# Short and Long Term CMS Opportunities in Today's Forest Carbon Markets

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Blue Source

# Overview

- About Blue Source
- Forest carbon offset markets & projects

- Forest carbon measurement needs, requirements, costs
  - Internal / External Decision Support
  - Decision Timeline
  - Current Decision Support Data

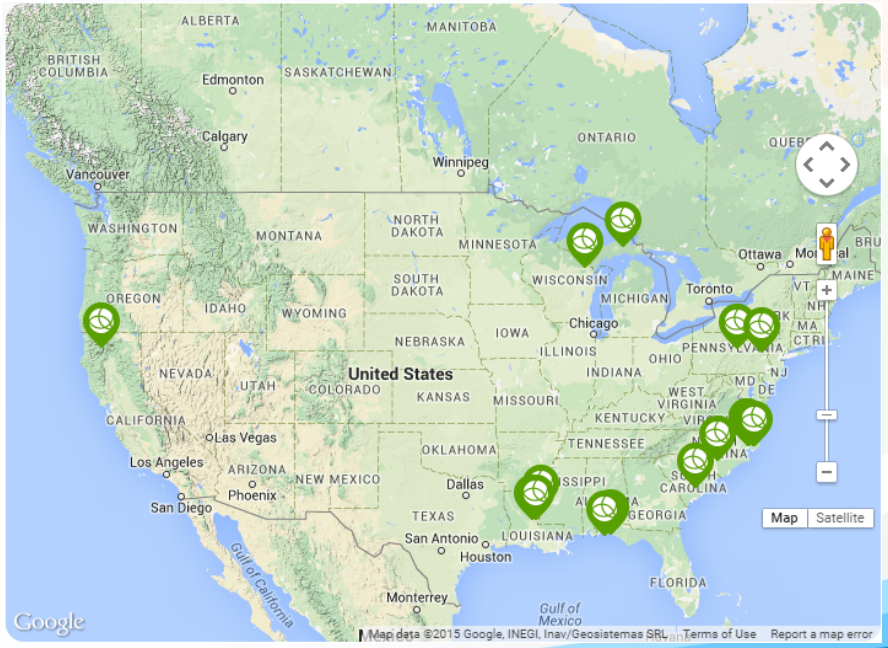
- Barriers to CMS adoption
- Speeding adoption

# Who is Blue Source?

Founded in 2001, Blue Source is the oldest and largest offset project developer in North America

- **200+ Projects**
- **100,000,000 offsets created**
- **Offset projects in nearly all 50 states and most Canadian provinces**
- **Most forest offsets generated**

- **Emphasis**
  - Generating high quality, high volume GHG emission reductions
  - Motivating industry to action through leveraging carbon markets to provide financial incentives to reduce emissions
  - Simplifying carbon markets for those companies that wish to or are forced to address their carbon footprints

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# Global Carbon Offset Markets

A Carbon Offset is a reduction of greenhouse gases, measured in metric tonnes of $CO_2$ equivalent ($mtC0_2e$), meeting the following criteria, that is created by one entity, transferred to another, and ultimately retired.

- **Offset Criteria**

| | |
|---|---|
| Real | Verifiable |
| Permanent | Surplus |
| Measurable | Additional |

A carbon market is a group of companies and individuals looking for cost-effective means for reducing their environmental impacts, out of either internal motivations or regulatory requirements.

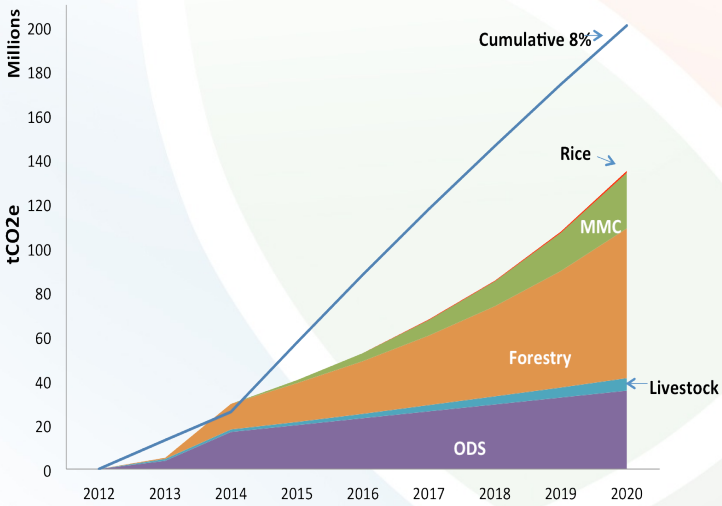
# Voluntary, Compliance, Pre-Compliance Carbon Markets

