BCA SEM – I

Skill Enhancement Compulsory Course (SECC)

Environmental Studies

CODE: US01SBCA21 (T)

UNIT 2: ECOSYSTEM

- Definition and Structure of Ecosystem – Abiotic and Biotic Components (Producers, Consumers and Decomposers)
- Functions of Ecosystem: Energy Flow in an Ecosystem, Food Chains, Food Webs with examples
- Types of Ecosystem; Forest Ecosystem, Lake/ Pond Ecosystem, Desert Ecosystem

ECOSYSTEM

CONCEPT

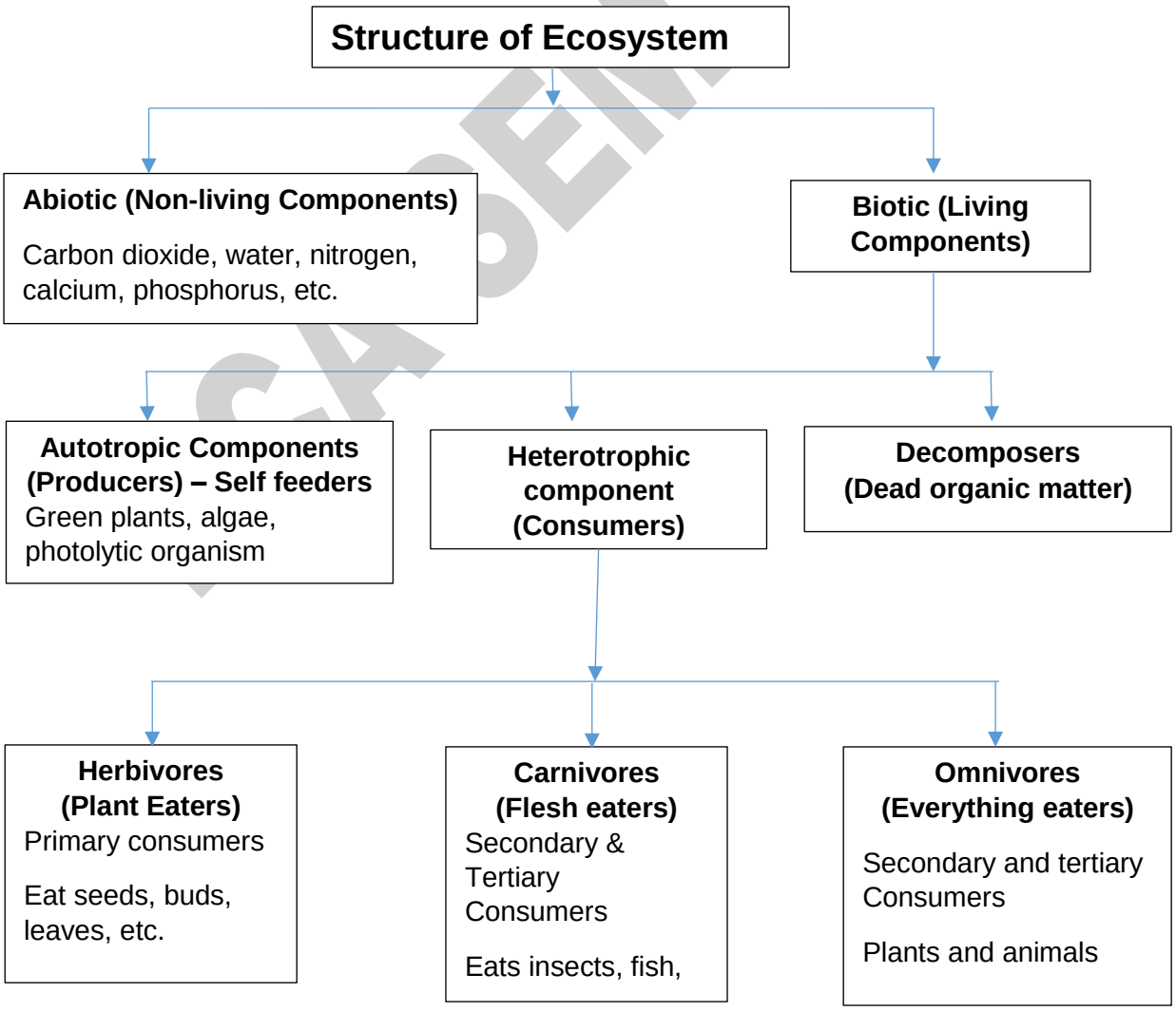
An 'ecosystem' is a region with a specific and recognizable landscape form, such as a forest, grassland, desert, wetland or costal area. The nature of ecosystem is based on its geographical features like hills, mountains, plains, rivers, lakes, coastal areas or island. It is also controlled by climatic conditions – the amount of sunlight, the temperature and the rainfall in the region. The geographical, climatic and soil characteristics form its non-living or abiotic component. These features create conditions that support a community of plants and animals that evolution has produced to live in these specific conditions. The living part of the ecosystem is referred to as its biotic component.

