

What are Ecosystem Services Worth? Valuation Methods and Applications

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Topics

- Definition and Types of Ecosystem Services
- Types of Economic Benefits Valuation
- Valuation Examples
- Resources for Benefits Estimation



Ecosystem Services Definition: economic perspective

- Direct and indirect benefits *people* obtain from ecological systems (Millennium Ecosystem Assessment, 2003)
- Ecosystems are natural assets that provide a flow of goods and services valuable to individuals and society collectively (Daily et al., 2000; Turner, 2008)

Types of Ecosystem Services

- Climate, water, and gas regulation
- Water supply, nutrient supply
- Soil formation, nutrient cycling
- Waste management, biological control
- Wildlife habitat, food production
- Recreation, cultural and scenic values

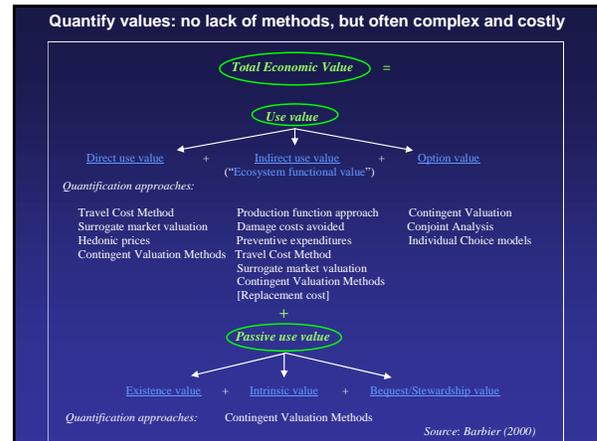
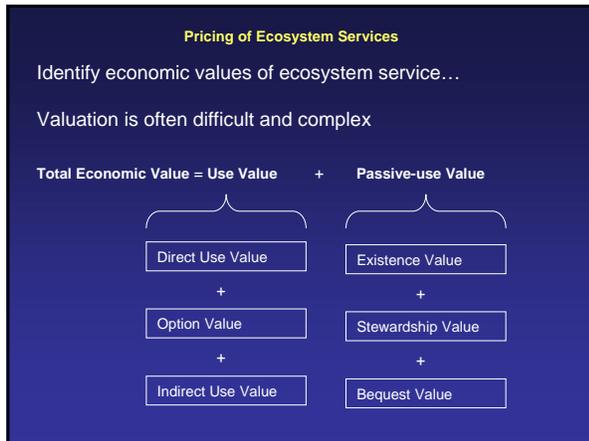


Ecosystem Functions vs. Ecosystem Services vs. Ecosystem Service Values

- Ecosystem Functions:
Biophysical processes in an ecosystem
- Ecosystem Services:
Outputs of ecosystem functions that directly or indirectly benefit humans
- Ecosystem Service Values: the benefits humans receive from ecosystem services

Ecosystem service valuation dilemma

- **Market Failure**
 - Many ecosystem services are public goods
 - **Their value cannot be captured by providers in free markets**
 - Few created markets for public goods (e.g., wetlands)



Valuation approaches

- Original valuation study

OR

Benefits transfer: using results from original studies for similar sites

Preferred approach depends on cost of original research and the potential opportunity cost of using benefit transfer (Bryon and Loomis, 2008)

Economic valuation of ecosystem services

Steps:

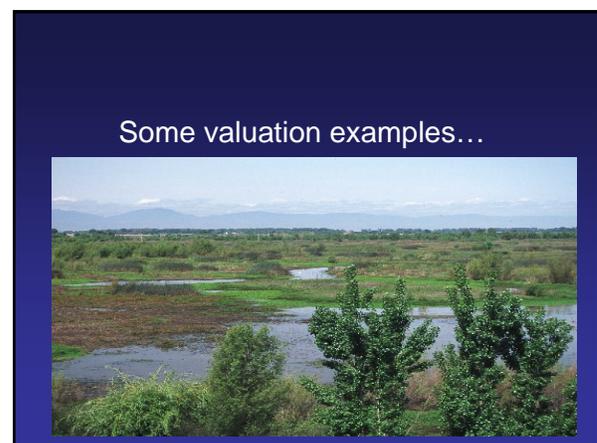
- 1) Identify the ecosystem (land area and land use) Identify services (human uses) provided by system
 - ❖ Biologists
 - ❖ Ecologists
 - ❖ Hydrologists
 - ❖ Recreation planners
- 2) Quantify service flows in physical terms
- 3) Identify unit values (\$) for individual flows

Economic values are always context-specific!