- **North America**
  - Voluntary (VCS, ACR, CAR)
    - Internal Sustainability, CSR
    - Carbon Neutral Product or Supply Chain
  - Compliance
    - California, Quebec, Ontario
    - RGGI
    - Alberta
    - British Columbia
  - Pre-Compliance

- **International**
  - Voluntary
  - Kyoto Protocol Driven (EUETS, CDM, JI)

# Forestry's Role in Carbon Market

- **Voluntary Benefits**
  - Co-benefits
    - Biodiversity
    - Local water quality
    - Community
    - Community-economic
- **California Compliance Benefits**
  - High volume projects
  - Large potential reductions across industry
  - EHS Regulatory conformance
- **Disadvantages**
  - High cost of development
  - High degree of difficulty, long path to market
  - Complexity for buyers
  - 100-year landowner commitments
  - Monitoring Challenges



*Source: American Carbon Registry*

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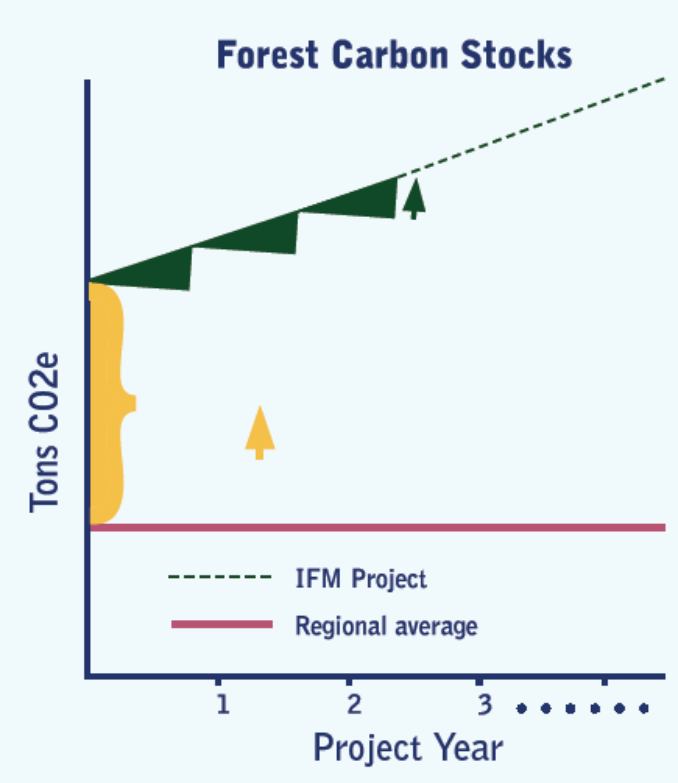
# Forest Offset Project Requirements (California Cap and Trade)

- A/Reforestation (AR), Avoided Conversion (AC), Improved Forest Management (IFM)
- Lower 48 states and Alaska
- Natural forest management, sustainable harvesting (e.g. SFI, FSC, Tree Farm)
- Clear title/ownership of carbon credits, eased or un-eased
- ~100 year commitments: measurement, verification, reversals
  - Resample every 12 years, verify every 6 years, model and report annually
  - Compensate for intentional reversals (i.e. harvests)
  - Similar to a conservation easement with a termination option
    - Can subdivide and sell, but commitment transfers w/ownership
    - Can exit at any time if pay back all credits issued (+ 0-40% penalty)
  - Endowment may be set aside in first years to cover 100-year expenses
  - Also: 3-8 year invalidation risk (offset buyer is liable)
- See also VCS, ACR, CAR forest carbon project protocols

**= Minimum Practical Size = 1,000 ac Avoided Conversion / 3,000 ac Improved Forest Mgt**

# Project Dynamics/Economics: Improved Forest Management (IFM)




| | Pacific Northwest Fir | Northern Mixed Hardwood | Southern Pine |
|---|---|---|---|
| Credits at project initiation | 190,000 | 120,000 | 115,000 |
| Revenue at project initiation | $1.9 | $1.2 | $1.2 |
| Annual credit generation from continued CO2 stock accumulation | 8,000 | 5,000 | 7,000 |
| Gross revenue in first project decade | $2.7 | $1.7 | $1.9 |
| Gross revenue per acre in first project decade | $270 | $170 | $185 |

Assumes

- 10,000 acres
- Carbon stocks 20% over average stock
- 50% annual growth harvested
- $10/ton carbon price
- 10 year crediting (25-100 year possible)

