Extinction Is Forever

Extinction

In time, all species become extinct:

- **Background Extinction:** continuous low level of extinction of species that is caused by “small” environmental changes

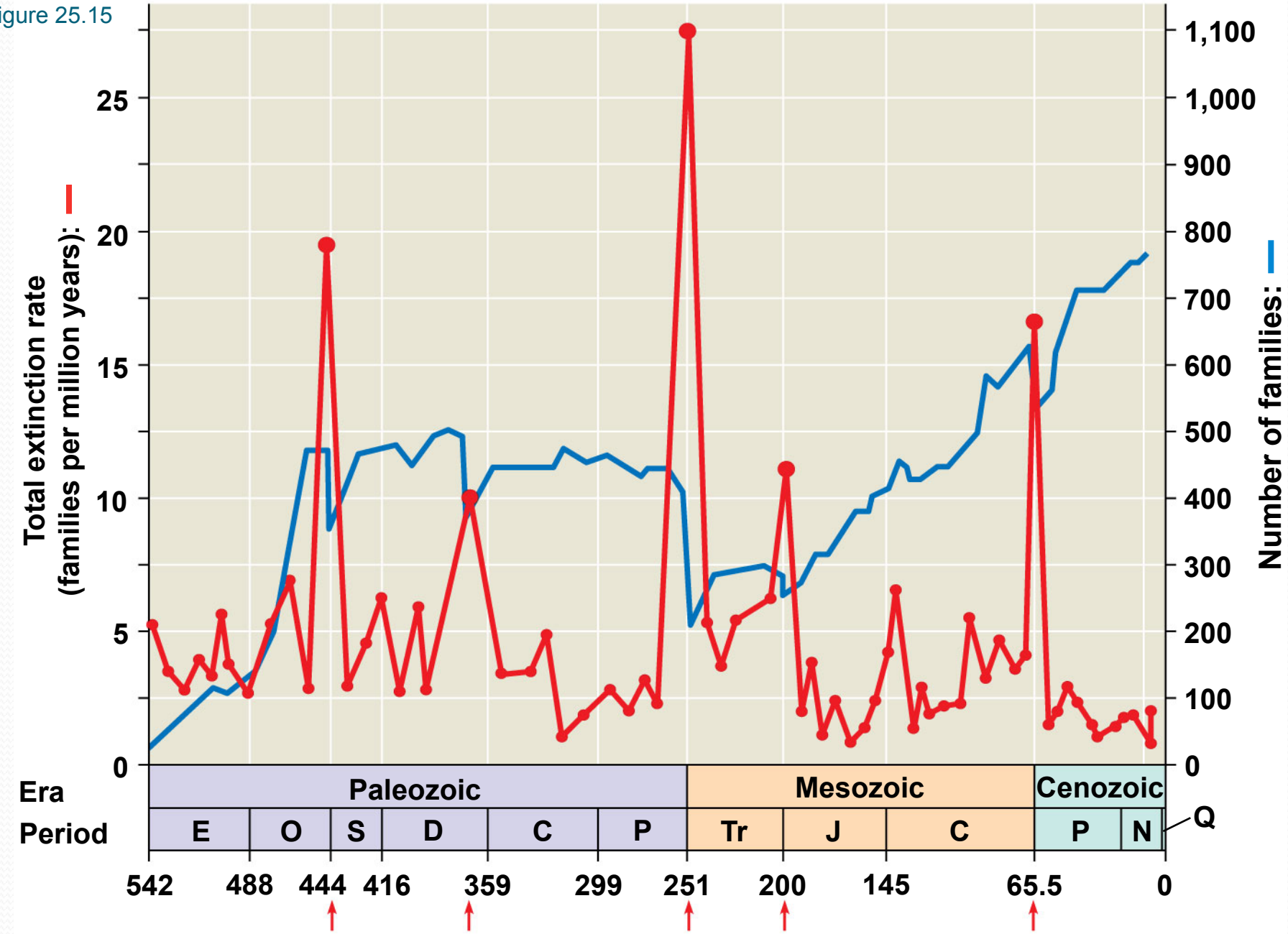
- **Extinction Rate:** % of species lost per year or 0.0001% before man became involved

- **Mass Extinction: A “short” geologic period of time when a great number of species go extinct due to widespread environmental changes**
- 5 mass extinctions – 50-95% of species were lost; but afterwards, biodiversity returned; causes include climate change, volcanoes or asteroids; man 6th?

