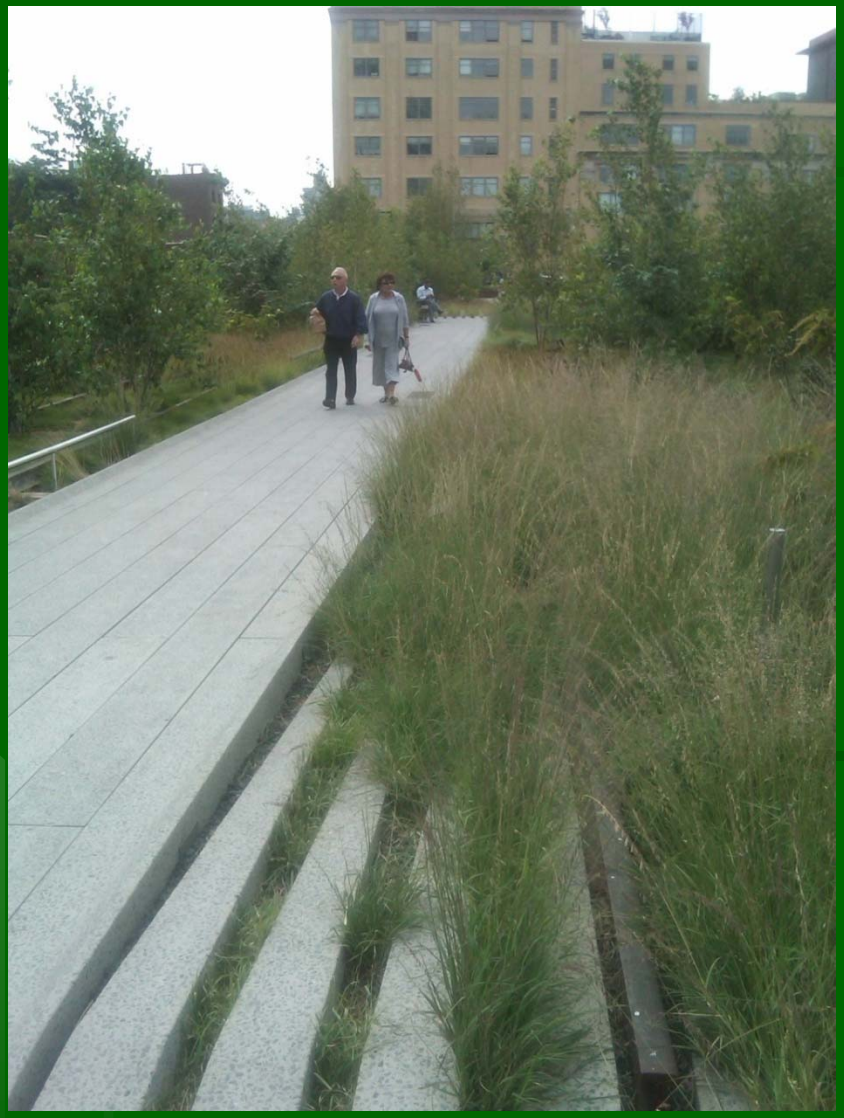
The Economics of Ecosystems



The High Line, New York City 2009

Sabina L. Shaikh
University of Chicago

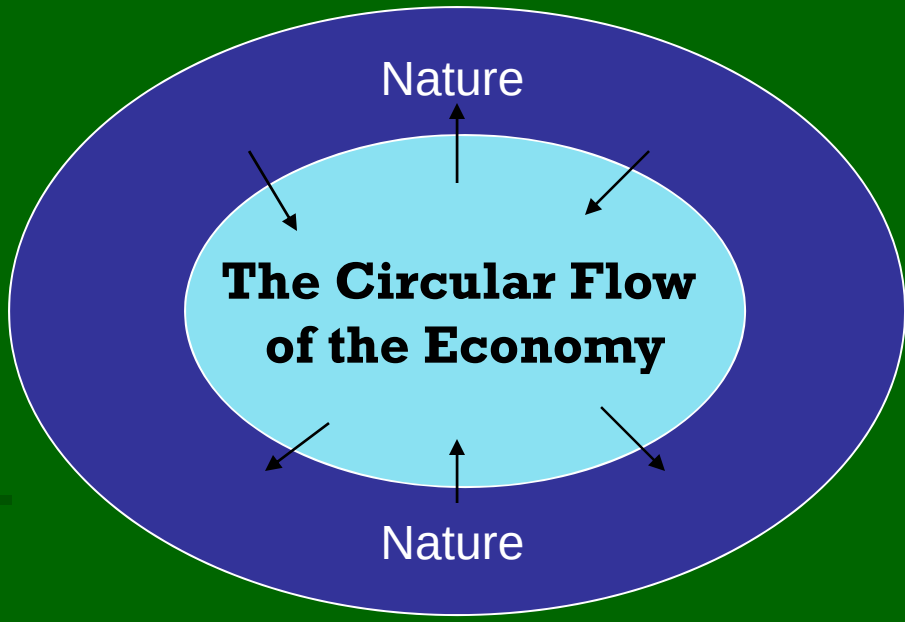
12th Biennial Governor's Conference on the Management of the Illinois River System

