



WESTCARB Annual Business Meeting

Phase I Results and Phase II Accomplishments to Date

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WESTCARB Features Strong and Diverse Set of Partners; Robust Cost Share

- More than 70 organizations comprising:
 - Resource management and environmental protection agencies
 - National laboratories and research institutions
 - Forest-product and ranching interests
 - Conservation nonprofits
 - Climate project standards organizations
 - Energy and pipeline companies
 - Colleges and universities
 - Trade associations and policy coordinating bodies
- Led by California Energy Commission
- Energy Commission/partner cost share >\$11.7 million

WEST COAST REGIONAL CARBON SEQUESTRATION PARTNERSHIP



Meeting Objectives

- Review technical progress
 - Accomplishments to date and next steps
 - Feedback on methods and interpretation of findings
- Address deployment barriers
 - Review issues being addressed by WESTCARB pilots; what barriers to commercialization will remain?
 - What can WESTCARB do to address these barriers?

WESTCARB Project Overview

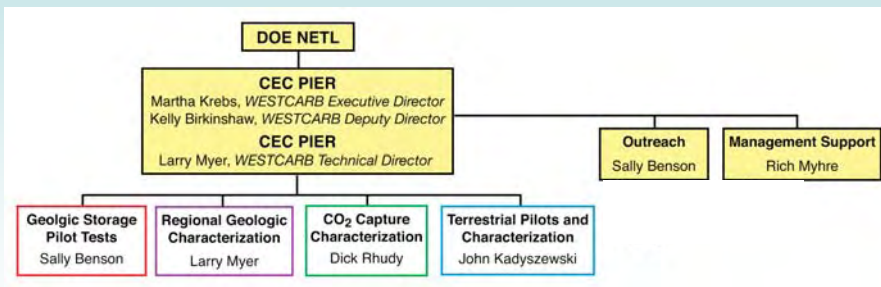
- Phase I began October 2003
 - About 40 participants
 - Regional assessments of terrestrial and geologic storage options
 - Source and sink characterization
 - Assessments of costs, risks, regulations
 - Raise public awareness
- Phase II began October 2005
 - About 70 participants
 - Continue regional assessments and public outreach
 - Focus on geologic and terrestrial pilots
- Phase III to begin October 2007
 - Pre-commercial geologic sequestration projects

Phase I Accomplishments

- Centralized GIS source and sink database
- Major point sources and geologic sinks identified and characterized
- Geologic and terrestrial storage estimates made for major sinks
- GIS-based method for source-sink matching implemented; marginal cost curves developed
- Terrestrial baselines and supply curves developed
- Current regulatory structure outlined
- Heightened awareness of sequestration among state, community, and industry leaders
- New approach for screening and ranking sequestration sites
- Wealth of data for the technical and policy communities in 12 comprehensive reports/papers and final report

