

EPA Road-testing of Afforestation Project Methodologies

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Afforestation

- Is establishing trees on land that has not had forest cover or use for a number of years
- Broadly considered to be GHG benefit
- EPA modeling suggests forest management and afforestation are the largest potential source of domestic U.S. GHG offsets
- Many aspects of quantification are well established

Protocols Tested

	Protocol Version	Year	Number of Projects Listed
Climate Leaders	Version 1.3	2008	None
RGGI	Revised RGGI Model Rule	2008	None
CCX	Afforestation Verification Guideline	2008	>25 forest projects registered but not clear how many are afforestation
Climate Action Reserve (CAR)	Revised Forest Project Protocol draft*	2008	None
Clean Development Mechanism (CDM)	AR-ACM0001: Version 3	2008	0 registered 39 at validation of registration request

*Draft was revised in April 2009 and is being revised again.

Protocol Key Differences

Issue	Climate Leaders	RGGI	CCX	CAR	CDM
Additionality	Performance standard	Regulatory surplus	None	Beyond business as usual	Plausible alternative, investment barrier, not common practice
Baseline	Performance standard	Starting stock	Starting stock	Modeled	Model alternative practice
Leakage	Activity shifting	Not addressed	Not addressed	Decision tree; 0-50%	Count grazing, fence posts, fuel wood, activity fuel

Protocol Key Differences, cont.

Issue	Climate Leaders	RGGI	CCX	CAR	CDM
Length of time required to keep carbon stored	Not specified	Permanent conservation easement; 10% reserve	Through 2010; attest 15 years	100 years	Replace after 20-60 years
Replacement of reversals	Being developed	10% of tons held in reserve	20% of tons held in reserve for 5 years	Buffer, with % by risk, or insurance	Replace on expiration; cancelled if not periodically verified

Project Boundary and Leakage

- CDM & CCAR require considering harvest across entire ownership and subtracting emissions from assumed or observed increases in harvest elsewhere from project sequestration
- All protocols count live tree biomass
- Only CCAR & CCX count carbon in wood products
- Large differences across protocols regarding counting minor pools and emissions

More on What's Counted

Item	Climate Leaders	RGGI	CCX	CAR	CDM
Tree biomass	√	√	√	√	√
Other biomass	√	Optional/ Conditional		√	Optional/ Conditional
Soil	√	√	√	√	Conditional
Harvested wood products			No, except forest management	√	
Management emissions	√			On site	Depends

Deductions

- CCAR deducts tons of measurements to not meet specified levels of precision; RGGI requires that measurements of all pools meet a precision requirement
- CCAR has several possible deductions for different types of risks of reversals; net deduction is large for accessible lands*

* This risk deduction was substantially reduced in the next version of the draft protocol

