

Chapter 5

How Ecosystems Work

Section 1: Energy Flow in Ecosystems

DAY 1

< Back

Next >

Preview 🏠

Main 🏠

Life Depends on the Sun

- Energy from the sun enters an ecosystem when plants use sunlight to make sugar molecules.
- This happens through a process called **photosynthesis**.



Life Depends on the Sun

- Photosynthesis is the process by which plants, algae, and some bacteria use **sunlight, carbon dioxide, and water to produce carbohydrates and oxygen**.
- End result of photosynthesis is a **carbohydrate (sugar molecules)**.
- Gives you energy to do daily activities.



From Producers to Consumers

- Because plants make their own food, they are called **producers**.
- A producer is an organism that can make **organic molecules from inorganic molecules**.
- Producers are also called **autotrophs, or self-feeders**.



From Producers to Consumers

- Organisms that get their energy by eating other organisms are called **consumers**.
- A consumer is an organism that eats **other organisms or organic matter** instead of producing its own nutrients or obtaining nutrients from inorganic sources.
- Consumers are also called **heterotrophs, or other-feeders**.



From Producers to Consumers

- Some producers get their energy directly from the sun by absorbing it through their leaves.
- Consumers get their energy indirectly by eating producers or other consumers.



An Exception to the Rule

- Deep-ocean communities of worms, clams, crabs, mussels, and barnacles, exist in total darkness on the ocean floor, where photosynthesis cannot occur.
- The producers in this environment are **bacteria that use hydrogen sulfide** present in the water.
- Other underwater organisms eat the bacteria or the organisms that eat the bacteria.



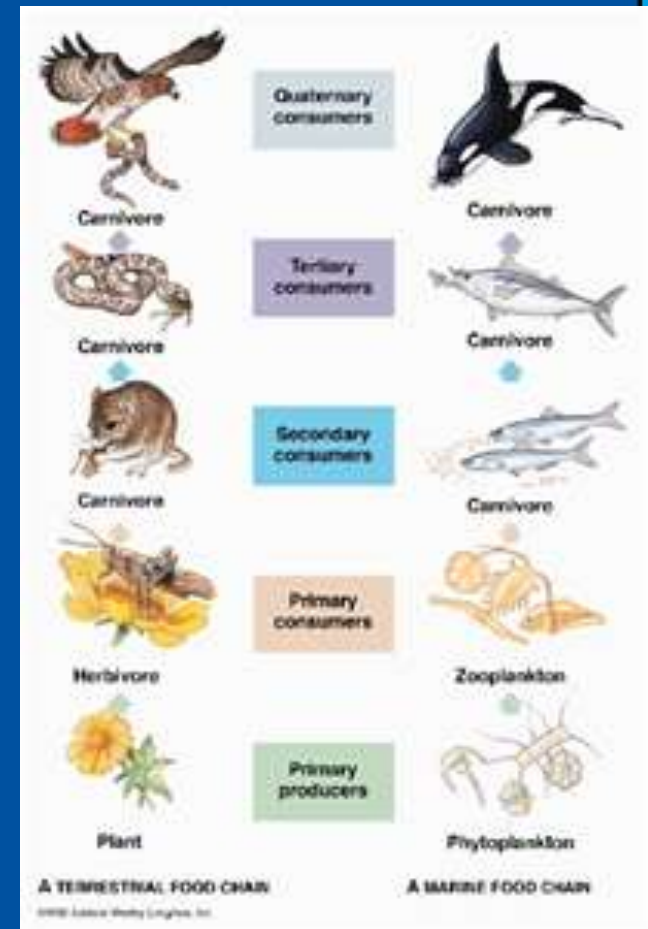
What Eats What?

- Organisms can be classified by what they eat.
- Types of Consumers:
 - Herbivores – **eat only plants**
 - Carnivores – **eat only animals**
 - Omnivores – **eat both plants and animals**
 - Decomposers – **eat dead organic matter**



What Eats What?

- Consumers that eat producers to get energy are what we call **primary consumers**.
- In other words they are **herbivores**.
- Most of the energy will be used up by the consumer (herbivore).
- A consumer that eats another consumer is called a **secondary consumer**.



