Ecological Succession

Ecology

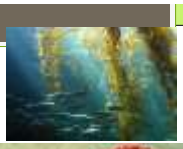
Question of the Day

- We know species can change due to interactions with their environment (adaptations).
- Can physical environments also be altered by living things?
  - Give an example.

Ecological Succession

- Ecosystem biotic communities change over time
- New species occupy the ecosystem in each phase

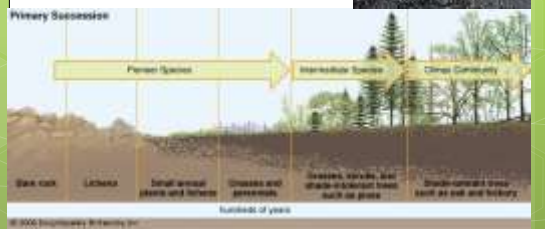
Ecosystem Engineer



- A species that creates or modifies the ecosystem that it inhabits.
  - Ex: Algae alter the amount of light that can pass through water
  - Kelp create habitat for many other organisms
  - Many invertebrates aerate and turn over soil and sand
  - Elephants stomp out young trees, turning woodlands into grasslands
  - Deer disperse seeds around their ecosystems
  - And many more…

Primary Succession

- Begins in an area that was not occupied by an ecosystem
- Bare rock, covered by lava, etc.
- No soil present

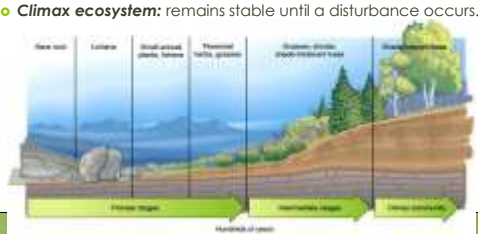


Pioneer Species Begin Primary Succession

- ***Pioneer species*** start the process
- Moss and lichen
  - Break down rock
  - Soil accumulates
- Algae (in aquatic systems)

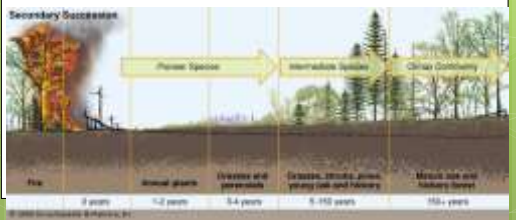
After Soil Forms…

- Lichen and moss community replaced by grass communities for several years
- Next come plants and small shrubs
- After several years, small trees move in
  - Examples: spruce, aspen, pines
- The final stage is a mature forest called a ***climax ecosystem.***
- ***Climax ecosystem:*** remains stable until a disturbance occurs.



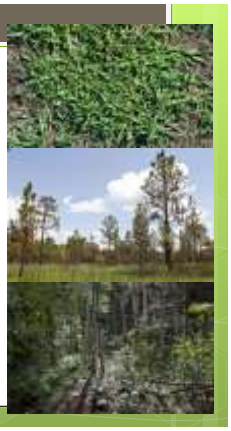
Secondary Succession

- Occurs after a disturbance
  - Fire
  - Cleared by humans
- Animals from surrounding ecosystems invade the area
- The ecosystem may "skip" the earliest steps of succession
  - Soil already exists there
  - Soil organisms already live there (decomposers)



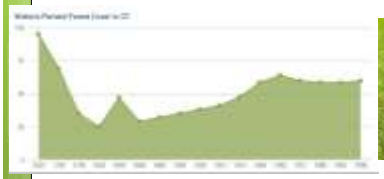
Example: Abandoned Agricultural Field

- Soil is already established
- Crabgrass invades
- Crabgrass is shaded out by taller plants – they take over
- Pine trees take over
  - Do well in sunny, open fields
  - Shade their own seedlings (need sun to grow)
- Deciduous seedlings begin invading
  - Hardwood trees (oak, hickory, beech, maple) move in
  - Climax ecosystem



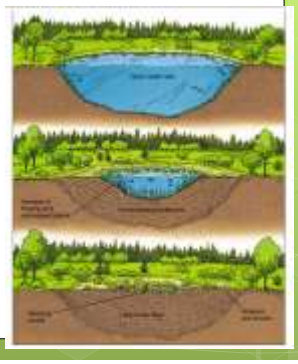
Succession in Connecticut

- In 1850, CT was almost entirely open land cleared for farming or timber
- Farming left the state in 1800's
- Connecticut has been reforested



Aquatic Succession

- Soil particles from land gradually fill lakes or ponds
- Aquatic organisms that die (detritus) also fill the pond or lake
- Shoreline advances, takes over lake
- Terrestrial species move in



Disturbance and Patches

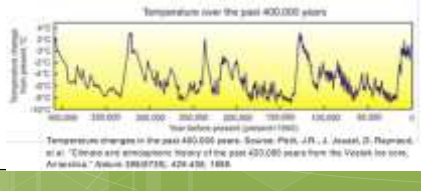
- What if a small "patch" of an ecosystem is disturbed, but the rest remains intact?
  - This happens often
- Small patches in different stages
- Early, middle and late species all coexist = more biodiversity
  - More niches
  - Diverse habitats and food
- Occasional disturbance = more biodiversity

Fire

- Fire is common in terrestrial ecosystems
- ***Scientists once thought fire was a bad thing***
  - Fire-prevention program
- Dead trees and branches accumulated (not burned up)
  - Breeding ground for insects
  - Blocks young seedlings
  - Grasslands taken over by trees that prevented animal grazing
  - Pines replaced by scrub oaks (loss of $$$)
- Bottom line: **naturally occurring *fire is a good thing.***
- ***Same goes for drought, flood, and storms.***

Climate Change (Historic)

- Climate has changed in our planet's past
- Ecosystems change with climate
  - Ex: Forests of the temperate zone have shifted from coniferous to deciduous w/ warmer temps
- Take place over hundreds of thousands of years
- What will happen if climate changes rapidly?



Sticker Question

- Which of the following could be a pioneer species?
  - An apex predator
  - A fast-growing invasive plant
  - A strong, sturdy oak tree
  - An endangered species