October 2009

Session B-1 Ecosystem Services: Introduction to Ecosystem Services

Economics and the Environment

- *Natural Resource Economics*
- *Environmental Economics*
- *Ecological Economics*
- *Neoclassical Economics*
  - *Comparison of costs and benefits*
  - *Invisible Hand – Markets*
  - *Market Failure*
    - *Public Goods*
    - *Externalities*
      - *Private Cost (+External Cost) Vs Private Benefit (+External Benefit)*
  - *Market Solutions for Market Failure*
    - *Examples: Clean Air Act SO_2 Trading Program, Conservation Reserve Program, Mitigation Banking*



Economics and Ecosystems

- Economic Growth and Ecosystem Protection
- Nature as an Investment/Asset
- Political buzz
  - Green Economy
  - Green Jobs
  - Green Infrastructure
- Economic Incentives
  - Ecosystem Service Provision
  - Price as an Incentive
  - Flexible Mechanisms

- How to generate social benefits from private decision makers?
- Economic Valuation– "Nonmarket" Valuation

Ecosystem Goods and Services

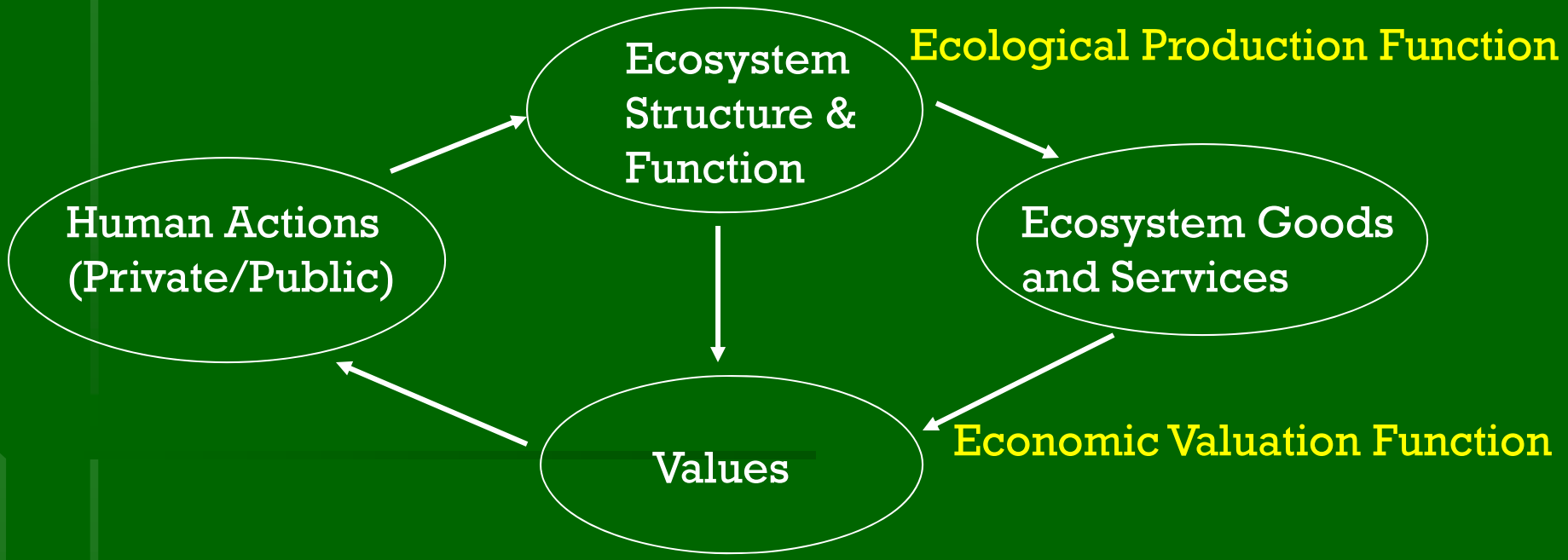
- Rural and Urban Eco-service Provision
- Marketable Goods: Fish, Lumber, Crops
- (Some) Ecosystem Services
  - **Recreation**
  - Habitat, Biodiversity
  - Carbon Sequestration
  - Soil Management and Erosion Control
  - Flood Control
  - Groundwater Recharge and Storage
  - Water Purification
  - Waste Decomposition
  - Climate Regulation
  - Pollination Services