What Eats What?

What Eats What in an Ecosystem		
	Energy source	Examples
Producer	makes its own food through photosynthesis or chemical sources	grasses, ferns, cactuses, flowering plants, trees, algae, and some bacteria
Consumer	gets energy by eating producers or other consumers	mice, starfish, elephants, turtles, humans, and ants
Types of Consumers in an Ecosystem		
	Energy source	Examples
Herbivore	producers	cows, sheep, deer, and grasshoppers
Carnivore	other consumers	lions, hawks, snakes, spiders, sharks, alligators, and whales
Omnivore	both producers and consumers	bears, pigs, gorillas, rats, raccoons, cockroaches, some insects, and humans
Decomposer	breaks down dead organisms in an ecosystem and returns nutrients to soil, water, and air	fungi and bacteria

Something to help you remember!

Energy Roles Song

< Back

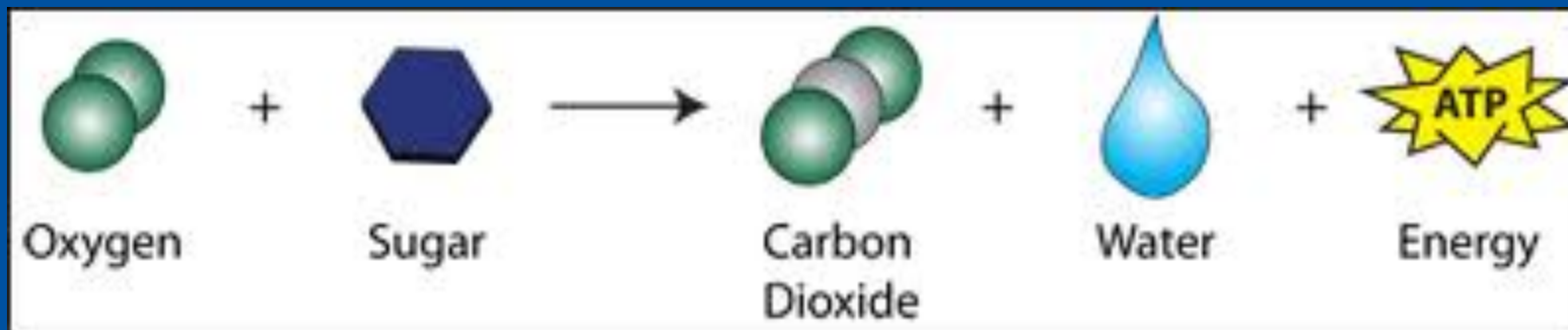
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Preview 🏠

Main 🏠

Burning the Fuel

- An organism obtains energy from the food it eats.
- This food must be broken down within its body.
- The process of breaking down food to yield energy is called **cellular respiration**.



Burning the Fuel

- Cellular respiration is the process by which cells produce **energy from carbohydrates**; atmospheric oxygen combines with glucose to form water and carbon dioxide.
- Cellular respiration occurs inside the **cells** of most organisms.



