

2.5 DESERT ECOSYSTEM

2.5.1 Introduction

- ❖ A desert is a landscape or region that receives almost no precipitation.
- ❖ Deserts are defined as areas with an average annual precipitation of less than 250 millimeters per year.
- ❖ It occupies about 17% of the earth's surface.
- ❖ Deserts are characterized by hot days & cold nights.
- ❖ The deserts of the world are mainly located in the South- western United States, Mexico, North America, Asia (Thar, Gobi, Tibet) & west Asia.
- ❖ Deserts are characterized by scanty flora & fauna.
- ❖ Soils of deserts often have abundant nutrients but little or no organic matter.

2.5.2 Structure and Functions of Desert Ecosystems

I. Biotic components

1) Producer Organisms

- ❖ In a desert, producers are mainly shrubs/bushes; some grasses & a few trees.
- ❖ Dominant plant species include: Succulents (water - retaining plants adapted to arid climate or soil conditions) & hardy grasses.

❖ Besides some lower plants such as lichens & xerophytic mosses are also present.

2) Consumer Organisms

These include animals such as insects, reptiles which are capable of living in xeric conditions

❖ Besides some nocturnal rodents, birds & some mammalians like camel etc are also found.

3) Decomposers

Due to poor vegetation with very low amount of dead organic matter, decomposers are poor in desert ecosystem.

❖ The common decomposers are some bacteria & fungi, most of which are thermophilic.

II. Abiotic components

Due to high temperature & very low rainfall, the organic substances are poorly present in the soil.



Producers



Consumers

Fig. 2.5 Forest Ecosystem

2.6 AQUATIC ECOSYSTEMS

2.6.1 Introduction

❖ Aquatic ecosystems deal with biotic community present in water bodies.

❖ In terrestrial ecosystem, carbon dioxide & oxygen are present in gaseous form whereas in aquatic ecosystem, these are available in dissolved state.

- ❖ Depending upon the quality and nature of water, the aquatic ecosystem are categorized into:
 - ❖ Freshwater Ecosystem and
 - ❖ Marine Ecosystem.

2.6.2 Freshwater Ecosystems

- ❖ Freshwater ecosystems cover 0.8% of the Earth's surface and contain 0.009% of its total water.
- ❖ Freshwater ecosystems contain 41% of the world's known fish species.
- ❖ Aquatic ecosystems perform many important environmental functions. For example:
 - They recycle nutrients, purify water, attenuate floods, recharge ground water and provide habitats for wildlife.
 - Aquatic ecosystems are also used for human recreation, and are very important to the tourism industry, especially in coastal region.
- ❖ There are three basic types of freshwater ecosystems:
 - ❑ Lentic: slow-moving water, including Pools, Ponds, and Lakes.
 - ❑ Lotic: rapidly-moving water, for example Streams and Rivers.
 - ❑ Wetlands: areas where the soil is saturated with water or inundated for at least part of the time

2.6.3 Lakes & pond Ecosystem

- ❖ A pond is a place where living organisms not only live but interact with biotic & abiotic components.
- ❖ Ponds are often exposed to tremendous anthropogenic pressure which significantly affects the system.
- ❖ Lakes are usually big standing freshwater bodies.
- ❖ They have a shallow water zone called Littoral zone; an open water zone where effective penetration of solar light takes place, called limnetic zone and a deep water zone where light penetration is negligible, called Profoundal zone.

I. Biotic components

1) Producer Organisms

- ❖ It includes submerged, free floating and amphibious macrophytes (like; Hydrilla, Utricularia, Wolfia, Azolla, Typha etc.) and minute floating and suspended lower phytoplanktons (like; Ulothrix, Spirogyra, Oedogonium etc.)

2) Consumer Organisms

- a) Primary consumers: These are zooplanktons (ciliates, flagellates, other protozoan, small crustaceans) and benthos.
- b) Secondary consumers: These are carnivores like insects and fishes feeding on herbivores
- c) Tertiary consumers: These are the large fishes feeding on small fishes.

3) Decomposers Micro – organisms like bacteria, fungi and actinomyctes.

II. Abiotic component

- ❖ These are the inorganic as well as organic substances present in the bottom soil or dissolved in water. In addition, to the minerals, some dead organic matter is also present.

