



Global Biodiversity II : Losses and Threats

Losses of Biodiversity

- We are in a phase of *mass extinction* and the cause is anthropogenic.
- Tropical ecosystems are losing richness at the fastest rate: of the 10 million species on earth, 90% are terrestrial, 80% or 7.2 million species are believed to occur in the tropics.
- Marine environments are threatened and contain the most phyla (34; 16 endemic ones) whereas terrestrial environments have 11 phyla. Some deep sea areas have incredible diversity.

Losses of Biodiversity (*continued*)

- **Coral reefs are very diverse habitats having very high species richness, often higher in species/area than tropical rainforests. As high as 93% of the world's coral reefs have been damaged and at the current rate of destruction 60% could be gone in 20-40 years.**
- **Tallgrass prairie is one of the most threatened habitats in the world! Only 1% remain in their original condition.**

Losses of Biodiversity (*continued*)

- Many freshwater ecosystems are high in diversity and are threatened. Examples: African Rift Valley Lakes (Lake Victoria has lost 200 of 300 species of Cichlids; the largest vertebrate extinction since recorded time!, cause - introduction of Nile Perch and overfishing); Devils Hole Pupfish in Nevada; Alabama; Mississippi River Basin (loss of mussels, fishes)

Losses of Biodiversity (*continued*)

- **Estimating the loss of species is difficult. Even estimating habitat loss is difficult but we know for rainforests that about 2% of the remaining rainforest is lost per year.**
- **E.O. Wilson has estimated that about 75 species per day are being lost; 27,000 species per year in tropical forests. Tropical forests are only about 6% of the world's surface area.**
- **Wilson's general rule is that a 90% loss of area reduces the number of species by**

losses - continued

- 50%. This estimate must be "fitted" for the conditions of the habitat studied (i.e., the exponents of the equation are adjusted).
- Equation to remember: $S = cA^z$ ($z = 0.15$)
do the variables stand for? How would you graph this equation to get a straight line?

losses - continued (*continued*)

- **Case study: Extinction of birds on Barro Colorado Island (Karr)**
 - Are species lost at random?
 - What demographic attributes are associated with extinction?
 - Why are undergrowth species especially prone to extinction?
 - Does risk of nest predation vary among undergrowth species?
 - Does inbreeding account for extinctions on the island?

Hot Spots for Extinction

- 18 Global "Hotspots" have been identified. 14 occur in tropical rainforests and 4 in Mediterranean biomes. Below is a listing of the areas:
 - Madagascar
 - Brazil (Atlantic coast)
 - Ecuador (western)
 - Columbia (Choco)
 - Uplands of the western Amazon
 - Eastern Himalayas

list of hotspots continued -

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- Borneo**
 - Philippines**
 - Malaysian Peninsula**
 - New Caledonia**
 - Cote d' Ivoire**
 - Tanzania**
 - India (western Ghats)**
 - Sri Lanka**
 - California**
 - Chile (central)**
 - South Africa**
 - Australia (southwestern)**
 - (the last four are Mediterranean habitats)**

losses continued -

- Species-area inventories suggest there are at least 40 animal species for every plant species (total number assumed to be 10M)



losses continued - (continued)

- **Conservation International created the RAP (Rapid Assessment Program) in 1989.**
 - **RAP's goal is to quickly analyze and disseminate information on poorly known areas that are potentially important biodiversity conservation sites.**
 - **Each RAP team is comprised of the world's best field biologists in their areas of specialty (i.e. plants, birds, mammals, etc.).**

Patterns of Species Vulnerability

- **Rare Species - species can be rare in at least 7 different ways:**
 - **Locally abundant over a large range in a specific habitat**
 - **Locally abundant in several habitats but restricted geographically**
 - **Locally abundant in a specific habitat but restricted geographically**
 - **Constantly sparse in a specific habitat but over a large range.**
 - **Constantly sparse and geographically restricted in several habitats**

rarity continued -

- Constantly sparse and geographically restricted in a specific habitat
- **Rarity is a typical situation in most natural communities.**
- **Species need not be "rare" to become extinct. Examples: Passenger Pigeon, Carolina Parakeet, Bison, Bighorn sheep.**
- **Life History Characteristics - K-selected organisms.**
- **Species Dependent on Keystone Species**
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Patterns of species vulnerability continued -

- Predators that reduce competition
- Food sources that reduce competition
- Decomposers (nitrogen fixing bacteria, phosphorus mobilizing fungi) that allow nutrient flow.
- Mobile link species - pollinators (bees, bats, insects, birds, etc.)
- Keystone Mutualist Species - plants that supply food to mobile link species (palms, figs)

Patterns of Species Vulnerability -

- **Genetic Losses**
 - intraspecific biodiversity
 - subspecies, races, populations
- **Threats to Biodiversity**
 - Habitat destruction, fragmentation, alteration.
 - Exotic Species
 - Exploitation
 - Pollution and Toxification
 - Secondary and Synergistic Interactions
 - Disruption of the evolutionary process