

## Chapt. 55 – Conservation Biology (and Environmentalism)

**Conservation biology** is a goal-oriented science that seeks to understand and counter the biodiversity crisis

### Biodiversity Crisis

The crisis: human activities are eroding biodiversity at rates that match or exceed the highest in Earth's history [Fig. 26.8]

*E.g.*, the Hawaiian Islands case study:

Half of Hawaii's native birds went extinct soon after the Polynesians arrived  
Half of the remaining species of birds went extinct soon after Captain James Cook arrived

*E.g.*, the Dodo went extinct ~80 years after Europeans landed on Mauritius

[Recommended reading (after the semester ends):

*The Song of the Dodo* by David Quammen]

The crisis is affecting biodiversity at all levels of biological organization [Fig. 55.2]

Gordon Orians, National Academy of Sciences member, refers to the current geologic epoch as the “**Homogocene**”

**Conservation biology** is a goal-oriented science that seeks to understand and counter the biodiversity crisis

**Conservation biology** blends both **curiosity-driven research** and **applied research**:

What causes biodiversity to decline?

To the extent that the causes are unnatural and anthropogenic, what can be done?

### Why should we be concerned?

Conservation biologists in particular, and environmentalists in general, provide at least 3 types of arguments:

#### **Aesthetic reasons**

Would you rather live in a world with or without clear mountain streams, grizzly bears, and orchids?

#### **Ethical reasons**

Do we have the right to drive other species to extinction?

Do we have the right to leave the world in worse shape for our children and grandchildren than it was in when we were born?

### **Economic reasons**

Would we be better off without penicillin and other pharmaceuticals derived from nature?

Would we be better off without the estimated \$33 trillion (2 x the global gross national product) in **ecosystem services** provided by the whole-earth ecosystem?

Would we be better off without commercial and sport fisheries?

### **What are the main threats to biodiversity?**

E. O. Wilson, National Academy of Sciences member, uses the acronym **HIPPO** to list them:

#### **Habitat destruction**

**Habitat destruction, degradation, and fragmentation** are probably the most important causes of extinction today [Fig. 55.14; see also Figs. 55.5 & 55.15]

[Fig. 55.13] Red-Cockaded Woodpecker (An endangered species according to the U. S. Endangered Species Act)

[Fig. 55.17] These **hotspots of biodiversity** account for only 1.5% of the Earth's land, but if they were destroyed, 1/3 of Earth's species would go extinct

#### **Introduced and invasive species**

**Introduced (exotic) species** often become **invasive**, at which point they rapidly exclude native species

*E.g.*, Fire Ant (*Solenopsis invicta*), Philippine Brown Tree Snake, European Starling, Kudzu, Hydrilla, Snakehead, Walking Catfish

#### **Pollution**

#### **Population**

The human population explosion is the root cause of the other threats [Fig. 52.22]

#### **Overexploitation**

Harvesting at rates exceeding the ability of populations to rebound is not **sustainable**

*E.g.*, Atlantic Cod

The threats to biodiversity generally reduce population sizes of native species

Small populations suffer for **genetic** and **demographic** reasons

Small populations may enter into an **extinction vortex** owing to loss of genetic variability [Fig. 55.9]

Small populations are also especially susceptible to **demographic stochasticity** (the random component in population dynamics)

**Managers** try to maintain native populations well above their **minimum viable population (MVP) sizes** – the population sizes below which populations will inevitably become extinct in the near future

**Managers** use a variety of strategies, including habitat **restoration**

[Fig. 55.13] Red-Cockaded Woodpecker (An endangered species according to the U. S. Endangered Species Act)

**Managers** often need to coordinate their activities beyond the borders of their domains... which usually increases the complexity of their task

[Fig. 55.18] Grizzly Bears in Yellowstone National Park

### Conflicting demands...

Conservation and environmental stewardship attempt to preserve biodiversity at all levels; to do so requires the combined contributions of science, technology, policy-making, economics, and *etc.*

*E.g.*, A Machigenga family, a jaguar, and a member of the developed world differ in their interests in Peruvian rainforest

### What can you do?

Follow the environmental mantra: **Reduce, Reuse, Recycle**

Combat social inequality and environmental degradation through personal and political action

Consider the words of Nobel Peace Prize laureate (2004), Ms. Wangari Maathai of Kenya: “Protecting the global environment is directly related to securing peace”

Devote some of your time and energy to meaningful causes (local to global)

Be informed...

You could take **BIOL 4015, Conservation Biology**; offered every semester, including summer

See *Time Magazine*, April 9, 2007 issue for “51 things you can do to make a difference”