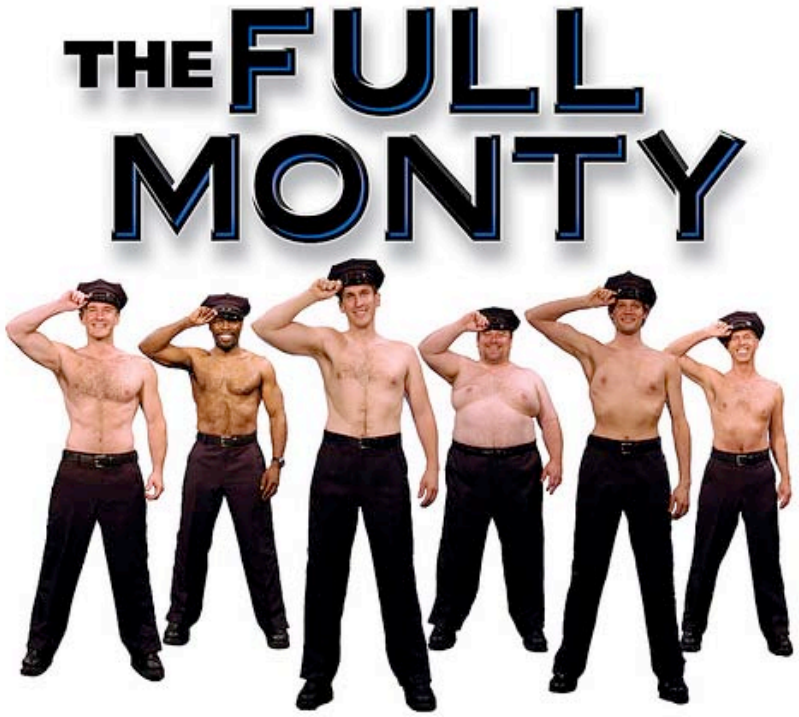
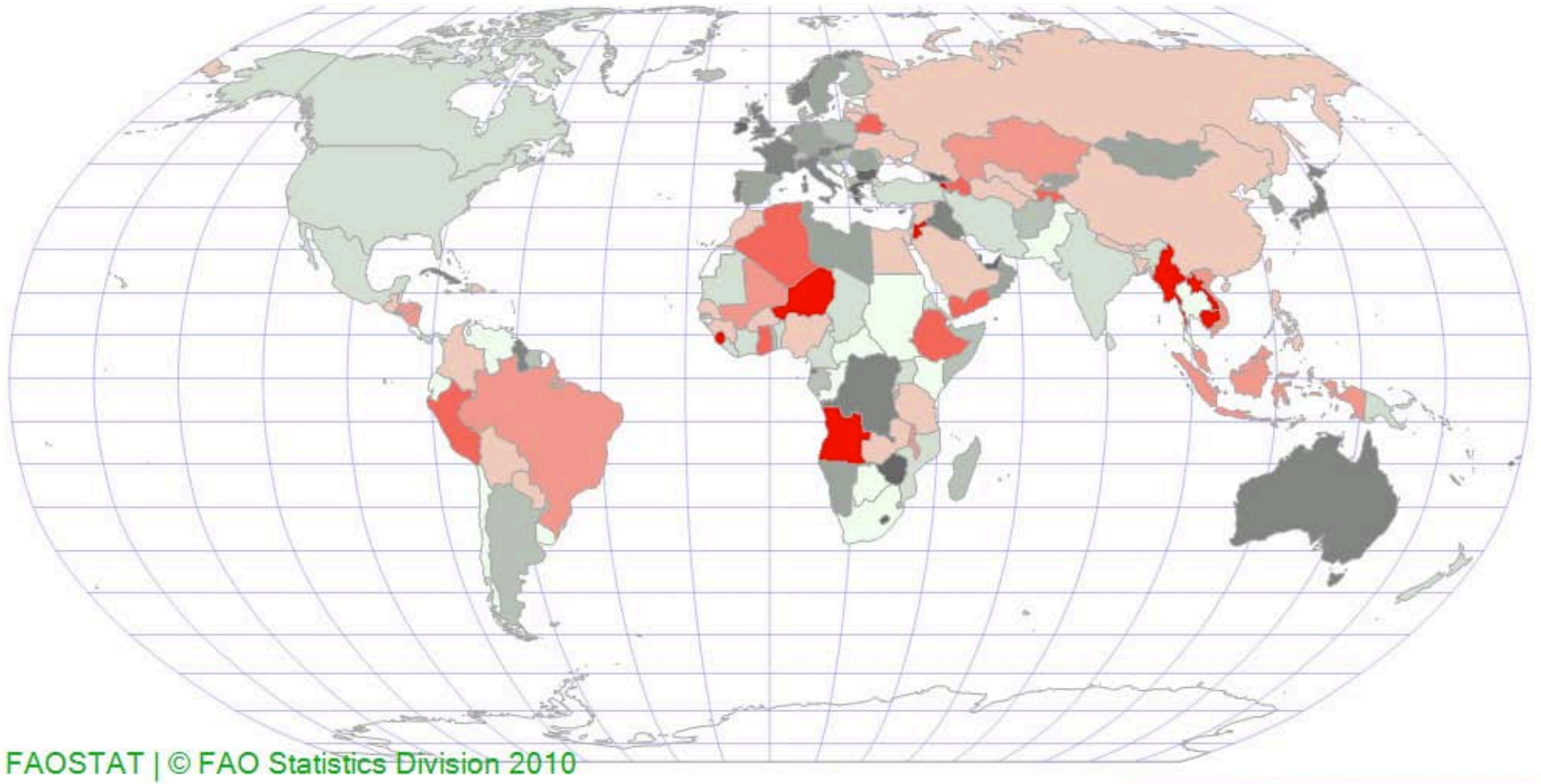


