

# Biodiversity



# Biodiversity

- Biological diversity
- The variety of Earth's species, the genes they contain, the ecosystems in which they live and the ecosystem processes (nutrient cycling, energy flow...) that sustain all life

# Biodiversity

The variety of organisms considered at all levels, from genetic variants belonging to the same species through arrays of species (E. O. Wilson)



# Why Care About Biodiversity?

Things you need to survive?



# Why Care About Biodiversity?

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Things you need to survive?

Food  
Water  
Air  
Clothing  
Shelter

All provided by living things . . .

# Why Care About Biodiversity?

- Vital part of natural capital
- Provides us with wood, fiber, energy and medicines
- Preserves the quality of water and air
- Maintains the fertility of soils
- Helps dispose of our wastes
- Controls pest populations (natural enemies)

# Buy-0-Diversity Quiz

In the USA, which of the following products are often dyed before you buy them in the store?

- A. Margarine
- B. Macaroni and cheese
- C. Oranges
- D. All of the above

# Buy-0-Diversity Quiz

What is **the largest commodity** in volume of global trade?

- A. Coal
- B. Oil
- C. Gas
- D. Coffee



# Buy-0-Diversity Quiz

What is the **second** largest commodity in volume of global trade?

- A. Coal
- B. Oil
- C. Gas
- D. Coffee

# Coffee Facts

Coffee is the seed of a fruit of the plant *Coffea arabica*!!



# Coffee Facts

- Quality of coffee depends upon climate, altitude, soil, and care.
- Finland holds the per-capita consumption title, with per capita consumption of 22 pounds of coffee a year. Thus, a family of four will make about 15 cups a day.

# Buy Organic Coffee When/ Where Possible!!

Product 

Organic 

Certified 

Home 



Café Britt's Shade-Grown Blend: Arabica and Organic Arabica coffees are the most aromatic, least acidic coffees in the world. All "gourmet" coffees are of the arabica variety, which is grown in mountainous regions between 1,000 and 1,300 meters above sea level. These coffees are hailed worldwide for their unequaled quality and flavor.



# Buy-0-Diversity Quiz

Which of these products is typically grown on land that was once tropical rain forest?

- A. Bananas
- B. Coffee
- C. Chocolate
- D. All of the above

# Bananas, Coffee and Chocolate



# Bananas, Coffee and Chocolate

- Bananas, coffee beans, and cocoa (used to make chocolate) grow well in the warm, moist conditions that produce tropical rain forests!!
- These forests are often **clearcut!!**

# Bananas, Coffee and Chocolate

- Some farmers are starting to use less pesticide to grow bananas.
- Some are growing coffee and cocoa in the **shade** of rainforest trees.
- Look for products labeled “**Fair Trade**,” bananas with “**Eco-OK**” certified label, or “**Shade-grown**” organic coffees (If you find them, tell me!!)



# Buy-0-Diversity Quiz

Which of the following has been used to make medicines?

- A. Corals
- B. Vampire bat saliva
- C. Sharks
- D. All of the above

# Medicine from Nature

- Corals used to make a substance used to replace broken human bones; also offer treatments for such ailments as arthritis, asthma, cancer and some viral diseases
- Vampire bat saliva used to make blood-thinning medication
- Parts of sharks used for everything from artificial skin for burn patients to anticoagulants for people with heart problems

# Bats

- Fearsome, filthy, aggressive, rabies-carrying bloodsuckers!



# Bats

- 950 known species
- The only mammals that can fly
- Very vulnerable to extinction
  - Reproduce slowly
  - Live in huge colonies in caves and abandoned mines (often closed by people!)

# Bats

- 70% of all bat species feed on crop-damaging nocturnal insects and other pests like mosquitoes!
- Pollen-eating bats pollinate flowers!
- Fruit-eating bats disperse seeds!
- If you love bananas, cashews, dates, figs, avocados and/or mangoes, love bats!!

# Buy-0-Diversity Quiz

Where do the marshmallows you eat come from?

