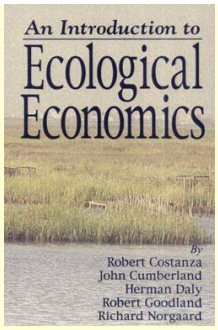


Ecological economics

The problem of valuation

The primary issue

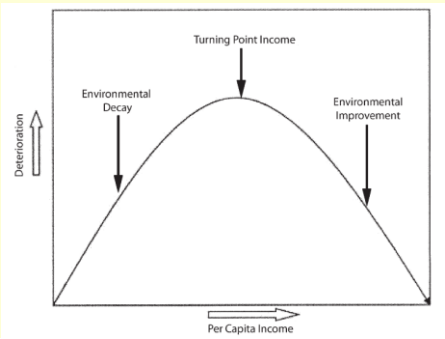
- Is saying "do the right thing" enough when you are trying to do conservation?
- Perhaps something else is needed?

Capitalism today

- "It is not the benevolence of the butcher, the brewer or the baker that we expect our dinner, but from their regard to their own self-interest"
  - Adam Smith (1776)
- "Greed is good. Greed works. Greed is right..."
  - Gordon Gekko (1987)
- "There is plenty of room in this country. We can develop without limits with respect to economic growth and jobs."
  - Bruce Babbitt (1998)

Income is good

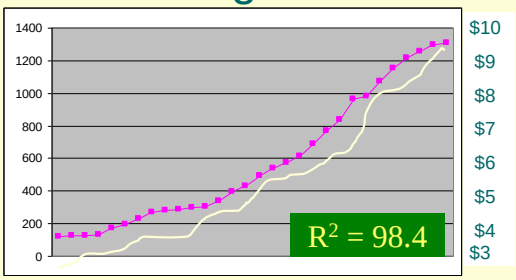
- Environmental Kuznets Curve



A different view

- "Production and consumption of all goods and services ultimately require liquidation of natural capital, including habitats for wildlife. Habitats have generally declined in extent and quality, with corresponding declines in and endangerment of many wildlife species. There is a **fundamental conflict between economic growth and wildlife conservation** that is supported by sound theoretical and empirical evidence."
  - The Wildlife Society (2003)

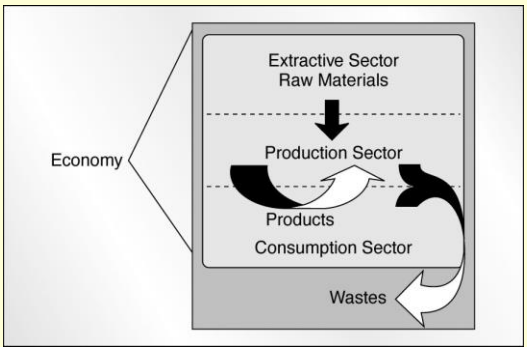
ESA Listings and GDP



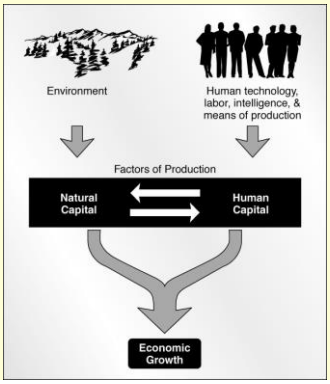
Brian Czech (2004)

Traditional economics (1)

- Where's the environment?



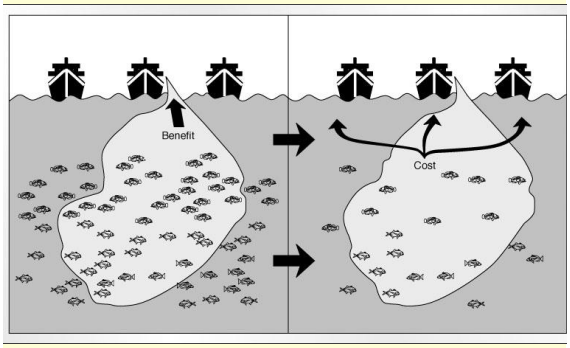
Traditional economics (2)



Recognition of a problem

- Garrett Hardin (1968)
- Examined Adam Smith's model of individual behavior as the basis for rational economic policy for all
- Hardin examined the model with respect to human use of a *common environment*

The tragedy of the commons



Environmental Economics 101 (1)

- The environment as a sustainable <u>necessity</u> vs. as a sustainable <u>resource</u>
- We have an impact on the environment
- We depend on the environment for resources, but it comes with a <u>price</u>
  - When resource depletion occurs, it costs more to obtain the resource
  - Economic output over time declines unless inputs are increased
  - Increasing expenses over time devoted to pollution prevention and waste disposal

Anyone who believes exponential growth can go on forever in a finite world is either a madman or an economist.

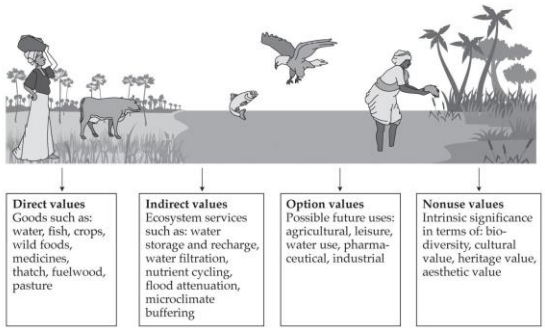
Stephen Boulding*

Enviro Econ 101 (2)

- Sustainable economic practices require:
  - A redefinition of 'growth' and differentiation among types of growth
  - Recognizing and measuring environmental constraints on economic growth
  - Defining the functions of the environment for economic systems
  - Creating markets for environmental goods and services and properly valuing these resources
    - Try to "**internalize" an "externality**" (Arthur Pigou)
  - Considering different measures of human well-being

Types of economic values

Fig. 5.3



Services = money (1)

Land acquisition is significantly less expensive (~500 million) than the cost of building a filtration plant (3–8 billion). Land acquisition also provides the added benefits of protecting the environment, adding green space, and avoiding additional taxes to pay for a new treatment plant (Ehlers *et al.*, 2000). The bulk of the land acquisition money has been directed toward the purchase of undeveloped and sensitive lands near reservoirs, streams, and wetlands in the C/D watersheds. The expected result of land acquisition and conservation practices is the protection of hundreds of stream miles, the preservation of thousands of acres of natural areas, and continued high water quality without the cost of a multi-billion dollar filtration system.