Revealing the Environmental and Social Costs and Benefits of Agriculture

Heather Tallis

Agricultural Production

Agricultural Production



% Growth in Agricultural Production 1999-2009

This is a good thing, right?




If you like ***dust storms***

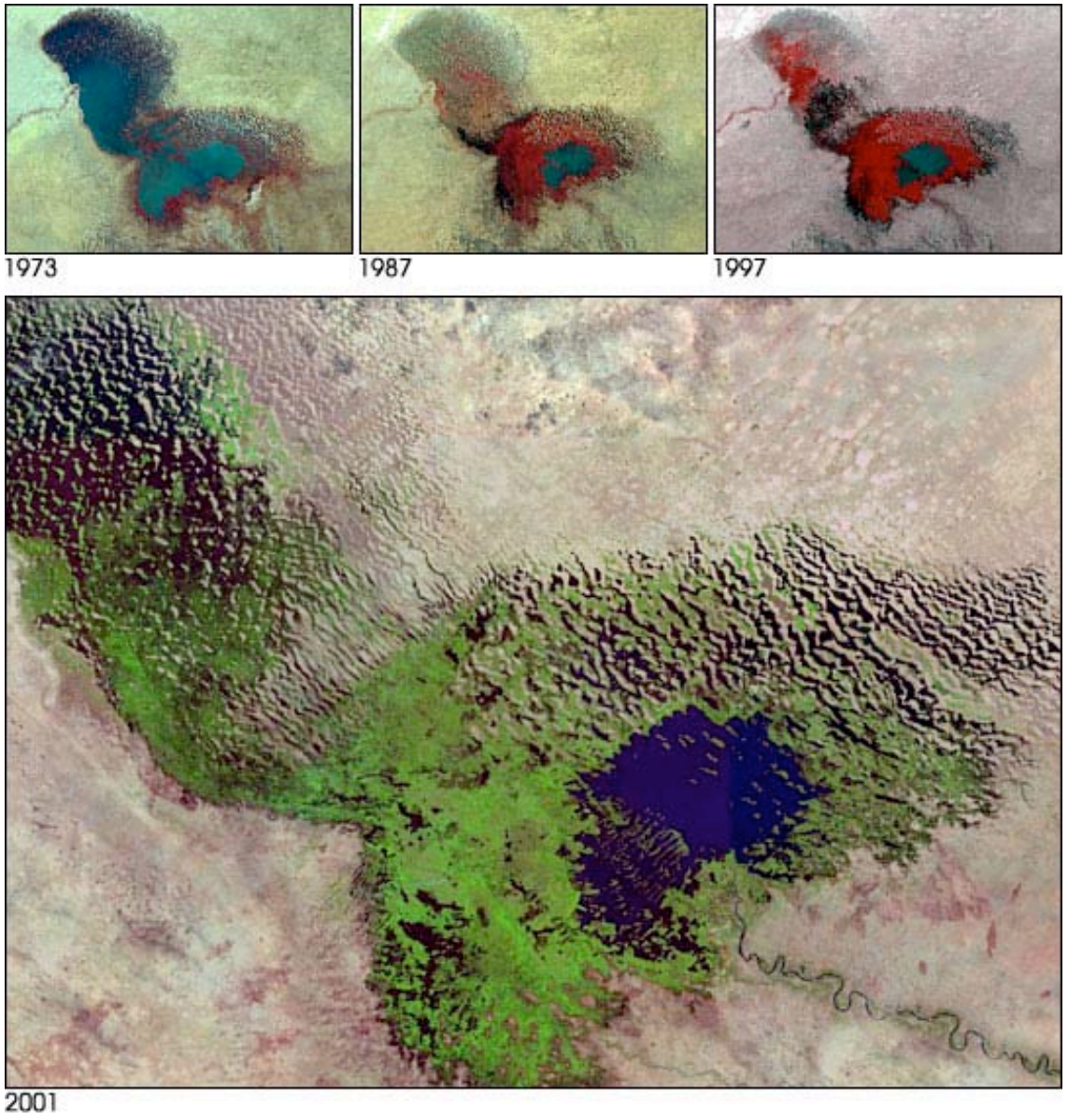
1930's USA

2010 China

If you like ***dead zones***

Fertilizer = 8,500+ square miles of dead space in the Gulf of Mexico

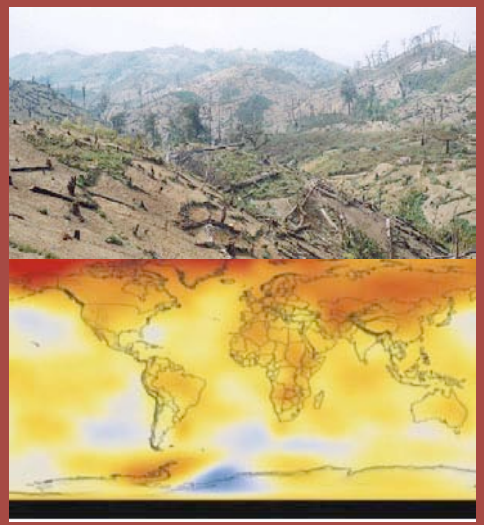
Or if you ***don't*** like ***water***



The Full Monty: Ag production comes with tradeoffs



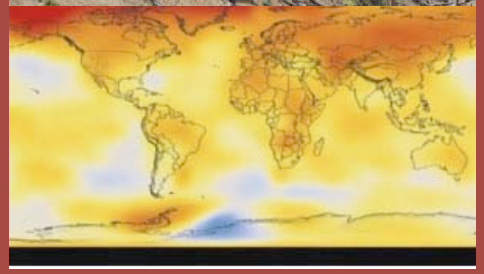




Ecosystem Services





Ecosystem Services

Ecosystem services are the goods and services people receive from nature.

Clean water	Flood mitigation	Recreation
Timber	Storm protection	Cultural or spiritual
Food (crops, fish)	Disease control	Livelihoods
Fuel	Climate regulation	Existence value




Ecosystem Services

Current decisions only account for *some*
We need to account for them all!

