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Plant succession

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- Introduction.
 - Kinds of succession.
 - Hydrosere.
 - Xerosere.
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- Here I will discuss about what is **plant succession and its different types**.
 - Hydrosere in detail and in part-2—Xerosere in detail.

Plant succession

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- **Vegetation** is a dynamic and ever-changing complex.

Observation of the natural changes in vegetation long ago resulted in the concept of **succession**.

- Under natural conditions the vegetation occupying a given habitat is called **plant community**.

Since the community is not stable, it passes through many developmental stages from **simple to complex**.

Plant succession

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- The gradual replacement of one type of community by the other is referred to as plant succession.
- According to **E.P.Odum**, plant succession is an orderly process of community change in a unit area.
- According to **Salisbury**, Plant succession is a competitive drift in which at each phase, until the climax, the constituent species render the habitat more favourable to their successors than to themselves.
- **Clements** defined succession as a natural process by which the same locality becomes successively colonised by different groups of communities.

Plant succession

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- **KINDS OF SUCCESSION-** Depending upon the nature of bare area on which it develops Plant succession may be of two kinds-
- **1. Primary succession-** When the **succession starts** on the extreme **bare area** on which there was no previous existence of vegetation, it is called **primary succession or presere**.
- **2.Secondary succession-** This type of succession starts on the **secondary bare area** which was once occupied original vegetation but later became completely cleared of vegetation(naked, denuded or bare) by the process **denudation**. This denudation process is brought about by the destructive agencies, such as fire, cultivation, strong winds and rains. The succession progressing on such area is termed as **subsere**.

- These primary and secondary successions may be of following types—
- **A) Hydrosere**— The plant succession which starts in the aquatic environment is called **hydrarch**. A series of changes taking place in vegetation of hydrarch is called hydrosere.
- **B) Halosere**- It is special type of sere which begins on a **salty soil or in saline water**.
- **C) Xerosere**- When the vegetational succession develops on **xeric or dry habitats**, it is called xerarch or xerosere. Xerosere may be of two types- Psamosere and Lithosere.
- i) Psamosere- It refers to the vegetational succession that begins on **sandy soil**.

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- ii) Lithosere- It refers to the succession occurs on **rock surface**.
- D) Serule- It refers to the **miniature succession of microorganisms**, such as bacteria and different types of fungi **on the fallen logs of decaying wood, tree bark etc.**

All types of succession generally lead the plant communities towards the climax stage of **mesic community** (mesophytic or mixed mesophytic forests).

