

2.1 Energy Flow in Ecosystems

Name:

Date:

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(Refer to p. 54 - 67 of BC Science 10)

What are krill?



- tiny, shrimp-like organisms that play a big role in marine ecosystems

Give two reasons why krill are important for marine ecosystems?

1. They are an essential energy source for salmon, squid + many species of whale.
2. They recycle nutrients in marine ecosystems.

Why is leaf litter (fallen leaves) important for organisms on the forest floor?

It forms an important energy source.



Explain the role that fungi play in this nutrient cycle.

Fungi secrete enzymes which break down leaf litter (cellulose) into usable (digestable) nutrients.



This vast amount of leaf material (cellulose) forms part of the biomass in the biosphere.

Biomass: the total mass of living things; plants, animals, fungi + bacteria in a given area.

- Also sometimes used describe the mass of certain types of organic materials used for biofuels.
- generally measured in g/m^2 or kg/m^2

HOW ENERGY FLOWS IN ECOSYSTEMS

Within an organism's niche, the organism interacts with the ecosystem in two ways:

1. the organism obtains food energy from the ecosystem
2. the organism contributes energy to the ecosystem

Energy flow: the flow of energy from the ecosystem to an organism, or from one organism to another.



- Producers: produce food in the form of carbohydrates during photosynthesis
Ex. sunflower tree plants, algae, cyanobacteria, etc.

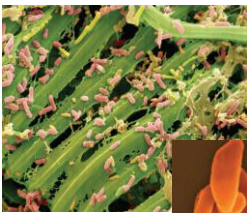


- Consumers: an organism that gets food energy by feeding on producers or other organisms.
Ex. bee, humans, spider, birds, etc.

Organisms continue to contribute to the energy flow in an ecosystem, even after they die, through a process called decomposition.

Decomposition: the breaking down of organic waste and dead organisms

- Decomposers: change waste and dead organisms into usable nutrients
Ex. anthrobacteria, fungi, microorganisms, earthworms



- Biodegradation: the action of living organisms (bacteria) to break down dead organic matter.

ENERGY FLOW AND LOSS IN ECOSYSTEMS

Three models used by scientists to demonstrate how energy flows through or is lost in an ecosystem include:

1. food chains
2. food webs
3. food pyramids

Food Chains and Food Webs

Food chains are models that show the flow of energy

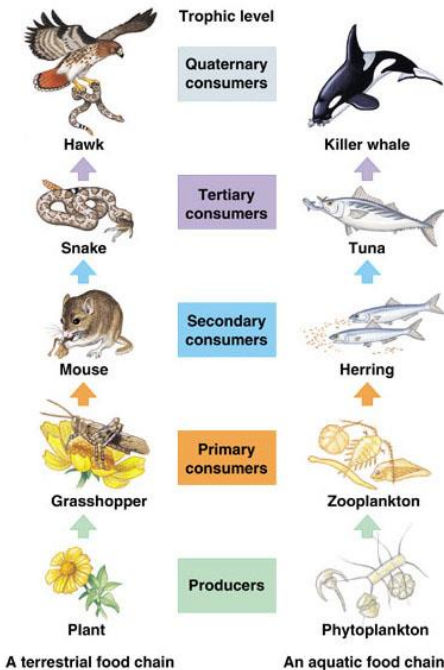
from plant to animal and from animal to animal.

- Each step in a food chain is called a trophic level.
 - Show the feeding and niche relationships among organisms.

** Use arrows to show energy transfer.*

****Complete the following table.**

	Trophic Level	Example	How they get energy
Quaternary consumers	5th	hawk	feed on tertiary consumer (snake)
Tertiary consumers	4th	snake	feed on secondary consumer (mouse)
Secondary consumers	3rd	mouse	feed on primary consumers (grasshopper)
Primary consumers	2nd	grasshopper	feed on producers (plant)
Producers	1st	plant	photosynthesis (Sun)



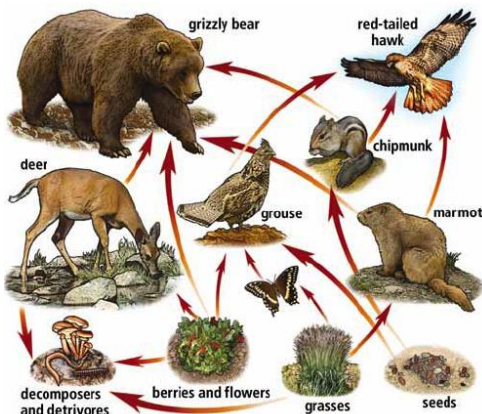
Consumers in a food chain can be classified as:

