WHAT WE WILL COVER

1. Introduction to Forest Carbon
2. Forestry and Carbon Additionality
3. Overview of Markets for Forest Carbon Credits
4. Assistance Opportunities to Landowners
Introduction to Forest Carbon
Carbon in Forests: Big Picture

- US forests annually sequester the equivalent of 11% of US GHG emissions.
- Harvested wood products store 4%.
## Carbon in Forests: Oregon Picture

<table>
<thead>
<tr>
<th></th>
<th>% distribution of carbon within pools (Oregon Coast Range)</th>
<th>% distribution of carbon within pools (Oregon West Cascades)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Live trees</td>
<td>38%</td>
<td>44%</td>
</tr>
<tr>
<td>Snags</td>
<td>3%</td>
<td>5%</td>
</tr>
<tr>
<td>Downed wood</td>
<td>7%</td>
<td>8%</td>
</tr>
<tr>
<td>Vegetation on floor</td>
<td>7%</td>
<td>5%</td>
</tr>
<tr>
<td>Below ground (organic and soil)</td>
<td>45%</td>
<td>38%</td>
</tr>
</tbody>
</table>

- For PNW old growth the ratio of SOC and in tree carbon is 15 - 32% and 53 - 67% respectively.

Carbon in Forests: Oregon Picture

- Coast Range forests average 179 metric tons CO2e/acre above ground, and are capable of storing more than 421 metric tons CO2e/acre.

- Currently, Coast Range forests are at 43% of total ecological potential.
• Above ground biomass largest pool and most sensitive to management.

• Total amount of carbon stored can be greatly affected by forest management.

Source: Old-growth coniferous forest in western Oregon (Harmon et al. 2004) Units = g C /m2
Carbon in Forests: Coast Range

Metric Tons CO2e/acre above ground

Per acre, Camp Adams’ nine acre stand is storing significantly more CO2e/acre than the average non-industrial forest in Western Oregon.

An amount equal to:
To harvest or not to harvest (from a carbon mgmt. perspective)...

It depends...

• Even if harvested material is stored in long term products- can take many years to recover carbon.

• Any analysis makes assumptions about usage, substitution and leakage.

• PNW on average stands accumulated 75% of maximum stocks by age 127 ± 35 yr (Gray et al 2016).

• Total ecosystem carbon (TEC) ranged from 195 Mg C/ ha in eastern Oregon to 1127 Mg C/ ha at the Oregon coast (public lands). Indicates a much higher potential.

Source: McKinley et al. 2011
Forestry and Carbon Additionality
What is Additionality?

![Graph showing the comparison between ACR Carbon Baseline, Live Tree Carbon with Additionality, and Live Tree Carbon without Additionality.](image-url)
Additionality: Improved Forest Management

1. Extended Rotations
2. Reserve areas & Retention
3. Silviculture
   • Thinning
   • Single tree selection
   • Shelterwood/seed tree
   • Group selection/patch cuts
If all non-industrial forests in the Coast Range and West Cascades (1.1 million acres) were managed to have the additionality of this nine acre stand at Camp Adams it would be like:

<table>
<thead>
<tr>
<th>Greenhouse gas emissions from</th>
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</thead>
<tbody>
<tr>
<td>Passenger vehicles driven for one year</td>
</tr>
<tr>
<td>Miles driven by an average passenger vehicle</td>
</tr>
<tr>
<td>Tons of waste recycled instead of landfilled</td>
</tr>
<tr>
<td>Garbage trucks of waste recycled instead of landfilled</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CO₂ emissions from</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gallons of gasoline consumed</td>
</tr>
<tr>
<td>Pounds of coal burned</td>
</tr>
<tr>
<td>Tanker trucks' worth of gasoline</td>
</tr>
<tr>
<td>Homes' energy use for one year</td>
</tr>
<tr>
<td>Wind turbines installed</td>
</tr>
<tr>
<td>Homes' electricity use for one year</td>
</tr>
<tr>
<td>Railroads' worth of coal burned</td>
</tr>
<tr>
<td>Incondent lamps switched to LEDs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Carbon sequestered by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barrels of oil consumed</td>
</tr>
<tr>
<td>Propane cylinders used for home barbecues</td>
</tr>
<tr>
<td>Coal-fired power plants in one year</td>
</tr>
<tr>
<td>Tree seedlings grown for 10 years</td>
</tr>
<tr>
<td>Acres of U.S. forests in one year</td>
</tr>
<tr>
<td>Acres of U.S. forests preserved from conversion to cropland in one year</td>
</tr>
</tbody>
</table>
Additionality:
Extending Rotations
Additionality:
Reserve Areas and Retention