Clean water	Flood mitigation	Recreation
Timber	Storm protection	Cultural or spiritual
Food (crops, fish)	Disease control	Livelihoods
Fuel	Climate regulation	Existence value




Agriculture Needs to Keep Growing

Agriculture Needs to Keep Growing

Can we fill the yield gap *while maintaining*
clean drinking water
climate regulation
hydropower production
flood regulation
carbon sequestration
and *other services?*

The Natural Capital Project

Woods Institute for the Environment
Stanford University

WWF

The Nature Conservancy

Institute on the Environment
University of Minnesota
Driven to Discover℠

Free Software

Steve Polasky, Erik Nelson, Guillermo Mendoza, Driss Ennaanay, Stacie Wolny, Heather Tallis, Marc Conte, Jim Regetz, Peter Kareiva, Taylor Ricketts, Gretchen Daily, Mary Ruckelshaus, Anne Guerry, Katie Arkema, Greg Guannel, Jodie Little, Chong Ki Kim, Mike Papenfus, Apollo Qi, Nasser Olwero, Nirmal Bhagabati, Robin Naidoo, Eric Lonsdorf, Kai Chan, Rebecca Shaw, Dick Cameron, Neil Burgess, Andrew Balmford

InVEST

Map, quantify and value multiple ecosystem services

Example: Colombia

How can we get the most beef and sugarcane from the Northern Andes region of Colombia?

InVEST

How can we get the most beef and sugarcane from the Northern Andes region of Colombia?

Connected by other ecosystem services:
water yield
erosion control

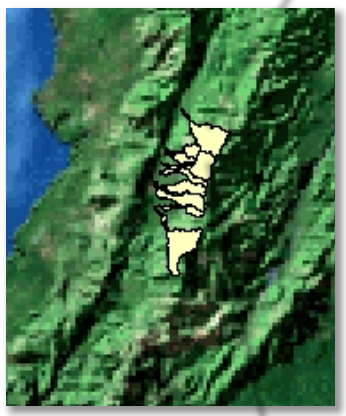
Water Fund

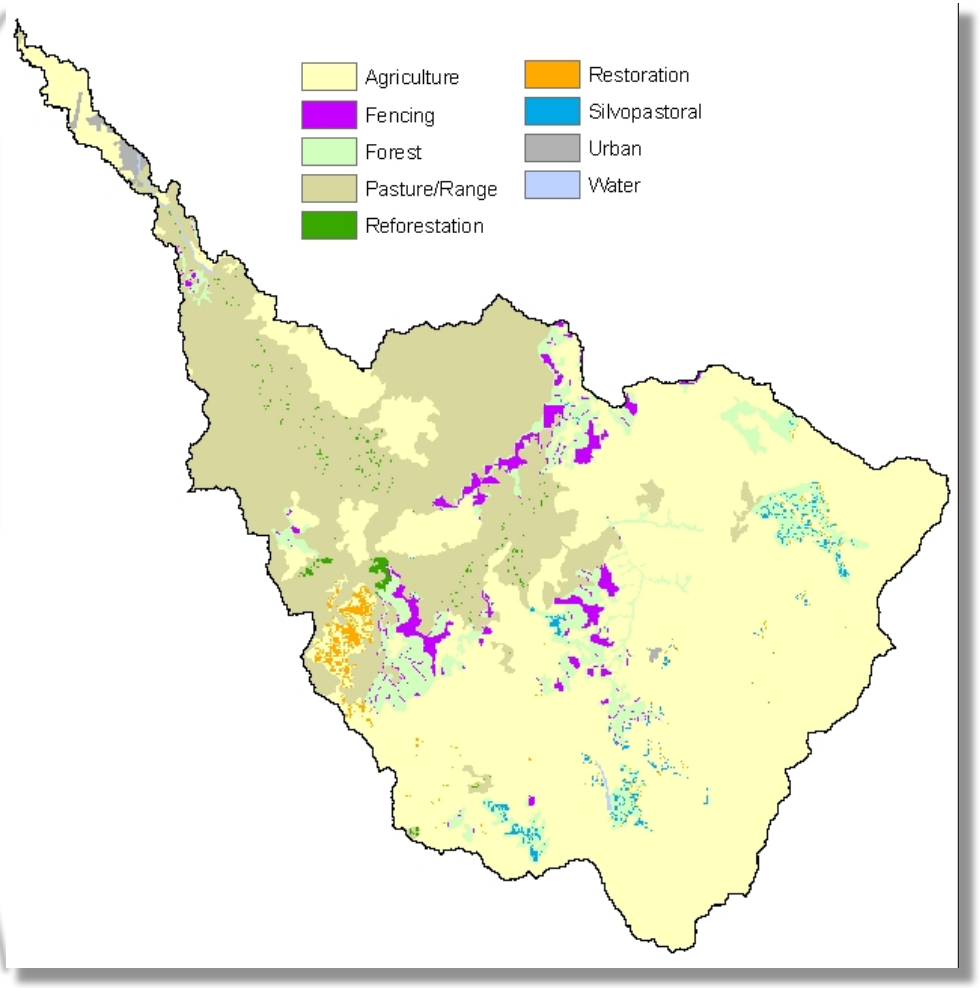
Sugarcane growers and water municipalities pay ranchers to change their practices

