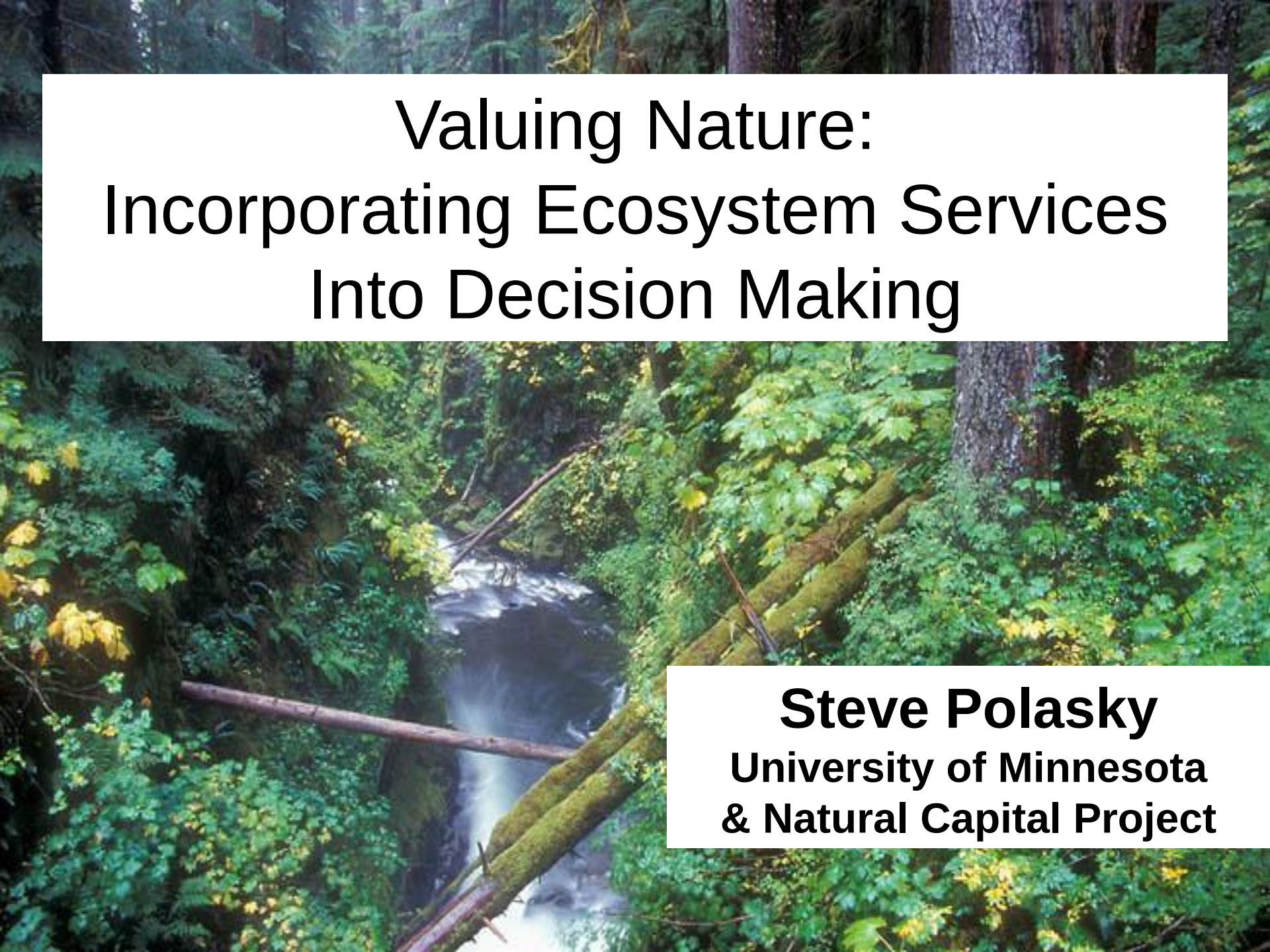


Valuing Nature: Incorporating Ecosystem Services Into Decision Making

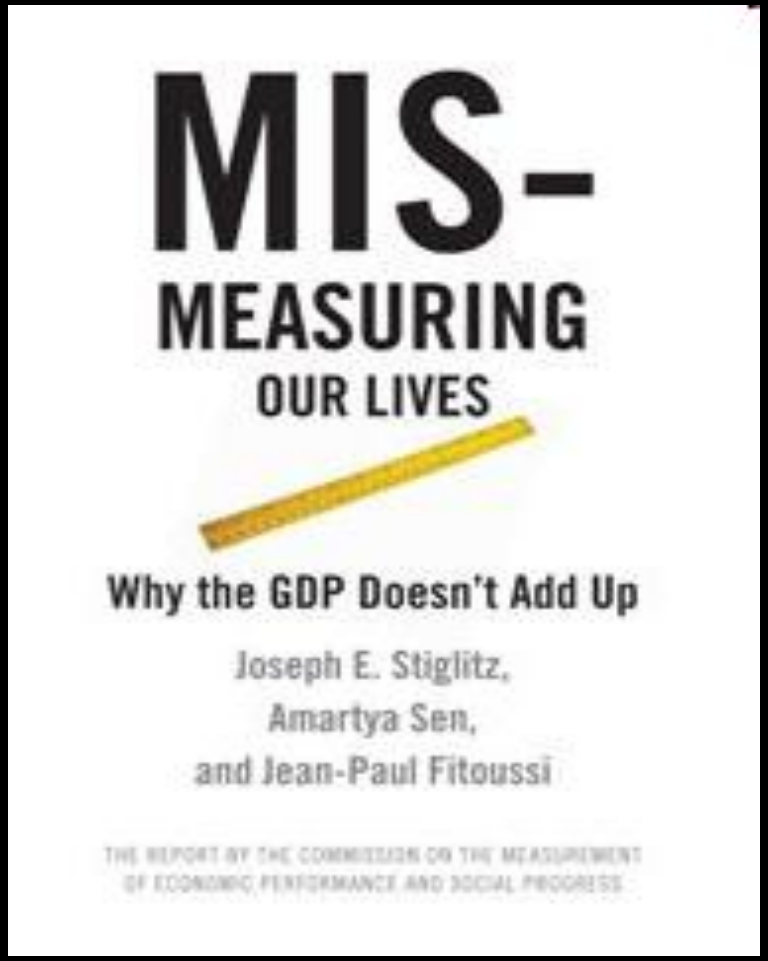
Steve Polasky
University of Minnesota
& Natural Capital Project