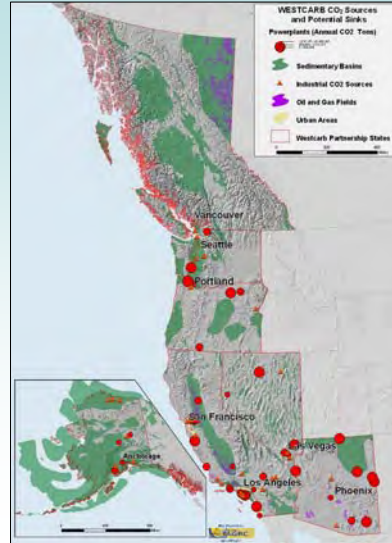


WESTCARB Phase II Management Team

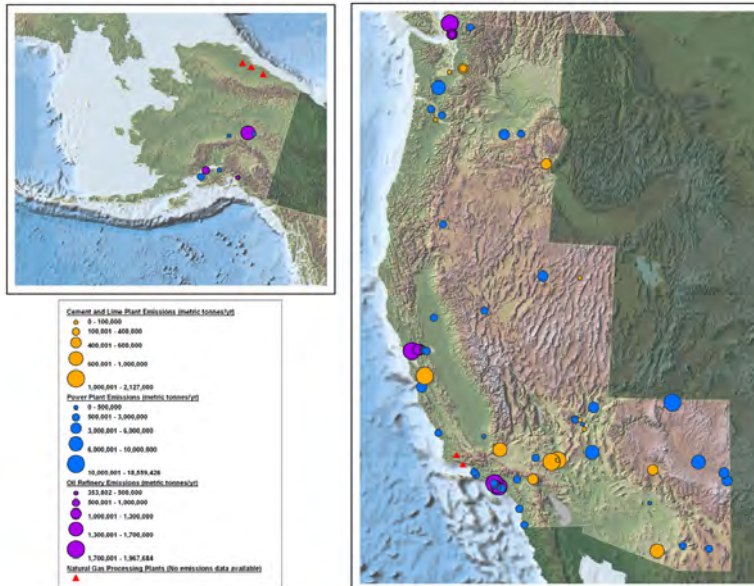


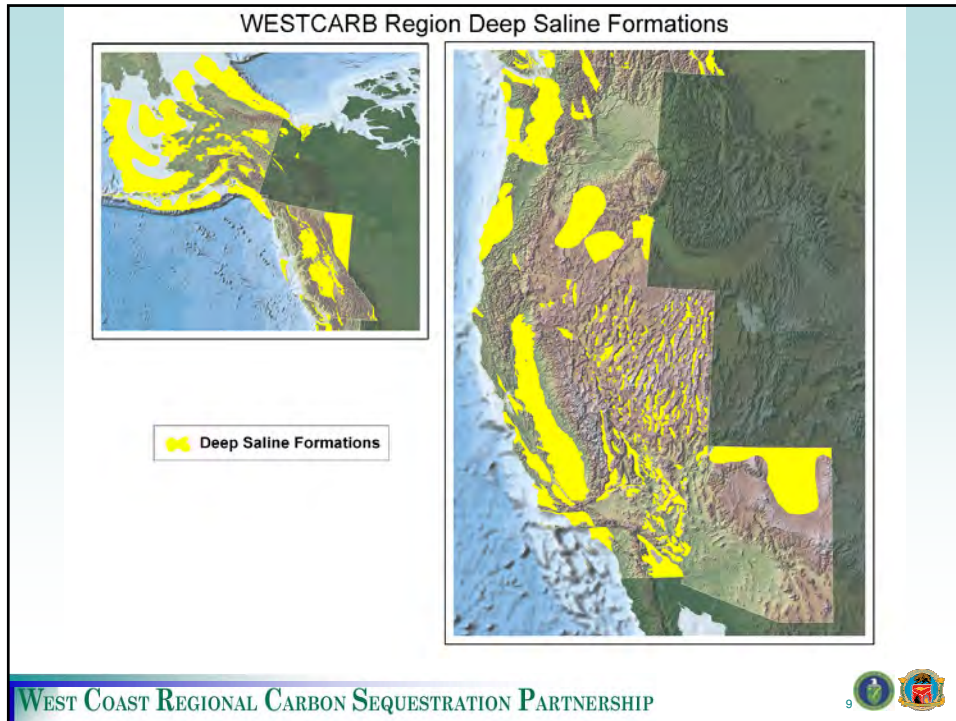
Continued Regional Geologic Characterization

- Phase II emphases
 - Improving characterization of states studied on a limited basis in Phase I (e.g., Alaska)
 - Improving characterization of high-potential formations and refining capacity estimates
 - Studying new storage types (e.g., mafic rock in Nevada)
- New data added to publicly accessible sets via WESTCARB and NATCARB databases
- Outreach to partners assures awareness of data by potential commercial project developers