Maintain consistent water flows necessary for drinking water, agriculture and biodiversity through a coordinated strategy.

Water Fund

Tulua River Watershed





Take Home Message

More beef production is good for beef, but not for water supply, erosion control or sugarcane

Example: Minnesota

Was agricultural expansion in the 1990's worth it?

Would more agricultural expansion be worth the social and environmental costs in carbon and water quality?

Polasky et al. 2010

Example: Minnesota

Actual agricultural expansion 1992-2001

Predicted further expansion,
primarily biofuels

Polasky et al. 2010

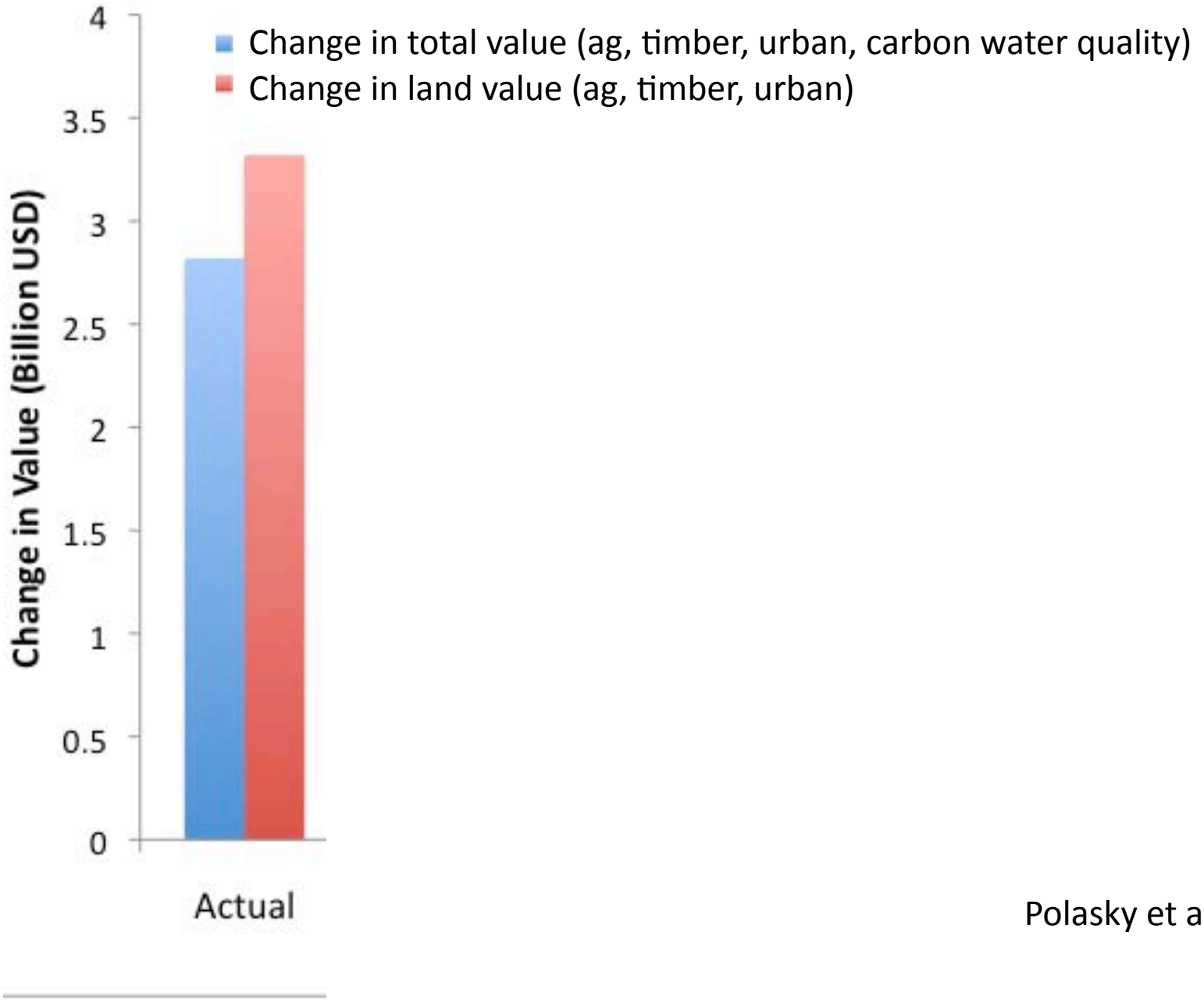
Example: Minnesota

How much did each landscape provide in:

- Agriculture revenues
- Timber revenues
- Rural residential revenues
- Carbon sequestration revenues
- Avoided water treatment costs

