

Biodiversity

Biodiversity

- ✦ Short for “**biological diversity**”
- ✦ **Number** and **variety** of different **species** in an area
- ✦ 1.7 million **known** species, mostly insects
- ✦ Estimated over 10 million exist



Levels of Diversity

- ✦ Species diversity-The **number** and **variety** of different **species** in an area.
- ✦ Ecosystem diversity- Variety of **habitats** and **communities** in and between ecosystems.
- ✦ Genetic diversity- Different **genes** contained within all members of a population (Gene pool)



Benefits of Biodiversity

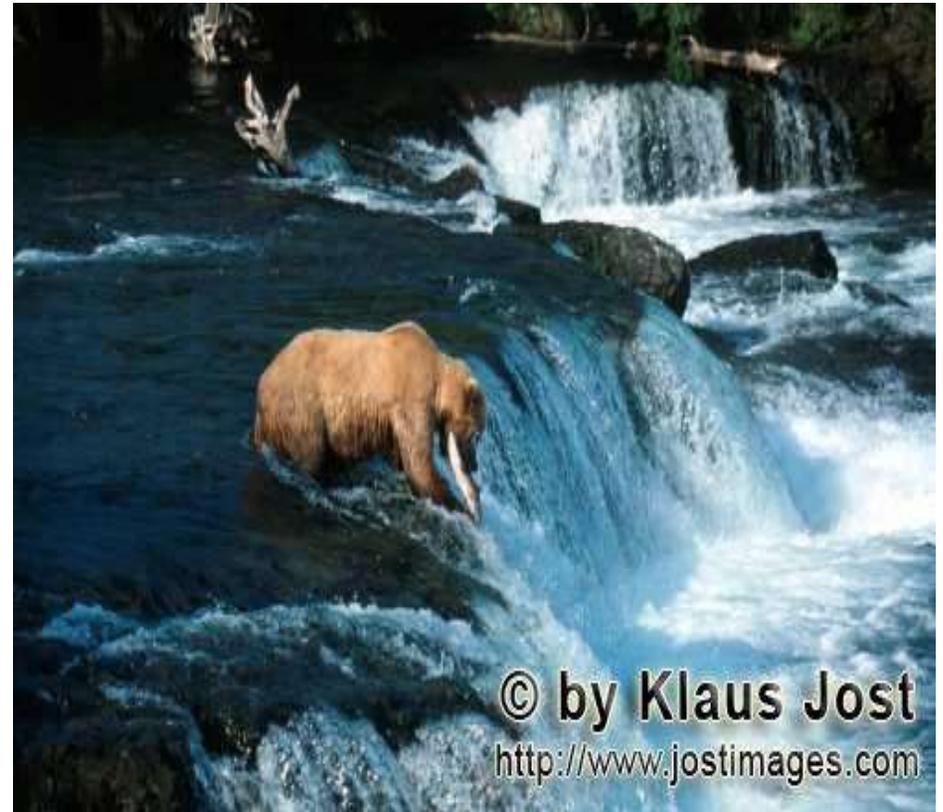
- ✦ Species have **niches** within food web
- ✦ Keystone species- **Species critical** to the functioning of the ecosystem and food web
 - ◆ Ex: Sea otters and kelp beds
 - ◆ Sea Otters protected...eat sea urchins...kelp beds regenerated.
- ✦ Larger populations with **larger gene pools survive** pressures
- ✦ **Bottleneck**- If populations shrink, the gene pool does as well
 - ◆ Increase in genetic disorders
 - ◆ Increase in possible extinction



