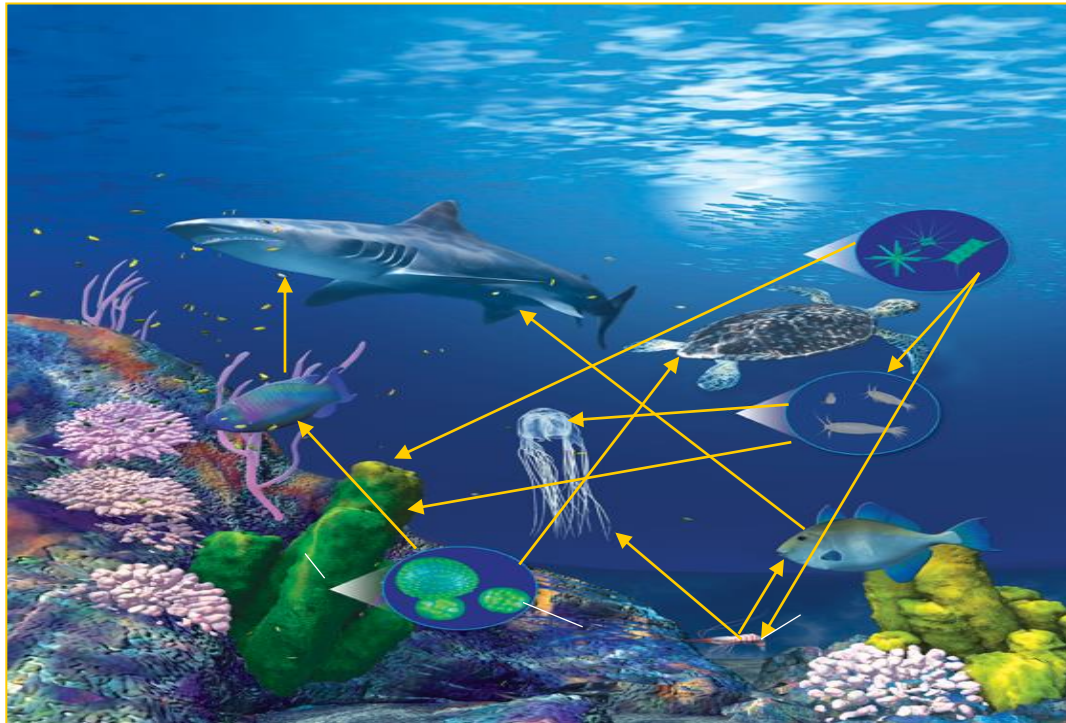


HARRIS' S HAWK



A food web shows a complex network of feeding relationships.

- An organism may have multiple feeding relationships in an ecosystem.
- A **food web** emphasizes complicated feeding relationships and energy flow in an ecosystem.



A food chain is a model that shows a sequence of feeding relationships.

- Consumers are not all alike.
 - 1. **Herbivores** eat only plants.
 - 2. **Carnivores** eat only animals.
 - 3. **Omnivores** eat both plants and animals.
 - 4. **Detritivores** eat dead organic matter.
 - 5. **Decomposers** are detritivores that break down organic matter into simpler compounds.



carnivore



decomposer

A food chain is a model that shows a sequence of feeding relationships.

- **Trophic levels** are the nourishment levels in a food chain.
 - **Primary consumers** are herbivores that eat producers.
 - **Secondary consumers** are carnivores that eat herbivores.
 - **Tertiary consumers** are carnivores that eat secondary consumers.
 - **Omnivores**, such as humans that eat both plants and animals, may be listed at different trophic levels in different food chains.