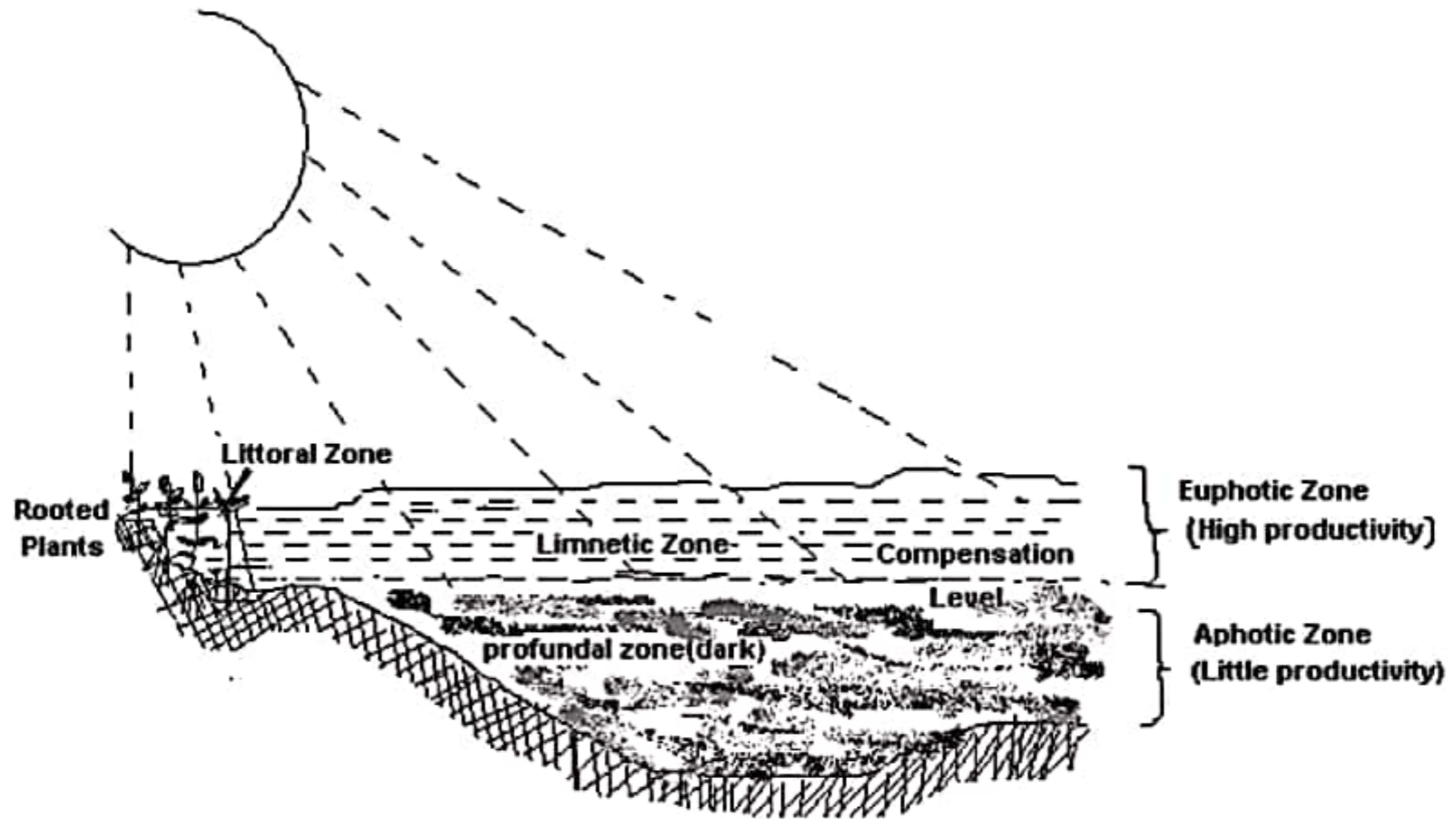


Fig.2.6.4 Zonation in a lake ecosystem

2.6.4 Marine or Ocean Ecosystem

- ❖ Marine ecosystems are among the Earth's aquatic ecosystems. They include: Oceans, Estuaries and Lagoons, Mangroves and Coral reefs, the Deep sea and the Sea floor.
- ❖ These are the gigantic reservoirs of water covering approximately 71% of the Earth's surface (an area of some 361 million square kilometers).
- ❖ These ecosystems are different from freshwater ecosystem mainly because of its salty water.
- ❖ The salt concentration in an open sea is usually 3.5% (35 parts per thousand (ppt)). Dominant ions are sodium & chloride.
- ❖ Average temperature of Marine ecosystem is 2-3 degree centigrade, devoid of light.

I. Biotic components

1) Producers It includes phytoplanktons (diatoms, dinoflagillates), large seaweeds (mainly algae like chlorophyceae, phaeophyceae & rhodophyceae; angiosperms like Ruppia, Zostera, posidonia), and mangrove vegetation (like Rhizophora, Carapa etc.)

2) Consumers

- Primary consumers: These are herbivores and feed directly on producers (Crustaceans, Mollusks, fish etc.)
- Secondary consumers: These are carnivorous fishes (Herring, Sahn and Mackerel)
- Tertiary consumers: These are top carnivorous fishes (Cod, Haddock, etc.)

3) Decomposers These are micro – organisms like bacteria, fungi

II. Abiotic components

- ❖ High Na, Ca, Mg and K salt concentration, variable dissolved oxygen content, light & temperature make a unique physiochemical conditions in marine water.