Keystone Species



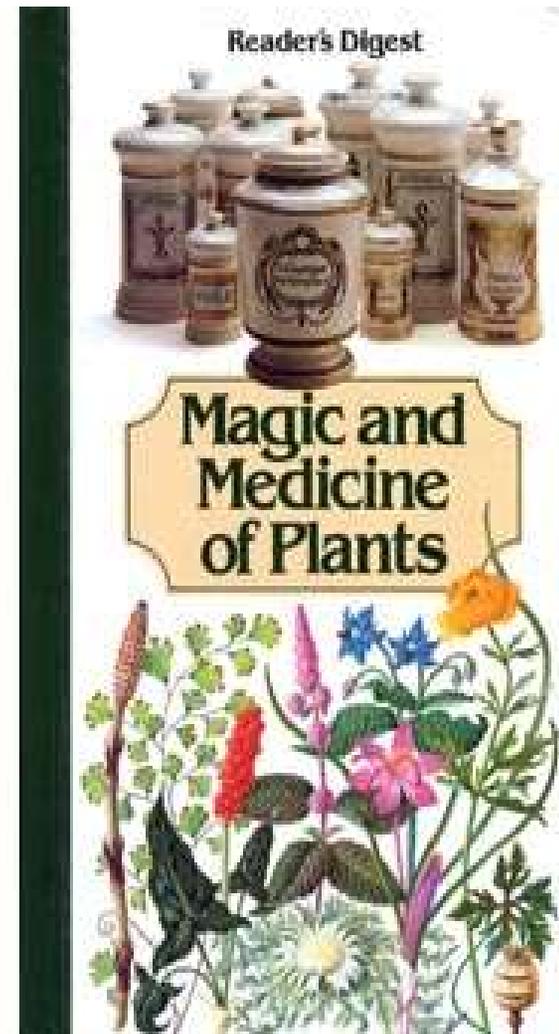
Sea otter in a kelp bed



Brown bear fishing for salmon

Benefits of Biodiversity

- ✦ Some species used for food, clothing, shelter, and **medicine**
- ✦ 1/4 of drugs derived from plants
- ✦ Almost all **antibiotics** from fungi
- ✦ **Undiscovered** species represent potential products and medicines



Benefits of Biodiversity



- ✦ Most **crops** originated from a few areas of **high biodiversity**
- ✦ **Hybrid-** New crop variety from genetic **recombination**
- ✦ **Famine** can result from dependence on too few plants

Ethics and Recreation

- ✦ Species and ecosystems have the **right to exist** regardless of value
- ✦ Outdoor activities enhanced by nature
- ✦ **Ecotourism-** Supports the conservation and sustainable development of ecologically unique areas



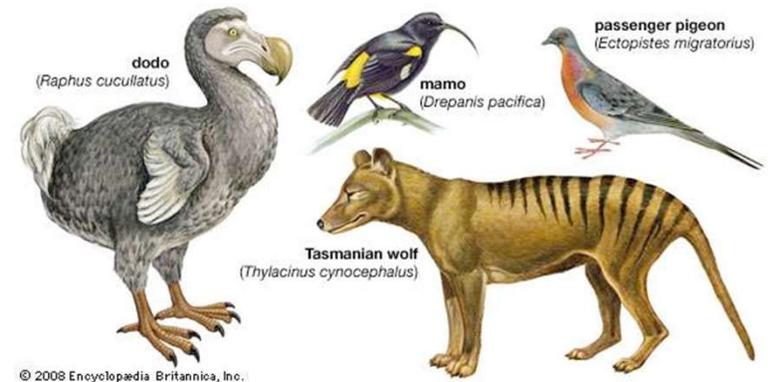
Extinctions

✦ **Mass extinction-** many species extinct in a short time

- ◆ Dinosaurs, 65 million years ago
- ◆ 25% of all species currently living by 2100

✦ **Species prone to extinction**

- ◆ **Small populations**
- ◆ **Migrating species**
- ◆ Those with large or **special habitats**
- ◆ **Ones exploited** by humans exploitation



