

Ecological Succession

- The process by which communities of plant and animal species in an area are **replaced or changed** into another over a period of time is known as **ecological succession**.
- Succession is a universal process of **directional change in vegetation**, on an ecological time scale.
- Succession occurs due to large scale changes or destruction (natural or manmade).
- The process involves a progressive series of changes with one community replacing another until a **stable, mature, climax community** develops.

According to Kerbs (1994), succession is the universal process of directional change in vegetation and can be recognized by the progressive change in the species composition of the community. In his words, the development of the community by the action of vegetation on the environment leading to the development of new species is called succession.

It is important to emphasize that the phenomenon of succession is “community controlled”. Each group of organisms changes its physical substrate and the microclimate (e.g., local conditions of light, temperature), thereby making conditions favourable for another group of organisms. In other words, we say that each species alters the environment in such a way that it can no longer grow so successfully as others.

When the site has been fully modified by biological processes, an ecological steady state is developed. The species involved, time taken and the degree of stability achieved depend on the topography or climate of the area, and other physical factors. But the process of succession itself is biological, not physical. Thus, the physical environment determines the pattern of succession but does not cause it.

Ecological succession may be defined in terms of the following three parameters:

- (a) It is the orderly process of community changes, which are directional and therefore, predictable,
- (b) It results from the modification of the physical environment by the community, and

(c) It culminates in the establishment of as stable an ecosystem as is biologically possible on the given site.

CAUSES OF ECOLOGICAL SUCCESSION

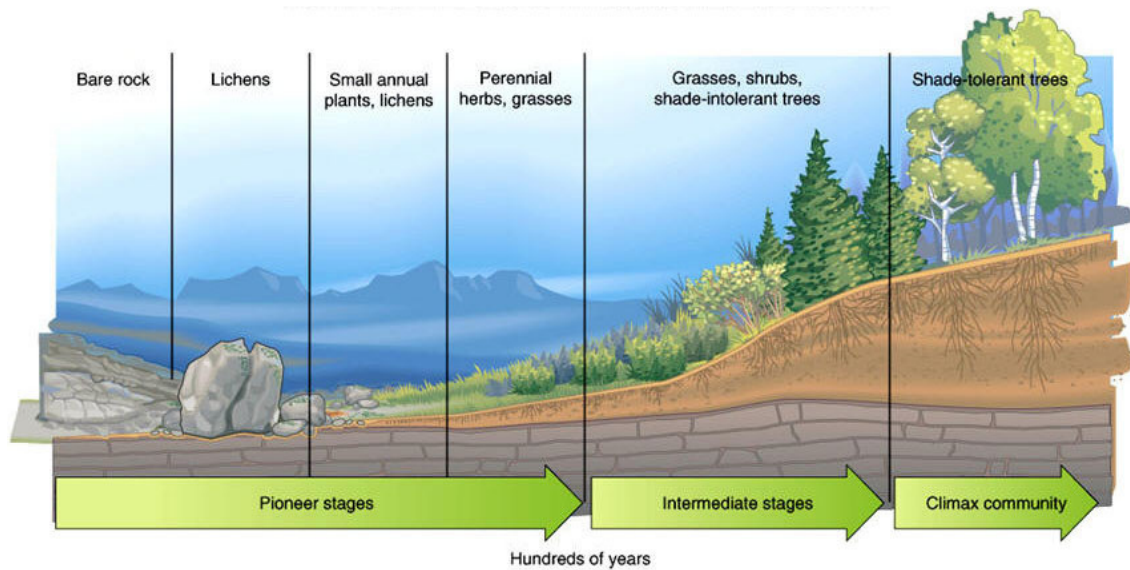
(i) Initial causes. Initial or initiating causes are climatic as well as biotic. Climatic causes include factors, such as, wind, fire, erosion and deposits, etc. ; while the biotic causes include the various activities of organisms. These causes are responsible in the production of bare areas or in the destruction of the existing population in an area.

(ii) Ecesis causes. Ecesis or continuing causes are the processes that include migration, ecesis, aggregation, competition, reaction, and so on which cause successive waves of populations as a result of changes, mainly in the edaphic features of the area.

(iii) Stabilising causes. These are responsible for the stabilization of the community. According to Clements, “climate of the area is the chief cause of stabilization, other factors are of secondary value.”

