

ECOLOGICAL SUCCESSION

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PREFACE

It is my great pleasure to present the first formal content on this topic. This has been prepared according to the course outline and will be useful primarily for the undergraduate readers though it may also serve as useful introductory text to those preparing for their master's degree. I have tried my level best not to fall into the lapses of matter but still error have the habit of seeking in inadvertently .As merciless criticism and vigorous use of the content certainly improve it, I shall very much appreciate a flow of comments, objections , suggestions from readers.

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1. ECOLOGICAL SUCCESSION

1.1 DEFINITION

Ecological succession is a process through which ecosystems tend to change over a period of time.

1.2 CHARACTERISTICS OF ECOLOGICAL SUCCESSION

- It is a steady and gradual change.
- The changes are directional and take place as a function of time.
- It is a predictable change.
- It is an inevitable process of nature.
- It occurs systematically.
- It involves variations in species structure and diversity.
- Succession operates in a stabilized ecosystem.
- It aims at reaching the equilibrium in the ecological system.

1.3 SOME IMPORTANT TERMS USED IN ECOLOGICAL SUCCESSION

a).Bare area – Habitat without any vegetation where the succession starts.

It is of 3 types

a).Wet or Hydric

b).Dry or xeric

c).Intermediate or mesic

b).Pioneer Community - It is the community through which succession starts in a bare area.

c).**Climax Community** -Succession ends with a community in which the species perpetuate themselves through reproduction till the climate remains the same.

d).**Sere** - The sequence of communities that undergo changes is called sere.

e).**Seral communities** - Each community that changes is called a seral stage or seral community.

1.4 TYPES OF ECOLOGICAL SUCCESSION

Some of the major types of ecological succession are as follows:

(a) Primary succession:

- It starts in a barren area, never having vegetation of any type where no living organism ever existed.
- Some bare primary areas are the newly exposed seafloor, igneous rocks, sand dunes, new cooled lava sediments, newly submerged areas, etc.
- As there is no soil, and the conditions are too hostile to sustain life thus, the succession is slower.
- It usually takes several hundred to a thousand years for establishing a biotic community.

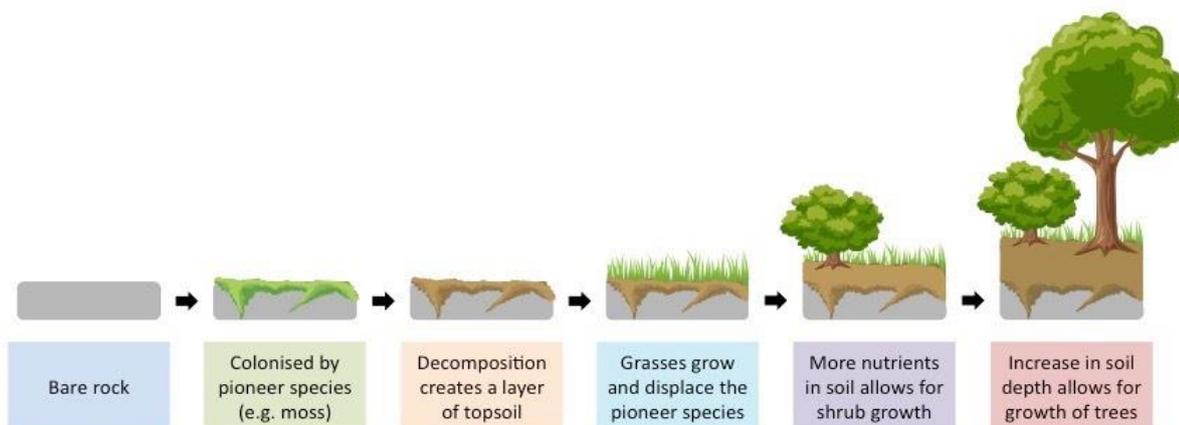


Fig.- Primary Succession

(b) Secondary succession:

- It starts in areas that somehow lost all the living organisms that existed there.
- Since some soil or sediment is present, succession is faster.
- Destruction of the previous community can occur due to forest fire, flooded lands, landslides, earthquakes, drought, overgrazed areas, storms, etc.
- It takes 50–100 years to complete a grassland and 100–200 years to develop a forest

