Why is Biodiversity Important?

Presentation
Working version, December 2003

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This material is based on work supported by the National Science Foundation under the Course, Curriculum and Laboratory Improvement program (NSF 0127506), and the United States Fish and Wildlife Service (Grant Agreement No. 98210-1-G017).

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Values are Subjective: Perspectives and Scales

Land developer

Local communities

Oil company

Government agency

Source: Sterling/Frey © AMNH-CBC

Aquaculture company

Environmental group

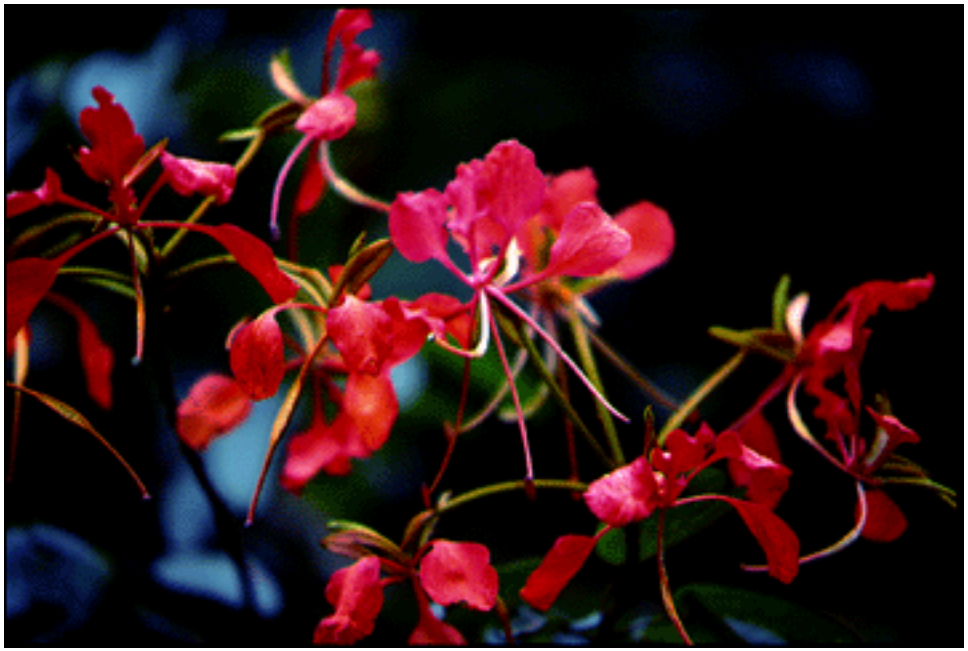
The Value of Biodiversity

- Intrinsic/inherent value
- Extrinsic/utilitarian/ instrumental value

Source: Burmbaugh © AMNH-CBC

Intrinsic/inherent value

- The value of something independent of its value to anyone or anything else



Source: Frey © AMNH-CBC

- A philosophical concept

Categorizing Values

Direct Use Value(Goods)	***Indirect Use Value (Services)***	***Non-Use Values***	
Food, medicine, building material, fiber, fuel	Atmospheric and climate regulation, pollination, nutrient recycling	Potential (or Option) Value	Future value either as a good or service
	Cultural, Spiritual and Aesthetic	Existence Value	Value of knowing something exists
		Bequest Value	Value of knowing that

Direct Use Value: Goods

Source: © AMNH-CBC

- Food
- Building Materials
- Fuel
- Paper Products
- Fiber (clothing, textiles)
- Industrial products (waxes, rubber, oils)
- Medicine

Food

- Today, most people rely on ~20 types of plants, and only 3 to 4 are staple crops.
- Diversity is critical for developing new strains and breeds, i.e. that suit a particular environment or are resistant to pests or disease and as a source of new crops

