Sustainable Land Architecture

Directions in Land Change Science

B. L. Turner II
Graduate School of Geography
Marsh Institute
Clark University

The emergence of land change science for global environmental change and sustainability

E. Irwin & N. Bockstael: The evolution of urban sprawl: evidence of spatial heterogeneity and increasing land fragmentation

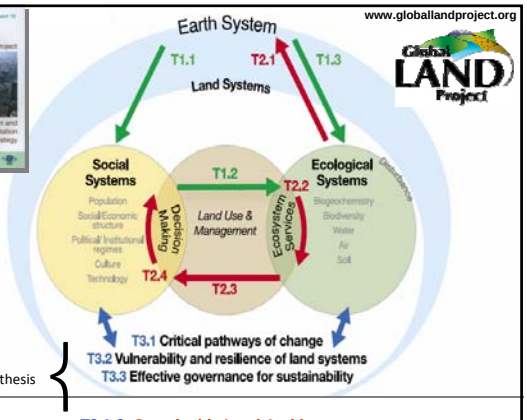
S. Diaz et al.: Incorporating plant function diversity effects in ecosystem service assessments (award)

D. Lawrence et al: Ecological feedbacks following deforestation create the potential for a catastrophic ecosystem shift in tropical dry forest

S. Manson & T. Evans: Agent based modeling of deforestation in the southern Yucatan, Mexico, and reforestation in the Midwest US

D. M. Stafford Smith et al. Learning from episodes of degradation and recovery in variable Australian rangelands

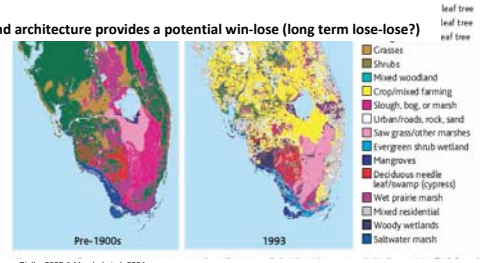
www.globallandproject.org



T3.1-3: Sustainable Land Architecture

Point: multiple governance & ad-hoc "design" of land uses (+ their patterns) to serve human wants now threaten the water balance with implications for agriculture, potable water, the Everglades, and land subsidence.

The land architecture provides a potential win-lose (long term lose-lose?)

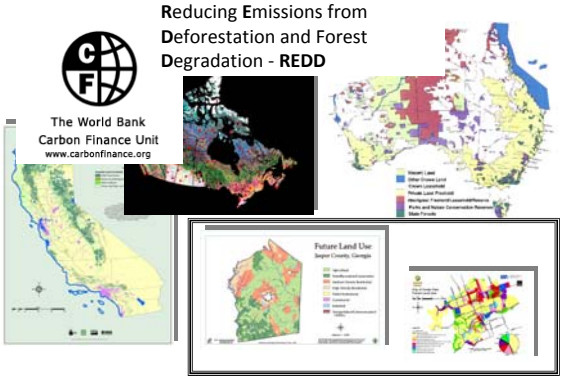


Pielke 2005 & Marshal et al. 2004

Land change → surface sensible & latent heat flux → with specific impacts on afternoon sea breeze fronts → *marked changes in spatial distribution & amount (↓) of July-Aug precipitation + increase in diurnal temp. cycle → affecting long term water balance*

Reducing Emissions from Deforestation and Forest Degradation - REDD

The World Bank
Carbon Finance Unit
www.carbonfinance.org

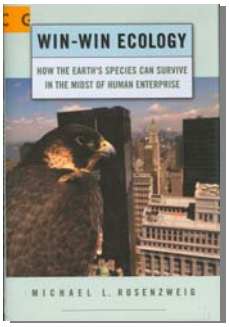


Towards Governance of Global Terrestrial Surface

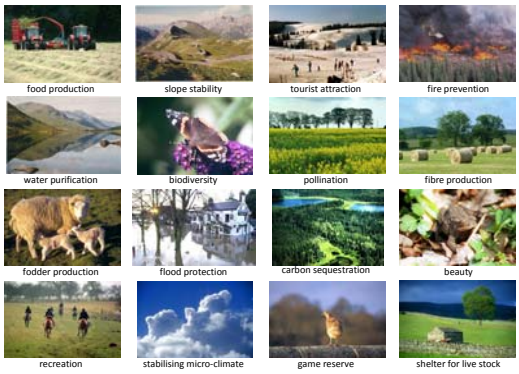
Sustainable What?

Provisioning humankind without threatening the capacity of the earth system to deliver ecosystem services.