Ecosystem was defined in its presently accepted form by Eugene Odum as, “an unit that includes all the organisms, i.e., the community in a given area interacting with the physical environment so that a flow of energy leads to clearly defined trophic structure, biotic diversity and material cycles, i.e., exchange of materials between living and non-living, within the system”.

The living community of plants and animals in any area together with the non-living components of the environment – such as soil, air and water – constitute the ecosystem.

STRUCTURE OF ECOSYSTEM

Every ecosystem has a non-living (abiotic) and living (biotic) components.



Abiotic Components:

Basic inorganic compounds of an organism, habitat or an area like carbon dioxide, water, nitrogen, calcium, phosphorus, etc. that are involved in the material cycles are collectively called as abiotic component. The amount of these inorganic substances present at any given time, in an ecosystem is called as the standing state or standing quality of an ecosystem.

Whereas, organic components e.g., proteins, amino acids, carbohydrates and lipids that are synthesized by the biotic counterpart of an ecosystem make the biochemical structure of the ecosystem. The physical environment, viz. climatic and weather conditions are also included in the abiotic structure of the ecosystem.

Biotic Components:

From the trophic (nutritional) point of view, an ecosystem has autotrophic (self-nourishing) and a heterotrophic (other nourishing) components:

(a) Autotrophic component (Producers):

This component is mainly constituted by the green plants, algae and all photosynthetic organisms. Chemosynthetic bacteria, photosynthetic bacteria, algae, grasses, mosses, shrubs, herbs and trees manufacture food from simple inorganic substances by fixing energy and are therefore called as producers.

(b) Heterotrophic component (Consumers):

The members of this component cannot make their own food. They consume the matter built by the producers and are therefore called as consumers. They may be herbivores, carnivores or omnivores. Herbivores are called as primary consumers whereas carnivores and omnivores are called as secondary consumers. Collectively we can call them as macro-consumers.

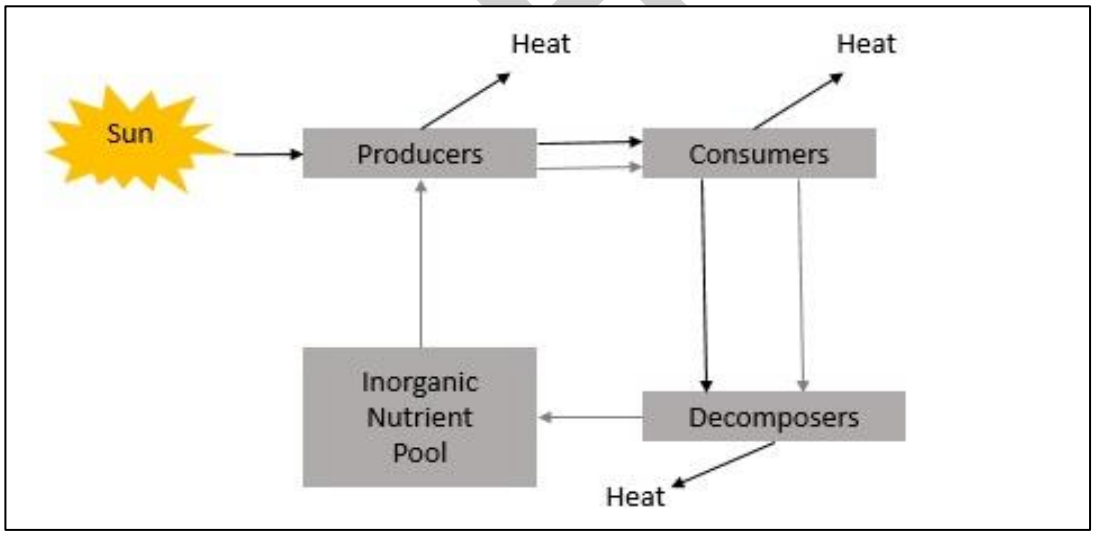
(c) Decomposers:

Heterotrophic organism chiefly bacteria and fungi that breakdown the complex compounds of dead protoplasm, absorb some of the products and release simple substances usable by the producers are called as decomposers or reducers. Collectively we call them as micro consumers.

