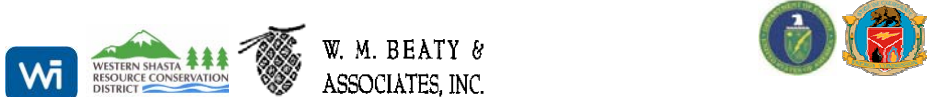


WESTCARB Annual Business Meeting

Afforestation Pilot Projects in Shasta County

Bob Rynearson
W.M. Beaty and Associates, Inc.
bohr@wmbeaty.com

Scottsdale, AZ
September 15–17, 2009




Office Evaluation of 50 Potential Projects

Criteria for Feasibility & Selection:

- **CCAR Forestry Protocol eligibility (pre-2009):**
 - < 10% Tree Canopy (used NAIP or GE photos)
 - > 10 yr. out of forest cover
- **Seed Zone & Elevation**
- **NRCS Soil Surveys: Depth & AWC etc.**
- **Slope**
- **Access Roads (for equipment & crews)**
- **Easements & Property Corners/Lines**
- **Landowner's objectives**
- **Regulatory constraints: T& E, 1600 permits etc.**
- **Other Misc.**

.....**20 out of 50 selected for Site Visits**

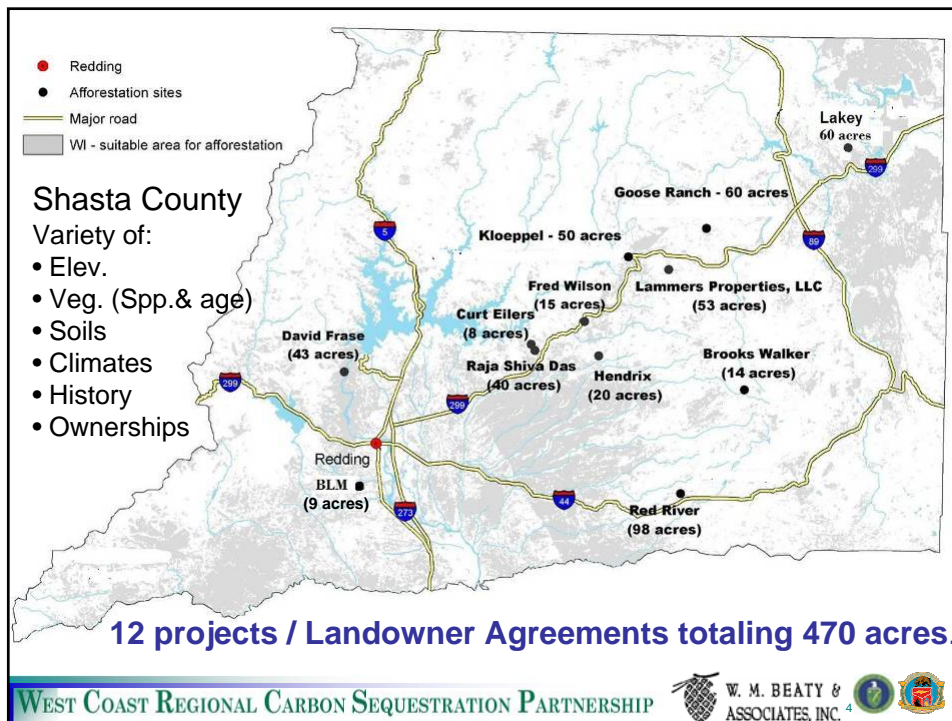
WEST COAST REGIONAL CARBON SEQUESTRATION PARTNERSHIP

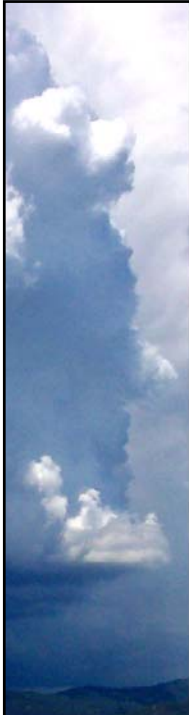


Site Visits resulted in 17 site-specific reforestation plans w/ estimates:

- **Background information:** acres, access, easements, boundary lines, soils, site class, precipitation, seed zone, elevation, current vegetation, topography, owner's objectives / historical background etc.
- **Step-by-step plan** for site prep, seedlings, planting, chemical and mechanical treatments
- **Estimated costs** including WESTCARB II and landowner portions

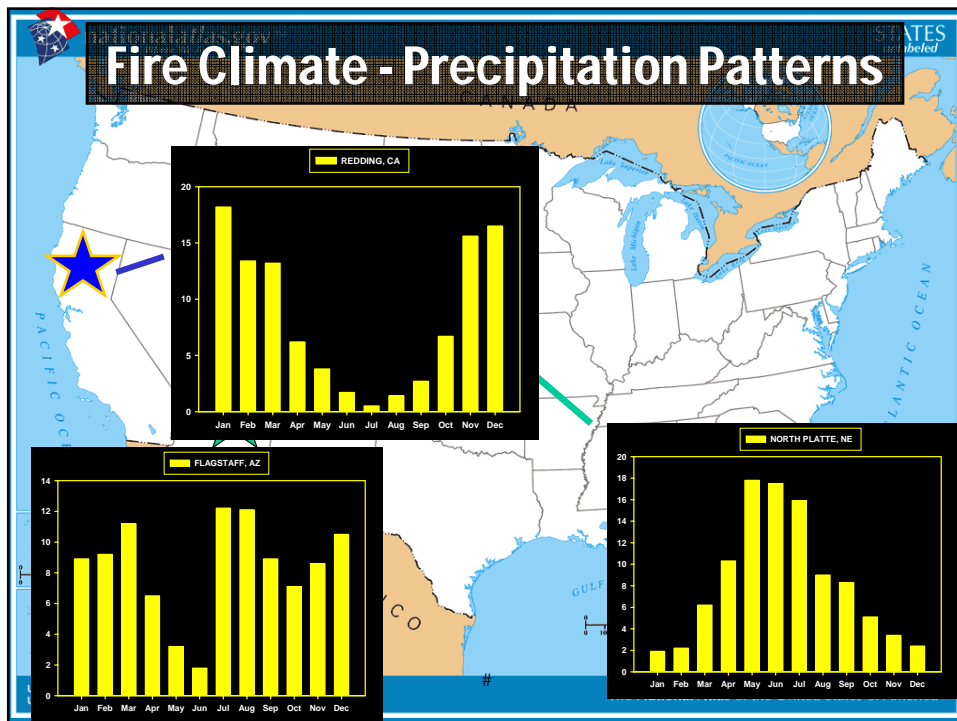
WEST COAST REGIONAL CARBON SEQUESTRATION PARTNERSHIP