Section 13.4 Cycling of Matter

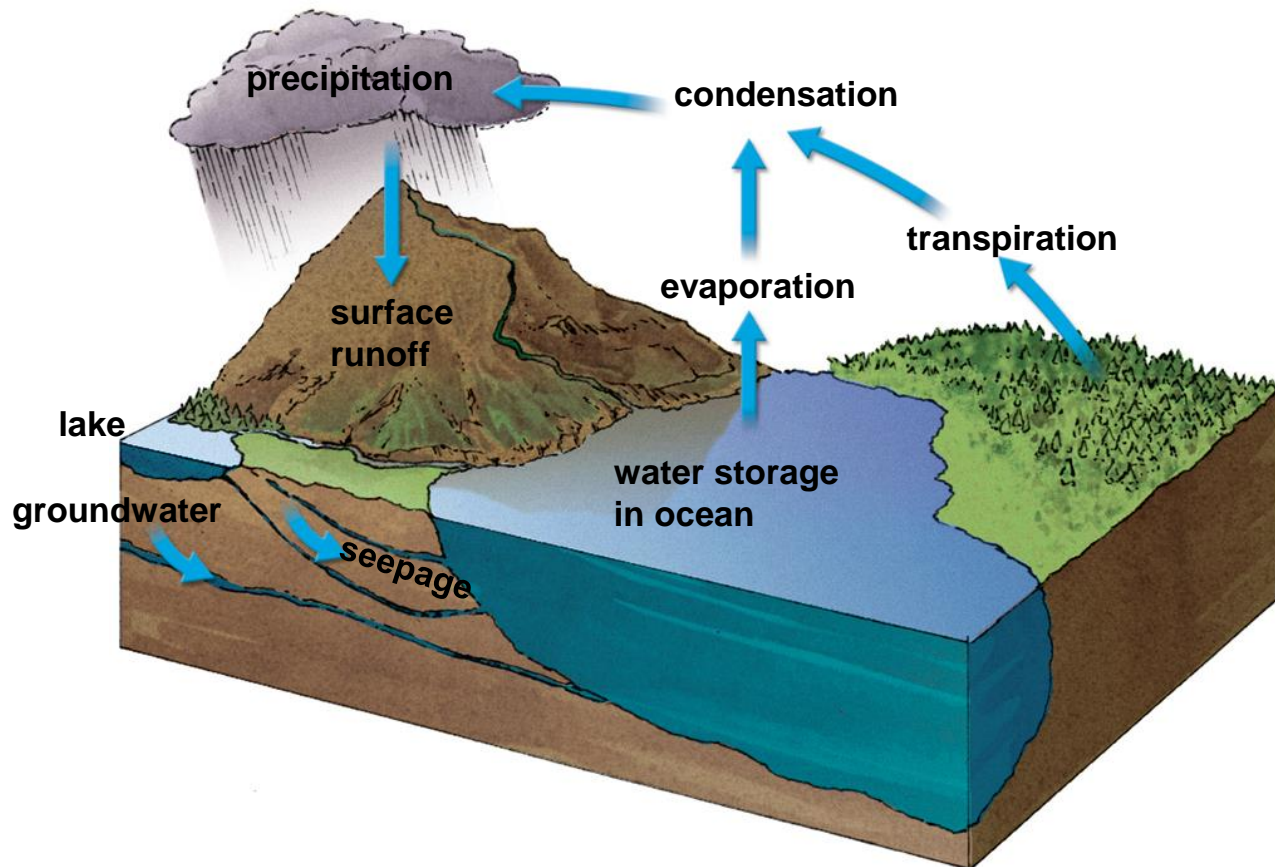
KEY CONCEPT

Matter cycles in and out of an ecosystem.



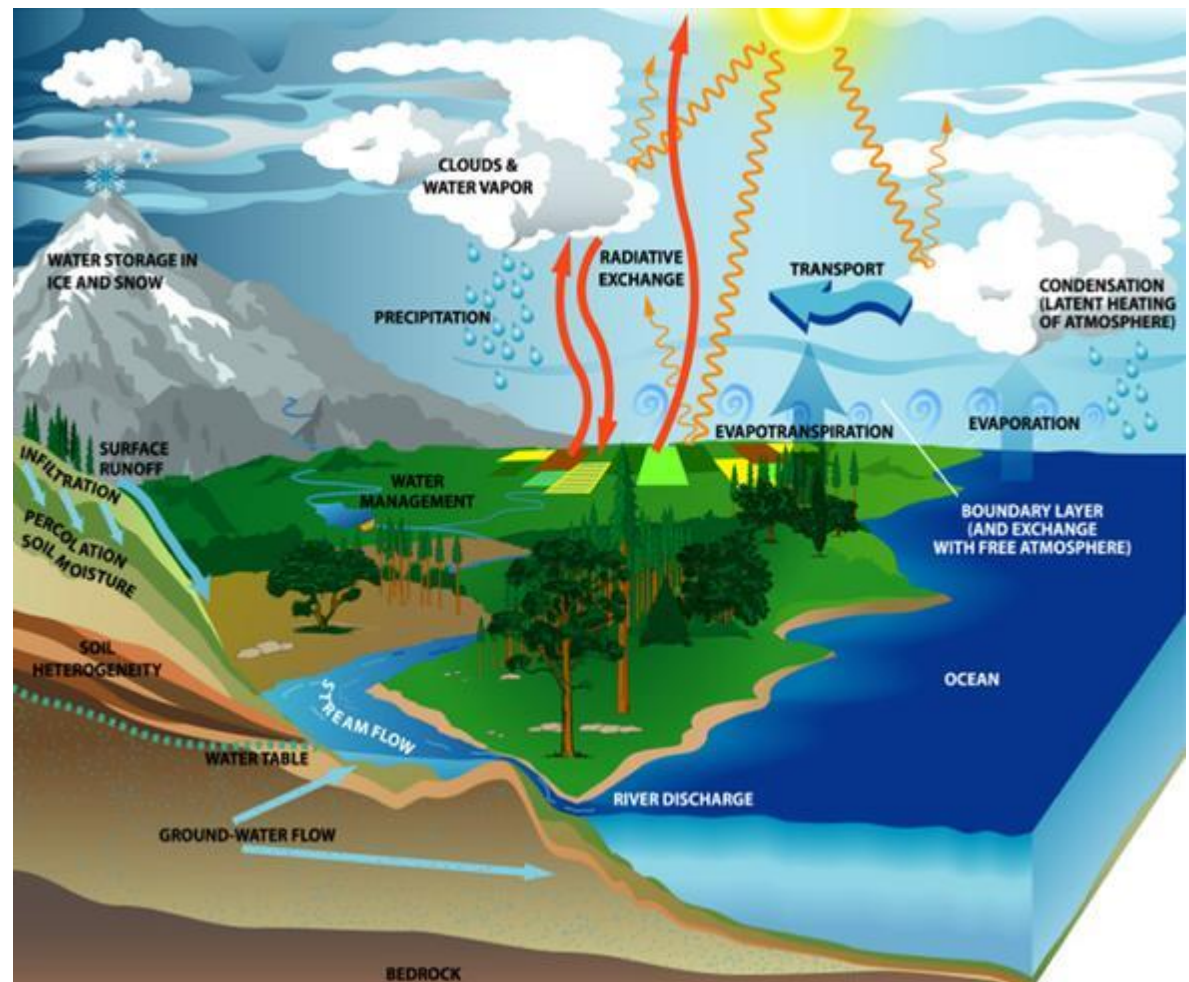
▶ Water cycles through the environment.