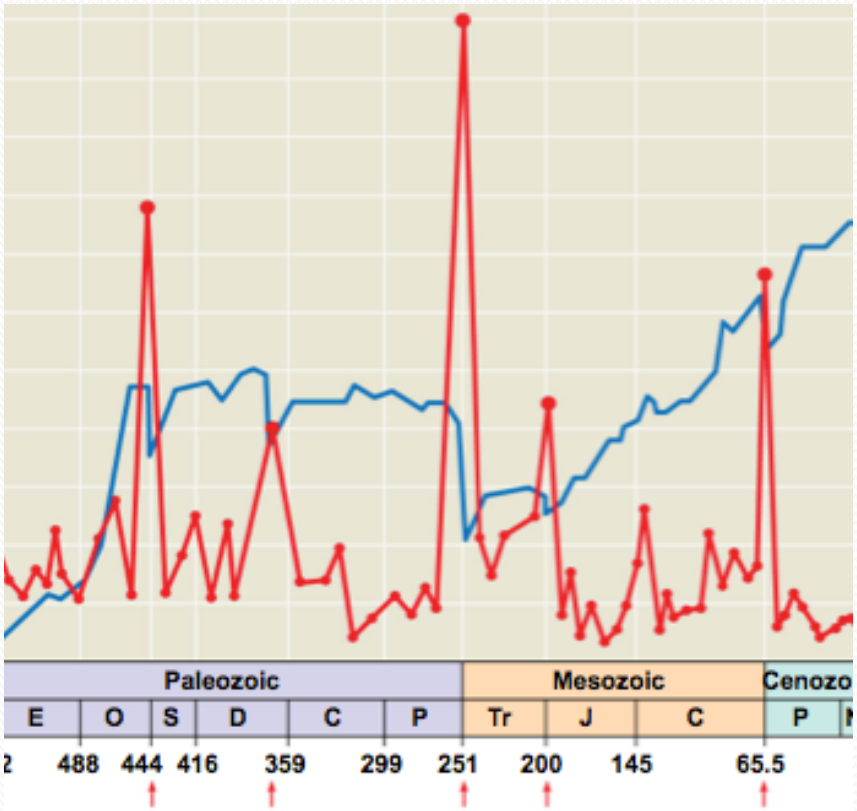
- **Levels of Species Extinction:**

  - **Local Extinction:** no longer found in an area but is found elsewhere
  - **Ecological Extinction:** only a few members left and it can no longer play an ecological role in the community it is found
  - **Biological Extinction:** no longer found on Earth; forever and represents an irreversible loss of the organism