Introduction

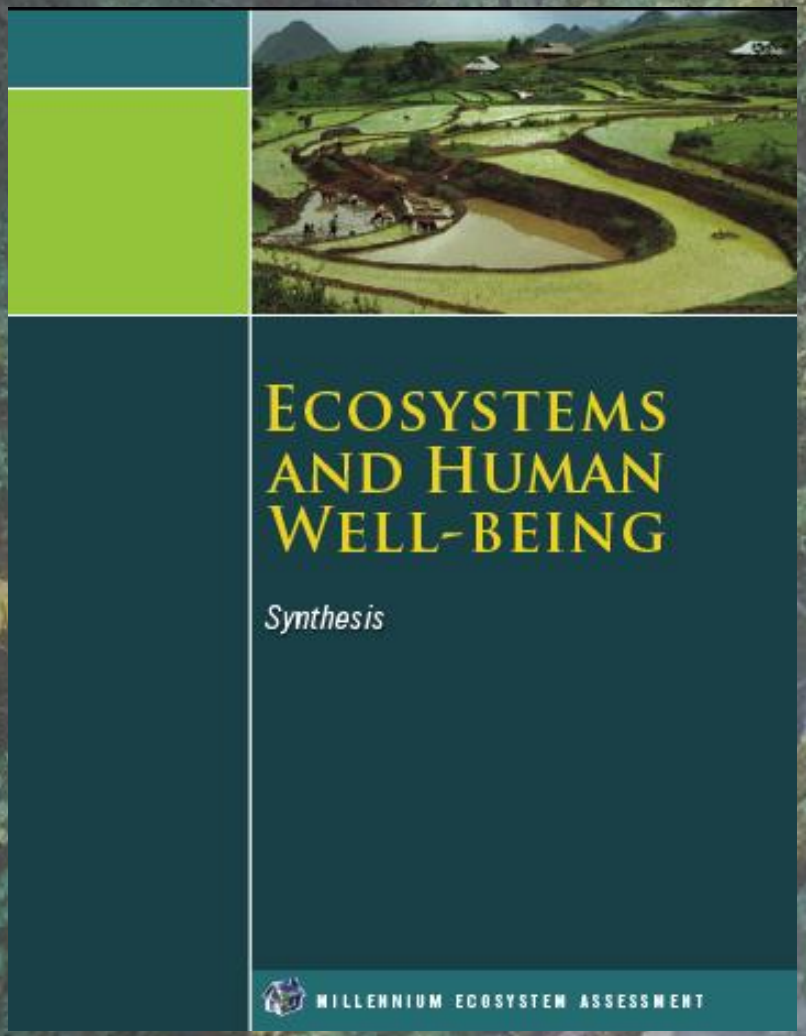
- Prior to the 1930s there were was no systematic accounting of the state of the economy
- First estimates of national income in the 1930s and measure of measure of Gross Domestic Product (GDP) in 1940s
- First national income accounts were published in 1947
- Provided much clearer picture of the state of the economy

Need for new measures

- GDP was designed for a specific purpose: to measure flow of activity in the economy
- GDP is NOT a measure of welfare or a measure of sustainability



Getting back to nature



- The Millennium Ecosystem Assessment (2005): Ecosystems and biodiversity are essential for human well-being
- Notion of “ecosystem services”
- But most ecosystem services do not go through markets and do not show up in economic accounts

Clouded vision

- We lack the right set of measures and accounts to judge the full consequences of our actions
- Distorted views leads to distorted decisions