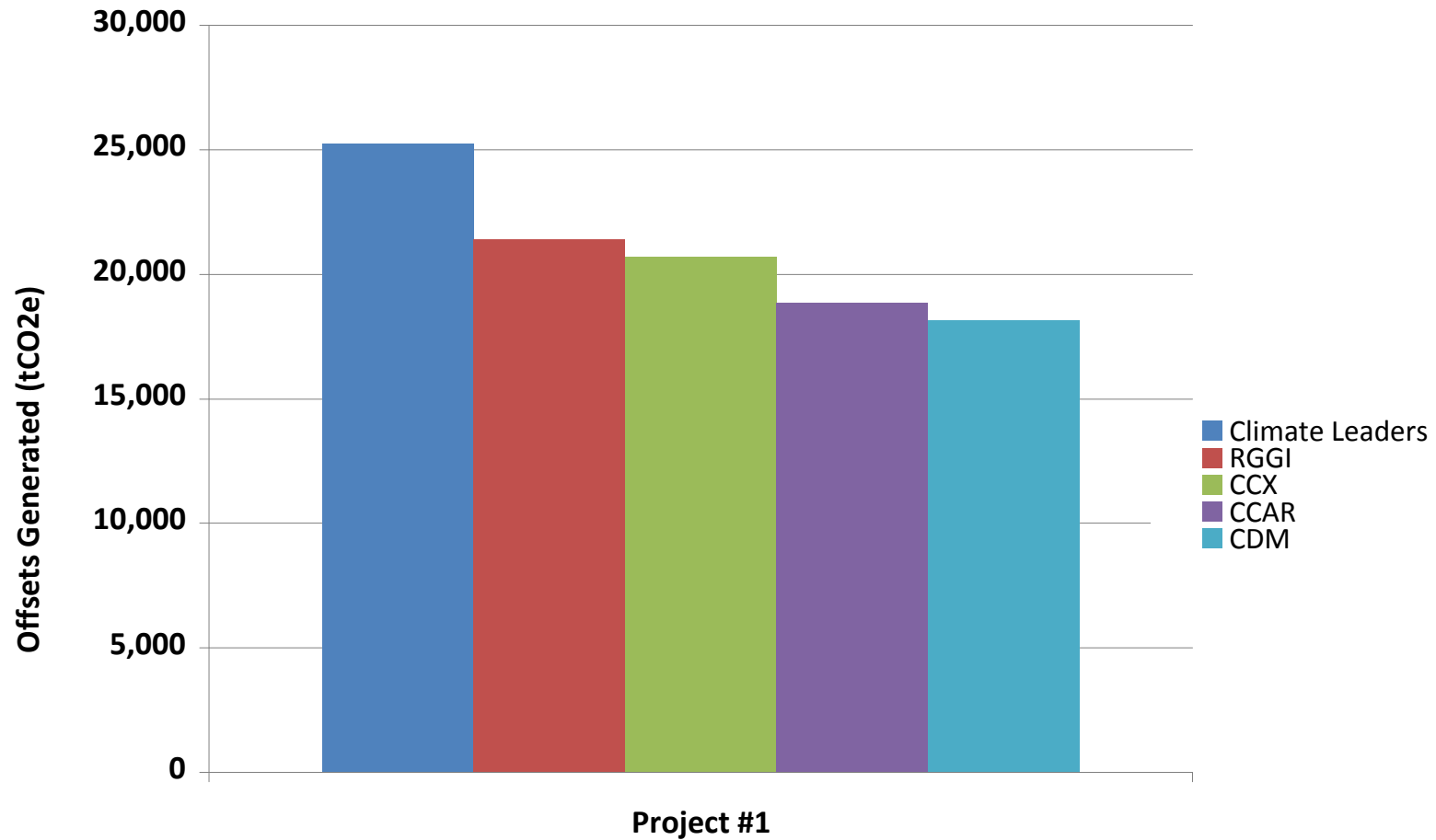
Sample Projects

	Type	State	Analysis Period	Management
Project #1	Restoration	OR	50 years	Plant Ponderosa Pine in areas degraded by logging & grazing; uneven-age management; most trees cut by age 75 (300 acres)
Project #2	Afforest crop land	FL	40 years	Plant slash pine on crop land; clearcut at age 20 & replant (20 acres)