- The **hydrologic**, or water, **cycle** is the circular pathway of water on Earth.
- Organisms all have bodies made mostly of water.



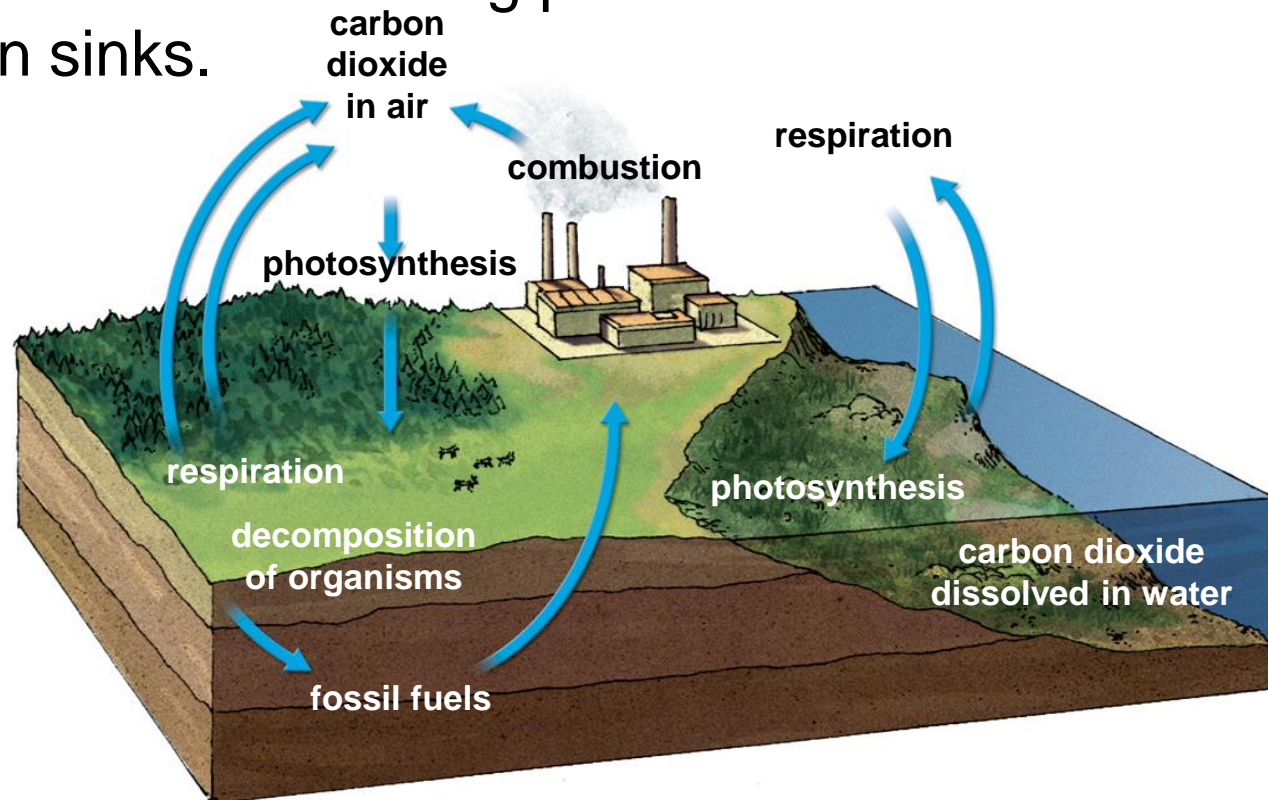
▶ **Elements essential for life also cycle through ecosystems.**