Figure 25.15

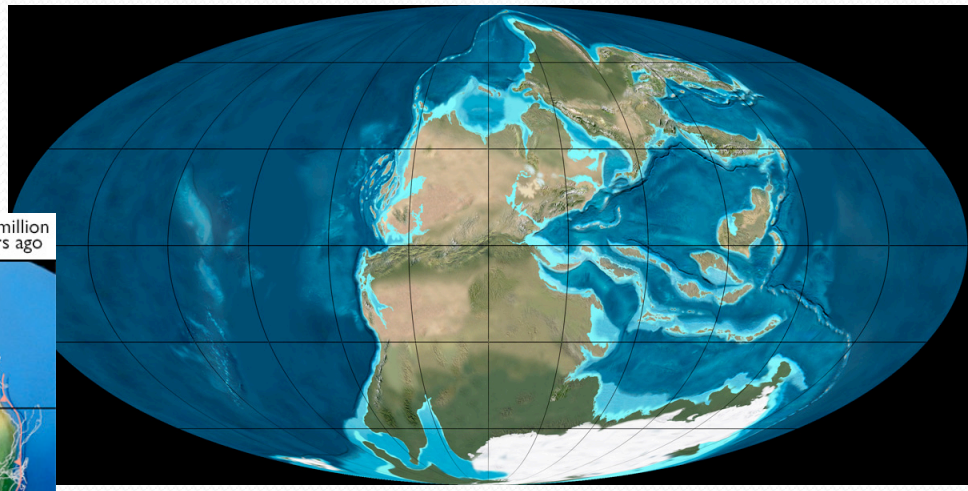


Mass Extinctions

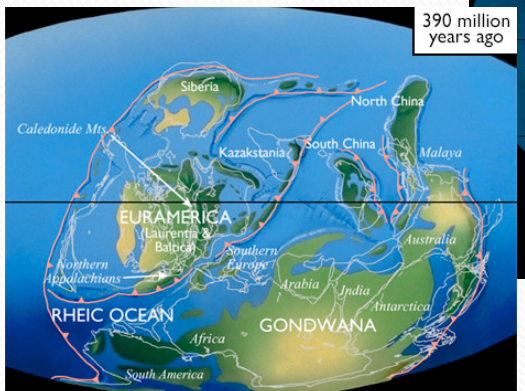


Permian Extinction was the biggest of all

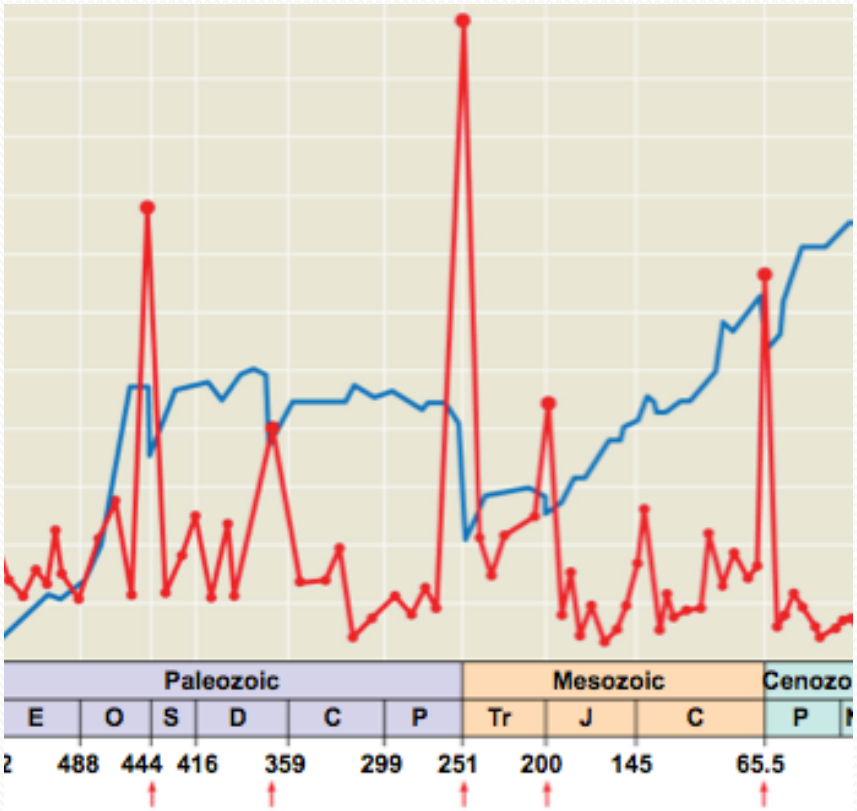
- Climate changed, shallow sea habitat was destroyed, ocean chemistry changed, and there were volcanic eruptions due to the creation of Pangea. (Plate Tectonics led to this).



More land= less land close to water=more desert



Mass Extinctions



Causes

- Climate Change is a common cause of extinction. Climate affects what plants and animals can survive in an area.
- Climate can be changed by volcanoes, asteroid collisions, changes in sea circulation, tectonic drift, ect.

Estimates of Extinction

- Conservative **Estimates of Extinction**:
  - 0.01-1.0% which is 100-1000x the background rate before man existed 150,000 years ago
  - Assuming a rate of 0.1% we are losing 5000 species a year if there are 5 mil species; 14,000 if 14 mil
  - Others estimate we can lose 25% of current animal and plant species by 2050; 50% by 2100
- **Extinction Rates** are increasing:
  - Growth of human population will increase this loss
  - Rates are higher where there are more endangered species
  - Tropical forests and coral reefs, wetlands and estuaries—sites of new species—being destroyed

What causes organisms to go extinct?

- When the environment changes
- If a species doesn't have the VARIATIONS in its population to survive a change, the species dies out.
- Changes in climate, loss of habitat, a new predator, loss of food sources, disease, competition from other organisms, ect. Can cause extinction.
- EX. A species of birds eats only a specific berry type. If that plant dies out, so do the birds.

- If the birds had some individuals who ate other berries, the birds may survive.

What causes organisms to go extinct?

- When the environment changes
- If a species doesn't have the VARIATIONS in its population to survive a change, the species dies out.

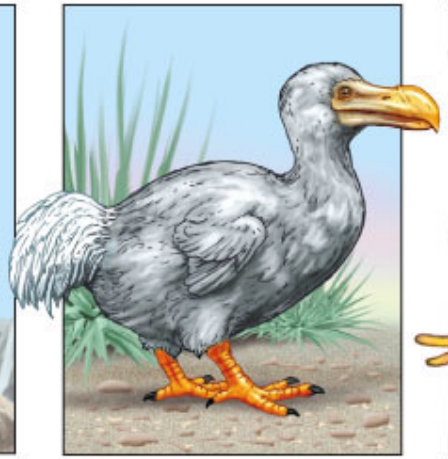
- EX. A species of fish can survive in water above 25 C only. If the temperature drops, they would all die

- If the fish had some individuals who could withstand colder waters, the species would survive.