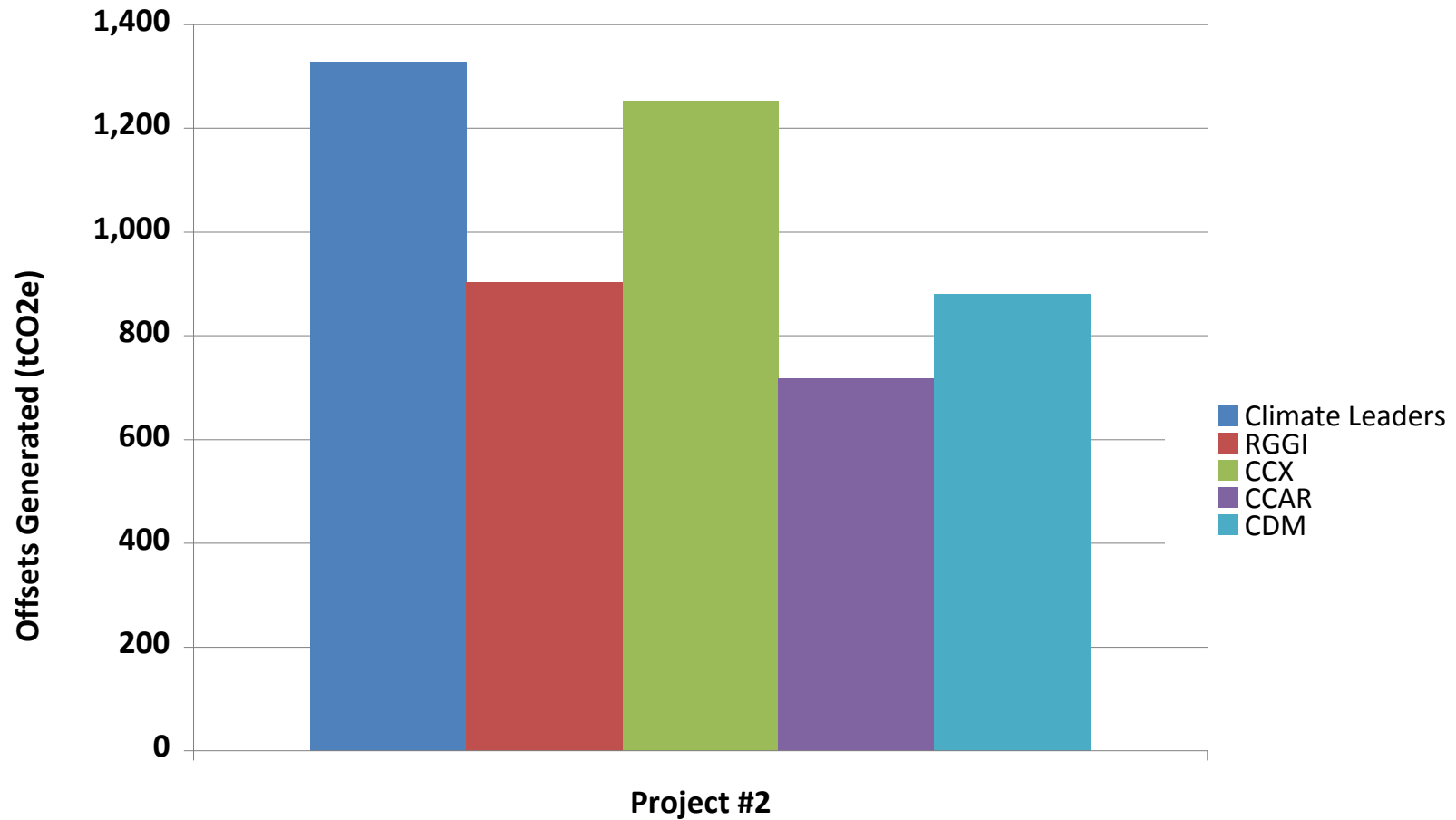
Note on Carbon Stock Numbers

- For each project, actual biomass stocks, biomass stock changes, and fuel emissions were assumed to be the same across all protocols
- Measurement methods and conversion factors were generally assumed to be the same across protocols, to highlight differences between boundary conditions and accounting rules of protocols
- In practice, project developers might use flexibility measurement measurement and conversion options to calculate maximum offsets

Cumulative Offsets: Project #1



Cumulative Offsets: Project #2



Quantification: PNW Project

	Climate Leaders	RGGI	CCX	CCAR	CDM
Baseline Carbon Stocks (A)	17,684	16,956	16,956	19,056	2,100
Live trees, ABGR	466	0	0	0	0
Live trees, Belowground	101	0	0	0	0
Standing dead trees	50			0	0
Shrubs	43		0	2,100	2,100
Woody Debris	39			0	0
Forest Floor	29			0	
Soil	16,956	16,956	16,956	16,956	0
Wood Products					
<i>Fire methane</i>					
<i>Fuel</i>	0	0	0	0	0
Project Carbon Stocks (B)	42,947	40,738	37,984	42,947	20,258
Live trees, ABGR	14,388	14,388	14,388	14,388	14,388
Live trees, Belowground	3,118	3,118	3,118	3,118	3,118
Standing dead trees	1,542	1,542		1,542	1,542
Shrubs	1,320			1,320	0
Woody Debris	1,212	1,212		1,212	1,212
Forest Floor	891			891	
Soil	20,478	20,478	20,478	20,478	
Wood Products			0	0	
<i>Fire methane</i>					
<i>Fuel</i>	-2	0	0	-2	-2
Leakage (C)				0	0
Buffers and Discounts (D)		2,378	317	5,017	
Total offsets (B-(A+C+D))	25,263	21,404	20,711	18,874	18,158

Quantification: SE Project

	Climate Leaders	RGGI	CCX	CCAR	CDM
Baseline Carbon Stocks (A)	3,307	3,266	3,266	3,266	0
Live trees, ABGR	19	0	0	0	0
Live trees, Belowground	4	0	0	0	0
Standing dead trees	1			0	0
Shrubs	4			0	0
Woody Debris	4			0	0
Forest Floor	8			0	
Soil	3,266	3,266	3,266	3,266	0
Wood Products					
<i>Fire methane</i>					
<i>Fuel</i>	0	0	0	0	0
Project Carbon Stocks (B)	4,634	4,269	4,534	4,662	881
Live trees, ABGR	594	594	594	594	594
Live trees, Belowground	129	129	129	129	129
Standing dead trees	29	29		29	29
Shrubs	110			110	0
Woody Debris	131	131		131	131
Forest Floor	257			257	
Soil	3,386	3,386	3,386	3,386	
Wood Products			424	424	
<i>Fire methane</i>					
<i>Fuel</i>	-2	0	0	-2	-2
Leakage (C)				430	
Buffers and Discounts (D)		100	15	644	
Total offsets (B-(A+C+D))	1,328	903	1,253	719	881

SEI Conclusions

- Relative numbers of offsets granted under different protocols varies across projects
- Boundary rules matter a lot
- Discounts and deductions matter a lot (leakage and buffers)
- A project may be attributed similar numbers of offsets under different protocols, for very different reasons
 - A protocol that counts wood product carbon and has a large leakage buffer could give a similar offset count to a different protocol that has neither

Conclusions, 2

- In this test, permanence provisions (discounts and buffers) were the biggest source of variation in the amount of offsets credited
- Differences in baseline differences did not cause large differences in amounts of offsets (unlike other project types)
- Carbon in small pools and fluxes has little effect on offset counts

Recommendations

- Carbon in tree growth is the main basis of offsets; quantification rules should require accurate measurement of trees
- Standardized baseline rules are needed
- More work on leakage is needed; in some cases leakage may cancel much a project's benefit; under some policies leakage may be negligible
- Permanence must be addressed; we recommend requiring offsets be permanent unless replaced
- Less expensive verification is needed for long-term tracking of sequestered carbon



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