Economics & the environment: Opportunities for conservation finance & constituency building

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Today’s talk

- What are ecosystem services?
- Getting the science right
- Getting the policy right
- Recent developments in the field
- Ecosystem services in the Chicago region
Why are you here?
What are ecosystem services?

- Critical for human well-being
- Non-market goods/services - hard to value
- Active research area in environmental & ecological economics

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**Millennium Ecosystem Assessment, 2005**
From ecosystems to value

Ecosystem Structure & Process

Ecosystem Functions
1. Regulation
2. Habitat
3. Production
4. Information

Ecosystem Goods & Services

Ecological Values
Based on ecological sustainability

Socio-cultural values
Based on equity and cultural perceptions

Economic Values
Based on efficiency and cost-effectiveness

Total Value

Decision making process to determine policy options & management measures

*) The problem of aggregation and weighing of different values in the decision making process is an important issue, but is not the subject of this paper (see other papers in this issue for further discussion)

Fig. 1. Framework for integrated assessment and valuation of ecosystem functions, goods and services.

De Groot et al. 2002
## Ecosystem service types

<table>
<thead>
<tr>
<th>Supporting services</th>
<th>Regulating services</th>
</tr>
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<tbody>
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<td>Nutrient cycling</td>
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<td>Disturbance regulation</td>
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<td>Habitat</td>
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<td>Water regulation</td>
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<td>Spiritual &amp; historic</td>
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<td>Ornamental resources</td>
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- **Supporting services**
  - Nutrient cycling
  - Net primary production
  - Pollination & seed dispersal
  - Habitat
  - Hydrologic cycle

- **Regulating services**
  - Gas regulation
  - Climate regulation
  - Disturbance regulation
  - Biological regulation
  - Water regulation
  - Waste regulation
  - Nutrient regulation
  - Soil retention

- **Provisioning services**
  - Water supply
  - Food
  - Raw materials
  - Genetic resources
  - Medicinal resources
  - Ornamental resources

- **Cultural services**
  - Recreation
  - Aesthetic
  - Science & education
  - Spiritual & historic
A good or service is RIVAL if by my consuming it, you can’t

_example: Food_

A good or service is NONRIVAL if my consuming it doesn’t stop you from being able to consume it

_example: A stable climate_

Rivalness is a physical characteristic - can’t be changed
A good or service is EXCLUDABLE if you can be legally stopped from using it

*Example*: A park with an entrance fee

A good or service is NONEXCLUDABLE if you can’t legally be stopped from using it

*Example*: The waste absorption capacity of the atmosphere

Excludability is a legal arrangement - can be changed
Why is it hard to value ecosystem services?

<table>
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<th>Rival</th>
<th>Excludable</th>
<th>Non-Excludable</th>
</tr>
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<tbody>
<tr>
<td>Market Good</td>
<td>cars, houses, land, oil, timber</td>
<td>Open Access resource: Oceanic fisheries, timber etc. from unprotected forests, waste absorption capacity</td>
</tr>
<tr>
<td>Non-rival</td>
<td>Club or toll good patented information, toll roads, country clubs</td>
<td>Pure Public Good: Information, most ecosystem services, e.g. climate stability, coastline protection, life support functions, etc.</td>
</tr>
</tbody>
</table>
Why do we degrade natural capital?

- Who benefits and who loses?
  - Protect the ecosystem:
    - Winners: the public (all of us)
    - Losers: landowners who could make money with extractive use
  - Degrade the ecosystem:
    - Winners: private property owner(s)
    - Losers: the public (all of us)
- A solution: legal rights to ecosystems and their services (propertization, not privatization)
How to value ecosystem services?

- **Primary valuation:**
  - Survey “willingness to pay,” actual spending, or costs to avoid damage or replace ecosystem service

- **Secondary valuation:**
  - “Value transfer”: apply values from elsewhere to your site of interest

- **Ecological-economic modeling:**
  - Promising but complex
Why aren’t ecosystem services used more in decision-making?

- Valuation is expensive and time consuming
- Uncertainty/credibility surrounding the numbers
- Need to better identify who benefits from ecosystem service protection (create demand for ES protection)
- A new concept, need to create awareness and political will
Getting the science right

- Complex problem for:
  - Ecology
  - Geography
  - Economics
Getting the science right - step 1

- ES assessments at scales that inform decisions
ES come in bundles - problems when you only consider one, e.g., “water for carbon”
Getting the science right - step 3

- Ecological production functions to measure & predict ecosystem services

Flood regulation = f(impervious surface, rainfall, soil permeability, vegetation cover)

GIS database
Getting the science right - step 4

- Don’t ignore the demand side - way to examine equity implications.
- How services flow to users/beneficiaries

Ruhl et al. 2007
Getting the science right - step 5

- Enable scenario analysis
- Don’t wait until we have final answers to inform the public and decision makers
Getting the science right - step 6

- Ecological thresholds: economics informed by science

Farley 2008
Getting the policy right

- Incentives to protect ecosystem services don’t arise spontaneously
- **All** markets need some government involvement:
  - Consumer protection
  - Information disclosure/transparency
  - Standard units for commodities being bought & sold
  - Property rights & legal recourse
Why the excitement about markets?