Mediterranean Climate

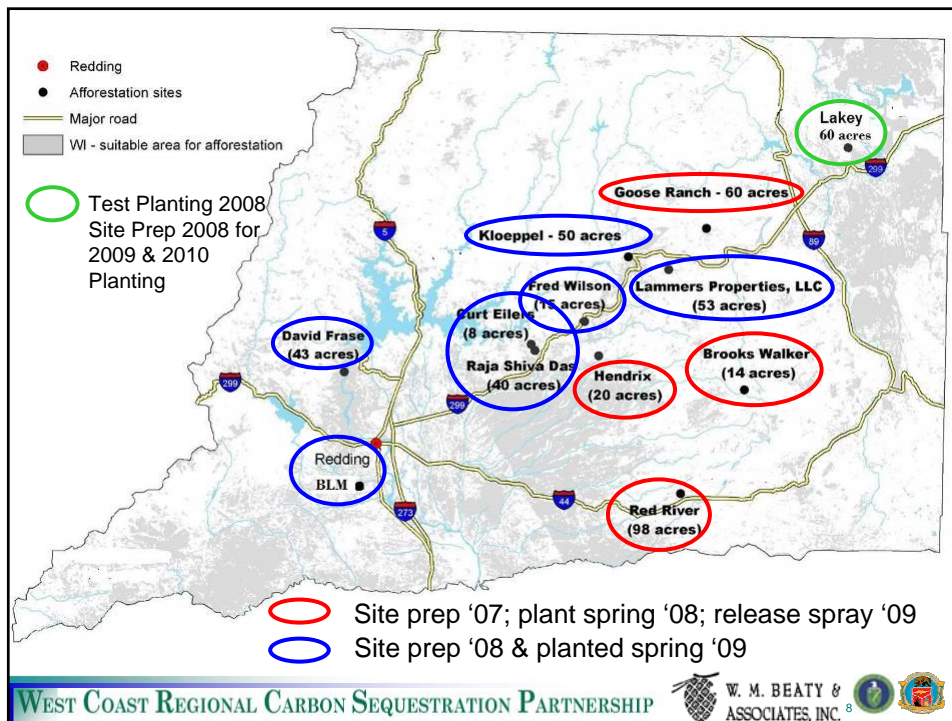
- Cool/wet Winters
 - vegetation/fuel
- Warm/dry Summer
 - Annual fire season
 - Soil moisture is limiting factor for conifer seedling survival
- Lightning



BASIC AFFORESTATION STEPS (Sequential)

1. **Fall 1st Year:** Collect cones & process seed (or purchase seed) of desired species from appropriate zone and elevation
2. **Winter 1st Year:** Contract w/ Nursery to grow seedlings
3. **Summer 2nd Year:** Mechanical and/or Chemical Treatments to Prepare Site for Planting (Site Prep)
4. **Fall/Winter 2nd Year:** Burn piles (if necessary)
5. **Winter 2nd Year:** Lift & Package Seedlings & Transport to Cold Storage Facility
6. **Spring 3rd Year:** Plant Seedlings
7. **Spring 3rd Year:** Install Seedling protectors (if needed)
8. **3rd - 6th Years:** Follow up release spray to control competing vegetation

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**Conifer Seed from:
CAL FIRE, W.M. Beatty & SPI**

Various:

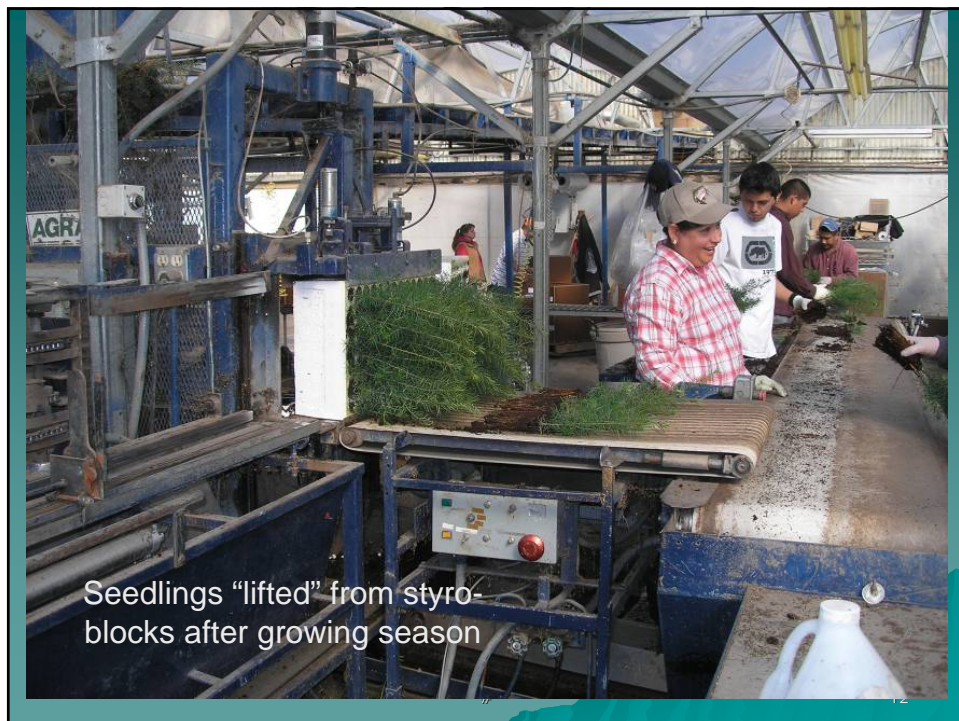
- Species
- Elevations
- Seed Zones

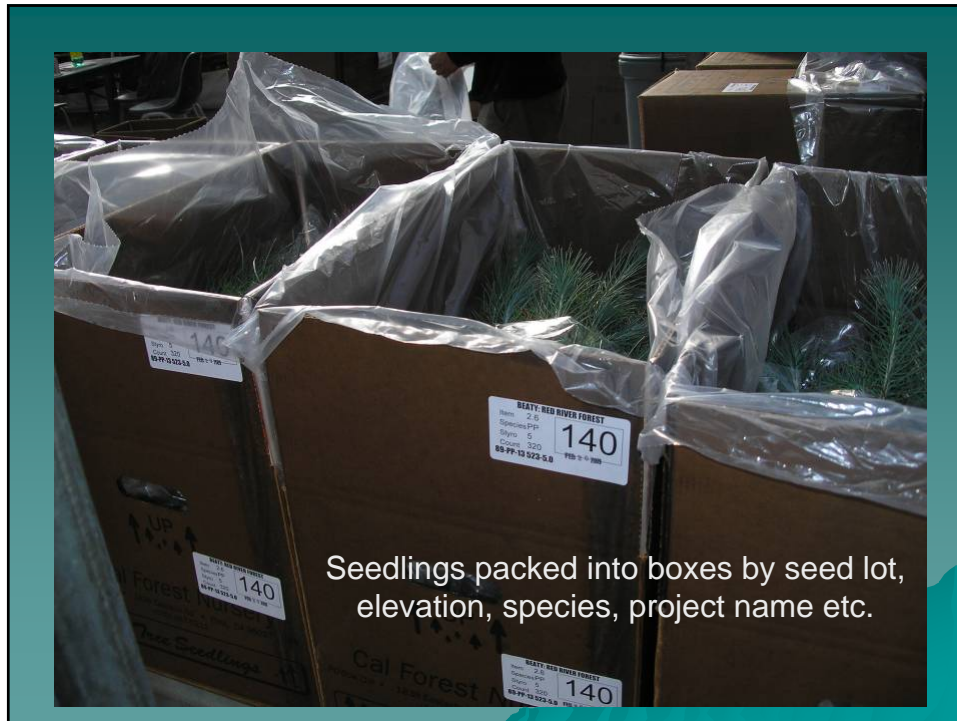


Handwritten tag text: CAL FIRE, W.M. BEATTY, SPI, 10/10/08, 142 # 2, CHINA, DE-21, 1/4/09, BEATTY



CAL FOREST NURSERY
Sowing seeds into styro-
block containers






Seedlings packed into boxes by seed lot, elevation, species, project name etc.




