

PowerLecture:
Chapter 27
Biodiversity In Perspective
Section 27.0: Weblinks and InfoTrac

See the latest Weblinks and InfoTrac articles for this chapter online or click highlighted articles below (articles subject to change)

- Section 27.0: NOVA—Secrets of Easter Island
- Section 27.0: Mysterious Island (Easter Island). Paul Trachtman. *Smithsonian*. Mar. 2002.
- Section 27.0: The Physical Destruction of Nauru. John Gowdy. *Land Economics*. May 1999.

How Would You Vote?

The following is the question for this chapter. See national results below.

- Would you be willing to pay extra for goods that are produced in ways that protect biodiversity?

Impacts, Issues: The Human Touch

- 165 km² island in Polynesia
- Hundreds of massive stone statues
- When Europeans first visited in 1722, the population was small and there was little vegetation

Impacts, Issues: The Human Touch

- Colonized around 350 A.D.
- Island was fertile and densely forested
- By 1400, soil fertility and crop yields had declined
- By 1550, the forests were all gone
- Food scarcity led to warfare

Impacts, Issues: The Human Touch

- On Easter Island, 15,000 people nearly totally destroyed the biodiversity upon which they depended
- Today, there are six billion people on Earth and global biodiversity is declining
- A worldwide extinction crisis is in the making

Section 27.1: Weblinks and InfoTrac

See the latest Weblinks and InfoTrac articles for this chapter online or click highlighted articles below (articles subject to change)

➤ Section 27.1: The Extinction Files

➤ Section 27.1: The Currency and Tempo of Extinction. Helen Regan et al. *The American Naturalist*, Jan. 2001.

Biodiversity & Extinction

- 90 percent of all species that have ever lived are now extinct
- Biodiversity is greater than ever
- Current range of biodiversity is the result of past extinctions and recoveries

Mass Extinctions

- There have been five great mass extinctions
- Causes of mass extinctions are not always clear
 - Asteroid hit Earth at the K-T boundary, but many species were already in decline

Slow Recoveries

- Each mass extinction has been followed by an adaptive radiation
- Biodiversity recovers very slowly
- It takes 20 million to 100 million years to reach the pre-mass extinction level of diversity

Dead as a Dodo

- Flightless bird lived on the island of Mauritius
- Killed off by Europeans
- Once the dodo was extinct, a native tree stopped reproducing
- May have coevolved with dodo

Section 27.2: Weblinks and InfoTrac

See the latest Weblinks and InfoTrac articles for this chapter online or click highlighted articles below (articles subject to change)

➤ Section 27.2: NOVA—World in the Balance

➤ Section 27.2: Atlas of Population & Environment

➤ Section 27.2: Cultivating Revolutions (early pressures to use agriculture). Bruce Bower. *Science News*, Feb. 5, 2005.

➤ Section 27.2: Applying the Brakes (cars). Jane Holtz Kay. *The Nation*, Sept. 17, 1990.

Humans and
Mammalian Diversity

- Humans began hunting mammals about 2 million years ago
- About 11,000 years ago, they began to drastically reduce mammalian habitat

- Of the 4,500 living mammal species, 300 (6.7 percent) are endangered

Section 27.3: Weblinks and InfoTrac

See the latest Weblinks and InfoTrac articles for this chapter online or click highlighted articles below (articles subject to change)

- Section 27.3: [Rachel Carson \(biographical site\)](#)
- Section 27.3: [PAN Pesticides Database:](#)
- Section 27.3: [The Unquiet Voice of *Silent Spring*: The Legacy of Rachel Carson. Martin Walker. *The Ecologist*. Aug.–Sept. 1999.](#)

Rachel Carson

- Oceanographer and marine biologist
- Published *Silent Spring* in 1962
 - Described the harmful effects of pesticides on songbirds and other species
- Book helped launch the environmental movement

Section 27.4: Weblinks and InfoTrac

See the latest Weblinks and InfoTrac articles for this chapter online or click highlighted articles below (articles subject to change)

- Section 27.4: [The Red List of Endangered Species](#)
- Section 27.4: [USGS—Status & Trends of Biological Resources](#)
- Section 27.4: [Invasive Species Program](#)
- Section 27.4: [Dammed Experiments! \(habitat fragmentation\). Jared Diamond. *Science*. Nov. 30, 2001.](#)
- Section 27.4: [The Endangered Species Act Is Broken. William Murray. *Wood & Wood Products*. Mar. 1994.](#)