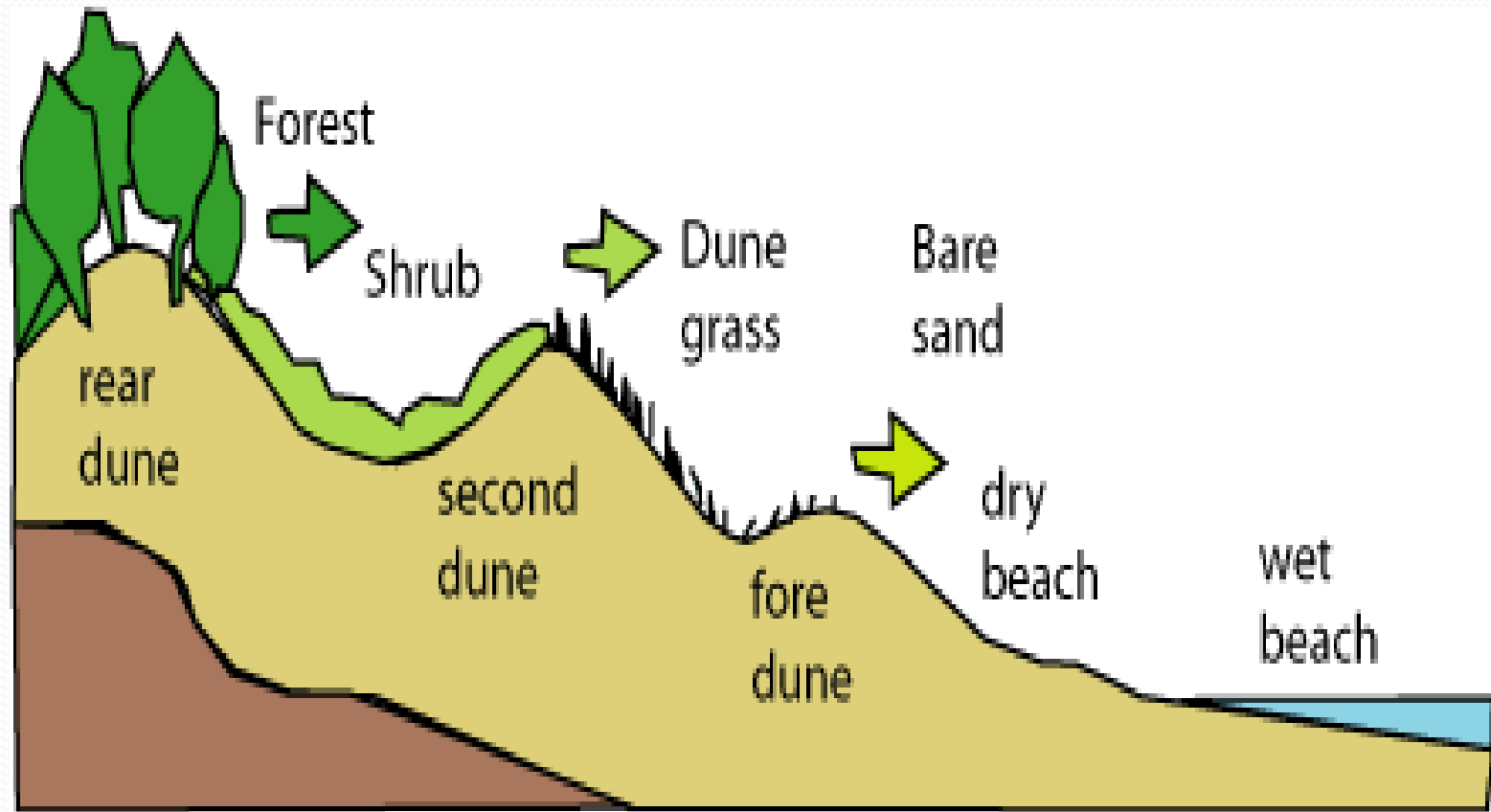
Halosere

- * Succession which starts in salt water.
- * A salt marsh



Psamosere

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Ray Chal

Psamosere

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Hydrosere

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- **It is succession occurring in the aquatic environment.** Such a type of succession does not necessarily lead the aquatic communities toward the development of land communities.
- If the body of water is large and very deep or very strong wave action and other powerful physical forces are at work, the succession results in a stable aquatic community in which any considerable further change is hardly recognizable.
- **Succession is recognizable only if the colonization of plant communities takes place in artificial small and shallow ponds, lakes, etc.** where wave action speeds up the process by allowing the erosion of soil towards edge regions. In this way, the filling process also speeds up quickly and consequently the body of water disappears within few years time.

- **1. Phytoplankton stage:** In the initial stage of succession algal spores are brought in the body of water. The simple forms of life like bacteria, algae and many other aquatic plants (phytoplankton) and animals (zooplankton) floating in water are the pioneer colonizers. All these organisms add large amount of organic matter and nutrients due to their various life activities and after their death, they settle at the bottom of pond to form a layer of mud.
- **2. Submerged stage:** The phytoplankton stage is followed by submerged plant stage. When a loose layer of mud is formed on the bottom of the pond, some rooted submerged hydrophytes begin to appear on the new substratum. The submerged aquatic vegetation develops in the regions of ponds or lakes where water depth is about 10 feet or more. The pioneers are **Elodia, Potamogeton, Myriophyllum, Ranunculus, Utricularia, Ceratophyllum, Vallisnena, Chara,** etc.

These submerged plants form tangled mass and have marked effects upon the habitat. When these plants die their remains are deposited at the bottom of the ponds or lakes. The eroded soil particles and other transported materials are also deposited at the bottom. This gradually raises the height of the ponds and lakes up. As this process of stratification progresses the body of water becomes more and more shallow, consequently the habitat becomes less suited for the submerged vegetation but more favourable for other plants.