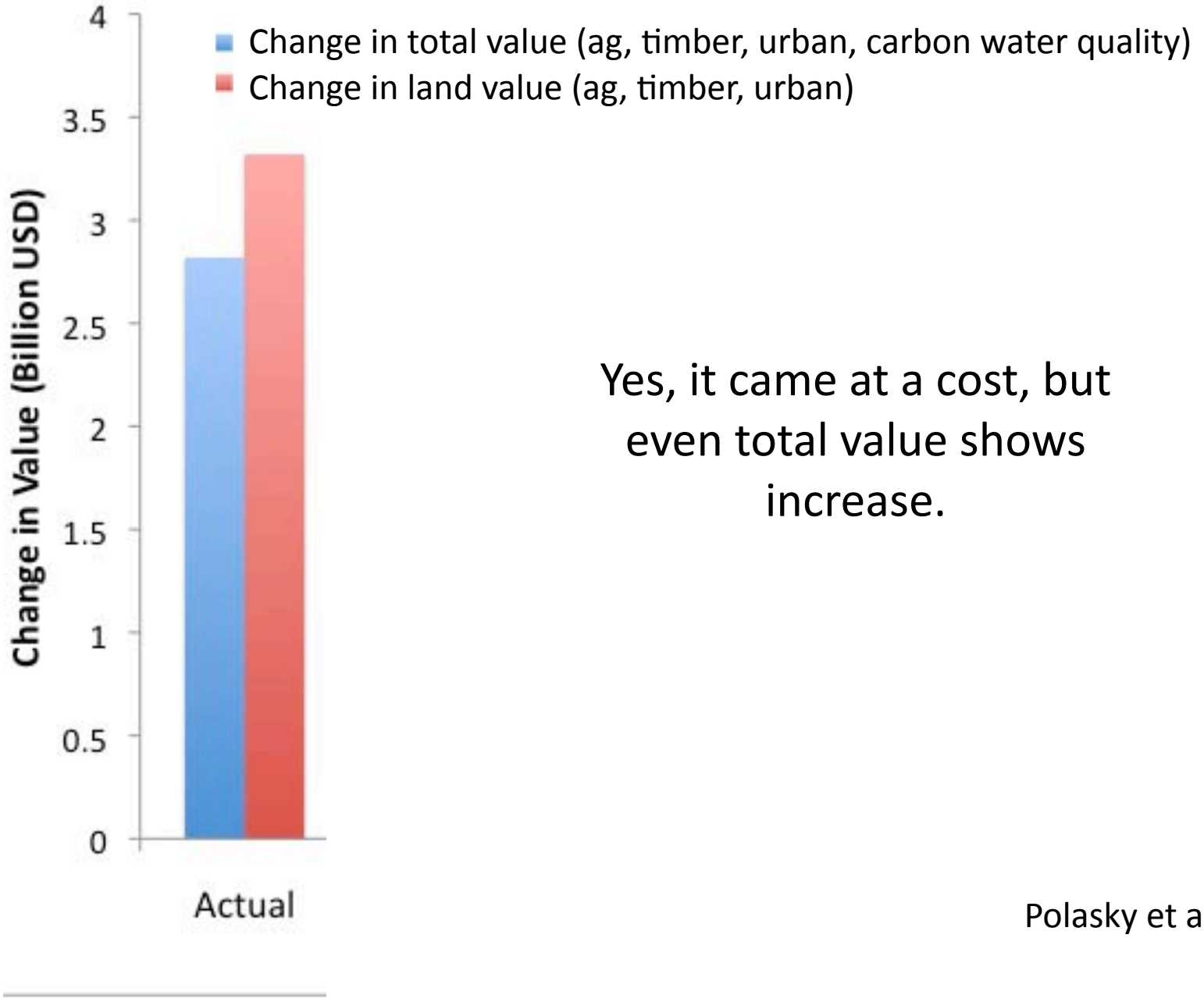
Polasky et al. 2010

Did past expansion come at a cost?