FUNCTIONS OF ECOSYSTEM

ENERGY FLOW IN AN ECOSYSTEM

Energy moves life. The cycle of energy is based on the flow of energy through different trophic levels in an ecosystem. Our ecosystem is maintained by the cycling energy and nutrients obtained from different external sources. At the first trophic level, primary producers use solar energy to produce organic material through photosynthesis.



The herbivores at the second trophic level, use the plants as food which gives them energy. A large part of this energy is used up for the metabolic functions of these animals such as breathing, digesting food, supporting growth of tissues, maintaining blood circulation and body temperature.

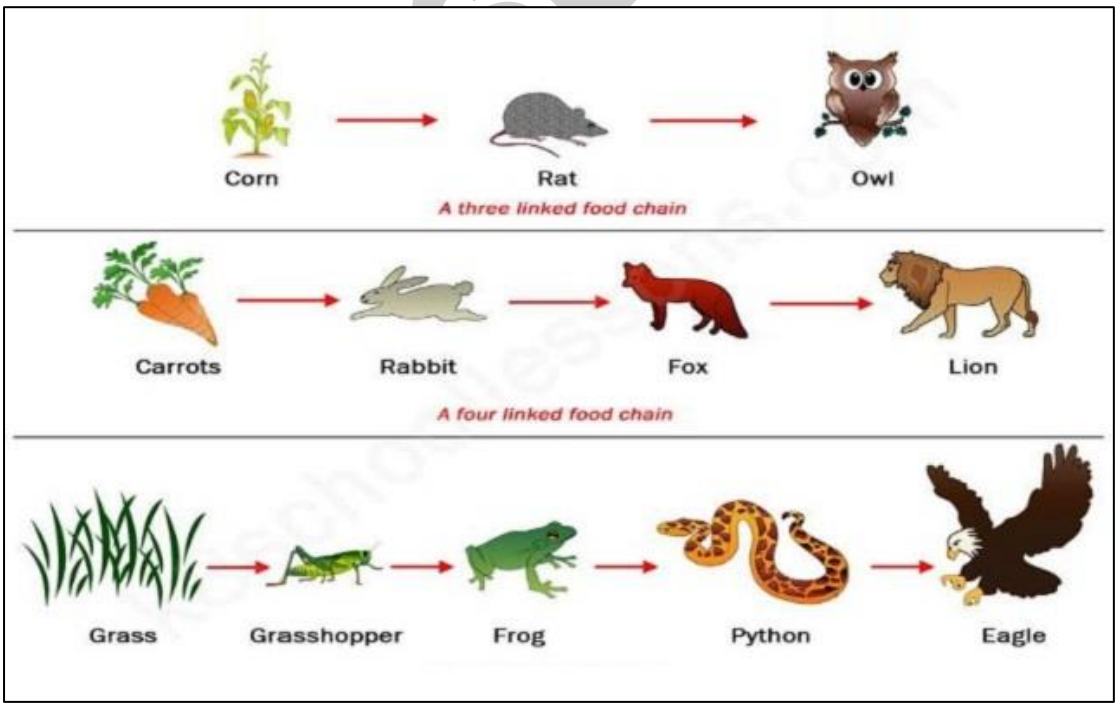
The carnivores at the next trophic level, feed on the herbivores and derive energy for their sustenance and growth. If large predators are present, they represent still higher trophic level and they feed on carnivores to get energy.

Thus, the different plants and animal species are linked to one another through food chains.

Decomposers which include bacteria, fungi, molds, worms, and insects break down wastes and dead organisms, and return the nutrients to the soil, which is then taken up by the producers. Energy is not recycled during decomposition, but it is released.

