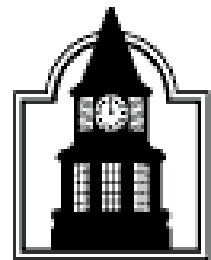


Ecosystem Services: Some Basic Concepts

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Ecosystem Services

- **Ecosystem services are the goods and services derived from natural and managed ecosystems upon which human welfare depends**

The Diversity of Ecosystem Services-Examples

- Fresh water
- Water supply and ground water recharge
- Flood mitigation
- Habitat
- Soil
- Maintenance of air quality
- Noise abatement
- Nutrient storage and recycling (N, P)
- Pollution control and detoxification
- Pollination of crops
- Maintenance of biological and genetic diversity
- Eco-tourism, recreation
- Food and biofuels

- 
- **Ecosystem services (ESS) and human welfare**
 - **Current status of ecosystem services:**
 - **60% of ESS degraded or used unsustainably**
 - **Provisioning Services**
 - **Regulating/Supporting Services**
 - **Cultural Services**

ESS & Natural Capital



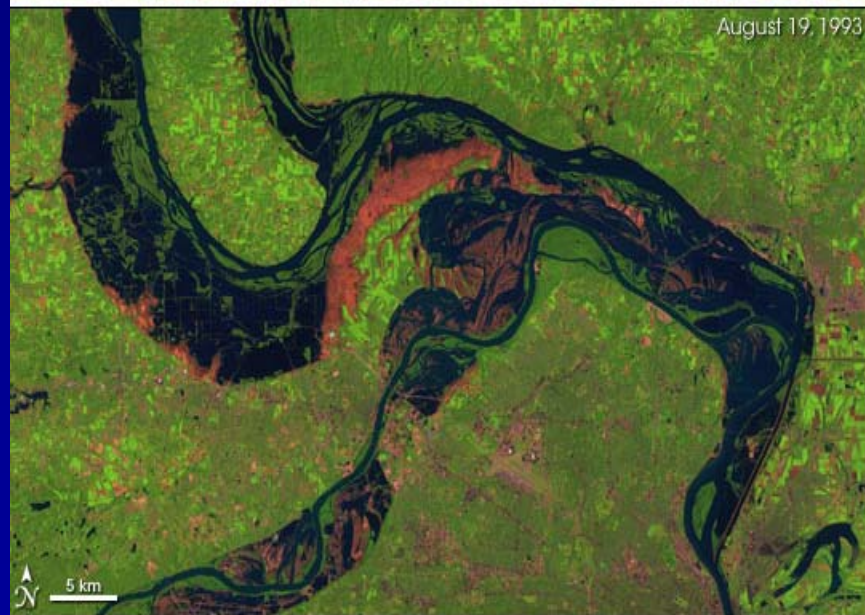
Frequently, an analogy is used between capital and ecosystems: both yield valuable flows of services.

The former yields interest which is easily valued and sought by individuals and society.

The latter yields a range of services which while valuable are problematic in terms of valuation.

However, increasingly ecosystems in the context of providing ESS are being referred to as “natural capital”.





USGS

1993 floods on the
Mississippi River, losses
estimated at \$15-20
billion dollars, USGS:

<http://mo.water.usgs.gov/Reports/1993-Flood/>

NASA Photos 1991, 1993

2008 Summer Flooding



**Cedar River, June 14, 2008, in Cedar Rapids,
Iowa.**

(AP Photo/Jeff Roberson)

If ESS are so important, why these challenges and changes?

Wetland Ecosystem



Riparian Ecosystem



A Mixture of Explanations



- Some “Obvious”
- Some “Less Obvious”



Obvious Explanation - 1



Photo by Scott Bauer, USDA

Increases in population and consumer demands associated with changes in standards of living put pressures on diverse ecosystems for more food, feed, fresh water, timber, fiber, fuel, etc. creating frequently competitive pressures on the provisioning of associated ESS

Less Obvious Explanation - 2

- Lack of understanding of the complex relationships among ecosystems, the diverse flows of ecosystem services they support, and the vital roles these services play in sustaining humanity
- Lack of awareness on the part of the public in general and **politicians** in particular about the role of ESS.

Consequences - 2

- No incentives to
 - (1) protect or enhance the ecosystems that provide the ESS
 - (2) provide funding to learn more about the complex interrelationships among ecosystems, ESS, and Quality of Life
 - (3) develop, evaluate, and implement alternative policy tools to enhance the provisioning of ESS

Consequences - 2

- A significant role for public policy to support research into these complex relationships
 - The coupling of complex ecological and socio-economic relationships
 - Development of policy relevant tools: nonregulatory and regulatory
 - Financing of long-term, interdisciplinary research
 - NSF; USDA-CSREES, FS, NRCS; NIH-National Institute of Environmental Health; EPA; other federal and state agencies; and NGOs

Less Obvious Explanation – 3: the public goods problem

- Many of the ESS are public goods
 - one person's utilization of the good does not prevent others from also using it
 - it is not possible to prevent people from having access to the good once it is provided
- In short, there are few incentives for anyone to provide these services, e.g., hard to market them for a profit
- Hence, they tend to be under produced (or supplied) from private lands relative to societal demand

Less Obvious Explanation – 3: the public goods problem, con't



Many ESS come from ecosystems on privately owned lands. If given the option to convert a unit of land from an ecosystem producing an ESS such as flood mitigation to a commercial use such as corn for ethanol, the land owner has an incentive to make the switch.

Consequences - 3

- Need to develop mechanisms/incentives for landowners to maintain and/or enhance the provisioning of ESS
 - The case of NYC's water supply
 - Filter strips on riparian lands
 - Payments for carbon sequestration
- Mechanisms/incentives need knowledge

Policy Challenges: markets or other mechanisms

- Market solutions are attractive given their relative efficiency and low cost in resource allocation, price discovery, among other factors
- **Creating markets for “new” commodities or services is not always a “slam-dunk”:**
 - Items to consider for a new market in an ESS
 - Government as midwife
- **Frequent separation between where an ESS is “produced” and its effect**

ESS and Policy Challenges: markets or other mechanisms (nonregulatory or regulatory)

- ESS maintenance as a requirement of land stewardship
- ESS Management Districts
- Management for ESS on public lands

Ecosystem Services and Policy

- Maintenance or enhancement of the flows of ecosystem services
- Systems approach to understanding the complexity of the relationships among a mix of ecosystems providing a diversity of ecosystem services, traditional commodities and services while supporting human welfare
- Challenge for the 21st Century—developing policy tools to ensure the future viability of ecosystem services in adequate quality, quantity, timing, and location of availability
- A role for adaptive management