STAGES

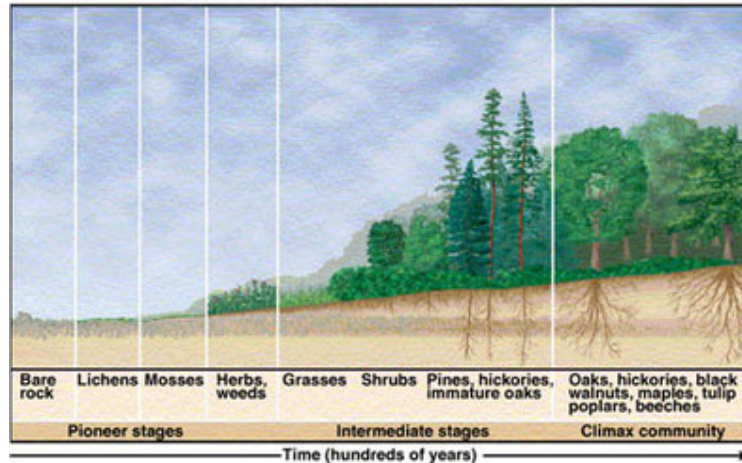
- The first plant to colonize an area is called the **pioneer community**.
- The final stage of succession is called the **climax community**.
- **A climax community is stable, mature, more complex and long-lasting.**
- The stage leading to the climax community is called **successional stages or seres**.
- Each transitional community that is formed and replaced during succession is called a **stage in succession or a seral community**.
- Succession is characterized by the following: **increased productivity, the shift of nutrients from the reservoirs, increased diversity of organisms, and a gradual increase in the complexity of food webs.**
- **Succession would occur faster in area existing in the middle of the large continent.** This is because here seeds of plants belonging to the different **seres** would reach much faster.



Primary Succession

- Primary succession takes place on **where no community has existed previously**.
- Such areas include rock outcrops, newly formed deltas and sand dunes, emerging volcano islands and lava flows, glacial moraines (muddy area exposed by a retreating glacier), etc.
- In primary succession on a terrestrial site, the new site is first colonised by a few hardy **pioneer species** that are often **microbes, lichens and mosses**.
- The pioneers over a few generations alter the habitat conditions by their growth and development.
- The pioneers through their death and decay leave patches of organic matter in which small animals can live.

Primary succession



- The organic matter produced by these pioneer species produce organic acids during decomposition that dissolve and etch the substratum releasing nutrients to the substratum.
- Organic debris accumulates in pockets and crevices, providing soil in which seeds can become lodged and grow.
- The new conditions may be conducive to the establishment of additional organisms that may subsequently arrive at the site.
- As the community of organisms continues to develop, it becomes **more diverse, and competition increases**, but at the same time, **new niche opportunities develop**.
- The pioneer species disappear as the habitat conditions change and **invasion of new species** progresses, leading to the replacement of the preceding community.

Secondary Succession

- Secondary succession is the sequential development of biotic communities **after the complete or partial destruction of the existing community**.
- A mature or intermediate community may be destroyed by natural events such as floods, droughts, fires, or storms or by human interventions such as deforestation, agriculture, overgrazing, etc.
- This abandoned land is first invaded by hardy species of grasses that can survive in bare, sun-baked soil.
- These grasses may be soon joined by tall grasses and herbaceous plants. These dominate the **ecosystem** for some years along with mice, rabbits, insects and seed-eating birds.