Animal Species Prematurely Extinct Due to Human Activities

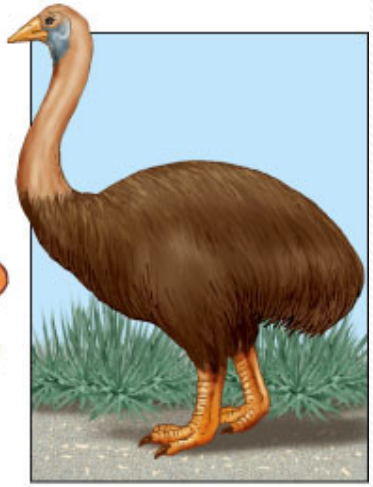
Passenger pigeon

Great auk



Dodo

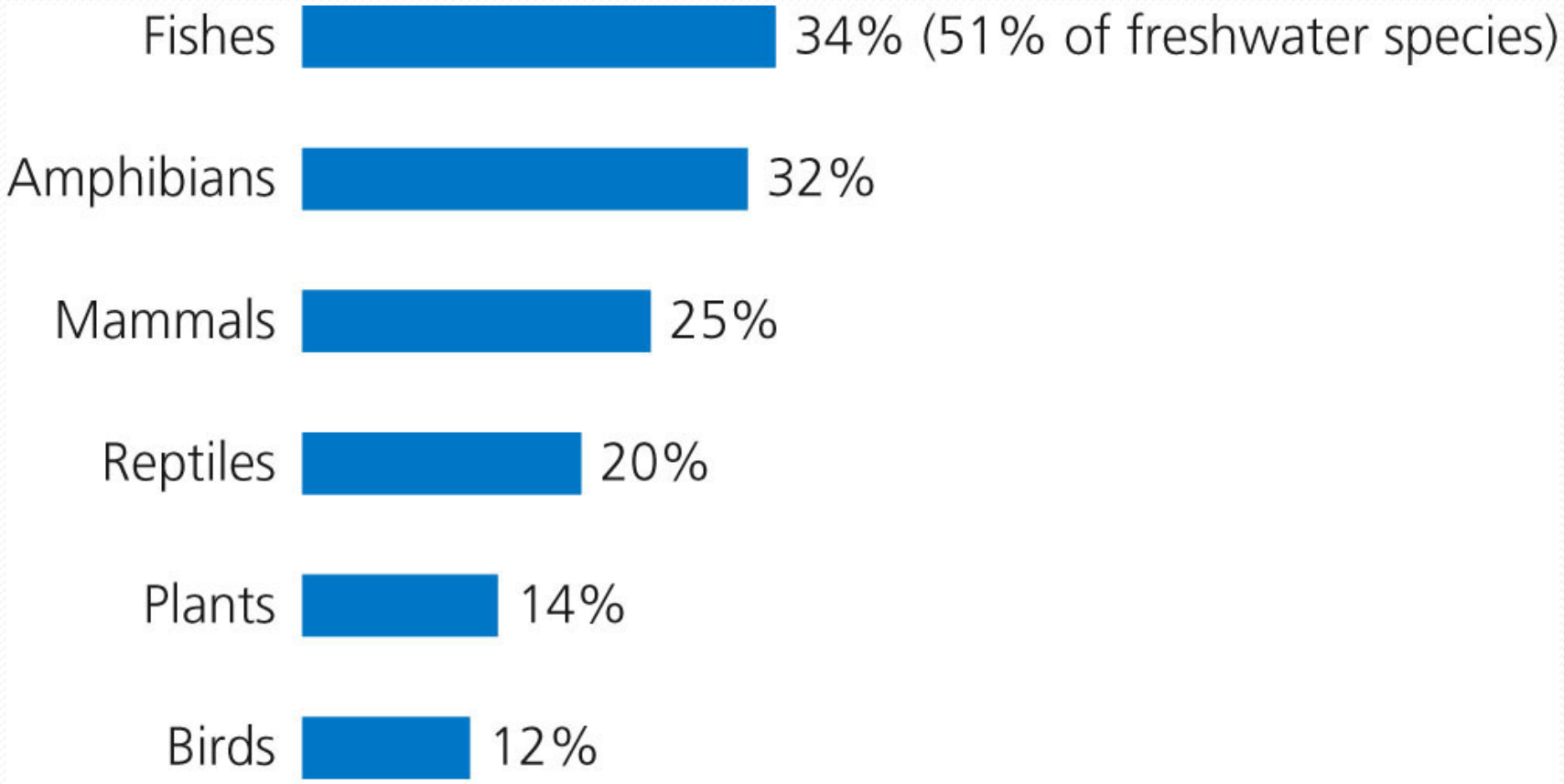
Golden toad



Aepyornis (Madagascar)