- A. They grow in the ocean.
- B. They grow on plants found in marshes.
- C. They are made mostly from sugar and gelatin.
- D. They are made from milk.

# Marshmallows

- *Althea officinalis*



# Marshmallows

- **Marsh mallows** are plants that grow in marshes.
- Sap from the plants' roots was used to make marshmallow candies until the 1800s.
- Marshmallows we eat today made from a blend of sugar or corn syrup, gelatin, and other ingredients



# Buy-0-Diversity Quiz

Which of the following is sometimes used in cosmetic products such as eye shadow, nail polish, and lipstick?

- A. ground-up feathers
- B. crushed fish scales and insect wings
- C. crushed diamonds
- D. all of the above

# Cosmetics

- Crushed fish scales and insect wings are natural additives that lend a sparkly appearance to many cosmetics.

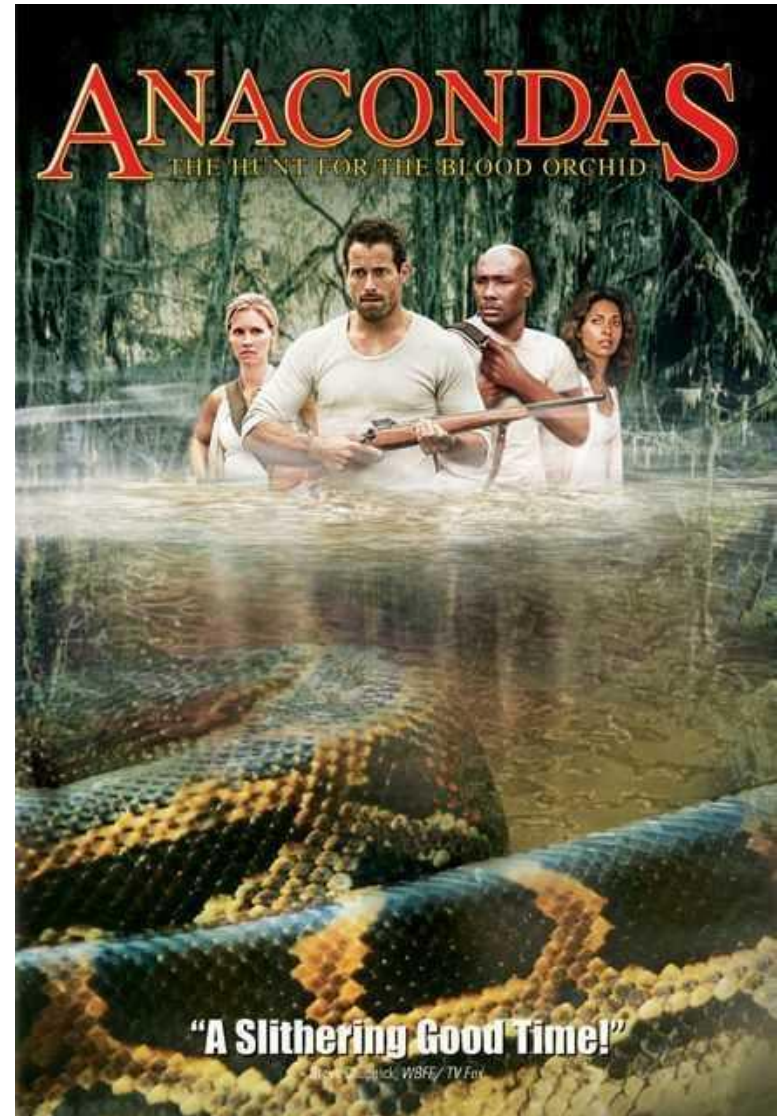
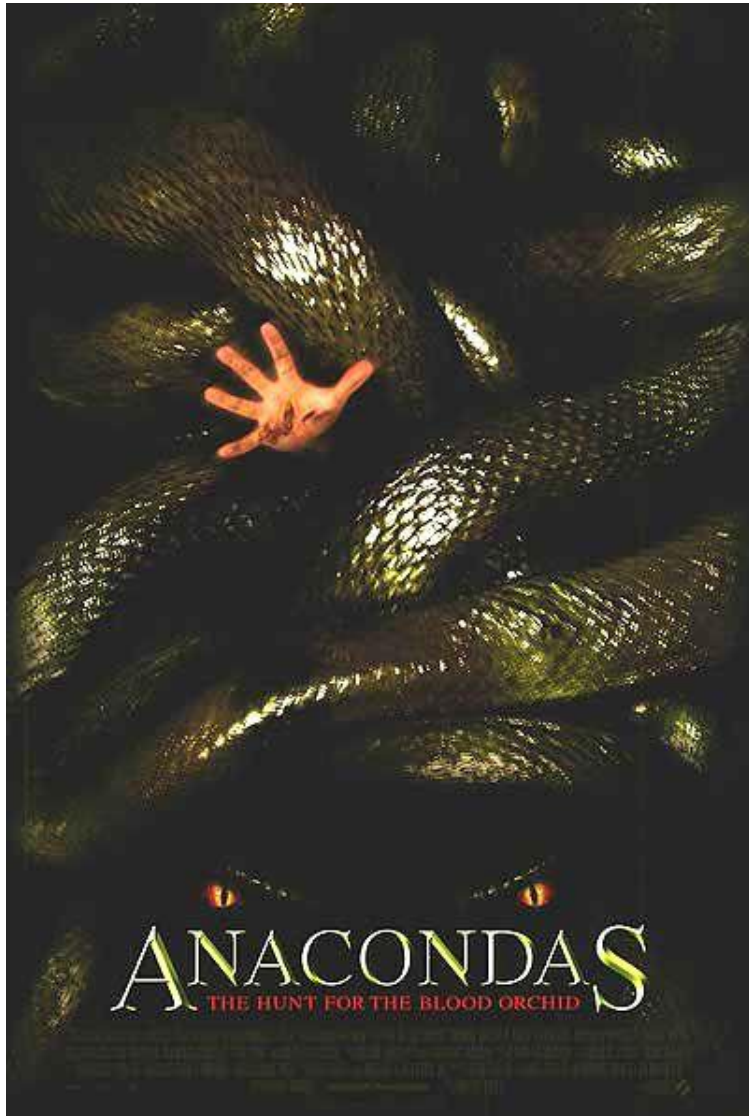
# Why Care About Biodiversity?

