Reforestation Practices for Conifers in California

Presentation to the BOF on July 15, 2020
by William Stewart, Technical Editor, UCANR and Tom Jopson,
FVMC Forest Legacy Committee Chair
on the update of the 1971 classic with 500+ pages and 800+ references
16 year old plantation Modoc Co.: both areas planted after wildfire
No weed control (L) vs. weed control (R)
Forty years of research and testing, 5 simply stated principles:

Five Principles of Reforestation

1. Use tree species from known appropriate seed sources which can be established and grow vigorously on the site without irrigation;

2. Control vegetation that would otherwise compete with planted seedlings for limited soil moisture during the critical first and possibly the second year after planting;

3. Use seedlings that are able to withstand the conditions on the site when planted and are able to rapidly grow new roots after planting;

4. Properly handle, transport, store and plant seedlings and plant them properly when conditions on the site allow for rapid root growth;

5. Protect seedlings from damage by animal and insect pests, if necessary.

Simple principles, complex implementation:
FIGURE 3.1 – REFORESTATION FLOW CHART

Landowner Initiates a reforestation project
↓
Identify an experienced reforestation forester
↓
Define Project Type
↓
Define Goals & Develop funding strategy
↓
Confirm availability of appropriate seed
↓
Perform a Site Assessment
↓
Define Specific Objectives
↓
Describe desired planting conditions and outcomes
↓
Develop prescription & schedule of activities
↓
Develop Budgets
Reforestation Project Types

- Restoration/rehabilitation
  - Forest Management/Restoration plan
- Timber harvest/green sale
  - Timber Harvest Plan
- Post-wildfire
  - Exemption/Emergency Notice

1. Identify Necessary Permits
2. Obtain appropriate seed
3. Order seedlings and identify cooler storage
4. Contract for and conduct pre-harvest veg management spray
5. Coordinate with Harvest operations
6. Find Site Prep Contractors
7. Vegetation Management: Mechanical/Manual/Burning/Chemical
8. Request Timing of Seedling Packing and Delivery
Find Planting Contractors
   ↓
Obtain seedling delivery
   ↓
Plant seedlings (or store seedlings for later planting)
   ↓
Planting Follow-up/Monitoring: (survival, density, veg competition, damage)
   ↓
Post Establishment Treatments
   ↓
Treat for insects, disease & animal damage as needed
   ↓
Perform Pre-commercial thinning
   ↓
Perform Pruning and other fuel reduction treatments if needed
   ↓
DOCUMENT LESSONS LEARNED
1. **Reforesting California**: Herb Baldwin, William Stewart, Sari Sommarstrom
2. **Investing in Reforestation**: William Stewart, Richard Standiford, Susie Kocher, Jeff Webster
3. **Planning a Reforestation Project**: Jeff Webster, Ed Fredrickson, Bob Rynearson
4. **Site Assessment**: Jeff Webster, Ed Fredrickson, Bob Rynearson
5. **Seeds**: Teri Griffis, Laurie Lippitt
6. **Seedlings**: Thomas Jopson, Mark Gray
7. **Site Preparation**: Mark Gray, Jeff Webster
8. **Vegetation Management**: Ed Fredrickson, Mark Gray
9. **Planting**: Bob Rynearson
10. **Precommercial Thinning in California Forests**: Martin W. Ritchie, John-Pascal Berrill
11. **Damage**: Don Owen, Greg Giusti
12. **Reforestation of Areas Burned by Large Wildfires**: Mark Gray
Ch. 1 Reforesting California
Herb Baldwin, William Stewart, Sari Sommarstrom

• Early History
• Current Needs:
  – Why?
  – Where?
  – Who?
  – When?
  – What?