Source: © AMNH-CBC

Building Materials, Paper Products, and Fuel

Source: © AMNH-CBC

Fiber

Source: USDA Cotton Program

Source: USDA Photo b Ken Hammond

Industrial Products

Originating plant or animal	**Product/End use**
Cork oak (*Quercus suber)*	Cork
PARÁ RUBBER TREE (*HEVEA BRASILIENSIS*)	Rubber
Lac insect (*Laccifer spp.*)	shellac
CARNAUBA PALM (*COPERNICIA CERIFERA*)	**CARNAUBA WAX**
Wax plant (*Euphorbia antisyphilitica)*	candelilla wax
Jojoba plant (*Simmondsia chinensis)*	jojoba oil
Cochineal insect (*Dactylopius coccus*)	**CARMINE DYE***

Medicine

Source: © AMNH-CBC

- About 80% of the people in developing countries use plants as a primary source of medicine.
- 57% of the 150 most-prescribed drugs have their origins in biodiversity

Traditional Medicine:Basis of Many Drugs

Drug	**Source**	**Use**
Barbaloin, aloe-emodin	**Aloe** (*Aloe spp.*)	antibacterial, skin conditions, purgative
Atropine	**Belladonna** (*Atopa belladonna*)	Relaxant, sedative
Codeine	**Opium poppy** (*Papaver somniferum*)	Painkiller
Colchicine	**Autumn crocus** (*Colchicum autumnale*)	Anticancer agent
Digitoxin	**Common foxglove** (*Digitalis purpurea*)	Cardiac stimulant
Ephedrine, Pseudoephedrine	**Joint fir** (*Ephedra sinica*)	Asthma, emphysema, bronchiodilator, hay fever
L-Dopa	Velvet bean *(Mucuna deeringiana*)	Parkinson's disease
Menthol	**Mint** (Menta spcs.)	Nasal congestion
Morphine	**Opium poppy** (*Papaver somniferum*)	Painkiller
Quinine	**Yellow cinchona** (*Cinchona ledgeriana*)	Malaria
Reserpine	**Indian snakeroot** (*Rauvolfia serpentina*)	Hypertension
Scopolamine	**Thornapple** (*Datura metel*)	Sedative
Taxol	Pacific Yew (*Taxus brevifolia*)	Anticancer
Vinblastine, vincristine	Rosy periwinkle (Catharanthus roseus)	Leukemia

Indirect Use Values: Services

- Regulating global processes, such as atmosphere and climate
- Soil and water conservation
- Nutrient cycling
- Pollination and seed dispersal
- Control of agricultural pests
- Genetic library
- Inspiration and information
- Scientific and educational
- Tourism and recreation
- Cultural, spiritual, and aesthetic
- Community Resilience
- Strategic