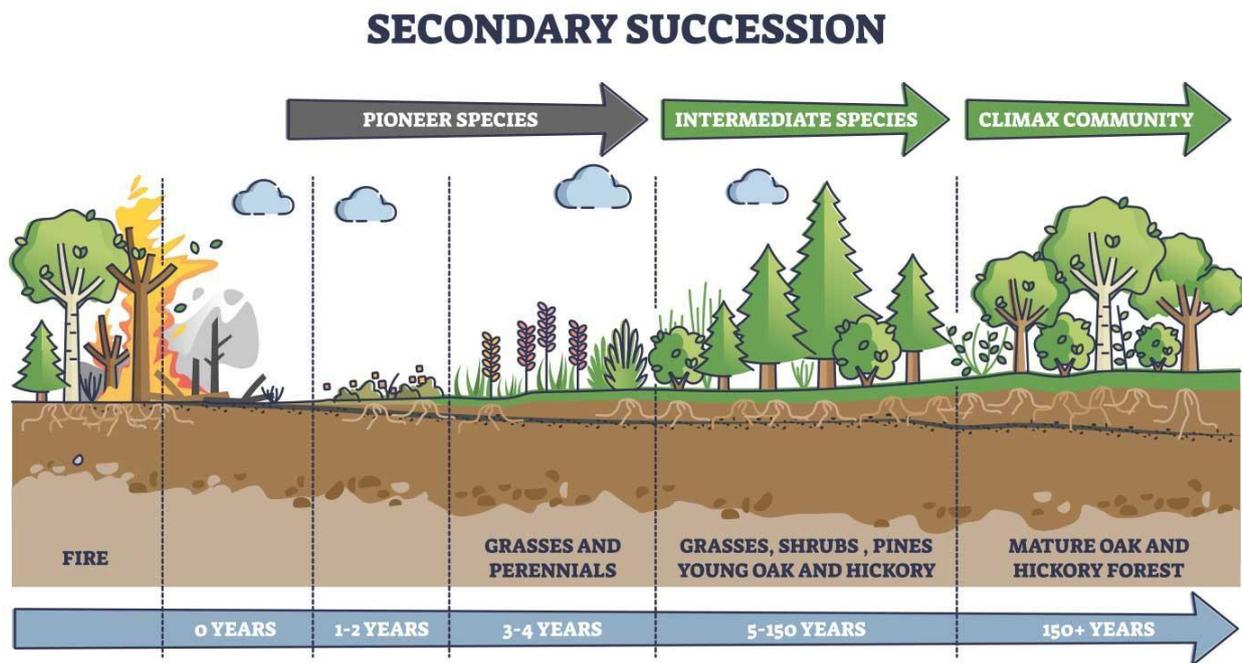
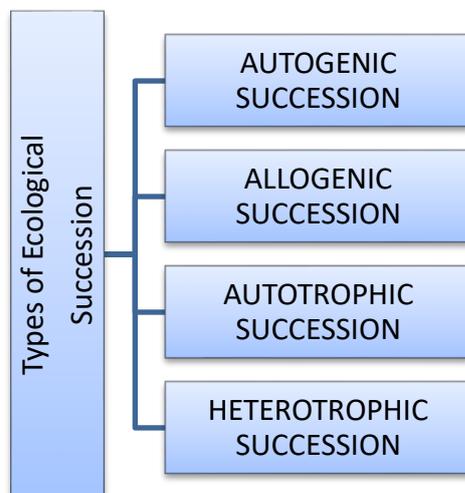


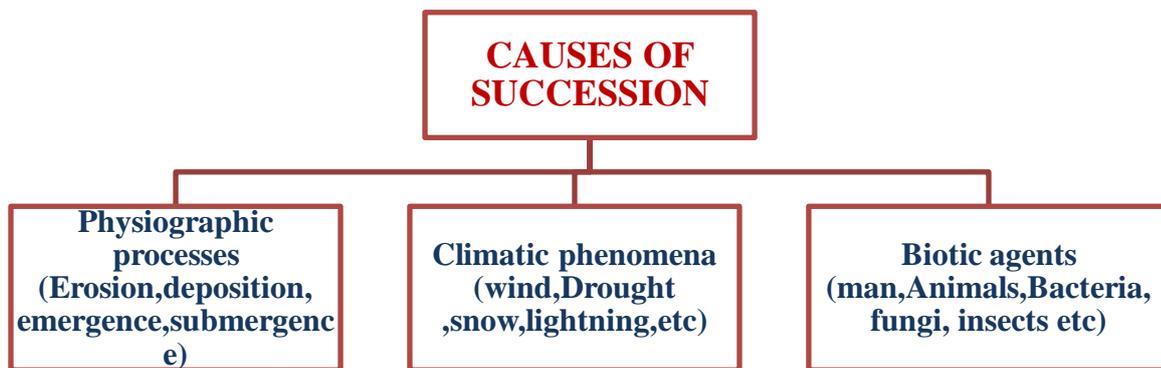
Fig.- Secondary succession

Other types of ecological succession are as follows



1.5 CAUSES OF ECOLOGICAL SUCCESSION

Plant succession is brought about by a number of factors.