Endangered Species

- An endemic species that is extremely vulnerable to extinction
 - *Endemic* means a species originated in one geographic region and is found nowhere else

Threatened Regions

Habitat Loss

- Physical reduction of suitable places to live, as well as loss of habitat as a result of chemical pollution
- In the U.S.:
 - 98 percent of tallgrass prairies are gone
 - 50 percent of wetlands have been destroyed

Habitat Fragmentation

- Habitats are chopped up into patches
- Three effects:
 - Increases habitat edges
 - Decreases number of individuals that can be supported; may be too few to allow breeding
 - Decreases the area in which individuals can find food or other resources

Island Biogeography

- Study of the factors affecting diversity on islands
- Has implications for predicting extinction of non-island species
- Isolated patches of habitat are like islands

MacArthur-Wilson Model

- Uses island biogeography to estimate future extinctions
- Model predicts
 - Destruction of 50 percent of a habitat island will drive 10 percent of endemic species to extinction
 - Destruction of 90 percent of a habitat island will drive 50 percent of species to extinction

Indicator Species

- Species that provide warning of changes in habitat and impending widespread loss of biodiversity
- Example:
 - Migratory birds that breed in N. America and winter over in tropical forests
 - Study found populations are plummeting as a result of deforestation, habitat fragmentation

Exotic Species

- Species that have been introduced into a habitat, either deliberately or accidentally
- Exotic species often have characteristics that allow them to outcompete endemic species
- Play a role in 70 percent of cases where endemic species are threatened

Hunting and Whales

Section 27.5: Weblinks and InfoTrac

See the latest Weblinks and InfoTrac articles for this chapter online or click highlighted articles below (articles subject to change)

- Section 27.5: Coral Health & Monitoring Program
- Section 27.5: Coral Reefs Face the Threat of Extinction. Peter Weber. USA Today. May 1993.

Distribution of Coral Reefs
Threats to Coral Reefs

- Natural threats, such as hurricanes
- Man-made threats
 - Water pollution, oil spills
 - Dredging
 - Dynamite and cyanide fishing
 - Coral bleaching

Coral Bleaching

- Reef-building corals have photosynthetic, dinoflagellate symbionts
- When stressed, corals expel the protists
- If the stress persists, the coral dies, leaving its bleached hard parts behind
- Coral bleaching may be an effect of global warming and increased sea temperatures

Section 27.6: Weblinks and InfoTrac

See the latest Weblinks and InfoTrac articles for this chapter online or click highlighted articles below (articles subject to change)

- Section 27.6: Society for Conservation Biology
- Section 27.6: UNEP World Conservation Monitoring Centre
- Section 27.6: The Land Needs Friends (10 profiles). Steve Howe et al. Backpacker. Sept. 1996.
- Section 27.6: Natural Capital. Todd Wilkinson et al. American Forests. Winter 2005.

Conservation Biology

- Systematic study of biodiversity

- Works to elucidate the evolutionary and ecological origins of biodiversity
- Attempts to identify ways to maintain biodiversity for the good of human populations

Identifying Hot Spots

- A global survey of biodiversity is impossible
- Researchers are identifying habitats where many endemic species are facing extinction
- Regional data is pooled to create a global inventory of biodiversity

What's It Worth?

- Economic analysis can assign future value to ecoregions
- Successful conservation requires that sustaining biodiversity have greater economic value than destruction
- Biodiversity may have future economic value as a source of medications or chemical products

People versus Biodiversity

- The main threat to biodiversity is growth of human populations
- Many poor people must now choose between the good of endangered species and the good of their families
- People will sustain biodiversity when they can make a living by doing so

Section 27.7: Weblinks and InfoTrac

See the latest Weblinks and InfoTrac articles for this chapter online or click highlighted articles below (articles subject to change)

- Section 27.7: Cows and Fish—Riparian Awareness
- Section 27.7: Conservation Biology in the U.S.-Mexican Border Region. Rick Van Schoik. *World Watch*, Nov.–Dec. 2004.

Strip Logging

- Allows tropical woods to be logged in a profitable, sustainable way
- Sloped forested area is logged in strips, working up the slope
- Runoff from logged areas flows to regenerating forest, enhancing its growth

Strip Logging

Riparian Zones

- Narrow corridors of vegetation along streams or rivers
- Rich in endemic species
- In the American West, cattle have destroyed most riparian vegetation
- Rotating cattle away from riparian zones saves endemic species and provides richer grazing

