

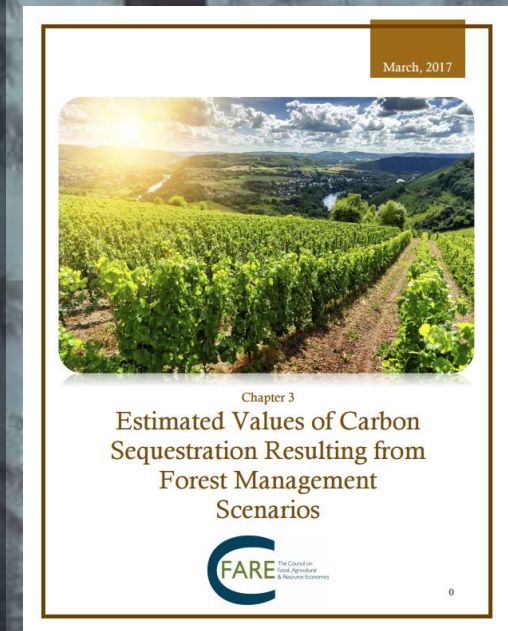


United States Department of Agriculture

Carbon Sequestration from Forests: Valuing Forest Management Scenarios

Background

- Organized by Council on Food, Agriculture and Resource Economics (C-FARE)
- Editors: Lisa Wainger and Dave Ervin
- Can we do a better job of quantifying and valuing the benefits of USDA conservation programs?
- Three case studies: water, habitat, carbon

