ECOLOGICAL SUCCESSION

- Plant succession is the process where different groups of living organisms gradually replace each other at the same location until a stable community, known as a climax community, forms. This gradual change from one type of plant community to another in the same area is called plant succession.
- The study of plant succession began with King in 1685, and the term "succession" was coined by Hult in 1885.
- The initial biotic community that develops on a bare area is called the "pioneer community."
- The complete sequence of plant succession is referred to as a "sere." When ecological succession occurs in water, it's termed as Hydrarch, forming a hydrosere in ponds or lakes, or halosere in saline water. In dry areas, it's known as Xerarch, with succession on bare rocks termed as Lithosere and on sand dunes termed as Psammosere.
- Both Hydrarch and Xerarch successions lead to medium water conditions (mesic), neither too dry (xeric) nor too wet (hydric).
- The various intermediate stages of a plant succession are called "seral stages" or "seral communities." The final stage in a sere is known as the "climax" or "climatic climax."

TYPES OF SUCCESSION:

Depending upon the type of nudity of the area, it is of two types:

(i) Primary Succession (= Prisere):

- Primary succession refers to the process of plant growth on a barren area that has never previously supported vegetation. Examples include newly exposed sea floors, newly formed ponds, igneous rocks, sandy dunes, estuaries, and mud banks.

(ii) Secondary succession (= Subsere):

- This type of succession happens on land that was once covered by vegetation but was later destroyed by events like fire, deforestation, overgrazing, volcanic eruptions, or floods.

On the basis of replacement, it is of two types:

(i) Autogenic succession:

- When a plant community alters its environment, leading to the replacement of one community with another that is better suited to the changes, it's referred to as autogenic succession.

(ii) Allogenic succession:

- Sometimes, the replacement of one community by another is primarily driven by external conditions rather than by the organisms in the existing community. This type of succession is known as allogenic succession. In a state of perfect balance, both the non-living (abiotic) and living (biotic) parts of an area coexist harmoniously. The last community, dominated by specific species, remains unchanged by any other group of plants. This community is termed the climax community, and the stage is referred to as the climax stage.

Xerosere (Biotic Succession on Dry area):

- Various seral stage of lithosere are as following.

(i) Lichen stage:

- Lichen spores carried by the wind settle on damp rock surfaces after rain or heavy dew. They grow tiny roots called rhizoids for anchorage. Crustose lichens, such as Graphis and Rhizocarpon, are the first to appear and act as pioneer lichens. They release acids that gradually erode the rock surface. Over time, soil particles and organic matter accumulate around them, allowing larger lichens like foliose lichens, such as Dermatocarpon and Parmelia, to thrive. These larger lichens create more shade, deepen

crevices, and gather more soil and organic matter. Eventually, the foliose lichens shade out and outcompete the crustose lichens, causing them to die off.

(ii) Moss Stage:

- The changing conditions become suitable for the growth of resilient mosses like Tortula and Grimmia. These mosses produce more organic material and shade, which helps in displacing lichens.

(iii) Annual Grass Stage:

- Tough grasses and herbs that grow annually start to take over the surface covered with moss and rich in organic material. Examples include Aristida, poa, etc. Their roots break apart the rock, leading to more soil, organic material, and moisture.

(iv) Perennial grass stage:

- Perennial grasses, like Cymbopogon and Heteropogon, take the place of annual grasses as moisture and soil in the rock crevices increase over time.

(v) Shrub stage:

- A sufficient amount of soil develops during the grass stage, allowing the growth of woody shrubs. These shrubs, such as Fragaria, Rubus, Rhus, Capparis, and Zizyphus, migrate to the area from neighboring regions through seeds and other means. These plants thrive in direct sunlight and contribute to the increase in soil, organic material, and moisture levels.

(vi) Forest stage or climax forest:

- Various resilient trees that thrive in well-lit conditions begin to grow in the space occupied by shrubs. Over time, the environment becomes increasingly humid and shaded, allowing plants from the climax community to spread throughout the area. The specific type of climax community depends on the climate of the region. Therefore, it's also known as the climatic climax community. For example, it may become a rainforest in a moist tropical area, a coniferous forest or deciduous forest in a temperate area, or a grassland in regions with lower rainfall. As a result, the shrub and tree stages are no longer present.

Hydrosere (Biotic Succession In Water):

- The various seral stage of hydrosere are as follows.

(i) Plankton stage:

- Tiny plants such as diatoms, green algae, and blue-green algae, known as phytoplankton, are the first stage of growth in a hydrosere. These are eaten by certain tiny animals called zooplankton. As plankton die and break down, they create a thin layer of organic material at the bottom of the pond or lake.

(ii) Submerged stage:

- Hydrilla, Potamogeton, and Najas grow thickly at the bottom, which is rich in organic material.

(iii) Floating stage:

- Floating-leaved plants like Nymphaea and Nelumbo start growing in areas where the water becomes shallow. These plants have tuberous rhizomatous and creeping stems, with leaves floating on the water's surface. Additionally, some areas may have free-floating plants like Azolla, Wolffia, and Lemna. As these plants proliferate, the bottom of the water body rises, making the water shallower.

(iv) Reed Swamp stage:

- Plants that can thrive both in water and on land grow in shallow water. Examples include Phragmites, Typha, Scirpus, and Sagittaria. These plants produce a lot of organic material, contributing to the buildup of silt and humus at the bottom of the water body.

(v) Marsh Meadow stage:

- Plants like Carex, Sedge, Cyperus, Juncus, grasses such as Themeda and dichanthium, and herbs like Campanula, Caltha, and Polygonum start to grow on the newly formed shores.

(vi) Woodland stage:

- Shrubs and small trees with rhizomes that can withstand bright sunlight and waterlogged conditions begin to grow on the edge of the sedge or marsh meadow. Examples include Populus (cottonwood), Salix (willow), Cephalanthus, Alnus, Terminalia, and Cornus (Bogwood).

(vii) Forest stage or climax forest

- New trees, shrubs, and herbs begin to grow that are well-suited to the area's climate. The type of climax forest that develops depends on the climate—for example, a rainforest in a moist tropical area or a mixed forest of conifers and deciduous trees in a temperate area. In a mixed temperate forest, you may find broad-leaved trees like Oak, Elm, and Maple, as well as coniferous trees like Fir, Yew, and Spruce.