7th Grade
Ecology and the Environment

Chapter 2: Ecosystems and Biomes

Lesson 1 (Energy Flow in Ecosystems)

Each organism in an ecosystem fills an energy role.

Producer – an organism that can make its own food (plants, algae, some bacteria)

Consumer – an organism that obtains energy by feeding on other organisms

consumer types:

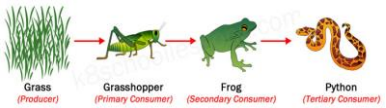
- **herbivores** – eat plants as main food source
- **carnivores** – eat mainly animals
- **omnivores** – can survive on either plants or animals
- **scavengers** – feed on the bodies of dead organisms

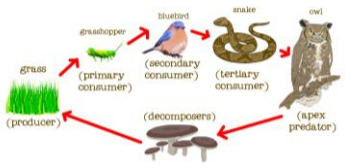
decomposers – organisms that break down chemicals from wastes and dead organisms, and returns important materials to the soil and water

– "nature's recyclers", such as bacteria and fungi

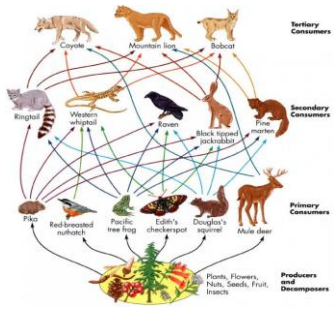
Energy enters most ecosystems as sunlight. Energy moves through an ecosystem when one organism eats another.

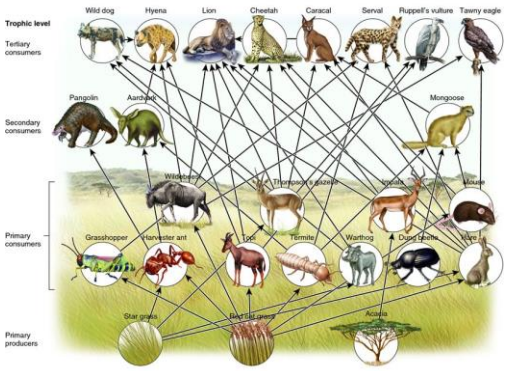
Food chain – a series of events in which one organism eats another an obtains energy





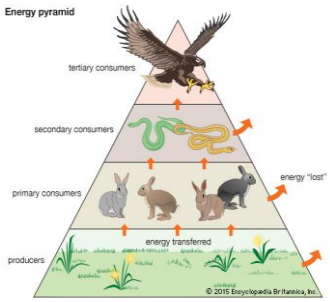
Food web – consists of many overlapping food chains in an ecosystem

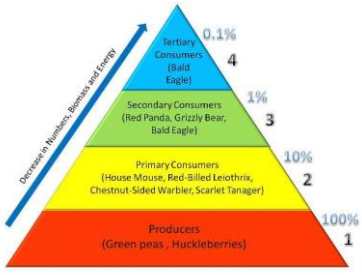


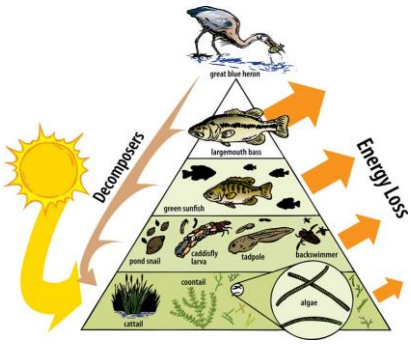


Energy pyramid – a diagram that shows the amount of energy that moves from one feeding level to another in a food web

- When an organism in an ecosystem eats, it obtains energy.
- It uses some of this energy to move, grow, reproduce, and other activities.
- These activities produce heat that is released into the environment.
- The amount of energy that is available to the next consumer is now reduced.
- As energy moves up the pyramid, each level has less energy than the level below.







Lesson 2 (Cycles of Matter)

Water, carbon, oxygen, and nitrogen are necessary building blocks for living things.

Cycles of Matter:

1. **The Water Cycle** – continuous process by which water moves from Earth's surface to the atmosphere and back
   - The processes of **evaporation**, **condensation**, and **precipitation** make up the water cycle.
   - **Understand Fig. 1, p. 51**

Evaporation – the process by which molecules at the surface of a liquid absorb enough energy to change to a gas

- Water evaporates from bodies of water, as well as from plants and animals, forming water vapor.

Condensation – the change in state from a gas to a liquid

- As water vapor is pushed upward, it cools and turns back into a liquid.
- These water droplets collect around dust particles to form clouds.
- When droplets become to large, gravity pulls them down.

Precipitation – any form of water that falls from clouds and reaches Earth's surface as rain, snow, sleet, of hail

2. **The Carbon and Oxygen Cycles**

- Producers, consumers, and decomposers play a role in recycling oxygen and carbon. (All living things contain carbon compounds.)
- Carbon is an essential building block in all living things.
- Most organisms use oxygen for life processes.
- **Producers** take in water and CO_2 to make oxygen and carbon compounds (sugars that form their foods.) during **photosynthesis**.
- **Consumers** (and plants themselves) take these carbon compounds (sugars) and oxygen to make CO_2 and energy during **cellular respiration**.
- **Decomposers** break down dead producers and consumers to put carbon back into the soil and CO_2 into the air.
- **Understand Fig. 2, p. 53**

Photosynthesis and cellular respiration are opposite processes in the carbon and oxygen cycles.

