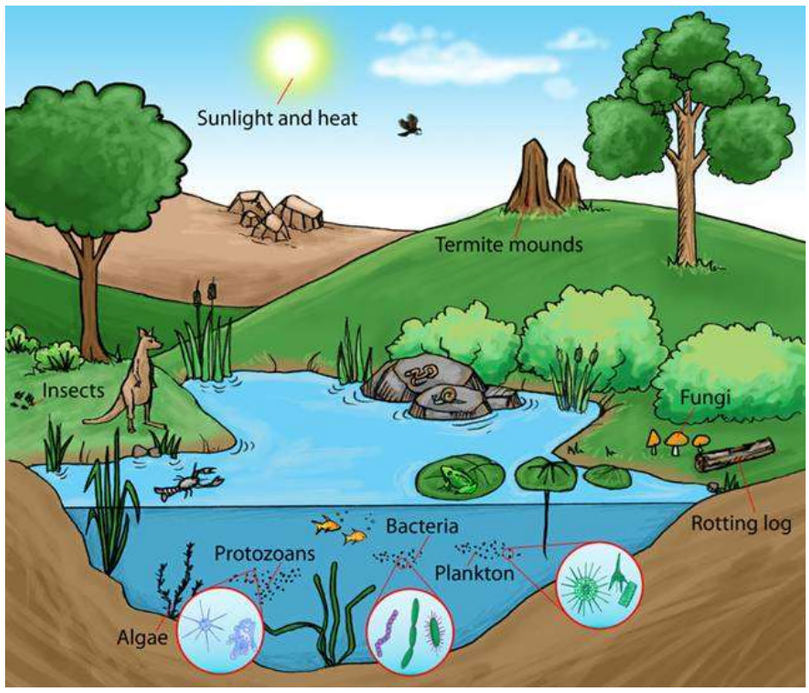
Lecture-1

Biological Community

A biological community consists of several to many populations each containing all the members of a single species in a given area. Species are not fixed or unalterable, however. They evolve and adapt in response to the environment in which they live. Because, environmental conditions also are dynamic and constantly changing, the process of evolution and adaptation of living organisms is never complete. And yet many biological communities are self-perpetuating, resilient, and stable over relatively long times.

A. Biotic Community

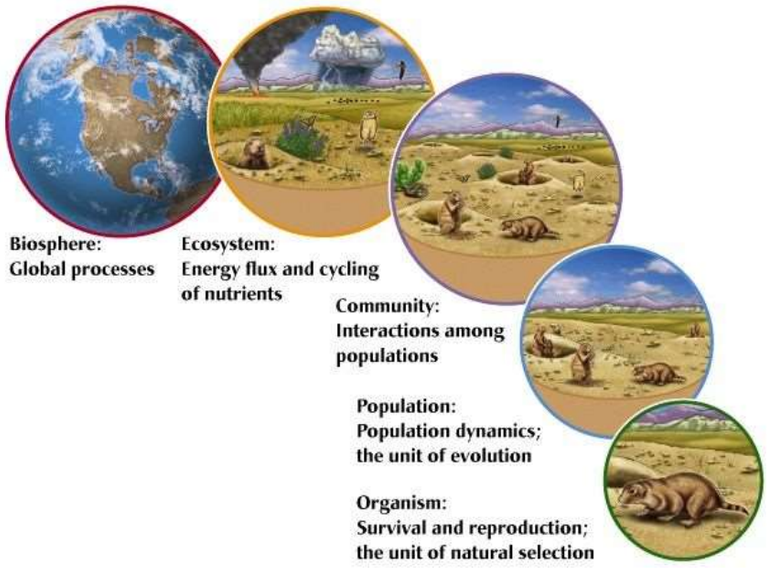
The most familiar classification system used for grouping plants and animals is one based upon presumed evolutionary relationships. However, ecologists tend to arrange species on the basis of their functional association with each other. A natural grouping of different kinds of plants and animals within any given habitat is termed as a biotic community.



Biotic community like ecosystem is a broad term, which can be used to describe natural groupings of widely different sizes, from the various microscopic diatoms and zooplankton swimming in a drop of pond water to the hundreds of species of trees, wild flowers, insects, birds, mammals etc.

Biotic communities have characteristics trophic structure and energy flow patterns and also have a certain taxonomic unity in the sense that certain species tend to exist together.

