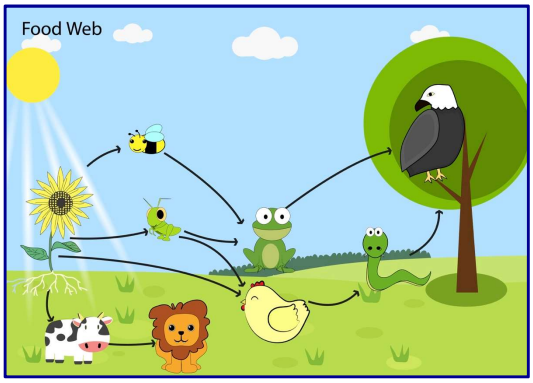
Feeding Relationships



What happens to energy in an ecosystem as one organism eats another?

The energy flows in a one-way path through the ecosystem.
Energy enters the ecosystem in the form of sunlight.

Photosynthetic organisms convert the sun's energy into molecules of glucose .
This energy is then passed on to the animals that eat the plants and to the animals that eat other animals.

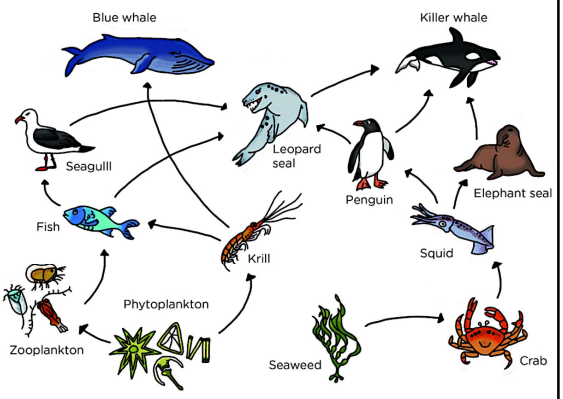
I must repeat this one more time!

Energy flows through an ecosystem in one direction , from the sun to autotrophs and then to various heterotrophs .

Food Chains

The energy stored by producers in the form of glucose molecules can be passed through an ecosystem along a food chain .

A food chain is…..
…..a series of steps in which organisms transfer energy from one organism to another by eating and by being eaten.

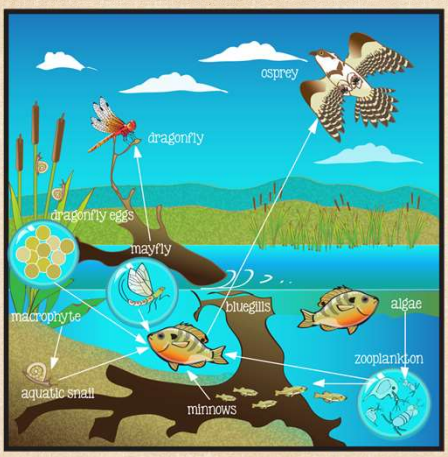


All food chains begin with an autotroph .

Examples of Food Chains:

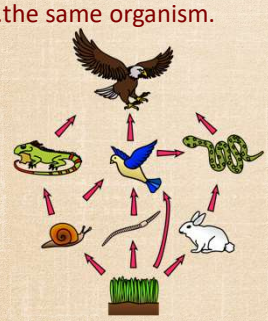
a) grass → mouse → snake → hawk

b) marine algae → zooplankton → small minnow → squid → whale

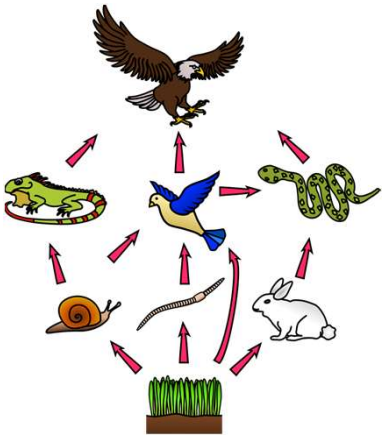


Food Webs

1. In an ecosystem, the feeding relationships between organisms are much too complex to be shown in a …..
   ….. single food chain.
2. Many consumers eat:
   more than one type of food.
   More than one species may feed on:
   …the same organism.