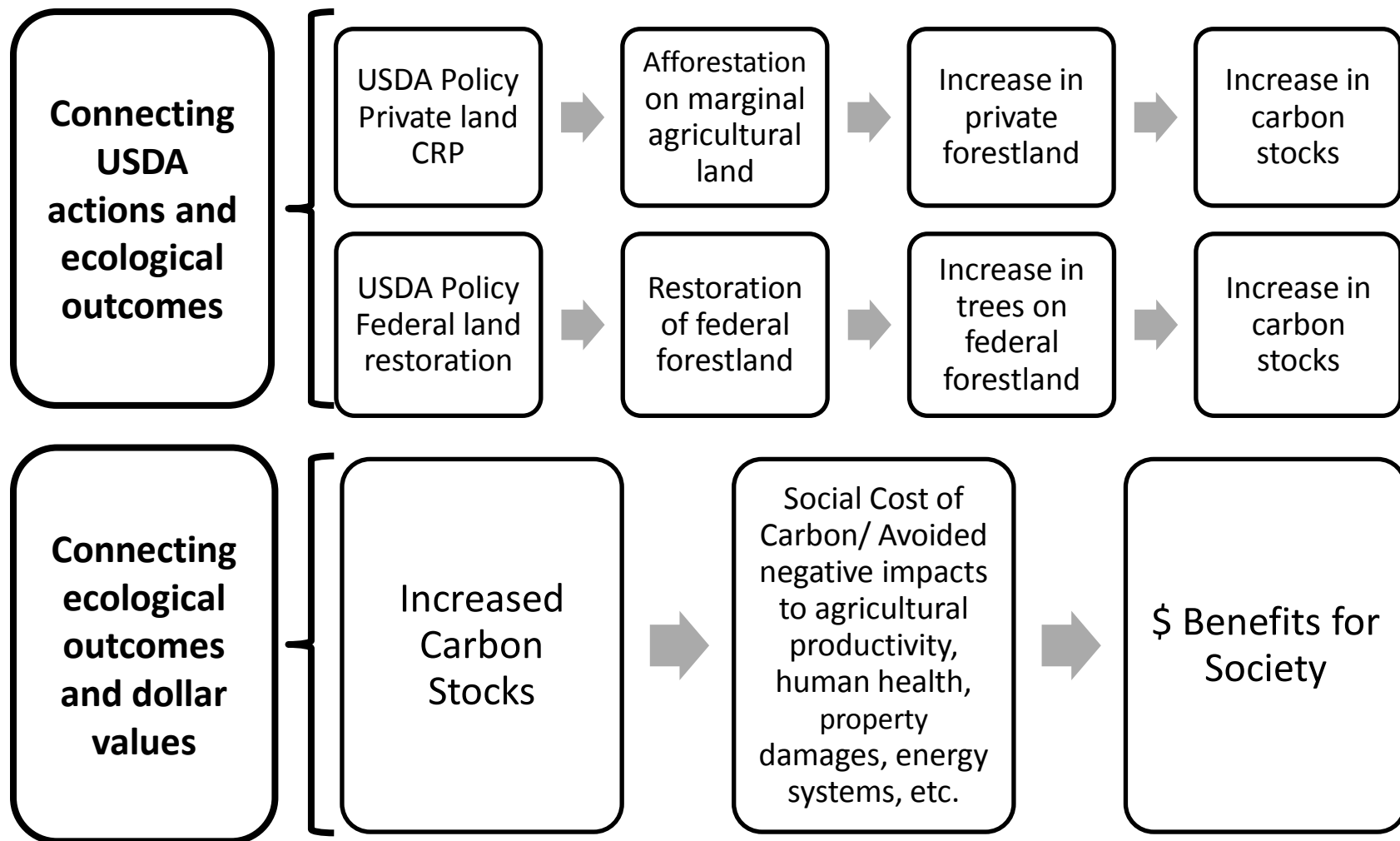


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What makes this case study different?

- Carbon as a final ecosystem service
- Scale
- Social Cost of Carbon

Conceptual model



Part 1: quantifying and projecting forest carbon

- Forest Inventory and Analysis (FIA) data
 - Forest trends and predictions
 - Observations from over 350,000 monitoring locations across the US
- Wear and Coulston (2015)
 - Projections of future land use and forest carbon
 - Land use and disturbance (e.g. cutting, fire, insects & diseases) derived from plot records are integrated

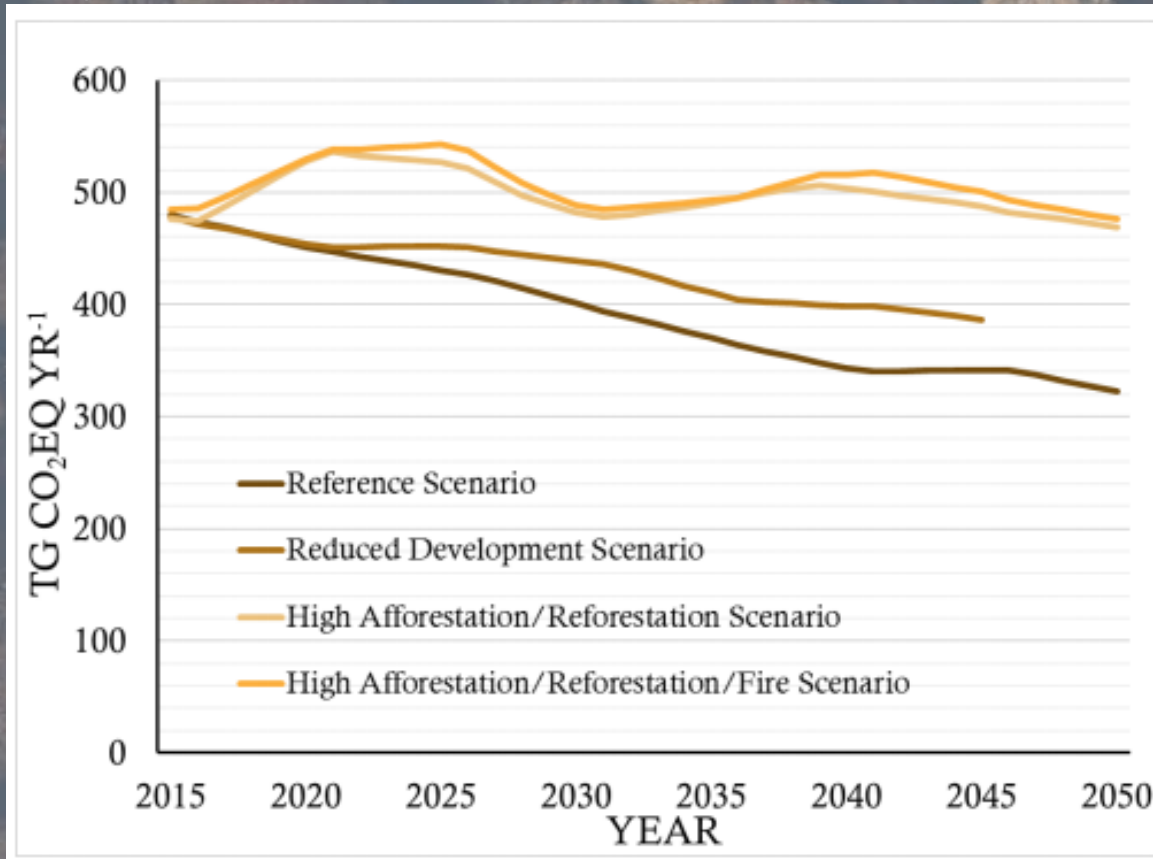
Part 1: quantifying and projecting forest carbon

