THE NURSERY PROGRAM OF THE CALIFORNIA DIVISION OF FORESTRY

by

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The Legislature of the State of California has authorized the Division of Forestry to produce and distribute tree planting stock. Planting trees contributes to the economic welfare of the State by making idle, inadequately stocked forest lands more productive. Farm lands and watersheds can be protected from wind-and water-caused erosion. Public parks, school grounds, and public streets and highways can be improved by tree planting.

Four nurseries are operated by the Division of Forestry. They are the Davis Headquarters Nursery near Davis, Yolo County; the Parlin Fork Nursery near Fort, Bragg, Mendocino County; the Magalia Nursery near Magalia, Butte County; and the Ben Lomond Nursery near Felton, Santa Cruz County,

State law governs the sale of planting stock from the State forest nurseries. It is found in Sections 4681-4685 of the Public Resources Code. In accordance with the requirements of this law planting stock can be sold only for the following purposes:

1. Reforestation of public lands,
2. Planting along public streets and highways, on public grounds, and on lands of non-profit organizations for beautification.
3. Erosion control on private lands.
4. Watershed protection of private lands.
5. Farm windbreaks.
6. Production of forest and farm woodlot products on private land,

No stock can be sold for landscaping and beautification of private land excepting land of non-private organizations. Trees are sold in the following minimums: 100 of each species for potted stock and 500 of each species for bare root, stock,

The four nurseries of the Division of Forestry distribute three to four million trees annually, Planting on private land for forestry purposes utilizes the largest number of trees distributed, approximately 77 percent of the total. On all ownerships forest planting utilizes approximately 83 percent of the total. The remaining 17 percent is divided as follows:- planting of public grounds and roadsides, 8 percent; planting on private land for erosion control and watershed protection, 7 percent; and planting on private land for farm windbreaks, 2 percent,

All four nurseries of the California Division of Forestry have been cleared as 'Pinto Tae nurseries. Stock shipped under the Pinto Tag Clearance permits shipping into any county in California without inspection by the County Agricultural Inspector prior to planting.

THE DAVIS HEADQUARTERS FOREST NURSERY

The two basic areas of operation of this nursery are as follows;

1. Seedling production, primarily for erosion control and farm windbreaks.
2. Processing of seed for sowing in the four nurseries of the Division of Forestry.

Seedling Production

Some basic facts concerning production are as follows:

1. Annual production is 100 to 150,000 seedlings.
2. Species produced are: Arizona cypress, beefwood, manna gum eucalyptus, iron bark eucalyptus, red gum eucalyptus, Monterey pine, Aleppo pine, Canary Island pine, and toyon.
3. Propagation is entirely by seed. Approximately 80 percent is seeded directly in pots; the remainder is started in seed flats and then transplanted into pots. Eventually it is hoped to direct seed the entire production.
4. Stock is distributed primarily as one year.
5. All stock grown in open bottom pots made of 15 pound building felt or pressed peat paper. Size of pots is 1 1/2" x 1 1/2" x 6".

The main facilities and areas used in propagation are: greenhouse, plastic house, soil mixing area, potting room and lathhouse.

Greenhouse

1. Size: 22' x 53'
2. Type: glass, with cement lower wall and floor.
3. Capacity:
   a) 11,500 potted seedlings on benches.
   b) 156 seed flats in germinator.
4. Use: Start seedlings from seed either by direct seeding of pots or by sowing of seed flats. Direct seeding held on benches; seed flats in germinator.
5. Bench space is 300 sq. ft. and does not have bottom heat.
6. Germination space is 250 sq. ft. and has electric bottom heat.
7. Seed flats are sown in December, January, and February. Direct seeding is also done at this time.
8. The seed flat mix is 7 shovels of sand to 4 cu. ft. of vermiculite. Granite grit is used for covering the seeds.
9. Watering is by sprinkler heads and by hand.
10. The following fungicides are used for control of diseases during and after germination:
    a) Captain 50W as a dust over the seed flats prior to filling.
    b) Same material or panogen as a drench over the mix surface.