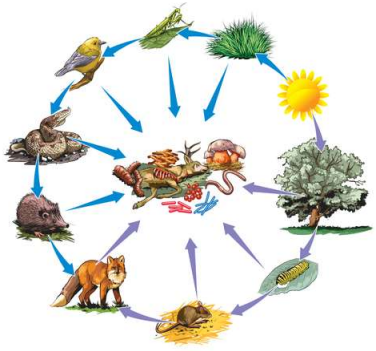
3. There are many complex interactions between many different food chains.

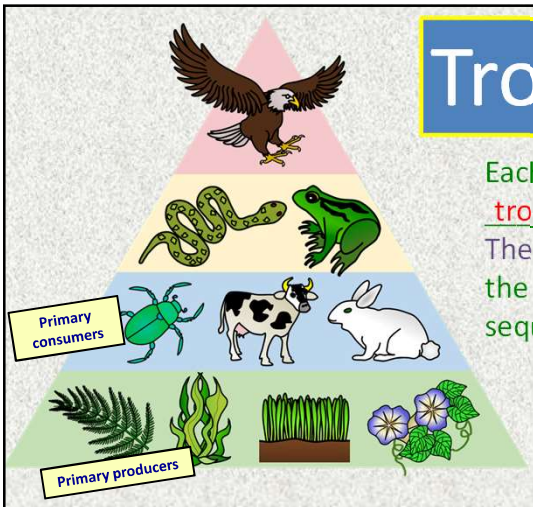


A food web links *all the food chains* in an ecosystem together.

Food web

The network of complex interactions formed by the feeding relationships among the various organisms in an ecosystem.



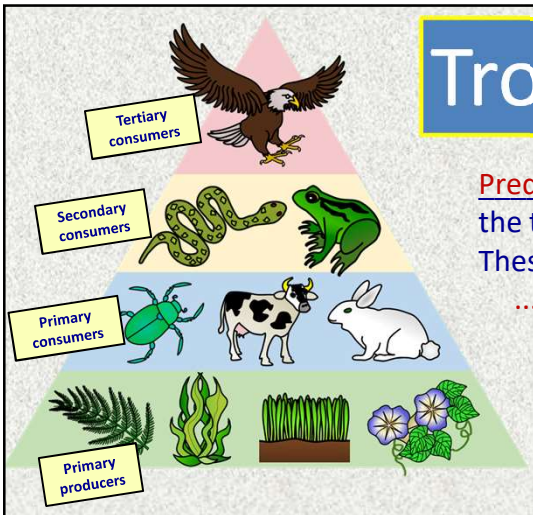


Trophic Levels

Each step in a food chain is called a trophic level.
The trophic level indicates:
the organism's position in the sequence of energy transfers.

The first trophic level in a food chain is always made up of producers. These organisms are referred to as primary producers.

The second trophic level is occupied by the herbivores that feed on the producers. These organisms are referred to as primary consumers.