- **3. Floating stage:** When the depth of water reaches about 4 to 8 feet, the submerged vegetation starts disappearing from its original place and then the floating plants make their appearance gradually in that area. In the beginning the submerged and floating plants grow intermingled but in the course of time the submerged plants are replaced completely. The most tolerant species in the area are able to reproduce and perpetuate. Their broad leaves floating on the water surface check the penetration of light to deeper layer of water.

This may be one of the main causes responsible for the death of submerged plants. Due to continuous interaction between plant communities and aquatic environment, the habitat becomes changed chemically as well as physically. More water and air borne soil and dead remains of plants are deposited at the bottom. Thus, the substratum rises up in vertical direction. Important floating plants that replace the submerged vegetation are **Nelumbm**, **Trapa**, **Pistia**, **Nymphaea**, and **Limnanthemum** etc.

- **4. Reed-swamp stage**-When the ponds and lakes become too shallow (water depth one to three feet) and the habitat is changed so much that it becomes less suited to the floating plants some other plants which are well adapted to new environment will then come in .Under these conditions, the floating plants start disappearing gradually and their places are occupied by amphibious plants which can live successfully in aquatic as well as aerial environment Important examples are **Bothrioclova**, **Typha**, **Phragmites (Reed)**, etc.

The foliage leaves of such plants are exposed much above the surface of water and roots are generally found either in mud or submerged in water. The foliage leaves form a cover over submerged and floating plants and thus they cut off light from the plants underneath them. Under such conditions neither submerged nor floating plants can survive. Further deposition of soil and plant debris at the bottom reduces the depth of water and makes the habitat less suitable for the pre-existing plants.

When the bottom reaches very close to the water surface many secondary species, such as those of **Polygonum**, **Sagittaria**, etc. make their appearance. Later, they also bring about such reactions by which the habitat becomes less suitable for most of the existing species, and consequently new successional step follows.

- **5. Sedge Marsh or Meadow Stage:** The filling process finally results in a marshy soil which may be too dry for the plants of pre-existing community. Now the plants well adapted to new habitat begin to appear in the pre-existing community in mixed state. Important plants that are well suited to marshy habitat are the members of **cyperaceae** and **gramineae**. The species of **sedge (Carex)** and **rushes (Juncus)**, species of **Themeda**, **Iris**, **Dichanthium**, **Eriophorum**, **Cymbopogon**, **Campanula**, **Mentha**, **Caltha**, **Gallium**, **Teucrium**, **Cicuta**, etc. are the first invaders of marshy area.

As these plants grow most luxuriantly in the marshes, they modify the habitats in several ways. They absorb and transpire a large quantity of water and also catch and accumulate plant debris and wind and water borne soil particles. Consequently a dry habitat results which may be totally unfit for the growth of normal hydrophytes. Gradually the mesophytes start appearing and after some time the sedge vegetation is totally replaced by them.