Seedlings must be kept in cold storage from lifting/packing until they are planted in the field

June 2008 lightning caused wildfires:



- Fire very close to 2 projects
- Fire burned 1/3 of one project
- Delayed site prep
- **Prolonged smoke impacted PP seedlings @ nursery scheduled for spring '09 planting**



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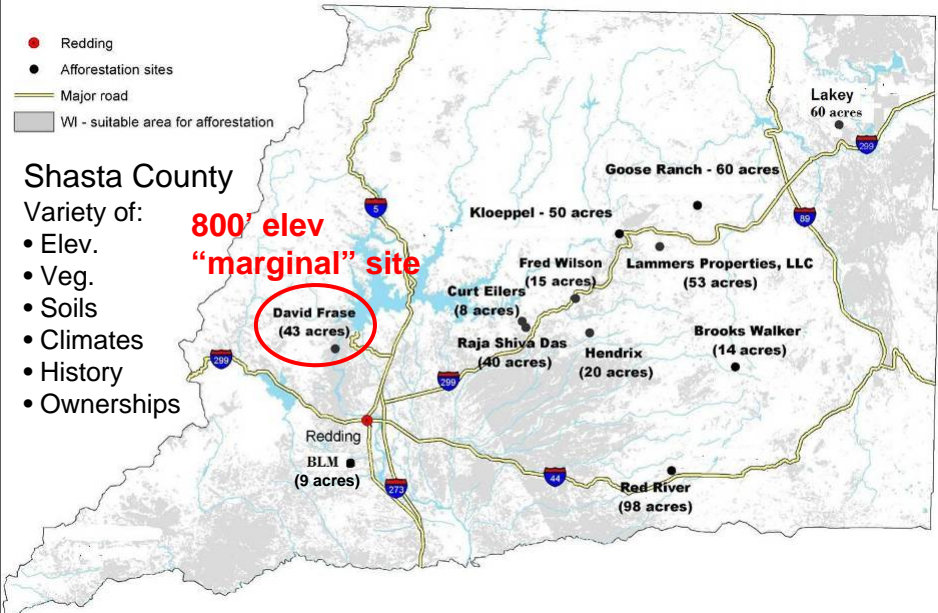
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Shasta County

Variety of:



- Elev.
- Veg.
- Soils
- Climates
- History
- Ownerships

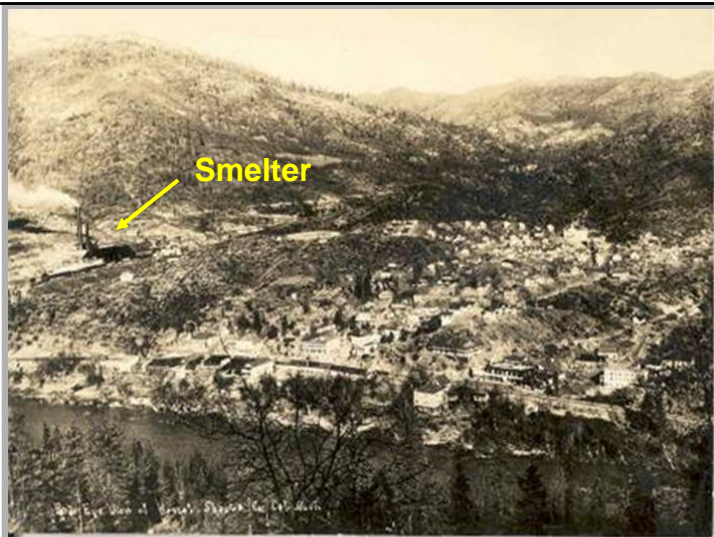


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Smelter


Fumes from the copper smelting activities in the early 1900's killed off thousands of acres of ponderosa pine forest along the Sac. river

Kennet 1907

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17

Frase Project @ 800' Elevation
Whiteleaf manzanita etc. on eroded soils w/ low AWC



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18

Frase Project 2008 Spray to prep site for planting in 2009



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1/3 of project
area burned 8
months prior
to planting



2008 Motion Fire

Frase Project Area

How would soil & seedlings respond to loss of "mulch" on shallow soils at very low elevation w/ very high summer temps?

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Planted: Feb 2009; picture: Sept 11, 2009
No rain from mid June through mid Sept 2009



2008 Motion Fire Area

> 95% Survival w/ weed control



Masticated unburned area > 95% Survival



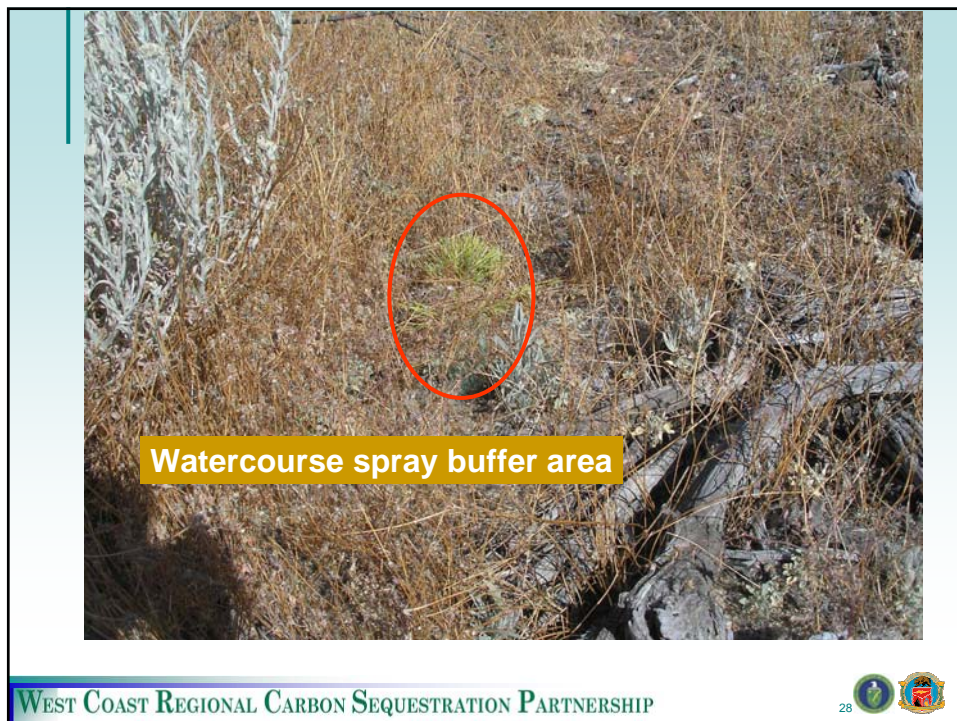
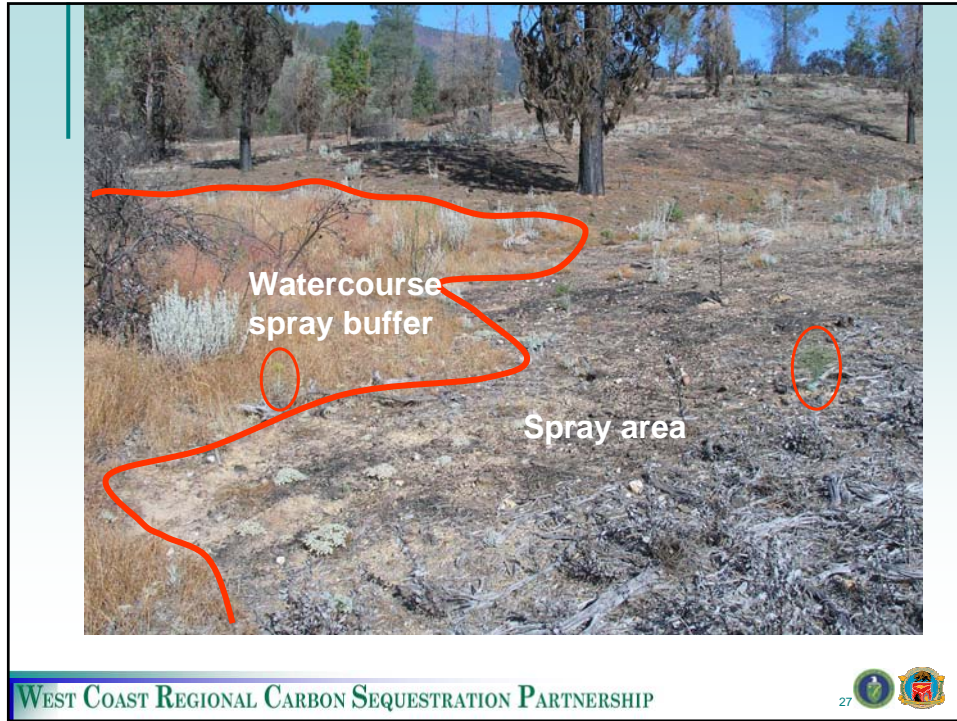
PP seedling under "sparse" canopy are less vigorous than....

