

Selection of Nursery stock

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State Seed Bank Program Objectives

- PRC directs the Dept. to provide an adequate, reliable & continuous supply of site adapted seed of the widest possible diversity & highest quality
 - for purposes of reforestation after fire & other disasters, gene conservation, and to mitigate the effects of climate change
- Provide seed processing, testing & storage services for CAL FIRE, agencies and the private sector
- Provide technical assistance to landowners & resource professionals on a wide range of reforestation and cone & seed matters

Seed quality is the goal

- Vigorous site adapted seedlings come from good quality **local** seed
- Seed quality affects every phase of the reforestation effort :

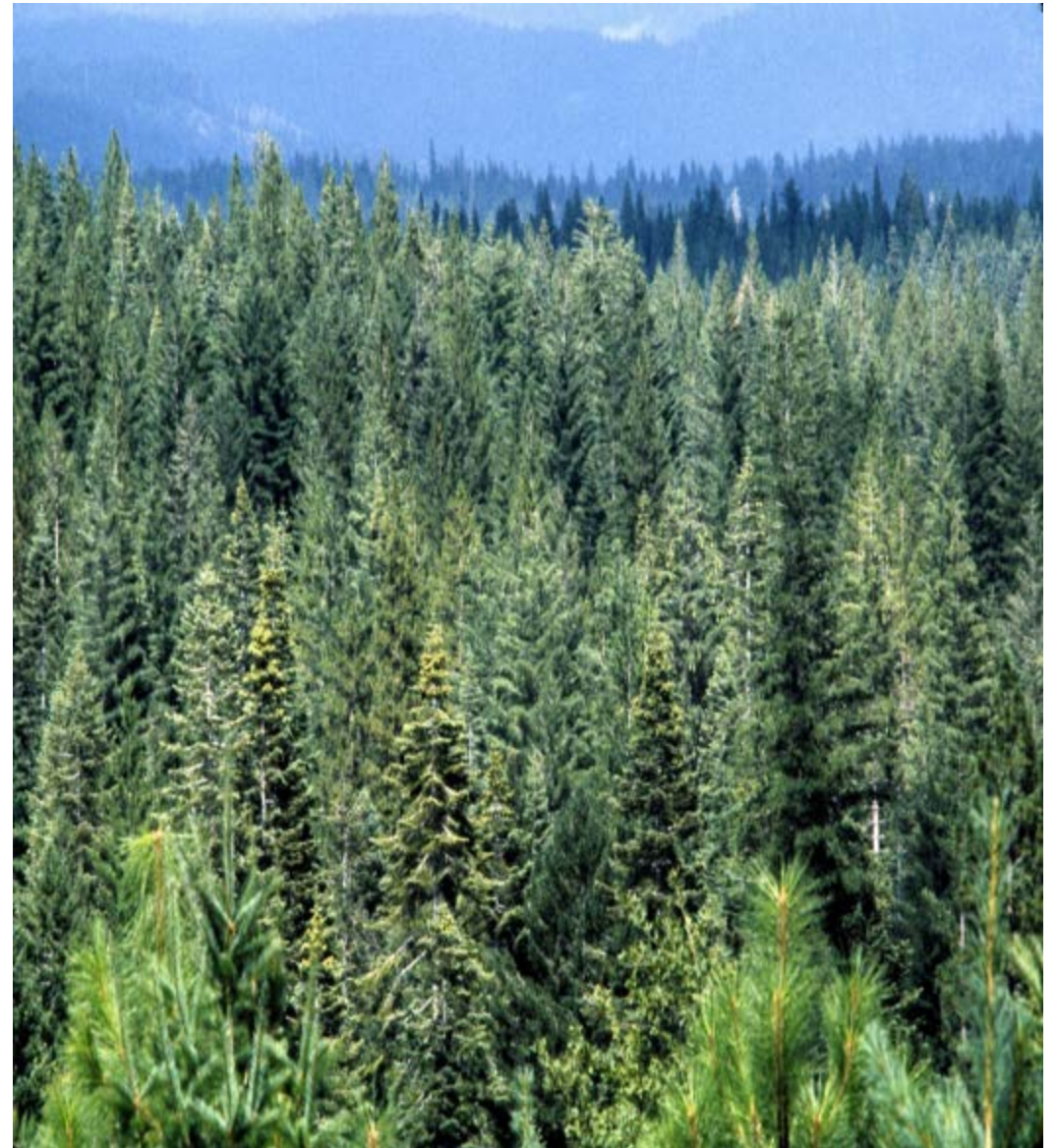
Planning – collections – processing – yield – growing – planting

