

FACTSHEET FOR PARTNERSHIP FIELD VALIDATION TEST

Partnership Name	West Coast Regional Carbon Sequestration Partnership (WESTCARB)		
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Field Test Information: Field Test Name	WESTCARB Shasta County Terrestrial Sequestration Pilot		
Test Location	Shasta County, California		
Amount and Source of CO ₂	Tons	Source	
	TBD.	Includes afforestation, fuels/fire management and biomass energy, and forest management activities.	
Field Test Partners (Primary Sponsors)	Western Shasta Resource Conservation District, W.M. Beatty & Associates, Wheelabrator Shasta Energy Company, Pacific Forest Trust, USDA Forest Service – Pacific Southwest Research Station, USDA Forest Service – Pacific Northwest Research Station, California Department of Forestry and Fire Protection, The Climate Trust, California Climate Action Registry, USDA Forest Service – Shasta Trinity National Forest, Pacific Gas & Electric, US National Park Service – Whiskeytown NRA, U.S. National Park Service – Lassen Volcanic National Park, USDI Bureau of Land Management, Bascom Pacific LLC, Winrock International.		
<p>Summary of Field Test Site and Operations: Terrestrial pilot activities will take place on federal, state, and private lands throughout Shasta County, California. In addition to various types of landowners, Shasta County’s broad spectrum of elevation, topography, forest, range, and agricultural land types make it an excellent location for field validation of the array of terrestrial sequestration opportunities identified in WESTCARB Phase I. Sequestration approaches demonstrated in Shasta County can be replicated on similar land types elsewhere in the WESTCARB region.</p> <p>Terrestrial activities in Shasta County include:</p> <ul style="list-style-type: none"> • Afforestation/reforestation pilot activities to validate the potential of rangelands, non-forested timberlands, and past fire sites to support new trees as a means of increasing carbon stocks. • Development of a new methodology to quantify GHG emissions from wildfires and determine potential carbon credits from improved management of forest fuels, including reduced emissions from less severe wildfires and the emissions benefits of displaced fossil-fuel use when fuel removed from the forest is burned in a biomass energy facility. • Pilot activities for forest fuel treatments and “before” and “after” carbon stock measurements to quantify potential (and in some cases, actual) biomass energy generation. • Pilot activities for conservation-based forest management of timberlands to increase carbon stocks. • Outreach to decision-makers and the public through Web-accessible, GIS-based carbon project reporting. • Project review with emissions credit market protocol developers to assess market recognition potential. 			

Research Objectives:

The overall objectives of WESTCARB Phase II terrestrial field work activities are to:

- Validate and demonstrate the terrestrial carbon sequestration opportunities identified in WESTCARB Phase I through pilot projects, methodology development, field measurements, reporting, and project review with emissions credit market protocol developers.
- Conduct research to help policymakers, communities, and businesses make informed decisions on how to invest in CCS technology development and deployment to achieve climate change mitigation objectives.

Research objectives for afforestation include:

- Refine the WESTCARB Phase I economic analysis for afforestation with improved cost data.
- Gain real-world experience to support the feasibility and success of afforestation projects.
- Refine carbon estimates for afforestation using baseline measurements, proxy measurements in relevant species groups, and industry data.
- Gain experience with site preparation, seedling sourcing, planting techniques, post-planting maintenance treatments, and other considerations necessary to inform the efforts of land managers, landowners, and businesses in replicating and expanding afforestation projects for climate change mitigation in California and the WESTCARB region.
- Work with the California Climate Action Registry to road-test the Registry's Forest Project Protocols for afforestation activities.
- Explore potential impacts of climate change on afforestation projects in California and the WESTCARB region over the timeframe of afforestation projects (projected changes in temperatures, water availability, snow pack, and optimum conditions for forest growth including possible "migration" of forests and other vegetation types to higher elevations as they affect present siting of afforestation projects).

Research objectives for improved fuels/fire management and biomass energy include:

- Develop methodologies, reflecting the consensus of the scientific and policy communities, for quantifying GHG emissions from wildfires and net sequestration benefits and emissions reductions attributable to improved fuels management combined with biomass energy production.
- Compile field data and/or imagery to assist in validating the methodology.
- Design measurement, monitoring, and verification (MMV) protocols for fuel treatments.
- Collect data on treatment costs and potential revenues (biomass fuel sales).
- Estimate carbon benefits from biomass energy production.
- Work with the California Climate Action Registry to evaluate potential for new accounting and reporting protocols for fuels/fire management/biomass energy activities.

