



THE LANDSCAPE OF ECOSYSTEM SERVICES (ES) & ES MARKETS

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What are ecosystem services?
...The benefits that people obtain from ecosystems...







How Climate Change and Variability May Affect Forests

- Productivity may change
 - Longer growing season (+)
 - Increasing atmospheric CO2 (+)
 - Air pollution (-)
- Damage from weather events
 - Freeze/thaw events (-)
 - Droughts, ice storms, etc. (-)
 - Wildfire (-)
- Forest pests and wildlife
 - Altered insect and disease incidence (-)
 - Shifts in bird and other species populations
- Species composition is changing

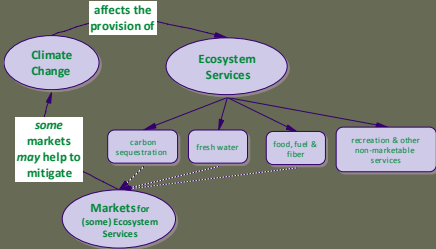
And so... How does climate change affect the provision of ecosystem services?





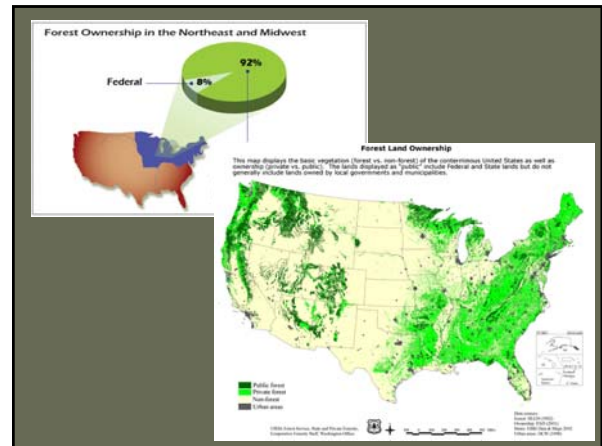

All of this influences the ecosystem services that we receive from forests...

Climate Change & Ecosystem Services: A conceptual relationship



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    graph TD
      CC((Climate Change)) -- affects the provision of --> ES((Ecosystem Services))
      ES --> CS[carbon sequestration]
      ES --> FW[fresh water]
      ES --> FF[food, fuel & fiber]
      ES --> R[recreation & other non-marketable services]
      CS -.-> MS((Markets for some Ecosystem Services))
      FW -.-> MS
      FF -.-> MS
      R -.-> MS
      MS -.->|some markets may help to mitigate| CC
    
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Carbon: a snapshot

Offset (carbon offset) n. A greenhouse gas (GHG) offset is generated by the reduction, avoidance, or sequestration of GHG emissions from a specific project.

1. What is the purpose of offsets...?
2. What is the difference between geologic and terrestrial carbon...?
3. Are forest offsets good or bad...?
4. What is the current status of forest offsets in the marketplace?
 - C sequestration rates, tools to quantify C, economic costs/benefits, minimum efficient scale, projects allowed, accounting rules and criteria...
5. Are there program-based approaches to enhanced mitigation (in addition to/instead of market-based approaches)?

Education & Research	A project developer initiates landowner interest via workshops, mailings, etc.
Appraisal	If interested in participating in a forest offset project, a landowner provides initial information about their land.
Contract	The project developer determines whether the site qualifies for participation, and if so the landowner signs a contract.
Project Creation	A carbon inventory, forest management plan, growth modeling and conservation laws verification establish the project.
Carbon Pooling	Multiple small projects are pooled to gather in terms a carbon pool by the project or sub-aggregation.
Verification	The project is reviewed by a third party to ensure that all requirements of the carbon standard are being met.
Registration	The aggregator registers the carbon pool as a segregated carbon register.
Marketing	The aggregator markets the carbon pool to potential buyers.
Sale	At an acceptable price, the pool is sold. All fees are deducted from the gross revenue before the landowner receives a payment.
Monitoring	Landowners continue to monitor the carbon that has been sequestered over the life of the contract to ensure performance verification.

Source: Payments for Forest Carbon: Opportunities and Challenges for Small Private Landowners, Northern Forest Carbon Markets, and Coastal Ecosystems.

ES Markets: A tool to SUSTAIN and ENHANCE where previous conservation efforts have fallen short

...what values are represented here?

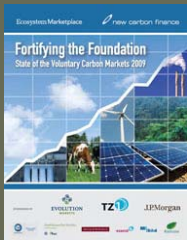
Wetland Mitigation Banking: What went wrong? (sustain and enhance!)

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." Ecological Biology 28(4): 753-767.

Ecosystem Services Markets...



What do markets need to be successful?

- Transparency
- Access to information

What role does the federal government play?

1. Measurement (processes, not outputs!)
2. Demonstration (successes, impositions, tweaks)
3. Rules of the game (don't facilitate environmental degradation...!)



Some Ecosystem Services Projects in the Pipeline...

...how do these relate to climate change?



Kerry-Boxer: S.1733
...and the Stabenow Amendment



QUIZ

1. What are ecosystem services (ES)?
2. Why is the concept/language of ecosystem services helpful?
3. What is the relationship between climate change and ecosystem services?

QUESTIONS?

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