FOOD CHAINS

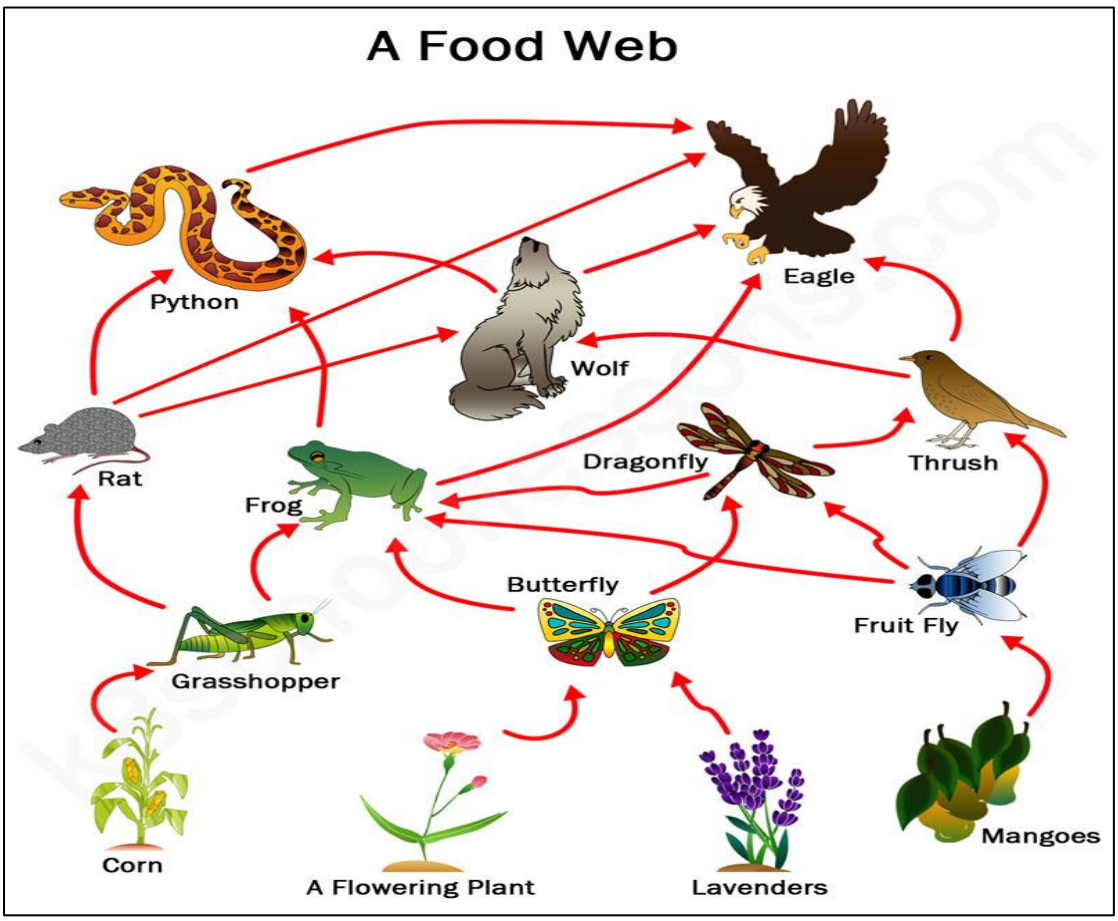
All ecosystems are made up of food chains that begin with energy – i.e., sunlight extracted from the physical environment and converted into organic matter by plants. Herbivores (Plant eating animals) synthesize a portion of the plant material in their bodies. The flesh of the herbivore provides nutrition and energy to the carnivore (flesh eating animals). Thus, energy is passed on from one organism to another step by step, thus establishing a link. These links together form a food chain.



Food chains are also found in the water where zooplanktons survive on phytoplankton. The small aquatic organisms consume zooplanktons; the small fish, which is consumed by the large fish, consumes these.

FOOD WEBS

Food chain represents an isolated relationship between the producers and consumers. In reality or in the environment all elements are inter-related and inter-dependent and hence we find that the elements of different food chains are inter-related and inter-dependent on the elements of other food chains. Such a set of integrated food chains or the combination of different food chains is called as food web.



TYPES OF ECOSYSTEM

FOREST ECOSYSTEM

Forest are formed by a community of plants, which is predominantly structurally defined by its trees, shrubs, climbers and ground cover. Natural vegetation looks and is vastly different from a group of planted trees in orderly rows. The most 'natural' undisturbed forests are located mainly in our national

parks and wildlife sanctuaries. The landscapes that make up various types of forests look very different from each other. Their distinctive appearances are fascinating aspects of nature. Each forest type forms habitat for a specific community of animals that are adapted to live in it.

The forest ecosystem has two parts:

1. The non-living or abiotic aspects of the forest – the forest on mountain and hills differ from those along river valleys. The vegetation is specific to the amount of rainfall and the local temperature, which vary according to latitude, altitude and soil type.

2. The living or the biotic aspects of the forest – the plants and animals form communities that are specific to each forest type.

