

Ability Enhancement Compulsory Course(AECC)
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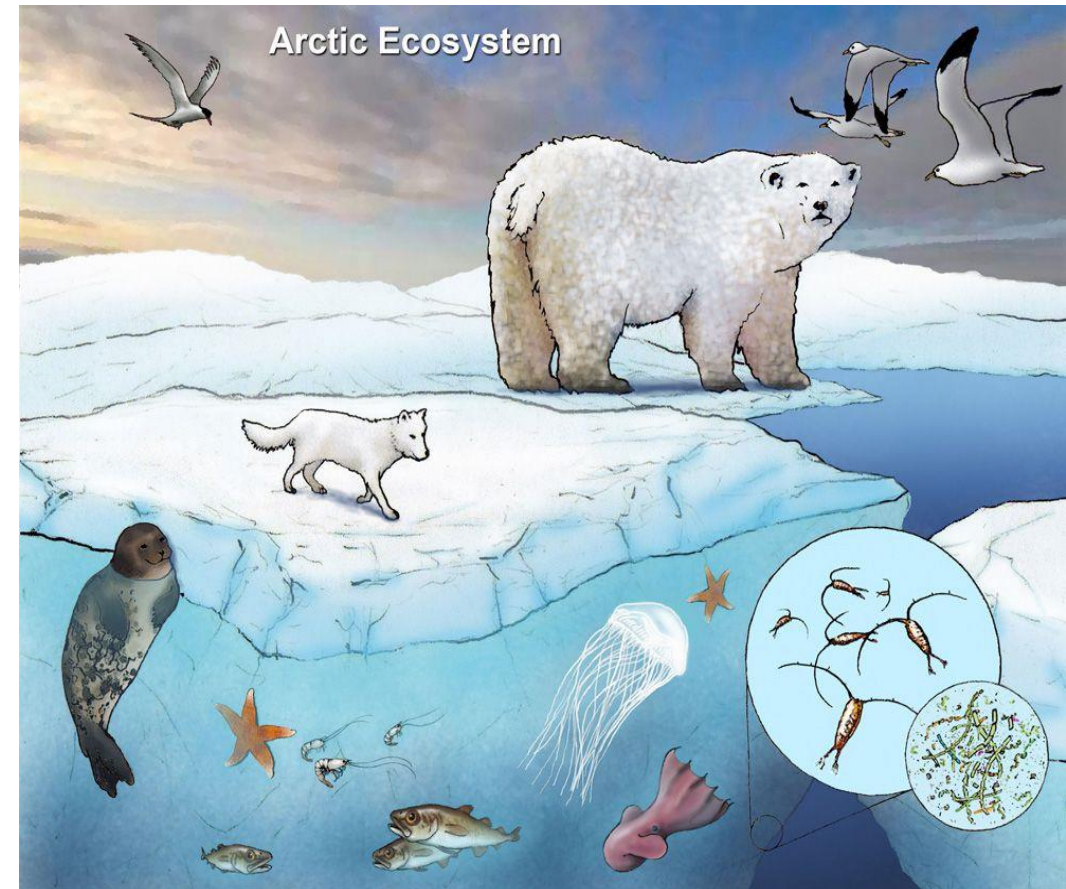
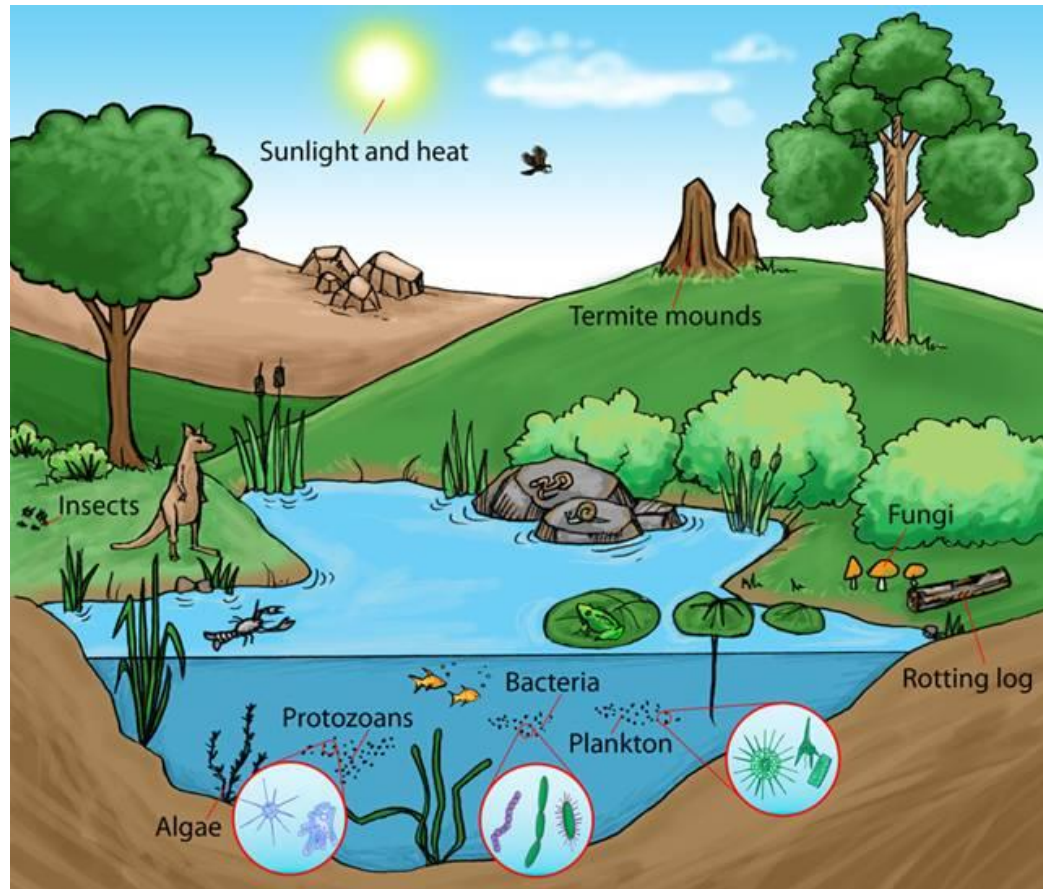
Topic: Ecosystems

