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Subsidizing Carbon Sequestration via Forestry in Maryland: A Benefit-Cost Assessment

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Funded By: NASA

Motivation

- Increasing **forest carbon sequestration** is one mitigation strategy in the fight against global climate change
- **Maryland** is at the forefront of incentivizing private landowners to invest in forestry
- Both state and federally funded programs are in place for private landowners in Maryland to receive **cost-share assistance for forestry investments**
- This analysis suggests that certain programs have large **carbon sequestration potential (CSP)**, but **participation seems slow relative to the program scope**

Research Questions

1. Are the **current subsidies big enough** to elicit program participation? In other words, do **net present values (NPVs)** of forestry investments turn positive with current subsidies?
2. If the subsidies were based on the amount of **permanently sequestered carbon** from forestry investments, would they be larger? How do **carbon abatement costs** of forestry investments compare to current **carbon market prices?**

Methods

Use private Benefit-Cost Analysis (BCA) results to estimate the individual's economic return or loss from participating in a forestry cost-share program

↓

Use social BCA results to compare current cost-share assistance to the social carbon benefits that result from the forestry investments

↓

Compare BCA results to actual program participation and program scope according to the results of a GIS analysis, based on NASA's Carbon Monitoring System data products

↓

Compare program scope with goals set forth by Maryland's climate change initiatives

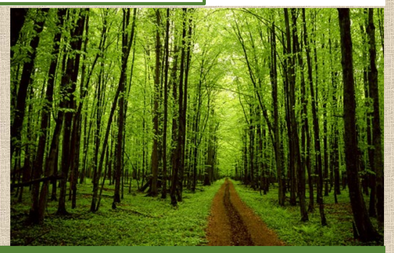
Woodland Incentive Program (WIP)

- State funded program that provides **65% cost-share assistance** for **timber stand improvements** for landowners with at least **5 acres of forested land**
- **BCA scenario:** private landowner who has a loblolly pine stand that is in need of **pre-commercial thinning (PCT)**, which is an eligible management practice for **WIP cost-share assistance**
- **NPV results** indicate that the landowner would realize a **positive economic return** by investing in pre-commercial thinning and participating in WIP
- **Carbon sequestration benefits** provided to society are **larger** than the current cost-share assistance

***736,761** eligible acres*
***24,443** acres enrolled from 2007-2014*
*CSP: **139 million tons***

NPVs: With minus Without ($/acre)

Discount Rate	With PCT	With PCT & WIP
2.5%	$17.49	$98.93
5%	-$20.72	$60.62



Environmental Quality Incentives Program (EQIP)

- Federally funded program that provides cost-share assistance for **conservation practices on agricultural land** based on pre-determined **average costs** of each practice
- **BCA scenario:** private landowner who is considering **converting** (conv.) **cropland/pastureland** to **an oak/hickory stand**, which is an eligible practice for **EQIP cost-share assistance**
- **NPV results** indicate that the landowner would realize an **economic loss from converting cropland to forest** in all cases; **Converting pastureland or marginal land to forest results in a positive economic return** in some cases

***1.9 million** eligible acres*
***344** acres enrolled from 2009-2013*
*CSP: **2548 million tons***

NPVs: With minus Without ($/acre)

Discount Rate	With Conv.	With Conv. & EQIP	With Conv.	With Conv. & EQIP
	Cropland		*Pastureland*	
2.5%	-$1,075.07	-$777.56	$122.01	$419.52
5%	-$1,376.52	-$1,079.01	-$534.74	-$246.23

Lawn to Woodland Initiative (L2W)

- State funded program that provides **100% cost-share assistance** for **establishing forests** on at least **1 acre of lawn**
- **BCA scenario:** private landowner who has 1 acre of **lawn to convert to forest**, which is eligible for **L2W cost-share assistance;** NPVs calculated with and without timber harvest
- **NPV results** indicate that the landowner would realize **higher economic returns by investing in the conversion to forest** in all cases; **Avoided lawn maintenance costs are large**
- **Carbon sequestration benefits** provided to society are **larger** than the current cost-share assistance when no timber is harvested

***230,450** eligible acres*
***15** acres enrolled in 2014*
*CSP: **302 million tons***

NPVs ($/acre)

Discount Rate	Without Conv.	With Conv.	With Conv. & L2W	With Conv.	With Conv. & L2W
		No Timber Harvest		*With Timber Harvest*	
2.5%	-$11,230.18	-$616.41	-$280.50	$1,033.31	$1,369.22
5%	-$7,812.57	-$548.35	-$212.44	$80.86	$416.77

Abatement Costs of Forestry Investments

- The **effective abatement costs of forestry investments** were calculated using the following equation:

$$\frac{-(\text{NPV "with investment"} - \text{NPV "without investment"})}{\text{tons of carbon sequestered by the investment}}$$

- **Negative abatement costs** indicate that those investments are profitable for private landowners with the current incentives
- L2W abatement costs would be **even more negative** if avoided lawn maintenance costs were included as **opportunity costs**

Effective Abatement Costs of Forestry Investments ($/ton)

	2.5%	5%
WIP: *PCT*	-$12.67	$15.02
EQIP: *Cropland*	$138.24	$176.99
Pastureland	-$15.69	$69.91
L2W: *Timber Harvest*	-$132.86	-$10.40
No Timber Harvest	$5.96	$5.31
Carbon Price: *RGGI*	$4.94	$4.94
California	$12.14	$12.14
Social Cost of Carbon: *Interagency Working Group*	$54.54	$11.76