Ecology and Environment is an important topic from the point of view of competitive exams. it is commonly asked in UPSC, State PCS and other major competitive exams. Here in the article, we have covered all the functions of ecosystems in detail.

Functions of ecosystem: food chain, food web & food pyramids

FUNCTIONS OF ECOSYSTEM

The ecosystem is said to be the structural and functional unit of Biosphere. It includes all living beings interacting and influencing each other and the environment surrounding them. The functional factors of the ecosystem keep the components running together.

Functions of an ecosystem can be studied as an exchange of energy amongst different natural processes that are taking place in plant and animal communities of different biomes of the world. All exchange processes help in sustaining life on the planet as well as the production of biomass and the decomposition of organic matter. All these functions take place through balanced and controlled processes.

Functions of an ecosystem can be studied under three heads:

- Energy flow
- Nutrient's cycle (biogeochemical cycle)
- Ecological succession or development

Energy flow- Energy is the primary force responsible for all activities in an ecosystem. The flow of energy from producers to top consumers is called energy flow which is unidirectional.

Food chain

Food chains are dynamic in nature which link the biotic and abiotic components of an ecosystem. One organism eats other and is eaten by another. A sequence of organisms which feed on one another and transfer energy form a food chain. Each food chain depicts a vital pathway for energy and the nutrients to follow through the ecosystem.

The **African-Arab scientist Al-Jahiz** introduced the concept of the food chain for the first time in the 9th Century AD and it was later popularized in a book by Charles Elton in 1927.

Trophic levels in the food chain:

Autotrophs or Producers

- They are food-producing organisms who produce food for all other organisms in the ecosystem.
- They are usually green plants and prepare food in the presence of sunlight by the process of photosynthesis.

Note: Gross Primary Production (GPP) is the total rate at which the radiant energy is stored by the process of photosynthesis in the green plants. This is also known as total photosynthesis or total assimilation. A part of the GPP is utilized by the plants for its own metabolism and the remaining amount is stored as **Net Primary Production** (NPP) which is available to consumers.

Consumers

- Next trophic levels are for consumers who depend upon others for food.
- **Primary consumers-**The animals which eat the plants directly are called primary consumers or herbivores e.g. insects, birds, rodents and ruminants.
- **Secondary consumers**-They are both carnivores and omnivores (animals that eat both plant and animals). Example-frog, dog, cat and tiger
- **Tertiary consumers**: Animals that eat carnivores. Example-pig, bear and man.