Endangered Species

Percentage of Various Species Threatened with Premature Extinction



If Species Become Extinct, we lose:

- **Instrumental value:** usefulness to us in providing many of the ecological and economical services
  - **Use Value:** benefits all from economic goods to science
    - **Ecotourism**: wildlife tourism: generates between 950,000 to $1.8 mil per minute in tourist expenditures worldwide; male lion living to age 7 generates $515,000 in tourist dollars but only $1000 if killed for its skin
    - **Genetic Information:** loss increases our reliance of small number of crop plants or animals
  - **Nonuse Value**
    - **Existence Value:** knowing its there even if we never see them
    - **Aesthetic Value:** appreciate it for its beauty
    - **Bequest Value:** pay to protect for future generations

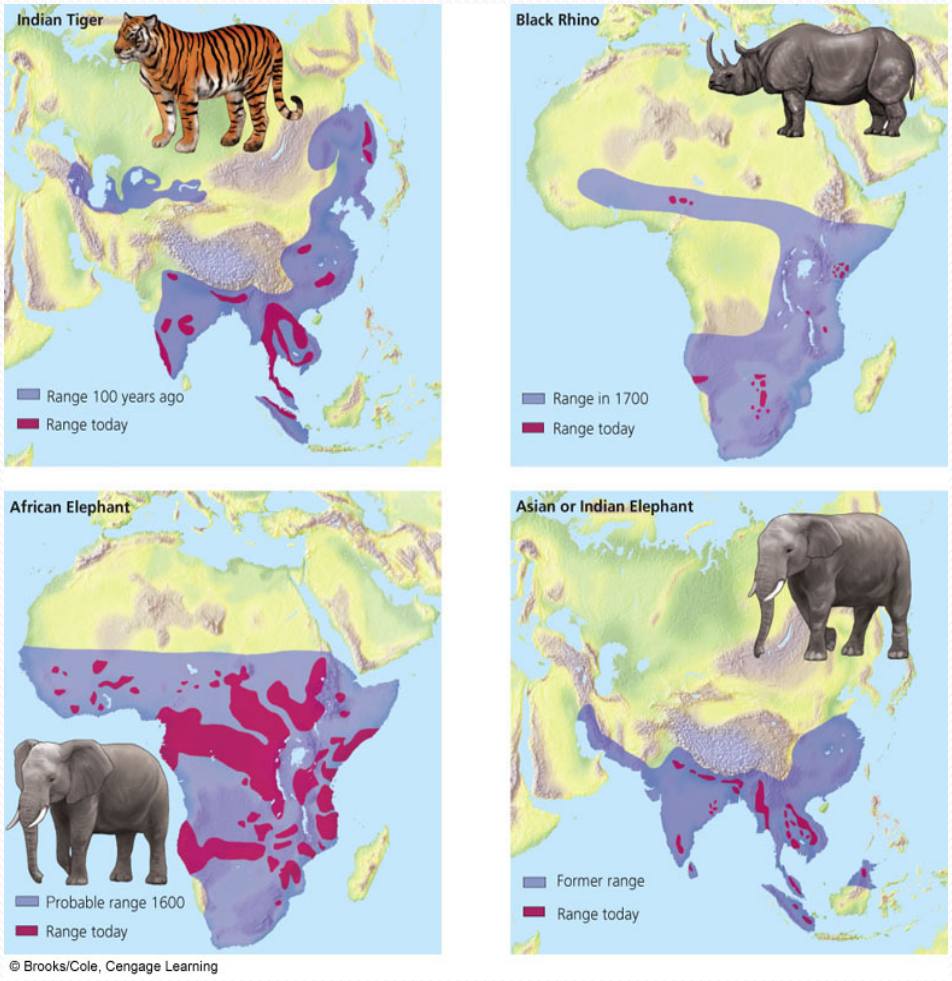
- **Ecological Value:** species are a vital component of key ecosystem functions of energy flow, nutrient recycling and population control

Protecting species from premature extinction and their vital habitats from premature environmental degradation, we are helping to sustain our own health and well being.