Reserve area
Variable retention harvest
Silviculture Diagrams

- Clearcutting
- Shelterwood
- Group Selection
- Single Tree Selection
Thinning

THINNING FOR FOREST HEALTH

UNTHINNED STAND  (HIGHER FIRE RISK)

MODERATE THINNING

LIGHT THINNING

HEAVY THINNING  (LOWER FIRE RISK)

Image courtesy Oregon Forest Resources Institute
Shelterwood / Seed Tree

Uncut stand

Preparatory cut

Establishment cut

Removal cut

Image courtesy Humboldt State University- Matthew Johnson, Ph.D.
Shelterwood Example
Does Carbon Fit with Other Goals?

Forest health, productivity, and conservation are top priorities for many landowners

Co-benefits of carbon management

- Biodiversity/Wildlife Habitat
  - Soil Health
  - Water/Air Quality
  - Aesthetic beauty
  - Recreation
- Increased wood production
Overview of Carbon Markets
Carbon Markets: The Big Picture

- Carbon markets provide landowners money in exchange for long-term commitments to maintaining forest carbon stocks.
- Not for everyone but can be a great fit for some.
- Market rules are complex. Not developed with small landowners in mind.
- Transaction costs are high and opportunity costs are large.
- Technology and cost-share can reduce transaction costs.
## Market Comparison

<table>
<thead>
<tr>
<th>Compliance Market</th>
<th>Voluntary Market</th>
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<tbody>
<tr>
<td>California cap and trade</td>
<td>Voluntary buyers (e.g. Microsoft)</td>
</tr>
<tr>
<td>~ $10 / ton projected to increase</td>
<td>$.01- 45 / ton</td>
</tr>
<tr>
<td>25 year crediting period plus 100 years of monitoring</td>
<td>40 year project periods or the length of an average rotation</td>
</tr>
<tr>
<td>Common practice baselines</td>
<td>Calculated baselines</td>
</tr>
</tbody>
</table>
Compliance Market Requirements

- Offsets must be real, additional, and have some degree of “permanence.”
- Credits = Gross additionality – (20% buffer pool contribution + leakage deductions + development costs).
- Must be legal forest management. Can’t count legal set-asides (eg. regulatory buffers)
- 25 year crediting period. Inventory and verification every 6 years during the crediting period.
- 100 years of monitoring after last credit issuance to ensure carbon stocks at the start of the project (at a minimum) are maintained.
- Intentional and non-intentional “reversals”
Carbon Credit Project Development Process

- **Step 1.** Initial credit assessment.
- **Step 2.** Carbon inventory completed.
- **Step 3.** Model assisted carbon management planning.
- **Step 4.** Contracting.
- **Step 5.** Project design document (modelling, documentation).
- **Step 6.** 3rd party verification and registration.
370 acres
Site class 2
Trees aged 30 - 75
Regional Average Carbon Stocks

Carbon Additionality Measured and Modelled

CO2e / acre (above ground)

Carbon Accretion

Regional Average Carbon Stocks
**Projected Carbon Credit Payments**

<table>
<thead>
<tr>
<th>Years</th>
<th>Years 7 - 10</th>
<th>Years 11 - 20</th>
<th>Total over 20 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>$348,135</td>
<td>$298,607</td>
<td>$728,933</td>
<td>$1,318,778</td>
</tr>
</tbody>
</table>

**Assumptions:** Modelled grow-only; Credits transacted in the compliance market under contract with FCW; deductions accounted for; verification expense included; forecasted price escalation included ($9.56 - $17/Ton CO2e)
Forest growth & removals and net carbon accretion on the property

Regional average carbon stocking

Tons of Carbon

100 years
Assistance Opportunities for Landowners
Regional Conservation Partnership Project (RCPP)

1) Leverage EQIP as the on-ramp to market access and cover many of the up front development expenses.

2) Create a pipeline—initial assessment, innovative inventory, carbon management plans.
Target Outputs of the RCPP Project

- Direct technical consultations
- 60 initial carbon assessments
- 60 forest management plans
- Template carbon management plan
- 60 carbon registry compliant carbon inventories
- 24 practice implementation projects
- Landowner workshops and trainings
Initial Carbon Credit Assessments

• Data required:
  – stand area,
  – stand age (average),
  – dominant species,
  – monoculture or mixed,
  – site class (1-5), stand area,
  – thinned? (yes/no) if yes when.