

Section MA: Mitigation and Adaptation

Readings: Parts of Chapter 17, 18, 20

Learning outcomes

- know the definitions of mitigation and adaptation
- understand how ecosystems participate in mitigation, especially in agriculture and forestry
- describe ways humans can facilitate adaptation of plants/animals/ecosystems to future climate change

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Definitions

- mitigation = “actions to limit the magnitude and/or rate of long-term climate change”
- adaptation = “the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects that moderates harm or exploits beneficial opportunities.” IPCC, Working Group 2, AR4, AR5; National Climate Assessment, 2014

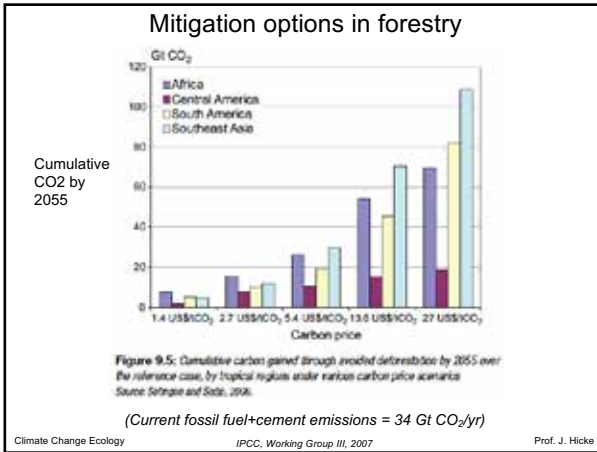
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Mitigation options in agriculture

Figure 6.5: Total potential mitigation potential (GtCO₂e/yr) for each region by 2030, including cropland. Note: based on the 50 scenarios through the pattern is similar for all 50 scenarios. Source: Green et al. in Smith et al., 2007.

Sum = 6000 Mt CO₂-eq/yr
Current fossil fuel+cement emissions = 34,000 Mt CO₂/yr

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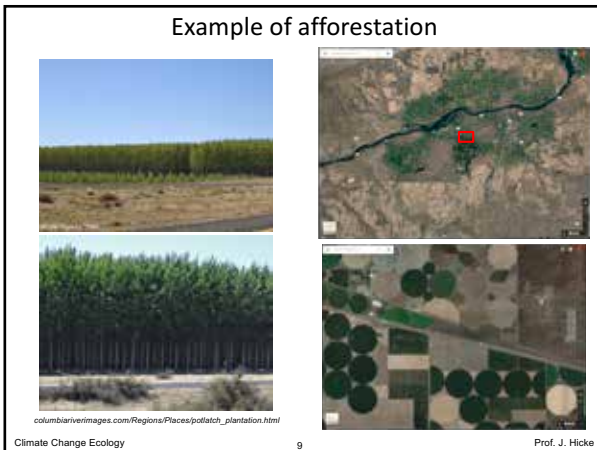


Mitigation potential of US forests

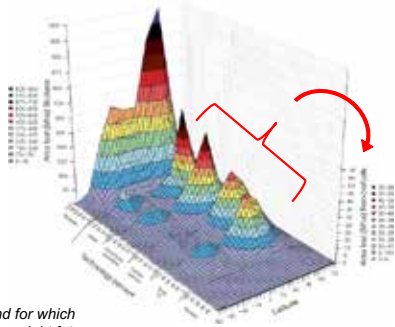
Item	Estimate (Tg C/yr)
Reference/context	
Forest growth	349
Forest sector C storage (includes harvested wood storage)	313
US CO ₂ emissions	1615
Fire emissions	67
Mitigation potential	
afforestation (1 Tg C/yr requires 262,000–1,133,000* ha of crop or pastureland suitable for tree growth)	1-225**
forest management (activities include longer harvest interval, increasing growth, establishing preserves)	29-105*
biomass energy	130-190

**size of 0.5xRhode Island-2xDelaware per 1 Tg C/yr
*depends on carbon price (\$18-183 per Mg C)

Climate Change Ecology | McKinley et al., Ecological Applications, 2011 | Prof. J. Hicke

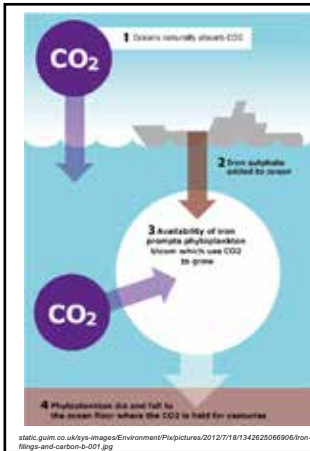


Mitigation options that affect land and biodiversity



Where and for which technology might future biodiversity loss be greatest?