- Economic theory says:
  - Markets bring together buyers and sellers
  - Markets can reduce “transaction costs”
  - Markets can concentrate activity where benefits are highest and costs are lowest (promote economic efficiency)

- Proven successes: phase out leaded gas in the 80s, reduced SO$_2$ emissions in the 90s

- Bipartisan appeal

- “Cap-and-trade” sounds better than “tax”?!
A well-functioning market...

- Promotes environmental sustainability
- Distributes benefits and costs *fairly*
- Operates *efficiently*
- Uses politically & economically sustainable *financing mechanisms*
**How do we do this?**

- **Sustainability**: cap emissions or use of an ecosystem below a safe ecological threshold
- **Equity**: distribute rights to the resource or waste absorption fairly
- **Efficiency**: develop institutions to enable trading that minimizes transaction costs
And if we don’t?

- **Non-sustainable system**: environmental goals not achieved
- **Unfair allocation of resource/rights**: loss of property rights, wealth transfer to polluters
- **Market inefficiency**: trades don’t happen, cost savings not achieved
- Many of these problems arise due to lobbying & political compromise
Markets aren’t the only way to protect ES

“5 P’s”:
- Prescription
- Penalties
- Persuasion
- Payments
- Property rights
Recent developments: science

- New tools for valuation, evaluating tradeoffs
  - World Resources Institute: Corporate ESR
  - University of Vermont: ARIES project
  - Stanford University: InVEST tool
Recent developments: CO$_2$ & climate

- Voluntary markets
- Regional initiatives: RGGI, WCI, Midwest, Florida - 24 states
- Kyoto’s successor
- Pending federal legislation
Recent developments: state & federal

- 2006: Hawaii requires assessment of economic incentives for conservation on privately-owned lands
- 2008: Florida requires ES assessments for acquisition of new land under Florida Forever program
- 2008 Farm Bill
- December 2008: creation of USDA Office of Ecosystem Services & Markets
Recent developments: raising awareness

- Big business: Businesses for Social Responsibility
- National conferences: December 2008 - 350-400 participants
- International: Proposed “Intergovernmental Platform on Biodiversity and Ecosystem Services” (IPBES)
Valuation in Chicago

- 10 land cover types modified from CNT/Openlands Green Infrastructure Map
- Value estimates from an exhaustive survey for ecosystem service values in U.S., Canada, Europe
- Value per acre-yr ranged from $34 for agricultural to $42,147 for beach ($0 for urban, barren)

Results

- Total $1.7 billion/yr in ecosystem service value
- Greatest per-acre value in northern Cook, Lake, McHenry counties
- Regionwide, 8.6% of land area protected, including 18% of ecosystem service value
- Individual Forest Preserve Districts provide $16-91 million/yr in benefits
“Threatened & Endangered” natural capital
### Loss of ecosystem services, 1995-2000

<table>
<thead>
<tr>
<th>Cover type</th>
<th>1995 ac</th>
<th>2000 ac</th>
<th>Change, 1995-2000</th>
<th>ESV change ($/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>661,593</td>
<td>638,744</td>
<td>-22,849</td>
<td>-$789,966</td>
</tr>
<tr>
<td>Grassland</td>
<td>353,522</td>
<td>269,255</td>
<td>-84,267</td>
<td>-$3,739,279</td>
</tr>
<tr>
<td>Forest</td>
<td>282,268</td>
<td>296,173</td>
<td>13,905</td>
<td>$7,806,261</td>
</tr>
<tr>
<td>Urban &amp; barren</td>
<td>680,068</td>
<td>727,751</td>
<td>47,683</td>
<td>$0</td>
</tr>
<tr>
<td>Urban open space</td>
<td>265,487</td>
<td>359,476</td>
<td>93,989</td>
<td>$232,207,245</td>
</tr>
<tr>
<td>Wetland</td>
<td>106,733</td>
<td>49,934</td>
<td>-56,799</td>
<td>-$494,094,476</td>
</tr>
<tr>
<td>Surface water</td>
<td>52,610</td>
<td>56,318</td>
<td>3,708</td>
<td>$3,090,391</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td><strong>-</strong></td>
<td><strong>-$265,618,171</strong></td>
</tr>
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</table>

- Loss of ($53 million/yr); total decline from $1.95 billion/yr to $1.68 billion/yr
Competing visions?
Where you come in

Communicate value you provide for your stakeholders, participate in markets where compatible with conservation goals

Develop tools to enable ES-based policy (mapping, analysis of tradeoffs)

Use ES to limit liability, develop new revenue sources

Develop policies, institutions, including markets, to protect ES

Educate yourself & others, advocate with elected officials
Thanks!

Further questions, or to get a copy of this presentation: kbagstad@uvm.edu

"I do not challenge the purchase of public lands for conservation... I do challenge the growing assumption that bigger buying is a substitute for private conservation practice. Bigger buying, I fear, is serving as an escape-mechanism - it masks our failure to solve the harder problem. The geographic cards are stacked against its ultimate success. In the long run it is exactly as effective as buying half an umbrella... conservation will ultimately boil down to rewarding the private landowner who conserves the public interest"

- Aldo Leopold, 1934