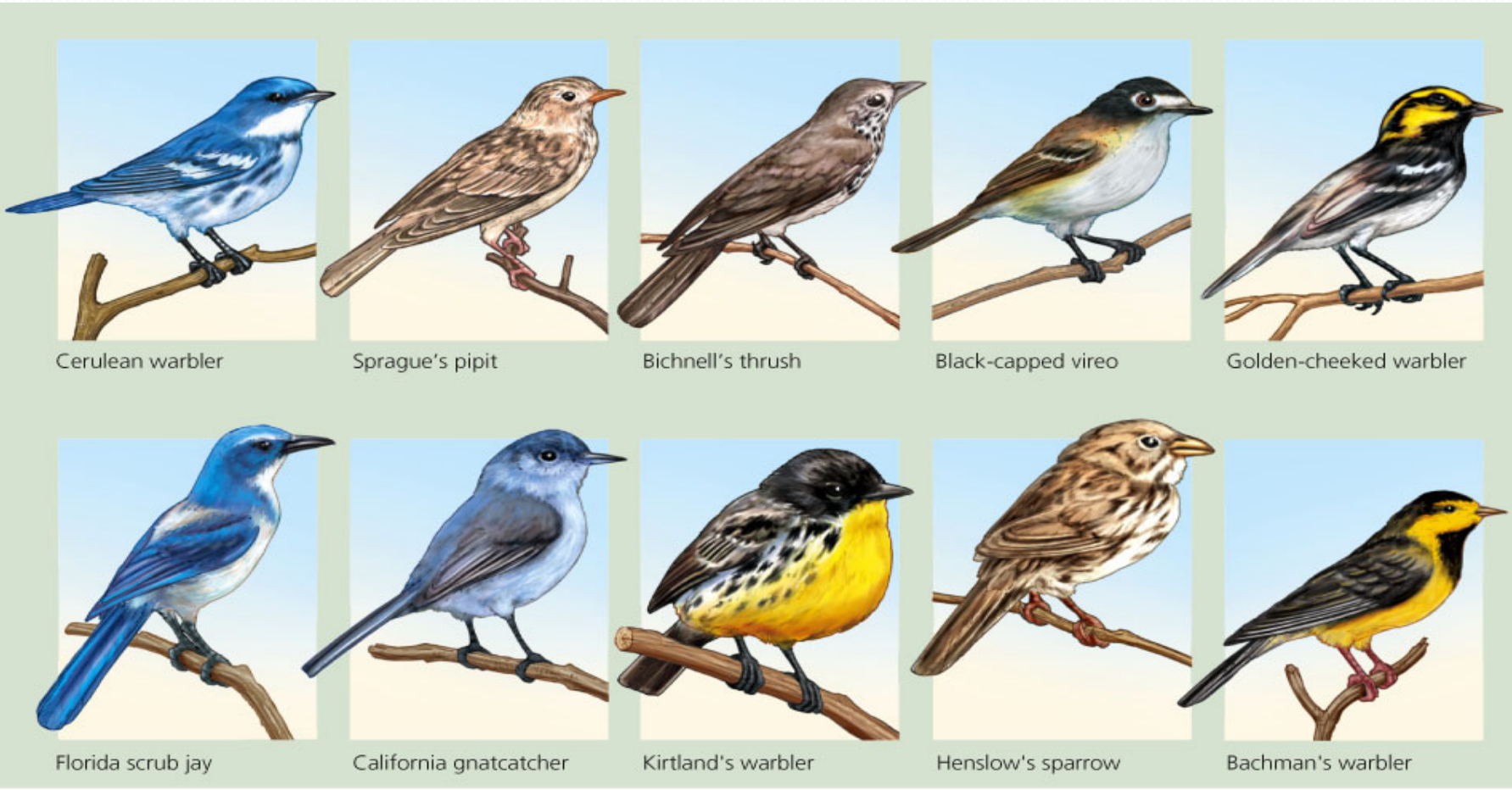
Extinction Is Forever

- Passenger pigeon was hunted to extinction by 1900 when a young boy in Ohio killed the last in the wild
- In 1813, John James Audubon saw a huge flock that took 3 days to pass and was so dense it darkened the sky
- Many uses from food to feathered pillows; hunted; loss of habitat led to extinction
- Commercial hunters used a **"Stool Pigeon";** capture one alive, sew its eyes shut and tie it to a stool – it's bird friends came to join him and were killed or trapped in nets; hunting had become such big business that a professional trapper made $60,000 by killing 3 million birds
- ***Extinction is forever!***