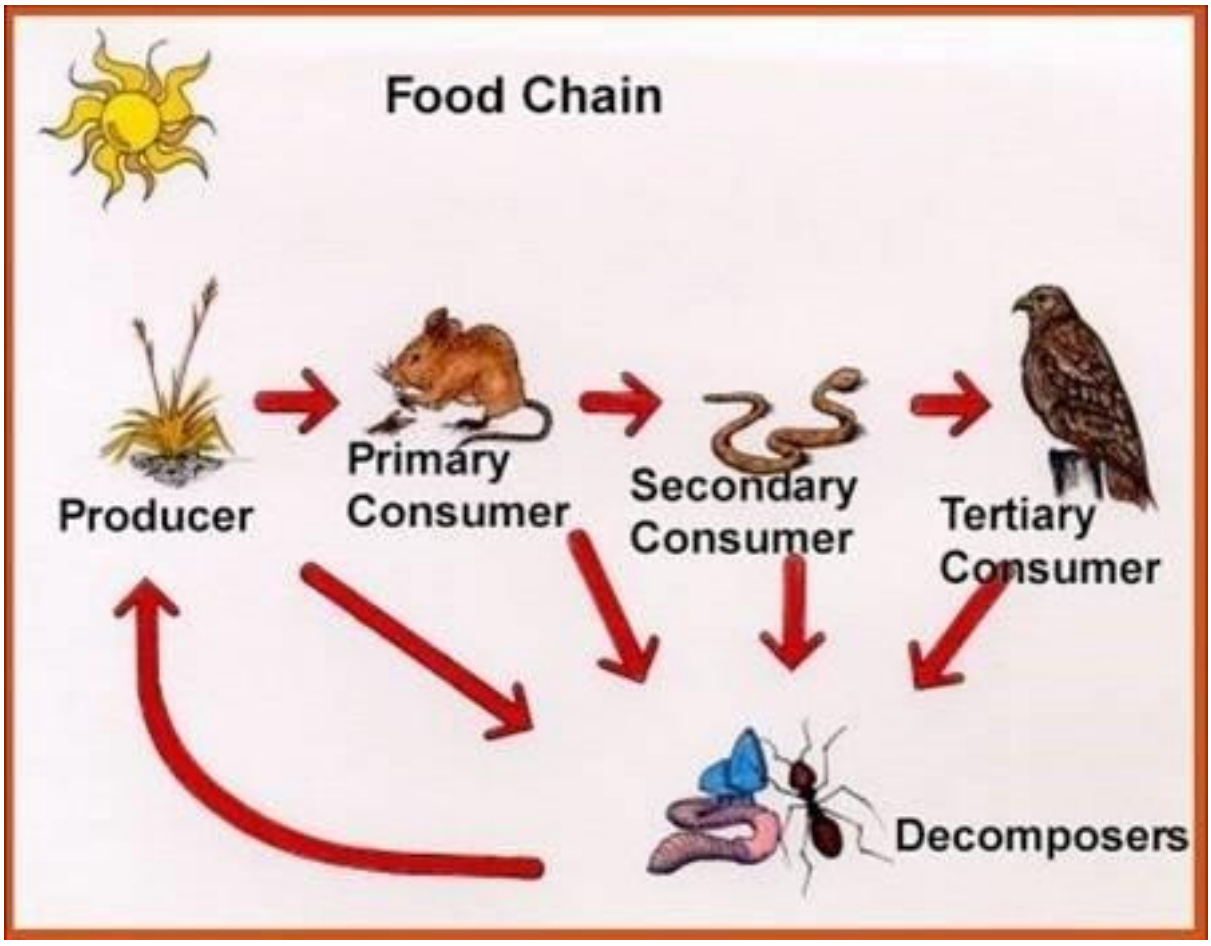
Decomposers

- These organisms break down dead organic material and waste products to simpler compounds and thereby help in the decomposition of decaying matter.
- They work on the dead remains of organisms at each trophic level and help in recycling of the nutrients e.g. bacteria and fungi.

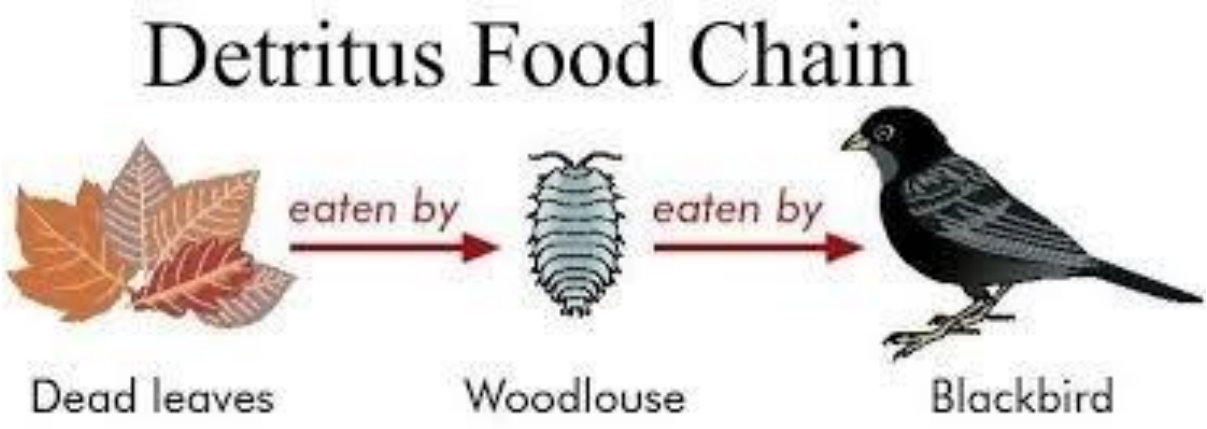
There are two types of food chains:

1. Grazing food chains- It starts from the food making green plants which are succeeded by herbivores and then by carnivores.

For example- in terrestrial ecosystem grass is eaten up by caterpillar, which is by lizard and lizard is eaten by a snake.