High quality seeds produce more vigorous seedlings!



Cone Crop Periodicity

- Periodicity is the number of years between collectable crops of a particular species
- Depending on species, there can be 3-7 or even 10 or more years between acceptable crops
- The goal is to collect the maximum amount of high quality seed in the good years and store for the years in-between



Genetic Considerations

Importance of seed source

Correct identification of seed source is crucial for survival & growth rate of seedlings

Why? – Local trees are best adapted to the local environment

Mismatching elevation or geographic origin w/planting site may cause:

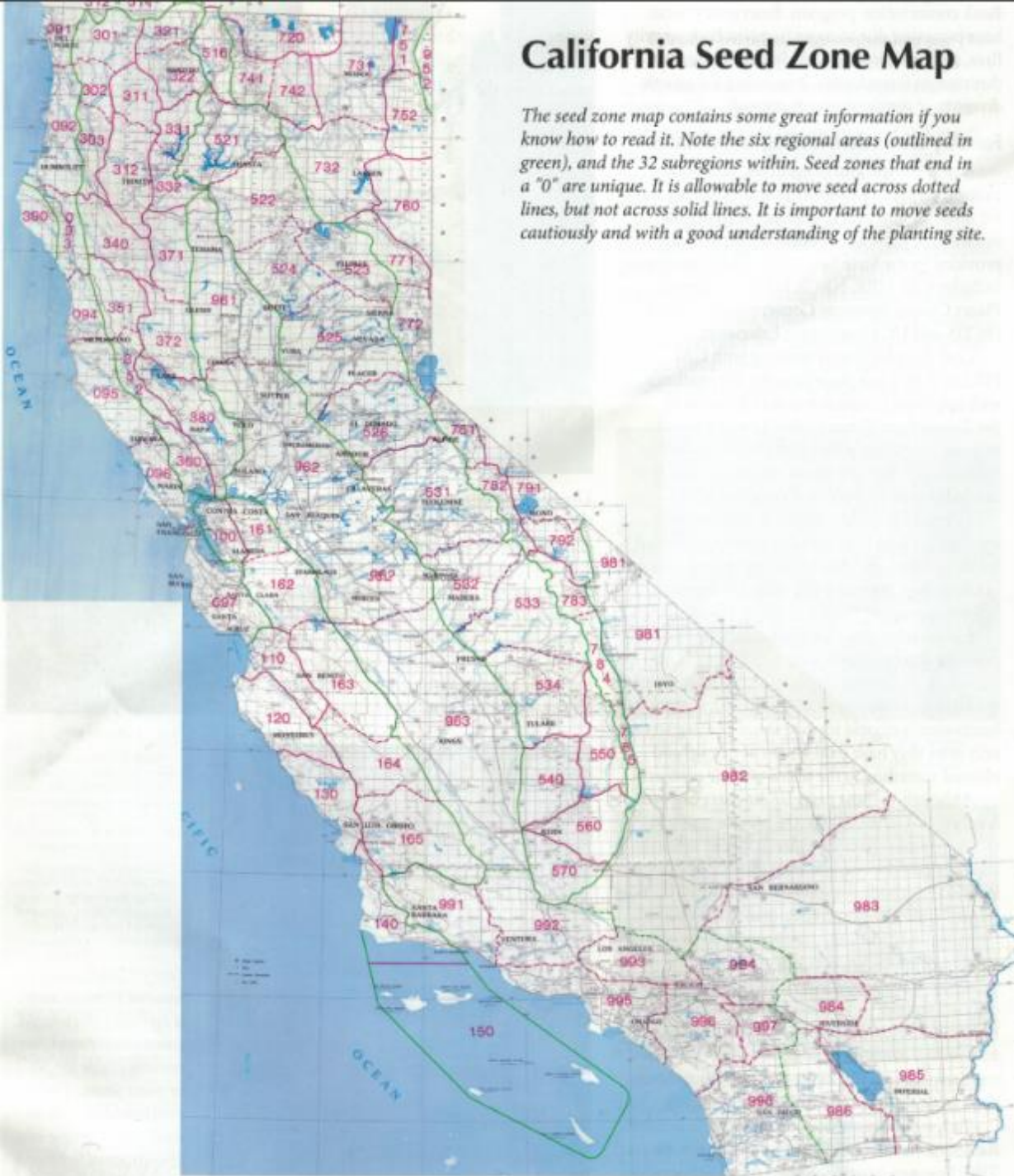
Stunted growth, Poor form, Low drought resistance, High susceptibility to insects & disease, Frost damage from premature bursting