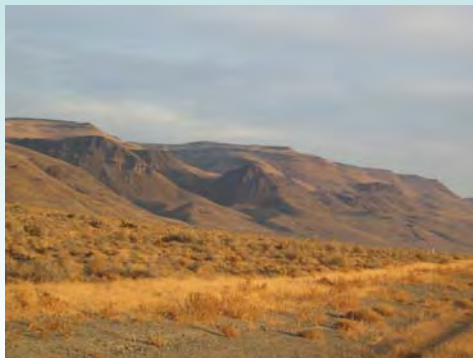


WESTCARB Region Major Point Sources





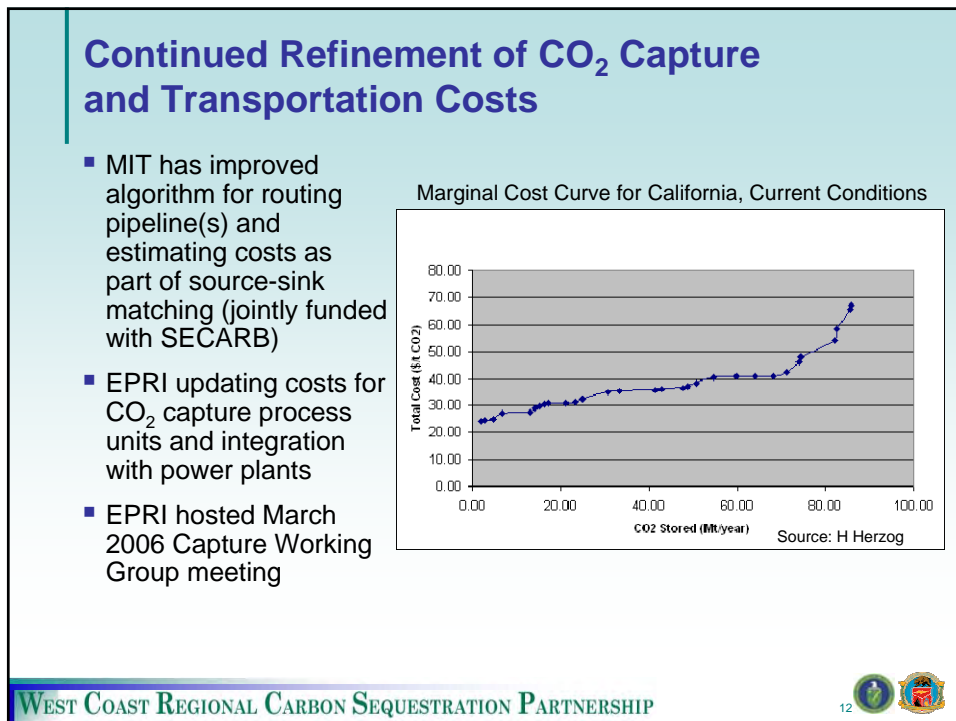
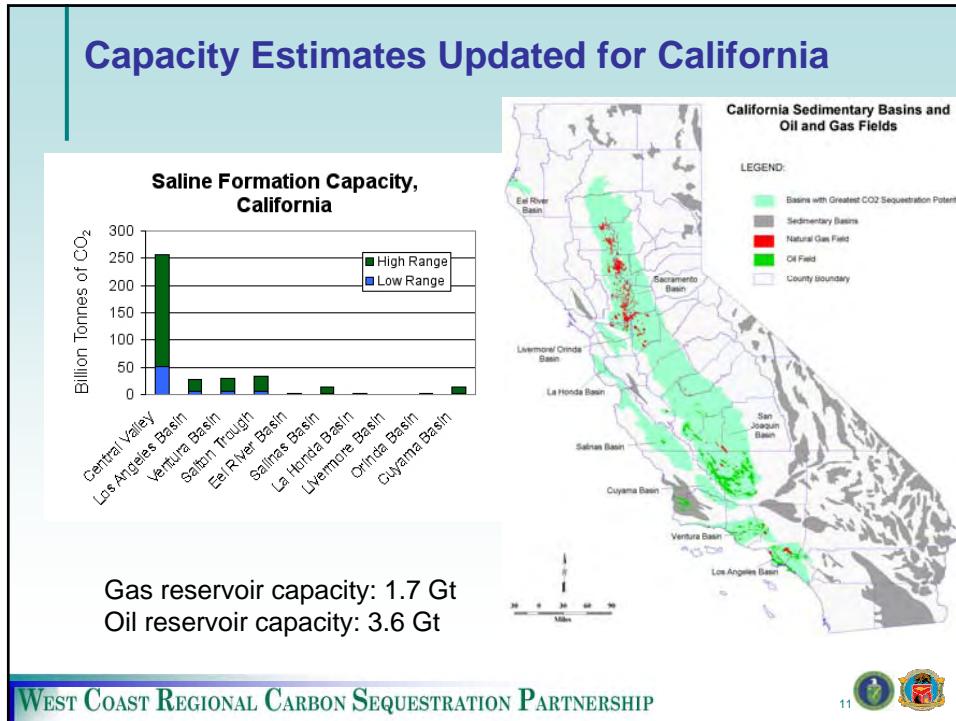
Surveying Mafic and Ultramafic Rock Volumes in Nevada