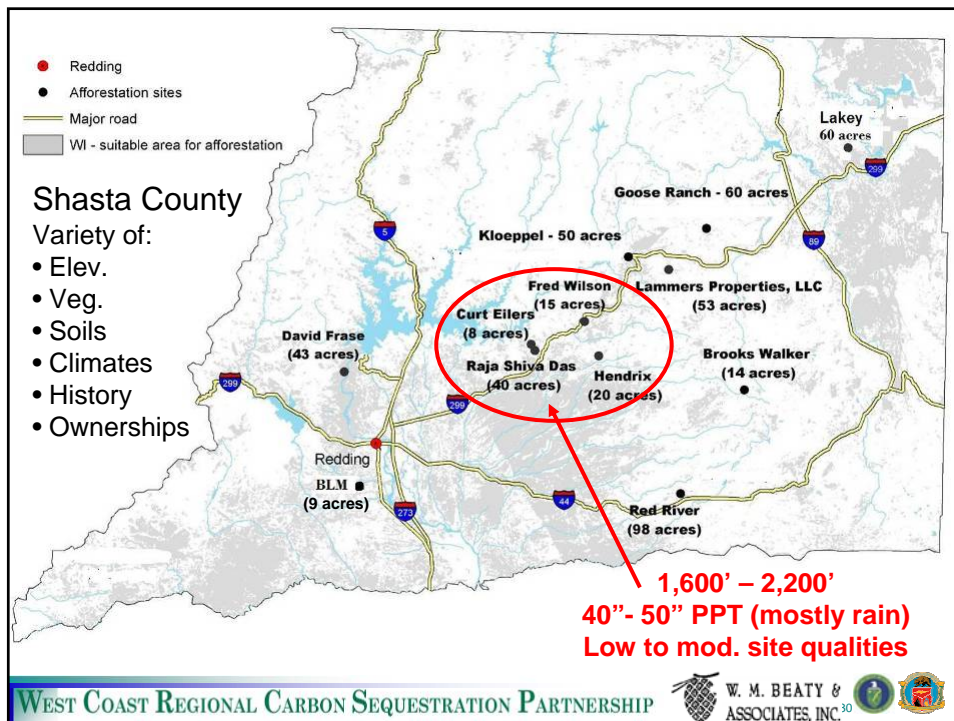


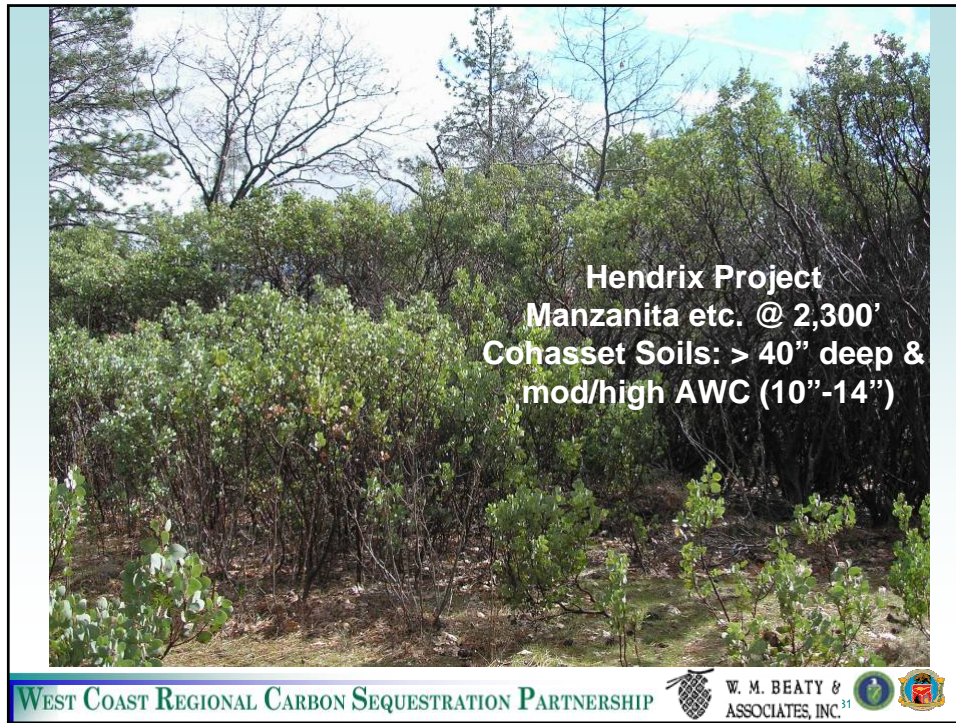
.....open grown ponderosa pine seedlings



Shallow soils from early 1900's erosion after smelters denuded the forest







2008 Planting - Climatic Conditions During 1st Year of Seedling Establishment

Project	Elev.	Date Planted	Precip. Sept-June		Precip. March-June		
			Normal	2007/08	Normal	2008	% of Normal
Hendrix	2,300'	March 7	52.75"	34.08"	16.17	2.29	14.2%

PPT Data from: PRISM Group, Oregon State University, <http://www.prismclimate.org>, created 23 Sep 2008

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Seedlings @ end
of summer 2008
> 90% survival



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2nd year seedlings
@ end of dry
2009 summer

