5. **Stabilization or climax**:-The final terminal community become more or less stabilized for a longer period of time is climax community.

- **Types of communities**

1. **Pioneer community :-** The first community to inhibit an area is called Pioneer community
2. **Climax community: -** The last and stable community in an area is called Climax community.

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- ❖ **Pro-climax** is referred to that community which is more or less stable resembling the climax community in some respects**.**

- ❖ **Sub-climax** is a stage or community in an ecological succession immediately preceding a climax community.
- ❖ **Post-climax**, is the new climax formed.
- ❖ **There are three different theories regarding the concept of climax.**

- ➢ **Monoclimax theory-** Proposed by **Fredrick Clements in 1916.** According to this theory there is only one climax community in a particular climatic region.

- ➢ **Polyclimax theory- -** Proposed by **Tansley in 1935**. According to this theory a number of different climax communities may be present in a particular climatic region.

- ➢ **Climax pattern hypothesis-** Proposed by **R.H. Whittaker in 1953.** According to this hypothesis there is,one big community that changes according to soil, slope and other habitat factors.

3. **Seral Community / Transitional Community**

- ❖ A seral community is an intermediate stage of ecological succession advancing towards the climax community.
- ❖ A seral community is replaced by the subsequent community.
- ❖ It consists of simple food webs and food chains.
- ❖ The entire series of communities is called **Sere.**
- ❖ Individual transitional communities are called **Sere stage**

Types of seres :-

Types of Seres	Explanation
Hydrosere	Succession in aquatic habitat.
Xerosere	Succession in dry habitat.
Lithosere	Succession on a bare rock surface.
Psammosere	Succession initiating on sandy areas.
Halosere	Succession starting in saline soil or water.
Senile	Succession of microorganism on dead matter.
Eosere	Development of vegetation in an era.

HYDROSERE

- It is succession occurring in the aquatic environment.
- 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 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.

Various stages of succession in a lake or pond are:-

1. Plankton stage:

- The pioneer community starts with germination of spores which reach in water through wind or animals.
- Phytoplanktons =>Diatoms, phytoflagellates, Cynobacteris, Green algal cells.
- Zooplanktons are formed due to phytoplanktons.
- Death and dcomposition of organisms add large amount of organic matter and nutrients.

2. Submerged 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, Hydrilla, Elodea,*

Potamogeton, Myriophyllum, Ranunculus, Utricularia, Ceratophyllum, Vallisnena, Chara etc.

3. Floating stage:

- When the depth of water reaches about 4 to 8 feet, the submerged vegetation starts disappearing and then the floating plants make their appearance gradually in that area.
- Their broad leaves floating on the water surface check the penetration of light to deeper layer of water.
- Due to continuous interaction between plant communities and aquatic environment, the habitat becomes changed chemically as well as physically.
- The substratum rises up in vertical direction. Important floating plants that replace the submerged vegetation *are Nelumbmm, Trapa, Pistia, Nymphaea, Wolffia, Lemna, Aponogeton and Limnanthemum* etc.

4. Reed swamp stages:

- 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, Scripus, Sagittaria* 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.

5. Sedge Meadow stage:

- **T**he filling process finally results in a marshy soil which may be too dry for the plants of pre-existing community.
- The members of cyperaceae and grammeae appeared. The species of *Carex ,Juncus*, *Themeda, Iris, Dichanthium, Eriophorum, Cymbopogon, Campanula, Mentha, Caltha, Gallium, Teucrium, polygonum, Eleocharis,Cicuta,* etc.

6. Woodland stage:

- **I**n 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. The prominent plants of woodland community are species of *Buteazon,Cornus,Populus, Almus, Acacia, Cassia, Terminalia, Salix, Cephalanthus*, etc.

7. Climax forest:

- After a very long time the hydrosere may lead to the development of climax vegetation, well adapted self-maintaining and self-reproducing.
- In the climax forest, all types of plants are present 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.

Succession of plant is followed by succession of animal

- Fish-> Insect, Prawn, Snail-> Birds-> Land animals

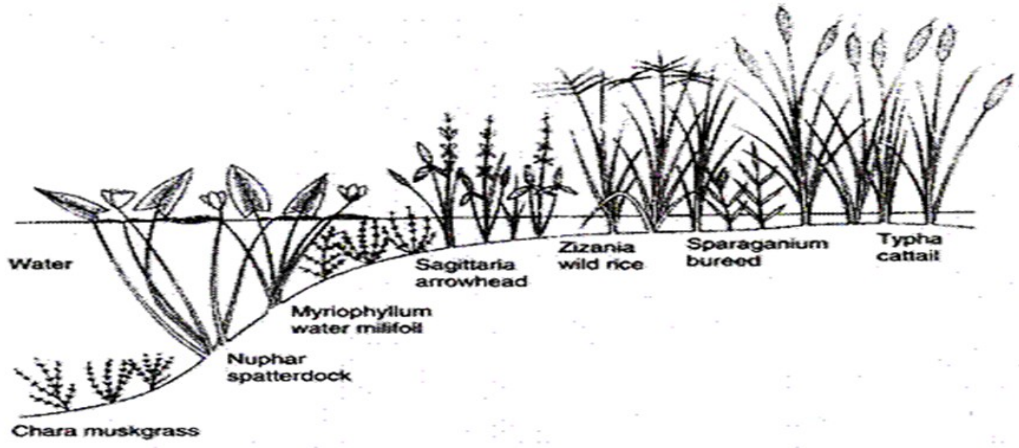

Figure3:- Community succession along a pod and along river banks.