- Instrumental value
  - Biodiversity useful to us
  - Provides many of the ecological and economic services that make up Earth's natural capital
- Intrinsic value: The inherent right to exist and play its ecological roles, regardless its usefulness to us

# Why Care About Biodiversity?

- Instrumental value takes two forms
  - Use value: Economic value
  - Non-use value:
    - Existence value
    - Aesthetic value
    - Ecological value

# Value of Biodiversity – Economic Value



# Value of Biodiversity – Economic Value

- Bioprospectors search for plants and animals possessing chemicals that can be converted into medicinal drugs.
- Every species that goes extinct is one lost opportunity to find a cure for cancer or AIDS.

# Value of Biodiversity – Economic Value

## Pharmaceuticals & other chemicals

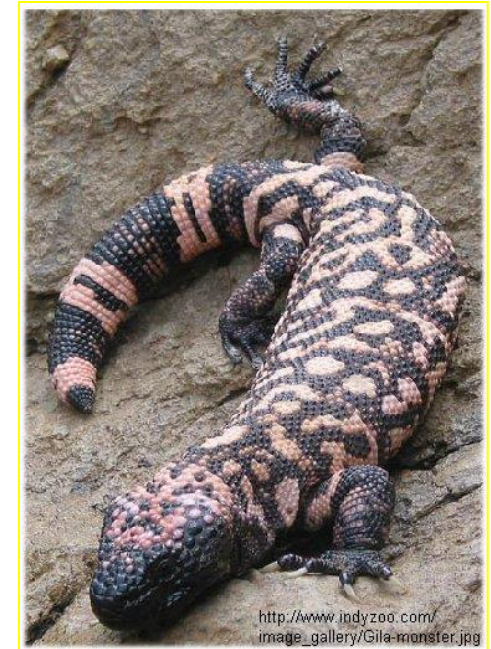
Rosy Periwinkle:  
anti-leukemia drug



Dart Poison Frog skin  
secretion: analgesic for  
severe, chronic pain



Gila Monster saliva  
extract: diabetes  
medicine



# Value of Biodiversity – Economic Value

- Biodiversity provides drugs and medicine.