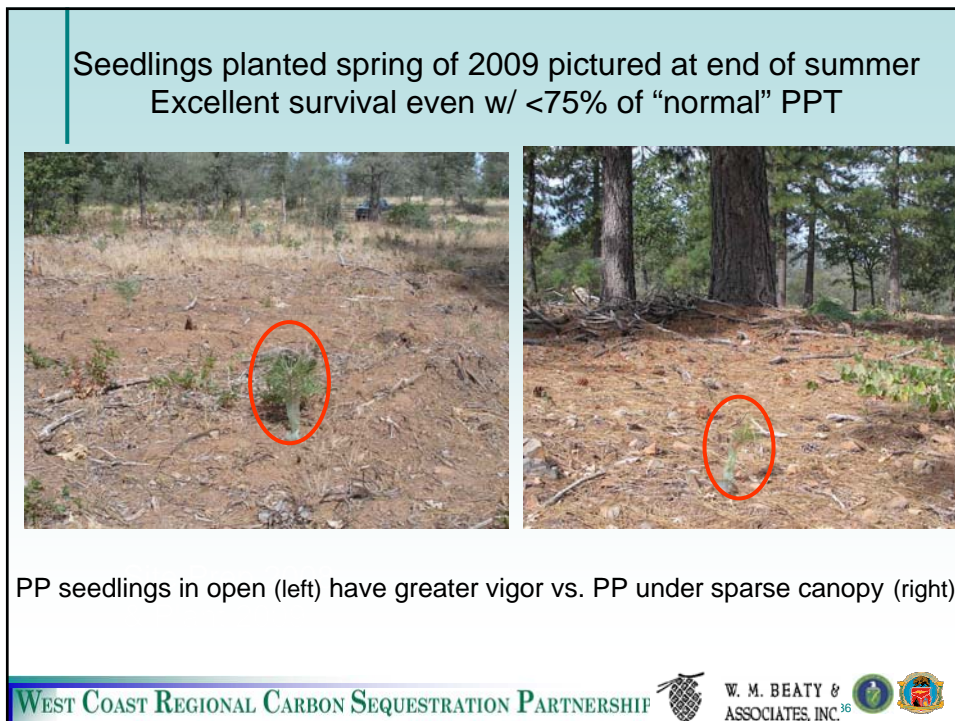


WEST COAST REGIONAL CARBON SEQUESTRATION PARTNERSHIP

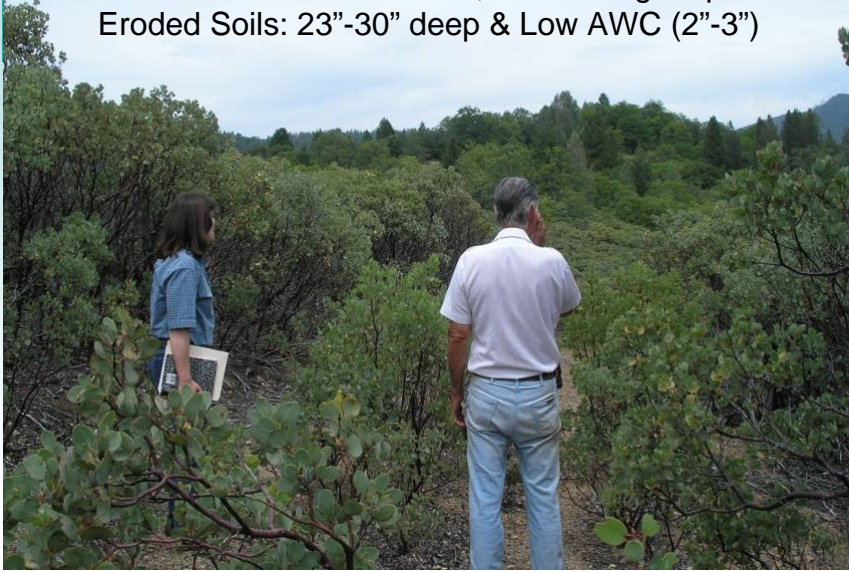





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Whiteleaf manzanita @ 1,700' on ridge tops
Eroded Soils: 23"-30" deep & Low AWC (2"-3")



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Site Prep 2008 & Plant Feb. 2009



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Ponderosa Pine seedling one month after planting &
Just prior to weed control treatment

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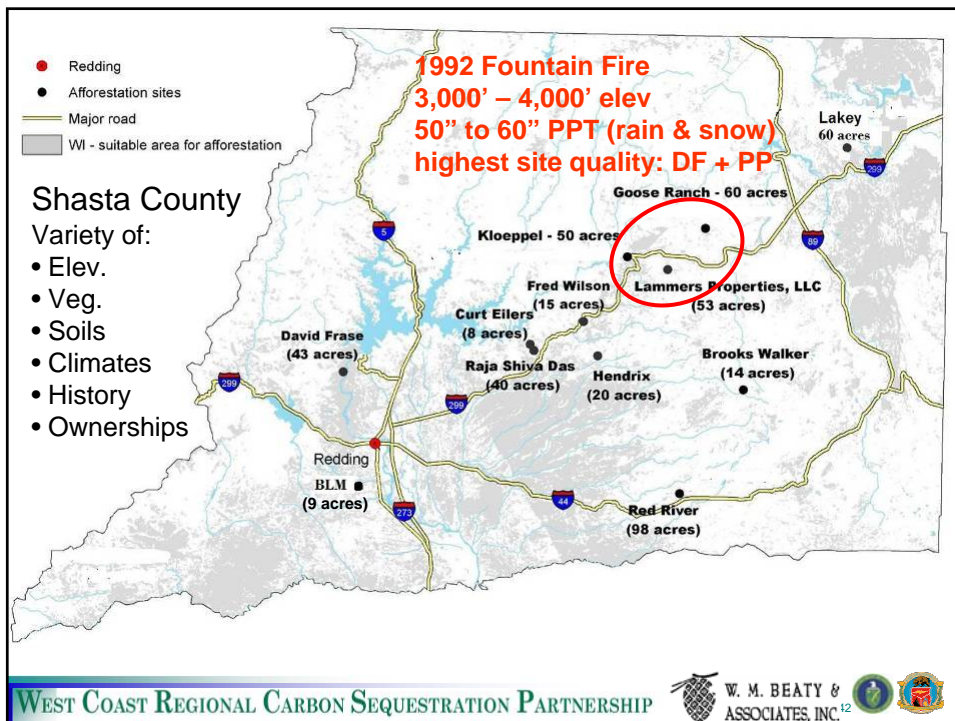
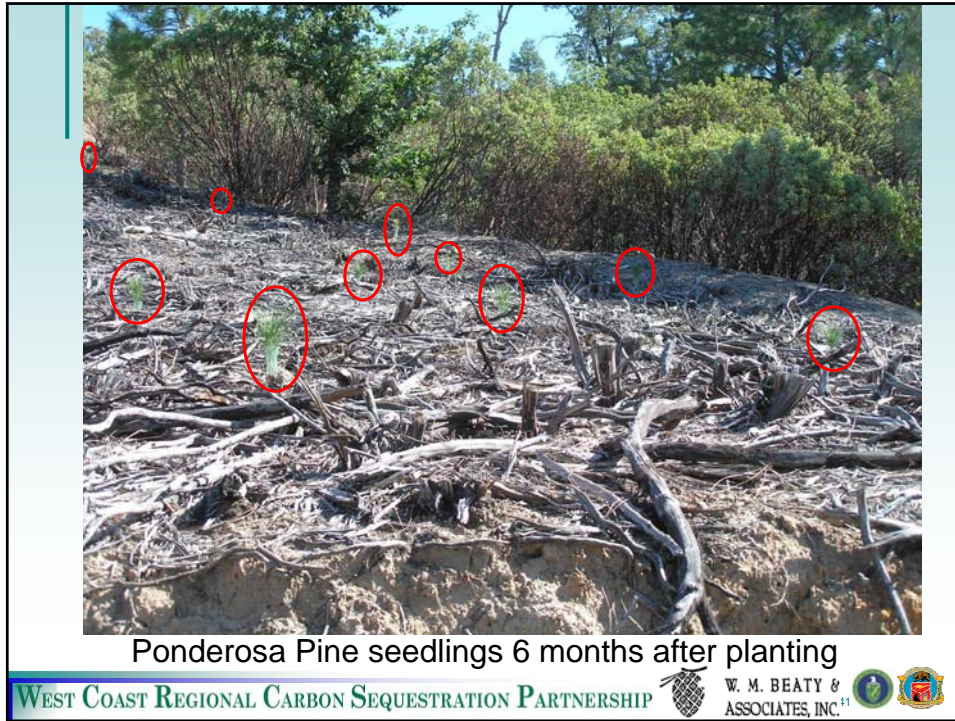
Ponderosa Pine seedling 6 months after planting

