

# A Brief Introduction to Ecosystem Services

# Why Should We Protect?



**Cauca Valley, Colombia**

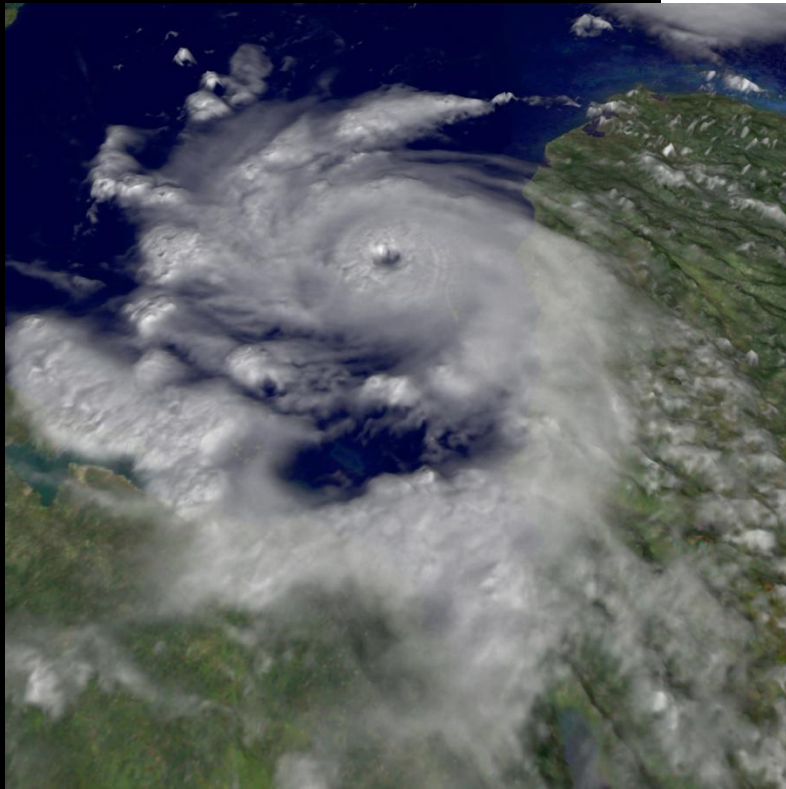
**Mesoamerican Reef, Belize**



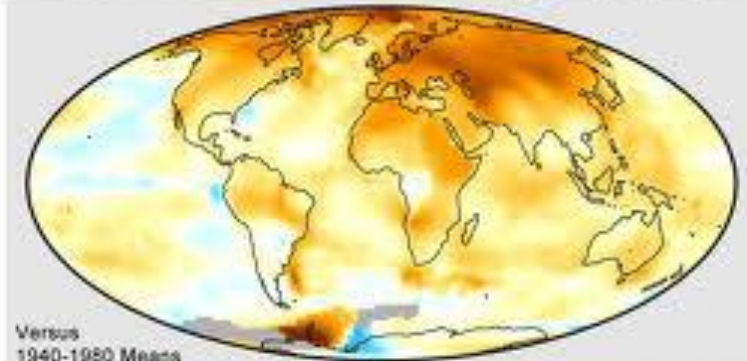
# "Provisioning Services": Consumable Goods



# "Regulating Services": Risk Reduction & Management



1999-2008 Mean Temperatures



-2 -1.5 -1 -0.5 0 0.5 1 1.5 2

Temperature Anomaly (°C)

# "Cultural Services": Life Enhancement

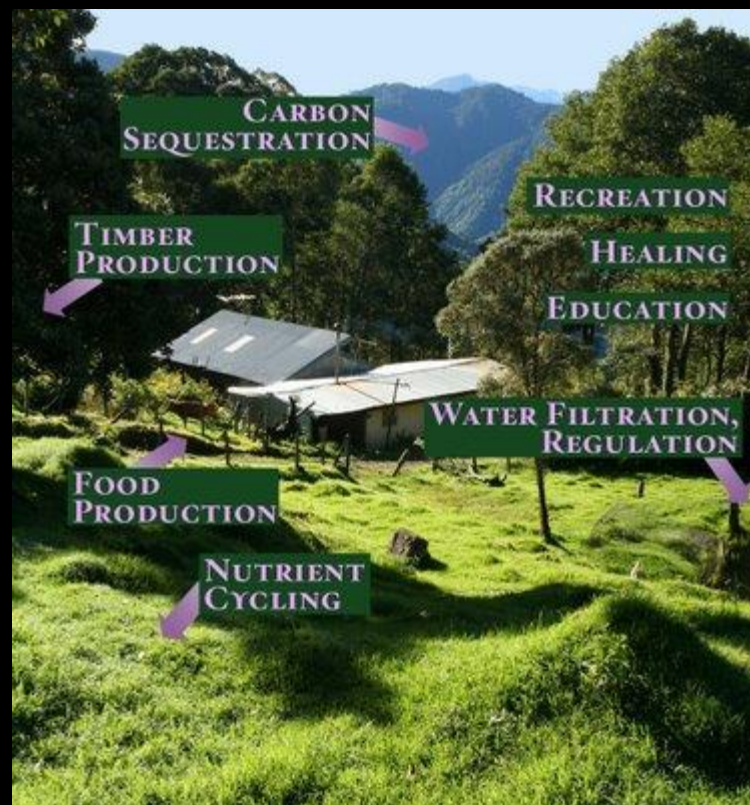


# “Supporting Services”: Services that Enable the Other Services



# So What's Different?

- Wider Consideration
  - Not just resources
  - More emphasis on ecosystem processes
- Integrated System View
  - Joint provision of multiple services
  - Encourages better understanding of entire ecological system
- Essential for Humans to Survive