Source: © AMNH-CBC

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Source: © AMNH-CBC

Global Processes: Atmospheric Regulation

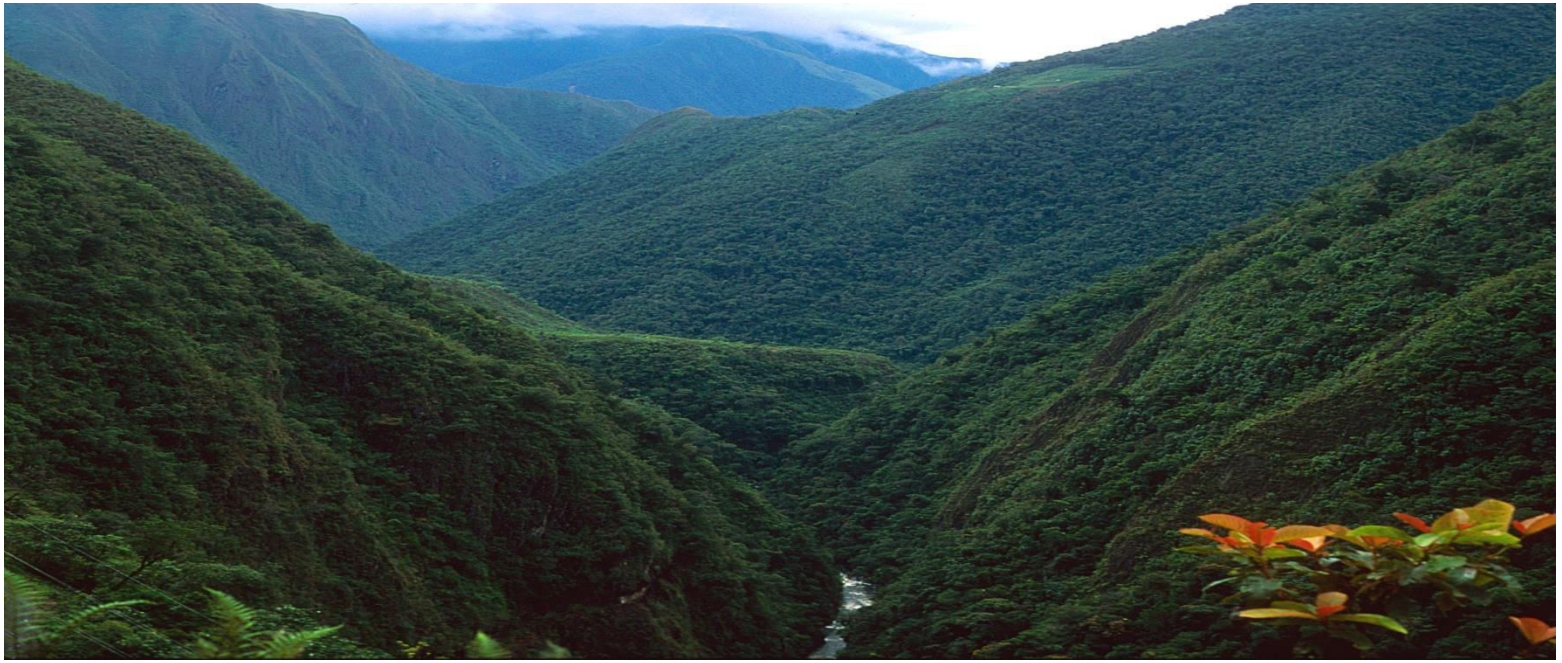
- Photosynthetic biodiversity created an oxygenated atmosphere, and also has the potential to moderate the rising amounts of atmospheric carbon dioxide linked to global climate change

Source: Frey © AMNH-CBC

Global Processes: Climate Regulation

- Forests and other vegetation modify climate: by affecting sun reflectance, water vapor release, wind patterns and moisture loss. Forests help maintain a humid environment, for example, half of all rainfall in Amazon basin is

  produced locally from forest-atmosphere cycle



Source: Bain © AMNH-CBC

Soil and Water Conservation

Example: Coastal wetlands and mangroves

- Filters excess nutrients and traps sediments that would otherwise impact neighboring marine and aquatic areas

Other services:

- Minimizes damage from waves and floods
- Serves as a nursery for juvenile commercial fish
- Provides habitat for many birds, fish, and shellfish

Source: Ersts © AMNH-CBC

Nutrient Cycling

- Biodiversity is critical to nutrient cycling and soil renewal
- Decomposers such as algae, fungi, and bacteria

Source: Snyder © AMNH-CBC

Pollination and Seed Dispersal

- Many flowering plants depend on animals for pollination to produce food.

- 30% of human crops depend on free services of pollinators; replacement value estimated billions of dollars/year in US alone

Source of Inspiration or Information

- Biomimicry
- Applied Biology
- Medical Models
- Education and Scientific Research

Source: Brumbaugh © AMNH-CBC

Medical Models

Source: New Jersey Fish and Wildlife

Hibernating bears may improve the treatment of:

- trauma patients
- kidney disease
- osteoporosis

Spiritual and Cultural Values

- The survival of natural areas and species are important to different cultures around the world.
- Thousands of cultural groups in the world, each have distinct traditions and knowledge for relating to natural world

