

Ecological Succession (Hydrosere)

ECOLOGICAL SUCCESSION IN A COMMUNITY

Hult (1885), while studying communities of Southern Sweden, is said to have used for the first time the term 'Succession.' However, the authentic studies on succession were started in America by **Cowles** (1899) and **Clements** (1907).

Definition—An orderly sequence of different communities over a period of time in some particular area.

SERE

Particular example of plant succession. Seres originating in water are referred to as **Hydroseres**; those arising under dry condition as **Xeroseres**, of which those developing upon exposed rock surfaces are known as **Lithoseres**. The term sere is often used to describe the sequence of plant communities.

The progressive development in an ecological succession can be enumerated as below—

(a) There is usually progressive development of the soil with increasing depth, increasing organic content and increasing differentiations of layers towards mature soil of the final community.

(b) The origin, height, massiveness and differentiation into strata of the plant communities increases.

(c) As density of above ground plants increases, the microclimate within the community is increasingly determined by characteristics of community itself.

(d) Species diversity increases from simple to complex communities of early succession to the richer communities of mature or of late succession.

(e) Population and density of pioneer stages rise and fall and replace one another with the time gradient due to interspecific and intraspecific competition for space. The rate of this replacement

slows through the course of succession as smaller and ephemeral (short-lived) pioneer species are replaced by larger and longer-lived ones.

(f) As a result, the relative stability of the communities increases and the final community which is usually stable called 'Climax' stage is termed.

Basic types of succession—

- (1) Primary succession
- (2) Secondary succession
- (3) Autogenic succession
- (4) Allogenic succession
- (5) Autotrophic succession, and
- (6) Heterotrophic succession

PATTERNS OF SUCCESSION

Depending upon the types of habitat and varying amount of moisture, the successions are designated as below—

HYDROSERE

Hydrosere, originating in a pond, starts with colonisation of some phytoplanktons which forms the pioneer community and finally terminates into a forest or climax community. The various stages of hydrosere can be enumerated as below—

(1) **Phytoplankton stage**—They constitute the pioneer community. Some blue green algae, green algae, diatoms and bacteria are the first organisms to colonise the primitive medium of the pond. The soils are very much reduced with a pH value of not more than 5.00. They multiply and grow for sometime.

(2) **Rooted submerged stage**—As a result of death and decay and composition of phytoplanktons and their mixing with the silt, brought from the surrounding land by rain waters and by wave action of pond water, these develop a soft mud of the bottom of pond. This new habitat which tends

to be a bit shallower and where light penetration may now occur easily now becomes suitable for the growth of root submerged hydrophytes like—*Myriophyllum*, *Elodea*, *Hydrilla*, *Potamogeton*, *Vallisneria* and *Ultricularia* etc. These plants bring about further build up of the substratum as a result of their death and decay. This habitat now replaces these plants giving way to another type of plants which are of floating-leaved types.

(3) **Rooted floating stage**—By now the water depth is almost 2–6 feet. These plants colonise the habitat with their rhizomes. They all are rooted hydrophytes with their large leaves floating on the water surface. Example—*Nelumbo*, *Nymphaea*, *Limnathemum*, *Aponogeton*, *Monochoria*, *Trapa* etc. And some free floating species as *Azolla*, *Lemna*, *Wolffia*, *Pistia*, *Spirodella*, *Salvinia* also become associated with the rooted plants. The water level by now becomes very much decreased, making the pond much shallower. The decomposing organic matter formed due to death of these plants brings about further build up of the

substratum. Thus, floating species sooner or later disappear from the area.

(4) **Reed swamp stage**—This stage is also known as amphibians stage as the plants of community are rooted but most parts of their shoots (assimilatory organs) remain exposed to air. Species of *Scirpus*, *Typha*, *Sagittaria* and *Phragmites* etc. are chief plants of this stage. They have well developed rhizomes and form a very dense vegetation. The water level is by now very much reduced and finally becomes unsuitable for the growth of these amphibians species.