Polasky et al. 2010

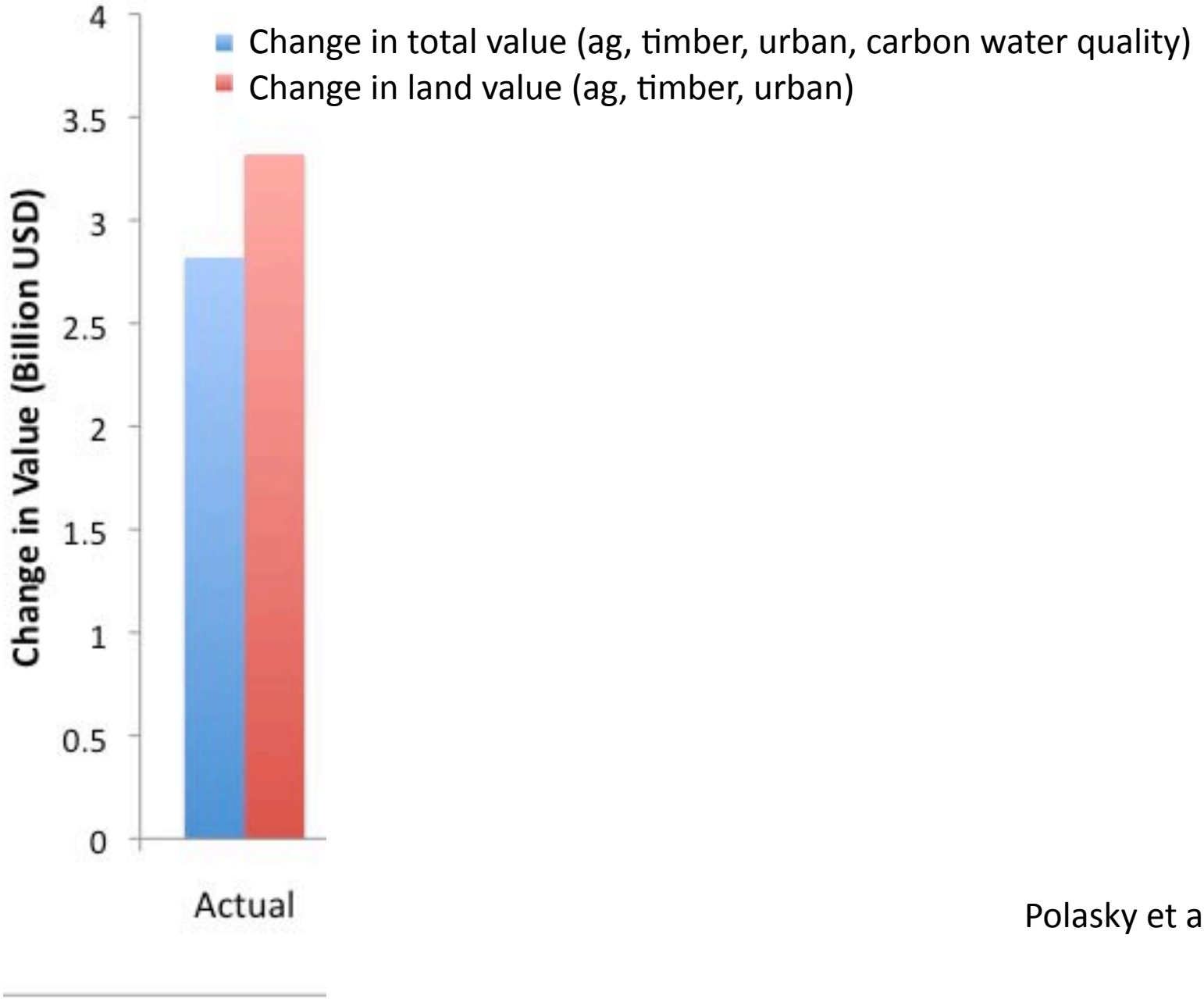
Did past expansion come at a cost?



