



Community Ecology

- **Community**
 - all the organisms that live together in a place
 - interactions
- **Community Ecology**
 - study of interactions among all populations in a common environment

To answer:
In what way do the populations interact?



Interspecific interactions

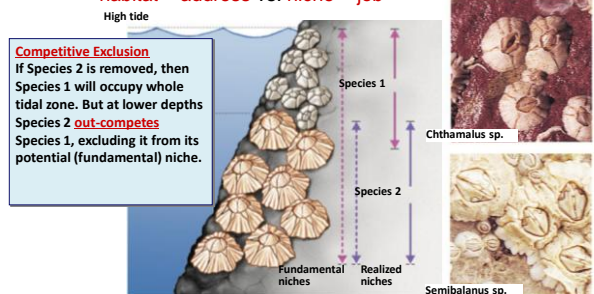
- **competition** (-/-)
 - compete for limited resource
 - competitive exclusion!
- **herbivory/predation / parasitism** (-/+)
- **facilitation**
 - **mutualism** (+/+)
 - lichens (algae & fungus)
 - **commensalism** (+/0)
 - barnacles attached to whale



Niche

- An organism's niche is its **ecological role**

– **habitat = address** vs. **niche = job**



Niche & competition

- **Competitive Exclusion**
 - No two similar species can occupy the same niche at the same time



Predation drives evolution

- Predators adaptations
 - locate & subdue prey
- Prey adaptations
 - elude & defend

horns, speed, coloration



spines, thorns, toxins



Predation provides a strong selection pressure on both prey & predator



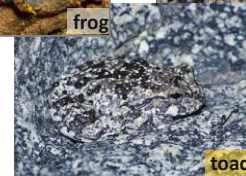
Anti-predator adaptations

- Hide from predators
 - avoid detection
 - cryptic coloration
- Warn predators
 - advertise how undesirable you are as prey
 - aposematic coloration
 - apo = away & sematic = sign/meaning
 - Batesian mimicry
 - Mullerian mimicry



Defense mechanisms

- **Camouflage**
 - cryptic coloration

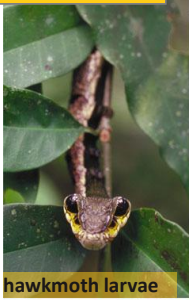


Convergent evolution

Mimicry

palatable or harmless species mimics a harmful model

Batesian mimicry



hawkmoth larvae



green parrot snake

Hawkmoth larva puffs up to look like poisonous snake

Mullerian mimicry

two or more protected species look like each other



cuckoo bee

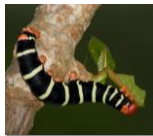


yellow jacket

- group defense?
- predators may evolve innate avoidance

Common warning coloration

- Harmful species come to resemble each other



black, red, orange & yellow means: DONT EAT ME!



What kind of mimicry?



Coral snake is poisonous

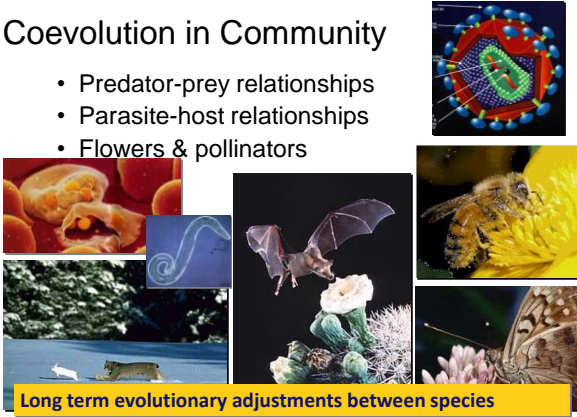


King snake is not

Red on yellow, poison fellow; red on black, safe from attack

Coevolution in Community

- Predator-prey relationships
- Parasite-host relationships
- Flowers & pollinators



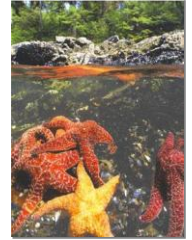
Long term evolutionary adjustments between species

Characterizing a community

- Community structure

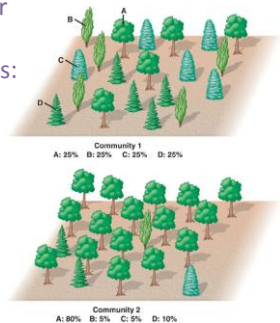
– species diversity

- how many different species
 - Species richness
- amount of each species
 - Relative abundance



Species diversity

- greater diversity = greater stability
- Greater biodiversity offers:
 - more food resources
 - more habitats
 - more resilience in face of environmental change