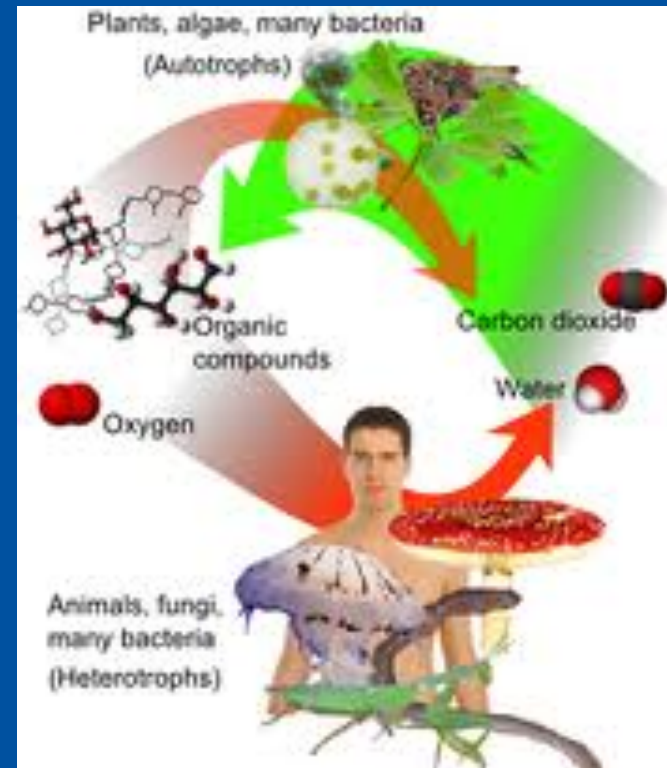
Burning the Fuel

- During cellular respiration, cells **absorb oxygen and use it to release energy from food.**
- Through cellular respiration, cells use **glucose (sugar)** and oxygen to produce carbon dioxide, water, and energy.



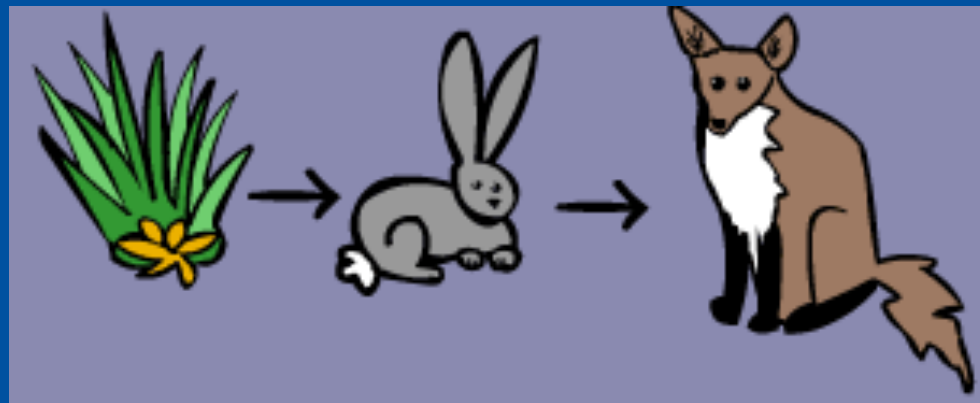
Burning the Fuel

- Part of the energy obtained through cellular respiration is used to carry out daily activities.
- Excess energy is stored as **fat or sugar**.



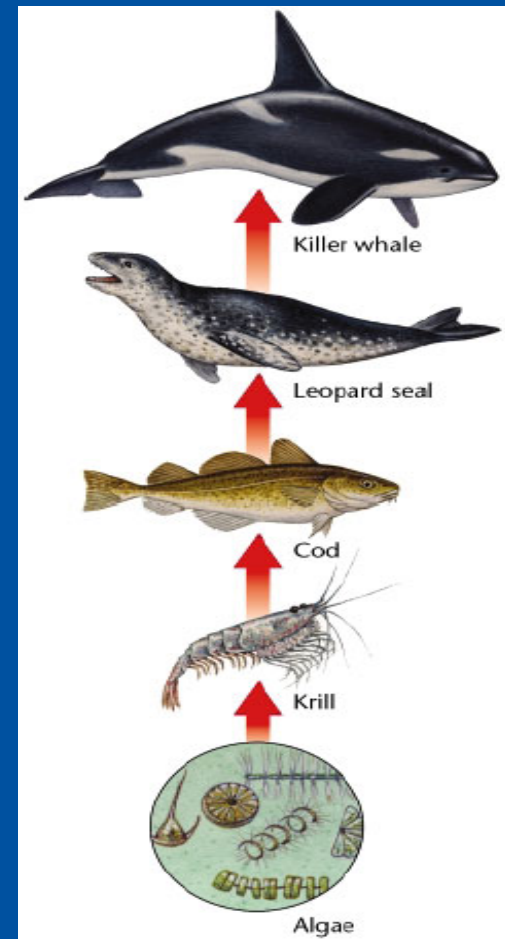
Energy Transfer

- Each time an organism eats another organism, an **energy transfer** occurs.
- This transfer of energy can be traced by studying **food chains, food webs, and trophic levels.**