How? – 2 components of seed source

- Seed Zone
- Elevation

California Seed Zone Map

The seed zone map contains some great information if you know how to read it. Note the six regional areas (outlined in green), and the 32 subregions within. Seed zones that end in a "0" are unique. It is allowable to move seed across dotted lines, but not across solid lines. It is important to move seeds cautiously and with a good understanding of the planting site.



Six Major Regions based on physical features and climate:

- 090 – N coast redwood
- 100 – Central coast
- 300 – N coast interior
- 500 – W slope Cascades/Sierra
- 700 – E slope Cascades/Sierra
- 900 – Catchall (950,960,980,990)

Each seed lot must be separated by zone and 500-foot elevation band!

How far can a seed source be moved?

- **Broadly adapted versus narrow**
DF, LP are specialists – occupy a narrow niche
IC, WWP are generalists – they have more adaptive traits so can be moved farther
- **Center versus edge**
Material from center of range - more diversity
Crops at edge of range - less frequency; less diversity

Genetic Considerations

Broad genetic base

Within a stand, it is highly likely that many individuals are related. Best approaches to avoid inbreeding & decreased vigor of progeny are:

- Collect from widely spaced trees in a stand
200-300 feet apart
- Collect from a number of different trees within a stand and an equal amount from each
- Collect from a number of different stands within an elevation band

Good Collection Candidates

Characteristics of individual tree

- Dominant or co-dominant – wind firm
- **Fast growth rate**
- High vigor - full, compact crown
- **Free from disease & insects**
- Straight stem
- **Small branch size**
- Branch angle horizontal or slightly upward
- **Free of obvious defects**

Finding the cones

Surveys

Conduct cone crop survey(s) on a stand basis within each designated seed zone & across elevation bands within a seed zone using CAL FIRE cone crop survey form(s)

Cone Sampling

Upon results of surveys, contractors are needed to collect cone samples for assessment and/or transport them to LAMRC for assessment

Certification

Oversee cone collection work and certify the collection according to CAL FIRE protocols

