Conservation Biology:
The science of managing our earth’s biological systems

Conservation Biology
• Integrates ecology, population biology, physiology, molecular biology, genetics, evolutionary biology to conserve biological diversity at all levels
• Sustain ecosystem processes
• Restoration ecology - rehabilitate degraded systems

Biodiversity
• Species diversity: number of different species
• Genetic diversity: ensuring a healthy gene pool—problems with bottlenecks
• Ecological diversity: numbers of ‘habitat types’ — relates directly with species diversity
• But WHY is it important??

What’s the problem?
• Fisheries crashing
• Resource depletion
• Sustainable harvesting?
• Social/economic problems?
• That global insurance policy?
• Disease
• Unknowns?

4 major threats to biodiversity
• Habitat destruction
• Introduced species
• Overexploitation
• Ecosystem dynamics disruption (eg. the otters and the kelp beds)

Approaches to conservation biology
• Population approach
  – Managing for individual populations, not an entire species.
    Eg. Elephants
  – Relocation programs
• Species approach
  – Managing for a species, eg. one in critical status: Pandas, California Condors
• Breeding programs
• Ecosystem approach
  – Managing for an interconnected system to preserve diversity
Asian Elephants

- 30,000 in 13 countries??
- Fragmented habitat
- Habitat loss and conflict with farmers
- Ivory poaching
- Illegal capture: work or tourism

Species Approach Case Study: The Asian Elephant

- Elephant and wildlife corridor between park and sanctuary
- Manage human/elephant conflict (elephant deterrents
- Education
- Use domesticated Elephants to help protect
- Radio-tagging elephants outside of protected areas
- Control poaching
- Restore landscapes for elephants
- Ecotourism ($$)
- Breeding
- Monitoring populations
- Research: life history, behavior
- Translocation

African Elephants

- History of severe poaching and habitat fragmentation
- Establishment of protected areas left some populations expanding and others still in trouble
- Manage populations separately
- Complex social systems
- Translocation programs
- Induced sterility
- Culling

Ecosystem Approach

IUCN - world conservation union:

The Ecosystem Approach places human needs at the centre of biodiversity management. It aims to manage the ecosystem, based on the multiple functions that ecosystems perform and the multiple uses that are made of these functions. The ecosystem approach does not aim for short-term economic gains, but aims to optimize the use of an ecosystem without damaging it.

Population Approach

- Population Viability Analysis
  - Chances of a population persisting or becoming extinct
  - What are the specific characteristics of this population?

  - Takes into account:
    - Habitat disturbances
    - Genetic variability
    - Life History Characteristics
    - Fertility
    - Birth and Death rates

  Minimum viable population
  Minimum habitat needed
  Effective population size

Management approaches

- Landscape and regional conservation
  - Sustaining biotas - look at past and present patterns
- Habitat fragmentation
  - Corridors
  - Metapopulations/subpopulations
- Establishing protected areas - not an easy process!
  - Eg. marine reserves
  - Multiple use?
  - Zoned reserves
Management

**Restoration** Ecology: restoring disturbed/depleted habitats
Bioremediation—using living organisms to detoxify and/or restore ecosystem function
Augmentation of ecosystem processes: biogeochemical cycles and limiting nutrients: restore those

Protected areas:
The Convention on Biological Diversity defines protected areas as: "a geographically defined area which is designated or regulated and managed to achieve specific conservation objectives."

IUCN the world conservation union defines protected areas as: "areas of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means."

Protected areas:
Multiple use
Wilderness areas
Buffer zones for use
Recreational areas

Your National Wildlife Refuge System
Methods Box (page 1169) Using Computer Mapping Techniques to Inventory and Manage Landscapes:

**Gap Analysis**

- Map of vegetation patterns and their causes
- Distribution of rare endemic species
- Distribution of protected areas
- Projected range of Orange-footed skinks
- Protected areas

*Diagram by Professor modestus, Inc. - publishing and academic consultancy.*