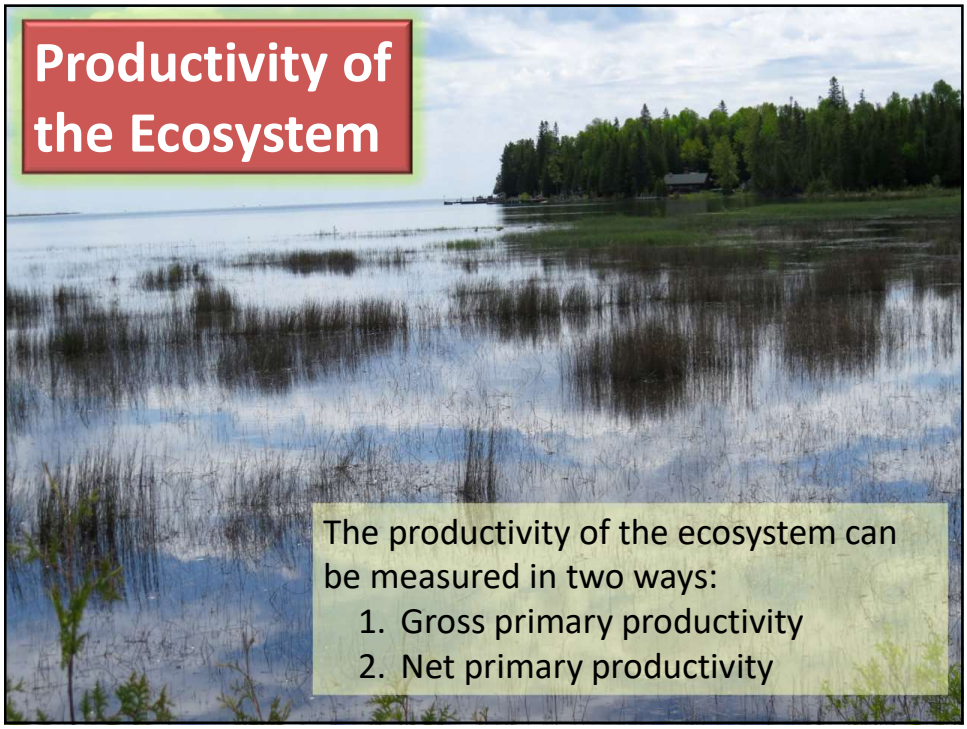
Trophic Levels

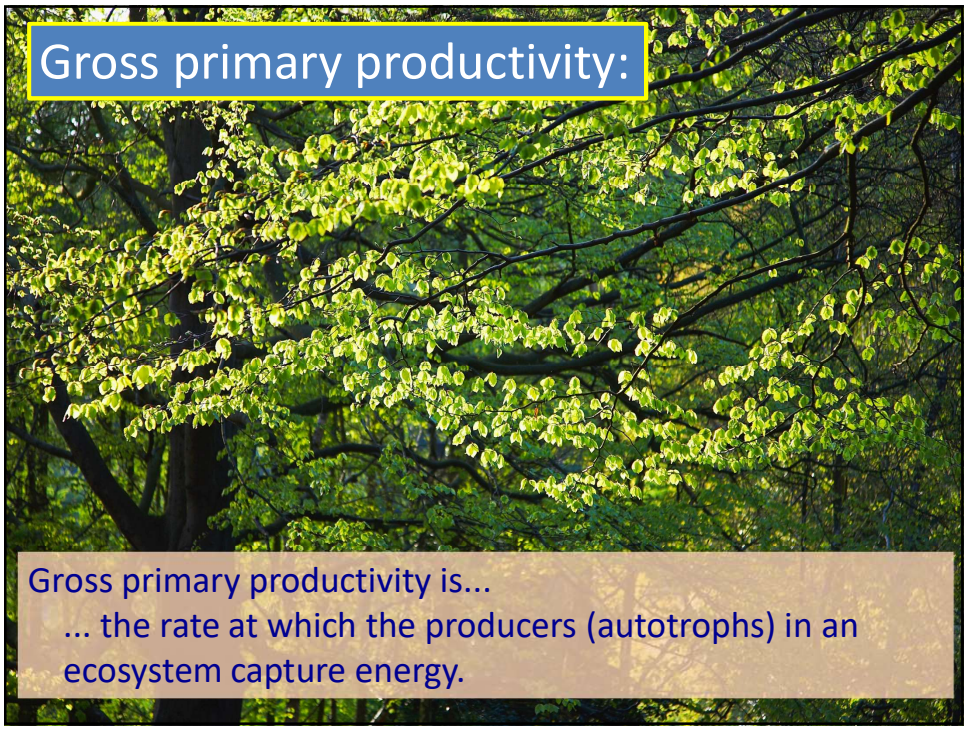
Predators of herbivores belong to the third level.
These organisms are referred to as:
... secondary consumers.