Accounting for ecosystem services:
provide a clearer view of the full picture

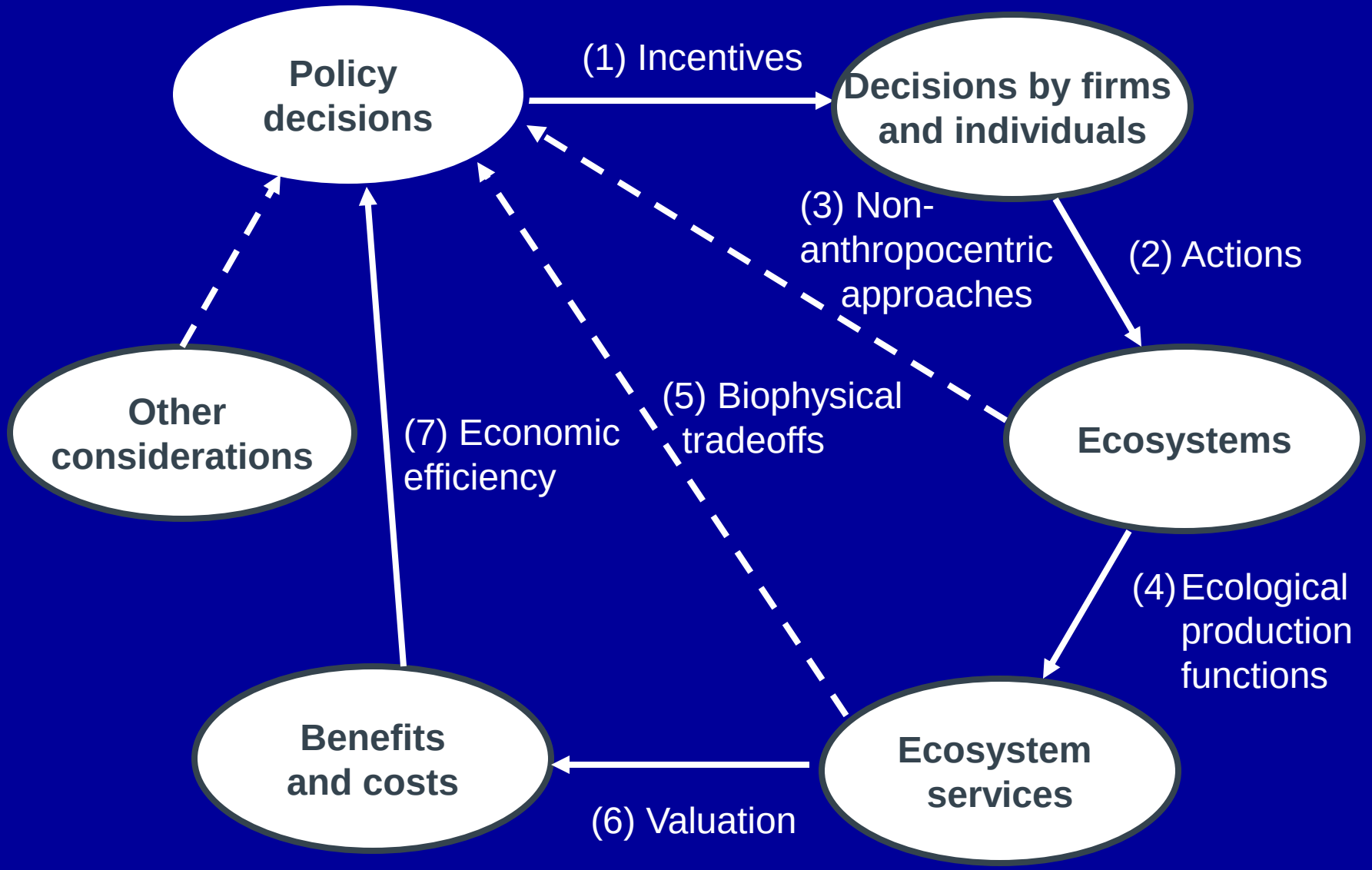
Introduction

- How can we “mainstream” ecosystem services?
- Factor ecosystem services into everyday decisions by individuals, businesses and governments

Three main tasks

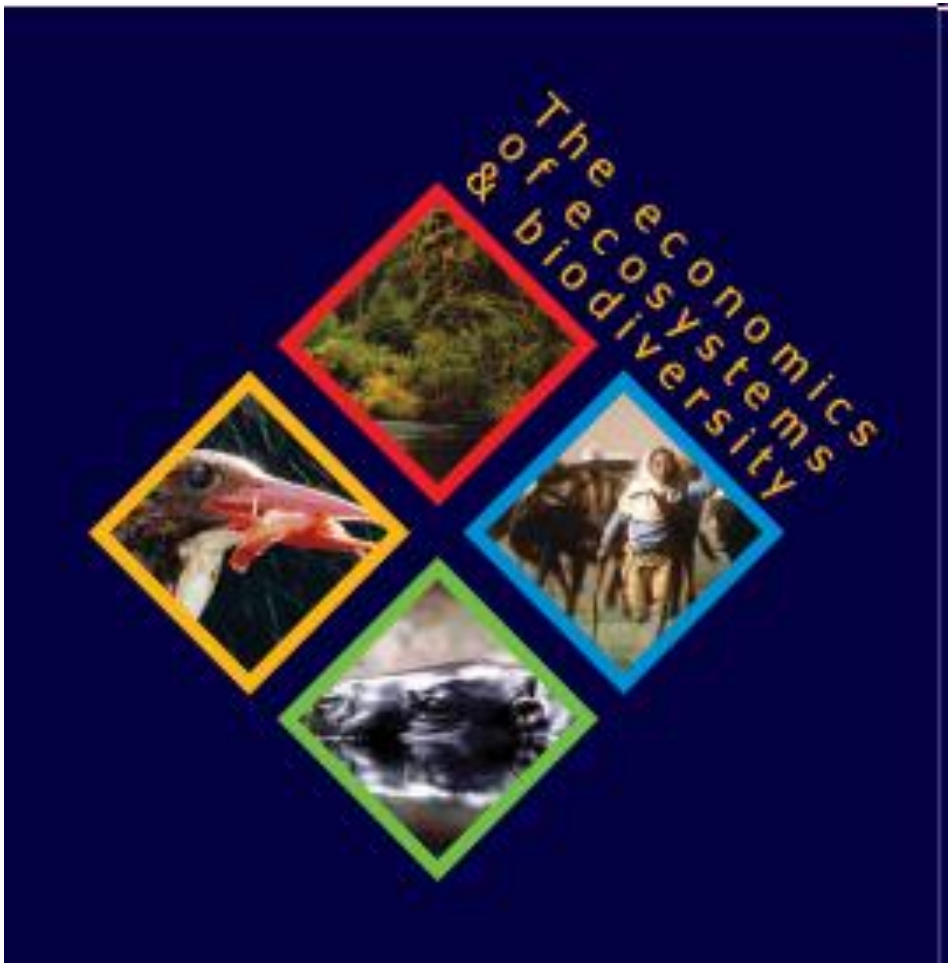
1. Understanding the ***PROVISION***
2. Understanding the ***VALUE***
3. Create incentives for sustainable provision: ***POLICY***

A research agenda for ecosystem services



Polasky & Segerson *Annual Review of Resource Economics* 1: 409-434.