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Iron fertilization in the ocean to sequester carbon

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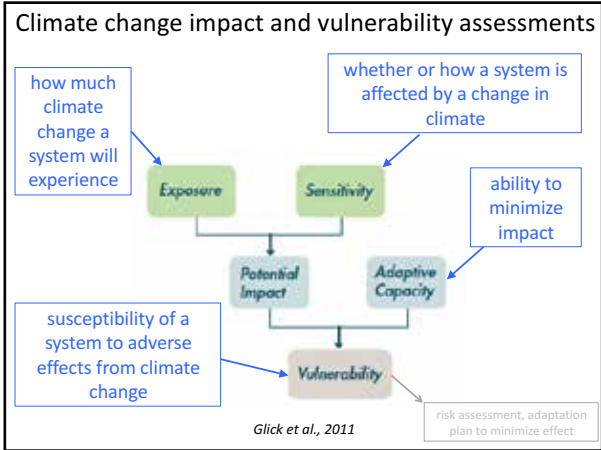
Adaptation in wilderness areas

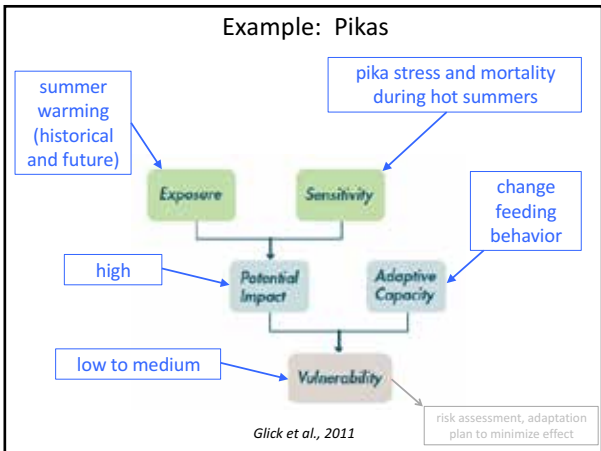
Climate change: Wilderness's greatest challenge

By Nathan L. Stephenson and Constance E. Miller

1. restraint (do nothing)
2. resilience (buy time)
 - facilitate an ecosystem's or organism's ability to rebound/recovery from a disturbance
 - remove other stressors (invasive species, human pressure)
 - thin forests to decrease drought vulnerability
3. resistance (buy time)
 - fuel breaks to stop wildfires
 - controlling insect outbreaks
 - drip irrigation
4. realignment (long-term change)
 - assisted migration
 - plant with species better adapted to new/future climate following severe disturbance
 - mixing genotypes from other regions (that may be more resilient/resistant)

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2009 CALIFORNIA CLIMATE ADAPTATION STRATEGY

California Climate Adaptation Strategy, 2009

www.climatechange.ca.gov/adaptation/strategy/index.html

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Climate Change Adaptation Strategies to Conserve California's Biodiversity

- Create a large scale well connected, sustainable system of protected areas across the State.
- Manage for restoring and enhancing ecosystem function to conserve both species and habitats in a changing climate.
- Adjust management actions as appropriate for threatened and endangered species.
- Prioritize research needs and pursue collaborative partnerships with the research community to ensure that the best available science is informing management actions.
- Re-evaluate existing policies and programs to incorporate climate change and seek regulatory changes as appropriate.
- Pursue endeavors that will support implementation of the strategies including funding, capacity building, collaborative partnerships, and education and outreach.

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Forestry: Strategies and Actions

Strategy 1: Incorporate Existing Climate Information into Policy Development and Program Planning.

Strategy 2: Improve Institutional Capacity for Data Development and Analysis, Assess Climate Effects and Forest Vulnerabilities, and Recommend Strategic and Tactical Responses.

Strategy 3 - Actions to Address Climate Vulnerabilities

Strategy 4 - Implement Priority Research Agenda

Strategy 5 - Implement Forest Health Monitoring in an Adaptive Management Context