Individual of the same species living together within a given area is collectively called population. Such population constitutes groups more or less isolated from others. A population within a biotic community in certain region is not a static entity but it is continuously changing in size and reshuffling in hereditary characteristics in response to environmental changes and to fluctuations in the population of other members of the community. The community concept is one of the most important ecological principles. Because:



1. It emphasizes the fact that different organisms are not arbitrarily scattered around the earth with no particular reason as to why they live where they do together in an orderly manner.
2. By illuminating the importance of the community as a whole to any of its individual parts, the community concept can be used by man to control a particular organism, in the sense of increasing or decreasing its numbers.

The realization that the success of any particular species is dependent on integrity of its biotic community as a whole has profound implications for human welfare.

B. Ecological Dominance

Although all members of a biotic community have a role to play in the life of a community, it is obvious that certain plants or animals exert more of an effect on the ecosystem as a whole than do others. Those organisms, which exert a major role in having controlling influence on the community, are called" **Ecological Dominants**." Such dominants comprise those keystone species, which largely control the flow of energy through the community, if they were to be removed from the community, much greater change in the ecosystem would result than if a non-dominant species were to be removed. Example: If farmers chop down dominant forest trees for cultivation, the changes produced by the removal are:

- Loss of animal species, which depend on the trees for food and shelter
- Loss of shade loving plant
- Change in soil micro biota
- Raising of soil temperature

- Increase in soil erosion

Consequently, the stability of the ecosystem would be disturbed. In most terrestrial biotic communities' certain plants comprise the dominant role because not only do they provide food and shelter for other organisms but also directly affect and modify their physical environment. That is: -

i. They build up topsoil
ii. Moderate fluctuation of temperature
iii. Improve moisture retention
iv. Affect the pH of the soil.

C. Biomes

The species composition of any particular biotic community is profoundly affected by the physical characteristics of the environment particularly temperature and rainfall. For instance, the kinds of plants and animals one will find in Simen Mountains in Ethiopia would differ significantly from those found in the Awash Park. Ecologists have divided the terrestrial communities of the world into general groupings called **Biomes,** which are areas that can be recognized by the distinctive life forms of their dominant species. In most cases, the key characteristic of a biome is its dominant type of vegetation. It could also be said that a biome is a complex of communities' characteristic of a regional climatic zone. Each biome
has its pattern of rainfall, season, temperature and changes of day length all of which combine to support a certain kind of vegetation. Starting at the polar region the major biomes of planet earth are:

1) Tundra

Tundra is the northern most of the world's landmasses. It is characterized by permanently frozen subsoil called Permafrost, which has low rainfall. These are bogs and lakes, which propagate mosquitoes more than any thing else.
Dominant vegetation is moss grass and some small perennials

2) Taiga

Taiga is a Russian world meaning " Swampy forest". Taiga is mostly identified with its abundant coniferous forest. The trees available, mostly conifers are less diverse in number of species than those in the deciduous trees forests found further south from Taiga and the soil has different kind of humus which is more acid. Precipitation is low, but like Tundra there are a number of bogs
and lakes available.