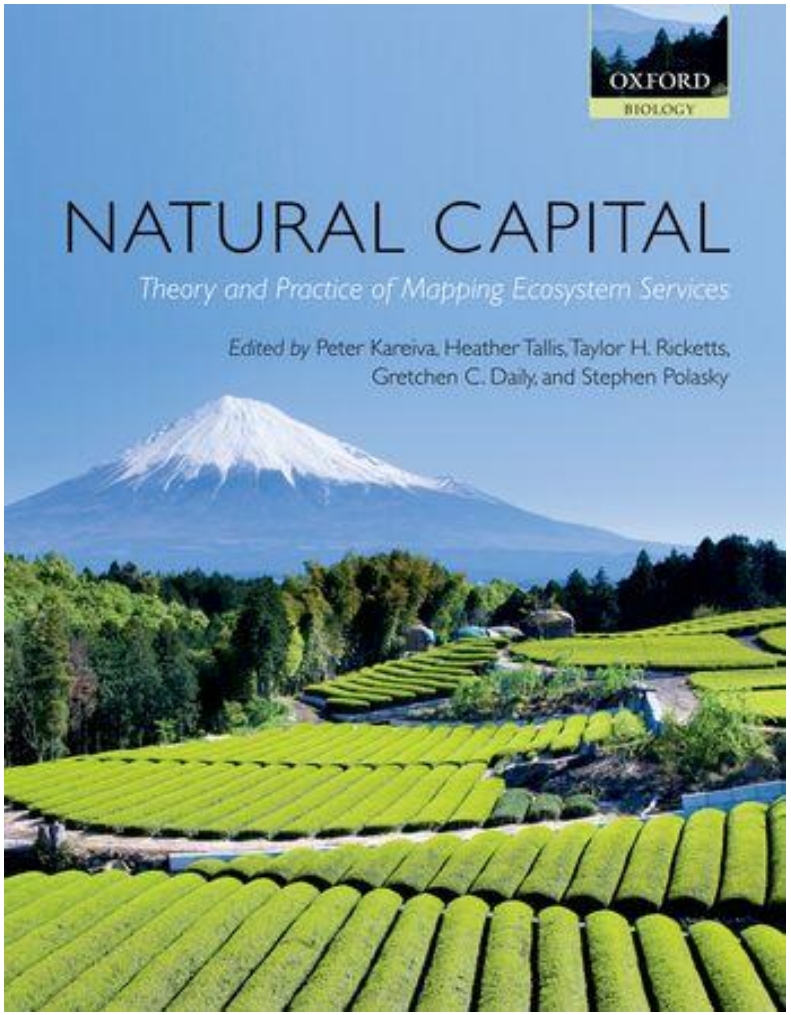
Need for evidence and implementation



- **Moving beyond the MA**
- **How can we provide evidence of the value of ecosystems and biodiversity?**
- **How can we "mainstream" the value of nature?**

Methods to mainstream ecosystem services

- Approaches to mapping and valuing ecosystem services: Kareiva et al. 2011. Oxford University Press.

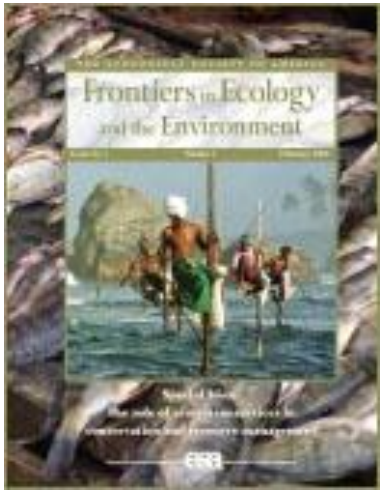


natural capital PROJECT

ALIGNING ECONOMIC FORCES WITH CONSERVATION

"InVEST"
Integrated **V**aluation of **E**cosystem **S**ervices and **T**radeoffs

http://www.naturalcapitalproject.org/InVEST.html



Frontiers of Ecology and Environment Feb 2009

Economic valuation

Vertical Lightning At Sunset" by Christian Meyn

FreeDigitalPhotos.net

Arguments against valuation

- Putting dollar values on nature is controversial and some would say misguided
- McCauley 2006 “Selling out on nature” *Nature* 443: 27-28
- “…ecosystem services are rapidly assuming an importance in discussions on conservation that is far out of proportion to their actual utility.”
- “Nature has an intrinsic value that makes it priceless, and that is reason enough to protect it.”

Valuation and/or intrinsic value

- My view: valuing nature in monetary terms is not always essential and doing so does not exclude ethical arguments
  - These are complementary approaches not substitute approaches
- Pragmatic: most people care (to some degree) about nature for both ethical and self-interested reasons
- If people truly care about nature (for whatever reason) then they value it

Applications of integrated assessment of ecosystem services

Where to put things? Spatial land management with biological and economic objectives

Polasky et al. 2008. *Biological Conservation* 141(6): 1505-1524.