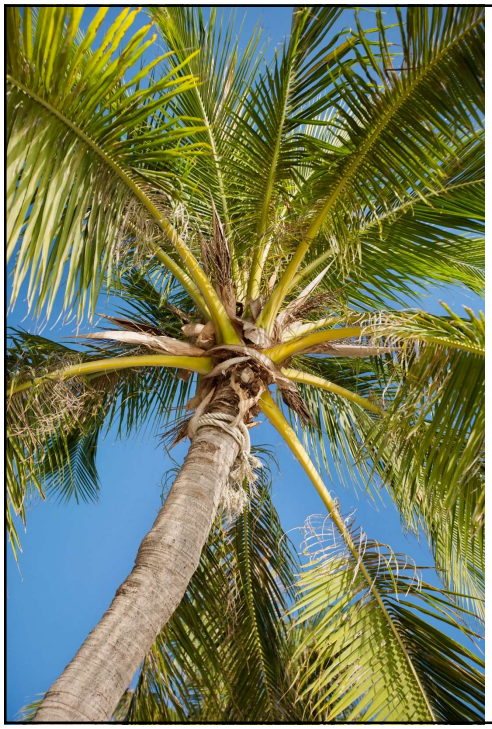
A tertiary consumer eats the secondary consumer.

Most ecosystems contain only three or four trophic levels.

Each consumer depends on the: trophic level below it for energy.


Productivity of the Ecosystem
The productivity of the ecosystem can be measured in two ways:
1. Gross primary productivity
2. Net primary productivity


Gross primary productivity:
Gross primary productivity is...
... the rate at which the producers (autotrophs) in an ecosystem capture energy.



Gross primary productivity is the amount of light energy that is converted to chemical energy by photosynthesis per unit time.

The photosynthetic organisms in the ecosystem capture the energy from the sun and store it in molecules of glucose .

What does the plant do with the glucose it produces?

About half of the glucose is used immediately in cellular respiration . Respiration is the conversion of: glucose into molecules of ATP, the energy source for a cell.

Some of the glucose molecules are used as raw materials (building blocks) for the building of other organic compounds within the cell.

Much of the glucose is…..
…..stored by the plant for future use.

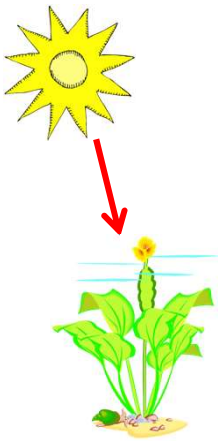
BIOMASS

Biomass is a term that is used to describe:
the amount of organic material in an ecosystem.

Producers add biomass to an ecosystem by making organic compounds.

Net Primary Productivity

The energy stored as biomass is available to other organisms in the ecosystem.



Remember: Gross primary productivity is the total amount of glucose produced by photosynthesis.

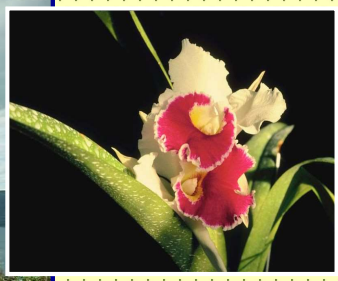
- Some of this glucose is used immediately by the plant in cellular respiration.
- The remaining glucose is stored and is available to consumers.

Net primary productivity is equal to: gross primary productivity minus the amount of energy used by the producers for respiration.

NPP = GPP - R

Net primary productivity is the most important measurement because it represents the amount of chemical energy (glucose) that will be available to consumers in the ecosystem.

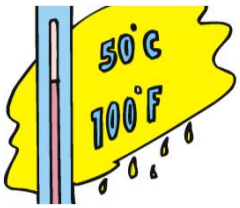
Net primary productivity varies greatly from one ecosystem to another.
For example, net primary productivity in a tropical rain forest is about 25 times greater than the net primary productivity in a desert of the same size.



Rain forests account for 5% of the Earth's surface, but account for 30% of the world's net primary productivity .

In terrestrial ecosystems, three factors determine the net primary productivity:

Light



Temperature

Rainfall

An increase in these three factors generally leads to an increase in the amount of photosynthesis taking place, and therefore, an increase in productivity.