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1992 Fountain Fire: 65,000 acres


- Timber companies replanted within 5 years after fire: now ~ 20 ft. tall conifers & some re-sprouted oaks
- Most “small” non-industrial landowners did not replant: now brush and re-sprouted oaks

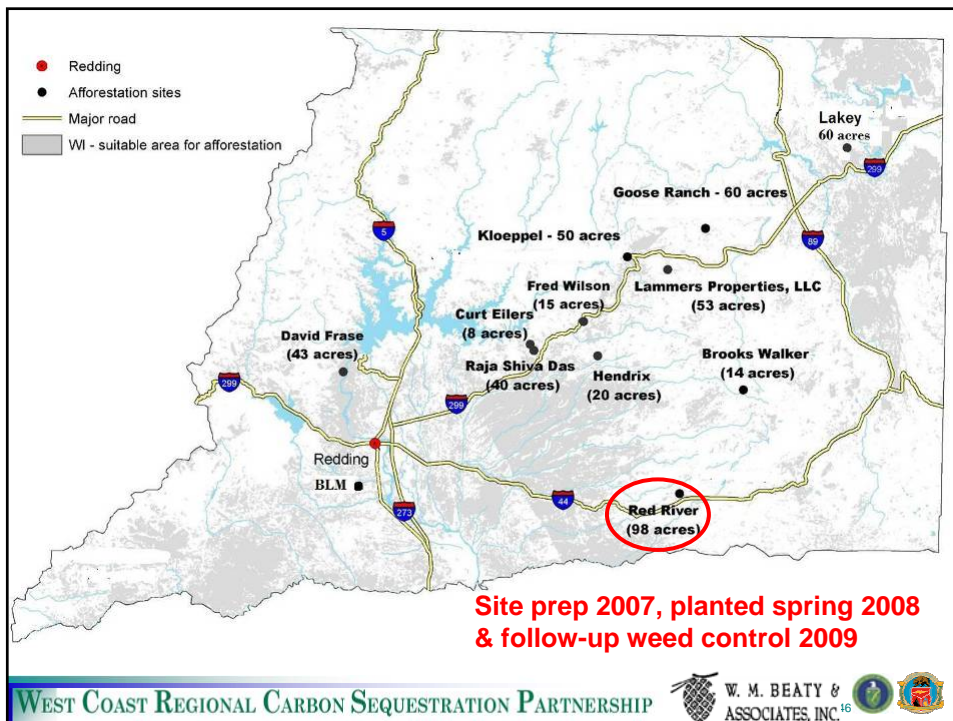


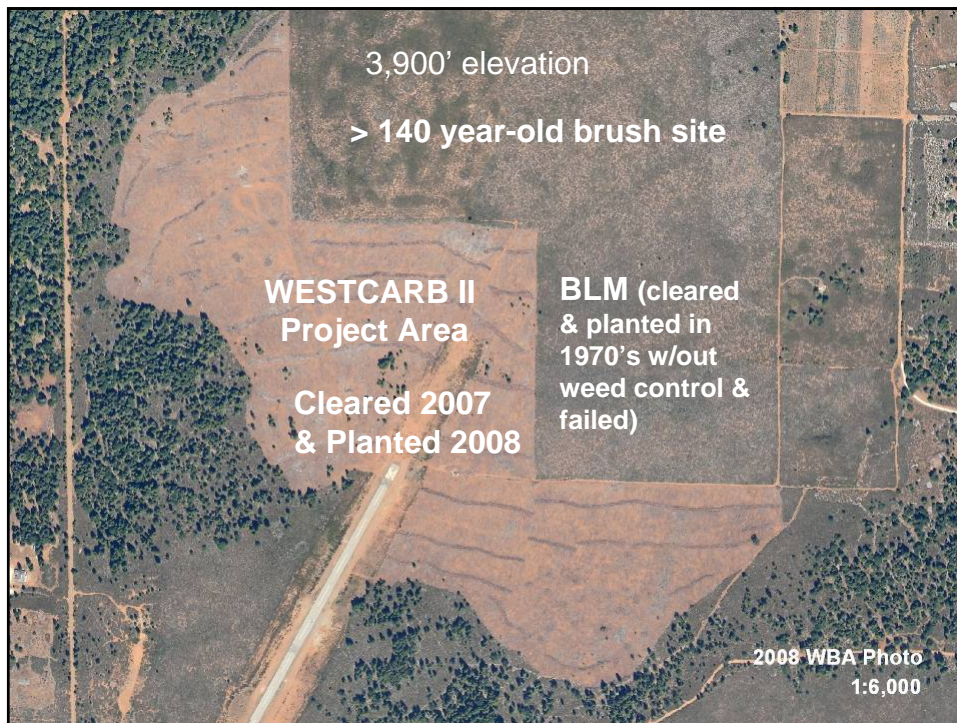
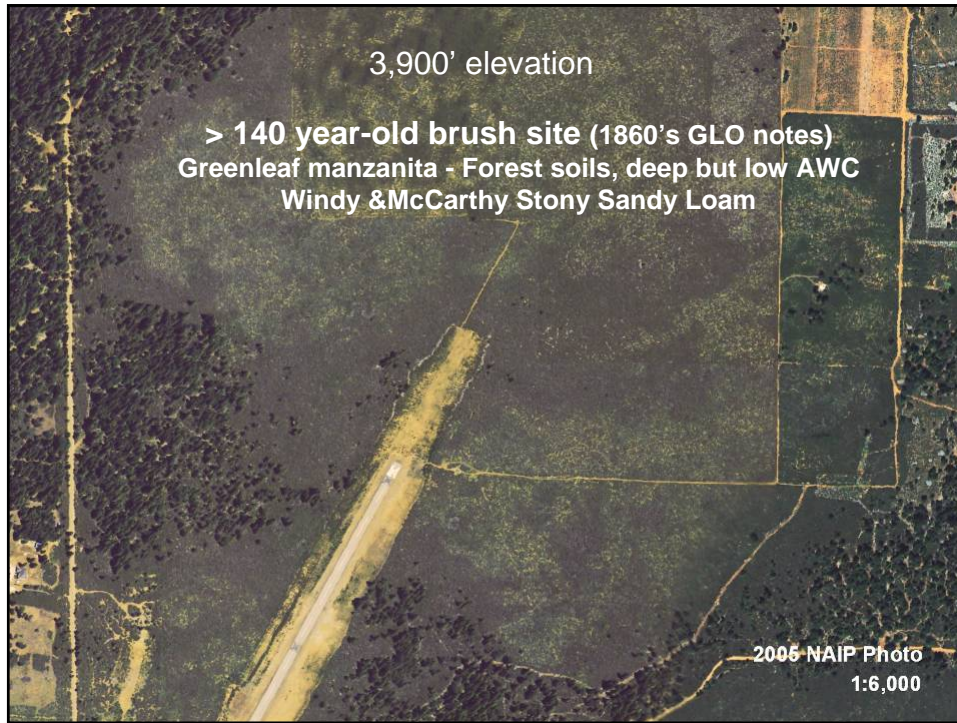
WEST COAST REGIONAL CARBON SEQUESTRATION PARTNERSHIP 43 