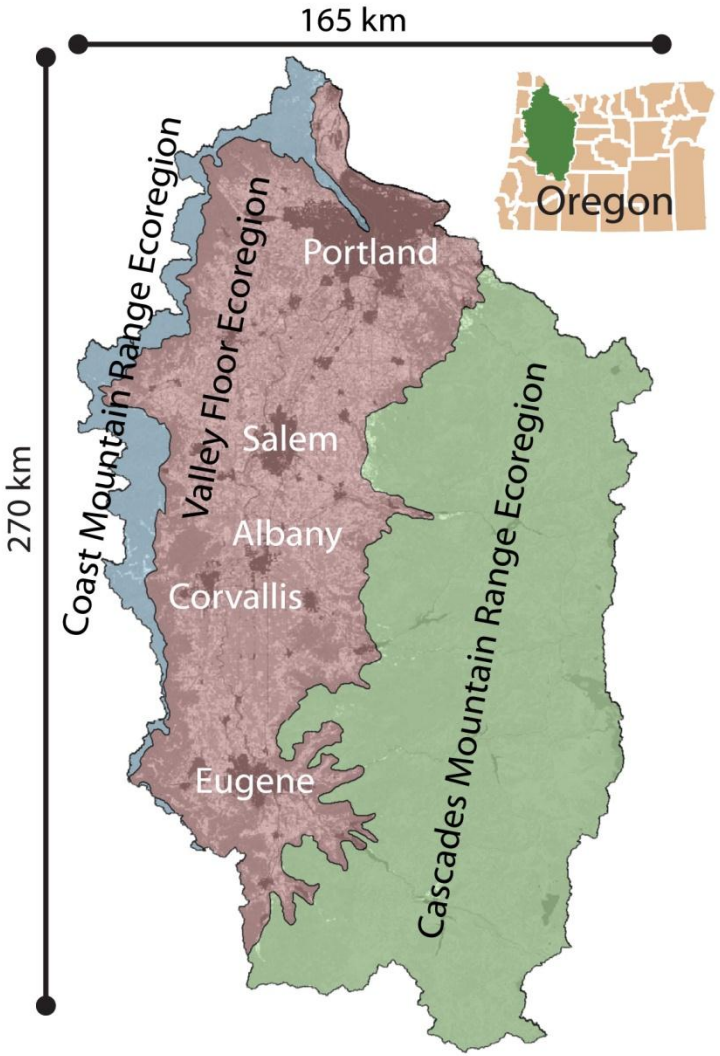
Introduction

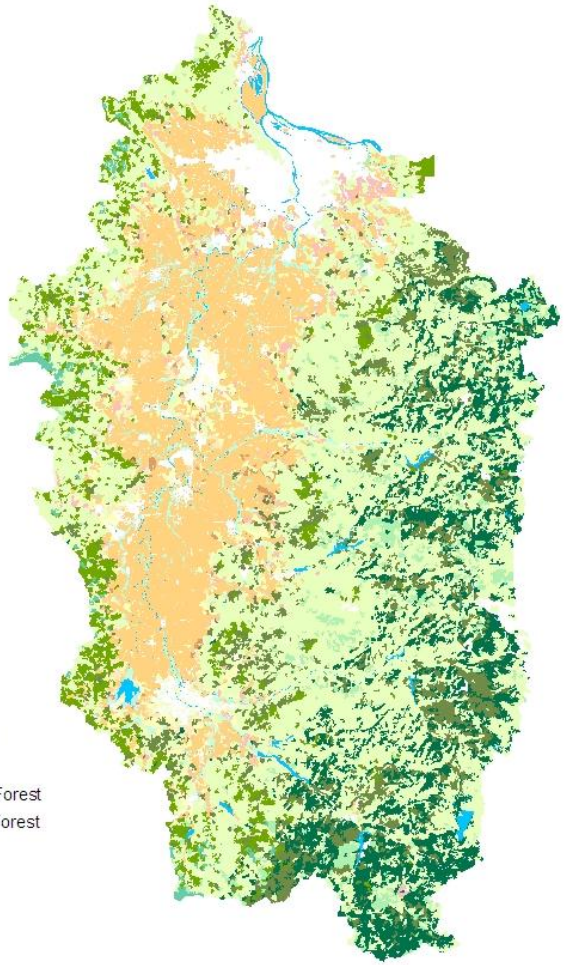
- Analyze effect of alternative land use patterns on
  - Biodiversity
  - Value of agriculture, timber and housing development
- Biological model:
  - Land use determines pattern of habitat
  - Predict probability of persistence for 267 terrestrial vertebrate species
- Economic model:
  - Value of agricultural crops and timber harvest are a function of yield, price and production costs
  - Value of rural residential housing: hedonic property price model to predict housing value as function of distance to urban areas and county location
- Efficiency frontier: find land use patterns that maximize biodiversity score for given economic return