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Definition

The interaction and interrelationship between the living community (plants, animals, and organisms) in relation to each other and the non-living community (soil, air, and water) is referred to as an **ecosystem**.

Eco → Environment & system → interacting and interdependent complex



Characteristics of Ecosystem

According to **Smith (1966)**, the ecosystem has the following general characteristics:

- It is a major structural and functional unit of ecology.
- Its structure is related to its species diversity; the more complex ecosystems have high species diversity and vice versa.
- Its function is related to energy flow and material cycling through and within the system.
- The relative amount of energy needed to maintain an ecosystem depends on its structure. The more complex the structure, the lesser the energy it needs to maintain itself.
- It matures by passing from fewer complexes to more complex states. Early stages of each succession have an excess of potential energy and a relatively high energy flow per unit biomass. Later (mature) stages have less energy accumulation and its flow through more diverse components.
- Both the environment and the energy fixation in any given ecosystem are limited and cannot be exceeded without causing serious undesirable effects.
- Alternations in the environment represent selective pressures upon the population to which it must adjust. Organisms which are unable to adjust to the changed environment must necessarily vanish.

Kinds of Ecosystems

Artificially ecosystems may be classified as follows:

- 1. Natural ecosystems**
- 2. Artificial (Man - engineered) ecosystems**

Natural ecosystems

These operate under natural conditions without any major interference by man. On the basis of the type of habitat these may be further divided as:

a) Terrestrial

Forest, grassland, desert, etc.

b) Aquatic

1. Fresh water - which may be lotic (e.g., running water as spring, stream or rivers) or lentic (e.g., standing water as lake, pond, pools, puddles, ditch, swamp, etc.).
2. Marine - such deep bodies as ocean or shallow ones as seas or an estuary, etc.

Artificial (Man - engineered) ecosystems

These are maintained artificially by man whereby addition of energy and planned manipulation, natural balance is disturbed regularly, e.g. cropland ecosystem. In addition to above types, some other types such as spacecraft and microecosystem have also been recognised.

