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XEROSERE: Xerosere is a plant succession that is limited by water availability. A xerosere may be lithosere initiating on rock and psammosere initiating on sand.

LITHOSERE

Bare rocks

Bare rocks are eroded by rain water and wind loaded with soil particles. The rain water combines with atmospheric carbon dioxide that corrodes the surface of the rocks and produce crevices. Water enters these crevices, freezes and expands to further increase the crevices. The wind loaded with soil particles deposit soil particles on the rock and its crevices. All these processes lead to formation of a little soil at the surface of these bare rocks. Algal and fungal spores reach these rocks by air from the surrounding areas. These spores grow and form symbiotic association, the lichen, which act as pioneer species of bare rocks.

There are six steps of xerosere. They are as follows:

1) Crustose lichen stage.
2) Foliage and fruticose lichen stage.
3) Moss stage.
4) Herbaceous stage
5) Shrub stage.
6) Climax forest stage.

1) Crustose lichen stage

A bare rock consists of a very thin film of soil and there is no place for rooting plants to colonize. The plant succession starts with crustose lichens like ***Lecanora, Lecidia, Rhizocarpon*** **lichen** which adhere to the thin film of soil on the surface of rock and absorb moisture from atmosphere. These lichens produce lichenic acids which corrode the rock and their thalli collect windblown soil particles among them that help in formation of a thin layer of soil. When these lichens die their thalli are decomposed to add humus. This promotes soil building and then it become unfit for crustose lichen to grow any more the environment becomes suitable for growth of foliose and fruticose type of lichens.

2) Foliose and fruticose lichen stage

Foliose lichens like ***Parmelia, Dermatocarpon*** have leaf-like thalli, while the fruticose lichens like ***Usnea, Ramalina*** are like small bushes. They are attached to the substratum at one point only, therefore, do not cover the soil completely. They can absorb and retain more water and are able to accumulate more dust particles. Their dead remains are decomposed to humus which mixes with soil particles and help building substratum and improving soil moisture contents further. The shallow depressions in the rocks and crevices become filled with soil and top soil layer increases further. These changes favor growth and establishment of mosses.

3) Moss stage

The spores of xerophytic mosses, such as ***Polytrichum, Tortula*** and ***Grimmia***, are brought to the rock where they succeed lichens. Their rhizoids penetrate soil among the crevices, secrete acids and corrode the rocks. The bodies of mosses are rich in organic and inorganic compounds. When these die they add these compounds to the soil, increasing the fertility of the soil. As mosses develop in patches they catch soil particles from the air and help to further increase the amount of soil. The changing environment leads to invasion of herbaceous vegetation that can out-compete mosses.

4) Herb stage

With the increase of humus and mineral salt in soil layer the annual herbs such as **asters, evening primroses** and **milk weeds** grows. Their roots penetrate deep down, secrete acids and enhance the process of weathering. Leaf litter and death of herbs add humus to the soil. Shading of soil due to presence of herbs results in decrease in evaporation. Later on the biennial and perennial plants such as ***Poa, Cynodon*** and ***Aristida*** start growing. These climatic conditions favor growth of bacterial and fungal populations, resulting in increase in decomposition activity.

5) Shrub stage

The herb and grass mixture is invaded by shrub species, such as ***Rhus*** and ***Phytocarpus***. The leaves, stems, roots of these plants are decomposed by bacterial and fungal populations and the soil becomes rich in organic substances. The soil formation continues and its moisture content increases which initiates growth of vegetation.

6) Climax forest stage

Change in environment favors colonization of tree species. The trees begin to grow among the shrubs and establish themselves. The trees form canopy and shade the area. Shade-loving shrubs continue to grow as secondary vegetation. Leaf litter and decaying roots increase the

soil layer further and add humus to it making the habitat more favorable for growth to trees. Mosses and ferns make their appearance and fungi population grows abundantly.

The succession, thus, culminates in a climax community which is the forest. Many intermediate tree stages develop prior to establishment of a climax community. Among the plants ***Shorea robusta, Tectona grandis, Dipterocarpus turbinatus*** are prominent**.**

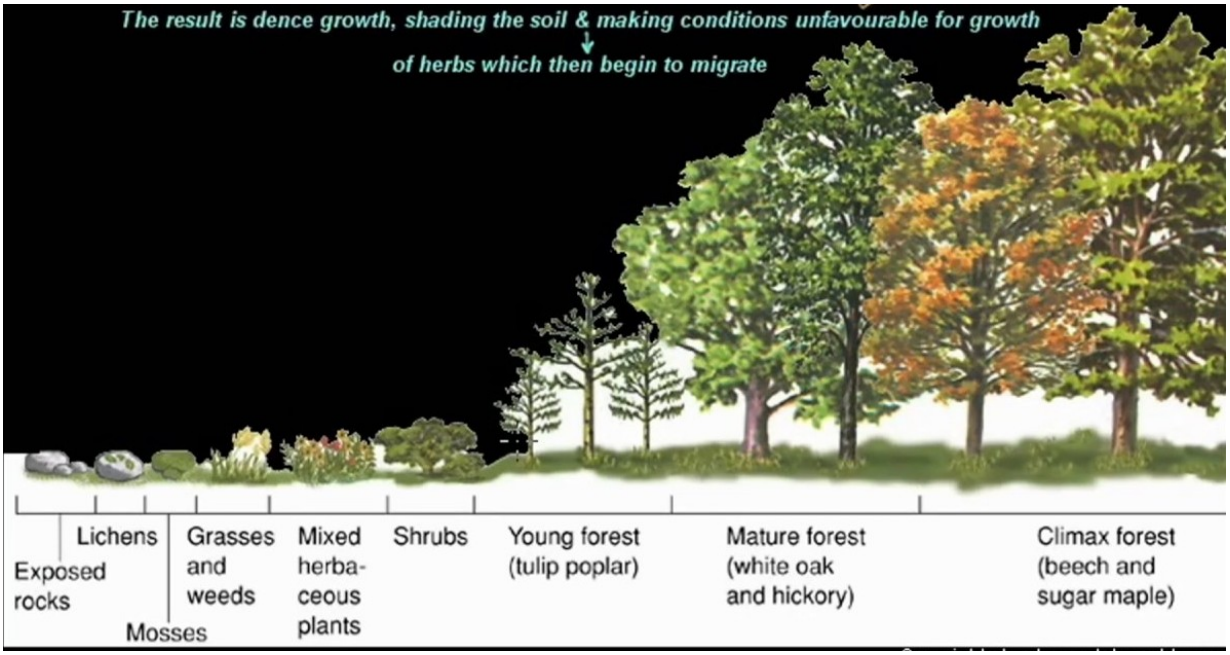
The forest type depends upon climatic conditions. The climax forest may be:

Oak-Hickory Climax Forest: In dry habitat oaks and hickories are climax vegetation.

Beech-Hemlock Climax Forest: These climax forests develop in mesic climates. The dominant vegetation is Beech and Hemlock.

Spruce-Alpine Fir Climax Forest: At high altitudes in Rocky Mountains the climax forest is dominated by spruces and alpine firs.

Thus a hard stony and rocky area which was once unfit for plant growing becomes transformed into a forest.



Different stages of xerosere (lithosere)