Afforestation Pilot Projects in Shasta County

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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
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

**Shasta County**

Variety of:
- Elev.
- Veg. (Spp. & age)
- Soils
- Climates
- History
- Ownerships

12 projects / Landowner Agreements totaling 470 acres.
Mediterranean Climate

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

Fire Climate - Precipitation Patterns
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

Site prep ‘07; plant spring ‘08; release spray ‘09
Site prep ‘08 & planted spring ‘09
Conifer Seed from:
CAL FIRE, W.M. Beaty & SPI

Various:
• Species
• Elevations
• Seed Zones

CAL FOREST NURSERY
Sowing seeds into styro-block containers
Seeds germinate into seedlings & grow for one season at the nursery.

Seedlings “lifted” from styro-blocks after growing season.
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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800’ elev “marginal” site

David Frase (40 acres)
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

Frase Project @ 800' Elevation
Whiteleaf manzanita etc. on eroded soils w/ low AWC
Frase Project
2008 Spray to prep site for planting in 2009

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?
Frase Project Area

No rain from mid June through mid Sept 2009

> 95% Survival w/ weed control
Masticated unburned area > 95% Survival

PP seedling under “sparse” canopy are less vigorous than….
Frase Project Area

…..open grown ponderosa pine seedlings

Shallow soils from early 1900’s erosion after smelters denuded the forest
Almost all seedlings died within watercourse buffer - no spray areas

Shasta County

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1,600’ – 2,200’
40” - 50” PPT (mostly rain)
Low to mod. site qualities
Hendrix Project
Manzanita etc. @ 2,300’
Cohasset Soils: > 40” deep &
mod/high AWC (10”-14”)

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

<table>
<thead>
<tr>
<th>Project</th>
<th>Elev.</th>
<th>Date Planted</th>
<th>Precip. Sept-June</th>
<th>Precip. March-June</th>
<th>% of Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hendrix</td>
<td>2,300’</td>
<td>March 7</td>
<td>52.75”</td>
<td>16.17”</td>
<td>14.2%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>34.08”</td>
<td>2.29</td>
<td></td>
</tr>
</tbody>
</table>

PPT Data from: PRISM Group, Oregon State University, http://www.prismclimate.org, created 23 Sep 2008
Seedlings @ end of summer 2008 > 90% survival

2nd year seedlings @ end of dry 2009 summer
Whiteleaf manzanita etc. @ 1,600’
Soil: 33”-37” Deep & Low/Mod AWC (4.7”)

Seedlings planted spring of 2009 pictured at end of summer
Excellent survival even w/ <75% of “normal” PPT

PP seedlings in open (left) have greater vigor vs. PP under sparse canopy (right)
Whiteleaf manzanita @ 1,700’ on ridge tops
Eroded Soils: 23”-30” deep & Low AWC (2”-3”)

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

Ponderosa Pine seedling 6 months after planting
Ponderosa Pine seedlings 6 months after planting

Shasta County

Variety of:
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1992 Fountain Fire
3,000’ – 4,000’ elev
50” to 60” PPT (rain & snow)
highest site quality: DF + PP
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

1992 Fountain Fire @ 3,000’ elev.
site prepped in 2008 & planted in 2009
1992 Fountain Fire @ 3,000’ elev.
Pond Pine & Doug fir planted in 2009

Site prep 2007, planted spring 2008 & follow-up weed control 2009
> 140 year-old brush site (1860’s GLO notes)
Greenleaf manzanita - Forest soils, deep but low AWC
Windy & McCarthy Stony Sandy Loam

3,900’ elevation

\[
\text{WESTCARB II Project Area}
\]
\[
\text{BLM (cleared & planted in 1970’s w/out weed control & failed)}
\]

3,900’ elevation

> 140 year-old brush site

Cleared 2007 & Planted 2008

Rynearson p.24
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

Shasta County
Variety of:
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July 2007 Power Wildfire
NE Shasta County

Re-burned a portion of
1982 Chalk Fire area

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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<tr>
<td></td>
<td></td>
<td></td>
<td>Normal</td>
<td>2007/08</td>
</tr>
<tr>
<td>Lakey</td>
<td>3,400’</td>
<td>Mar. 20</td>
<td>20.03”</td>
<td>13.89”</td>
</tr>
<tr>
<td>(Test)</td>
<td>3,800’</td>
<td></td>
<td>19.85”</td>
<td>12.96”</td>
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PPT Data from: PRISM Group, Oregon State University, http://www.prismclimate.org, created 23 Sep 2008
March 20, 2008 Test Planting

September 20, 2008
> 90 % survival

Power/Chalk Fire Project
2009 Operational Planting

March, 2009
Power/Chalk Fire Project - 2009 Operational Planting
Seedling on Sept 12 (3 months after last rain)
'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
“Regenerating Rangeland Oaks in California”

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

University of California
Agriculture & Natural Resources
Publication 21601

BLM – Redding – 500’
Canyon Live Oak
- Gravelly sandy loam
  24” – 60” deep
Low/Mod AWC (3.6”-6.6”)
Canyon Live Oak 2009 Planting (one acorn / spot)
Survival ~ 5% (~ 40% no germ & ~ 55% seedling died during summer)

Poor weed control = poor survival (~ 5%)

Eiler Project – 1,600’ elev
Blue Oak 2009 Planting

2 acorns per spot
Good weed control
Good Survival: ~ 86% spots w/ at least one oak seedling
### 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

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
Any Questions?

Mature PP forest =
High carbon storage =
resilient to fire

89 year-old Show Plantation