I: Natural: Terrestrial



Grassland



Forest



Desert

Natural: Aquatic



a) Marine: Oceans



b) Freshwater: Lakes

II: Artificial or Manmade

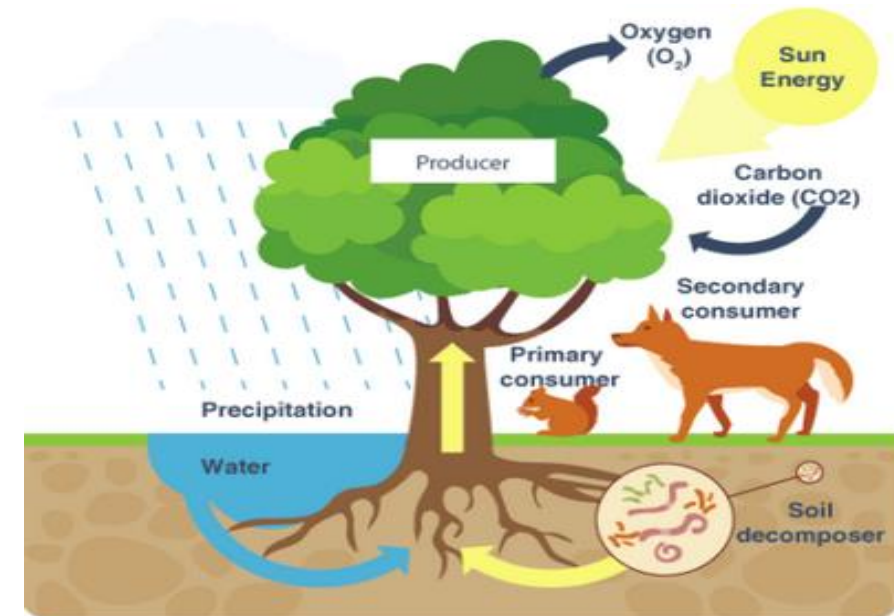
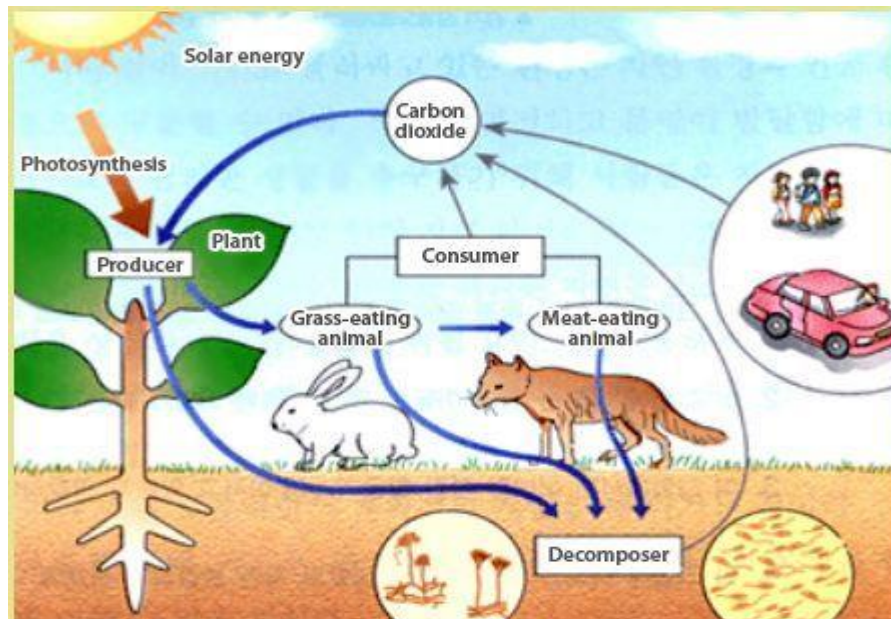
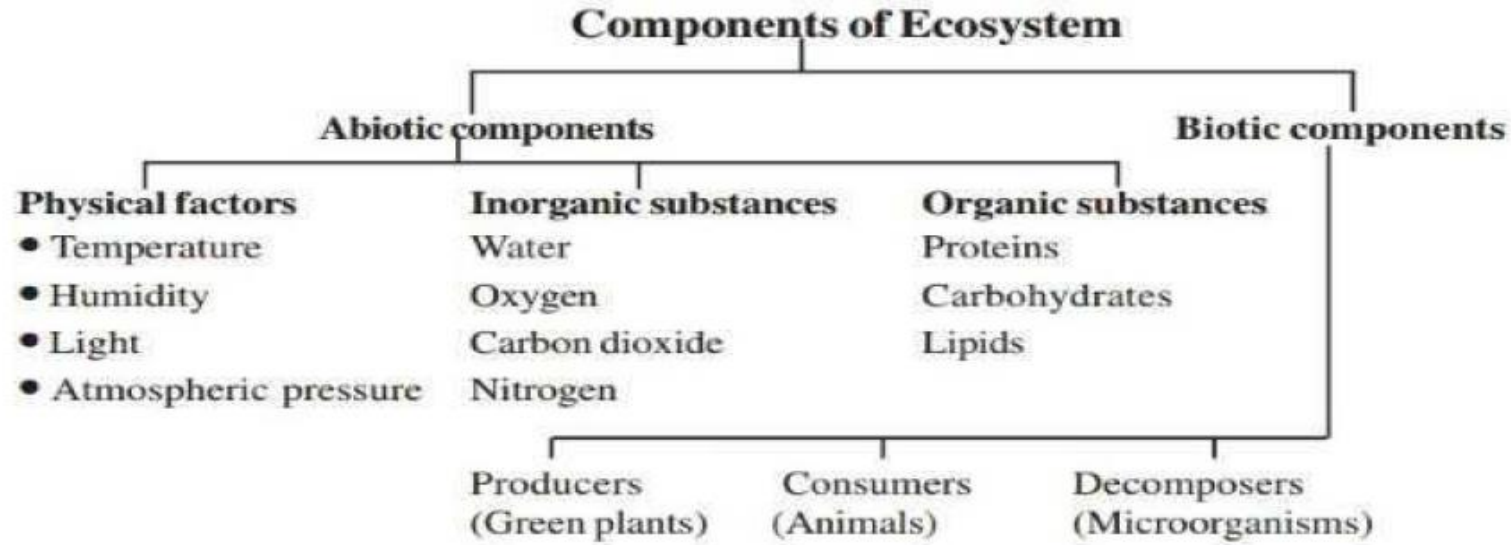
Aquarium