- A **biogeochemical cycle** is the movement of a particular chemical through the biological and geological parts of an ecosystem.



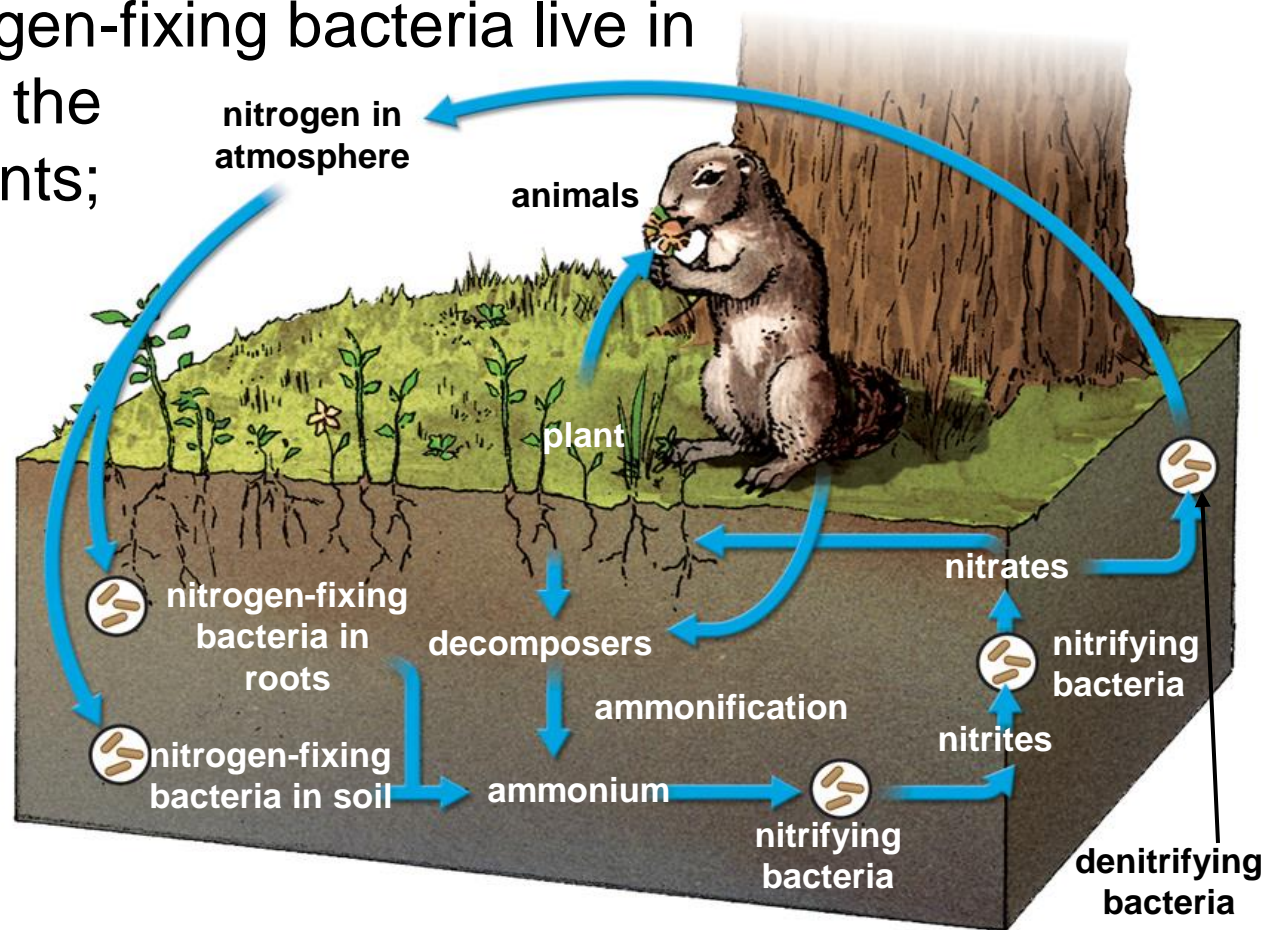
▶ Elements essential for life also cycle through ecosystems.

