

Ecology



"And may we continue to be worthy of consuming a disproportionate share of this planet's resources."

Conservation Ecology

- Biodiversity
 - Definition
 - Ecological services
 - Threats to biodiversity (habitat destruction, global warming, pollution, introduced species, overexploitation)
 - Fragmentation & Edges
- Conservation Biology
 - Methods Conservation
 - Legislation
 - Successes
 - Reserves
- Bioremediation
- Sustainable Development



Components of biodiversity



Genetic diversity



Species diversity



Ecosystem diversity



Sub-species diversity

Biodiversity hotspots - areas with a high concentration of endemic species, experiencing rapid habitat loss



Why care about biodiversity?

Aldo Leopold (1896-1948)



- Intrinsic Value
- Utilitarian



John Muir, 1838-1914

Ecosystem Services

Preserving biodiversity preserves ecosystem services, and directly provides things of pragmatic value to us.

- • Food, fuel, and fiber
- • Shelter and building materials
- • Air and water purification
- • Waste decomposition
- • Climate stabilization and moderation
- • Nutrient cycling
- • Soil fertility
- • Pollination
- • Pest control
- • Genetic resources



Healthy ecosystems provide free "services" to human communities, including: water filtration, groundwater recharging, stormwater control, air purification, nutrient recycling, crop pollination, and soil enrichment.

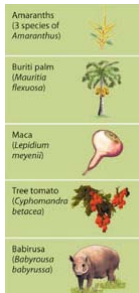
<http://oregonstate.edu/instruction/anth481/ectop/ecservices.htm>

Benefits of Biodiversity: “Biophilia”



- **Biophilia** = human love for and attachment to other living things

Benefits of Biodiversity: Food & Medicine



- Food species
- Genetic diversity on crops
- Pollination
- 10 of top 25 drugs come from plants

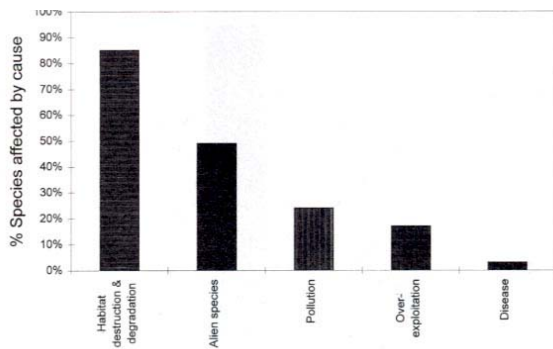
Plant	Chemical	Medical uses
Plavagin (Atractylodes chinensis)	Bromelain	Control blood inflammation
Azelaic (Ziziphora clinopodioides)	Colchicine	Anticancer agent
Yellow vincetoxin (Cathartus adjectivus)	Quinine	Antimalarial
Common thyme (Thymus vulgaris)	Thymol	Cure fungal infection
Pacific yam (Dioscorea oppositifolia)	Taxol	Anticancer (breast, ovarian, lung, etc.)
Velvet bean (Mucuna pruriens)	L-Dopa	Parkinson's disease suppressant
Common foxglove (Digitalis purpurea)	Digitalin	Cardiac stimulant

Biodiversity Loss & Extinction



- **Extinction** = last member of a species dies and the species vanishes forever from Earth
- **Extirpation** = disappearance of a particular population, but not the entire species globally

Primary Causes of Biodiversity Loss

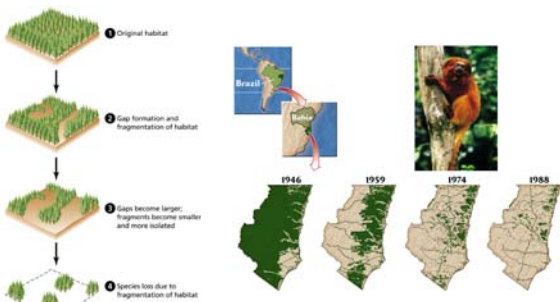


Threats to terrestrial species

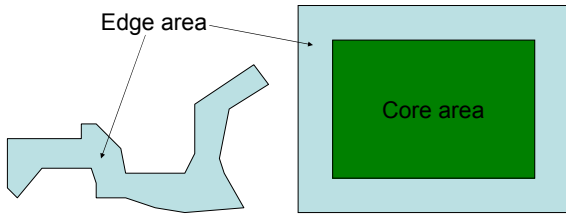
- Terrestrial Habitat Loss
- 39-50% of land surface transformation



Fragmentation

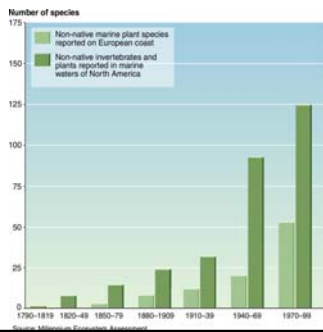


Edge Effects



- **Core area** – part of a patch not impacted by edge effects

Introduced/Invasives (Species & Diseases)



