LINKING CLIMATE CHANGE, ECOSYSTEM SERVICES & MARKETS

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Adapting to Climate Change in the Mid-Atlantic

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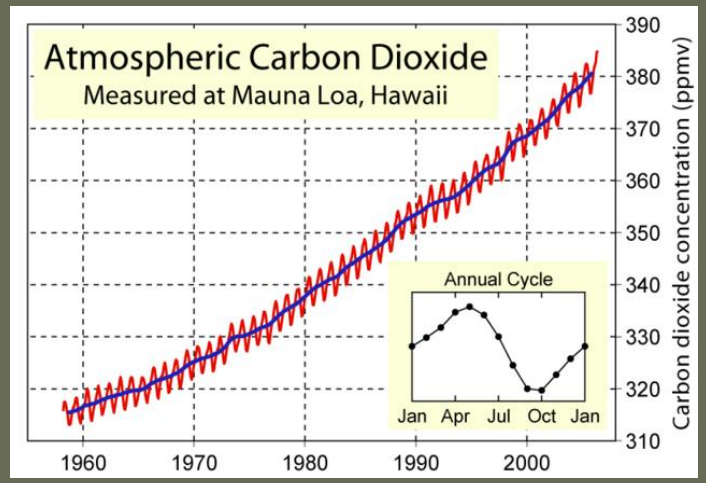
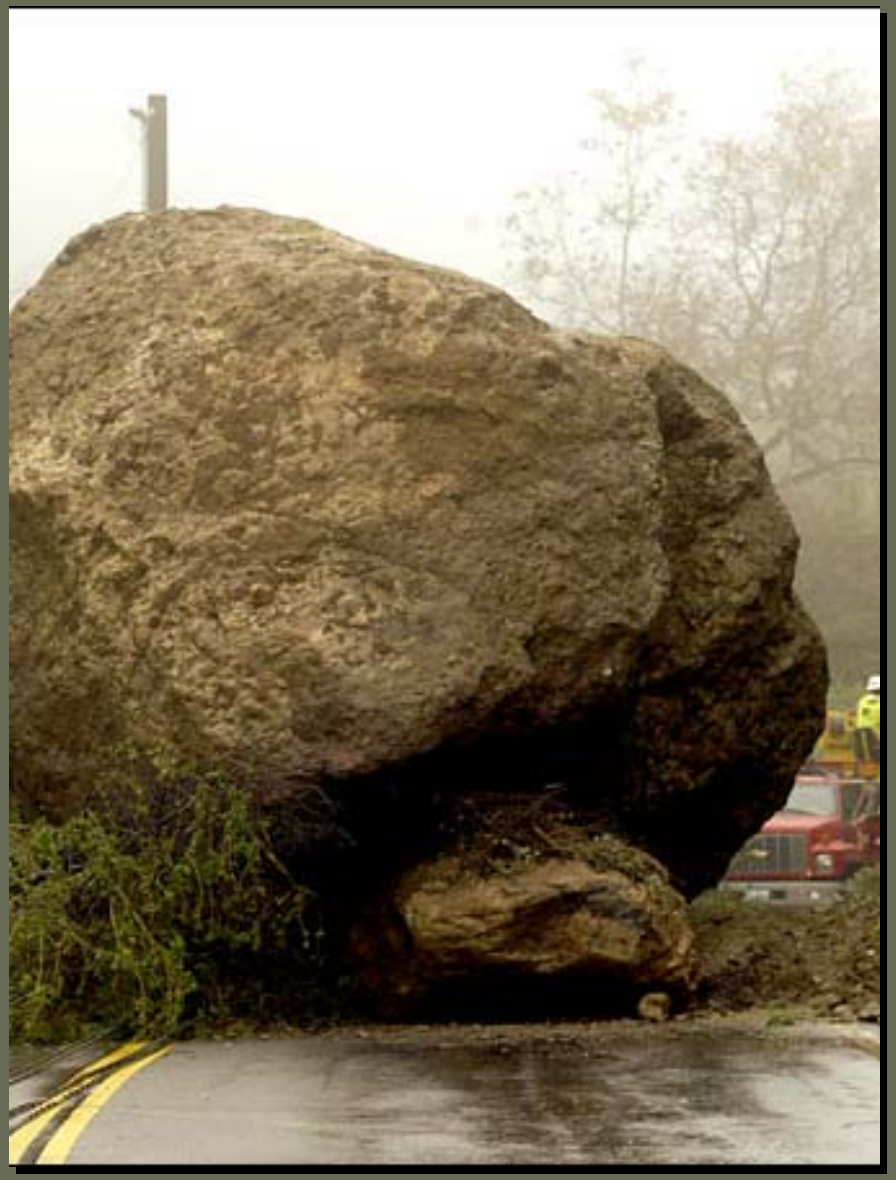
21st Century Threats to Forests:

- Complex, interrelated
- Have implications for management





All of this influences the **ecosystem services** that we receive from forests…

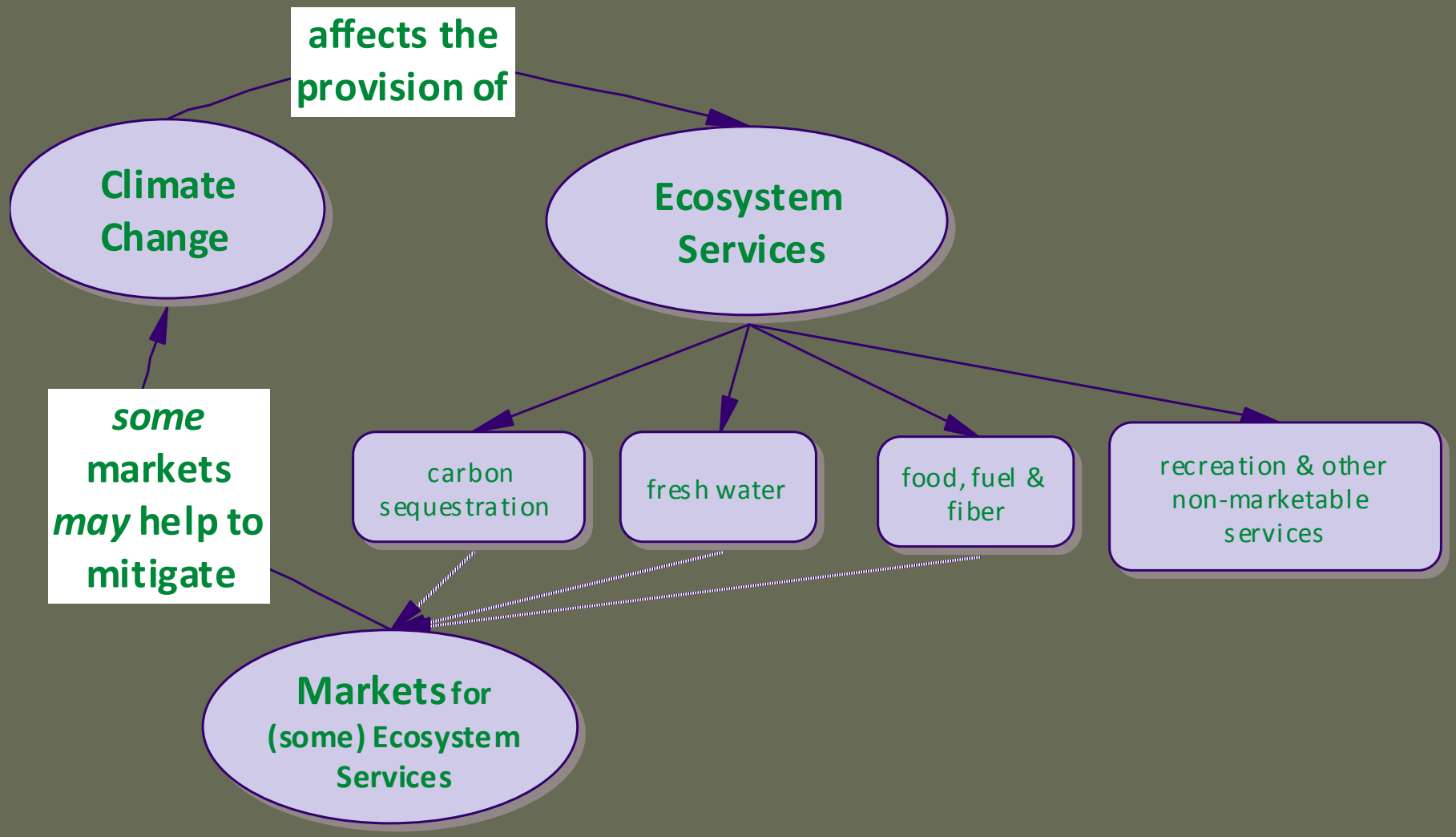
Categories of "*environmental benefits*"