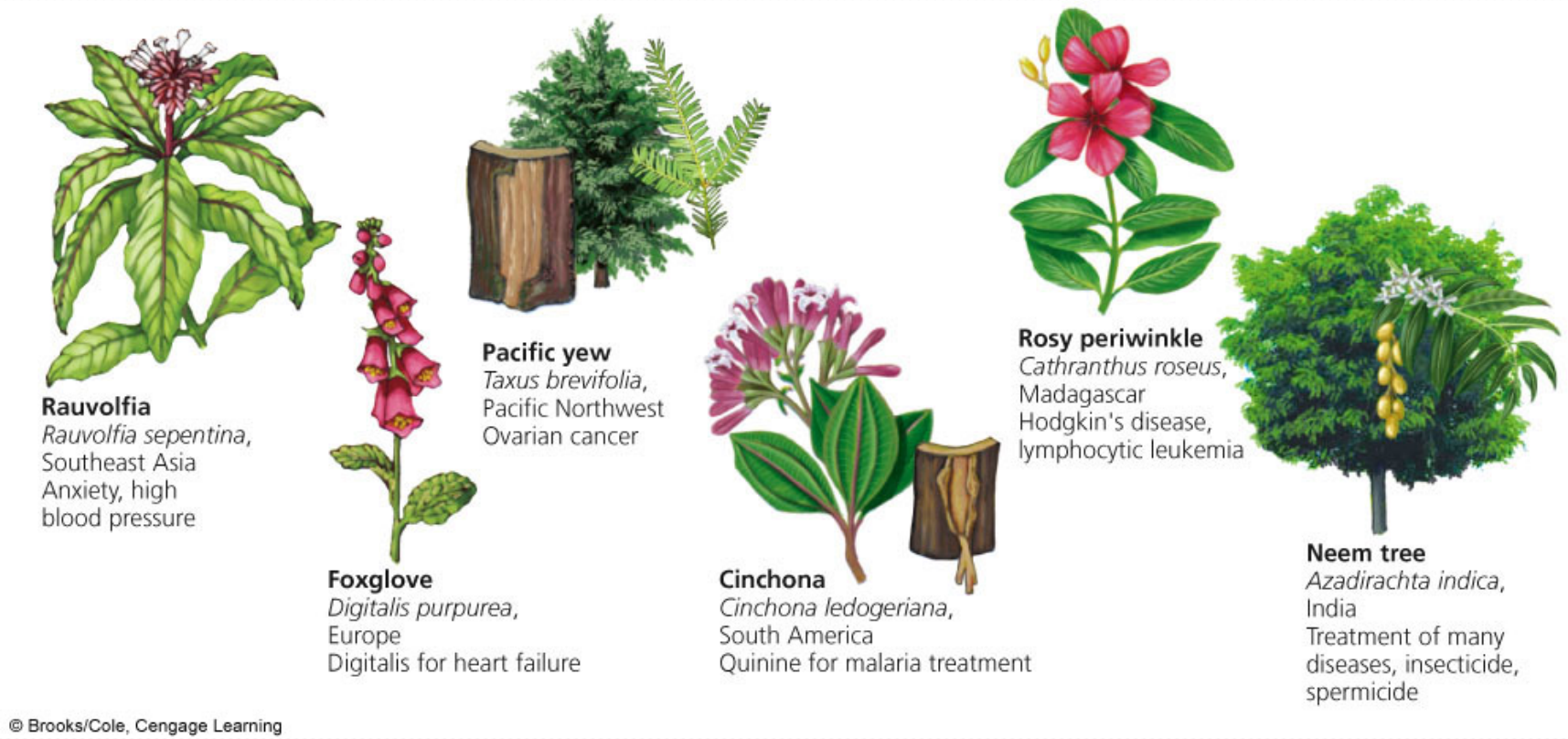
Territorial Range of Animals



The Ten Most Threatened Song Birds in the United States



Medicinal Benefits of Plants



Species Introduction

- ***<u>After Habitat Loss</u>, the biggest cause of premature animal and plant extinction is the deliberate or accidental introduction of a harmful species:***
  - 7100 species have caused ecological and economic harm
  - They threaten more than half of the 1300 endangered species in US
  - Harmful invader species cost $261,000 per minute

Species Introductions are beneficial:

- Food
- Shelter
- Medicine
- Aesthetic enjoyment

- **Nonnative Species** may have no natural:
  - Predators
  - Competitors
  - Parasites
  - Pathogens

INTRODUCED SPECIES CAN OUTCOMPETE NATIVE SPECIES AND LEAD TO EXTINCTIONS

Harmful Nonnative Species Introduced into the United States

Kudzu!

Was introduced to stop soil erosion in the US south.
No natural predators or diseases here, so it grows over other plants and chokes them out!

Can grow over a foot each day.

Emerald Ash Borer Beetle

- Accidentally introduced from Asian Ash trees.
- Bore into the ash trees that dominate North America, cutting off their food and water supply.
- The trees die.
- No natural predators in North America.

Nile Perch – Lake Victoria

- Lake Victoria is a large, shallow lake in East Africa:
  - Nile perch: deliberately introduced in the 50s and 60s to stimulate exports of fish despite warnings that the huge fish that had big appetite would reduce or eliminate species; and it did!
  - 500 species of fish; 80% were cichlids, which were small fish that fed on detritus, algae and zooplankton; 200 are now extinct
  - Fish were oily and could only be preserved by smoking; lost of forests for firewood
  - Nile perch population is being reduced – reduction of food supply and being overfished! This may allow the native cichlids to come back.