Crop field



Structure of Ecosystem



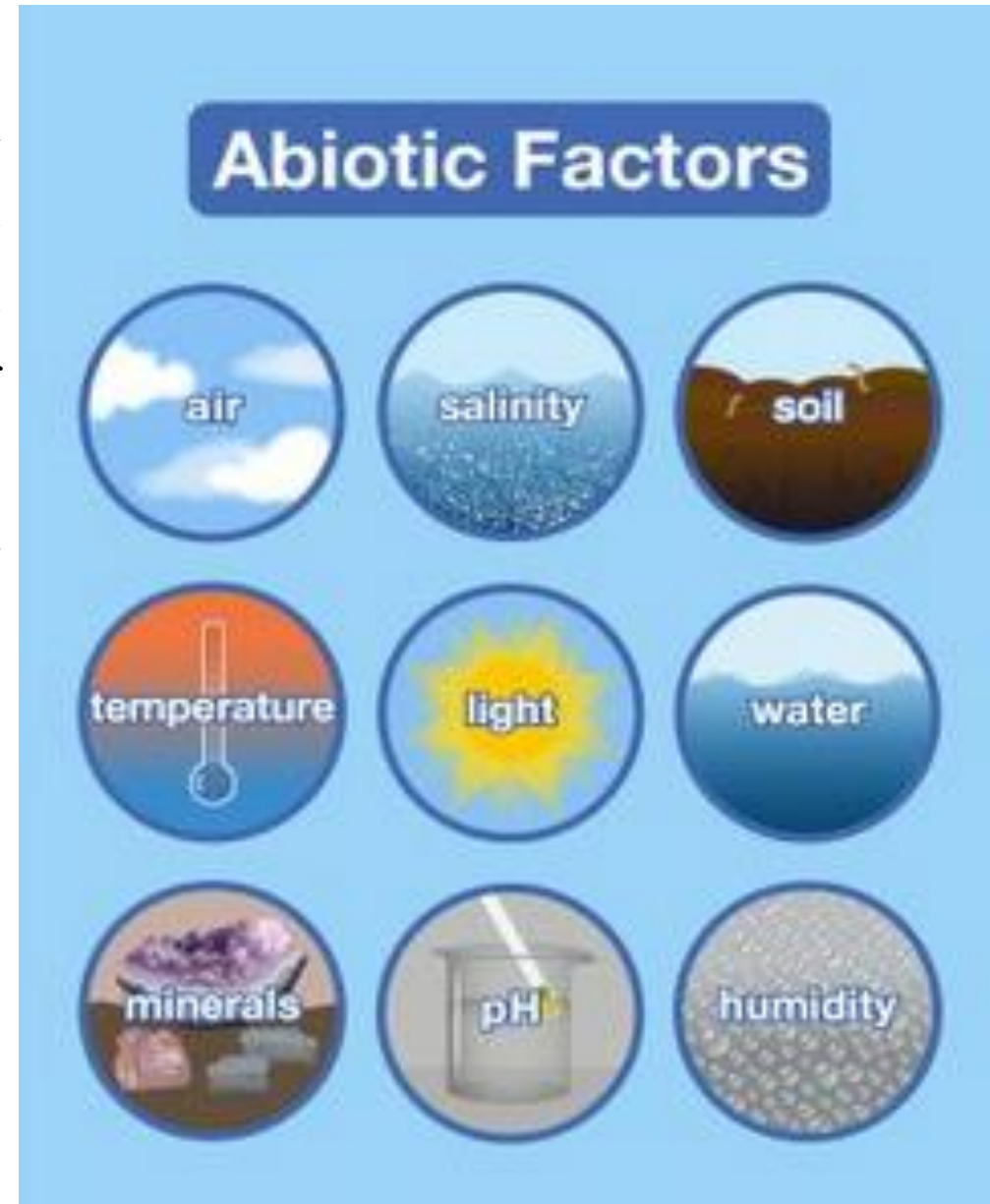
Source: Internet

1. Abiotic Components

Abiotic component of ecosystem includes basic inorganic elements and compounds, such as soil, water, oxygen, calcium carbonates, phosphates and a variety of organic compounds. It also includes such physical factors and ingredients as moisture, wind currents and solar radiation. Radiant energy of sun is the only significant energy source for any ecosystem.

The minerals and atmospheric gases keep on cycling. They enter into biotic systems and after the death and decay of organisms return to the soil and atmosphere. This is known as biogeochemical cycle. This circulation of materials involves trapping of the solar energy by the green plants which are ultimately lost by the organisms in several ways.

** The amount of non-living components, such as carbon, phosphorus, nitrogen, etc (abiotic materials) that are present at any given time is known as *standing state or standing quantity*.



2. Biotic Components

The biotic components include all living organisms present in the environmental system.