Provisioning

Regulating

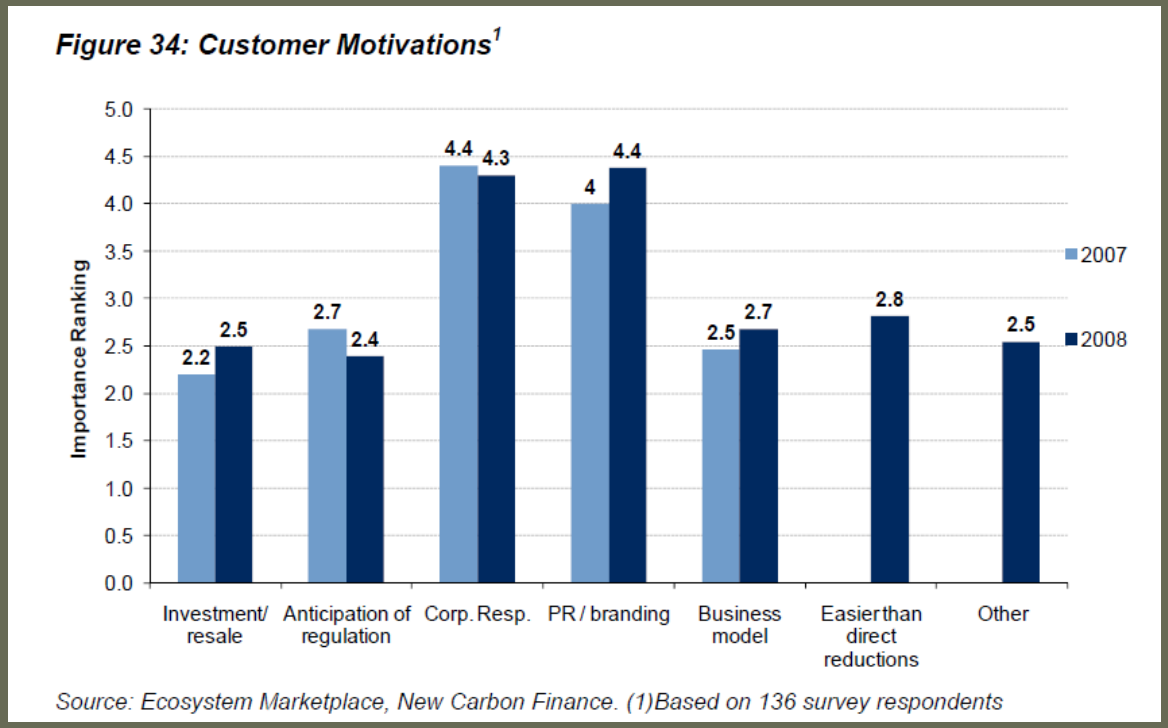
Cultural

Climate Change & Ecosystem Services:
A conceptual relationship



Why are Ecosystem Service Markets emerging?

- Regulation
- Innovation in conservation tactics
- Scarcity creates opportunity & value



Mitigation Hierarchy

MITIGATE/OFFSET the damage

MINIMIZE / REDUCE the extent of the impacts

AVOID as much as possible, carbon emissions and/or negative impacts to water quality, biodiversity,