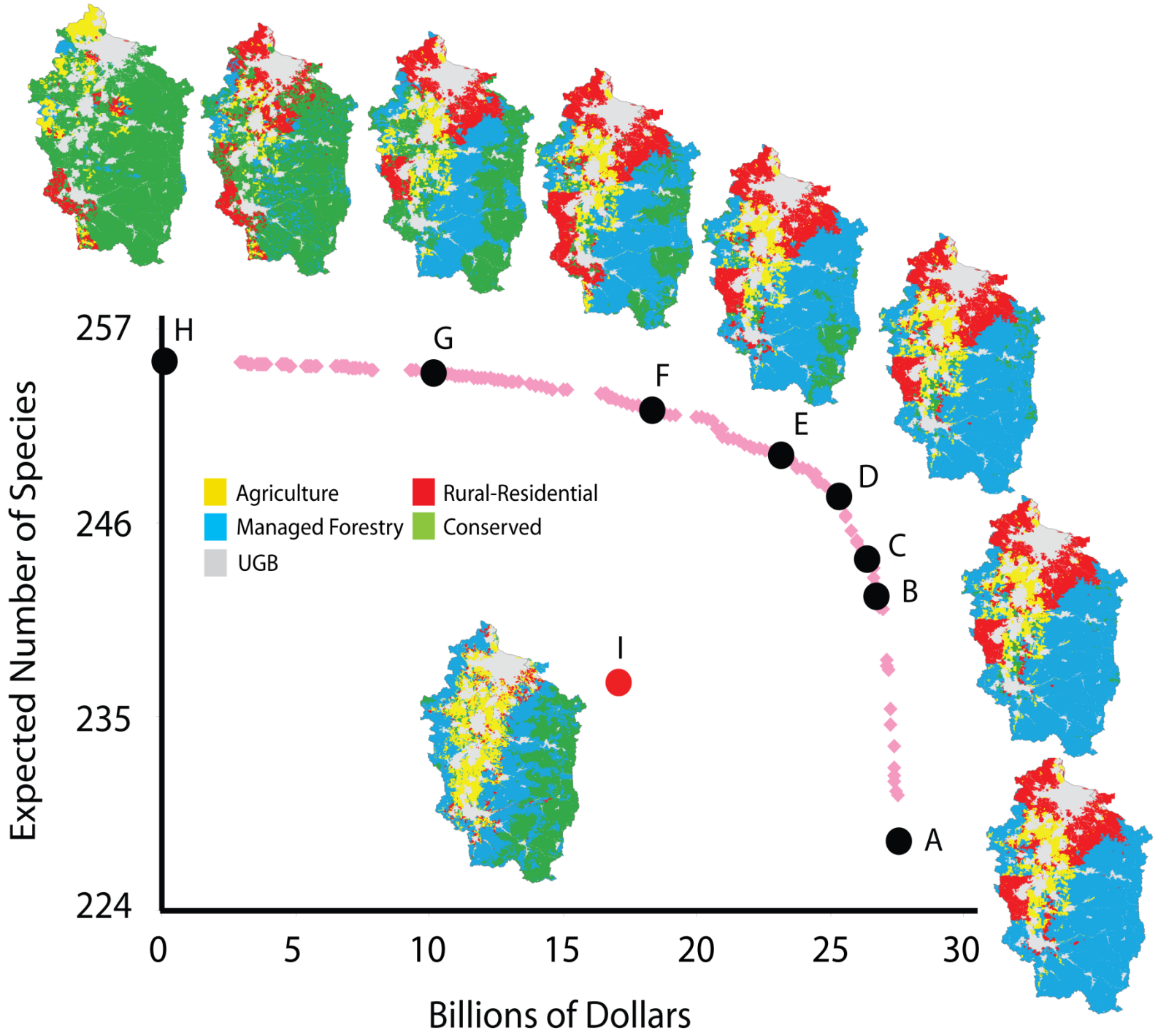
Land uses

- Consider 9 land uses in the Willamette application
  - row-crop agriculture
  - orchard/vineyard
  - Pasture
  - grass seed
  - 45-year rotation managed forestry
  - rural-residential development
  - conservation to create the dominant potential natural vegetation in the parcel
  - conservation to recreate conditions at the time of European settlement in the parcel
  - conservation to maintain 1990 land cover conditions in the parcel

Willamette Basin






257
246
235
224
Expected Number of Species
0
5
10
15
20
25
30
Billions of Dollars
H
G
F
E
D
C
B
A
I
Agriculture
Rural-Residential
Managed Forestry
Conserved
UGB

Modeling multiple ecosystem services and tradeoffs at landscape scales

Nelson et al. 2009. *Frontiers in Ecology and Environment* 7(1): 4–11.

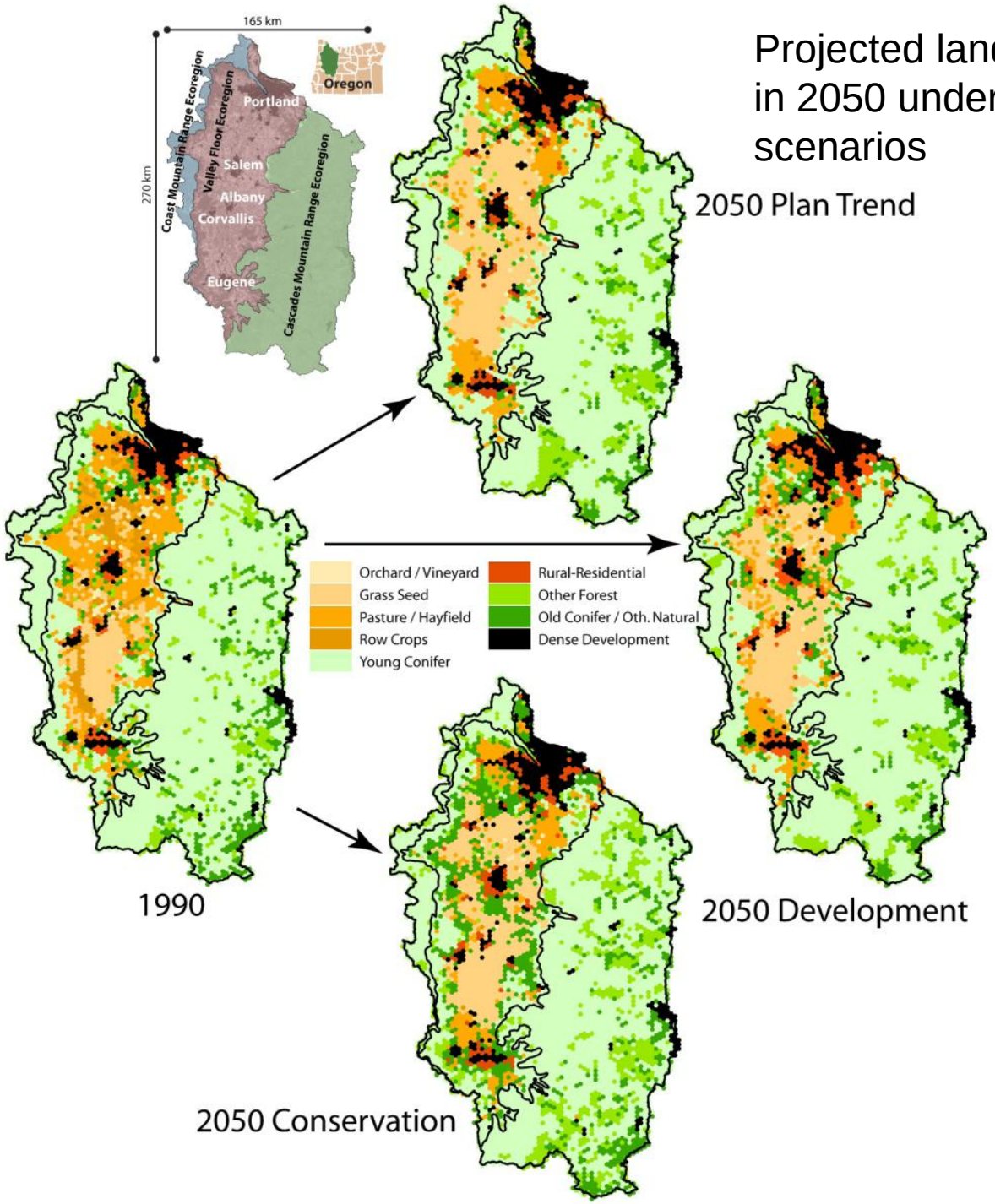
Modeling multiple services under alternative scenarios