1. **Detritivores:** get energy and nutrients from dead organisms, dead plants, & animal wastes.
Ex. earth worms, beetles
 - feed at every trophic level
 - have their own, separate food chains, and are very numerous
2. **Herbivores:** primary consumers that eat plants
Ex. grasshopper, deer, etc.
3. **Carnivores:** get their energy by feeding on primary, secondary, tertiary consumers
Ex. frog, snake, hawk, grey wolves, mouse,
 - secondary consumers eat non-producers, such as herbivores
 - tertiary consumers eat secondary consumers
 - ♦ aka top consumers, top carnivores or top predators
4. **Omnivores:** get their energy from feeding on plants & animals
Ex. bear, humans

*interconnected food chains.

Most organisms are part of many food chains.

- **food web:** model of feeding relationships within an ecosystem.



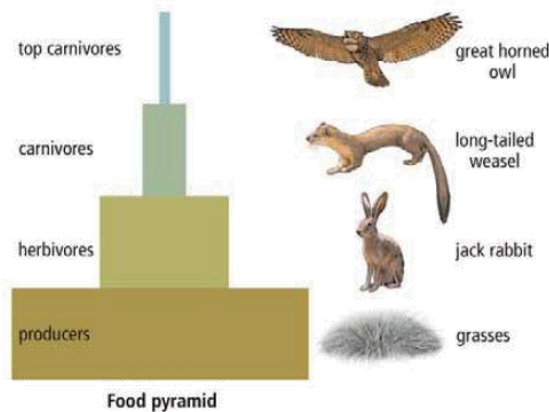
- Arrows in a food web represent the flow of energy and nutrients.
- Following the arrows leads to the **top carnivore**.

- Ex. grizzly bear
red-tailed hawk.

Food Pyramids

- Food pyramid: a model that shows the loss of energy from one trophic level to another

Food pyramids are also known as ecological pyramids.



The amount of life an ecosystem can support is based on the bottom level of the ecological pyramid, where producers capture energy from the sun.

Each level in the energy pyramid = a loss of 90 % of total energy available, therefore only 10 % of energy is passed to the higher level.

- Lower trophic levels have much larger population numbers than upper levels.

Food pyramids show:

- Most of the energy trapped by plants flows out of the ecosystem
- How important plant life is for making energy available in ecosystems

- This shows that maintaining the biodiversity of plants at the lowest levels of the food pyramid is important for the viability of ecosystems.

****Refer to the Science and Math Connect on p. 66 Comparing Ecological Pyramids**

There are 3 types of ecological pyramids:

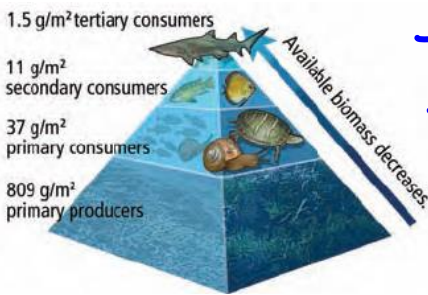
1. Pyramid of Numbers
2. Pyramid of Biomass
3. Pyramid of Energy

Define the following and state the limitations of each:



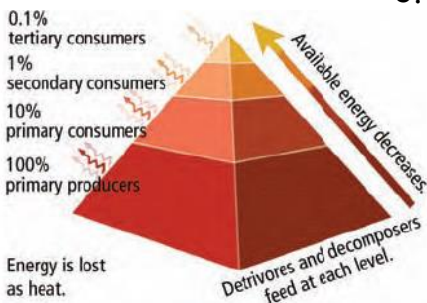
1. **Pyramid of Numbers:**

- shows the number of each organism at each trophic level.
- size of organisms vary = energy needs vary → making range of #'s large ⇒ impossible to rep. scale accurately.



2. **Pyramid of Biomass:**

- shows the # of organisms @ each trophic level multiplied by their mass.
- * compensates for the differences in size
- in some ecosystems, the biomass of lower trophic levels is less than higher trophic levels.
- ↳ inverted pyramid*



3. **Pyramid of Energy:**

- shows the amount of energy avail. @ each trophic level.
- difficult to obtain exact values of avail. energy,

**** Complete CC p. 67 #3-8, 10-14,16**