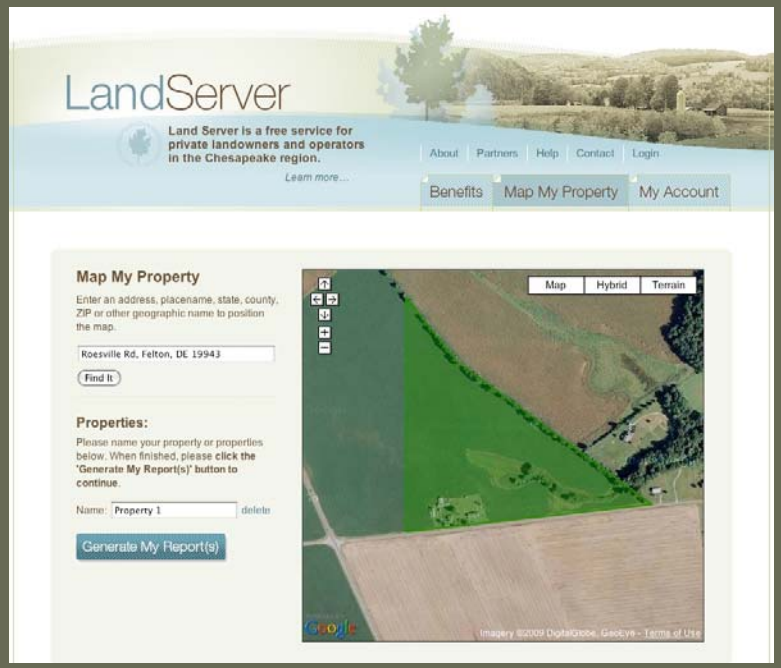
What is an offset (aka credit)?

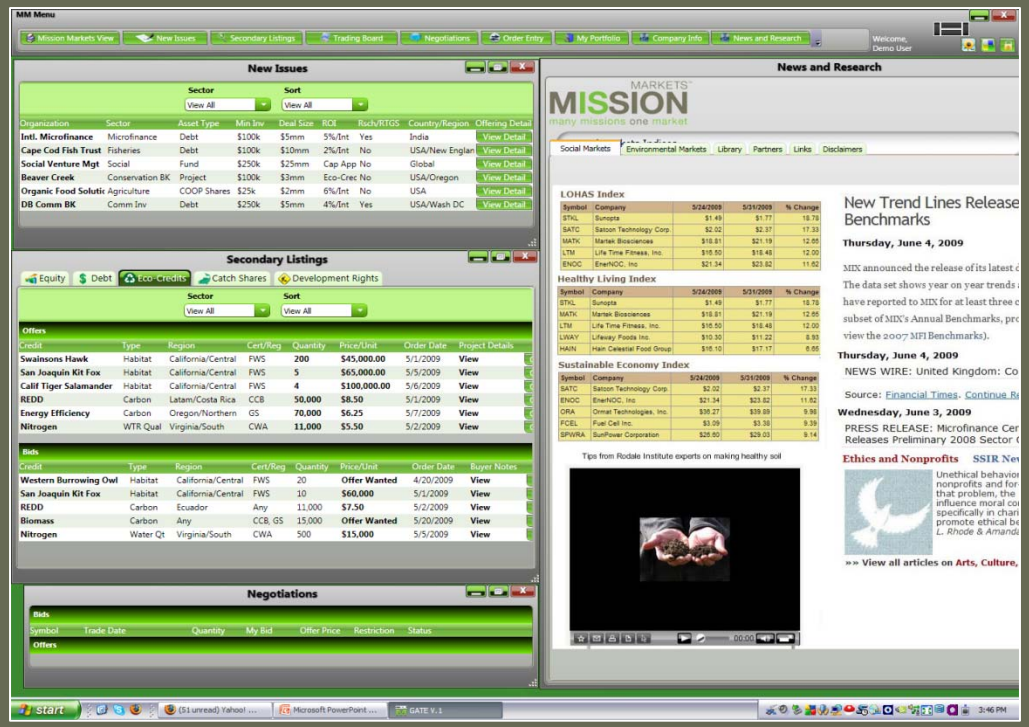
Offset v. A specific activity or set of activities that reduce, remove, or sequester GHG emissions from the atmosphere.

Offset (carbon offset) n. A greenhouse gas (GHG) offset is generated by the reduction, avoidance, or sequestration of GHG emissions from a specific project. Offsets are so named because they counteract or offset greenhouse gases that are emitted into the atmosphere; they are a compensating equivalent for reductions made at a specific source of emissions. Examples of offsets would include forestry and agricultural activities that absorb carbon dioxide, and reductions achieved by entities that are not regulated by a greenhouse gas control program.