**Rauwolfia**  
*Rauwolfia serpentina*,  
Southeast Asia  
Anxiety, high  
blood pressure



**Foxglove**  
*Digitalis purpurea*,  
Europe  
Digitalis for heart failure



**Pacific yew**  
*Taxus brevifolia*,  
Pacific Northwest  
Ovarian cancer



**Cinchona**  
*Cinchona ledgeriana*,  
South America  
Quinine for malaria treatment










**Rosy periwinkle**  
*Catharanthus roseus*,  
Madagascar  
Hodgkin's disease,  
lymphocytic leukemia



**Neem tree**  
*Azadirachta indica*,  
India  
Treatment of many  
diseases, insecticide,  
spermicide



# Value of Biodiversity – Economic Value

Medicines and Biodiversity: Natural sources of pharmaceuticals		
Plant	Drug	Medical application
Pineapple ( <i>Ananas comosus</i> ) 	Bromelain	Controls tissue inflammation
Autumn crocus ( <i>Colchicum autumnale</i> ) 	Colchicine	Anticancer agent
Yellow cinchona ( <i>Cinchona ledgeriana</i> ) 	Quinine	Antimalarial
Common thyme ( <i>Thymus vulgaris</i> ) 	Thymol	Cures fungal infection
Pacific yew ( <i>Taxus brevifolia</i> ) 	Taxol	Anticancer (esp. ovarian cancer)
Velvet bean ( <i>Mucuna deeringiana</i> ) 	L-Dopa	Parkinson's disease suppressant
Common foxglove ( <i>Digitalis purpurea</i> ) 	Digitoxin	Cardiac stimulant

# Value of Biodiversity – Economic Value

- Biodiversity provides economic benefits through ecotourism.
- \$ 950,000 to \$ 1.8 million per minute in tourist expenditures worldwide

# Value of Biodiversity – Economic Value

- One male lion living to age seven in Kenya generates \$ 515,000 in tourist dollars!!
- Only \$ 1000 if killed for its skin!!



# Value of Biodiversity – Economic Value

- Kenyan elephant worth \$ 1 million in ecotourism revenue
- Many times more than its tusk when it is illegally sold for ivory