1.6 STAGES OF ECOLOGICAL SUCCESSION

Clements (1916) has discussed the process of ecological succession. This process involves the following stages, which are as follows:

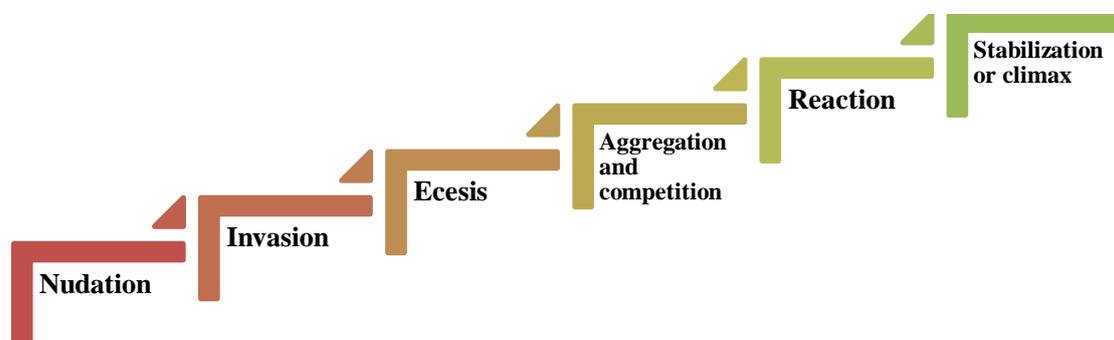


Fig.- Stages of Succession

1. Nudation

- Nudation is the development of a bare area.
- It is the first step in ecological succession.
- The causes of nudation are topographic, climatic or biotic.

2. Invasion

- Invasion is the successful establishment of a species in a bare area.
- It is the second step in succession.

3. Ecesis

- The process by which the migrants establish themselves in the new place is known as ecesis.
- It involves three processes- germination, growth and reproduction.

4. Aggregation and competition

- After ecesis the individuals of species increase their numbers and they stay close to each other. This process is called aggregation.
- This aggregation of individuals in an area leads to interspecific and intraspecific competition.
- competition is usually for: water, nutrients, heat, light ,carbon dioxide, oxygen, space etc.

5. Reaction

- It is the most important stage in ecological succession.
- It is the modification of the environment through the influence of living organism present on it.

6. Stabilization or climax

- It is the last stage in the ecological succession.
- The final or the terminal community becomes more or less stabilized for longer period of time.
- This final community is called climax community or climax stage.
- Climax community is determined by the climate of that region.

1.7 A TABULAR MODEL FOR STUDY OF ECOLOGICAL CHANGES DURING SUCCESSION

Ecosystem characteristics	Trend in succession: Early stage to climax
Species composition	Changes rapidly at first, then more gradually
No. of species of autotrophs	Increases in primary and often early in secondary succession, may decline in older stages
No. of species of heterotrophs	Increases until relatively late in the sere
Species Diversity	Increases initially ,then becomes stabilized or declines in older stages
Total biomass	Increases
Non-living organic matter	Increases
Chlorophylls	Increases during early phase of primary succession ,little or no increase during secondary succession
Pigment diversity	Increases ,at least early in the sere
Food webs	Become more complex
Gross production	Increases during early phase of primary succession, little or no increase during secondary succession
Net community production	Decreases
Community respiration	Increases
P/R ratio	$P > R$ to $P = R$

1.8 SIGNIFICANCE OF ECOLOGICAL SUCCESSION

Even in stable climax vegetation, different successional stages may also be found developing. A climax, therefore, may comprise orderly sequences of dynamically related patches called serule or microsere. This microseral phenomenon is the remarkable capacity of an ecosystem to repair damage, occurring due to natural causes or due to destruction by man. As a matter of fact from the viewpoint of human population there should be good mixture of early and mature successional stages for productive and stable vegetation. Early or young communities (crop plants) are essential for a large net primary production, whereas, a mature community with its greatest diversity and large organic structure is essential to buffer the complex physical environment (such as water, temperature and soil conditions). Excess food produced in early successional communities help feed older stages because production in the latter is mostly consumed in respiration. The older stages in return supply regenerated nutrients and help buffer the extremes of weather.

THANK YOU