On nutrition based

(i) Autotrophic components, and

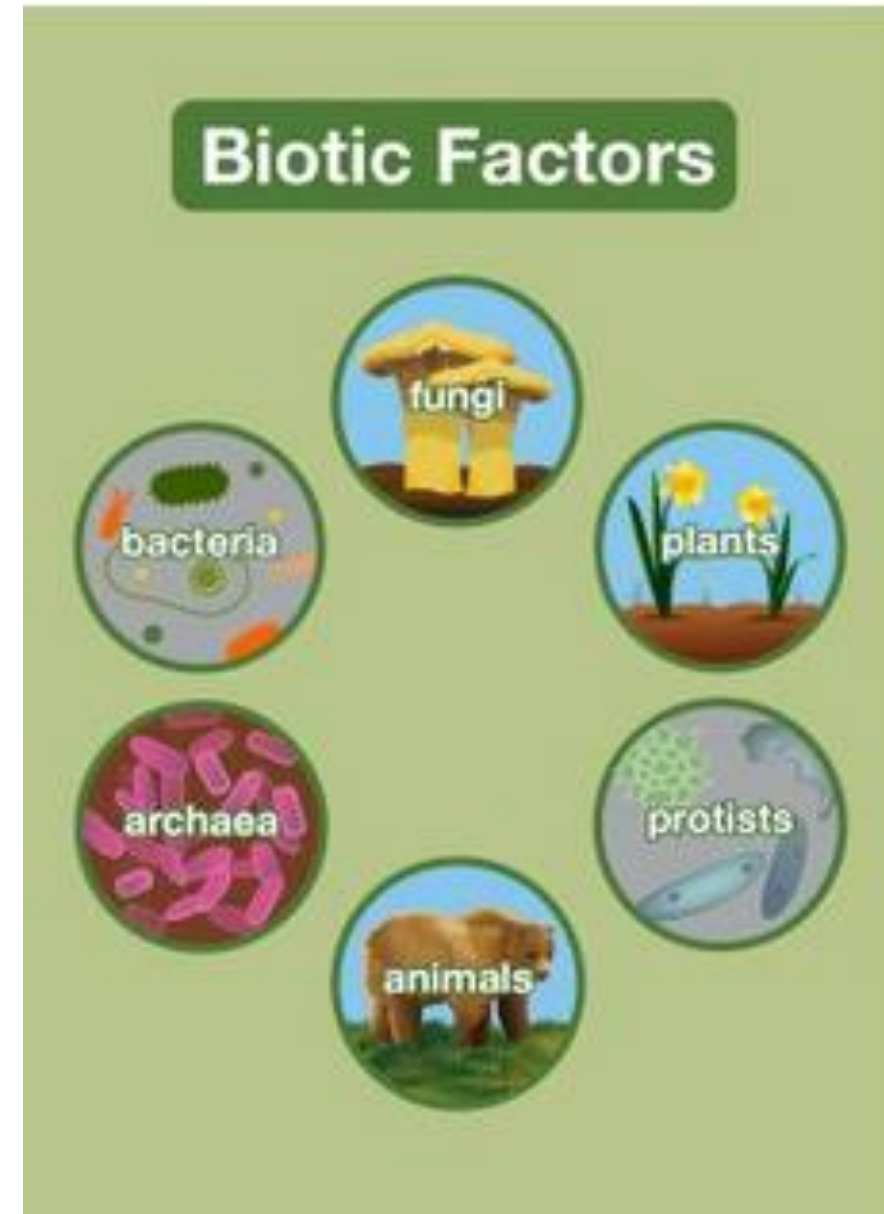
(ii) Heterotrophic components

The **autotrophic components** include all green plants which fix the radiant energy of sun and manufacture food from inorganic substances. The **heterotrophic components** include non-green plants and all animals which take food from autotrophs.

So biotic components of an ecosystem can be described under the following three heads:

1. Producers (Autotrophic components),
2. Consumers, and
3. Decomposers or reducers and transformers

** The amount of biomass at any time in an ecosystem is known as ***standing crop*** which is usually expressed as fresh weight, dry weight or as free energy in terms of calories/meter.



Producers (Autotrophic elements)

The producers are the autotrophic elements—chiefly green plants. They use radiant energy of sun in photosynthetic process whereby carbon dioxide is assimilated and the light energy is converted into chemical energy. The chemical energy is actually locked up in the energy rich carbon compounds. Oxygen is evolved as by-product in the photosynthesis. This is used in respiration by all living things. Algae and other hydrophytes of a pond, grasses of the field, trees of the forests are examples of producers. Chemosynthetic bacteria and carotenoid bearing purple bacteria that also assimilate CO₂ with the energy of sunlight but only in the presence of organic compounds also belong to this category.

Consumers

Those living members of ecosystem which consume the food synthesized by producers are called consumers. Under this category are included all kinds of animals that are found in an ecosystem.

There are different classes or categories of consumers, they are

- (a) Consumers of the first order or primary consumers,
- (b) Consumers of the second order or secondary consumers,
- (c) Consumers of the third order or tertiary consumers, and
- (d) Parasites, scavengers and saprobes.

(a) Primary consumers:

These are purely herbivorous animals that are dependent for their food on producers or green plants. Insects, rodents, rabbit, deer, cow, buffalo, goat are some of the common herbivores in the terrestrial ecosystem, and small crustaceans, molluscs, etc. in the aquatic habitat. Elton(1939) named herbivores of ecosystem as “*key industry animals*”. The herbivores serve as the chief food source for carnivores.

(b) Secondary consumers:

These are carnivores and omnivores. Carnivores are flesh eating animals and the omnivores are the animals that are adapted to consume herbivores as well as plants as their food. Examples of secondary consumers are sparrow, crow, fox, wolves, dogs, cats, snakes, etc.