Modeled Scenarios:

1. **Reference**: no net gains in forestland in the next decade followed by a slight decline in forest area through 2050
2. **Reduced development**: less conversion to development and no net loss of forest beginning in 2025
3. **USDA afforestation/reforestation policies**:
 - CRP policy in the Eastern US (30 million acres)
 - Reforestation of federal forests in the Western US (about 7.4 million acres)
4. **Fire reduction policy**: 10% reduction of high severity fire in the US

Part 1: quantifying and projecting forest carbon

Projected annual carbon sequestration in forests of the coterminous U.S. under different policy scenarios (USDA, 2016)



Wear and Coulston

Part 2: applying SCC

Table 1. SCC estimates (\$U.S. 2016) per Ton of CO2 Sequestered (Emitted)

	Average Annual Discount Rate			
Year	5%	3%	2.5%	3% discount rate and 95 th percentile Equilibrium Climate Sensitivity (ECS)
2015	\$13	\$42	\$65	\$121
2020	\$14	\$49	\$72	\$142
2025	\$16	\$53	\$79	\$160
2030	\$19	\$58	\$84	\$176
2025	\$21	\$64	\$90	\$194
2040	\$24	\$69	\$97	\$212
2045	\$27	\$74	\$103	\$228

U.S. Interagency Working Group (2015)

Methods

$$PV_1 = \sum_{t=0}^T \frac{SCC(t)C_1(t)}{(1+r)^t}$$

Reference Scenario

$$PV_2 = \sum_{t=0}^T \frac{SCC(t)C_2(t)}{(1+r)^t}$$

Policy Scenario

C_1 and C_2 : CO₂e sequestered

P_t : SCC

- Computed a vector of annual SCC levels (\$ per t CO₂) for years 2015-2050 by assigning each SCC estimate in Table 1 to the midpoint of its five year range and interpolating between the midpoint SCC estimates
- Multiplied the vectors of annual carbon sequestration and SCC together and summed to get total PV (\$ million)
- For each year between 2015 and 2050, we multiplied annual carbon sequestration times nominal SCC, and discounted to the base year (2015) to get net present value (\$ million)

Results: Dollar values

Present value (\$ billion) of projected CO₂ sequestered in US forests from 2015 to 2050 under alternative forest carbon policy and SCC discount rates

Policy scenario	Discount rate			
	5%	3%	2.50%	3% and 95th Percentile
Reference	125.5	517.3	806.7	1551.8
Reduced development	134.0	555.4	866.8	1668.0
Afforestation and Reforestation	155.4	649.0	1013.9	1951.4
Fire Suppression	158.0	660.1	1031.4	1985.0

Results: Marginal dollar values

Increase in present value (\$ billion) of each forest carbon policy relative to the reference scenario under alternative SCC discount rates

Policy scenario	Discount rate			
	5%	3%	2.50%	3% and 95th Percentile
Reference				
Reduced development	8.4	38.0	60.1	116.1
Afforestation and Reforestation	29.8	131.6	207.2	399.5
Fire suppression	32.4	142.8	224.6	433.1

Results: Summary

- There is a high value associated with the impact of both current (reference) and hypothetical modeled policies on U.S. forest carbon.
- Changes in USDA policy can have a large effect on the value of carbon stored in U.S. forests.
- Other things to consider:
 - Additional costs and benefits
 - Co-benefits (water quality, habitat, resource outputs, etc.)
 - Policy costs (estimates are needed for a full cost-benefit analysis)
 - Sources of uncertainty
 - Forest carbon estimates
 - Social Cost of Carbon
 - Voluntary incentives and adoption

Thank you!

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