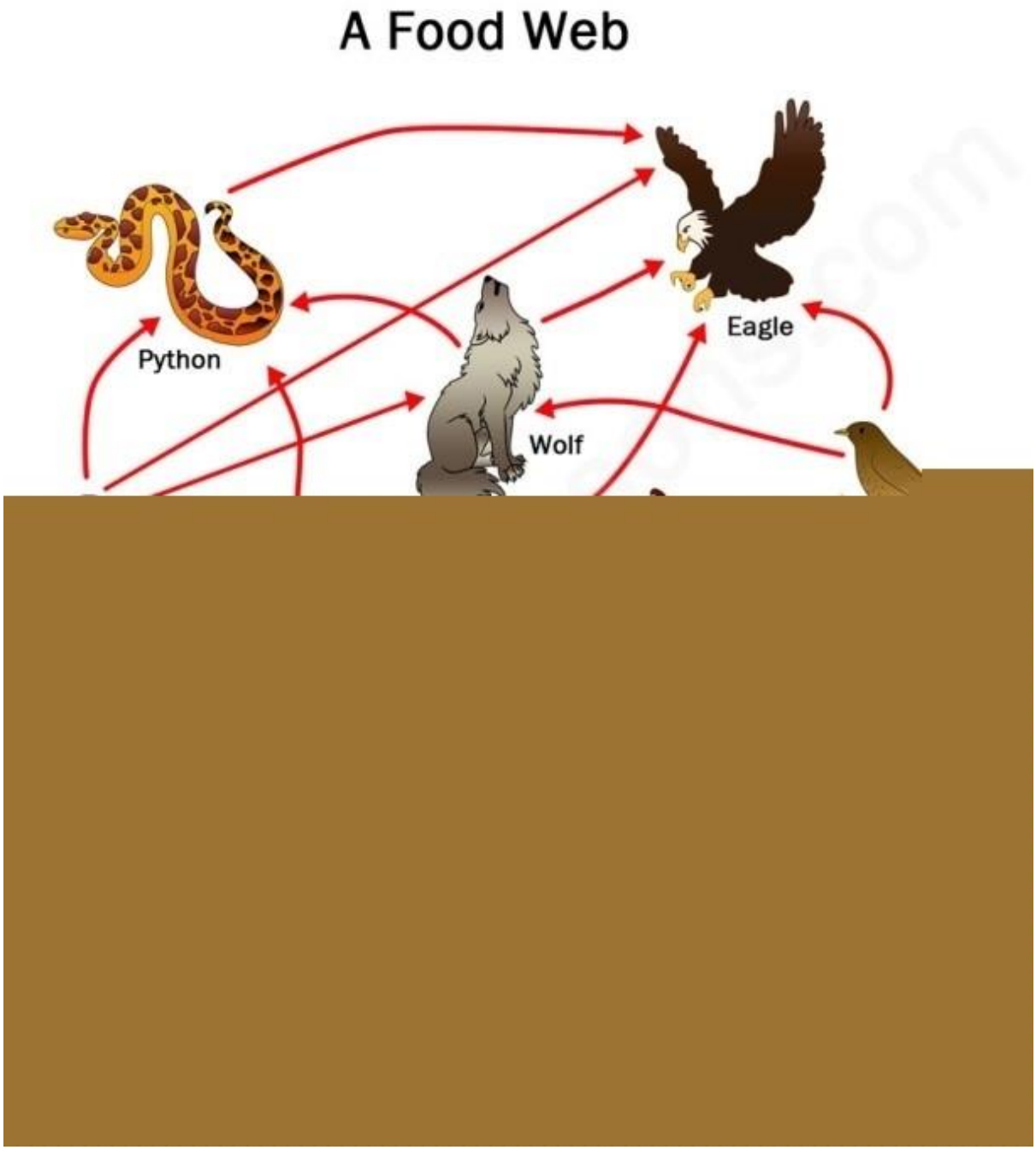
2. Detritus food chains- It starts from the dead organic matter of decaying plants and animal bodies to the detrivores organisms which in turn make food for protozoan to carnivores etc. One such example is depicted in the figure below



These two food chains are different on the basis of the source of energy for the first level consumer. These two food chains are linked; initial energy source for detritus food chain is waste material and dead organic matter from grazing food chain.

