

1 ☐

## Ecosystems - Succession

2 ☐ Ecosystems

### ✓ Ecosystem

- a concept in which the physical and biological components of the environment are considered as a single, interactive system
- two main categories
  - **terrestrial**
  - **aquatic**

3 ☐ Ecosystems & Biomes

### ✓ Ecosystem

- similar physical environments lead to
  - the evolution of organisms similar in form and function
  - similar ecosystems
- this is known as the rule of climatic similarity
  - leads to the concept of the **biome**
    - which is a kind of ecosystem

4 ☐ Ecosystems & Biomes

### ✓ Biomes

- major communities of organisms that
  - have a characteristic appearance
  - are distributed over a wide land area
    - defined largely by regional variations in **climate**

5 ☐ Ecosystems & Biomes

### ✓ Biomes

- the strong relationship between climate and life suggests that
  - if we know the climate of an area
    - we can predict what **biome** will be found there
      - » approximate biomass
      - » approximate productivity
      - » dominant types of organisms

6 ☐ Succession

### ✓ Succession

- concept that communities proceed through a series of regular, predictable changes in structure over time
  - results in a **climax community**
    - a stable, long lasting community
    - type that results depends largely on climate
- occurs because activities of organisms cause changes in their surroundings
  - that make local environment suitable for other kinds of organisms

## 7 ☐ Succession

### ✓ Succession

- pace and direction affected by several factors
- two different kinds are recognized
  - **primary succession**
  - **secondary succession**

## 8 ☐ Succession

### ✓ Succession

- two different kinds are recognized
  - **primary succession**
    - begins with
      - » total lack of organisms
      - » bare mineral surfaces, or water
    - less frequently observed
    - usually takes a very long time
      - » because of lack of soil and few nutrients for plants
  - **secondary succession**

## 9 ☐ Succession

### ✓ Succession

- two different kinds are recognized
  - **primary succession**
  - **secondary succession**
    - more commonly observed
    - proceeds more rapidly
    - begins with destruction or disturbance of existing ecosystem
      - » some soil present
      - » some seeds or roots from which plants can begin growing

## 10 ☐ Succession

### ✓ Succession

- **terrestrial primary succession**
  - factors affecting rate and direction
    - **substrate type**
      - » will affect soil type that develops
    - availability of **reproductive structures**
      - » will determine species available to colonize the area
    - **regional climate**

## 11 ☐ Succession

### ✓ terrestrial primary succession

- **pioneer community**

- collection of organisms that first colonizes bare rock
- dominant organism is the **lichen**
  - a mutualistic relationship between
    - » a fungus
    - » an alga OR a photosynthetic bacterium

## 12 ☐ Succession

### ✓ terrestrial primary succession

- **pioneer community**
  - **lichens**
    - develop slowly
    - accumulate debris
    - photosynthetic portion serves as a producer
      - » tiny consumer organisms live on them
    - acids produced by fungus
      - » cause breakdown of rock
    - contributes to accumulation of soil

## 13 ☐ Succession

### ✓ terrestrial primary succession

- **pioneer community**
  - **thin layer of soil**
    - can support variety of organisms
      - » bacteria
      - » protozoa
      - » fungi
      - » small worms, insects
      - » small annual plants
    - as these organisms grow, reproduce, die
      - » they contribute additional organic matter for soil building process

## 14 ☐ Succession

### ✓ terrestrial primary succession

- **pioneer community**
  - **thicker layer of soil**
    - can support more organisms that are a little longer lived
      - » perennial herbs and grasses
- **intermediate stages**
  - grasses, larger perennials, woody shrubs, shade intolerant trees

## 15 ☐ Succession

### ✓ terrestrial primary succession

- **climax community**
  - relatively stable, long lasting
  - complex and interrelated community
  - bacteria, protista, fungi, plants, animals
    - shade tolerant trees
  - specific types that occurs depends on climate, soil type
- **successional stage (seral stage)**

- each step in process
- a **sere** is the entire sequence of stages

## 16 Figure 6.2: Primary succession on land

## 17 Succession

### ✓ aquatic primary succession

- main concepts of terrestrial primary succession can be applied to aquatic ecosystems
- except for oceans, over time, most aquatic ecosystems are replaced by terrestrial ecosystems
  - aquatic ecosystems receive continuous input of soil particles and organic matter
  - as sediment increases, water depth decreases
    - types of organisms change

## 18 Figure 6.3: Primary succession from a pond to a wet meadow

## 19 Succession

### ✓ Secondary succession

- driven by same processes as primary succession
- occurs when an existing community is destroyed
  - by forest fire, flood, conversion to agriculture
- but the destruction doesn't usually return the ecosystem to bare rock
  - much soil may remain, with its nutrients
  - some plants and other organisms may survive
- proceeds more rapidly than primary succession
- some communities exist only as successional stages
  - continually re-established after disturbances

## 20 Figure 6.5: Secondary succession on land

## 21 Figure 6.6: Secondary succession from a beaver pond

## 22 Succession

### ✓ Climax communities

- show certain characteristics when compared to successional communities
  - maintain their mix of species for a long time
  - are in energy balance
  - tend to have more types of organisms and types of interactions
  - trend is toward more complexity, energy efficiency

## 23 Succession

### ✓ Climax communities

- there doesn't appear to be a pre-ordained climax community for a given area
- specific community that develops depends on
  - climate
  - types of seeds present
- differentiated from a successional community by the time scale over which change occurs
  - climax communities do not change as rapidly as successional ones

## 24 The End