

Succession in Ecosystems

Succession-

A series of changes in a community in which new populations of organisms gradually replace existing ones

There are two main types of Ecological Succession

Primary Succession: The process of creating life in an area where no life previously existed.

Secondary Succession: The process of re-stabilization that follows a disturbance in an area where life has formed an ecosystem.

Primary succession-

Colonization of new sites by communities of organisms – takes place on bare rock which comes from 2 sources:

1. Volcanic lava flow cools and forms rock
2. Glaciers retreat and expose rock

The development of an ecosystem in an area that has never had a community living within it occurs by a process called PRIMARY SUCCESSION such as would be a new lava or rock from a volcano that makes a new island. Begins in a place *without any soil*

In the beginning there is only rock, sand, volcanic ash. Since there is no soil, there is no community.

Pioneer organisms-

The first organisms to colonize a new site. Ex: lichens are the first to colonize lava rocks

Over many years lichens break down rock into sand. Weathering and erosion break down rock into sand.

Lichens grow larger. Some die. Decomposers arrive and break down the lichens. The dead lichens and waste materials of the decomposers enrich the sand. Nitrogen cycle begins. Eventually enough nutrients enter the sand and it becomes soil and adding more organic material. The soil layer thickens, and grasses, wildflowers, and other plants begin to take over

Medium sized animals and birds make this their habitat. The vegetation grows closer together, reducing the amount of space available for growing.

Competition between lichen and shrubs for the same space. Eventually one species (lichen) will die out (or move) and the other species will survive (shrubs).

These plants die, and they add more nutrients to the soil. Now larger trees can grow: Beech, Oak, Walnut, Maple. Insects, small birds, and mammals have begun to move in

Seeds are blown in by the wind or carried in by animals. Simple plants like mosses can grow in the new soil. The plants grow and the soil gets enriched as plants die..



Climax community-

A climax community is a mature, stable community that is the final stage of ecological succession. In an ecosystem with a climax community, the conditions continue to be suitable for all the members of the community.

Any particular region has its own set of climax species, which are the plants that are best adapted for the area and will persist after succession has finished, until another disturbance clears the area.

Ex: In most of Virginia, the climax community would be a deciduous oak–hickory forest

A stable group of plants and animals that is the end result of the succession process. Does not always mean big trees, Grasses in prairies, Cacti in deserts

Insects

Nationwide, 70 million acres of public and private lands are at serious risk from insects and diseases.

Across the South, one of the biggest forest management challenges is the Southern Pine Beetle. Attacking timber stands throughout the region, it is estimated that 57 million acres are at risk of infestation. From 1999 to the present, the Southern Pine Beetle outbreak has caused timber value losses of over \$1.5 billion.

Forest pests and disease have seriously harmed the environment and have imposed significant cost to the U.S. economy. Exotic pests and pathogens, such as the chestnut blight, Dutch elm disease, and beech bark disease have had a profound effect on Eastern forests.

Management of these pests and diseases has been impacted by a variety of factors such as forest fragmentation, increasing human population, and the expansion of invasive species.

Prompt identification and treatment of forest diseases

Invasive Plants

Invasive species have been characterized as a “catastrophic wildfire in slow motion.” Thousands of nonnative invasive plants have infested millions of acres of land and water across the Nation.

These invaders cause massive disruptions in ecosystems by reducing biodiversity and degrading the health of our nation’s forests, prairies, mountains, wetlands, rivers, and oceans. They have the capacity to dominate, overwhelm, or wipe out native species.

The financial impact from invasive species infestations in the United States has been estimated at \$138 billion per year in total economic damages and associated control costs.

Threats to Climax Communities

- Forest Fires
- Humans building cities and roads
- Flooding, Volcanic eruptions
- Clearing a community for agricultural purposes

Anything that destroys the existing community, but much of the soil remains. Sometimes, some of the organisms remain as well.

Two main physical factors determine the nature of the community that develops in an area. These are temperature and the amount of rainfall.

If we place the amount of rainfall on a graph’s “x” axis, from 0-10, 10-20, and 20-30+ inches and the temperature along the “y” axis from hot, moderate, to cold, the various types of ecosystems will fit into the graph based on the conditions that they require.

Temperature			
Cold	Cold desert	Tundra	Taiga
Moderate	Temperate forest	Grassland	Deciduous forest
Hot	Hot desert	Savanna	Tropical forest
Rainfall (inches)	0-10	10-20	20-30+

A summary of changes that occur during succession:

Pioneer species colonize a bare or disturbed site. Soil building.

Changes in the physical environment occur (e.g., light, moisture).

New species of plants displace existing plants because their seedlings are better able to become established in the changed environment.

Newly arriving species alter the physical conditions, often in ways that enable other species to become established.

Animals come in with or after the plants they need to survive.

Eventually a climax community that is more or less stable will become established and have the ability to reproduce itself.

Disturbances will start the process of succession again.

Secondary succession-

Sequence of community changes that takes place when a community is disrupted by natural disaster or human actions – **takes place on existing soil**

Organisms are destroyed but the soil is safe.

The soil already contains the seeds of weeds, grasses, and trees. More seeds are carried to the area by wind and birds.

Succession begins again but the primary species are different.

Because soil is present, this succession is faster.

During secondary succession

1. Some seeds in the soil begin to grow.
- 2-Larger shrubs move in.
3. Fast growing trees (such as pines) move in
4. These are followed by slower-growing hardwood trees

Secondary succession-

Ex: A fire levels portions of a forest

Secondary succession-

Ex:

A farmer plows his field

An avalanche