**1992 Fountain Fire @ 3,000' elev.
site prepped in 2008 & planted in 2009**



WEST COAST REGIONAL CARBON SEQUESTRATION PARTNERSHIP 44 





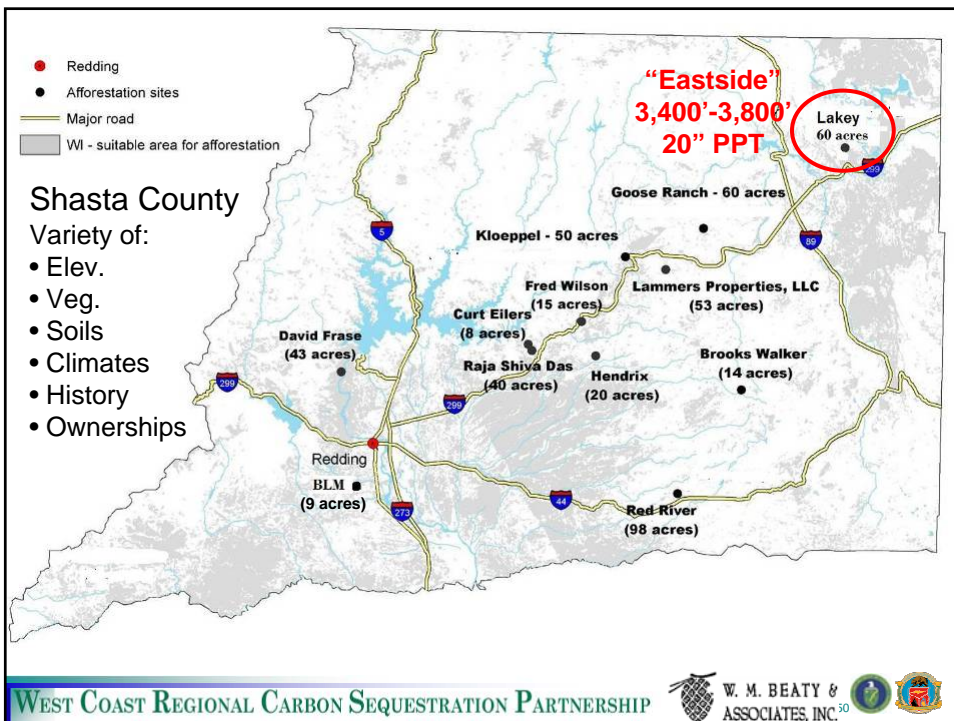


Ponderosa pine seedlings well established 18 months after planting
at the end of second long, dry summer on soils w/ low AWC.

Weed control was critical to successful establishment of new pine forest

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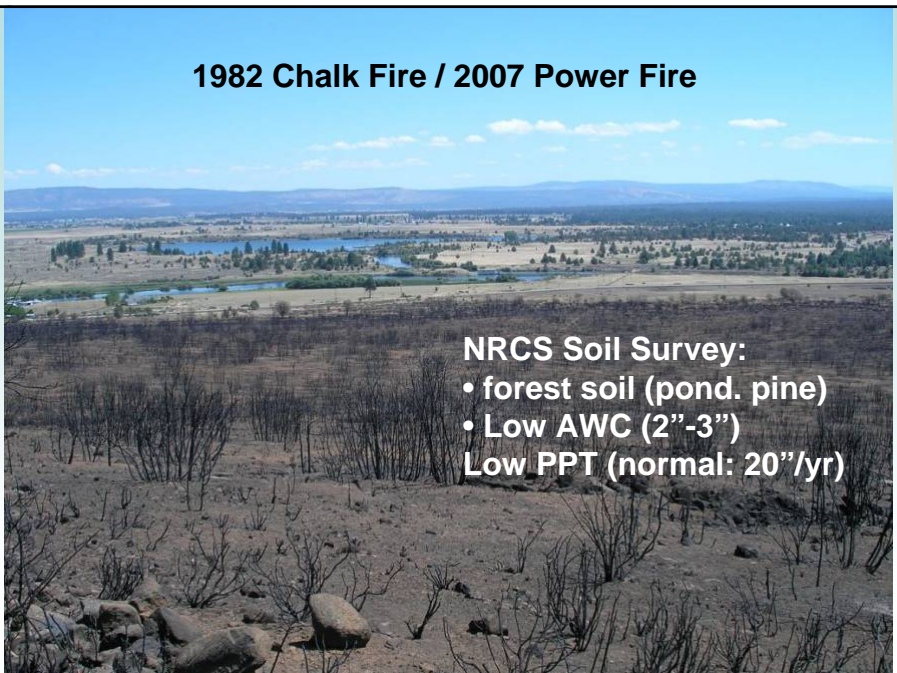


July 2007 *Power Wildfire*
NE Shasta County

Re-burned a portion of
1982 *Chalk Fire* area

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1982 Chalk Fire / 2007 Power Fire

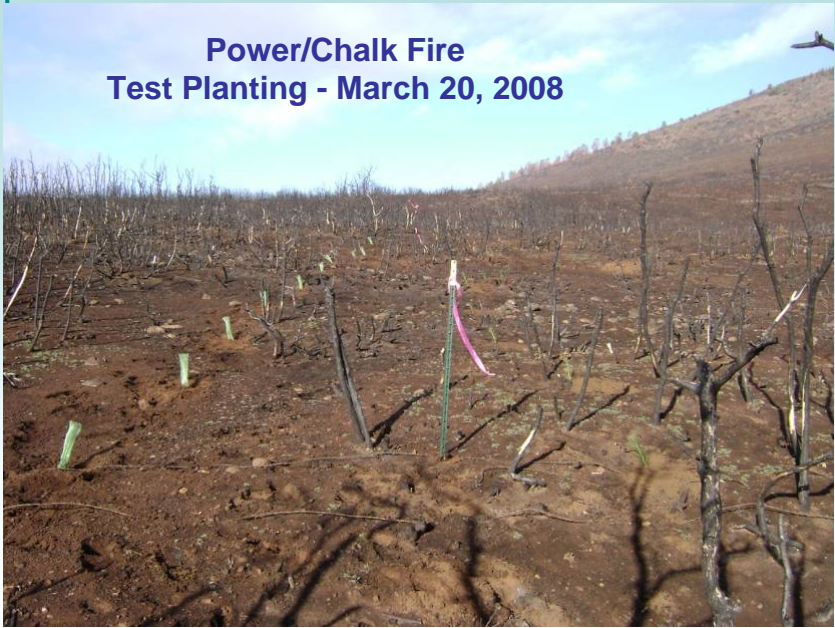
NRCS Soil Survey:

- forest soil (pond. pine)
- Low AWC (2"-3")
- Low PPT (normal: 20"/yr)


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**Power/Chalk Fire
Test Planting - March 20, 2008**



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**2008 Planting - Climatic Conditions During 1st Year
of Seedling Establishment**

Project	Elev.	Date Planted	Precip. Sept-June		Precip. March-June		
			Normal	2007/08	Normal	2008	% of Normal
Lakey (Test)	3,400'	Mar. 20	20.03"	13.89"	6.74"	1.99"	29.5%
	3,800'		19.85"	12.96"	6.67"	1.59"	23.8%

PPT Data from: PRISM Group, Oregon State University, <http://www.prismclimate.org>, created 23 Sep 2008



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September 20, 2008
> 90 % survival