Primary Ecosystem Service Markets:

- Carbon
- Water
- Biodiversity





A Real life example… how to integrate with current government conservation and cost-share programs?

Offsets MUST be real, additional, verifiable, permanent, enforceable

•In practical terms, this means we need accounting rules for:

Additionality – A GHG abatement project is considered "additional" if it *would not have occurred* without the added incentives provided by the carbon market.

Baseline – A project "baseline" is the schedule of GHG emissions related to a project that would be expected to *occur in the absence of the project* (aka "Business-as-Usual" (BAU) emissions).

Leakage – Refers to a shift of GHG emissions to a location or sector outside of a GHG abatement project's boundary where *they remain uncontrolled or uncounted*.

Permanence (Reversals)– Refers to the *potential of reversing GHG emissions reductions* achieved by an abatement project.

Overview of Domestic Programs, Protocols & Registries

Name	Scope & Type of Initiative
US DOE 1605(b)	National; Registry
Regional Greenhouse Gas Initiative (RGGI)	Regional (Northeast); Protocol, Registry & Market (based on legally-binding targets for capping power sector emissions)
Western Climate Initiative (WCI)	Regional; in process of determining which pre-existing protocols to potentially accept for certain activities; will eventually represent a voluntary regional market, based in part on legal state requirements
American Carbon Registry (ACR)	National; Registry; supplies the nebulous OTC market
Voluntary Carbon Standard (VCS)	National; Protocol & Registry; supplies the nebulous OTC voluntary market
Climate Action Reserve (CAR)	National; Protocol & Registry; supplies the nebulous OTC voluntary market, future CA market
Chicago Climate Exchange (CCX)	National; Protocol, Registry & stand-alone Market (voluntary but legally binding)

Summary of differences among forest carbon accounting methodologies

Proto-col	Project Types	Included carbon pools	Baseline method	Quantification of Wood Products	Risk buffer deduction	Leakage deduction
DOE 1605(b)		LT, BG, DT, L, S, WP	Base-year	100-year	No	No
CCX	A/R, FM	LT, BG, WP*	Base-year	100-year	Yes, 20%	No
CAR	R, IFM, AC	LT, BG, DT, L*, S*, WP*	Single-Practice Performace Std	100-year	Yes, project-specific	Yes, project-specific
RGGI	A	LT, BG, DT*, WP*	Base-year	regional threshold	No	No
VCS	ARR, IFM, REDD	LT, BG*, DT*, L*, S*, WP*	Single Practice Performance Std	100-year	Yes, project-specific	Yes, project-specific

Project Types: A afforestation; R reforestation; AAR afforestation, reforestation, revegetation; FM forest management; IFM improved forest management; REDD reduced emissions from deforestation and degredation; AC avoided conversion

Carbon Pools: LT live tree; BG belowground; DT dead tree; L litter; S soil; Wp wood products
* indicates optional pool

Ecosystem Services Markets…

- Facilitating new environmental impacts because new ways to mitigate these impacts become available?
- Danger to letting markets get too far ahead of the science (PROCESSES, not outputs!)
- Mitigation and efforts may conflict with one another (carbon/water; decreased nitrogen/increased mercury bioavailability)
- Markets create winners and losers: optimal economic value vs. social welfare; brittle ecosystems (carbon…?)
- Not all ecosystem services are benign…but economics consider only those that are desirable TO HUMANS are certain TIMES and PLACES…

Palmer, M. A. and S. Filoso (2009). "Restoration of Ecosystem Services for Environmental Markets." Science **325**(5940): 575-576.
Kent, H. R. and M. A. William (2009). "Payment for Ecosystem Services and the Challenge of Saving Nature." Conservation Biology **23**(4): 785-787.

RESOURCES:

USDA Forest Service Ecosystem Services:
http://www.fs.fed.us/ecosystemservices/

Northern Research Station (NRS) carbon tools page:
http://www.nrs.fs.fed.us/carbon/tools/

USDA Forest Service Climate Change Resource Center (CCRC):
http://www.fs.fed.us/ccrc/

CCRC – Adapting to Climate Change, A Shortcourse for Land Mgrs:
http://www.fs.fed.us/ccrc/hjar/

Ecosystem Marketplace:
http://ecosystemmarketplace.com/