(5) **Sedge-meadow stage**—Due to successive decrease in water level and further changes in the substratum species of Cyperaceae and Gramineae such as *Carex*, *Juncus*, *Cyperus* and *Eleocharis* colonise the area. They form a mat-like vegetation towards the centre of the pond with the help of their much branched rhizomatous systems. As a result of high rates of transpiration, there is much rapid loss of water and sooner or latter the mud is now exposed to air. As a result of which nutrients

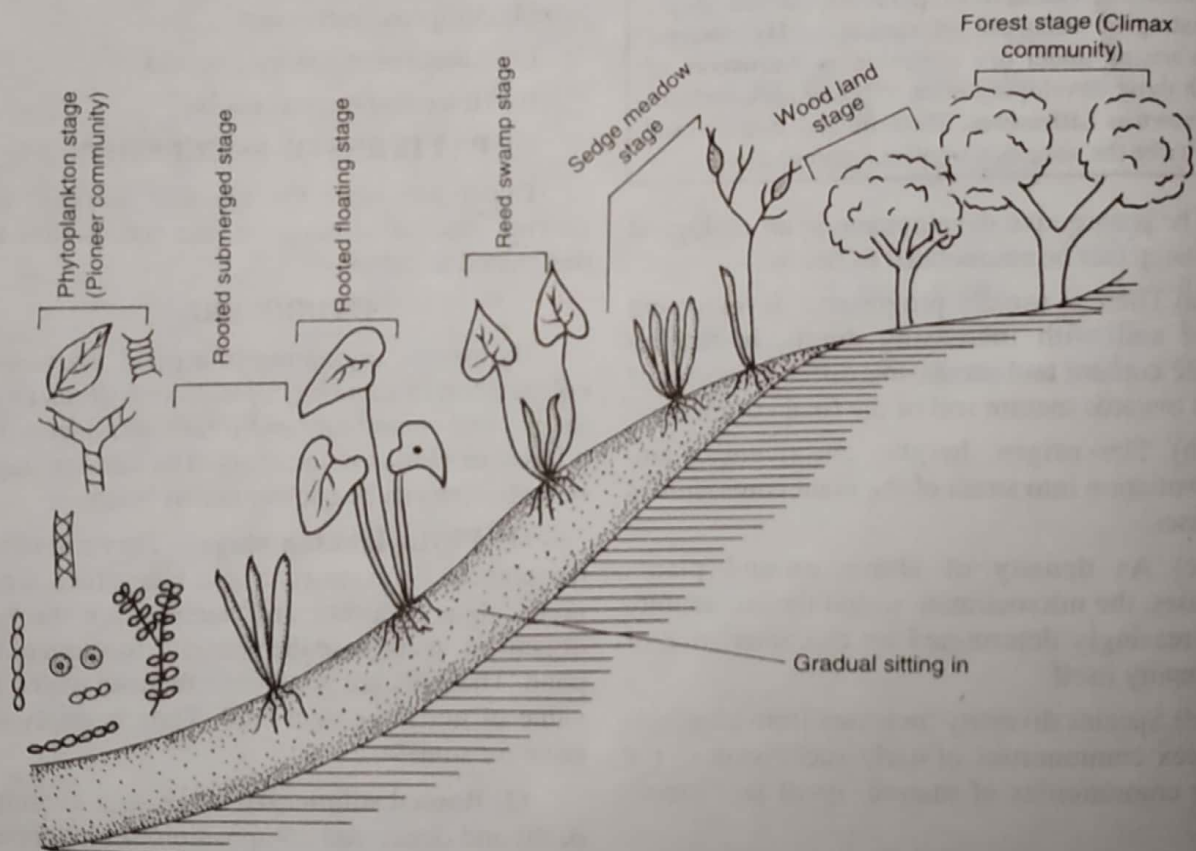


Fig. : Different plant communities appearing at different stages of hydrosere in a pond.

Dr. Anita Kumari

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like ammonia, sulphides etc. become oxidised to nitrates and sulphates. This mesic conditions approach the area and marshy vegetation disappears gradually.

(6) **Wood land stage**—By the time of disappearance of marshy vegetation, soil becomes drier for most time of the year. This area is now invaded by terrestrial plants like *Salix*, *Cornus*, *Populus*, *Alnus*. By this time there is much accumulation of humus with rich flora of microorganisms. Thus mineralization of the soil favours the arrival of new tree species in the area.

(7) **Forest stage**—This is the climax community of hydrosere succession. The wood land community is rapidly invaded by several trees. In tropical climates with heavy rainfall, there develop tropical rain forests, whereas in temperate regions, there develops mixed forest of *Ulmus*, *Acer* and *Quercus*. In regions of moderate rain fall, there develop tropical deciduous forests or monsoon forests.

Thus in hydrosere, stage first is the pioneer community and stage seven is the climax community and stages 2 to 6 as seral communities or stages.