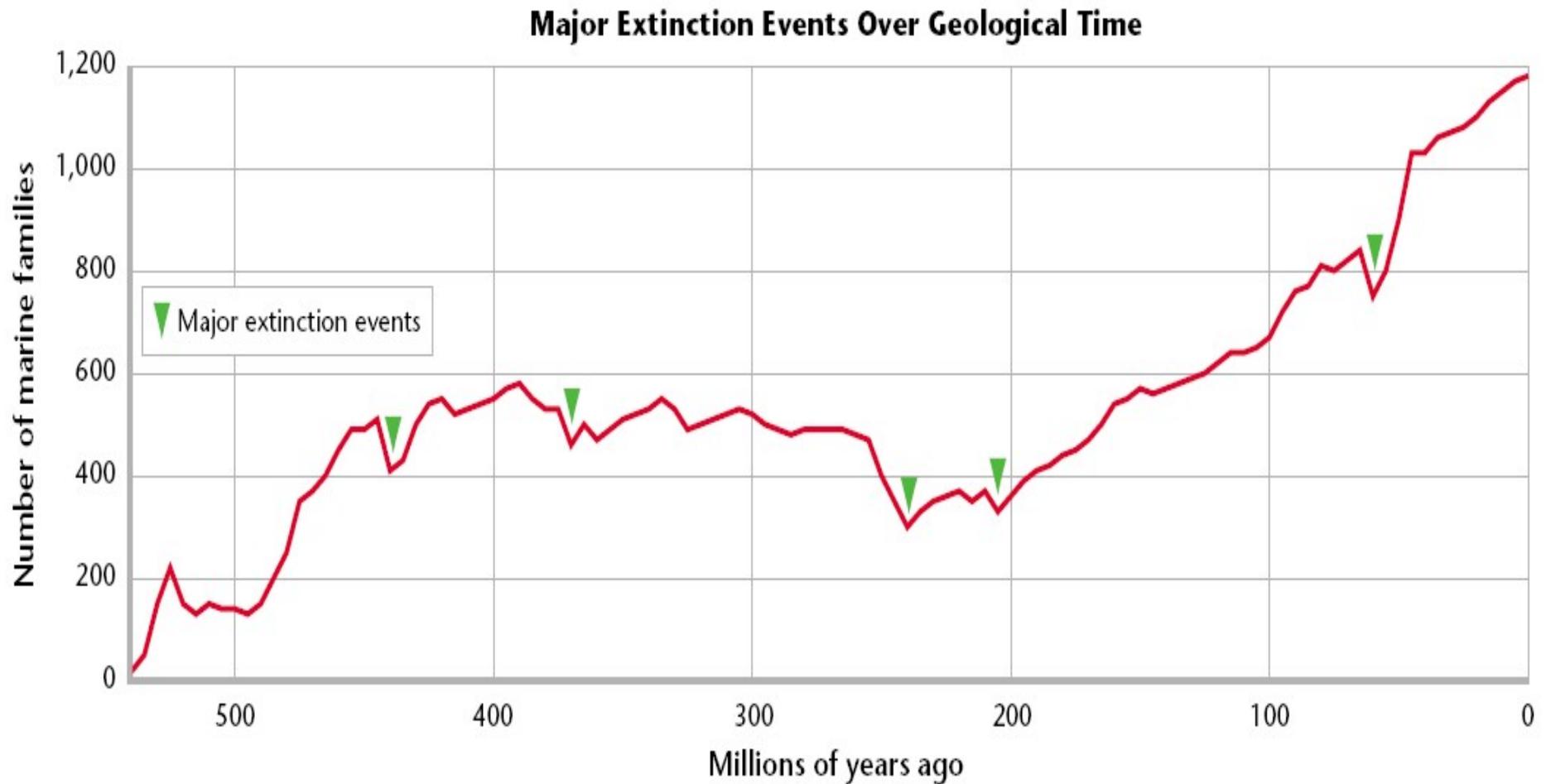
Endangered / Threatened

- ✦ **Endangered species-** Likely to become extinct
- ✦ **Threatened species-** Declining population and in danger of becoming endangered



Major Extinction Events Over Time

- ❖ Many scientists believe we are entering the 6th mass extinction.



Species Known to be Threatened or Extinct Worldwide

Species Known to Be Threatened or Extinct Worldwide			
Type of species	Number threatened (all categories of risk)	Number extinct (since ~1800)	Percent of species that may be threatened
Mammals	1,130	87	26
Birds	1,183	131	12
Reptiles	296	22	3.3
Amphibians	146	5	3.1
Fishes	751	92	3.7
Insects	555	73	0.054
Other crustaceans	555	73	1.03
Mollusks and worms	944	303	1.3
Plants	30,827	400	0.054

How Do Humans Cause Extinctions?