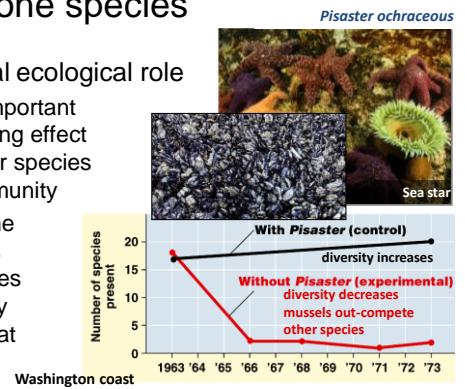


Keystone species

- Influential ecological role

– exert important regulating effect on other species in community

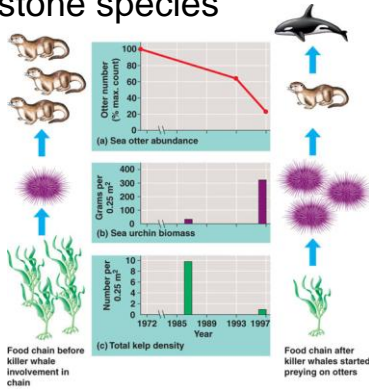
– keystone species increases diversity in habitat



Keystone species

Sea otter is a keystone predator in North Pacific

What is the impact of the Orca whale?



Keystone species

Beaver is a keystone species in Northeast & West



dams transform flowing streams into ponds creating new habitat

Ecological succession

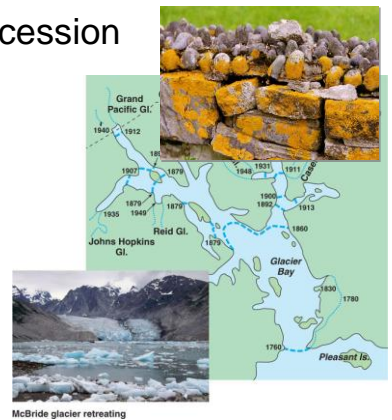
- Sequence of community changes
 - transition in species composition over time
 - years or decades
 - usually after a disturbance



Primary succession

- Begins with virtually lifeless area without soil, then...
 - bacteria
 - lichens & mosses
 - grasses
 - shrubs
 - trees

make soil



Secondary succession

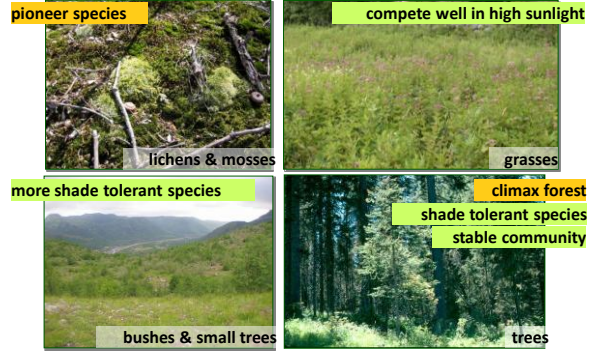
- Existing community cleared, but base soil is still intact

burning releases nutrients formerly locked up in the tissues of tree



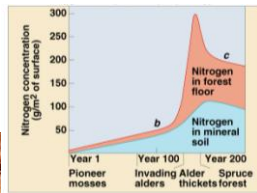
the disturbance starts the process of succession over again

Succession of species



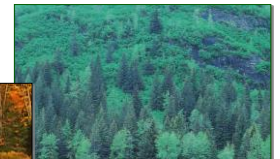
What causes succession?

- Tolerance**
 - early species are weedy **r-selected**
 - tolerant of harsh conditions
- Facilitation & Inhibition**
 - early species facilitate habitat changes
 - change soil pH
 - change soil fertility
 - change light levels
 - allows other species to out-compete



Climax forest

- Plant community dominated by trees
- Representing final stage of natural succession for specific location
 - stable plant community
 - remains essentially unchanged in species composition as long as site remains undisturbed
 - birch, beech, maple, hemlock
 - oak, hickory, pine



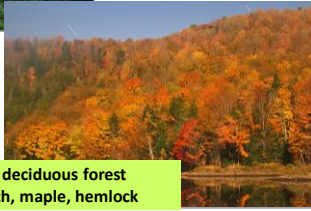
Climax forest

taiga



The species mix of climax forest is dependent on the abiotic factors of the region

- solar energy levels
- temperature
- rainfall
- fertility & depth of soil

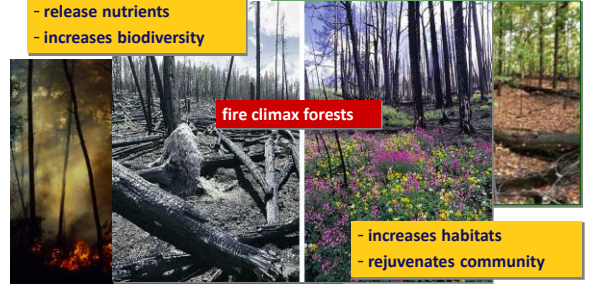


temperate deciduous forest
birch, beech, maple, hemlock

Disturbances as natural cycle

- Disturbances are often necessary for community development & survival

- release nutrients
- increases biodiversity



fire climax forests

- increases habitats
- rejuvenates community