Fig.2.6.5 Ocean Ecosystem

2.7 ENERGY FLOW IN ECOSYSTEM

- ❖ All organisms must obtain a supply of energy and nutrients from their environment in order to survive.
- ❖ The transformations of energy in an ecosystem begin first with the input of energy from the sun.
- ❖ Because, it is the first step in the production of energy for living things, it is called “Primary production”.
- ❖ Photosynthesis -- Chemical reaction where green plants use water & carbon dioxide to store the sun's energy in glucose.
- ❖ ENERGY is stored in glucose.
- ❖ Glucose is stored as starch in plants
- ❖ The majority of autotrophs are photoautotrophs that harness the energy of the sun and pass some of this energy onto consumers through feeding pathways.
- ❖ The energy contained within producers and consumers is ultimately passed to the decomposers that are responsible for the constant recycling of nutrients.
- ❖ Thus, there is a one-way flow of energy through the biotic community and a cycling of nutrients between the biotic and abiotic components of the ecosystem
- ❖ Energy flow cannot occur in reverse direction.
- ❖ Starts from autotrophs (the producer level, i.e., first trophic level) to Heterotrophs including plant eaters or Herbivores (second trophic level) and so on.
- ❖ The amount of energy decreases with successive trophic levels.
- ❖ Only About 1% of energy from the sun is used by green plants & rest remains unutilized.
- ❖ Similarly, there is loss of energy in each trophic level.
- ❖ The transfer of food energy between the organisms in an ecosystem can be tracked by constructing food chains, food webs, pyramids of numbers, biomass and energy and energy flow diagrams.

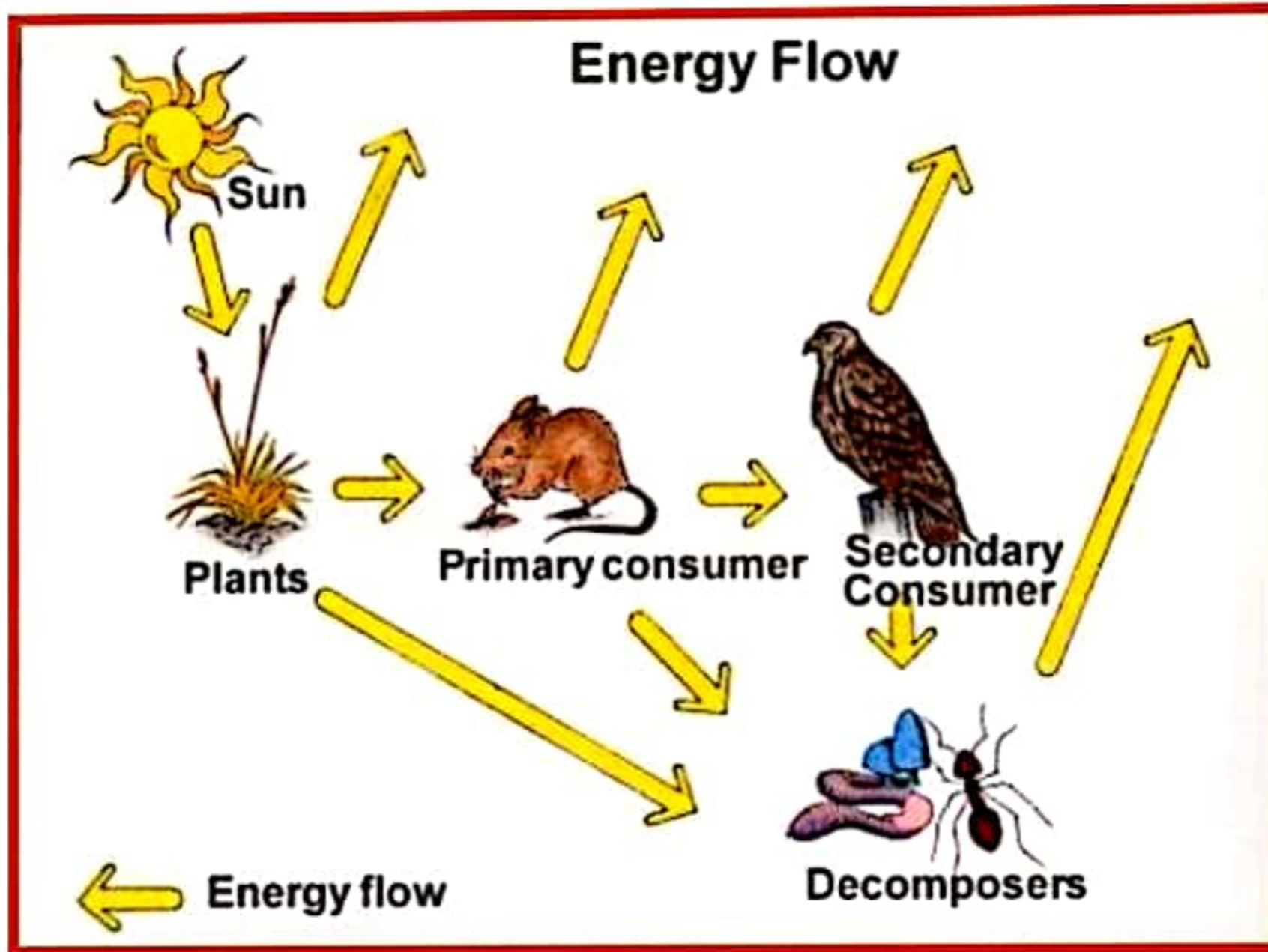


Fig.2.7 Energy Flow