- Three scenarios of land use / land cover change for the Willamette Basin developed by the Willamette Partnership for 1990 – 2050
  - Plan trend
  - Development
  - Conservation

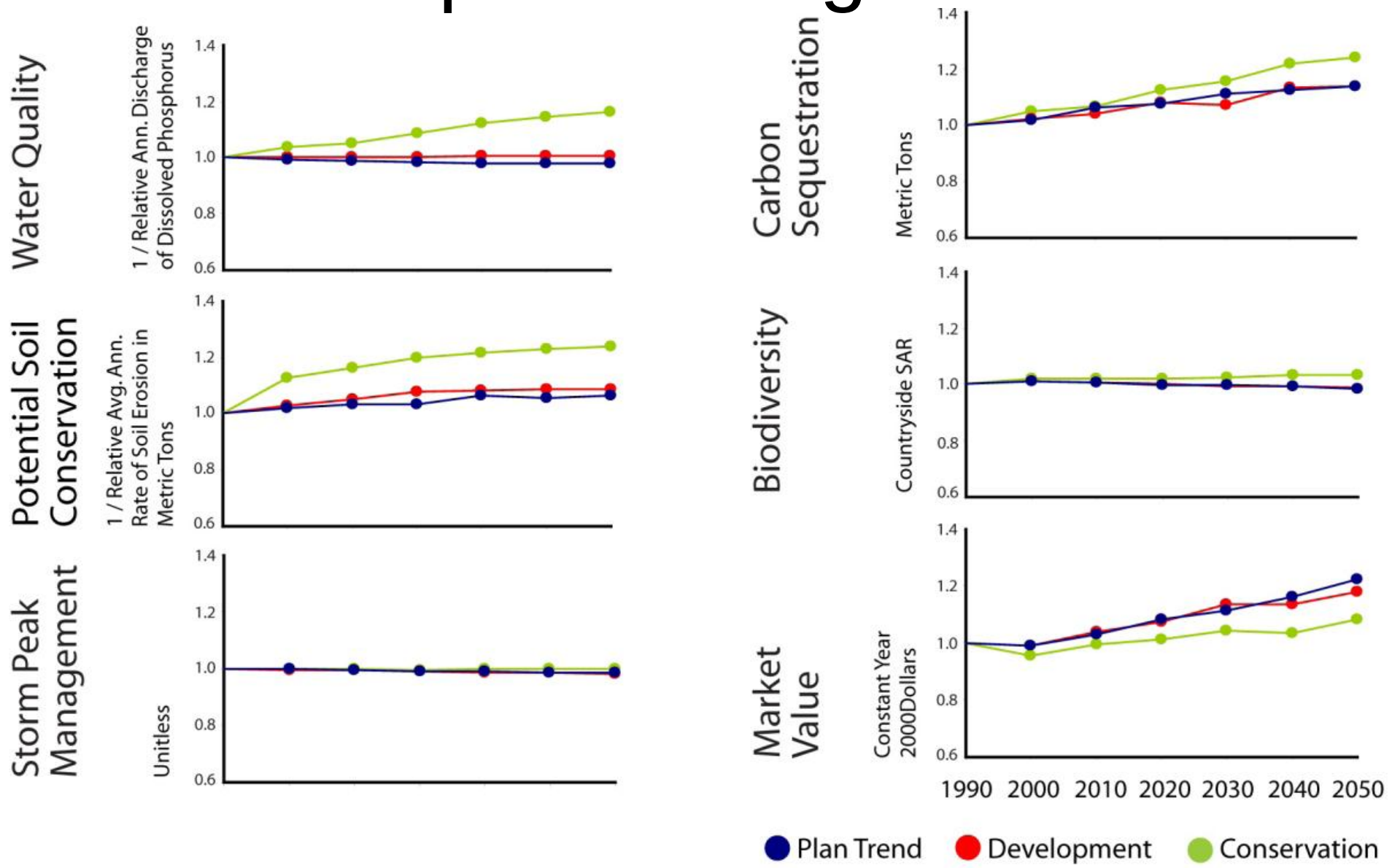
Modeling multiple services under alternative scenarios