Seed Cutting Test

Observe cone exterior for color & condition

Note scale flexing and damage or signs of insect activity

Cut cone in half lengthwise

Count the filled seed per $\frac{1}{2}$ face*

Note any insect activity in axis or among seed and scales

Break cone apart to release seed

Note seed wing color & condition

Does it fall freely or need to pry out

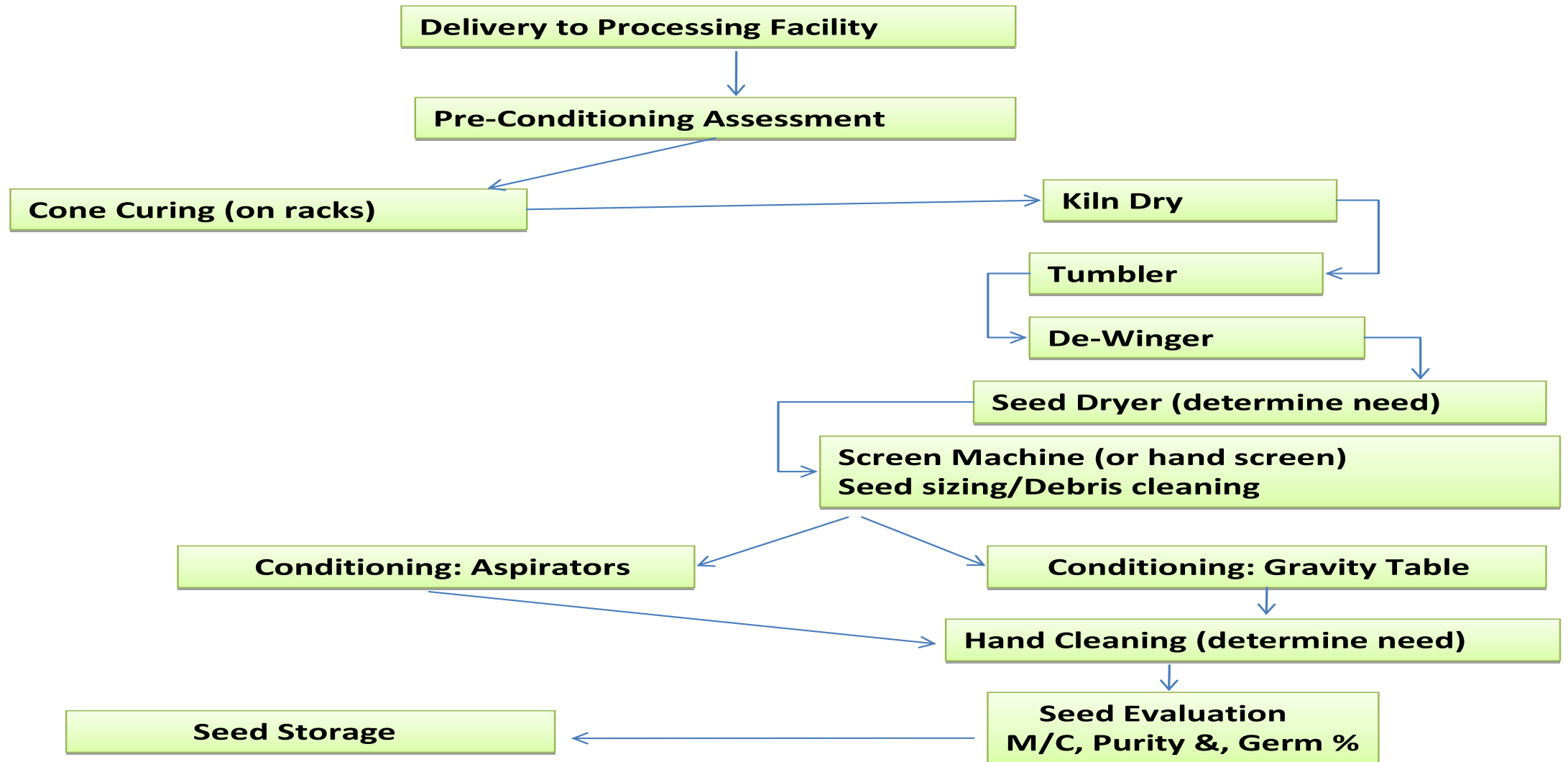
Should feel like parchment paper, not moist

