

Biodiversity and Conservation

Biodiversity – Part One



Florida Panther – 100 individuals remaining

1. Diversity (variability)

- a. **Species:** the number, or variety, of species in a particular region. This has two components:
 - i. Species Richness= # of species
 - ii. Evenness or relative abundance= how similar species are in numbers
 - iii. The higher this is, the more complex a system (and less impacted by changes)

- b. 1 minute: Think of a way to tell these two components apart:

1. Diversity (variability)

b. Genetic: the range of genetic material (DNA) present in a population or species.

- i. Populations without diversity are vulnerable to environmental change like:

Climate change, pollution, deforestation, disease/parasites

1. Diversity (variability)

c. Ecosystem/ Habitat: variety of ecological niches

- i. Low Habitat Diversity: Desert, Monoculture Corn Field
- ii. High Habitat Diversity: Tropical Rainforest, Coastal

2. 1.4 -1.8 million species known
8-100 million species estimated

a. -Best Estimate- 14 million

Most mammals, birds
and plants are known.



Many insects, nematodes,
fungi and bacteria have not
been found yet.



b. Biodiversity is hard to calculate because

i. Some species are teeny tiny and overlooked or hard to find. Bacteria, protists, nematodes, fungi

ii. Sometimes, things thought to be the same thing, are actually different

iii. Areas on Earth are hard to explore

2. Diversity (variability)

c. Normal variation depending on ecosystem

i. Example: tropical rainforests have high habitat diversity due to stratification

ii. Example: species diversity low at poles because of extreme climate

d. Human activities often simplify the three types of biodiversity, making them less stable

How do we get this diversity?

Speciation

- a. Species form slowly
 - i. Evidence includes: Fossil Record, Structure of DNA, and mutations

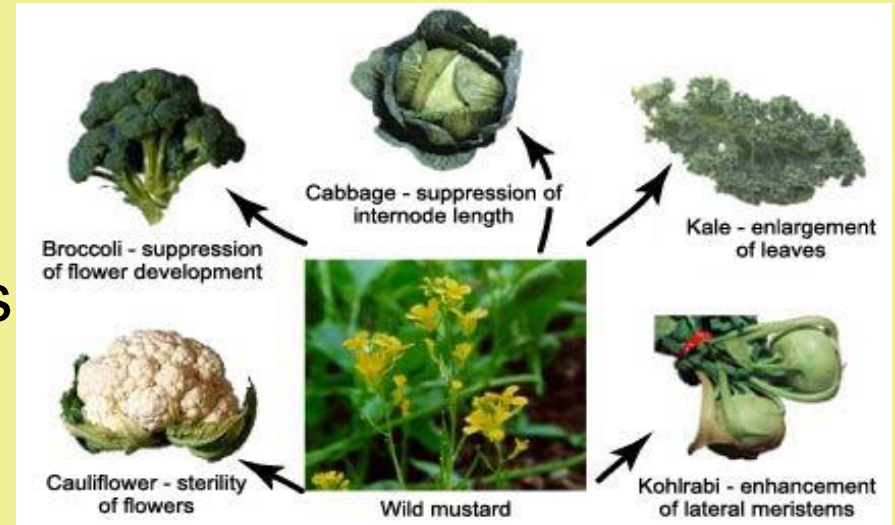
Speciation

- b. Natural Selection: Populations (**NOT INDIVIDUALS**) change over generations to be successful in their environment.
 - i. **variation** within population's DNA
 - ii. **Over production** of offspring
 - iii. competition for limited **resources**
 - iv. **survivors** pass along their genetics more frequently

Speciation

c. Artificial Selection:

Breeding animals and plants for specific traits.



d. Genetically Modified Crops:

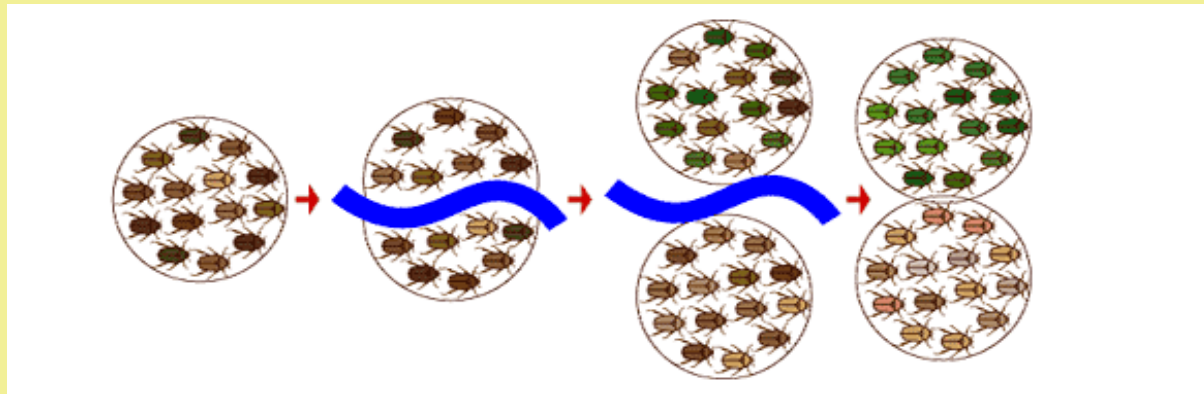
DNA of other species inserted into an existing species.