Food web

- A food chain represents only one dimension of food or energy flow through an ecosystem and shows a simple relationship between components.
- An ecosystem consists of many interrelated food chains. So, interconnected food chains in an ecosystem make a food web.
- If any of the food chains are removed then successive food chain will be harmfully affected. One animal may be part of several different food chains.
- The working between trophic levels is that at every level in a food chain or food web, the energy received by the organism is used by itself and the leftover energy is passed on to the next trophic level.



Ecological pyramids:

TThe steps of trophic levels expressed in a diagrammatic way where the food producers form the base of the pyramids and the top carnivore forms the tip. The pyramid consists of a number of horizontal bars depicting specific trophic levels which are arranged according to the increase in energy level.

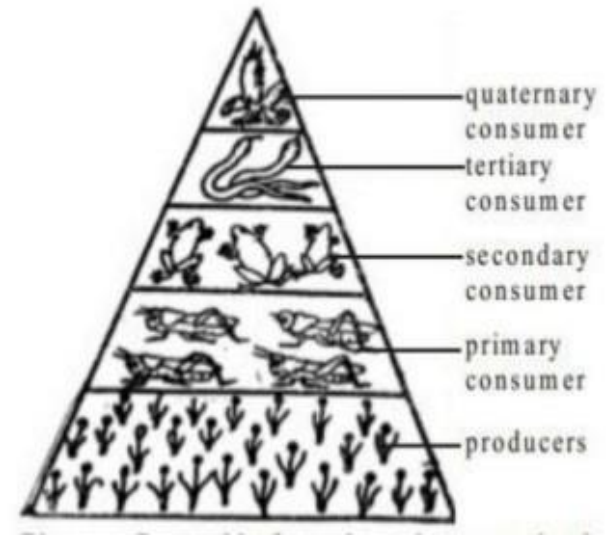
The number of individuals/organisms at each trophic level is represented by the length of each bar in a pyramid.

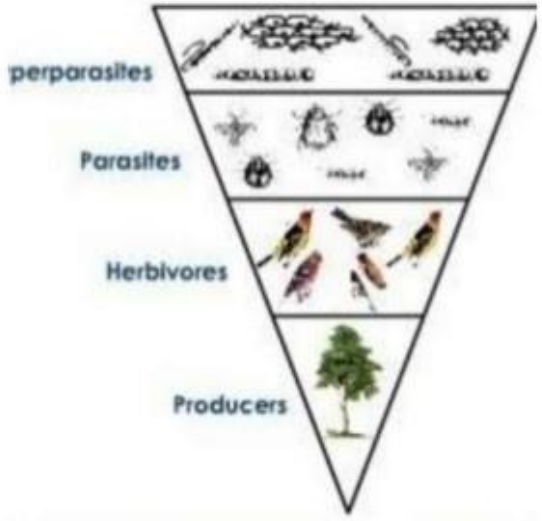
The ecological pyramids are of three categories:

- Pyramid of numbers
- Pyramid of biomass
- Pyramid of energy or productivity

Pyramid of number- This deals with the relationship between the number of organisms at different trophic levels. For example in the grassland food chain, the number of grasses are more than the number of herbivores that feed upon them and the number of herbivores is in turn more than the number of carnivores. So, the pyramid so formed is upright.

The pyramid of number can be inverted also, i.e herbivores are more than primary producers as in case of many caterpillars and insects feeding on a single tree.