Note seed coat color & condition

Approaching a golden to medium brown color



Cone Handling & Processing

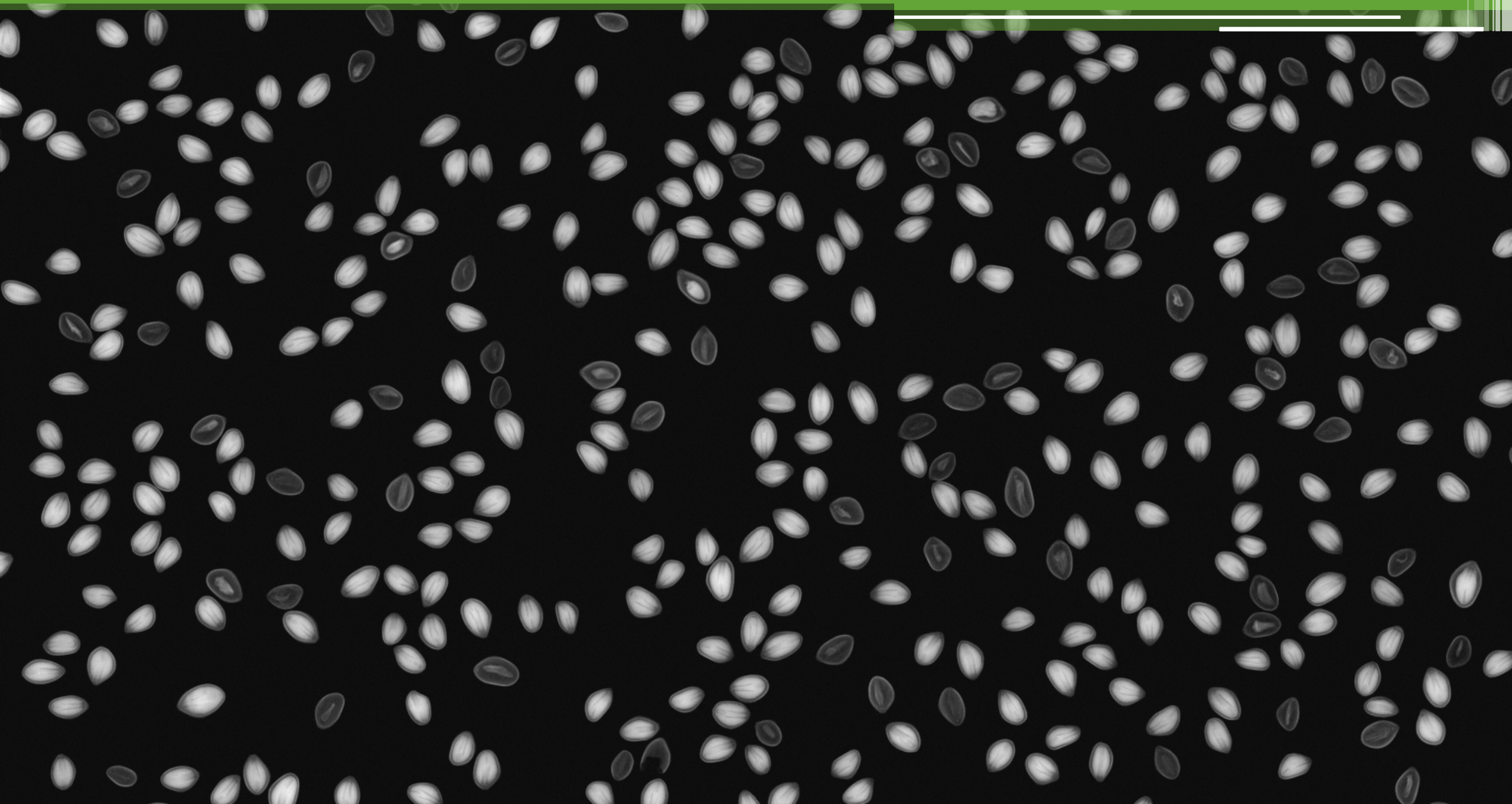