Thick basalts in the Buffalo Hills, near Gerlach, in Washoe County, Nevada

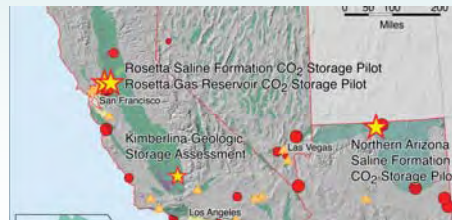
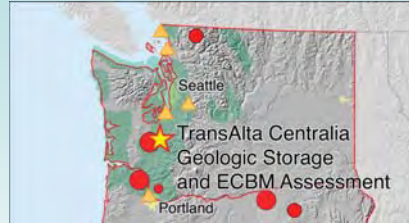


Thin basalts, Humboldt County; extensive, but insufficient volume

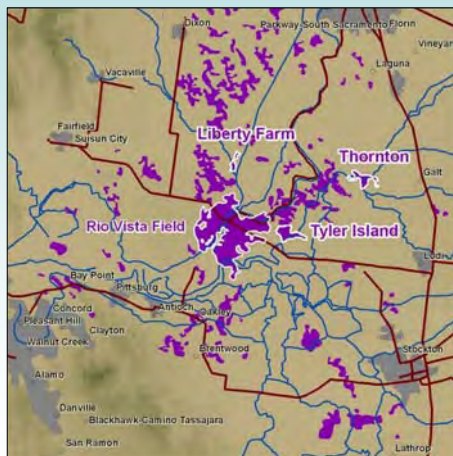


Geologic Pilots Planned in Arizona, California, and Washington

- Three injection pilots (two sites)
 - EGR and saline formation injections in Thornton, CA
 - Saline formation injection in northeast AZ
- Two “site characterization” pilots
 - ECBM/saline in Centralia, WA
 - EOR/saline in Kimberlina, CA



Rosetta Resources CO₂ Storage Pilots



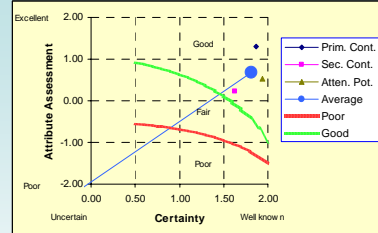
Major Sacramento–San Joaquin River Delta natural gas fields shown in purple

- Two-well, “stacked” saline and depleted gas zone injections
- First field test to collect data to assess CO₂-based EGR
- Reservoir structure, consisting of a well defined dome, will safely store injected CO₂
- Selection of narrow, confined zones minimizes risk of potential contamination of gas resources by CO₂
- One surface and one mineral rights owner. In contrast, large fields like Rio Vista are unitized and securing approval from ~900 owners was impractical.
- Rural site with few neighbors and little risk to cultural or environmental resources

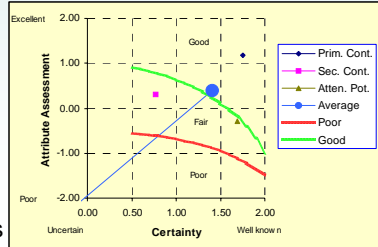
Tool Developed for Selecting Geologic Storage Sites

- Spreadsheet model for ranking/screening of sites, focused on assuring containment
- Three main controlling characteristics:
 - Primary containment potential
 - Secondary containment potential
 - Attenuation potential
- User can:
 - Evaluate and score various attributes
 - Specify the importance of various attributes through weighting factors
 - Specify uncertainty inherent at sites