Soil Mix Area

1. Size: 40' x 110'
2. Use: Mix and fumigate soil. Mix is 1:1 or 2:1 sandy loam soil and fine well aged sawdust. At time of mixing "MagAmp" Magnesium ammonimum phosphate) slow release fertilizer is added at the rates of 10 or 15 pounds per cu. yd,
3. Mixer in use is a surplus 4 cu. yd. transit cement mixer powered by a jeep motor, An International Haverster tractor-loader is used for movement of materials in bulk.
4. After mixing, soil is fumigated under a tarp with methyl bromide at the rate of 2 pounds per 100 cu. ft. A M-clean dispenser is used for metering of the fumigant.

Potting Room

1. Size: 32' x 50'
2. Use: potting seedlings or direct seeding.
3. Bench space is available for direct seeding and potting.
4. Potting is done primarily by dibbling young seedlings while still very small.
5. A new machine designed to fill pots with soil, sow seed, and cover seed mechanically is being installed in the potting room. Tentative daily production is estimated at 20 to 40,000 pots. Pots will be in the shipping boxes: boxes will be on pallets set between the rails over which the machine will roll.

Plastic House

1. Size: 36' x 100'
2. Type: Steel Frame with fiberglass panel roof and siding.
3. Capacity: 125,000 potted seedlings in boxes.
4. Use: Start seedlings from direct seeding.. Boxes are direct seeded starting in December and are placed on pallets and held until germination completed and seedlings started to harden off. Freshly potted plants are moved to the plastic house for approximately 3 weeks before removing to the lathhouse.
5. Watering is by an overhead misting system with automatic timer.

Lathhouse

1. Size: 96' x 97'
   Type: lath fencing 42 percent shade.
3. Capacity: approximately 4000 boxes containing 50 plants each 200,000).
4. Use: holding area for potted seedlings until of adequate size for distribution.
5. Plants are moved from plastic house to lath house and are held for a minimum of six months, Usually at the end of this time the plants are large enough to release.

6. Watering is by hand and by overhead rotating sprinklers.
7. Originally "MegAmp" was the only fertilizer used and no supplemental feeding was considered. However liquid Nitrogen fertilizer (20-0-0) is now used as a supplement.
8. Mortons Soil drench and Camptam 50W are used as a soil drench on toyon for the control of root fungi.
9. Trithion is applied, primarily to the eucalyptus species, for the control of white-fly. The rate of application is two tablespoons per gallon of water. Leaves are thoroughly coated.
10. Acti-dione is applied to toyon for the control of powdery mildew. The rate of application is two tablespoons per gallon of water.
11. Boxes are consolidated, starting at the beginning of cool weather so that each box contains 50 plants when shipped.

The boxes which have held the plants during the growing season are also used as a shipping container. A slat type wood top is nailed over the plants for protection. For additional strength a metal strap is placed around top and box.

Seed Processing

Some basic facts concerning seed processing are as follows:

1. Up to a maximum of 20,000 bushels of cones have been collected and 15,000 pounds of seed processed in a single year.
2. Some seed may be extracted at a Division of Forestry camp or station and only the rough-cleaned seed shipped to the Davis nursery for further processing.
3. Additional seed is purchased from commercial seed dealers.
4. Most of the seed processed or purchased is used for the sowing of the four Division of Forestry nurseries. A small quantity is used for reforestation studies. Occasionally seed may be released to public or private organizations for forestry research projects.
5. All seed, except for a few hardwood species, used by the Division is source identified. Cones collected by the Division are reported under a Report of Cone Collection. The Report gives the location (county, township, range, and section), elevation, and dates of collection. Conifer seed when purchased is requested from a particular source.
6. Between 100 and 150 lots of seed are tested annually for germination percent.

The major portions of the seed processing operation in the order of occurence, are: cone drying, extraction, scalping, dewinging, cleaning, air separation, storage, and testing.

Cone Drying

1. Purpose: Open or shatter cones.
2. Facility: cone drying slabs; 18,500 sq.ft. of cement slabs which have a capacity of 1850 bushels of cones.