- Model outputs: service provision and biodiversity
  - Water quality
  - Storm peak mitigation
  - Soil conservation (sediment retention)
  - Climate stabilization (carbon sequestration)
  - Biodiversity (species conservation)
  - Market returns to landowners (agricultural crop production, timber harvest and housing values)

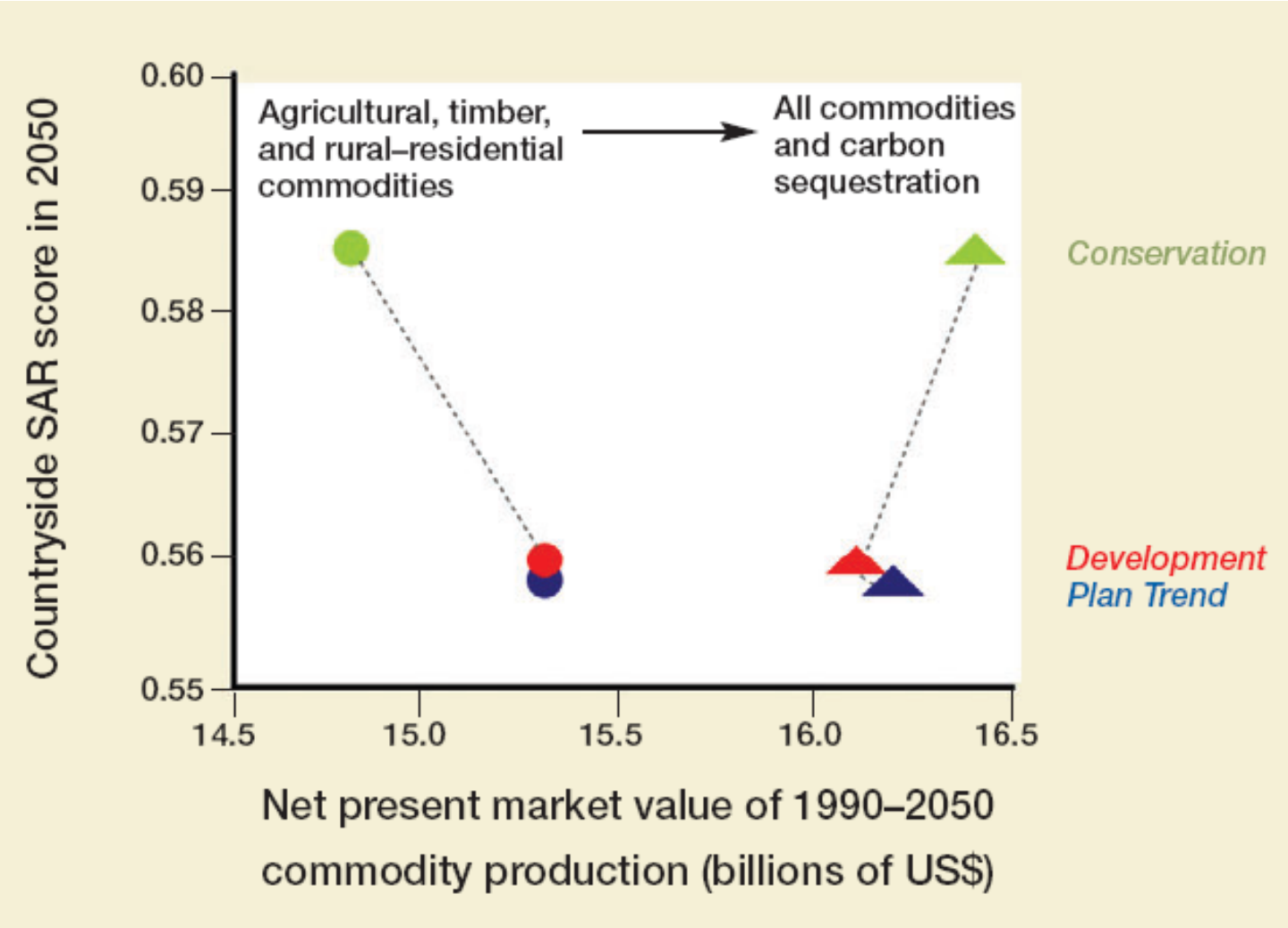
Projected land use change in 2050 under the three scenarios



Outputs through time



Ranking of scenarios depends on set of ecosystem services considered



Summary

- Spatially explicit analysis of multiple ecosystem services and biodiversity conservation
- Joint provision of services: one landscape, many consequences
  - Tradeoffs among services under alternative management
- Tools to address three related tasks of
  - Provision
  - Value
  - Policies and scenarios
- The failure to incorporate the value of ecosystem services in land use planning can result in poor outcomes
  - Low level of ecosystem services
  - Low value of total goods and services from landscape

Future challenges (1): quantification

- Social-ecological systems: dynamic and interconnected
- Do we understand systems well enough to predict short-term and long-term consequences of management actions on services?
- Particular challenges
  - Incorporating variability and uncertainty
  - Thresholds and regime shifts

Future challenges (2): valuation

- Do we understand systems well enough to establish payments for ecosystem services?
- Danger of not tying payments to service provision
  - Case of carbon and tillage practices
- Importance of cultural, spiritual and aesthetic values

Future challenges (3): policy and institutions

- Distribution of benefits: who benefits and who pays
  - Relationship to poverty alleviation
  - Equity and justice
- Adaptive governance: designing institutions that learn and adapt to new information and situations

Moving ahead

- We do not know enough BUT…
- We know enough to improve on current performance
- Pressing need to begin to mainstream ecosystem services into societal decisions
- The long road rather than the quick fix:
  - Better science to improve understanding
  - Better institutions/policy that reflect values
  - Adaptive process that learns through time


Thank you