Figure 1. Location within New York State of the Catskill/Delaware and Croton Water Supply Watersheds and the aqueduct system which carries drinking water to New York City.

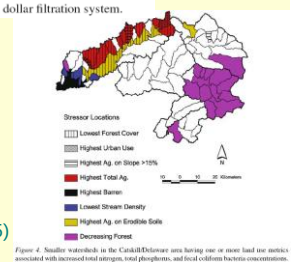


Figure 4. Smaller watersheds in the Catskill/Delaware area having one or more land use metrics associated with increased total nitrogen, total phosphorus, and fecal coliform bacteria concentrations.

Mehaffey et al. (2005)

Services = money (2)

InVEST: Integrated Valuation of Environmental Services and Tradeoffs

The Need for a New Tool

InVEST is a family of tools to map and value the goods and services from nature which are essential for sustaining and fulfilling human life.

Download InVEST

What is the value of the environment?

The value of the world's ecosystem services and natural capital

Robert Costanza*†, Ralph d'Arge‡, Rudolf de Groot§, Stephen Farber‖, Monica Grasso†, Bruce Hannon¶, Karin Limburg#, Shahid Naeem**, Robert V. O'Neill††, Jose Paruelo‡‡, Robert G. Raskin§§, Paul Sutton‖‖ & Marjan van den Belt¶¶

Nature 1997

The services of ecological systems and the natural capital stocks that produce them are critical to the functioning of the Earth's life-support system. They contribute to human welfare, both directly and indirectly, and therefore represent part of the total economic value of the planet. We have estimated the current economic value of 17 ecosystem services for 16 biomes, based on published studies and a few original calculations. For the entire biosphere, the value (most of which is outside the market) is estimated to be in the range of US$16–54 trillion ($10^{12}$) per year, with an average of US$33 trillion per year. Because of the nature of the uncertainties, this must be considered a minimum estimate. Global gross national product total is around US$18 trillion per year.

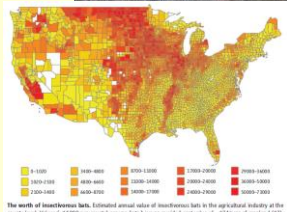
Estimated value of 1 taxonomic group

Economic Importance of Bats in Agriculture

Insectivorous bat populations, adversely impacted by white-nose syndrome and wind turbines, may be worth billions of dollars to North American agriculture.

Justin G. Boyles,[1]* Paul M. Cryan,[2] Gary F. McCracken,[3] Thomas H. Kunz[4]

Assuming values obtained from the cotton-dominated agroecosystem in Texas, and the number of acres of harvested cropland across the continental United States in 2007 (*13*), we estimate the value of bats to the agricultural industry is roughly $22.9 billion/year. If we assume values at the extremes of the probable range (*12*), the value of bats may be as low as $3.7 billion/year and as high as $53 billion/year. These estimates include the reduced costs of pesticide applications that are not needed to suppress the insects consumed by bats (*12*). However, they do not include the "downstream" impacts of pesticides on ecosystems, which can be substantial (*14*), or other secondary effects of predation, such as reducing the potential for evolved resistance of insects to pesticides and genetically modified crops (*15*). Moreover, bats can exert top-



Boyles et al. (2011); *Science*

What about in SC?

- 2016 study by Clemson found that natural resources were valued at $33 billion/year
  - Forestry: $19 billion
  - Coastal tourism: $9 billion
  - Fishing, hunting, wildlife viewing: $3 billion
  - Mining, boat manufacturing, commercial fishing: $3 billion
- Natural resources support 218,719 jobs (8.6% of total in SC)

Any caveats?

- What did Leopold say?
- Also, are all ecosystem services positive? (McCauley 2006)

Vol 443|7 September 2006 nature

COMMENTARY

Selling out on nature

Two key ideas

- Precautionary principle
- Polluter-pays precautionary principle:
  - An example?

from Wellcome Trust

How do you enact these principles and values?

- Government regulation
- Taxation
- Pollution 'rights' or 'credits', which are transferable
  - Cap & trade
  - Offsets

Government + Taxes

- Conservation easements

SC

http://www.wildlife.state.nh.us/merrimack/karnerblue.html.

Government + Taxes

- Electric vehicles
- Solar panels

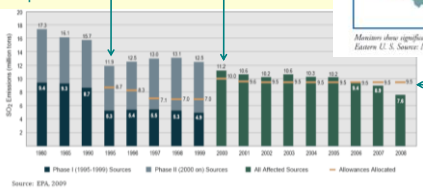
Cap and Trade: Acid Rain

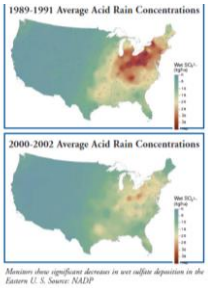
http://www.epa.gov/airmarkets/index.html

Program implemented In 1995

Electricity producers

All polluters on board





The cap

56% decline since 1980

Offsets

Or a C tax?