- Carbon is the building block of life.
 - The **carbon cycle** moves carbon from the atmosphere, through the food web, and back to the atmosphere.
 - Carbon is emitted during the burning of fossil fuels.
 - Some carbon is stored for long periods of time in areas called carbon sinks.



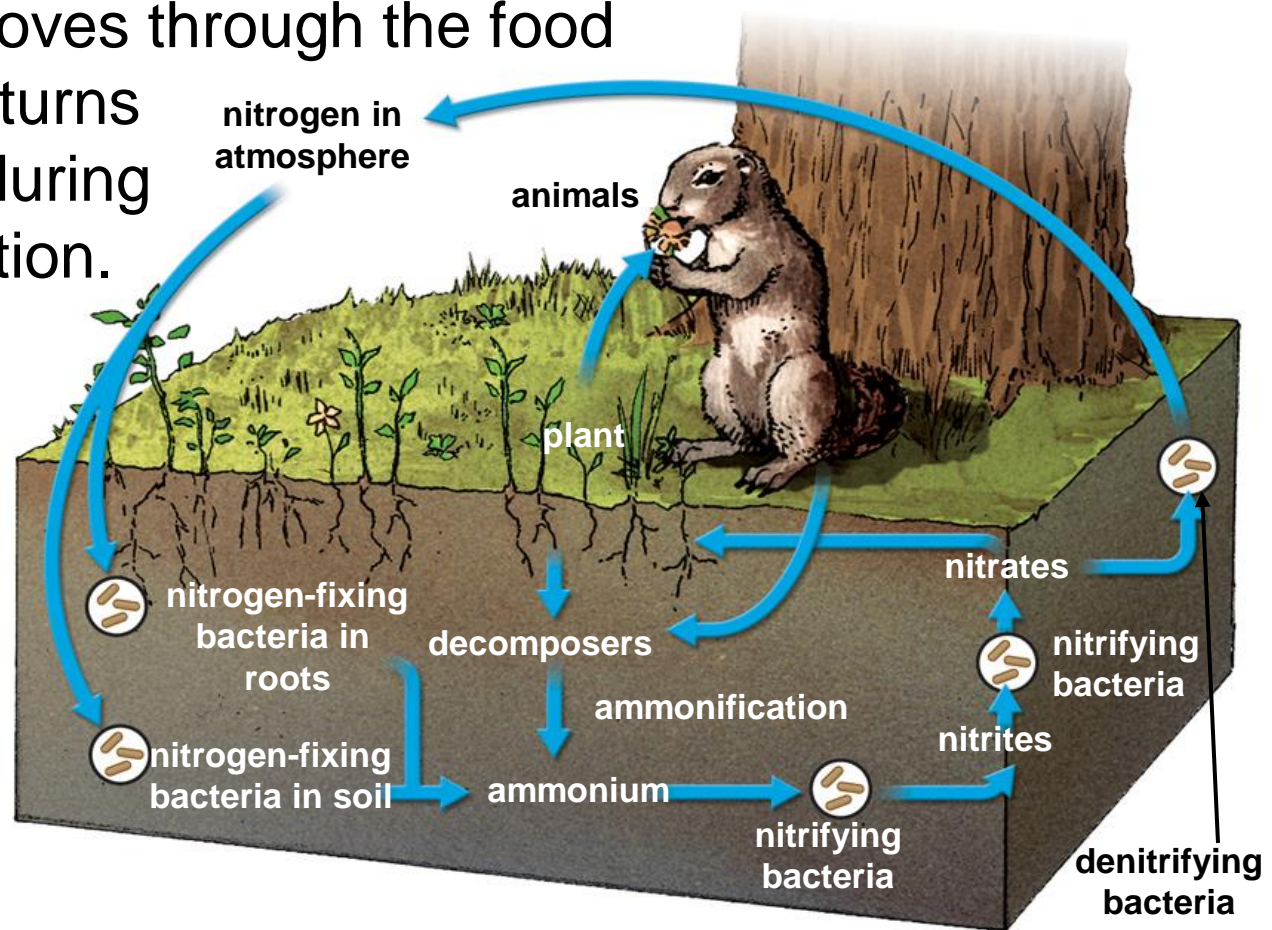
▶ Elements essential for life also cycle through ecosystems.

- The **nitrogen cycle** mostly takes place underground.
 - Some bacteria convert gaseous nitrogen into ammonia through a process called nitrogen fixation.
 - Some nitrogen-fixing bacteria live in nodules on the roots of plants; others live freely in soil.



▶ Elements essential for life also cycle through ecosystems.