Speciation

e. Causes of speciation:

i. **Geographic isolation:** ONE population divided into two smaller populations.



- Examples: "rivers change course, mountains rise, organisms migrate"

ii. **plate tectonics:** changes climatic conditions and creates new habitat

- Examples:
Antarctica & E. Oregon



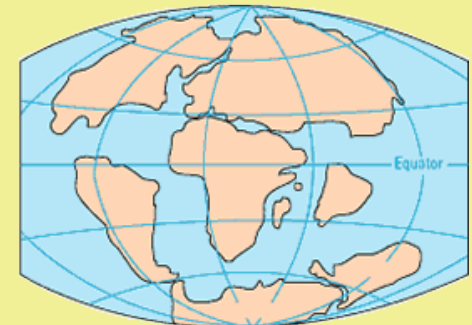
PERMIAN
225 million years ago



TRIASSIC
200 million years ago



JURASSIC
135 million years ago



CRETACEOUS
65 million years ago



PRESENT DAY

Speciation

iii. **Mass extinction:** open new niches and habitat



What is extinction?

- Extinction, when a species ceases to exist after the last individual in that species dies, is a natural process.
- Eventually all species become extinct.
- Wow.
- A species has a lifespan. Some species can live for 1 million years, some have been around for 10 million years or more.

3. Extinction Rates

b. **Background rates:** 1/million species/year

- varies by animal type
- Would expect 1 mammal / 200 years

c. Our planet has had 5 mass extinctions, humans are the 6th.

d. **Millennium Ecosystem Assessment:**

- current extinction rate is **1000** times greater than background rate.

4. Hotspots



<http://www.biodiversityhotspots.org/xp/Hotspots/pages/map.aspx>

5. Keystone species

- c. Species that have a disproportionately large effect on the ecosystem.
 - i. effect varies: top predators, base of food chain, engineers

ii. Examples

- Beavers dam rivers, creating swamp areas that fish use to breed and slows the erosion of river banks.
- African elephants remove trees allowing enough grasses to grow to support them and other herbivores.
- Wolves keep grazers (elk & deer) populations grow allowing shrubs and forbs to grow.



6. Prone to extinction?

a. **Narrow geographical range.**

i. captive breeding and zoo preserve species, but do not address issue of extirpation and ecosystem function.

ii. **Examples:** birds on oceanic islands, fish in lakes/rivers, fragmented areas

