California’s Regulatory Carbon Market: Panacea or Pandora’s Box for Forest Landowners?

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ACES conference
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Transcending research and real-world application

- Research on stocks and fluxes of greenhouse gases between terrestrial systems and the atmosphere.

- Making the green economy real
- 475,000 acres being verified under CAR/VCS
- 3.3 million initial compliance grade (ARB) credits
- 185,000 annual compliance grade
2006 Governor Schwarzeneggar signed AB 32 to reduce California’s GHG emissions to 1990 levels by 2020.

- Capped entities can meet 8% of compliance obligation with offsets from uncapped sector.

- Forestry are 2 of 4 approved offset protocols.

- Barclays, Reuters and Bloomberg place average prices at $35/ton between 2012-2020.
For the first time since 1800s NE forest are declining

Estimated 63% of private lands will be developed by 2030 (Stein et al., 2005)

Fragmentation affects wildlife habitat, species composition and has a climate change impact
Questions

- What are the predictors of project profitability?
  - What effect does property characteristics (i.e. size & forest stocking) and policy assumptions (i.e. policies that affect long-term monitoring costs) have on Internal Rate of Return?

- From a landscape perspective, where in the Northern Forest is the highest carbon sequestration potential at the lowest marginal costs?
How project sites compare to common practice?
Methods

• Phase 1: Conduct inventory for 25 Non-industrial private landowners
  • Collect site specific data
  • Identify true costs and benefits

• Phase 2: Conduct growth and yield modeling and quantify C using California Air Resources Board forest carbon protocol.

• Phase 3: Financials

• Phase 4: Classified and Regression Tree (CART) analysis to identify predictors of financial return
Phase 1: Inventory

Stratified Systematic Sampling

Plots

Carbon Pools

QA/QC
Phase 2: C quantification

Comparison of Initial Standing Live Carbon to Common Practice

- Stock Retention Credits

Year:
- 2007
- 2017
- 2027
- 2037
- 2047
- 2057
- 2067
- 2077
- 2087
- 2097
- 2107

MTCO2e /acre:
- 0
- 20
- 40
- 60
- 80
- 100
- 120
Phase 2: Modeling (Forest Vegetation Simulator)

Standing Live Baseline

**Modeling Standing Live Baseline**

- **Common Practice**
- **Standing Live Baseline Modeled**
- **Standing Live Modeled to Meet Common Practice**

Standing Live Pool Must Meet or Exceed Common Practice

**Graph Details:**
- **Y-axis:** MT CO2e/acre
- **X-axis:** Years from 2007 to 2107

**Legend:**
- Red line represents Common Practice.
- Green line represents Standing Live Baseline Modeled.
- Black line represents Standing Live Modeled to Meet Common Practice.

**Graph Description:**
- The graph shows the changes in Standing Live Baseline over a span of years, indicating the impact of common practice and modeled scenarios on CO2e emissions per acre.
Phase 2: Growth Credits: Modeling All Required Carbon Pools

Modeling Above Ground, Below Ground and Standing Dead

- All Pools Project Scenario
- Avg All Pools Baseline

Year: 2007, 2017, 2027, 2037, 2047, 2057, 2067, 2077, 2087, 2097, 2107

MT CO2e/acre
Examined impact of silvicultural treatments on C stocks
Examined policy assumptions

1. AB 32 is renewed post 2020 and 100 year monitoring is required.
   - Continues with 25 year crediting period
   - $200,000 Reserve Fund for long-term monitoring

2. AB 32 is not renewed post 2020, but there is a mandate to monitor for 100 years.
   - Project “buys its way out”

3. AB 32 is not renewed post 2020
   - No obligation to monitor
## Phase 3: Project finances

<table>
<thead>
<tr>
<th>Initial development costs</th>
<th>Cost</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registry opening account fee</td>
<td>$500</td>
<td>Once</td>
</tr>
<tr>
<td>Registry project listing fee</td>
<td>$500</td>
<td>Once</td>
</tr>
<tr>
<td>Labor for account opening and project listing</td>
<td>$1,500</td>
<td>Once</td>
</tr>
<tr>
<td>GIS stratification &amp; inventory</td>
<td>$15,000</td>
<td>Once</td>
</tr>
<tr>
<td>Growth and yield modeling and C quantification</td>
<td>$30,000</td>
<td>Once</td>
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<tr>
<td>Travels costs and lodging for inventory</td>
<td>$3,500</td>
<td>Once</td>
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<tr>
<td>Project Design Document</td>
<td>$29,000</td>
<td>Once</td>
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<tr>
<td>Third-party verification and verification management</td>
<td>$25,000</td>
<td>Once</td>
</tr>
<tr>
<td><strong>Total initial development costs</strong></td>
<td><strong>$105,000</strong></td>
<td>Once</td>
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</table>

### Monitoring Costs

<table>
<thead>
<tr>
<th>Cost Factor</th>
<th>Cost</th>
<th>Frequency</th>
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</thead>
<tbody>
<tr>
<td>Desk review verification</td>
<td>$3,000</td>
<td>Annual</td>
</tr>
<tr>
<td>Registry fee</td>
<td>$500</td>
<td>Annual</td>
</tr>
<tr>
<td>Annual carbon accounting, modeling, monitoring &amp; reporting</td>
<td>$5,000</td>
<td>Annual</td>
</tr>
<tr>
<td>Inventory</td>
<td>$12,000</td>
<td>Every 12 years</td>
</tr>
<tr>
<td>Onsite third-party verification</td>
<td>$15,000</td>
<td>Every 6 years</td>
</tr>
<tr>
<td>Other fees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brokerage fee</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>Registry credit issuance fee (cents/credit)</td>
<td>0.02</td>
<td></td>
</tr>
</tbody>
</table>
Phase 4: Classified and Regression Tree (CART) analysis to identify predictors of financial return

- Identifies predictors of financial return
- Nonparametric, binary procedure that partitions variance in a dependent variable through a series of splits based on values of independent variables.
- Dependent variable: Modified Internal Rate of Return (MIRR)
- Independent variables; % conifer, site class, hectares, % C above common practice, silvicultural treatments, certification, conservation easement, current use, type of landowner and policy assumption.
Policy Scenario Legend:

Policy A: AB 32 is renewed past 2020 & 100 year monitoring is required.

Policy B: AB 32 is not renewed past 2020, but there is a mandate to monitor for 100 years. Project “buys its way out”.

Policy C: AB 32 is not renewed past 202 & there is no obligation to monitor 100 years.
Take home message

1. Main predictors of project profitability
   A. % project C stocking above the regional C stocking ("common practice")
   B. Property size
   C. Policy assumption
   D. Silvicultural treatment

3. Interaction of predictors that estimate project offset profitability
   - 2,000 acre ‘no management’ scenario that is 40% above common practice
   - 10,000 acre project that is below common practice
   - Much of it depends on the policy assumption
Thank you

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