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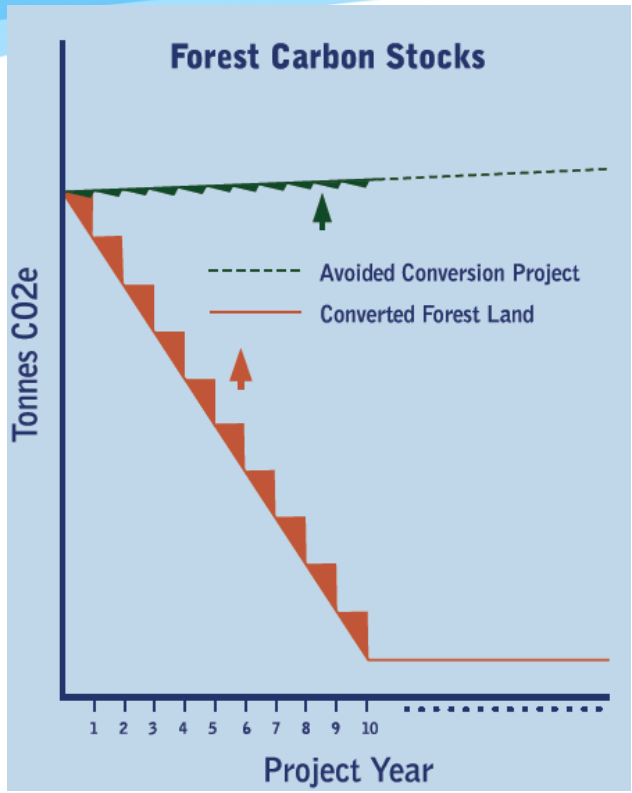
# Project Dynamics/Economics: Avoided Conversion (AC)




| | Pacific Northwest Fir | Northern Mixed Hardwood | Southern Pine |
|---|---|---|---|
| Annual Credits generated from conversion avoidance | 28,000 | 18,000 | 16,000 |
| Annual credit generation from continued CO2 stock accumulation | 2,200 | 1,400 | 2,800 |
| Gross revenue in first project decade ($ millions) | $3.0 | $1.9 | $1.9 |
| Gross revenue per acre in first project decade | $1,208 | $776 | $752 |

Assumes:

- 2,500 acres
- 3 acre residential development avoided
- Carbon stocks 20% over average stock
- 50% annual growth harvested
- $10/ton carbon price
- 10 year crediting (25-100 year possible)

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# Carbon Measurement Requirements, Costs, Potential Savings

| | Estimated Costs | | | |
|---|---|---|---|---|
| | Initial | Ongoing | Frequency | Potential Savings |
| 1 Feasibility Assessment (eligibility, volume) | $5-$15k | $0 | one time | ** |
| Legal (AC Only) | $0-20k | $0 | one time | |
| Appraisal (AC Only) | $5-30k | $0 | one time | * |
| 2 Forest Carbon Inventory | | | | |
| Inventory Methodology and Design | Varies | Varies | ~one time | * |
| Inventory Sampling / Field Work | $30-75k | $20-$100k | 12 years (6?) | ** |
| 3 Calculation of Carbon Benefits | | | | |
| Project Growth & Yield models | $15-$80k | $0-20k | 6 years/harvests | * |
| Baseline Scenario Harvest Model (legal, economic) | $5-$50k | $0 | one time | * |
| Conversion of "Gross" to "Net" Carbon Benefits (credits) | $5-20k | $0-10k | annual | |
| ▪Inventory confidence | | | | ** |
| ▪Leakage | | | | * |
| ▪Wood products | | | | |
| ▪Reversal risk, e.g. fire, wind | | | | * |
| 4 Project Design and Documentation | $10-100k | $0 | one time | |
| 5 Third-party Verification | | | | |
| Full (Site) Verification | $30-75k | ~80% Initial | 6 years | ** |
| Desk Verification | $0 | $7-10k | when crediting | * |
| 6 Registration | ~$0.20/credit | ~$0.20/credit | when crediting | |
| 7 Marketing, Sales, Contracting | Varies | Varies | when crediting | |
| 8 Annual Monitoring and Reporting | n.a. | $0-5k | annual | * |
| | | | | |
| 9 Project Finance | Varies | Varies | Varies | |

- 12 month process
- Upfront Inventory, Verification Costs: $60-150k In Year 1
- 100 Year Monitoring, Verification, Inventory Costs: $100-200k Endowment

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# CMS Best Fit

| Stage | Type | Timeframe | Current Data | Impact |
|---|---|---|---|---|
| Verification | External Requirement | Month 6-8 then ea. 6 yrs | Plot samples | **** |
| Inventory | External/ Internal | Month 2-6 then ea. 12 yrs | Plot samples Aerial Imagery | *** |
| Feasibility | Internal | Month 0 | Timber cruise USFS FIA | ** |

# Barriers to Adoption (CA Protocol)

- Strong support "as long as the science is there"
- Differing prospects for inventory, monitoring, verification; pre/post-crediting
- Specific protocol requirements would need modification
  - Plot sampling parameters including dbh, height for volumetric equations
  - Sampling Error <5%-20% of mean at 90% confidence
  - Required pools, verification protocols, modeling requirements