6. Prone to extinction?

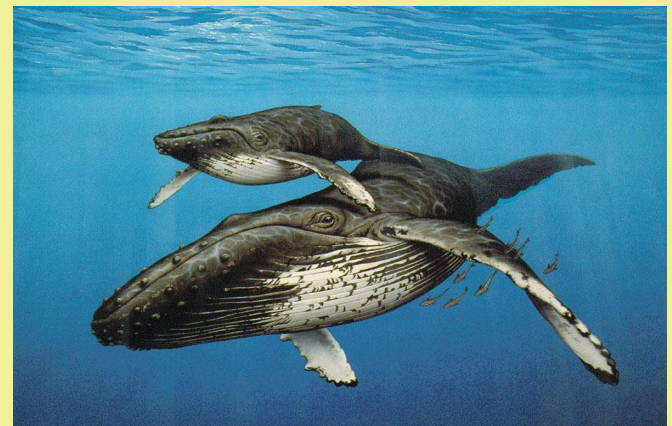
b. Small pop size. or few populations

- i. less genetic diversity makes them less able to adapt



c. K species

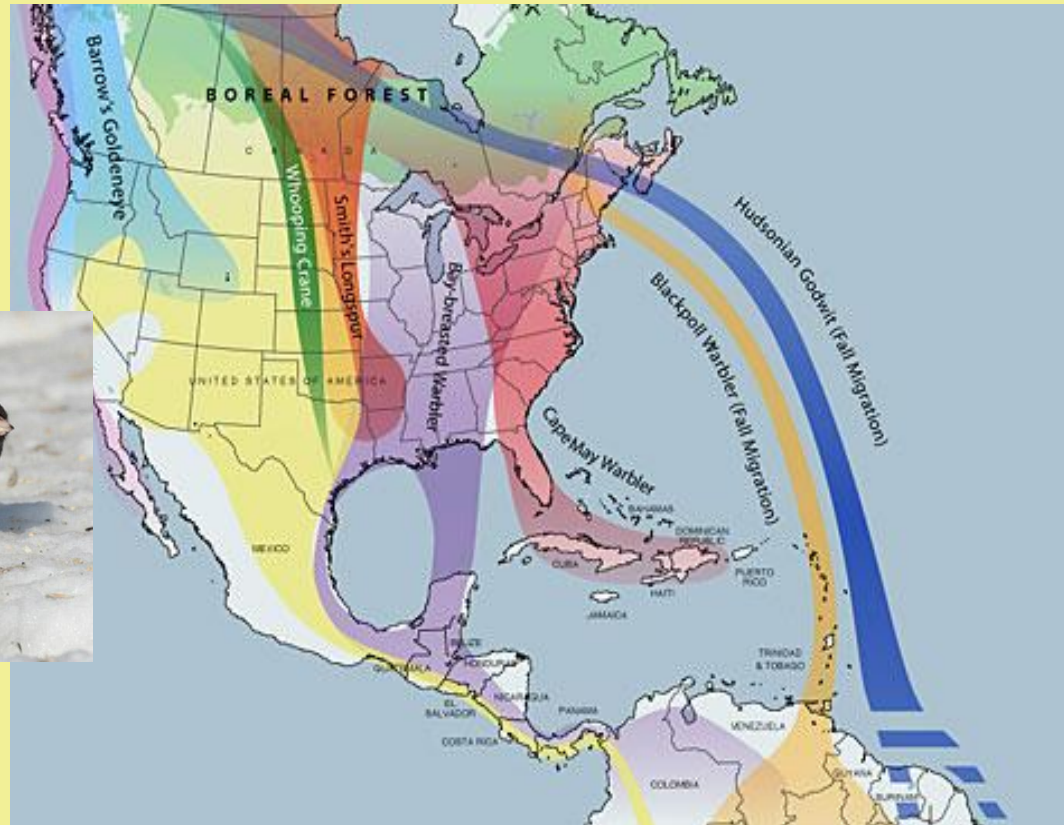
- i. large species rare and often low reproductive potential



6. Prone to extinction?

d. Seasonal migrants

i. require two habitats in good condition



6. Prone to extinction?

e. Specialized feeders or niches

i. If those areas coincide with human disturbance there are few options

f. hunted for food or sport

i. accelerates any of the previous pressures



7. Causes of Biodiversity Loss

a. Each of the five sources of biodiversity loss are intensified by **humans** and consumption of resources

b. Habitat Loss

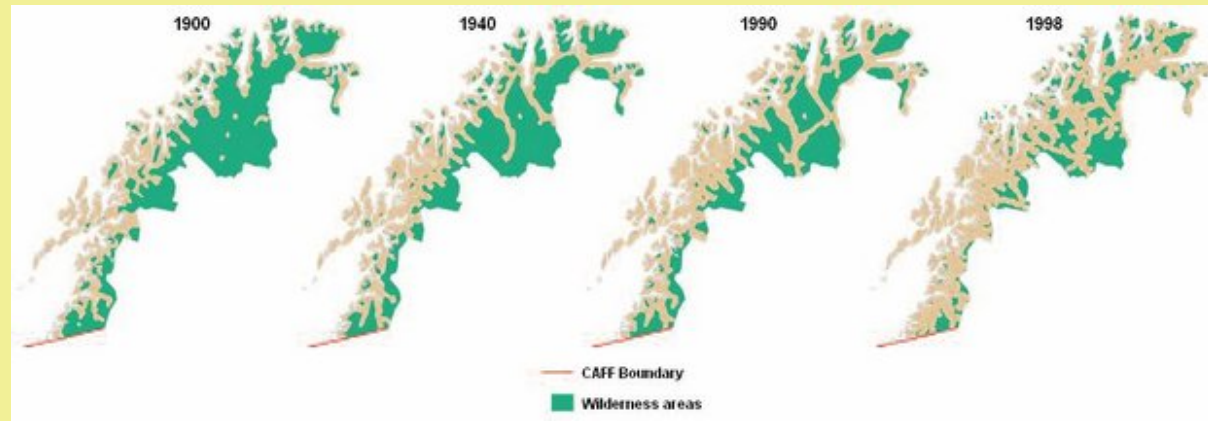
i. What causes habitat loss?

Dams, deforestation, developments, urban sprawl, grazing

ii. Fragmentation- gradual, piecemeal degradation

iii. Why not just adapt?

Takes a long time!!



7. Causes of Biodiversity Loss

c. Pollution: Fertilizers, car-exhaust, sediment in streams, plastics

d. Overharvesting

e. Invasive Species: Look at 11.6

i. How could species be introduced?

Bilge water, escape pet trade, some intentional

f. Climate Change:

2 minutes: Why threat to biodiversity is different with climate change?