✦ **Habitat destruction** and fragmentation

- ◆ 75% of extinctions
- ◆ Ex: Florida panther

✦ **Invasive** exotic species (non-native)-Not native to region

✦ **Harvesting, hunting, and poaching** (illegal hunting)

- ◆ Passenger pigeons (early 1900s)
- ◆ American bison

✦ **Pollution**

- ◆ DDT and Bald Eagle



Critical Areas of Biodiversity

✦ **Endemic species-** (Native) Found only in a certain region

✦ **Tropical Rain Forest**

- ◆ 7% of Earth's surface

- ◆ 50% of the world's species

✦ **Coral Reefs and Coastal Ecosystems**

- ◆ Fraction of marine environment with many species

- ◆ 60% threatened by humans



Critical Areas of Biodiversity

✦ Islands

- ◆ Distinct but limited species
- ◆ Ex: Hawaii and Honeycreepers

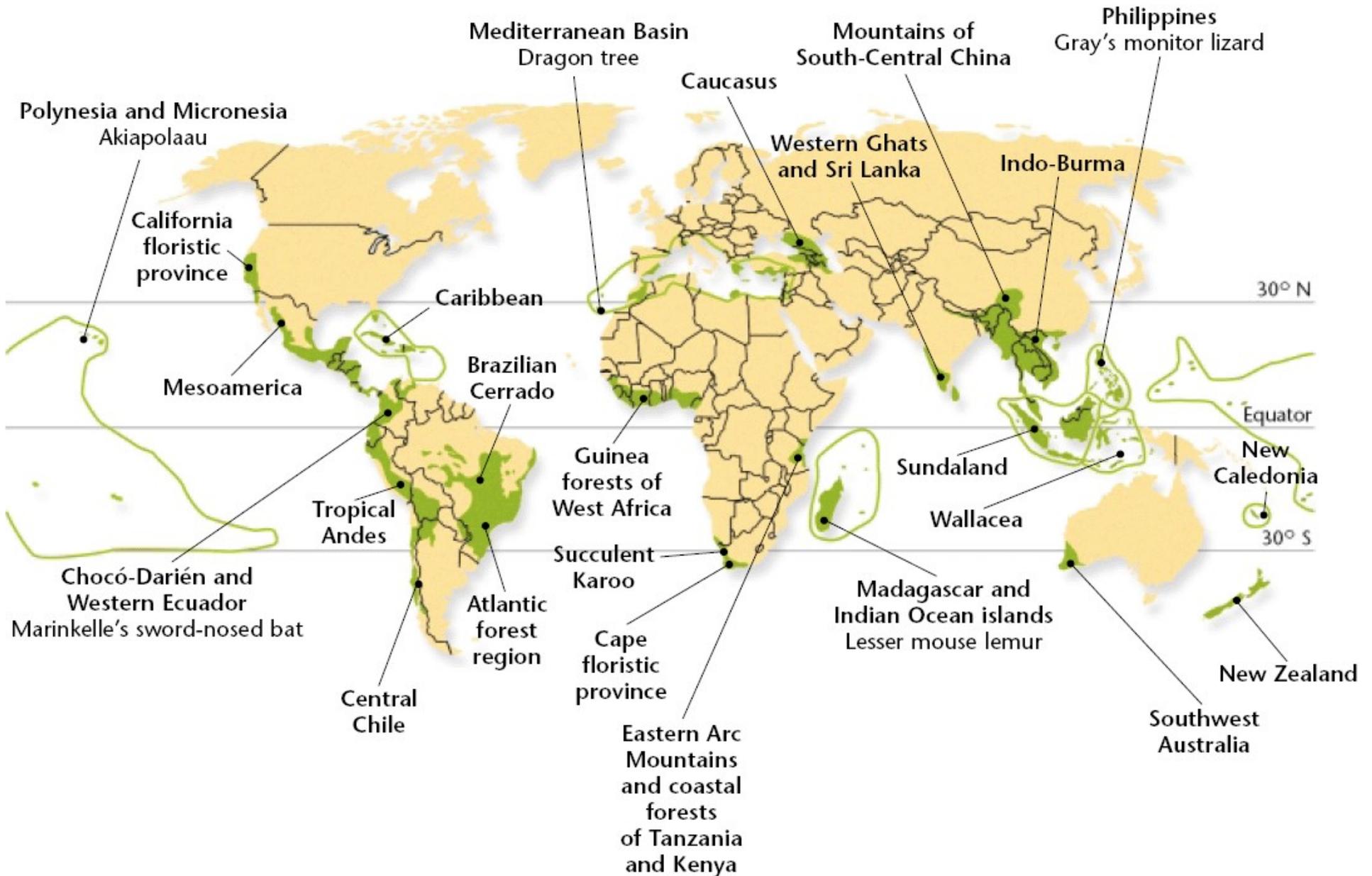


✦ Biodiversity hotspots- Most threatened areas of high species diversity

✦ Biodiversity in the U.S.

- ◆ CA Floristic Province: 3,488 native plants, 2,124 endemic species, and 565 threatened/endangered species
- ◆ Okefenokee Swamp (Georgia) Everglades, CA coast, Hawaii, Midwest prairies, Pacific NW forests

Biodiversity Hotspots



Saving Species One at a Time

✦ Captive-Breeding to return to wild.

- ◆ Ex: CA Condor
 - 9 left in 1986
 - 58 in wild/102 in captivity (2002)



✦ Preserving Genetic Material

- ◆ Germ plasm banks (reproductive cells / seeds)

✦ Zoos, Aquariums, and Gardens

- ◆ Some species last hope
- ◆ Living museums

✦ More Study Needed

- ◆ Captive species may not reproduce or survive in wild
- ◆ Small pop. vulnerable to infectious disease and inbreeding



Preserving Habitats and Ecosystems

✦ Most effective way to save species?

PROTECT the HABITAT

✦ Conservation strategies

- ◆ Protect entire ecosystems
- ◆ Focus on hotspots



Legal Protection for Species

✦ U.S. Laws

- ◆ 1973-Endangered Species Act
- ◆ USFWS- list of endangered and threatened species; 1,167 in 2018