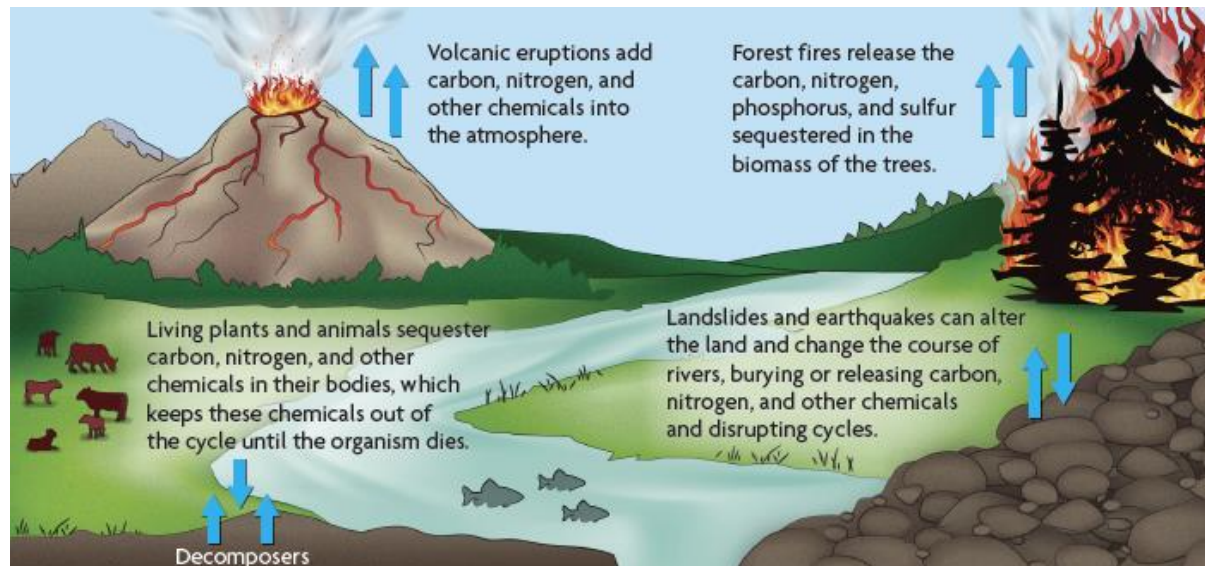
- Ammonia released into the soil is transformed into ammonium.
- Nitrifying bacteria change the ammonium into nitrate.
- Nitrogen moves through the food web and returns to the soil during decomposition.



▶ Natural and human activities can disrupt biogeochemical cycles and ecosystems.

- **Natural disruptions**

- volcanic eruptions
- forest fires
- landslides and earthquakes
- living organisms



▶ **Natural and human activities can disrupt biogeochemical cycles and ecosystems.**

- **Disruptions caused by humans**
 - poor farming practices
 - burning fossil fuels