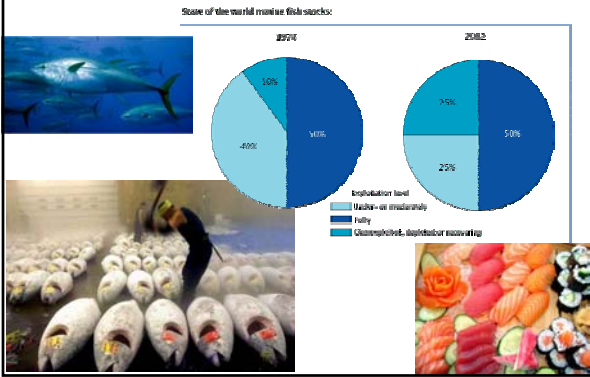
Invasive Species

HOMOGENIZATION

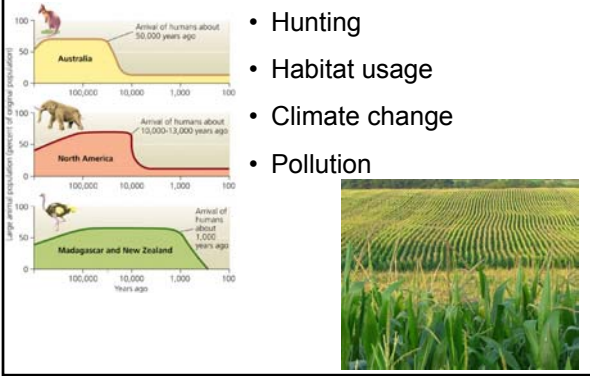
- The distribution of species on Earth is becoming more homogenous
- The rate of invasion is increasing over time



Exploitation/Overharvesting



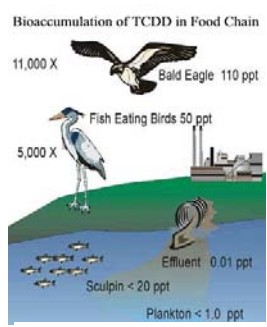
Human Population Growth



Pollution



Eutrophication at Salton Sea



Bioaccumulation of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) by fish downstream of pulp and paper mills in Maine.

Conservation Biology

Concerned with *loss of biodiversity*,
not just loss of species

- History & Legislation
- Methods
- Successes
- Reserves & Corridors



Conservation Policies

- Federal Water Pollution Control Act (Clean Water Act): 1948
- Clean Air Act: 1963
- Save San Francisco Bay Association: 1961
- National Wildlife System Administration Act: 1966
- National Environmental Policy Act: 1969
- CITES: 1973
- Endangered Species Act: 1973
- CBD: 1992
- Kyoto Protocol: 1997



Kay Kerr, Sylvia McLaughlin
and Esther Gulick

http://epw.senate.gov/environmental_laws.htm

Methods of Conservation

- Seed, sperm & egg banks
- Captive Breeding & Re-introductions
- Protection (Endangered Species Act)
- Translocations
- Habitat Restoration
- Protecting Hotspots
- Creation of Reserves



Captive Breeding



Many endangered species are being bred in zoos, to boost populations and reintroduce them into the wild.



[Last Living Pair of Rafetus Turtles](#)

[Updates on Rafetus Turtles](#)

Protecting Hotspots

- **Biodiversity hotspot** = an area that supports an especially high number of species **endemic** to the area, found nowhere else in the world



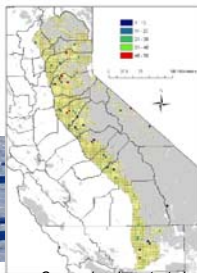
- *Endangered golden lion tamarin, endemic to Brazil's Atlantic rainforest Preserve, Poço das Antas, which has been almost totally destroyed by deforestation for agriculture.*

Reserve Design Goals

- Large intact functioning ecosystems
- Areas with high biodiversity
- Conserve significant species

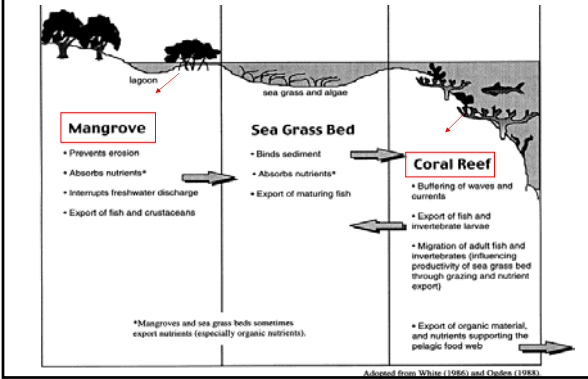


Wolves in Yellowstone National Park



Grey = already protected

Size & Functional Units



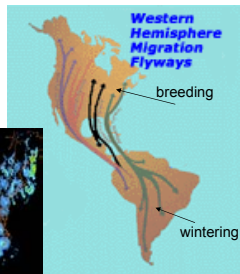
CONNECTIVITY

- Gene Flow
- Migration Routes
- Habitat Changes
- Migration



Wildlife Overpass

Stop-over sites on migration routes



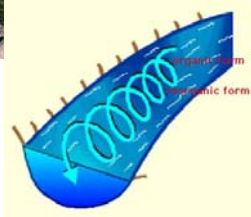
<http://www.news.cornell.edu/stories/June09/WindmillsWorkshop.html>

Sustainable Development

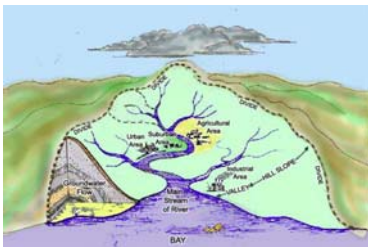


He wants a washing machine...like you...

She needs to plant crops to feed her kids...



Watershed



http://connecticutwatertrails.com/watershed_anim.gif

Oakland Creeks