Equipment: Kiln in extractory building which has a capacity of 500 bushels of cones at each loading,

4. Method: a) cones which open readily or shatter at air temperatures are spread in a thin layer on the slabs and stirred occasionally. The period required for cone opening is usually from four to seven days depending on species, maturity, and weather. Species which have cones of the above type are: ponderosa, sugar, and Jeffrey pine; red and white fir; coast and Sierra redwood; incense-cedar; and Douglas-fir. b) cones which do not open readily at air temperatures are placed in the kiln. Warm air at a temperature of about 120 degrees F, is circulated among the cones. The period required for cone opening ranges from 16 to 20 hours with Monterey, Bishop, and beach pine to 24 to 30 hours with Coulter pine,

Extraction

1, Purpose: Remove seed from cones.
2. Equipment: portable shaker and stationary tumbler in extractory. Capacity of portable shaker is about 90 bushels of Douglas-fir cones and 200 bushels of ponderosa pine cones per hour.
3. Method: a) portable shaker is moved from one location to another among the cone slabs as cones open. Cones are moved from slab to shaker in palletized boxes by means of fork lifts. Cones are dumped into shaker, the seed is removed by falling through the screened sides, and is retained, the cones continue through the shaker and are discarded. b) the kiln in the extractory building is loaded by lifting sacks of cones to top floor of extractory, by means of the elevator on west end of extractory buidling The sacks of cones are then opened and the cones are dropped onto the trays in the kiln. After the cones have opened the trays are lowered and the open cones and seed fall to a conveyor belt at the bottom of the building. The cones and seed are then carried to the tumbler where the empty cones are separated from the seed. The seed then is conveyed to the Crippen scalper for further processing,

Scalping

1. Purpose: reduce bulk of foreign matter from the seed to permit more efficient cleaning.
2. Equipment: scalper, 2 screen, Crippen
3. Method: the seed from the tumbler is fed into the Crippen scalper and through a process of screening and air flow from a blower much of the foreign material is removed. The seed is gathered from the scalper into storage boxes and moved by forklift to the seed cleaning building.

Dewinging

1. Purpose: remove seed wings from seed,
2. Equipment: seed mixer, seed buro
3. Method: the rough cleaner seed from the scalper is carried in boxes from the extractory building to the seed cleaning building

where it is dumped into hoppers. The pine seeds which require dewinging are carried by elevator into the dewinger where a mixing and rubbing action breaks loose the wings from the seed. Other species which do not require dewinging or cannot be dewinged without damaging the seed bypass the dewinger and are carried directly to the Hance cleaner.

Cleaning

1. Purpose: remove seed from foreign matter.
2. Equipment: cleaner, Hance 100
3. Method: the seed from the hoppers and/or the dewinger is then carried to the Hance seed cleaner where further screening and air separation takes place. The material larger and smaller than the seed is removed and light material is removed by air separation.

Air Separation

1. Purpose: upgrade quality of seed.
2. Equipment: pneumatic separator, Electric Sorting Machine, Model 8'7".
3. Method: the seed from the Hance Seed Cleaner is then fed into the pneumatic separator where the seed is dropped across a blast of air which blows off light and empty seed. The full, heavy seeds fall through and are collected in a hopper.