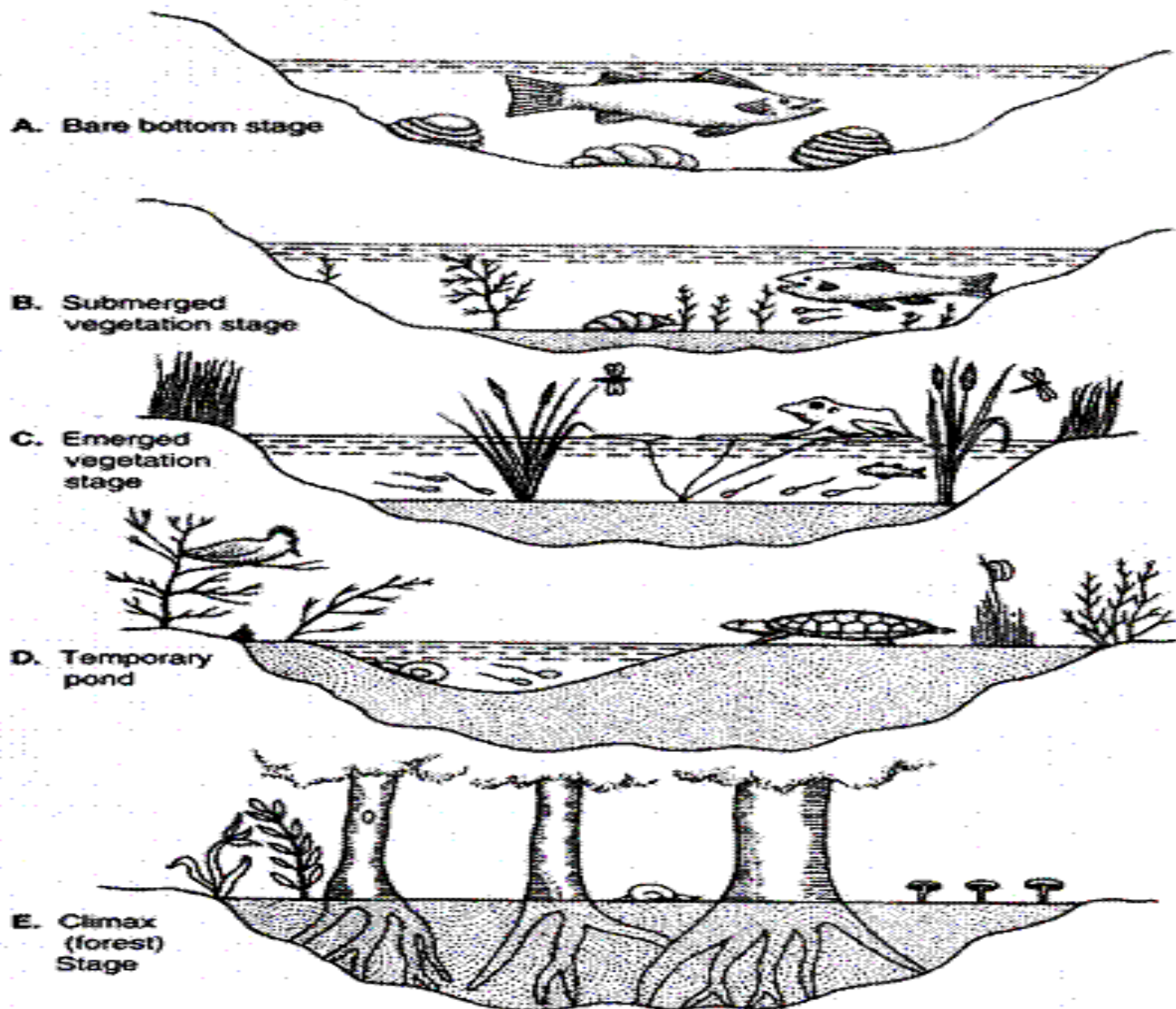


Fig. 7.2. Community succession in an open pond.

- **6. Woodland stage:** In the beginning some shrubs and later medium sized trees form open vegetation or woodland. These plants produce more shade and absorb and transpire large quantity of water. Thus, they render the habitat more dry. Shade loving herbs may also grow under the trees and shrubs. The prominent plants of woodland community are **species of Buteazon, Acacia, Cassia, Terminalia, Salix, Cephalanthus**, etc.
- **7. Climax forest:** After a very long time the hydrosere may lead to the development of climax vegetation. As the level of soil is raised much above the water level by progressive accumulation of humus and soil particles, the habitat becomes more dry and certainly well aerated. In such a habitat, well adapted self-maintaining and self-reproducing, nearly stable and uniform plant community consisting mostly of woody trees develops in the form of mesophytic forest.

Hydrosere

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- In the climax forest, all types of plants are met with. **Herbs, shrubs, mosses and shade loving plants** represent their own communities. **Trees are dominant and they have control over the entire vegetation.** Bacteria, fungi, and other micro-organisms are more frequently found in **the climax vegetation.** They react upon the habitat and make the soil rich in the organic materials. At the climax stage, a complete harmony develops between plant community and habitat.
- **This succession from open water to climax woodland is likely to take at least two hundred years (probably much longer).**