Major Provisions of the Endangered Species Act

- The U.S. Fish and Wildlife Service (USFWS) must compile a list of all endangered and threatened species.
- Endangered and threatened animal species may not be caught or killed. Endangered and threatened plants on federal land may not be uprooted. No part of an endangered and threatened species may be sold or traded.
- The federal government may not carry out any project that jeopardizes endangered species.
- The U.S. Fish and Wildlife Service must prepare a species recovery plan for each endangered and threatened species.

Legal Protection for Species

✦ **United States Fish and Wildlife Service** must prepare a **species recovery plan**

- ◆ Propose to restore or protect habitat
- ◆ Causes controversy between developers and conservationists

✦ **Habitat Conservation Plan**

- ◆ Protect one or more species across large areas of land through trade-offs or cooperative agreements



International Cooperation

✦ International Union for the Conservation of Nature and Natural Resources (IUCN)

- ◆ Over 200 government agencies and 700 private organizations

✦ International Trade and Poaching

- ◆ Convention on International Trade of Endangered Species (CITES)
 - Stopped slaughtering of African elephants

✦ The Biodiversity Treaty

- ◆ To preserve biodiversity and ensure sustainable and fair use of genetic resources
- ◆ United Nations Conference on Environment and Development (*Earth Summit*) in 1992.

✦ Private Conservation Efforts

- ◆ More effective
- ◆ World Wildlife Fund; The Nature Conservancy; Greenpeace International



Balancing Human Needs

- ✦ **Protecting** species often **conflicts** with wants and needs. Some endangered species sources of **food** or **income**
- ✦ Not considered **valuable** due to a lack of understanding. Understanding is key to **protecting** species