State of California (1971)
### Forest type

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>USFS</th>
<th>Corp</th>
<th>Family</th>
<th>O Govt</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA mixed conifer</td>
<td>4.2</td>
<td>1.6</td>
<td>0.5</td>
<td>0.1</td>
<td>6.5</td>
</tr>
<tr>
<td>Ponderosa pine</td>
<td>1.2</td>
<td>0.4</td>
<td>0.4</td>
<td>0.0</td>
<td>2.1</td>
</tr>
<tr>
<td>Douglas-fir</td>
<td>0.2</td>
<td>0.3</td>
<td>0.3</td>
<td>0.0</td>
<td>0.9</td>
</tr>
<tr>
<td>Red fir, etc</td>
<td>1.1</td>
<td>0.2</td>
<td>0.1</td>
<td>0.0</td>
<td>1.4</td>
</tr>
<tr>
<td>Redwood</td>
<td>0.0</td>
<td>0.4</td>
<td>0.2</td>
<td>0.0</td>
<td>0.7</td>
</tr>
<tr>
<td>Other</td>
<td>2.3</td>
<td>1.3</td>
<td>1.5</td>
<td>0.2</td>
<td>5.1</td>
</tr>
<tr>
<td><strong>Total CA Timberlands</strong></td>
<td><strong>8.9</strong></td>
<td><strong>4.3</strong></td>
<td><strong>3.0</strong></td>
<td><strong>0.4</strong></td>
<td><strong>16.6</strong></td>
</tr>
</tbody>
</table>

*Different managers, different species, different goals*
Ch. 2 – Investing in Reforestation
William Stewart, Rick Standiford, Susie Kocher, Jeff Webster

- Why invest? For healthy forests and future harvest value
- Financial options
- Cost-share programs
- Estimating costs & revenues
- Basic Analysis Tools
• California is perfect for growing shrubs
• Once established, well-spaced conifers can sequester ~2x carbon as shrub/tree sites
• As the IPCC noted again in 2019, sustainable forestry generates substantial climate benefits in the forest and through low-emission products

Reforestation Flow Chart

- Each step is essential to success.
- Failure at one step can result in reduced success or failure of the whole project.

Schedules of Activities:

- Post-Harvest
- Post-Wildfire
- Rehabilitation: Brush field conversion
Ch. 4 – Site Assessment

Jeff Webster, Ed Fredrickson, Bob Rynearson

• Making & Using Maps
• Pre-Field Site Assessment
• On-Site Assessment
• Templates & Example
Ch. 5 – Seed for Reforestation
Teri Griffis and Laurie Lippitt

- Seed Origin
- Biology
- Cone Collection
- Seed Banking
- Cone & Seed Processing
- Seed Lot Assessment
- Long-term Storage
- Tree Improvement
Ch. 6 – Seedlings
Tom Jopson and Mark Gray

1. Choosing Species
2. Choosing Stock Type
3. Choosing a Nursery
4. Seedling Storage, Shipping & Handling
Critical step for seedling survival and growth

- Needs and Constraints
- Types:
  - Mechanical
  - Manual
  - Biological
  - Burning
  - Cultural
  - Chemical
Ch. 8 – Forest Vegetation Mgt.

Ed Fredrickson

- Competing Vegetation
- Methods of Veg Control
- Choosing a Method
- Non-Chemical Control
- Types of Herbicides
- Herbicide Behavior
- Resource Protection
- Pre-planting (site prep) vs. Post-planting (release)
- Project level considerations
- Site-Specific Issues
- Application Methods
Ch. 9 – Planting
Bob Rynearson

• Planting Season
• Species, Stock, Spacing
• Transport, Handling, Storage
• Planting Methods
• Contracting
• Organizational Needs
• Inspection
• Installing Protection
• Follow-up Surveys
Ch. 10 – Precommercial Thinning
Martin Ritchie and John-Pascal Berrill

- PCT Outcomes
- Thinning Decision Space
- Density Management
- Regional Considerations

Diagram: PCT timing, intensity, and method affect how it can be implemented and the cost.
Ch. 11 – Damage

Donald Owen and Greg Giusti

- Assessing / Preventing / Mitigating Damage
- Insect Pests
- Diseases
- Vertebrate Pests
- Abiotic Damage
Ch. 12 – Reforestation of Areas Burned by Large Wildfires – Mark Gray

- Planning
- Unitizing
- Seed
- Mechanical Site Prep
- Veg Management
- Seedling Delivery
- Managing Sediment

Packing trees into the Moon Fire
How can the Board of Forestry help ensure successful reforestation?

- Seed Bank: Adequate seed for small private landowners
- Cost-share: Support implementation of all steps & promote relevant expertise
- Regulatory Structure: Provides timely approvals for necessary steps