The Photosynthesis Equation:

$$6CO_2 + 6H_2O \xrightarrow{\text{Light Energy}} C_6H_{12}O_6 + 6O_2$$

(carbon dioxide) and (water) (produces) (sugar) and (oxygen)

The Cellular Respiration Equation:

$$C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O + \text{energy}$$

(sugar) and (oxygen) (produces) (carbon dioxide) and (water) and

3. **The Nitrogen Cycle**

- Nitrogen moves from the air to the soil, into living things, and back into the air.
- Air is about 78% nitrogen gas, but most organisms cannot use it in this form.
- To make is usable, nitrogen needs to be combined with other elements and put into compounds.
- This is done by some kinds of bacteria on the roots of certain plants called **legumes**.
- Producers use these compounds for growth.
- Consumers get these compounds by eating producers.
- Decomposers eventually break down the compounds to release nitrogen into the air again.
- **Understand Fig. 4, p. 55**

Free nitrogen – nitrogen that is in the air and not combined with other elements

Fixed nitrogen – nitrogen that is combined with other atoms in a compound

Nitrogen fixation – the process of changing free nitrogen gas into nitrogen compounds that plants can absorb and use

Legume – a group of plants with nitrogen-fixing bacteria on their roots

Examples: beans, clover, alfalfa, peas, peanuts, and some trees

Lesson 3 (Biomes)

Biome – a group of land ecosystems with similar climates and organisms

- **Climate** determines an area's biome.

Climate – the average annual temperature and amount of precipitation of an area

- not the same as weather

6 Major Biomes:

1. Rainforest – an a rea that receives more than 200*cm* (80 inches) of precipitation per year

– contain a dense canopy (leafy roof from tall trees) and dense understory (layer of shorter plants and vines) that makes the forest floor nearly dark

– contain more species of plants and animals than all other biomes combined

temperate rainforest – the area of the Pacific northwest U.S. where over 300*cm* (120 inches) of precipitation falls yearly

tropical rainforest – found close to the equator

2. desert – an a rea that receives less than 25*cm* (less than 10 inches) of precipitation each year

– Often have extreme temperatures (either very hot or very cold)

3. grassland – contains non-woody plants

– includes **prairies** and **savannas**

prairie – a grassland in the middle latitudes receiving 25-75*cm* (10-30 inches per year)

savanna – grassland located close to the equator receiving up to 120*cm* (47 inches) per year

4. deciduous forest – has **deciduous trees** that shed their leaves and grow new ones each year

5. boreal forest – has **coniferous trees** that produce seeds in cones and have needle-shaped leaves

– found in the upper regions of the Northern Hemisphere

6. tundra – extremely cold, dry biome where most of the soil is frozen all year (called **permafrost**)

– The top layer of soil thaws in the summer, allowing growth of mosses, grasses, and shrubs.

– Rainwater cannot soak in (due to permafrost), forming many shallow ponds and marshy areas.

Permafrost – permanently frozen soil found in the tundra biome climate region

Lesson 4 (Aquatic Ecosystems)

Abiotic Factors Affecting Life in Aquatic Ecosystems:

1. Temperature of the water
2. Dissolved oxygen in the water
3. Dissolved salts in the water
4. Sunlight penetration

All determine what can live there.

Temperature – we have cold water fish and warm water fish

Oxygen – some organisms require more oxygen than others

– Cold water holds more oxygen than warm water.

Salts – not all aquatic organisms can survive in saltwater

Sunlight – important for aquatic plants to produce oxygen through photosynthesis

– Photosynthesis occurs only on the surface or in shallow water because sunlight can't reach to great depths.

Phytoplankton – floating algae that produce half of all oxygen produced on Earth

Types of Aquatic Ecosystems:

1. **Freshwater ecosystems** – rivers, ponds, and most lakes
   – Only 3% of water on Earth is freshwater.
2. **Marine ecosystems** – oceans and some lakes
   – 97% of all water on Earth is saltwater.

Estuary – a kind of wetland formed where freshwater from rivers mixes with salty ocean water

Intertidal zone – in the ocean, the area on the shore between the highest high tide and the lowest low tide

– Organisms here must survive pounding waves and changes in water levels and temperatures.

Neritic zone – the area of the ocean that extends from the low-tide line out to the edge of the continental shelf

Lesson 5 (Biogeography)

Biogeography – the study of where organisms live and how they got there

– studies the factors that explains why things live where they do

Dispersal – the movement of organisms from one place to another

Factors that assist species dispersal:

1. **Continental drift** – the hypothesis that the continents slowly move across Earth's surface

– As continents move, their species go with them.

2. Wind – small seeds, or very small organisms themselves can drift in the wind to new locations

3. Water – can move seeds or organisms that float to new locations

4. Other living things – can carry seeds or small organisms to new locations

Exotic species – species that are carried to a new location by people (on purpose, or not)

5. Gravity – carries things to lower elevations

Factors that limit species dispersal:

1. **Physical barriers –** large bodies of water and mountains can limit the movement from one place to another

2. **Competition –** a new species must compete for resources with the species that already live there

– Existing species might out-compete the new species.

3. **Climate –** a species may not be able to survive in the climate of a new area