In aquatic ecosystems, productivity is limited by two factors:

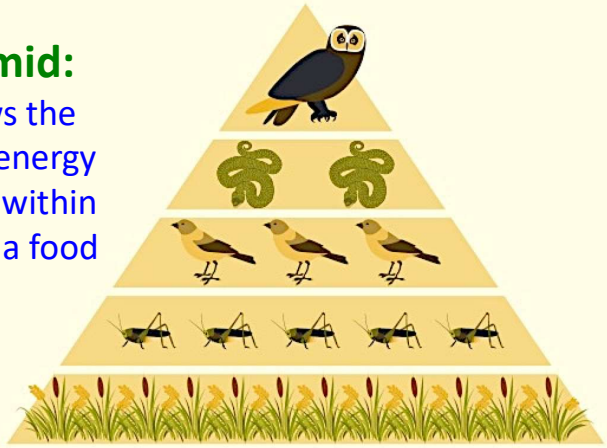
a) light b) the availability of nutrients.

Energy Transfer Between Trophic Levels

The amount of energy or matter in an ecosystem can be represented by an ...

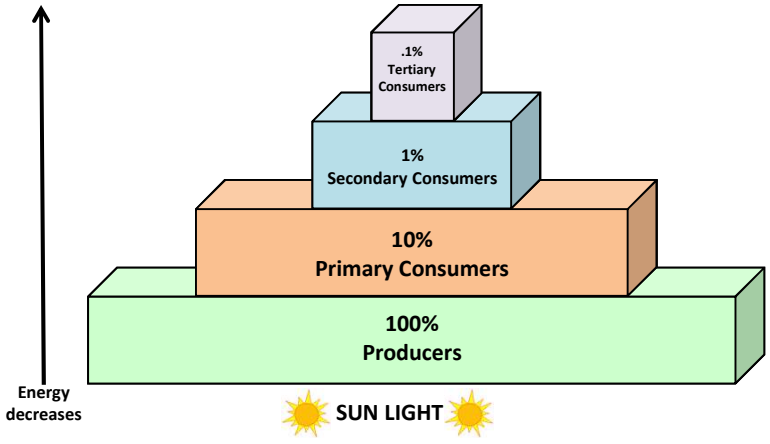
... ***ecological pyramid***.

Ecological pyramid:
A diagram that shows the relative amounts of energy or matter contained within each trophic level in a food chain or a food web.



Roughly 10% of the total energy consumed in one trophic level is passed to the organisms in the next trophic level .

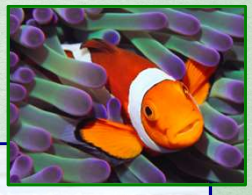
The pyramid shape of the diagram below represents the low percentage of energy transfer from one trophic level to the next.
Label each section of the energy pyramid.