Rio Vista Gas Field



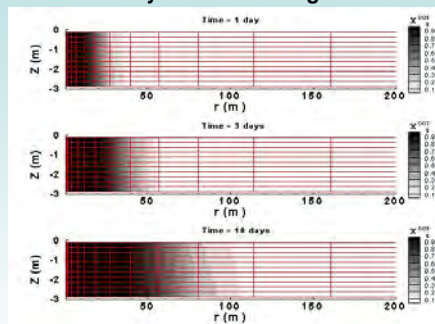
Ventura Oil Field



Rosetta Pilots Progress to October 2006

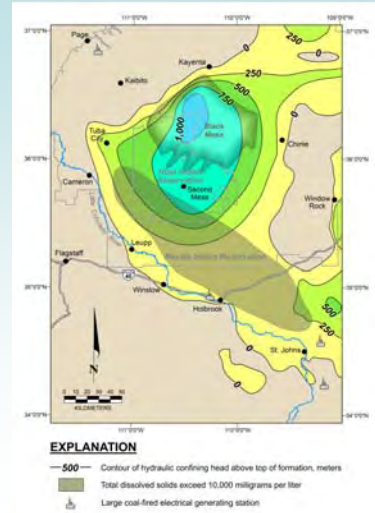
- Face-to-face meetings held with mineral rights and surface landowners; access agreements developed—approval pending
- Received NEPA categorical exemption from DOE
- Driller identified; contract for site management in negotiation
- Discussions with regulators ongoing
- Detailed field test plans being finalized—informed by reservoir simulations
- Meetings with community leaders have begun

Simulated injection into the gas reservoir



Northern Arizona Saline Formation CO₂ Storage Pilot

- Single-well test
- Target formation screening complete; low water table makes supercritical depth greater than normal
- Pilot host, Salt River Project, has convened advisory committee of key stakeholders
- Permitting issues discussed with key Arizona agencies
- MMV costs estimated
- Navajo Nation outreach planning under way

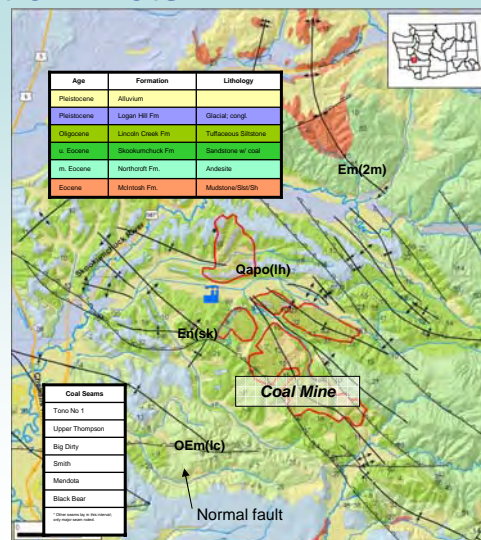


Source: Errol L. Montgomery & Associates



Two Site Characterization Pilots

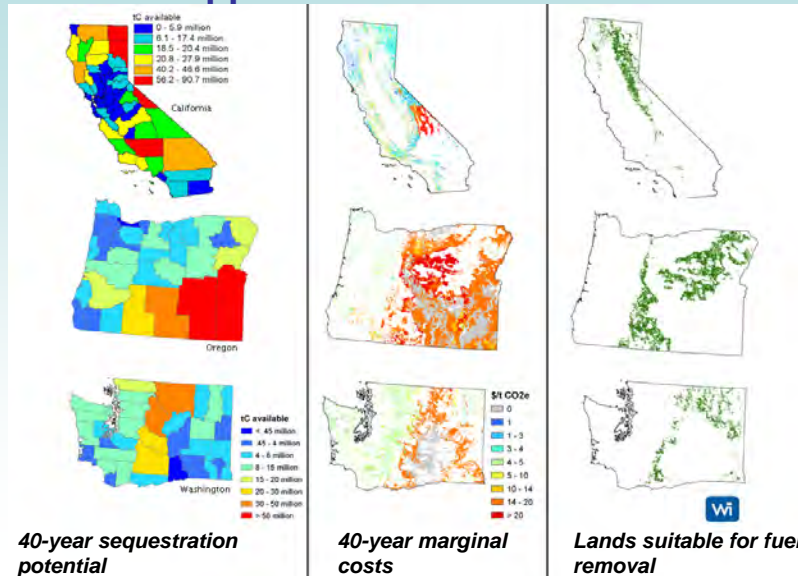
- Lead industrial partner: TransAlta Centralia Generation
- Evaluate ECBM potential of deep coals near plant in Centralia, Washington; also saline formation potential
- Lead industrial partner: Clean Energy Systems
- Evaluate EOR and saline sequestration potential near Kimberlina (California) plant



