Sustaining Wild Species

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Outline

1. Why Preserve Wild Species?
   economic, medical, scientific, ecological, aesthetic, recreational, ethical reasons

2. Current Crisis of Extinction
   background vs. mass extinction, endangered & threatened species

3. Causes of Depletion & Extinction
   root causes, habitat loss, overexploitation, poaching

4. Protecting Wild Species
   bioinformatics, treaties, laws, Endangered Species Act, refuges, zoos

5. Case Studies
   migratory birds, fisheries, whales

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1. Why Preserve Wild Species?

Why should we work to prevent the premature extinction of wild species?

- **economic & medical importance**: wild plants & animals provide a huge number of economic products & medicines;

- **scientific & ecological importance**: scientific understanding comes from study of wild species; ecological services include nutrient recycling, watershed value, production of oxygen, moderating climate, & detoxifying toxic substances;

- **aesthetic & recreational importance**: source of beauty, wonder, inspiration, & enjoyment;

- **ethical importance**: some believe that each species has an inherent right to exist.
2. Current Crisis of Extinction

Why do conservation biologist believe there is a mass extinction crisis?

- **background** or **natural rate of extinction** can be observed in the fossil record;

- **mass extinction** events, involving widespread extinction of large numbers of species, have been observed to occur five times in the fossil record (20 to 60 million years apart);

- about 1.75 million species have been identified; estimates that as many of 100 million species exist;

- while difficult to document, estimates show that humans are causing extinction rates much higher than background rates, such that there is a crisis.
Various species have become extinct because of human activities.

Fig. 25–3
What are threatened & endangered species?

• biologists distinguish three levels of extinction:
  - **local extinction**: when a species is no longer found in area it once inhabited, but is still found elsewhere;
  - **ecological extinction**: when so few individuals exist that a species no longer plays a significant ecological role;
  - **biological extinction**: when individuals of a species exist no longer exist.

• the Endangered Species Act requires listing & protection of two categories of species:
  - **endangered species**: a species with so few individuals that it could soon become extinct over all or most of its range;
  - **threatened species**: a species that is still abundant in its natural range, but declining such that it is likely to become endangered.
Some species that are endangered or threatened because of human activities. Populations of some species are recovering (such as the bald eagle & peregrine falcon).

Fig. 25–4
More species that are endangered or threatened because of human activities.

Fig. 25–4
Still more species that are endangered or threatened because of human activities.

Fig. 25–4
Some characteristics of extinction–prone species:

- Low reproductive rate (e.g., blue whale, California condor);
- Specialized feeding habits (e.g., giant panda);
- Feed at high trophic level (e.g., Bengal tiger);
- Large size (e.g., Asian elephant);
- Limited breeding area (e.g., green sea turtle);
- Limited distribution (e.g., woodland caribou);
- Fixed migratory patterns (e.g., whooping crane);
- Preys on livestock (e.g., timber wolf);
- Behaviors that contribute to extinction (e.g., Carolina parakeet, when one bird shot others hover over body).
Worldwide about 25% of mammals are at risk of extinction. The highest percentages at risk are apes & monkeys (46%), moles & shrews (36%), & antelopes & cattle (33%).

Fig. 25–5
Estimated number of species extinctions of plants & animals by state in the lower 48 states. Alabama leads in extinct species.

Fig. 25–6
3. Causes of Extinction & Depletion

Root causes:
- human population growth;
- economic systems & policies that fail to value the environment & promote exploitation;
- greater per capita resource use as a result of economic growth.

Direct causes:
- habitat loss & degradation;
- habitat fragmentation;
- commercial hunting & poaching;
- overfishing;
- predator & pest control;
- sale of exotic pets & decorative plants;
- climate change & pollution;
- deliberate or accidental introduction of nonnative species.
Many species of sea turtles are becoming endangered because of loss of beach habitat for laying eggs, taking of eggs for food, & unintentional capture by fishing boats.
Causes of Extinction & Depletion

Deliberate or accidental introduction of nonnative species is the second biggest cause of animal & plant extinctions (after habitat loss & degradation).

• example: introduction of fire ants in 1930s from South America to Alabama; subsequently spread throughout south, Texas, & various states in western U.S.; where established up to 90% of local ant populations reduced or eliminated;

• example: introduction to Great Lakes of zebra mussels from Europe & quagga mussels from Russia (in ship ballast water) has depleted food for other lake species & caused major property damage.

(see table 25–2)
4. Protecting Wild Species

Three approaches to protecting wild species:

- **ecosystem approach**: aims to preserve balanced populations of species in their native habitats;

- **species approach**: based on identifying & protecting endangered species on a case–by–case basis;

- **wildlife management approach**: manages game species for sustained yield.
Bioinformatics is the applied science of managing, analyzing, & communicating biological information.

- building computer databases to organize & store useful biodiversity information;
- providing computer tools to find, visualize, & analyze biodiversity information;
- providing means for communicating biodiversity information, especially using the internet.
The **Endangered Species Act (ESA)** of 1973 authorizes the listing & protection of threatened & endangered species & subspecies.

- National Marine Fisheries Service (NMFS) charged with listing & protection of marine species;
- U.S. Fish & Wildlife Service charged with listing & protection of all other species;
- since 1975 intense efforts have attempted to weaken the ESA;
- ESA is still one of the most powerful means for protecting wild species.
Reduction in the ranges of four mammals have resulted from a combination of habitat loss & hunting.

Fig. 25–8
In recent years overfishing has become an increasing threat to aquatic biodiversity.

Fig. 25–11

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Case Studies

Major commercial fishing methods. Modern methods enable increasing harvest of decreasing populations.

Fig. 25–12
The major flyways used by migratory birds, mostly waterfowl. Managing populations of waterfowl requires multinational efforts to protect habitats along the flyways.

Fig. 25–19
Populations of cetaceans (whales & dolphins) have been depleted & many species are threatened or endangered.

Between 1995 & 1975 overharvest drove 8 of 11 major whale populations to commercial extinction. Populations are in process of recovering.

Fig. 25–20