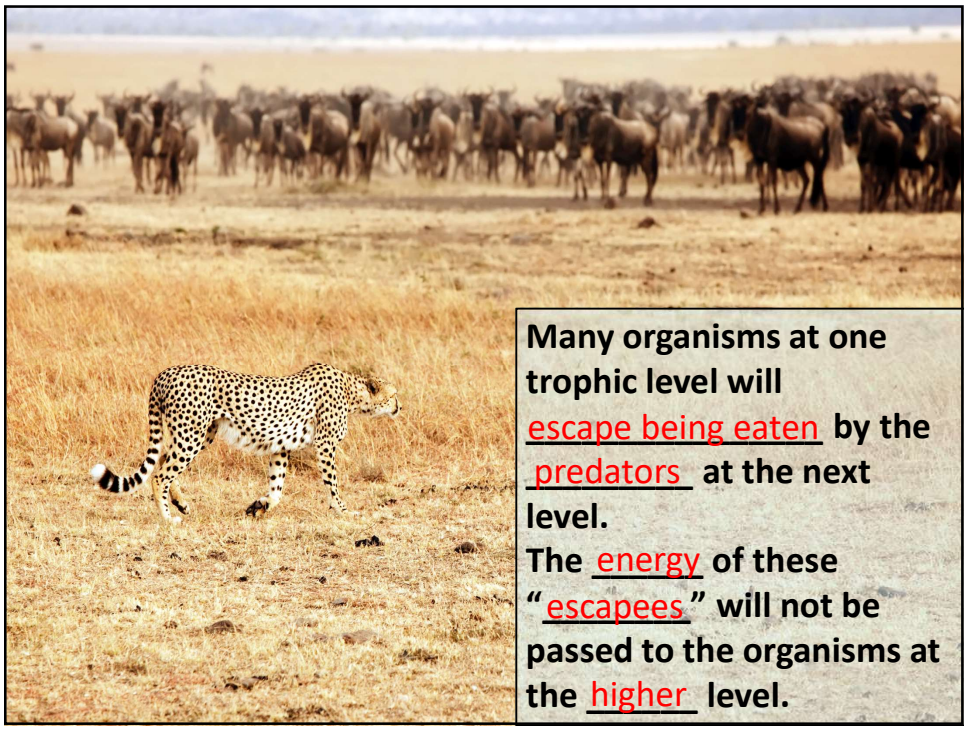


Why is the transfer of energy to the next trophic level so low?

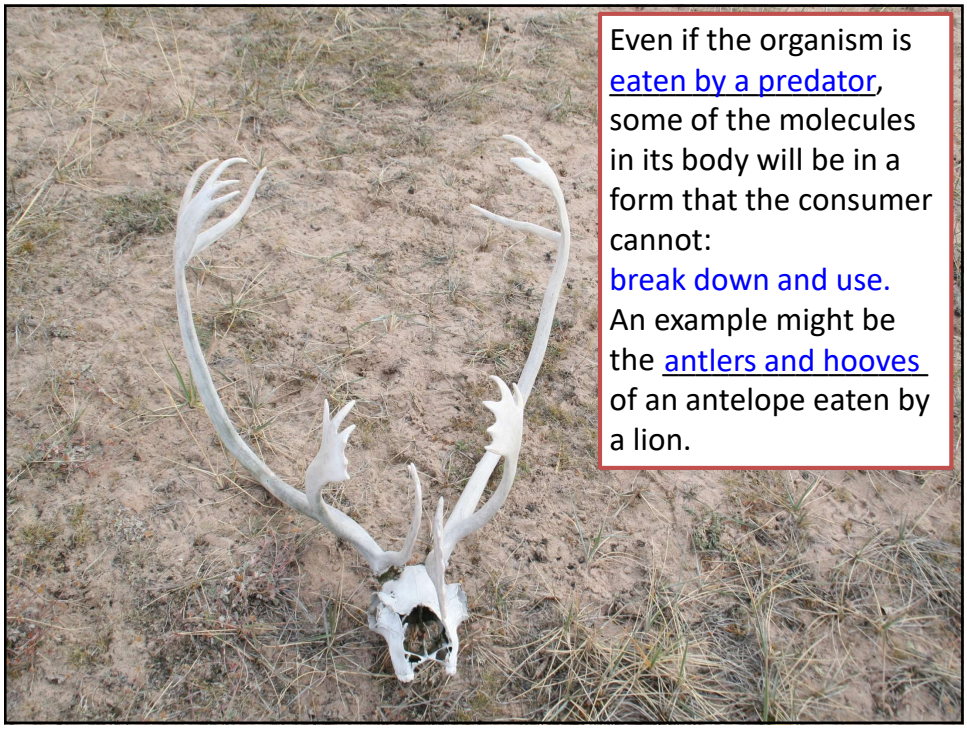
Not all of the energy possessed by the organisms at one trophic level will be passed up to the next trophic level.
Organisms use much of the energy they consume for their own life processes such as respiration, movement, or reproduction.



Many organisms at one trophic level will escape being eaten by the predators at the next level.
The energy of these "escapees" will not be passed to the organisms at the higher level.



Even if the organism is eaten by a predator, some of the molecules in its body will be in a form that the consumer cannot:
break down and use.
An example might be the antlers and hooves of an antelope eaten by a lion.