March 20, 2008 Test Planting

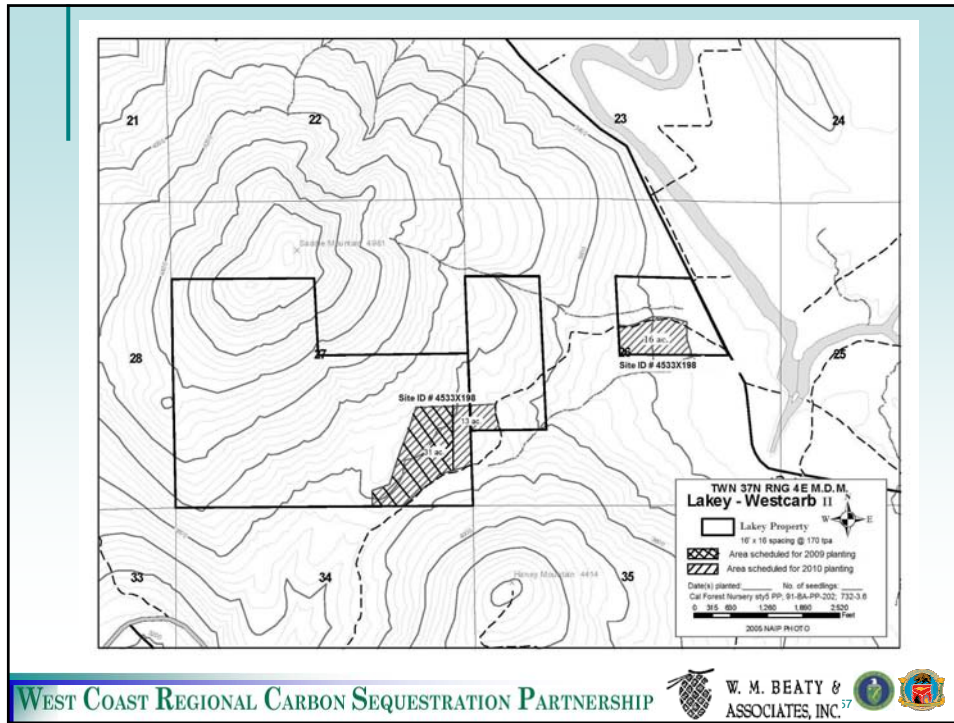
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March, 2009

**Power/Chalk Fire Project
2009 Operational Planting**

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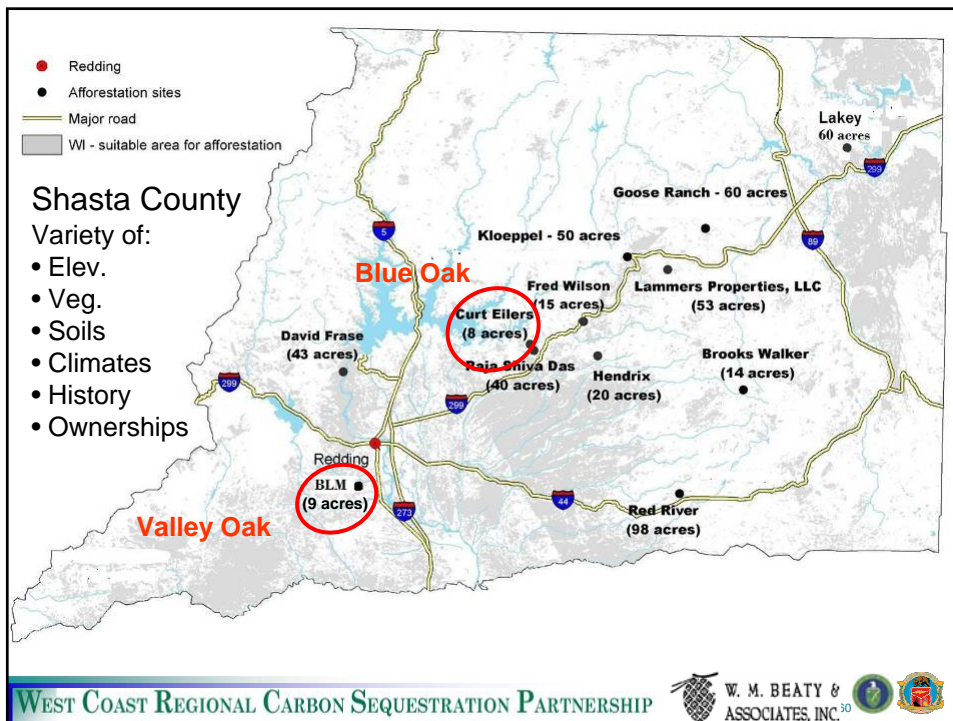
'09 planted PP seedling stunted by residual effects of 2008 imazapyr application to control resprouting brush.

Lesson: wait two winters after imazapyr application to plant PP on "eastside" sites w/ low ppt. & sandy soils

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“Regenerating Rangeland Oaks in California”

Douglas D. McCreary
University of California
Sierra Foothill Research & Extension Center

University of California
Agriculture & Natural Resources
Publication 21601

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BLM – Redding – 500'
Canyon Live Oak

Gravelly sandy loam
24” – 60” deep

Low/Mod AWC (3.6”-6.6”)

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Poor weed control = poor survival (~ 5%)

Canyon Live Oak 2009 Planting (one acorn / spot)
Survival ~ 5% (~ 40% no germ & ~ 55% seedling died during summer)

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2 acorns per spot
Good weed control

Good Survival: ~ 86% spots
w/ at least one oak seedling

**Eiler Project – 1,600' elev
Blue Oak 2009 Planting**

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SOME LESSONS LEARNED (OR RE-CONFIRMED)

- Must have a **good plan** & the **commitment** of all “partners” to follow through with the timely implementation of each sequential step over a multi-year project.
- **Quality control** and **oversight** at each step is critical to success.
- Need **good seed** that is adapted to the site. **Access to a well supplied and diverse seed bank is important.**
- Need good **quality nursery stock** and **quality control** during storage, handling and planting of seedlings.
- **Control of competing vegetation is critical to success.**
- **Cannot rely on “normal” rainfall patterns.**
- Non-industrial ownerships: higher costs/acre for many reasons. Many willing to pay 25% for conifers but not oaks

SOME LESSONS LEARNED (OR RE-CONFIRMED)

- Reforestation Project = Long term fuel management project
- Timely reforestation after wildfire:
 - Reduces costs
 - Reduces impacts to soils and environment
 - Increases the available acres (e.g. steep & rocky sites)
 - Faster net carbon gained in most accounting protocols
- Opportunities for artificial regen. of blue & live oaks (on non-conifer sites), but not needed for black oak (conifer sites).
- Mastication is viable alternative to clearing on sites w/ erodible soils and/or non-sprouting brush species
- Ponderosa pine success is good over wide range & variability in PPT and site conditions (w/ weed control!).
- Active management is needed to increase (or even maintain) acres of conifer forests in interior California

Important Lesson for Reforestation in interior Calif.:
EARLY WEED CONTROL IS CRITICALLY IMPORTANT

15 years after Wildfire destroyed forest

Planted + weed control

Planted & no weed control

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15 YEAR-OLD PLANTATION
Established after wildfire in Northeastern California

Both areas were planted after the same wildfire but:

NO WEED CONTROL **WEED CONTROL**



For the first 10 to 15 years both sites have = total carbon, so there is a long wait to re-coup investment even though long term carbon/climate benefits are huge: Brush/burn/brush etc. cycle vs. Fire resilient forest w/ large trees

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