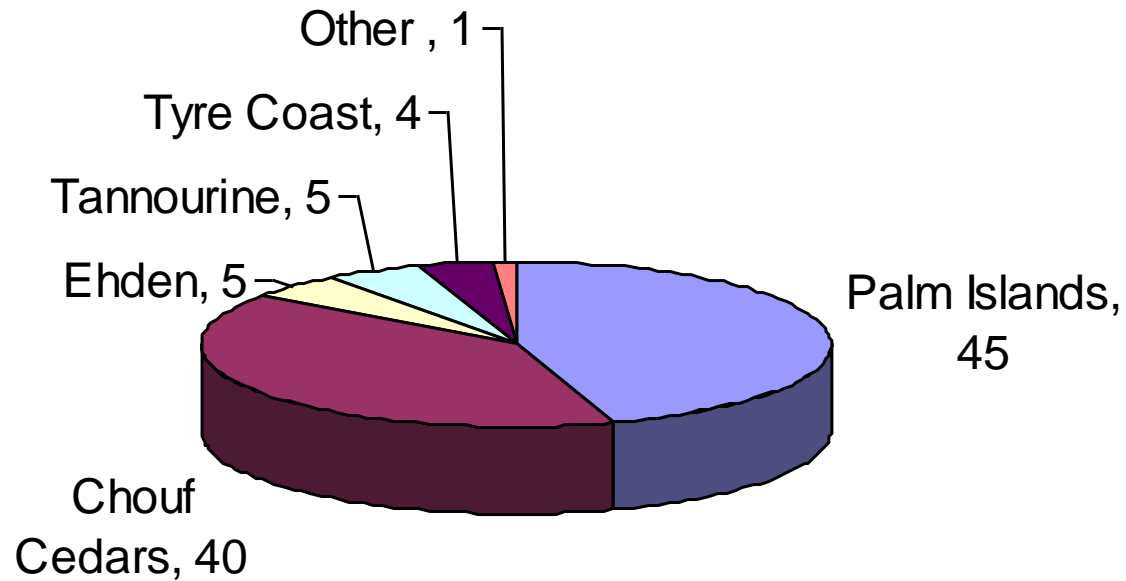


# Value of Biodiversity – Economic Value



# Value of Biodiversity – Economic Value

**Visitors (% of Total Visitors) to Lebanese Reserves  
in 2005**



# Value of Biodiversity – Economic Value

- Disadvantages of ecotourism?
- Many visitors may degrade wildlife.

# Value of Biodiversity – Economic Value

**Food security: beneficial genes for crop species!!**



<http://www.geol.umd.edu/~jmerck/gal04/life/images/gtomato.s.jpg>





# Value of Biodiversity – Economic Value

- Biodiversity enhances food security!!
- Genetic diversity within crop species and their ancestors is enormously valuable.
- In 1995, Turkey's wheat crops received at least \$ 50 billion worth of disease resistance from wild wheat strains.

# Value of Biodiversity – Economic Value

- Babassu palm of the Amazon
- Produces more vegetable oil than any other plant



# Value of Biodiversity – Economic Value

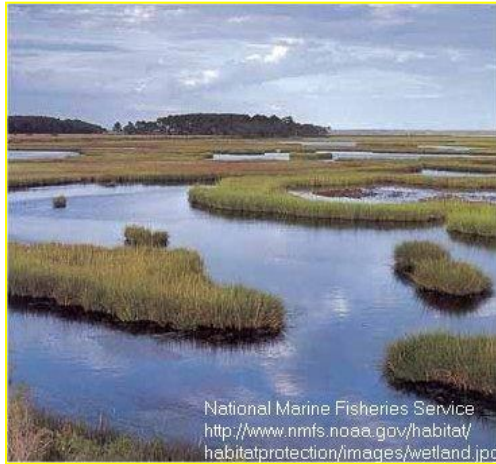
- The Serendipity Berry
- Produces a sweetener 3000 times sweeter than table sugar