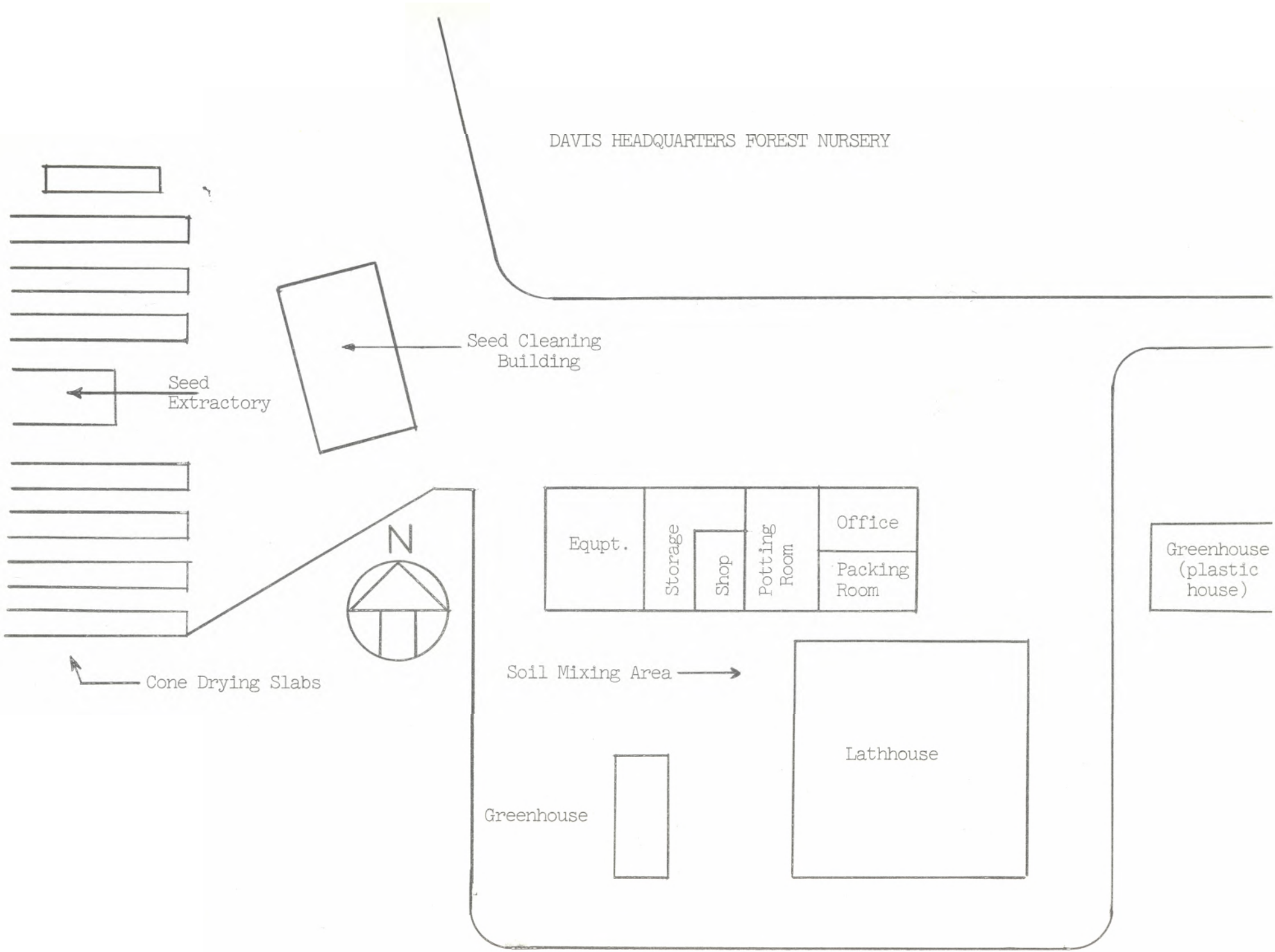
Storage

1. Purpose: retain viability of seed over longer periods of time.
2. Equipment: one 0 degree F. and one 35 degree F. walk-in cold storage box. Each box has roughly 200 sq.ft. of floor space.
3. Method: after seed had been put through the pneumatic separator it is stored in polyethylene bags inside 5 gallon metal cans. The true firs, Douglas-fir and sugar pine are stored in the 0 degree box and the other species, primarily pines, are stored in the 35 degree box. 0 degree temperatures retain the viability of seeds with poor storage qualities over a longer period than higher temperatures.

Testing

1. Purpose: to obtain moisture percent, purity percent, number of seed per pound, and germination percent of each individual lot of seed.
2. Equipment: Moisture determination balance, Ohaus Model 6550; small refrigerator; seed counter heads, Erickson; analytical balance, Torsion; and 3 germinators (one Reid, one Seedburo, one Harrington) with a capacity of 127 tests. A Luxo Magnification Lamp and a Kodak Deluxe Transparency Illuminator are used in the evaluation of radiographs of seeds for germination potential.

3. Method: a) the moisture determination balance is used to obtain the moisture content of seed. Seed must be stored with a maximum moisture content of between 6 and 11 percent, otherwise viability diminishes rapidly. b) the small refrigerator is used for the moist chill of seeds used in germination tests. c) the analytical balance is used to determine the number of seeds per pound and purity percent. d) seeds are counted by means of the seed counter heads for use in determining number of seeds per pound and for counting units of seed for germination tests. e) 300 seeds are divided into 60 replications of 50 seeds each. Each unit of 50 seeds is germinated in plastic dish.


DAVIS HEADQUARTERS FOREST NURSERY
Seed Cleaning Building
Seed Extractory
N
Equpt.
Storage
Shop
Potting Room
Office
Packing Room
Greenhouse (plastic house)
Soil Mixing Area
Lathhouse
Greenhouse
Cone Drying Slabs