

Biodiversity

Biodiversity preserves three ecological systems

- Genetic Diversity: the measure of the variety of different versions of the same genes with individual species
- Species diversity: the number of different kinds of organisms (richness)
- Ecological diversity: the richness and complexity of a biological community

Only 1.4 million species are known- a fraction of the total.

70% known species are invertebrates, only 10-15% species live in North America and Europe. The tropics has the highest diversity.

Hot Spots of the World: The centers of greatest biodiversity tend to be in the tropics, especially tropical rain forests and coral reefs.

How do we benefit from Biodiversity?

- Food- 80,000 plants are edible to humans
- Drugs and Medicines- more than half of prescription drugs come from natural products. ex. Madagascar periwinkle inhibits cancer growth!
- Ecological Benefits-soil formation, waste disposal, air and water purification, nutrient cycling, etc. 95% of pests are controlled by other species that prey on them- better than chemicals!
- Aesthetic and Cultural Benefits- nature as "church". Provides psychological and emotional rejuvenation. Ecotourism is big.

Loss of Biodiversity

- Extinction: the elimination of a species 99.9% of all species that have ever existed are now extinct!
 - Natural Causes of Extinction: in an undisturbed ecosystem. Background rate of loss is one species every decade. Mass extinctions (that wiped out dinosaurs at the end of the Cretaceous period and two thirds of all marine life and 90% of all species at the end of the Permian period) were caused by climate changes, perhaps triggered when large asteroids struck the earth.
 - Human Causes of Extinction: Now we are losing species at thousands of times the natural background rate of extinction. 1/3 to 2/3 of all current species could go extinct by the MIDDLE of this century. :(We are presently in our sixth mass extinction.
1. Habitat Destruction: The biggest reason for the current increase in extinction is habitat loss. Habitat Fragmentation: Habitat fragmentation divides populations into isolated groups that are vulnerable to catastrophic events.
 2. Over harvesting (hunting and fishing) is responsible for depletion or extinction of many species.

- Passenger pigeon: 3 to 5 BILLION birds lived 200 years ago.
 - Fish stocks: 13-17 % of fishing zones are exhausted or nearly so and 3/4 of commercial ocean species are overharvested. 85 million tons of fish and marine invertebrates caught/year. Advancement in fishing technology is the culprit- sonar, drift nets, long baited hook lines, mechanical dredges and suction devices.
 - Rhinos, Tigers and Elephants (oh my): Valuable commercial products are also overharvested from nature such as rhino horns.
3. Predator and Pest Control- some animals are killed off because they are deemed as dangerous.
ex. coyotes, wolves

Exotic Species Introduction

- Exotic organisms are aliens introduced into habitats where they are not native and they are one of the greatest threats to native biodiversity.
- Exotics can be thought of as biological pollution.
- There are now more than 4,500 alien species in the United States. ex. Kudzu vine, purple loosestrife, asian longhorn beetles, zebra mussels.
- They have no natural predators in their new home and can often out compete native plants for food and space.
- Diseases- pathogens (disease organisms) can become predators when natural checks and balances are lost.
 - American chestnut was practically killed off by a fungal blight from China

Endangered Species Management

- Hunting and Fishing Laws- 1890's most states authorized laws which has resulted in a massive come back. ex. white tailed deer, turkeys, wood ducks and snowy egrets.
- The Endangered Species Act- ESA of 1973 prohibits the killing of a endangered species. The act expired in 1992. US has 1,500 species on the endangered and threatened list
- Endangered: considered in imminent danger of extinction ex. blue whales, tigers, elephants and Florida panther
- Threatened: those that are likely to become endangered ex. grizzly bears, gray wolves and sea otters
- Vulnerable species: naturally rare or have become so because of human activities. Problems arose with lawsuits. What about saving Mrs. Furbisher's lousewort??? Area in US with most endangered species is Southwest.

Characteristics of endangered species: large body size, large or very small territory requirement, long-lived, specialist species, low reproduction rate.

Successful Comebacks: American alligator, Bald Eagle and California condor Some people want the economic cost of recovery to be included in the decision making process. ex. Snail darter and Northern

Spotted Owl. 80% of the habitat for more than half of endangered species live on nonpublic property. Land owners are resistant. Habitat conservation plans (HCP) can be drafted that allow landowners to harvest resources or build on the land as long as the species benefits overall. (hmmm?)

Over the past decade, growing numbers of scientists, land managers, policy makers, and developers have been making that case that it is time to focus on a rational, continent-wide preservation of ecosystems that support maximum biological diversity rather than a species-by-species battle for the rarest or most popular organisms.

Minimum Viable Populations: Island Biogeography. Small numbers of surviving species are more vulnerable to extinction. The smaller and farther away an "island" is from a continent, the faster the extinction rate. Small populations can lose their genetic diversity from the founder effect, demographic bottleneck and genetic drift.

International Wildlife Treaties Convention on International Trade in Endangered Species (CITES). Prohibits the trade of endangered species (or their body parts) internationally. ex. Elephant tusks

Captive Breeding and Species Survival Plans: zoo breeding can reintroduce endangered species back into the wild. California condor and the peregrin falcon are great successes. But bats and whales won't reproduce in captivity. Doesn't really do much good if the habitat is destroyed...