Example: The economic value of a wetland's removal of 100 kg of nitrogen per year from surface waters depends on whether the water is used by humans, the marginal value of the removal for those uses, and on the cost of alternative removal options.

Applications of ES Valuation

- Cost/Benefit Analysis of projects
- Level of return on an investment
- Damage Assessments/Compensation
- Evaluating Regulatory Programs
- Fundamental Recognition Tool

An Economic Analysis of the Benefits of Habitat Conservation on California Rangelands (2009).

- Applies cost benefit analysis.
- California rangelands generate a wide range of valuable services.
- Ranchers are unable to prevent others from enjoying the benefits from their management and do not have an incentive to take full benefits into account.
- Without cost share programs or ES markets, highest benefits will not be produced.



A California Rancher Survey on Payments for Ecosystem Services (2010)

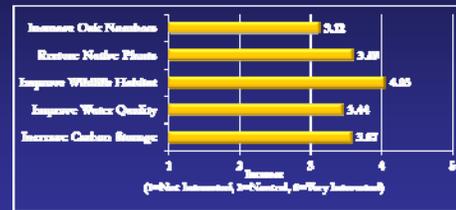
- Survey of California ranchers 2009
 - Rancher Background
 - Participation in conservation programs
 - Perspectives on payments for ecosystem services
- 158 responses



Survey Results

- Very little familiarity with terms Ecosystem Services or Payments for Ecosystem Services (PES).
- **BUT**
- Familiar with terms such as wildlife habitat management, water quality improvement, vegetation management, invasive species control.
- Ranchers are strongly interested in PES programs, particularly those tied to wildlife habitat.
- 77% were willing to participate in a PES program.

Rancher Interest in Selected Ecosystem Service Related Activities



Conjoint Analysis choice experiment:

PES program attributes:

Attributes	Description	Levels
Contract Length	Amount of time that land can be enrolled in a conservation program	5, 15, 30 years
Program Administration	Organization that would administer the program	Federal Agency State Agency Non-profit Organization Private Company
Payment Level	Rental payment (per acre, per year) for enrolling land in a program	\$5, \$10, \$20, \$50

- All program attributes have significant impact on decision to participate in PES program.
- Ranchers prefer flexible program structures that are built on shorter contracts, higher payments and minimal administrative burden.
 - Contract Length:
 - An additional year would cost an extra \$ 0.81/acre
 - Program administrator:
 - Conservation organization is the preferred administrator
 - Private company costs additional \$ 2.28
 - Federal agency costs additional \$ 11.50
 - State agency costs additional \$ 25.22

Policy Implications

- PES outcomes must result in win-wins
 - Conservation happens but also improves financial and productive health of the operation
 - Conservation of wildlife habitat is shared interest
- Implementation of a PES program more likely to succeed using conservation partners.
- Payment levels will have to be higher for long term conservation contracts.
- Low familiarity with PES terminology will require substantial outreach, education, and pilot testing using traditional media.

Valuation Tools

BLM/USGS Ecosystem Services Valuation Pilot (San Pedro River)

Artificial Intelligence for Ecosystem Services (ARIES)

Integrated Valuation of Ecosystem Services and Trade-offs (InVest)

Defenders of Wildlife: Habitat Benefits Toolbox



Valuation Tools

Multiscale Integrated Models of Ecosystem Services (MIMES)

Santa Cruz Watershed Ecosystem Portfolio Model

Business for Social Responsibility (BSR)

Corporate Ecosystem Services Review (WRI)

Eco-Matrix (Parametrix)

EcoAim (Exponent)

ESValue (Entrix)

Management-Scale Ecosystem Assessment using Remote Sensing (MEASURES-V Tech)

Valuation Tools

Ecosystem Service Market Establishment: Negotiations between buyers and sellers

Social Values for Ecosystem Services (SoIVES)

Ecosystem Portfolio Model (South Florida, Puget Sound)



Valuation going forward

- Growing body of literature
- Expanding Valuation Tools
- Potential Ecosystem Service Markets
- Increased Recognition

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Conclusions on Ecosystem Service Markets

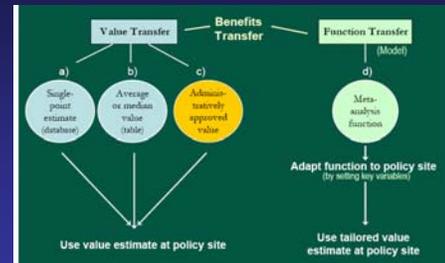
Promises

- Attract more financing and increase private incentives for protection of ecosystems and their services
- Make conservation more competitive with alternative land uses
- One more tool in the tool box for conservation



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