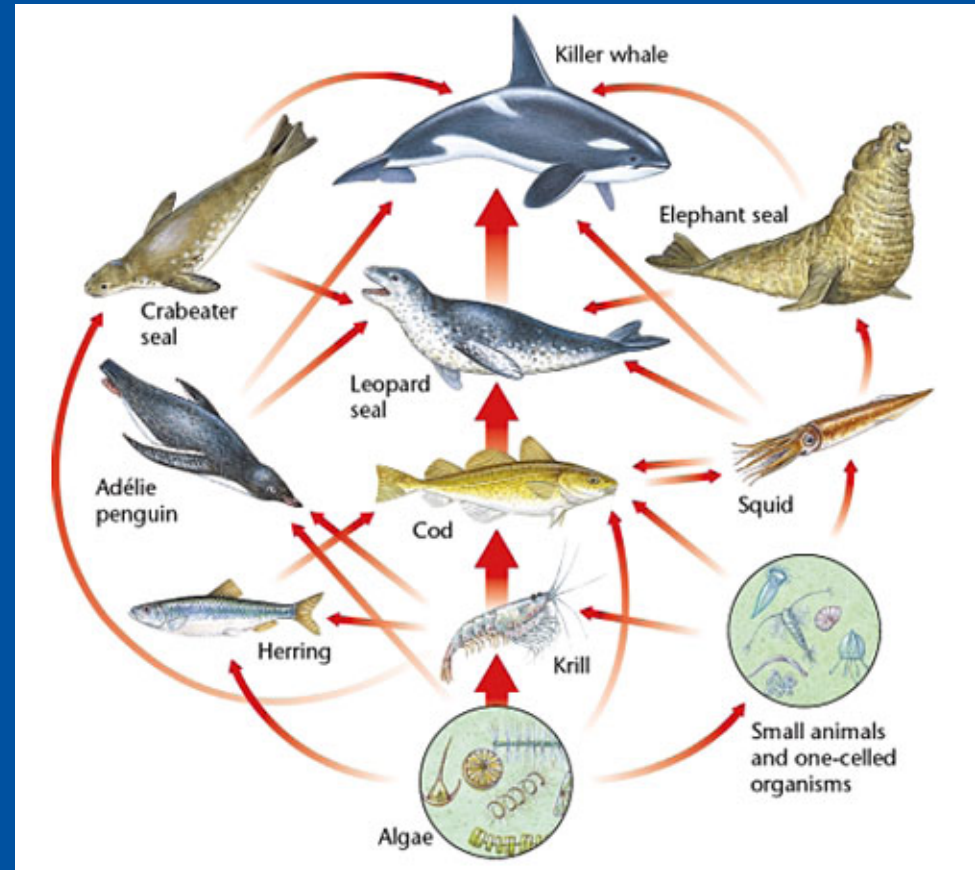
Food Chains

- A **food chain** is a sequence in which energy is transferred from one organism to the next as each organism eats another organism.



Food Webs

- Ecosystems, however, usually contain more than one food chain.
- A **food web** shows many feeding relationships that are possible in an ecosystem.