# Ecosystem Services Are Not a New Concept



- Organic Administration Act of June 4, 1897
- Two purposes for US National Forests:
  - “Securing favorable conditions of water flows”
  - Furnishing a “continuous supply of timber for the use and necessities of citizens of the United States”



# Ecosystem Services Are Immensely Valuable



- **Costanza et al. (1997)**
  - **\$33 trillion/year**
  - **Almost 2x global GDP**
- **Balmford et al. (2002)**
  - **Worldwide network of nature reserves**
  - **\$5 trillion**
  - **100x exploitation value**

# Ecosystem Service Balance Sheet

## Enhanced

Crops  
Livestock  
Aquaculture  
Carbon Sequestration

## Degraded

Capture Fisheries  
Wild Foods  
Wood Fuel  
Genetic Resources  
Biochemicals  
Fresh Water  
Air quality Regulation  
Regional Climate Regulation  
Erosion Regulation  
Water Purification  
Pest Regulation  
Pollination  
Natural Hazard Regulation  
Spiritual & Religious Value  
Aesthetic Value

## Mixed

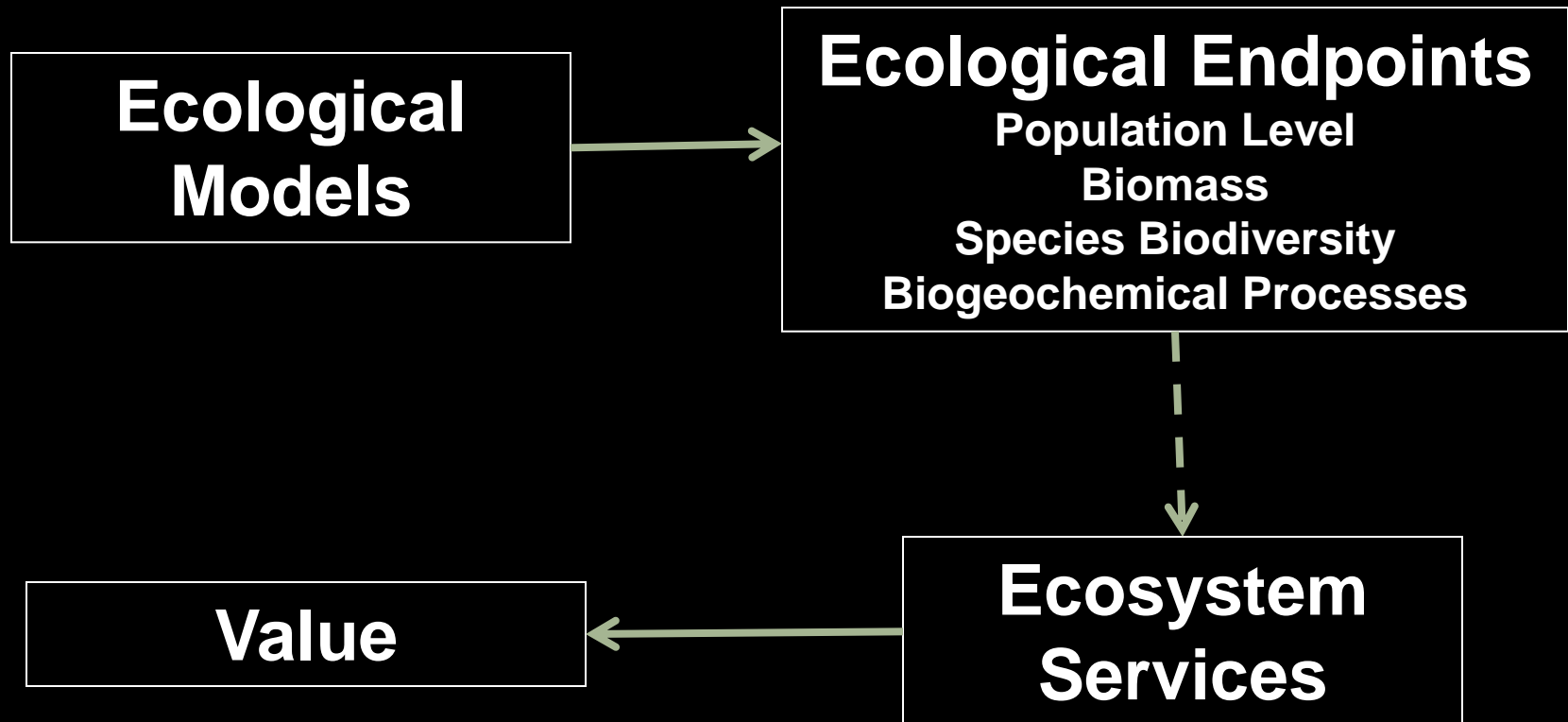
Timber  
Fiber  
Water regulation  
Disease regulation  
Recreation &  
ecotourism