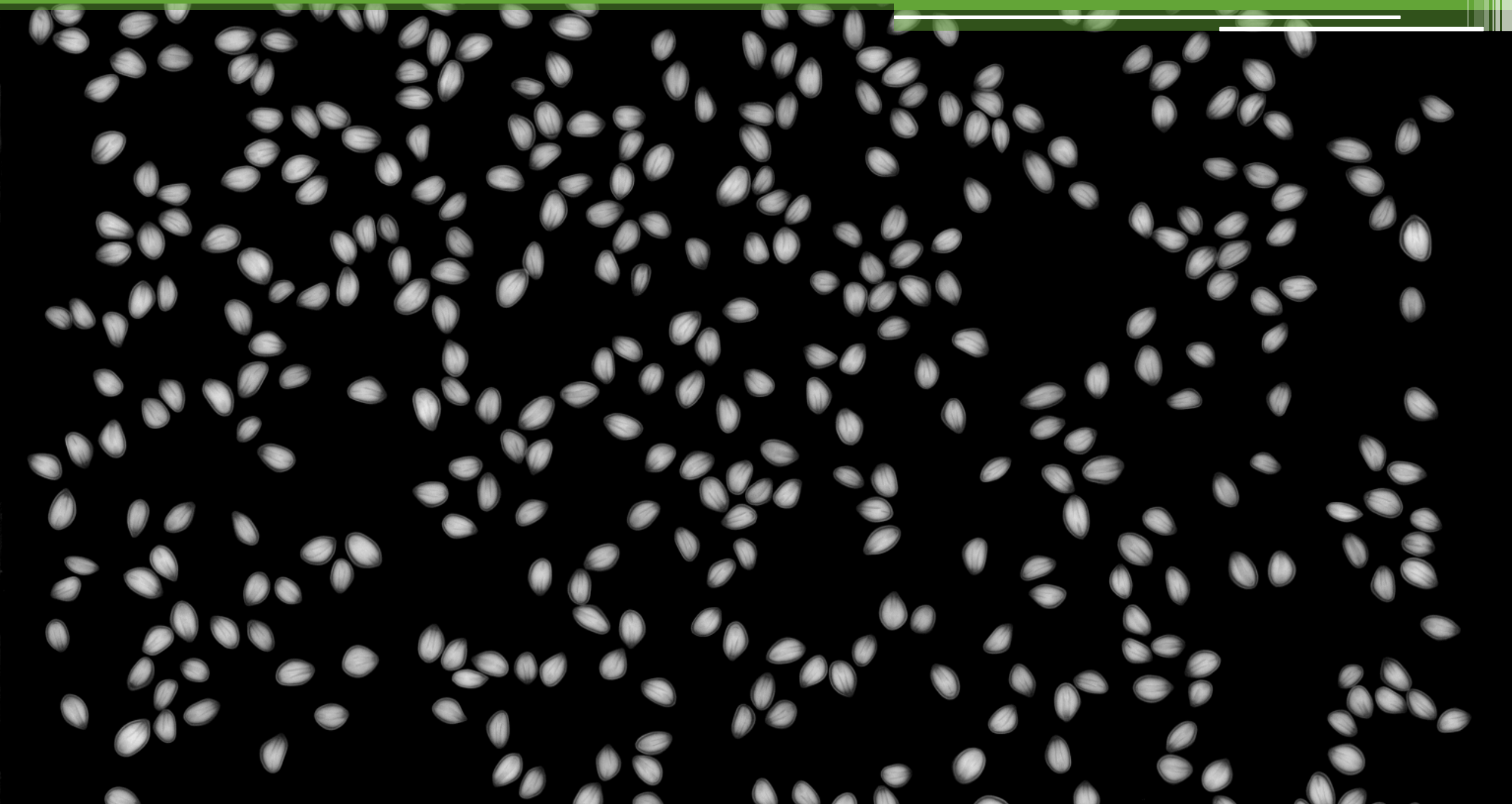








WARNING
Do not touch the
cabinet while it is
running.