Geologic data, Centralia region (TransAlta)



Afforestation and Fuel Management Are Major Terrestrial Opportunities

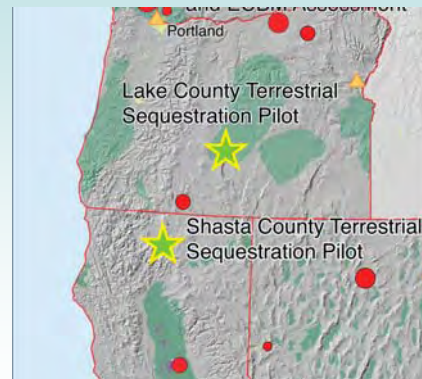


WEST COAST REGIONAL CARBON SEQUESTRATION PARTNERSHIP



Terrestrial Pilots Planned in California and Oregon

- Two terrestrial pilots (multiple sites)
 - Forest treatments to reduce severe fires and fast-growth afforestation assessment in Lake County, OR (as part of an Oregon Solutions Project)
 - Forest treatments to reduce severe fires, native-species afforestation, and forest conservation management in Shasta County, CA



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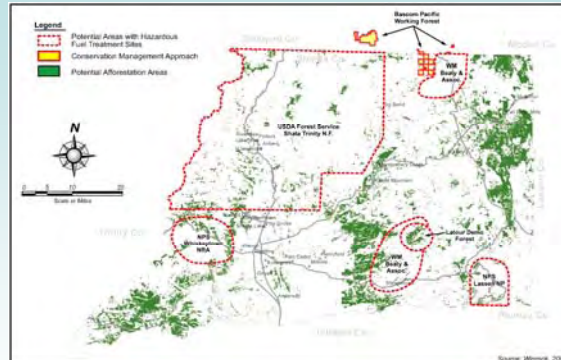
Lake County (OR) Terrestrial Pilot Progress

- Assembled expert panel to review fire models and carbon stock impacts (also applies to Shasta)
- Developed baseline fire emission methodologies
- Submitted NEPA documentation
- Identified first 8 fuel treatment plots in Fremont National Forest



Shasta County (CA) Terrestrial Pilot Progress

- Classified rangelands for afforestation (see figure); prepared work plan
- Identified candidate seedling species for afforestation
- Submitted NEPA documentation
- Developed baseline fire emission methods
- Hosted California Board of Foresters
- Partners/public outreach meeting held in October



Terrestrial Pilots Address Market Issues

- Assess practicality and effectiveness of protocols
- Effectiveness of certification oversight
- Cost and cost-effectiveness
- Offsets from fuel treatments?



Source: Pacific Forest Trust

Public Awareness Continues to Grow

- Legislative initiatives and executive orders require policy-relevant information
- Pilot-related media inquiries are increasing; fact sheets developed
- Public outreach materials tailored for general public
- Public perception research project
- Steady stream of meetings with state and local leaders under way
- International interest in U.S. program



WESTCARB Phase III

Department of Energy Advances Commercialization of Climate Change Technology

DOE to Provide Over \$450 Million to Support the Deployment of Carbon Sequestration Technologies in North America

(Oct 31, 2006 DOE Fossil Energy Techline)

- 10 year effort, beginning in October 2007
- Pre-commercial projects of scale—up to 1×10^6 tons CO₂ sequestered per year
- Focus on geologic sequestration
- California Energy Commission will release a request for expressions of interest



Summary

- Phase I has provided information for policy makers as well as data for participants interested in commercial development
- Phase II continues regional assessments
- Field work expected to commence by year-end for 4 of 5 pilots
- Public interest and scrutiny on the rise
- Phase III is coming soon!