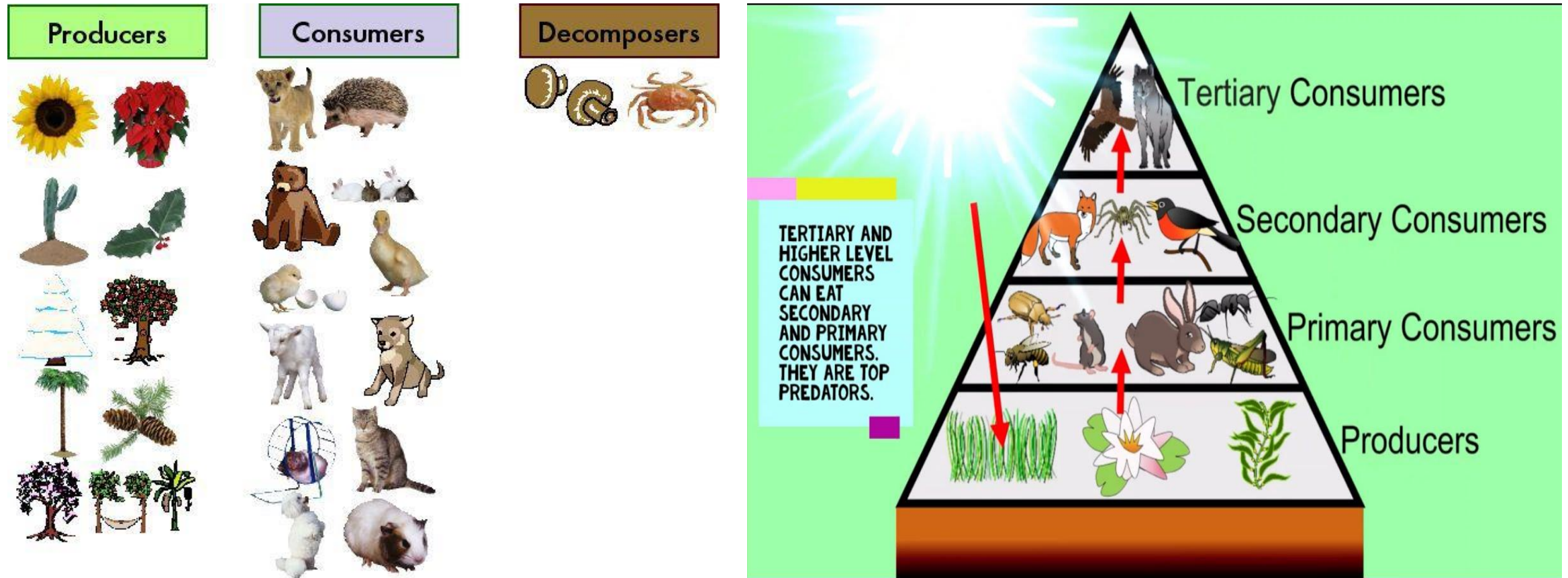
(c) Tertiary consumers:

These are the top carnivores which prey upon other carnivores, omnivores and herbivores. Lions, tigers, hawk, vulture, etc. are considered as tertiary or top consumers.

(d) Besides different classes of consumers, the parasites, scavengers and saprobes are also included in the consumers. The parasitic plants and animals utilize the living tissues of different plants and animals. The scavengers and saprobes utilize dead remains of animals and plants as their food.

Decomposers

Decomposers and transformers are the living components of the ecosystem and they are fungi and bacteria. Decomposers attack the dead remains of producers and consumers and degrade the complex organic substances into simpler compounds. The simple organic matters are then attacked by another kind of bacteria, the transformers which change these organic compounds into the inorganic forms that are suitable for reuse by producers or green plants



Function of Ecosystem

The function of the ecosystem is to allow flow of energy and cycling of materials which ensures stability of the system and continuity of life. These two ecological processes including interaction between the abiotic environment and the communities.

Thus, in any ecosystem we have the following functional components:

- (i) Inorganic constituents (air, water and mineral salts)
- (ii) Organisms (plants, animals and microbes), and
- (iii) Energy input which enters from outside (the sun).

Thus the Principal steps in the operation of ecosystem are as follows:

- (1) Reception of radiant energy of sun,
- (2) Manufacture of organic materials from inorganic ones by producers,
- (3) Consumption of producers by consumers and further elaboration of consumed materials; and.
- (4) After the death of producers and consumers, complex organic compounds are degraded and finally converted by decomposers and converters into such forms as are suitable for reutilization by producers.

Thank you...