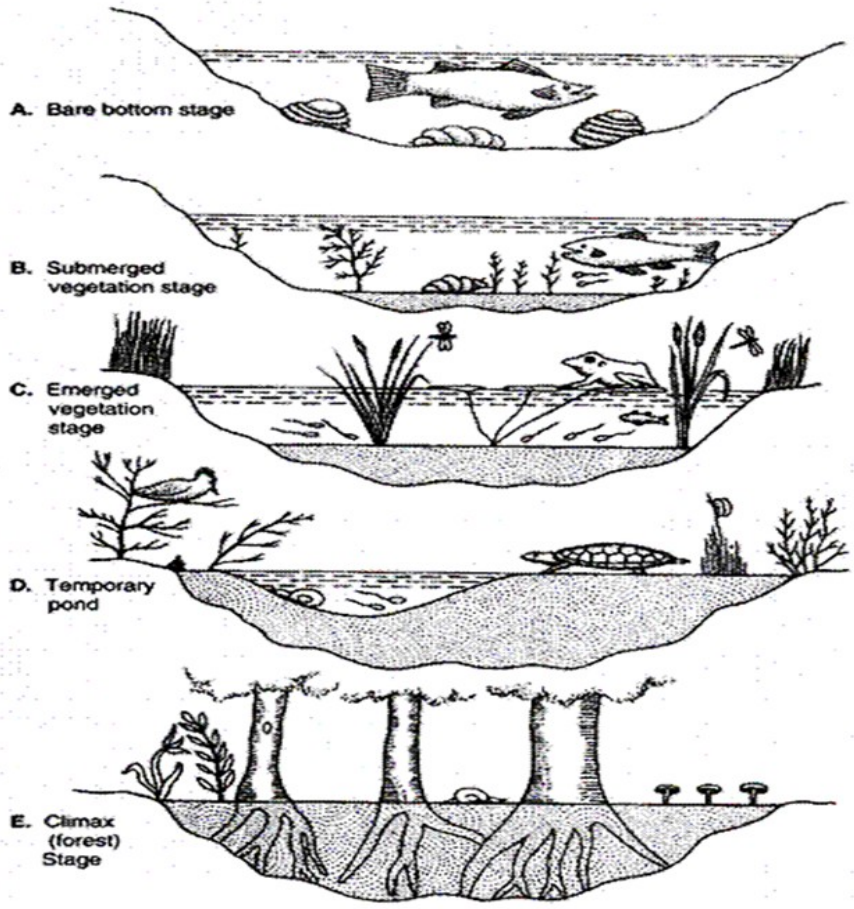

Figure4:- Community succession in an open pond

XEROSERE

- Xerosere involves the ecological succession on bare rock surface.
- The rocky habitat shows many extreme xeric conditions like very high surface temperature, deficiency of water and absence of organic matter.

The various stages of successions on bare area are:-

1. Crustose Lichen Stage:

- The pioneer colonisers on the bare area are crustose lichens which occur on the rock surface in the form of membranous crusts.
- Important crustose lichens are *Rhizocarpon, Rhinodina, Graphis, Lacidea, Lacanora* etc. Their spongy nature enables them absorb excess amount of water and minerals.
- These lichens migrate through their spores and soridia and their migration is facilitated by wind and water.
- The lichens secrete carbonic acid in excess.

2. Foliose Lichen Stage:

- After accumulation of little soil and humus, the rock surface now becomes covered with xeric foliose and fructicose lichens, like *Dermatocarpon, Parmellia, Umbilicaria*, etc.
- These lichens have delicate leaf like thalli which cover the rocks.
- When the supply of light is cut off the crustose lichens begin to die.
- Foliose lichens absorb and accumulate water and minerals and check evaporation of surface water.
- They also secrete carbonic acid which further pulverizes or loosens the rocks into small particles.

3. Moss Stage:

- The existing foliose lichens start disappearing in that area xerophytic mosses like *Polytrichum, Torulla, Grimmia* etc. grow in the crevices and the depressions of the rocks and become dominant.
- The xerophytic mosses develop rhizoids which penetrate deep into the rocky soil.
- The decaying older parts of mosses form a thick mat over the rock surface, which increases the water holding capacity of soil.

4. Herbs Stage:

- The herbaceous vegetation, mainly consists of annual herbs (*Eleusine, Aristida*) and perennial herbs (*Cymbopogon*, *Heteropogon*), develops very quickly.

- Increased moisture content of the soil favours the growth of herbs. The roots of these plants penetrate down almost to the level of unpulverized rock.

- Decaying leaves stems, roots and other parts of the plants the form of humus and increase the water holding capacity of the soil **.**

5. Shrub Stage:

- Xerophytic shrubs gradually occupy the area.
- Roots of shrubs also reach the surface of unpulverized rocks and corrode sufficient quantity of rock particles which make the soil more massive.
- Decaying leaves, twigs and roots of these shrubs also enrich the soil with humus. Some important shrubs are *Rhus, Phytocarpus, Zizyphus, Caparis.*

6. Forest Stage:

- The xerophytic trees invade the area which has been occupied previously by shrubs.
- The first trees growing in such areas are dwarf and widely spaced. Then mesophytic trees grow densely and become dominant.
- In the shade of mesophytic trees some shade loving herbs and shrubs which are well adapted to humid atmosphere also appear and they form their own communities.
- The climax stage established which remains unchanged unless some major environmental changes disturb it.

Succession of plant is followed by succession of animal

Spider and grasshopper -> Ants, Termites, Earthworm, Snails, Centipede, Millipede, Birds, and squirrels