Nile Perch – Lake Victoria

Asian Carp

- **Asian Carp:**
  - Asian Carp species were introduced intentionally in the 1990s when catfish farms in the south were importing them to control pests.
  - Fish have since spread throughout the Mississippi River system
  - Millions of dollars of taxpayer money have been spent to try to keep these foreign species from swimming into the Great Lakes
  - Some scientists say their presence in the Great Lakes would be an **"Ecological Disaster**
  - **Recently,** evidence of an Asian Carp species was found above an electric barrier designed to prevent their movement into the Great Lakes
  - Foreign fish breed so quickly and grow so large, they push out native fish species
  - Notorious for being easily frightened by boats which causes them to leap high into the air; fish can jump up to 2.5–3 m (8–10 feet) into the air, and numerous boaters have been severely injured by collisions with the fish
  - Fish are eaten in China

Asian Carp

Deforestation

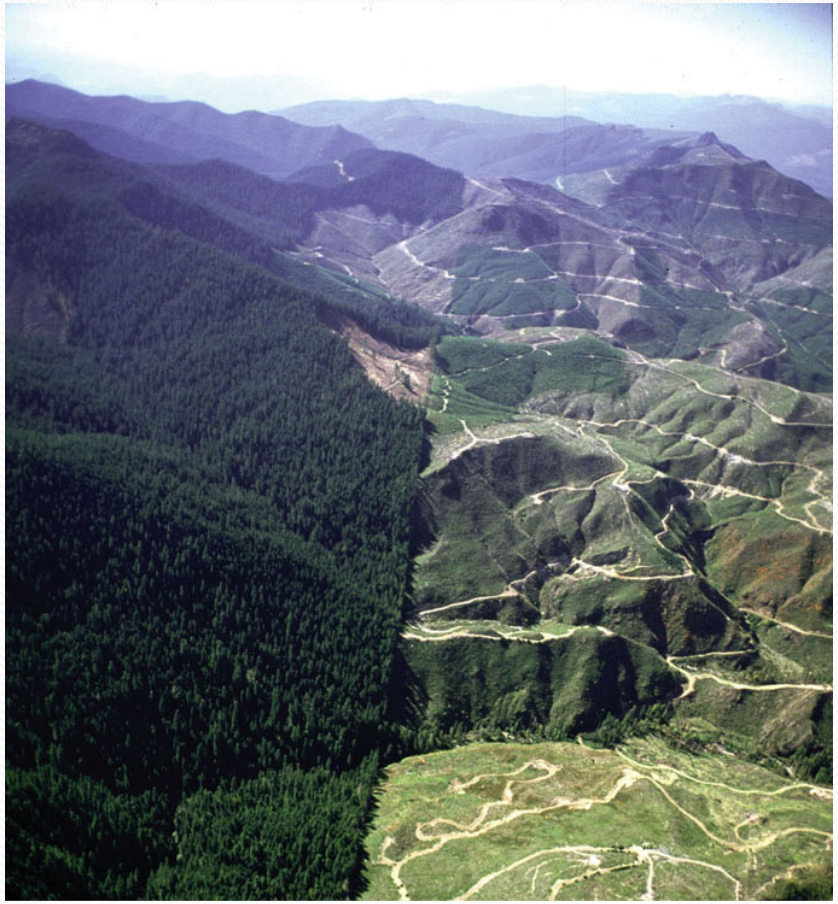
Habitat Loss is the <u>current</u> leading cause of extinction

Deforestation: temporary or permanent removal of large expanses of forest for agriculture, settlements or other uses

- In the past 8000 years, humans have reduced the original forest by 46% with most occurring in the past 60 years
- Global rate of forest cover loss between 1990 and 2000 was between 0.2 and 0.5% per year and at least another 0.1-0.3% were degraded every year mainly for grazing cattle and growing crops:
- Tropical Forests: Latin America, Indonesia, and Africa; 50,000 square miles are cleared each year or the size of Mississippi or Greece
- Boreal Forests: Alaska, Canada, Scandinavia, and Russia; coniferous forests are the world's greatest or organic carbon and play a major role in the carbon cycle and in climate regulation

- **If deforestation rates continue, 40% of remaining intact or converted forests will be logged or converted to other uses within 2 decades, if not sooner**
- **However, in the US, however, there was little change between 2000 to 2005**

Clear-Cutting of Forests



Deforestation Leads to Excessive Water Loss

Satellite Images of Amazon Deforestation between 1975 and 2001