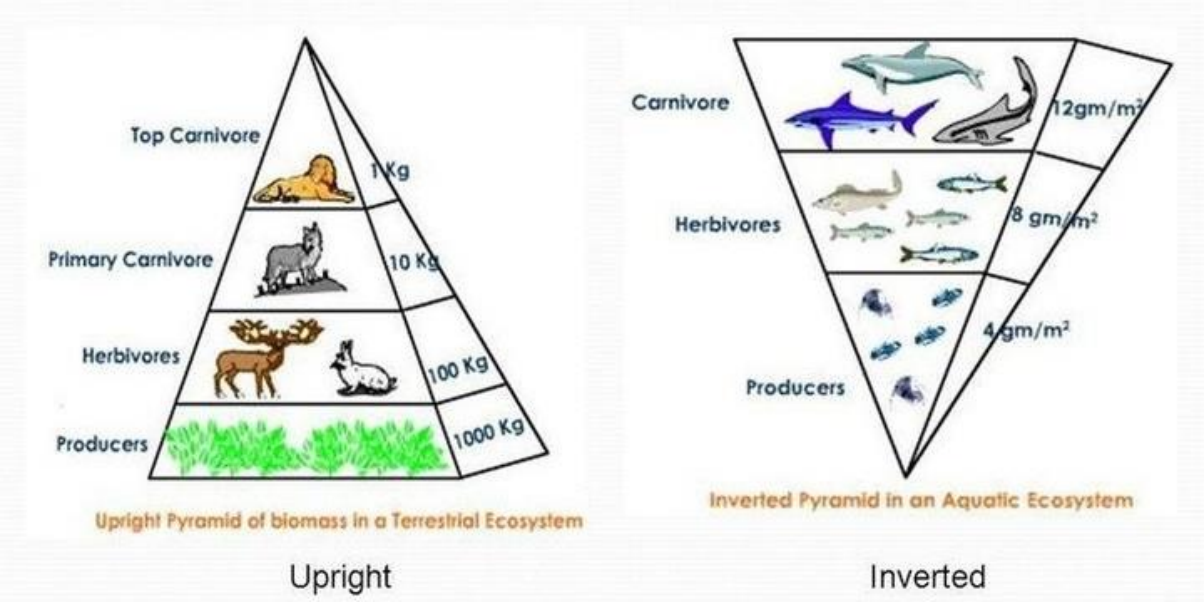




Pyramid of biomass- In this approach, individuals in each trophic level are weighted instead of being counted. This gives us a pyramid of biomass that is the total dry weight of all organisms at each trophic at a particular time.

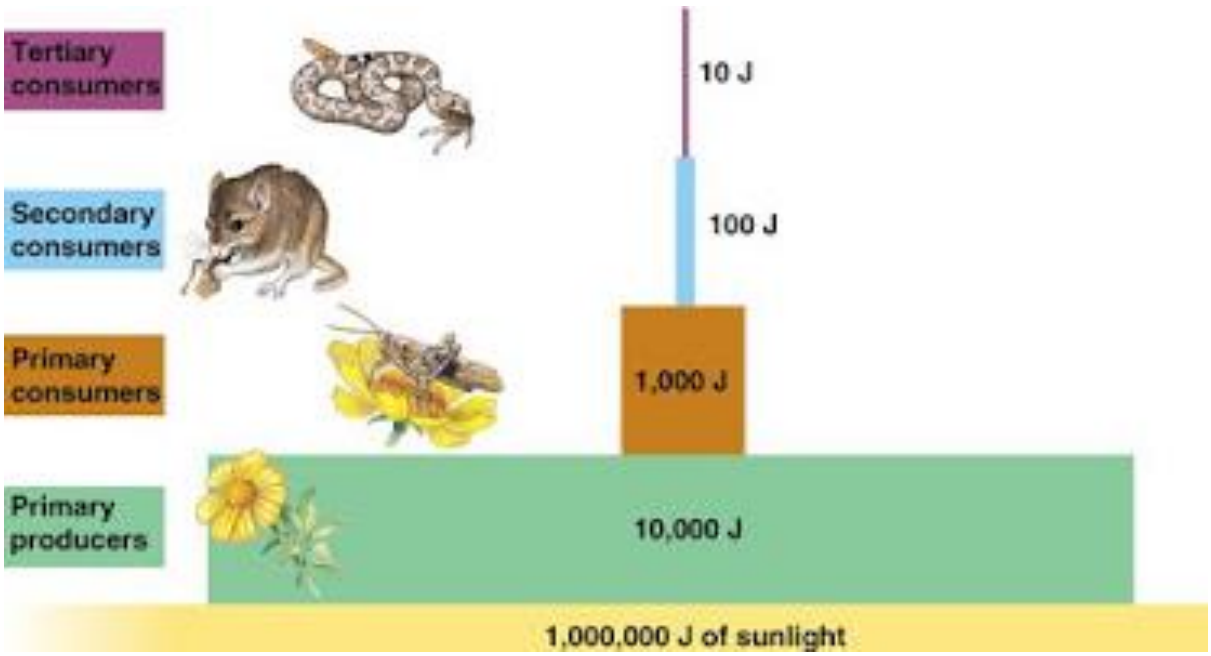
The pyramid showing the terrestrial ecosystem is upright.