Section 13.6 Pyramid Models

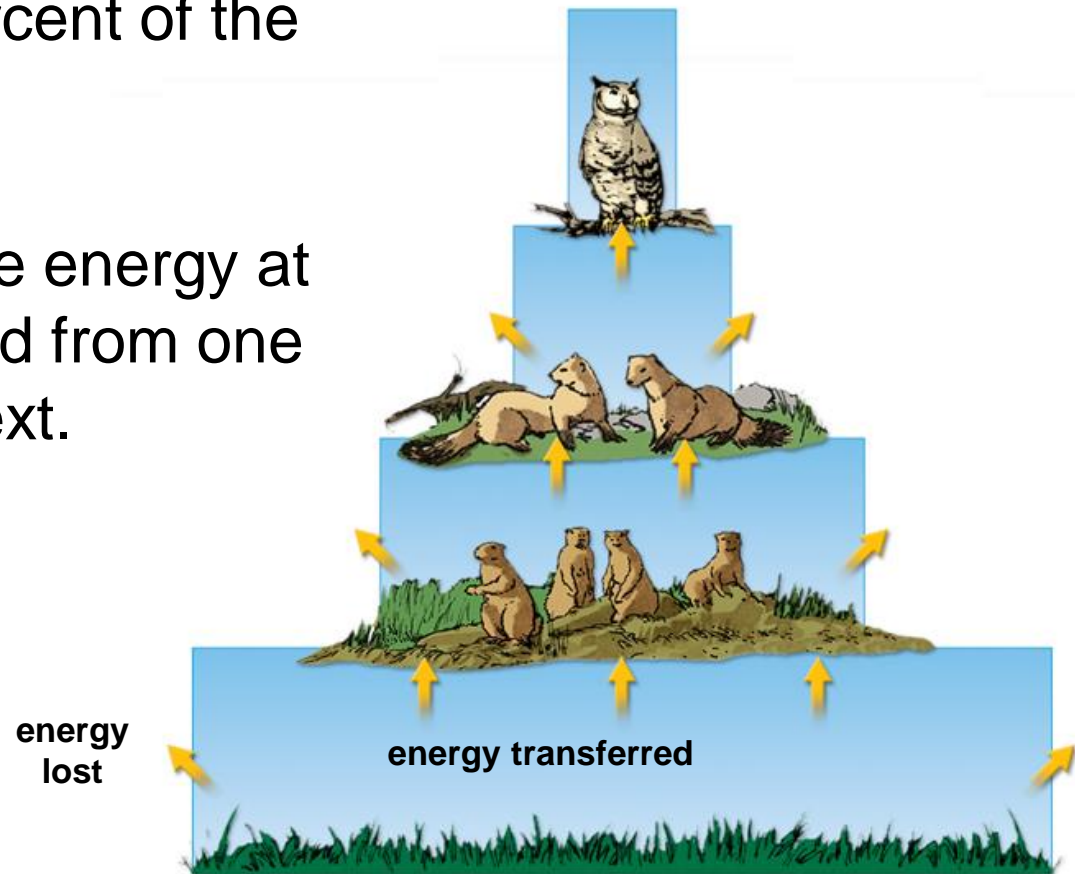
KEY CONCEPT

Pyramids model the distribution of energy and matter in an ecosystem.



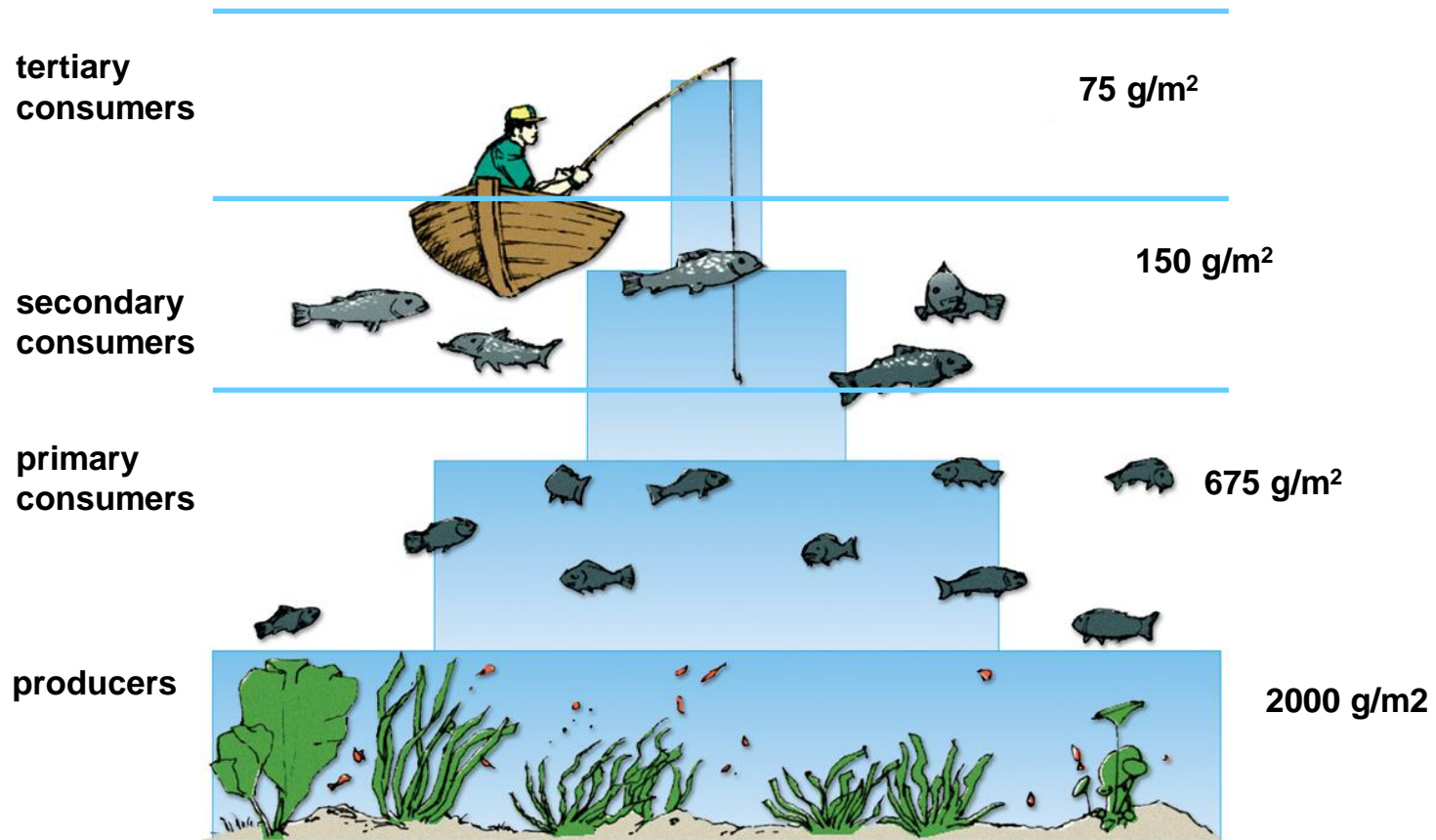
▶ **An energy pyramid shows the distribution of energy among trophic levels.**