Source: Projecto Gato Andino Bolivia, Villalba & Bernal, 1998

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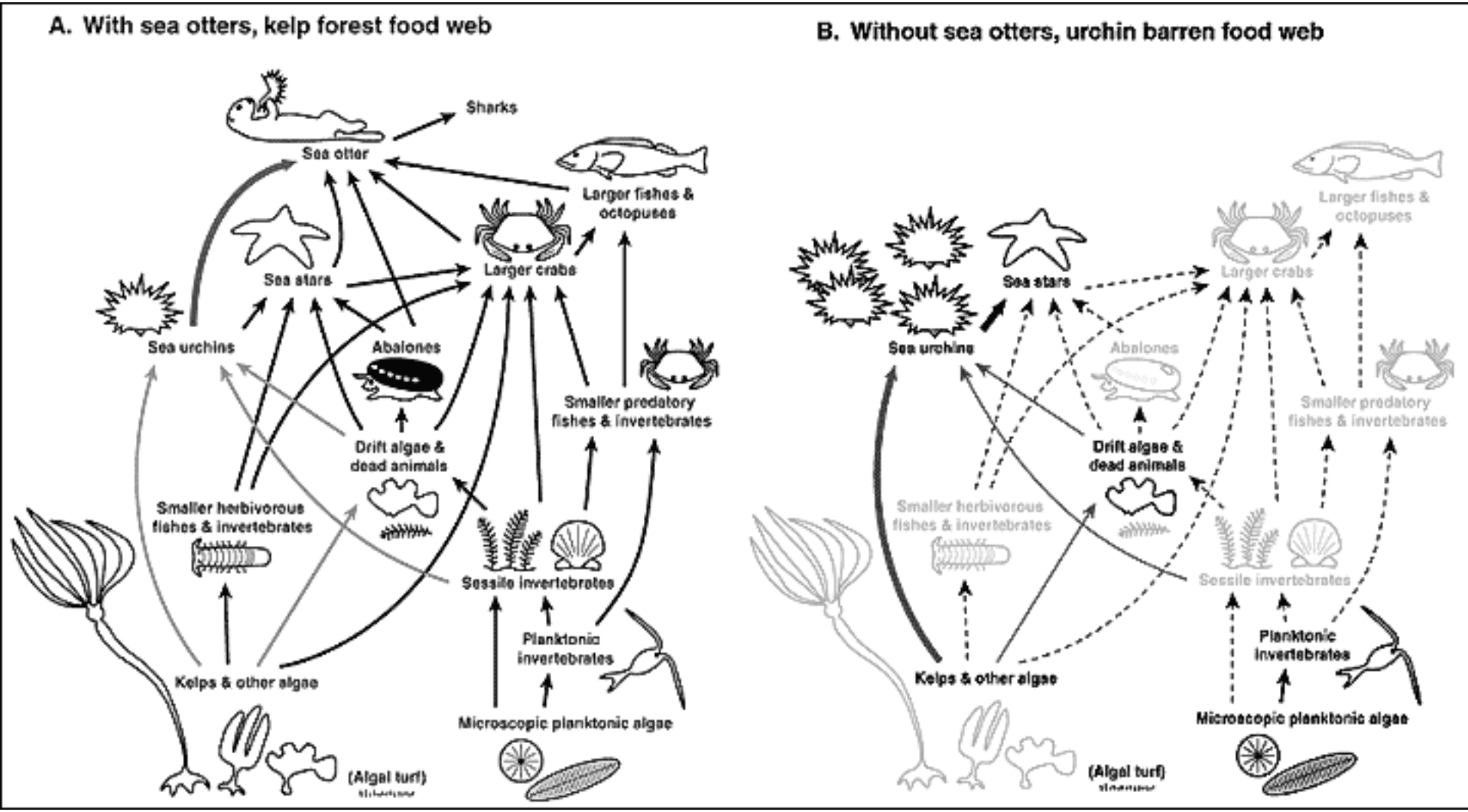
Ecological Value: Does Diversity Make Communities More Resilient?

- Resilient ecosystems are characterized by:
  - Constancy (Lack of fluctuation)
  - Inertia (Resistance to perturbation)
  - Renewal (Ability to repair damage)
- Not all species are critical to an ecosystems function; many fill redundant roles; basis for community resilience and integrity
- If too many species or keystone species are lost, eventually it leads to the failure of ecosystem function

Kelp Forest Food Webs



Source: Brumbaugh © AMNH-CBC

http://research.amnh.org/biodiversity/crisis/index.html

Non-Use or Passive Values

- Existence value
- Bequest value
- Potential or Option value

Why Do Values Matter?