**Table A.1.** Requirements of carbon pool categories and determination of value for pool

| Category | Carbon Pool | Improved Forest Management | Reforestation | Avoided Conversion | Determination of Value |
|---|---|---|---|---|---|
| Living biomass | Standing Live | Required | Required* | Required | Sampled in Project |
| | Shrubs and Herbaceous Understory | Excluded | Required | Excluded | Sampled in Project |
| Onsite dead biomass | Standing Dead | Required | Required | Required | Sampled in Project |
| Soil | Soil** | Required/ Excluded** | Required/ Excluded** | Required/ Excluded** | Sampled in project |

* Pre-existing trees must be distinguished from planted trees. Since pre-existing and new trees are easy to distinguish for several decades after tree planting, pre-existing trees do not need to be inventoried until the offset project first seeks verification of GHG reductions and GHG removal enhancements.
** Soil carbon is not anticipated to change significantly as a result of most Forest Project activities. Soil carbon is excluded except when specified in Section 5.

a. Standard procedures for the collecting of field measurements. These procedures must be detailed enough so that any qualified forester would be able to accurately repeat the previous measurements. These procedures must include a description of the types of sample plots, location of plots, and frequency for updating or replacing sample plots as well as the forest carbon inventory as a whole;
b. Standard procedures for where and how to measure parameters used in biomass calculations such as dbh and height (including for irregular trees), how to classify dead wood, and for any other aspects of sampling where a consistent method needs to be documented; and

The following growth models have been approved:

- CACTOS: California Conifer Timber Output Simulator
- CRYPTOS: Cooperative Redwood Yield and Timber Output Simulator
- FVS: Forest Vegetation Simulator
- SPS: Stand Projection System
- FPS: Forest Projection System
- FREIGHTS: Forest Resource Inventory, Growth, and Harvest Tracking System
- CRYPTOS Emulator
- FORESEE

**Table 10.1.** Minimum number of sample plots in sequence, as a function of project size.

| Test | Number of Strata Verified | Project Acres | | | | |
|---|---|---|---|---|---|---|
| | | <100 | 100 - 500 | 501 - 5,000 | 5,000 - 10,000 | > 10,000 |
| Paired/Unpaired | 3 | 2 | 3 | 4 | 5 | 6 |
| | 2 | 4 | 6 | 8 | 10 | 12 |
| | 1 | 8 | 12 | 16 | 20 | 24 |

***CA Air Resources Board:***
***Compliance Offset Protocol U.S. Forest Projects***
***Section 10, Appendix A, Appendix B***

# Other Potential Barriers / Questions

- Single tree selection yields uniform ht/canopy, yet carbon varies w/basal area?
- 2-3 age classes - ability to penetrate the canopy/measure understory?
- Differentiate between e.g. hard maple and soft maple?
- Mixed old and second growth have similar ht/canopy, very different dbh/carbon?
- What's realistic expected reduction in plots (inv, verif)?
- Tradeoff in sampling uncertainty

# Speeding Adoption

Verification

- Engage ARB to modify protocol; ACR/VCS/CAR to approve new protocol or module
  - Emphasize potential to reach small landowners, dramatically increase market potential
  - Post-crediting monitoring; use existing project data for ground truthing (Hurtt-03)

Inventory

- Start using to support inventory, demonstrate benefits (# plots, frequency)
  - Inventory likely easiest initial path; verification provides ground-truthing / safety-net
  - Some protocol changes required pre-full reilaince, non-paired t-test already approved

Feasibility

- Identify areas of (relative) high stocking and potential new projects
  - No barriers: use immediately: prove concept, provide data, generate revenues
  - Blue Source provides free eligibility assessments and revenue projection

# Needs and Potential Timeline

| Stage | Timeline | Data | Scale | Frequency |
|---|---|---|---|---|
| Verification | Next 3-5 yr | AGB (mt)<br>Canopy cover<br>Species? | Acre | ~ea. 6 yrs |
| Inventory | Next 1-2 yr | AGB<br>Species? | Acre | ~ea. 12 yrs |
| Feasibility | Now | AGB<br>Type | Stand | One-time |

# Research Projects of Interest

- Immediate Opportunity:  U.S. Compliance Forestry Projects
  - Any models of biomass mt/acre, anywhere in U.S.
- Future Opportunities:  Worldwide Voluntary and Compliance Projects
  - Grassland (vol. Avoided Conversion protocol approved)
  - Cropland (compliance rice protocol approved)
  - Blue Carbon (wetland protocol submitted)
  - Livestock emissions (free-range)

# Working hard to bring projects to market…

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