- **Energy pyramids** compare energy used by producers and other organisms on trophic levels.
- Between each tier of an energy pyramid, up to 90 percent of the energy is lost into the atmosphere as heat.
- Only 10 percent of the energy at each tier is transferred from one trophic level to the next.



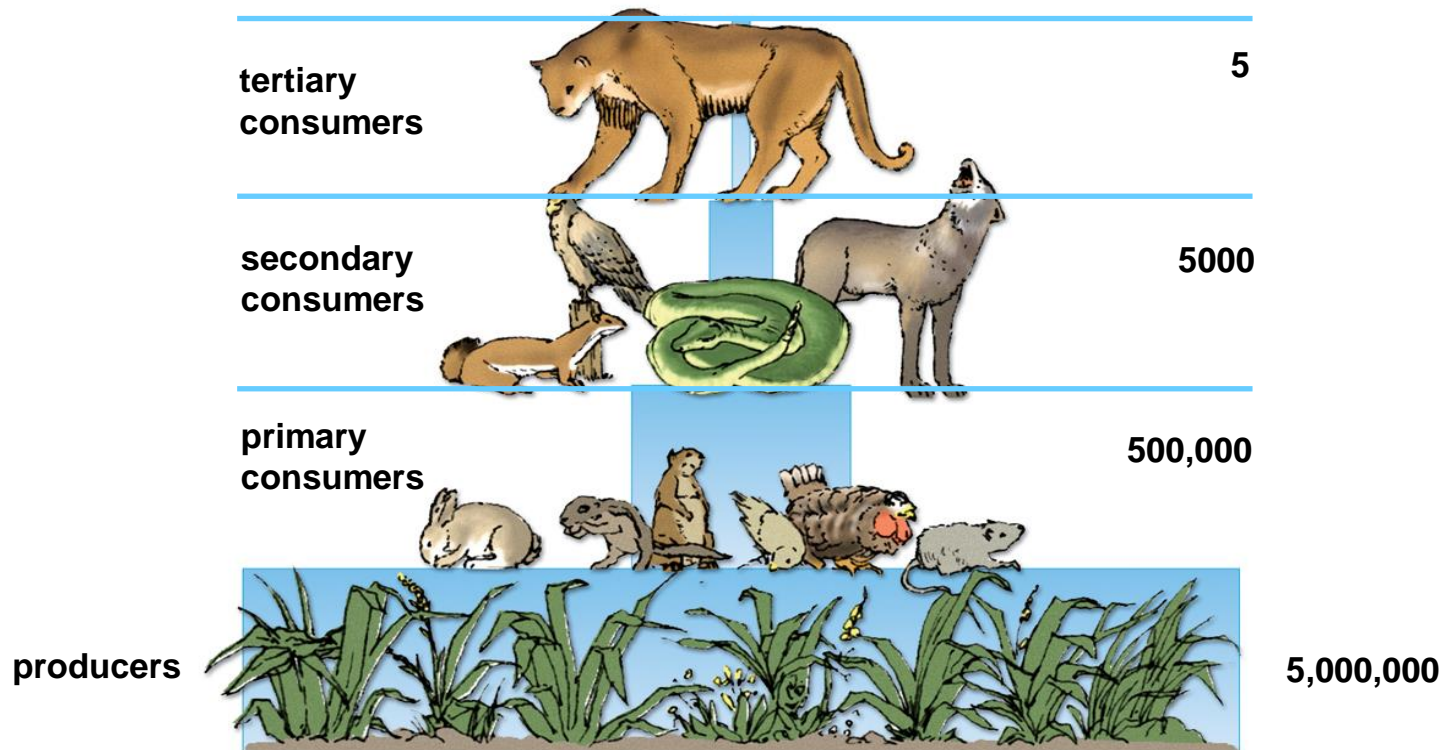
▶ Other pyramid models illustrate an ecosystem's biomass and distribution of organisms.

- **Biomass** is a measure of the total dry mass of organisms in a given area.



▶ **An energy pyramid shows the distribution of energy among trophic levels.**

- A **pyramid of numbers** shows the numbers of individual organisms at each trophic level in an ecosystem.



- A vast number of producers are required to support even a few top level consumers.