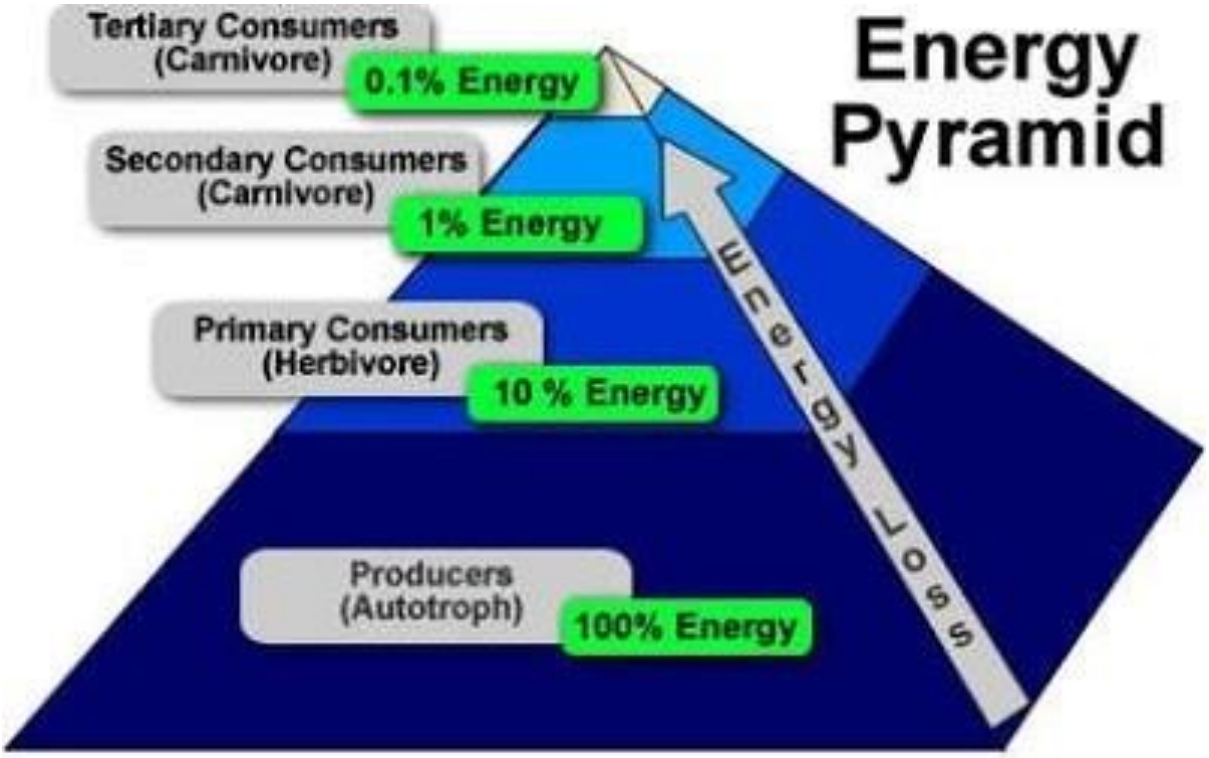
However, the pyramid of biomass showing aquatic ecosystem may be inverted. For example, in a pond, phytoplankton act as main producers who have very short life cycles and turn-over rate is high which are rapidly replaced by new plants.



Pyramid of energy-

A pyramid of energy is a graphical representation of how much energy from the sun is stored as new biomass at each successive trophic level. It helps in comparing the functional role of different trophic levels. This reflects the law of thermodynamics, with the conversion of solar energy to heat energy and chemical energy. This pyramid is always upward because of the loss of energy at each successive trophic level (10% energy law).




Energy Pyramid
Tertiary Consumers (Carnivore)
0.1% Energy
Secondary Consumers (Carnivore)
1% Energy
Primary Consumers (Herbivore)
10 % Energy
Producers (Autotroph)
100% Energy
Energy Loss