Research objectives for conservation-based forest management include:

- Evaluate net carbon benefits of conservation-based forest management activities such as harvesting at lower intensities than those mandated under California Forest Practice Rules, maintaining riparian buffers, managing riparian zones to favor large trees and dense canopies, and increasing stocking in forested areas. Estimate net emission reductions and sequestration benefits attributable to project activities over the lifespan of the project.

- Document costs and cost-effectiveness of activities.
- Research and develop model easement terms to guarantee maintenance of the carbon benefits of forest management.
- Evaluate economics of registering and marketing of carbon as a forest management strategy.
- Assess the practicality and effectiveness of the California Climate Action Registry forest protocols in addressing issues of baselines, additionality, permanence, leakage, treatment of wood products, certification requirements, and costs of participation.

Summary of Modeling and MMV Efforts: (Use the table provided for MMV)

Activity	Baseline scenario determination	With-project scenario	Techniques used
Afforestation	Review site history; document existing land use and trends in land use using ground-based and remotely sensed data. Quantify baseline carbon stocks through standard field measurements at the time of site preparation.	Model carbon accumulation in planted forests using standard growth models, for comparison to baseline scenario. Conduct field checks for planting success and survival.	MMV guidance from California Climate Action Registry Forest Project Protocols, Chicago Climate Exchange, and USDOE 1605b Guidelines for Voluntary Reporting of Greenhouse Gases.
Improved fuels/fire management and biomass energy	Estimate baseline GHG emissions from wildfires, building on existing fire models including area and spatial distribution and the corresponding changes in carbon stocks due to fire, emissions of non-CO ₂ greenhouse gases, and forest recovery after fire. Use fire data to validate and calibrate models. Estimate baseline GHG emissions from fossil fuel-based energy generation.	Choose fuel reduction prescriptions to be analyzed for net sequestration/ emissions reduction benefits. Model net benefits including reduced emissions from wildfire, sequestration benefits post-treatment, differences in GHG emissions from burning biomass on site vs. at power plants, emissions reductions from fossil fuel substitution or displacement, initial carbon removals from treatments, and direct emissions from treatments. Quantify pre- and post-treatment carbon stocks using standard field measurements.	New baseline and crediting methodology to be developed in cooperation with fire scientists, policymakers, and market validation entities. Will build on existing fire modeling approaches.
Conservation-based forest management	Baseline for forest management will be based on state-mandated minimum standards of the California Forest Practice Rules, Option C. Quantify baseline carbon stocks through standard field measurements.	Estimate net emission reductions/sequestration attributable to project activities over the lifespan of the project (e.g., 100 years), based on inventory data and appropriate growth models to compare projected carbon stocks and emissions from the project activity to baseline carbon stocks.	MMV guidance from California Climate Action Registry Forest Project Protocols, Chicago Climate Exchange, and USDOE 1605b Guidelines for Voluntary Reporting of Greenhouse Gases.

Accomplishments to Date:

Afforestation:

- 400 landowners contacted, 48 surveyed. 16 site-specific afforestation planting and maintenance plans developed.
- 12 afforestation pilots under way and landowner agreements signed, totaling 470 acres.
- NEPA Categorical Exemption received on all projects to date.
- Planting complete on 11 projects.
- Pre- and post-treatment (clearing) measurements completed on all projects. Analysis is currently underway to determine accurate baseline and project future growth.
- High level of landowner interest; landowners are willing to share costs.
- Submitted *Preliminary Afforestation Plan for Pilot Projects in Shasta County*.
- Submitted *WESTCARB Afforestation Pilot Projects in Shasta County, California: An Interim Report*.
- Collaborated on the video production of "Managing for Healthy Forest Landscapes," to be distributed to landowners. WESTCARB project personnel and landowners were interviewed by Prairie Public Television in the making of the Aurora award winning video, "Out of the Air – Into the Soil: Land Practices That Reduce Atmospheric Carbon Levels."

Improved fuels/fire management and biomass energy:

- Pre-treatment measurements complete on four fuel reduction projects; post-treatment complete on two.
- Assembled WESTCARB Fire Panel fire scientists and fuels experts to work on fire methodology development. Panel includes California Department of Forestry and Fire Protection, California Air Resources Board, Lake County Resources Initiative, Oregon Department of Forestry, Oregon State University, Spatial Informatics Group, TSS Consultants, University of California at Berkeley – Center for Fire Research and Outreach, USDA Forest Service – Pacific Northwest Research Station – Pacific Wildland Fire Sciences Laboratory, USDA Forest Service – Pacific Southwest Research Station – Redding Silviculture Laboratory, USDA Forest Service – Pacific Southwest Research Station – Sierra Nevada Research Center, USDI National Park Service – Whiskeytown NRA, W.M. Beaty & Associates, Western Shasta Resource Conservation District, and Winrock International. Conducted three Fire Panel meetings, October 2006, May 2007, and March 2008.
- Developed *Protocol for monitoring and estimating greenhouse gas benefits from hazardous fuels management in Western U.S. forests*, a "straw man" methodology for discussion.
- UC Berkeley – Center for Fire Research and Outreach developed alternate approaches to quantify baseline fire risk across the regions of northern California where WESTCARB fuel reduction pilot activities are being monitored. Completed baseline fire hazard mapping.
- USDA Forest Service – Pacific Northwest Research Station developed estimates of emissions to be paired with the baseline rate of fire; emissions estimation relies on USFS fire models and in particular on the Fuel Characteristic Classification System (FCCS).
- Oregon State University completed literature review and analysis of data on rates of decomposition of woody debris and conducted long-term modeling using STANDCARB.
- Pre-treatment carbon stock measurements were conducted on three fuels projects on private (private industrial and utility) forest lands in Shasta County, following a Standard Operating Procedures manual developed by Winrock. The purpose of the measurements was to identify, in real as opposed to modeled forests, the carbon stocks available to be burned before and after treatment, the direct impacts of fuel treatments on carbon stocks

in different carbon pools (e.g., increases in dead wood, decreases in dense growth), and the fuel removed from the forest for biomass energy during treatment. Measurements will also provide input data for fire models used to simulate fire behavior and emissions in the baseline (without-treatment) and with-treatment scenarios. Post-treatment measurements were also conducted on a portion of the treatments.

- Submitted *Summary of Work to Date: Developing a Project Methodology for Measuring GHG Benefits of Improved Fuels Management on Forested Lands*.

Conservation-based forest management:

- Continued implementation of forest management activities on the Bascom Pacific Conservation-Based Forest Management Pilot Project. Developed measurement plan; completed measurements of all carbon pools; planned forestry activities to increase carbon stocks; developed perpetual conservation easement; developed projections of the baseline scenario and project activity scenario.
- Submitted *Paper Summarizing the Carbon Baseline and Easement Creation for the Shasta County Conservation-Based Forest Management Pilot Activity*.

Summarize Target Sink Storage Opportunities and Benefits to the Region:

Afforestation:

	Shasta County	California	Oregon	Washington
Area of rangelands (acres)	749,000	56.5 million	26.9 million	11.9 million
Rangelands suitable for afforestation (acres)	600,000	23.1 million	19.1 million	9.1 million
Estimated sequestration potential at 40 years at <\$5.50/t-CO ₂ (MMT CO ₂)	88	3,017	403	335

Improved fuels/fire management and biomass energy:

Net sequestration benefits and emissions reductions of reducing forest fuels have yet to be quantified. However, the following is a summary of estimated baseline emissions from fire that could be reduced (not eliminated) though improved management of forest fuels and biomass energy generation.

Area	Estimated yearly baseline emissions from fires
Shasta County	0.019 MMTCO ₂ e/yr*
California	1.46 MMTCO ₂ e/yr
Oregon	1.03 MMTCO ₂ e/yr
Washington	0.18 MMTCO ₂ e/yr
Arizona	0.47 MMTCO ₂ e/yr

* Note that the analysis period for which data was available represented years with an unusually low incidence of fire. Over a longer timeframe, fire is probably a much more significant, potentially dominant, cause of change in Shasta County.

Conservation-based forest management:

Net sequestration and emissions reductions benefits will be estimated as the project progresses.

Cost:
Total Field Project Cost: \$7,624,123
 DOE Share: \$1,922,500 (25.2%)
 Non-DOE Share: \$5,701,623 (74.8%)

Field Project Key Dates:
Baseline Carbon Stock Completed: 2009
Afforestation/Fuel Treatments Begin: 2007
Afforestation/Fuel Treatments Complete: 2010
Post-Treatment Measurements & Analysis Complete: 2010

Field Test Schedule and Milestones (Gantt Chart):

DOE task	FY 2006				FY 2007				FY 2008				FY 2009				FY 2010			
	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul
- Administration	[Gantt bars for Administration task]																			
1.3 Ongoing regional characterization and pilot site identification	[Gantt bars for 1.3 task]																			
5.1 Fire methodology development	[Gantt bars for 5.1 task]																			
5.2 Lake County pilot	[Gantt bars for 5.2 task]																			
5.3 Shasta County pilot	[Gantt bars for 5.3 task]																			
5.4 GIS carbon reporting system	[Gantt bars for 5.4 task]																			
5.5 Market validation and outreach	[Gantt bars for 5.5 task]																			

Note: Lake County pilot is a separate field validation test with similar methodology and reporting.