# Value of Biodiversity – Ecological Value

## Ecosystem services

Water  
purification



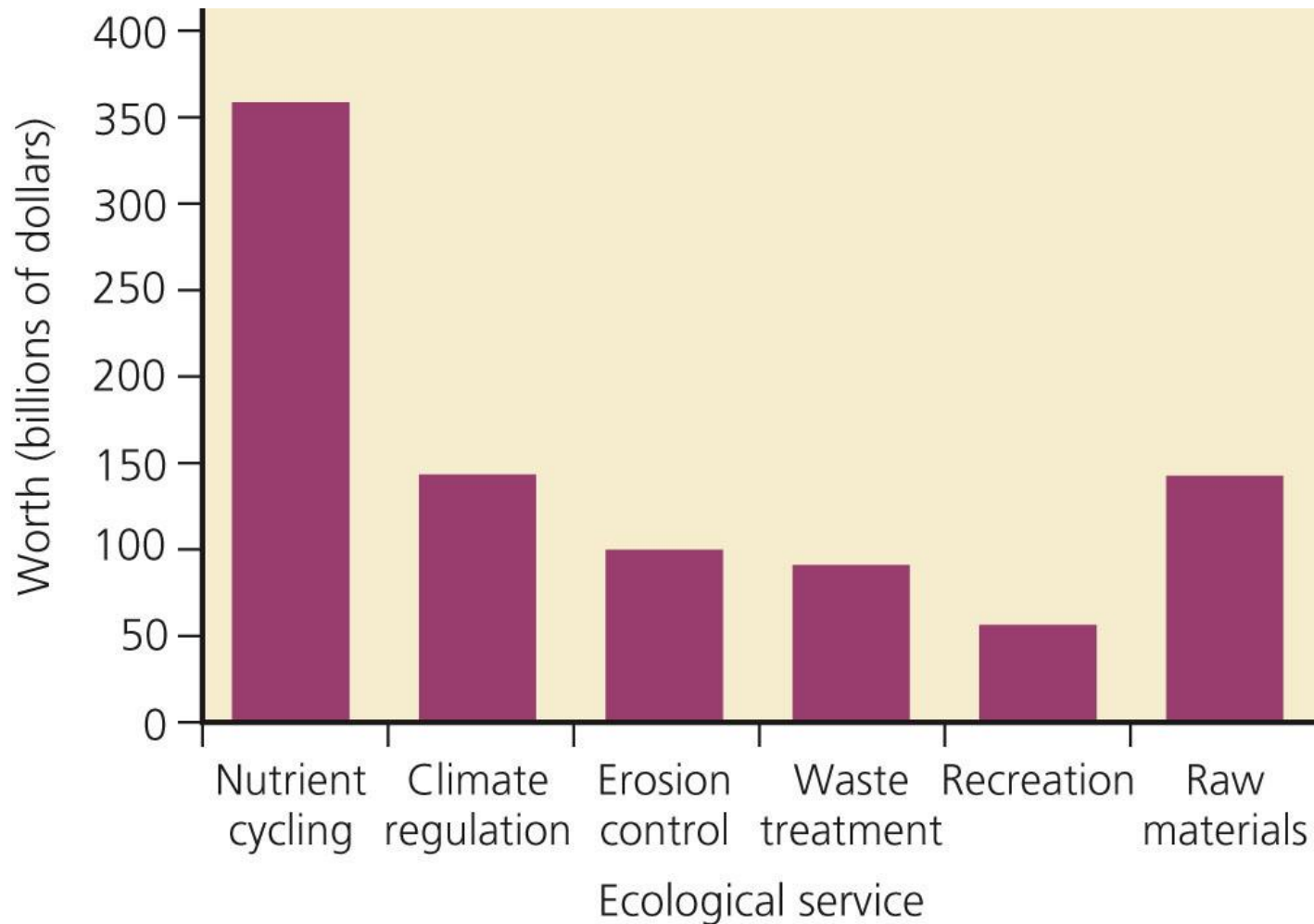
Soil formation  
& enrichment



Moderation of  
severe weather



# Value of Biodiversity – Ecological Value Ecosystem Services



# Value of Biodiversity – Existence Value

- The satisfaction of knowing they exist even if we will never see them or get direct use from them

# Value of Biodiversity – Existence Value

## Orangutans in Tropical Forests



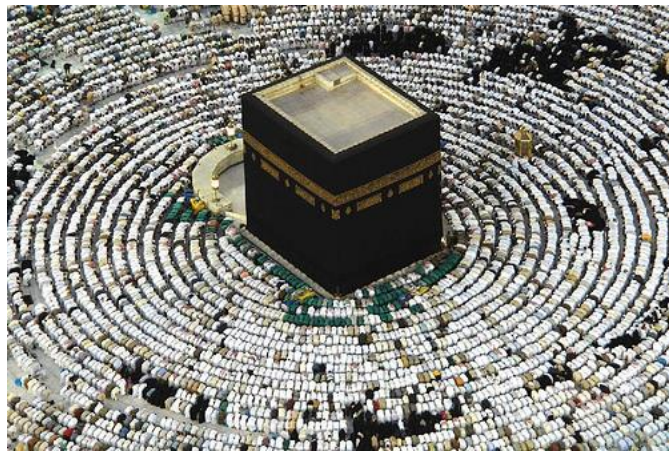
# Value of Biodiversity – Aesthetic Value



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# Value of Biodiversity – Spiritual Value



# Value of Biodiversity – Social Justice Value

- Many cultures rely on using natural resources in traditional ways.
- Preserving culture = preserving resources