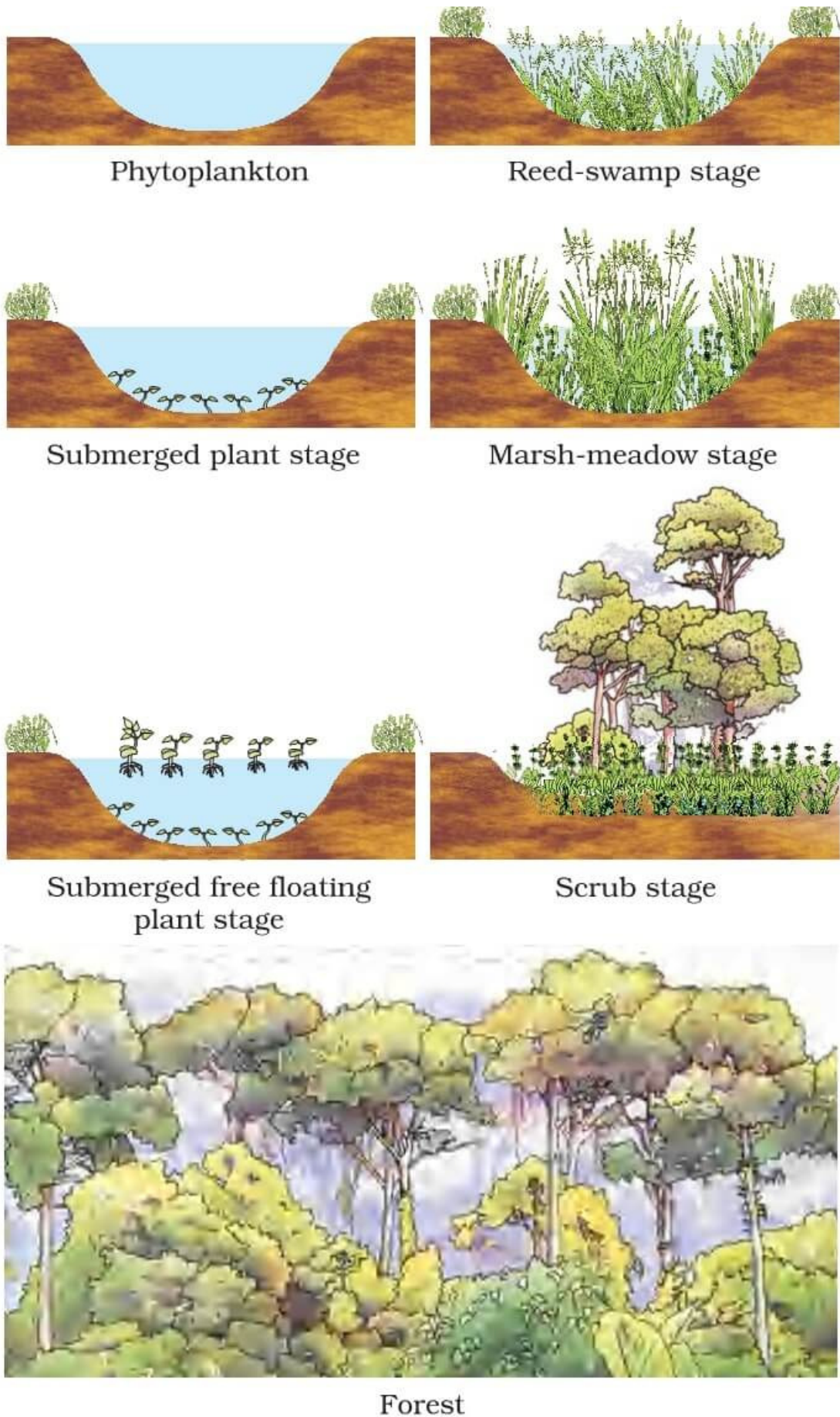


Figure 14.5 Diagrammatic representation of primary succession

Autogenic and Allogenic Succession

- When succession is brought about by living inhabitants of that community itself, the process is called **autogenic succession**, while change brought about by outside forces is known as **allogenic succession**.
- Autogenic succession is driven by the biotic components of an ecosystem.
- Allogenic succession is driven by the abiotic components (fire, flood) of the ecosystem.

Autotrophic and Heterotrophic succession

- Succession in which, initially the green plants are much greater in quantity is known as autotrophic succession; and the ones in which the heterotrophs are greater in quantity is known as heterotrophic succession.

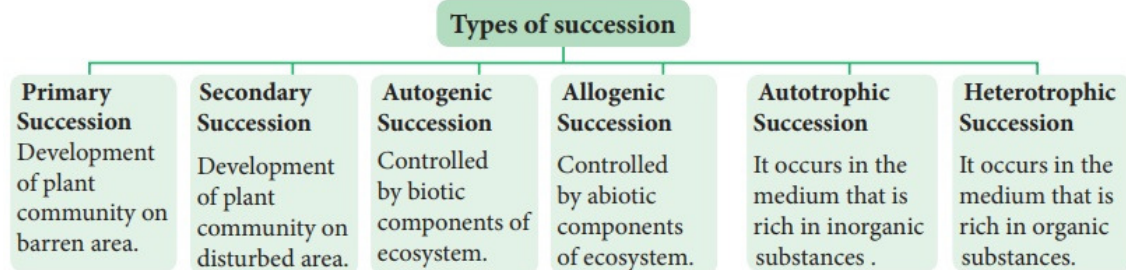


Figure 7.19: Types of succession

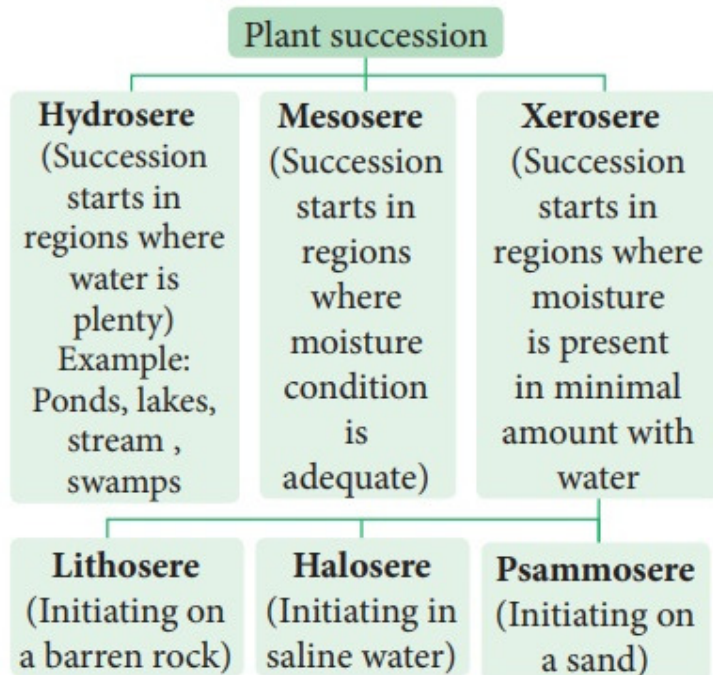


Figure 7.20: Classification of plant succession