Chicago City Hall Green Roof 2009

Economic Valuation Methods

- Why consider the economic value of ecosystems and ecosystem services?
- Non-Market Valuation for Environmental Quality
  - Revealed Preferences
    - Property Values
    - Travel Costs
  - Stated Preferences
    - Contingent Valuation
- Bio-Economic Models for Natural Resource Management
- Replacement Costs, Avoided Costs, Costs of Treatment
- Secondary Applications
  - Benefit Transfer and Meta Analysis
- Linking to Spatial Analysis and Ecosystem Mapping

Components of Ecosystem Valuation



Adapted from *Valuing Ecosystem Services*, National Academy of Sciences 2005

Challenges to Economic Valuation of Ecosystems

- Understanding the linkage between the structure and function of natural systems
- Relationships are Dynamic & Spatial
- Complex: One Service Vs Entire Ecosystem
  - Valuing a Park for Recreation
  - Valuing a Forest for Carbon Sequestration
- Creating Indicators for Economic Valuation
  - Air Quality Indicators – Changes in Health, Visibility
  - Water Quality Indicators – Changes in Health, Fish Populations, Recreation
  - Ecosystems, Biodiversity…
- Integrating Ecological Models and Economic Valuation from the Ground up

Policy Implications of Economics and Ecosystems

- Who owns the services provided by private land? (Clean Water Act Vs Farm Bill)
- Property Rights: Pay to Pollute or Get Paid Not to Pollute
- Aligning Private and Social Costs and Benefits
- Payments for Environmental Services (PES)
  - Conservation Reserve Program, Shoreline Protection Programs, Debt for Nature Swaps, Developing Country Programs
- Purchases of Eco-Services as compensation for social benefit provision
  - Droughts: Wetlands Purchases in Georgia, Everglades and Sugar Companies
  - Rainforest development rights for carbon and climate regulation
  - Tax Credits and Grant Programs

Florida Gulf Coast Dune Habitat 2009

Markets for Ecosystem Services

- Ecosystem Service Valuation is Evolving
  - Understanding interdependency of functions and services
  - Development of standardized methods and acceptable indicators
- Markets are Emerging but not Well Established
  - *Payments for Environmental Services*
  - *Markets for Carbon Mitigation*
  - Participation and Information: Farmers know how to market crops but ecosystem services?
  - Accounting and Verification
  - Additionality, Tradeoffs
- Precedent of Paying Polluters
  - "Polluter Pays" vs Pay not to Pollute
  - Moral Hazard?
- Economic Valuation can Improve Information and Reduce Transactions Costs for Markets

Example: Agricultural Land Conversion In Canada

- Shaikh, Suchanek, van Kooten (2004, 2007)
- Farmers indicate significant private benefits exist but large-scale tree planting not happening voluntarily due to transaction costs, information, uncertainty
- Private provision of tree planting < Socially Optimal Level due to positive externalities
- Payment Proposed for *external benefits* from carbon mitigation
- Total Costs of Land Conversion with Payment
  - Hybrid Popular Costs $10.76 to $23.25 per t CO2
  - Native Species Costs $30 to $125 per t CO2
- Compare Costs to other CO2 reduction strategies.
- Compare Related Ecosystem Services of strategies
- Big Driver: Uncertainty in Markets for Carbon