

## Temporal Community Development (Succession) Communities in transition

Remember biotic and abiotic factors (limiting factors) that lead to tolerance limits? In succession, a complex interaction of biotic and abiotic factors, often created by plants or animals themselves, sometimes climatic or geological forces, will serve to create a new suite of conditions (never the sum of its parts!), which benefit a different assemblage of organisms: Communities shift, oscillate, and sometimes move in a linear fashion towards a 'stable' community.

Evolution: shift in climates have led to shifts in Biomes.

Territoriality, symbiosis, predation, disease are all very important

Disturbance too very important: Intermediate disturbance hypothesis: intermediate dist = highest diversity.

Disturbance = change in environmental conditions.

Types of disturbances: animal caused, climate, storms, human  
frequently disturbed areas full of r-selected indiv. Occasional disturbance: reservoir of r-selected able to move in (blackberry).

Communities never disturbed (coral reefs/rainforests) take long time to recover cause no reservoir of opportunistic species.

Ecological Succession: process by which organisms occupy a site and gradually change environmental conditions so that other species can replace orig inhabitants. Progressive replacement of one community by another.

Succession can be organisms 'paving the way' for others (autogenic vrs. allogenic (external forces)

facilitation model: one species creates favorable conditions for another

Inhibition model: the existing species actually inhibit others, but are not efficient resource users, short life spans etc.

tolerance model: differences in development rates and competitive abilities.

Sere: stage defined by a community, Seral stage in succession

Succession can lead to a climax community (Community that resists further change, stable, mature)

Primary succession: establishment of a community where no community previously existed. Slow at first (hundreds years...) perhaps thousands years to a climax.

Pioneer organisms: hardy. Mosses, microbes, Lichens (algae/fungal symbiosis). Produce weak acids that erode rocks. Soil builders. As soils accumulate, grasses and mosses can establish. Roots crack rocks and widen area for soil accumulation. Soon, original lichens can not compete for sun water and minerals. Are competed out.

Secondary succession: new community where old community was disrupted.

Clearcutting, storms, fire etc.

Seral stages usually more rapid.

Ground cover creates soil. Fast growing shrubs and trees grow. Shade out young. Eg birch fast grow, replaced by shade tolerant maple and beech.

Environmental modification by organisms = ecological development.

Random or orderly process?? Succession may not be as deterministic as we once thought. But mature stable communities are more resistant to change.

Mature ecological communities:

high species diversity

narrow niche specialization

well organized community structure

good nutrient conservation and recycling

large amounts of total organic matter

Climax community revisited: What is a climax community? still evolving but very slowly. Some never reach climax community due to periodic disturbance

equilibrium or disclimax communities: Eg: fire climax community: grasslands, chaparral.

Some communities are cyclic: old fields in Michigan

bare areas---mosses--- bluegrass and dock---dead stems covered w/lichens, together crowd out grasses, rain, frost and wind destroy lichens---bare area---moss etc.

Aquatic communities:

1) barren (oligotrophic)

2) plankton, settle to form much on bottom ---phyto leads to zoo

3) support fish, insects etc.

meanwhile terrestrial runoff etc are providing increased nutrients (eutrophication)

4) Muck provides substrate for aquatic plants which consolidate bottom, add to stabilising and increasing deposition.

5) pond gets shallower

6) insect community changes due to vegetation on bottom, fish change too.

7) plants with weak roots take hold

8) Emergent plants take those over

9) oxygen decreases due to more animals and decay of plants and animals  
can lead to pond death

10) animals with low oxygen requirements take over (infauna etc)

11) sedimentation increases, marsh emerges, or temporary pond.

12) grasses colonize----trees etc.

Mangroves: red, black, white

### Terrestrial:

Dunes: stabilizing plants take over marra grass, beach pea. change albedo, and surface temperature, and shade, consolidate substrate, increase moisture retention .....etc.

### Influences on succession:

#### Fire:

can inhibit and stimulate growth of indiv plants. Can be used to control succession and economically maintaining valuable seral stages. Eg. in hardwood forest to eliminate understory (INDONESIA!!), grasslands to keep woody growth out etc.

#### Lumbering:

removing undesirable trees, clearcutting, thinning, cut mature trees to keep sunlight in (many valuable trees occur in non-climax seral stages such as pine, balsam fir and spruce).

#### Grazing and browsing:

can arrest or even reverse succession. overgrazing, dispersal of seeds through droppings

#### Cultivation:

simple highly artificial communities. Topsoil destruction, mineralization of soils...

#### Surface mining:

#### Industrialization and urbanization