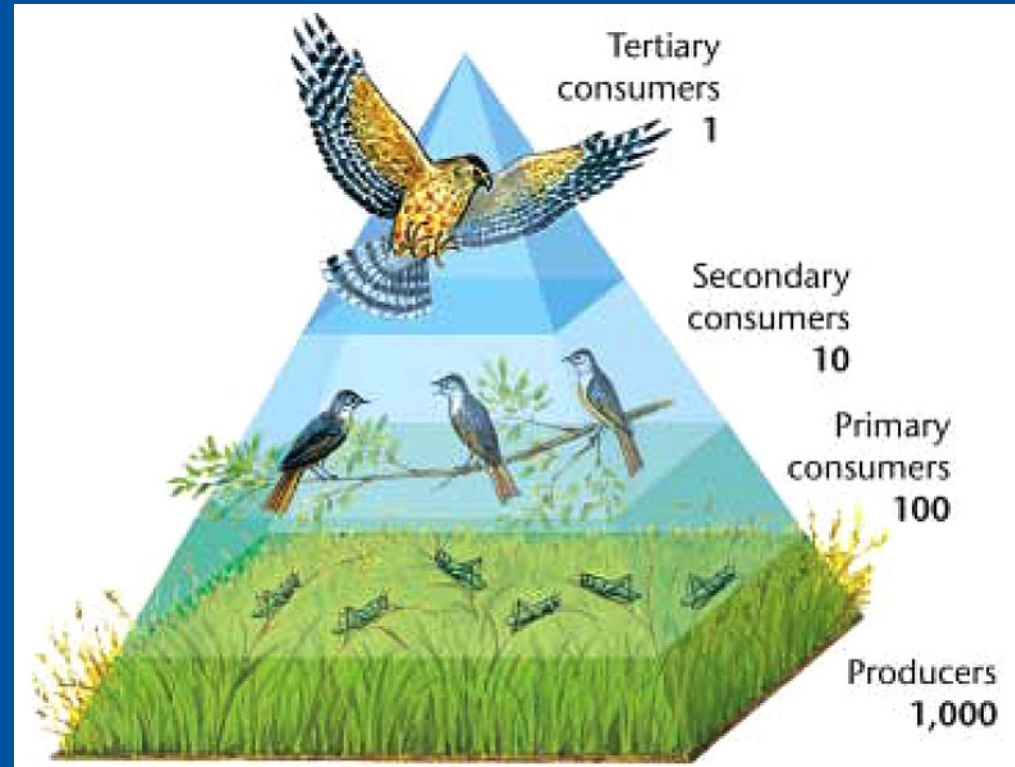
Trophic Levels

- Each step in the transfer of energy through a food chain or food web is known as a **trophic level**.
- A **trophic level** is one of the **steps in a food chain or food pyramid**; examples include producers and primary, secondary, and tertiary consumers.



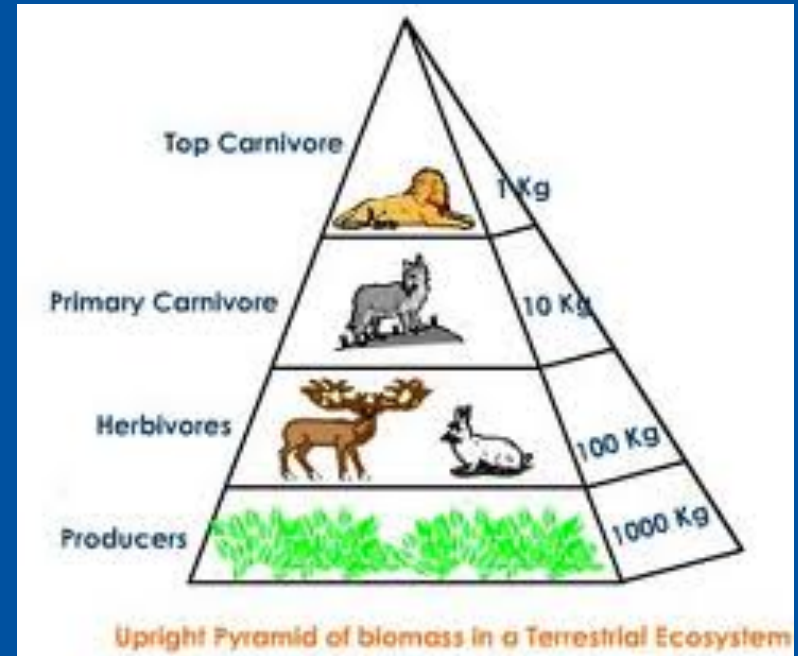
Trophic Levels

- Each time energy is transferred, some of the energy is lost as **heat**.
- Therefore, **less energy** is available to organisms at higher trophic levels.
- One way to visualize this is with an **energy pyramid**.



Trophic Levels

- Each layer of the pyramid represents one **trophic** level.
- Producers form the **base** of the energy pyramid, and therefore contain the **most energy**.
- The pyramid becomes smaller toward the top, where less energy is available.



Energy Loss Affects Ecosystems

- Decreasing amounts of energy at each trophic level affects the organization of an ecosystem.
- Energy loss affects the **number of organisms** at each level.
- Energy loss limits the **number of trophic levels** in an ecosystem.