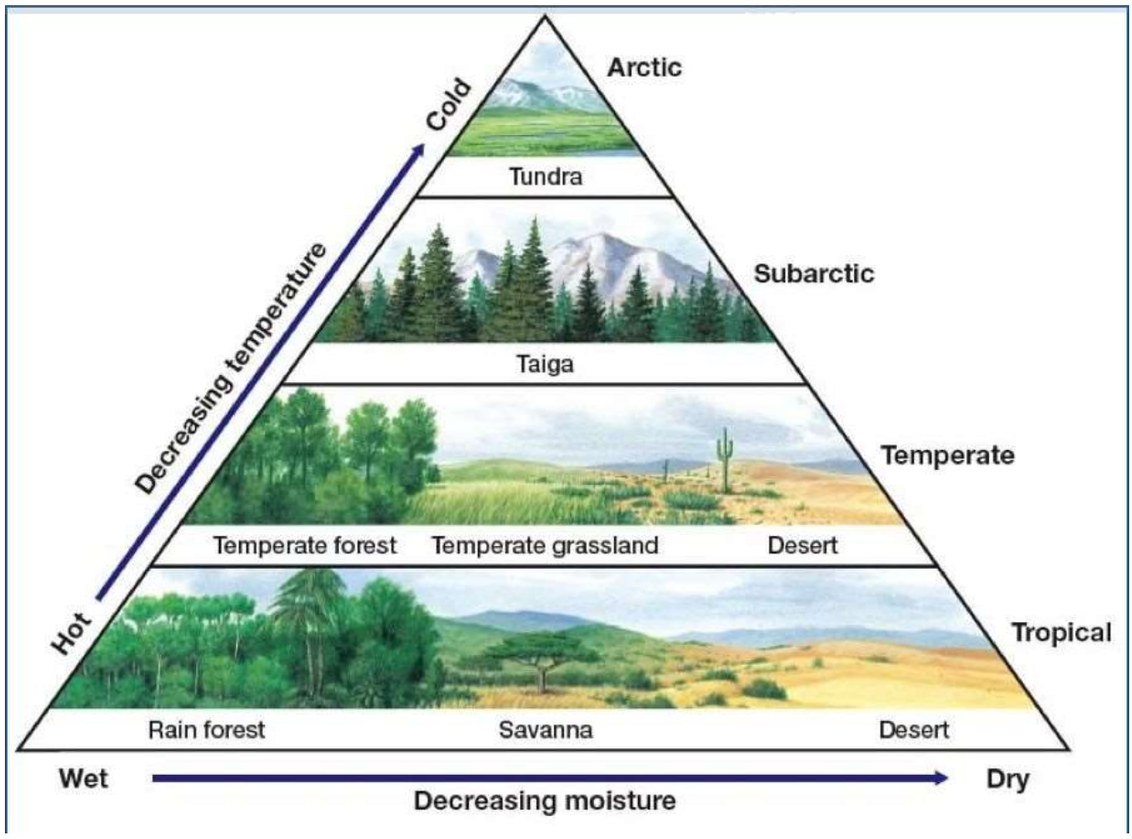
3) Temperate deciduous forests

This occurs in a belt south of the Taiga where climate is milder and where rainfall

is abundant relative to the amount of evaporation. The deciduous forest has a great variety of mammals, birds, and insects as well as modest number of reptiles and amphibians. Because of the annual leaf drop deciduous forest generate soils rich in nutrients, which in turn supports a multitude of soil microbes.

4) Grassland

In regions where annual rainfall is not sufficient to sustain the growth of trees and evaporation rates are high we find the grassland of the world. Example of such a



biome is the Savannah. The dominance of grass and herds of grazing animals characterize all. Carnivores are also abundant. Such biome has a higher concentration of organic matter in its soil than does any other biome, the amount of humus being 12 times greater than that in forested soils.

5) Desert

This is an area, which is receiving less than 10 inch of rainfall per year. Lack of moisture is the essential factor that shapes the desert biome.

6) Tropical Rain forest

It is characterized by high temperature and high annual rainfall (100 inch or more). Year round temperature variations is slight. Tropical rain forest is characterized by a great diversity of plants and animal species and by four distinct layers of plant growth:

a. Top canopy of trees reaching 60 meters,
b. Lower canopy reaching 30 meters,
c. Sparse under story and

d. Very few plants growing at ground level.

Both plants and animal species exist in greater diversity in the tropical rain forest than anywhere else does in the world. Tropical rain forest soils in general are exceedingly thin and nutrient poor relative to temperate regions. As a result nutrients are locked in the biomass in the tropics and removal of vegetation may severely disrupt nutrient cycling leading to ecological disaster.

This brief survey of biome characteristics should make it obvious that various regions differ in their ability to return to an ecologically stable condition once they have been disrupted by human activities.

D. Habitat and Ecologic Niche

In describing the ecological relation of organisms, it is useful to distinguish between where an organism lives and what it does as part of its ecosystem. The term habitat and ecological niche refers to two concepts that are of prime importance in ecology.

Habitat

The habitat of an organism is the place where it lives, a physical area, and some specific part of the earth's surface, air, soil or water. It may be as large as the ocean or a forest or as small and restricted as the underside of a rotten log or the intestine of a termite. However, it is always tangible, physically demarcated region. More than one animal or plant may live in a particular habitat.

Ecologic Niche

Diverse assortment of Organisms can live in a habitat. Every organism is thought to have its own role within the structure and function of a community. This status or role of organism in the community or ecosystem is termed as ecologic niche. Ecologic niche

depends on the organism’s structural adaptations, physiologic response and behavior.

An ecologic niche is difficult to define precisely; it is an abstraction that includes all the physical, chemical, physiologic and biotic factors that an organism requires to live; but not physically demarcated space. To describe an organism's ecologic niche, we must know what it eats, what eats it, what organism competes with, and how it interacts with and is influenced by abiotic component of the environment (like light, temperature, and moisture).It is helpful to think of the habitat as an organism's address (where it lives) and of the ecologic niche as its profession (what it does biologically). One of the important generalizations of ecology is that no two species may occupy the same ecologic niche.

Niche – each member of this community gathers food in a unique way