**Bottom Line:  
60% of  
Ecosystem  
Services are  
Degraded**

# For Ecosystem Services to Have Policy Relevance, 3 Tasks Are Essential

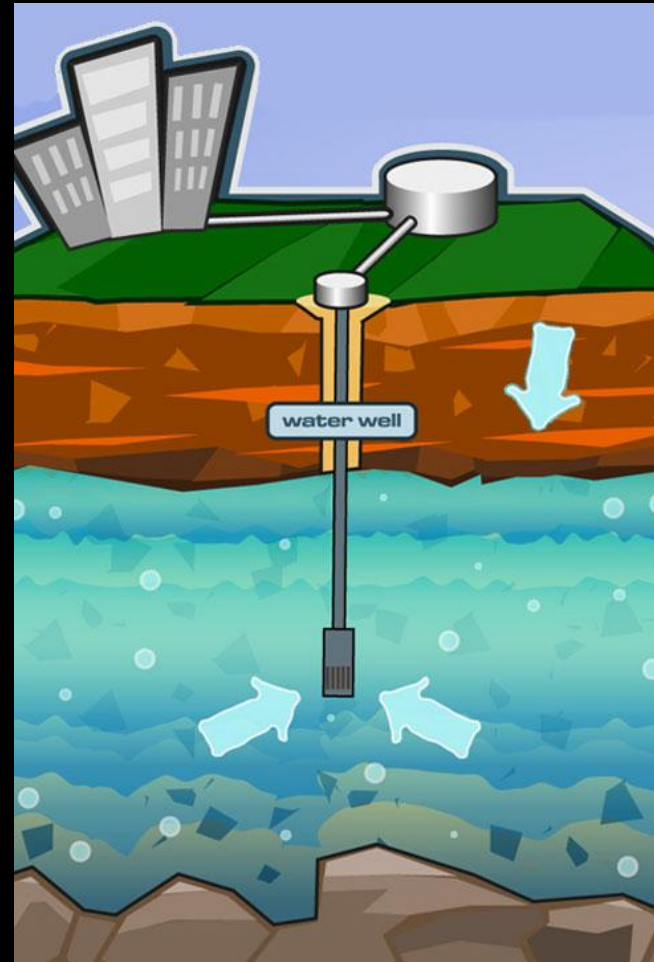
1. Understand (and be able to quantify?) processes
2. Understand (and be able to quantify?) value
3. Have policy framework needed to utilize the information from the first two tasks

# Ecological Production Function



# What's the Question for Groundwater?

- Groundwater-related services provided by water basins
  - Clean groundwater is a service
  - Question is management of basin
- Services provided by groundwater aquifers
  - Question is management of aquifer



# Monetary Valuation Techniques

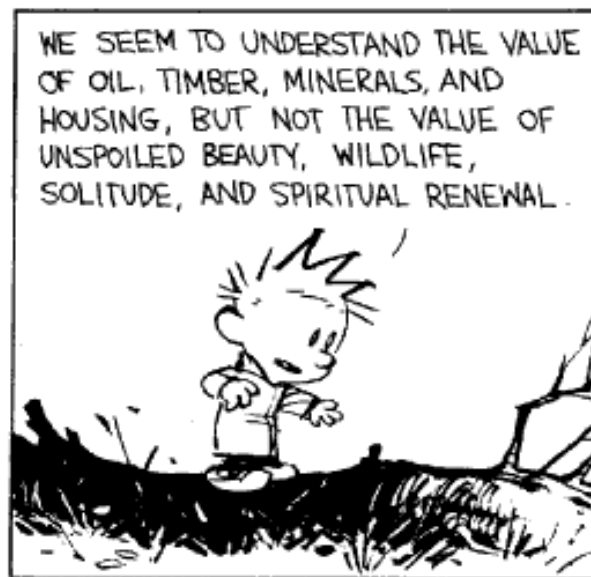
- Prices
  - Avoided or Replacement Cost
  - Hedonic Method
  - Travel Cost Analysis
  - Stated Preference
- 
- Are Other Valuation Approaches More Appropriate?

# Policy Uses

- **Political or Social Arguments**
- **Improved Goals or Standards**
  - **Payments for ecosystem services (PES)**
- **Improved Implementation**
- **Markets for Ecosystem Services (MES)**



# Concerns





# Principal Concerns

- Philosophical Concerns
  - Obscures people's duties and obligations
    - Conservation is a moral or ethical issue
  - Nature is "priceless."
    - Trying to measure its value debases nature.
- Practical Concerns
  - Measurement and valuation are imprecise and flawed
  - Methods tend to systematically underestimate the full value of ecosystem services
- Ecosystem Markets Raise Additional Ethical & Political Concerns

# Discussion