Yes, it came at a cost, but even total value shows increase.

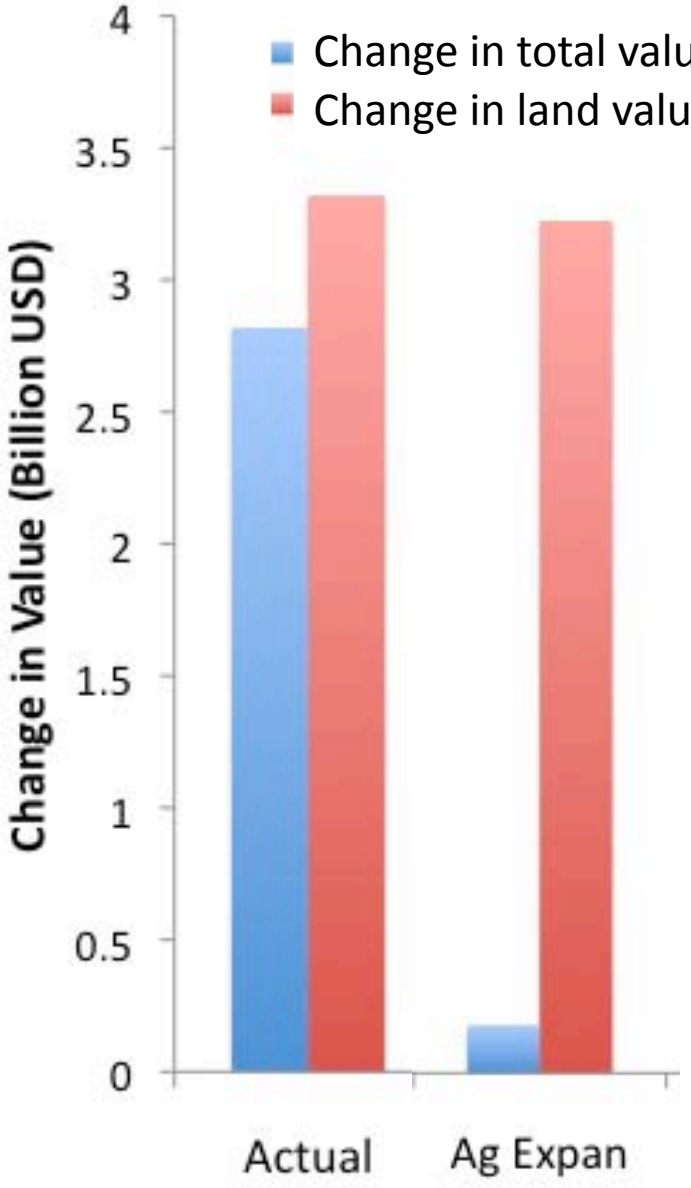
Polasky et al. 2010

Would further expansion be worth it?



Polasky et al. 2010

Would further expansion be worth it?



No! Decrease in total value:
Low soil fertility
Some land conversion
Low crop values

Polasky et al. 2010

Revealing costs and benefits