Win-Win (sustainable) solutions



Ecosystem (Environmental?) Services

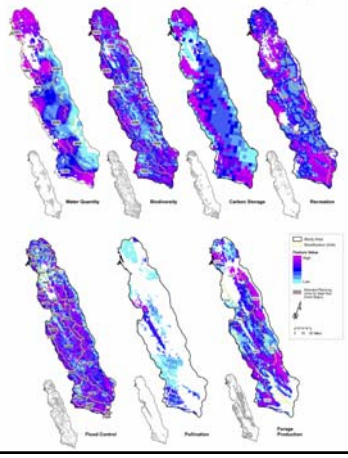


From: MEA

More than Resources *Per Se*

MEA slide

Photo credits (left to right, top to bottom): Purdue University, WomenAid.org, LSUP, NASA, unknown, CEH Wallingford, unknown, W. Reid, Staffan Widstrand

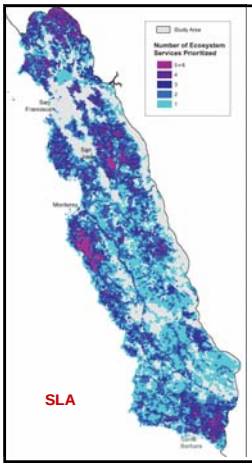


Spatial Congruence of 6 Ecosystem Services and Biodiversity

Does a focus on conservation-preservation of biodiversity alone yield best results for other ecosystem services?

SLA

Chan et al. 2006. *PLOS Biology* 4: 2138-2152



Spatial Congruence of 6 Ecosystem Services and Biodiversity

[Because]…**benefits [of ecosystem services] vary in the scale of their operation and dependence on habitat, [with dramatic affect on] simultaneous management for multiple services.**

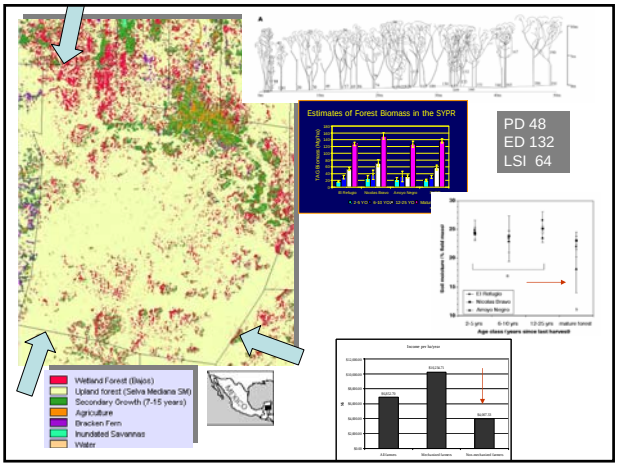
Protecting [locations] selected for their biodiversity value is not likely to maximize protection for the full suite of benefits unless [changes in biodiversity priorities].

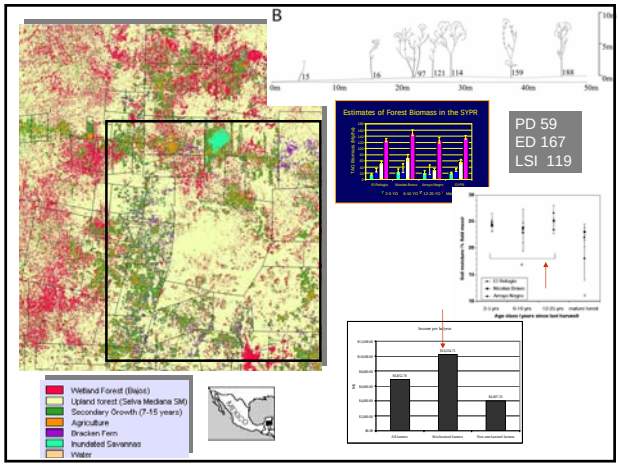
[Benefits] are more easily met if demand occurs at broad scales and supply varies considerably at local to regional scales. [e.g, carbon storage]

[In the reverse] spatial mismatches are exacerbated and [benefits] may be more difficult to achieve. [e.g., water]

SLA

Chan et al. 2006. *PLOS Biology* 4: 2138-2152





- POINT: SLA → understanding tradeoffs beyond provisioning services
- POINT: Implicit operational assumption → aggregation of sustainable solutions at the local scale = sustainable solutions at ascending scales.
- Ecological and spatial science → little to no foundation for this assumption.

SLA

Spatio-Scalar Dimensions of Land Dynamics