Seed Evaluation

The elements of seed quality measured are:

- moisture content
- purity percent
- clean seed per Lb
- Percent filled (x-ray)
- Germination percent or viability

Procedures for uniform testing of various types of seeds are described in Rules for Testing Seeds (AOSA, 1984 and ISTA, 1996). Standardized germ tests are designed to give maximum values with minimum variation, allowing the results to be repeated.

They are conducted :

- Upon completion of processing/upgrade
- Every 5 years thereafter





Seed Availability for Tuolumne County – SZ 531

Species	Zone Elevation	Approx. # seedlings
Ponderosa pine	531.20-40	4,862,244
Ponderosa pine	531.40-60	6,562,212
Douglas-fir	531.20-40	1,740,042
Douglas-fir	531.40-60	646,461
Sugar pine	531.20-40	68,400
Sugar pine	531.40-60	183,312
White fir	531.40-60	578,891

CFIP Speculative sowing order

Species	Seed Zone	Elev (low av)	Stock	Quantity
Ponderosa Pine	525	2,500	1Styro 6	6,000.0
Ponderosa Pine	526	2,000	1Styro 6	10,000.0
Ponderosa Pine	531	2,000	1Styro 6	18,000.0
Ponderosa Pine	532	3,000	1Styro 6	18,000.0
Giant Sequoia	534	6,500	1Styro 6	3,000.0
Sugar Pine	525	2,500	1Styro 6	1,500.0
Sugar Pine	526	3,000	1Styro 6	3,500.0
Sugar Pine	531	4,000	1Styro 6	9,000.0
Sugar Pine	533	5,500	1Styro 6	9,000.0
Sugar Pine	534	5,500	1Styro 6	1,500.0
Sugar Pine USFS	533	4,000-4,500	1Styro 6	2,000.0

How can you order seeds from LAMRC?

Directly from LAMRC:

- Identify species, SZ (T-R-S, aspect), elevation, quantities
- Choose/contract private nursery to grow the seedlings
- Orders for most nurseries must be placed by early November

From the El Dorado County Resource Conservation District:

- Seedlings grown at the US Forest Service Placerville Nursery
 - <http://www.eldoradorcd.org/nodes/info/reforestation.htm>



As a private landowner you can help the seed bank!

- Keep an eye on your conifer trees
- If it looks like an exceptional year for cones let us know!
- If you have a sizeable property and are willing to allow collections, we would appreciate it
- CAL FIRE reimburses landowners for the privilege of collecting cones from their properties through a rebate arrangement (10% of the yield) of clean upgraded seed

CALL LAMRC at 530-753-2441 or email: dorus.vangoidsenhoven@fire.ca.gov

References

Anatomy & Morphology of Conifer Tree Seed, David Kolotelo, 1997

Native Seed Collection, Processing, and Storage for Revegetation Projects in the Western United States, Lippitt, et al., Restoration Ecology Vol. 2 No. 2, pp. 120-131, June 1994

Reproduction of Conifers, EIS, et al., Canadian Forestry Service, Victoria, BC. March 1981

Rules for Testing Seeds, Association of Official Seed Analysts, Larsen, et al., 1984

Tree Seed Technology Training Course, Bonner, et al., General Technical Report, SO-106, Sept. 1994

Woody Plant Seed Manual, available online@ http://www.nsl.fs.fed.us/nsl_wpsm.html

CA Tree Seed Zone Map available online@ http://frap.fire.ca.gov/data/frapgisdata-sw-seed_zones_download

T. Griffis – retired CAL FIRE Forester

Thank You!

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