E.g. Himalayas – mangroves trees, thorn trees, snow – leopards, forest tigers, wild sheep, goats etc.

Plants – trees, climbers, grasses, fungi, etc.

Animals – mammals, birds, reptiles, fish, insects etc.

Forest type	**Plants e.g.**	**Common animal e.g.**	**Rare animals E.g.**
Himalayas Coniferous	Pine, deodar	Wild goats and sheep, Himalayan black bear	Snow leopard, Hangual, Himalayan brown bear, Musk deer, Himalayam Wolf
Himalayan Broad-leaved	Maple, Oak		
Evergreen North-East, Western Ghats, Andaman & Nicobar	Jamun, Ficus, Dipterocarpus	Tiger, Leopard, Sambar, Malabar Whishing thrush, Malabar Pied hornbill, Tree frogs	Pigmy hog, Rhino, Lion-tailed macaque

Forest type	Plants e.g.	Common animal e.g.	Rare animals E.g.
Deciduous-Dry	Teak, Ain, Terminalia	Tiger, Chital, Barking deer, Babblers, Flaycatchers, Hornbills	
Deciduous-Moist	Sal		
Thorn and Scrub, Semi-arid forests	Babul, Ber, Neem	Blackbuck, Chinkara, Four-horned antelope, Partridge, Monitor lizard	Bustard, Florican
Mangrove Delta Forest	Avicenia	Crocodile, Shorebirds, Sandipipers, Plovers, fish, Crustanceans	Water monitio lizard

LAKE/ POND ECOSYSTEM

A land, or terrestrial, ecosystem is all the living organisms and their physical environment on a particular piece of land. Terrestrial ecosystems may interact and overlap with marine (salt-water) and immunological (fresh-water) ecosystems. A number of terrestrial biomes can be used to classify smaller ecosystems.

1. Tundra

The tundra biome is found near polar latitudes or at high elevations. Temperatures are cold throughout the year. Trees are generally absent due to permafrost.

2. Taiga

Taiga lies at high elevations and latitudes where the growth of trees is possible. Thick forests of conifer trees are the predominant vegetation.

3. Temperate Forest

Temperate forests occur where there are distinct seasonal changes over the course of the year and have deciduous forests.

4. Rainforest

Rainforests occur at many latitudes but the largest rainforests occur in equatorial areas of South America, Asia, and Africa. The high rainfall of the rainforest often results in extremely poor soil due to leeching.

5. Grassland

Grasslands exist where biotic or abiotic factors limit the presence of trees. Grasses are the dominant vegetation type though sporadic or isolated shrubs or trees may also exist.

6. Other Terrestrial Biomes

Additional biomes can be classified according to precipitation, temperature and vegetation such as desert, chaparral and tropical deciduous forest.

DESERT ECOSYSTEM

Deserts are areas of land that are arid, or dry, and get less than 10 inches of rain per year. These areas can be covered by sand, rock, snow, and even ice. Additionally, they do not have a lot of plant life covering the land.

Deserts' ecosystems cover approximately 25% - 30% of the land on Earth. An ecosystem includes all the life in a particular environment or location. Deserts can be divided into two main types: hot and cold.

- Hot Deserts

Hot deserts are warm year round and very hot in the summer. During the day, temperatures often reach over 100 degrees Fahrenheit. In the evening, the temperatures drop sometimes below freezing. Much of the time rain does not

fall, but when it does, it is only for a short amount of time. The ground is usually rocky or sandy.

Most of the hot deserts in the world are located just north and south of the equator, where it is the hottest. The largest hot desert is the Sahara Desert in northern Africa. The Sahara covers over 3 million square miles and has some areas that receive no rainfall for years. Other well-known hot deserts include the Arabian, Mohave, and Sonoran deserts.

- Cold Deserts

Cold deserts are cool year around with very cold temperatures in the winter. Temperatures in cold deserts are often below freezing. Heavy snows happen during the winter, with most of the rainfall happening during the spring months. The ground can be solid ice in colder temperatures and rocky or spongy soil in milder temperatures.

The cold deserts of the world are mostly located on the coasts near oceans and closer to the north and south poles. The largest cold desert, and the largest desert in the world, is the continent of Antarctica. This desert is over 5 million square miles and is the driest, coldest, and windiest place on earth. In fact, there are no people that live permanently in Antarctica due to the harsh conditions. Other cold deserts include the Gobi, Great Basin, and Namib Deserts.

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