

The nursery industry coupled with the botanic gardens and universities can accomplish a great deal to bring some of our more desirable native plants to the forefront. The nursery trade has so far relied upon those plants that have been an easy fix. Work now needs to be directed toward plants such as those listed here that while they have definite advantages they are accompanied by a host of disadvantages.

LITERATURE CITED

Plant and Supply Locator. March 2003. Hutchinson Publishing Corp., Taylors, South Carolina.

Seedling Growing Innovations in Oregon[®]

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Carlton Plants produces bare-root trees, shrubs, and seedlings on 2000 acres in Oregon's Willamette Valley. About 4 million seedlings are grown annually in open-ground seedbeds, pots, and raised seedboxes. Seedbed production accounts about 95% of the total, produced on 35 acres.

Twenty years ago most liners were purchased and propagation facilities were limited to one greenhouse and about 2 acres of seedbeds; the current goal is to produce 99% of all in-house planting needs as well as seedlings and liners for sales.

The species grown range from *Acer* to *Zelkova*; seed for production is about 50% purchased and 50% collected. A seed orchard has been established to provide a substantial boost to in-house collections.

Seedling ground is cover cropped for 2 years between crops, using buckwheat, corn, wheat, and hybrid Sudan grass. Prior to sowing soil tests are done and the soil amended with lime and fertilizer as needed. Mocap is applied as well for control of soil-born insects. The soil is not fumigated; Vapam has been used in the past, primarily for weed control, but results have been unreliable. This is an area targeted for more trials.

At sowing time the ground is worked to a fine tilth, rotovating just prior to bedforming. The bedformer used is an elderly Northwest Tillers bedformer (actually a model used primarily for asparagus). It forms an aggressive bed; 7 to 8 inches high, 36 to 38 inches across the top. A high bed is needed in our soils, which are fairly heavy; in light of the substantial Oregon winter rains.

At sowing time a slow-release fertilizer is broadcast over the beds. Historically we have used Osmocote 18N-6P-12K (7-8 month) in the fall and 19N-6P-12K (3-4 month) in the spring, but are now looking at Multicote as a less expensive option. Rates are on the low end of suggested broadcast rates. The fertilizer is applied using a Gandy model 6500 three-point mount fertilizer spreader with hydraulic drive and hydraulic shutoff.

Contact herbicides will be applied over the winter as needed; Roundup or Gramoxone are the chemicals of choice.

As seedlings germinate the beds are covered with floating row cover. Metal stakes are set out every 4 ft and rows are covered in pairs or individually. Row cover gives 3-4 degrees of frost protection while also protecting from insects. We also have observed reduced foliar disease and enhanced early season growth. Covers remain in place from about mid-March through early May.

Through the growing season additional fertilizer (15.5N-0P-0K or 34N-0P-0K) may be applied to some crops if warranted. Fungicides and insecticides are applied as needed; some crops are sprayed on a preventative basis on a bi-weekly rotation (such as *Gleditsia triacanthos* for pod gall midge and *Malus* stock for mildew).

Harvesting is done beginning in mid-November using a Fobro Super HD bed digger. Roots are washed (if needed) on washing tables with open grates; runoff is collected in settling pond surrounded by a special bio-filter mix of grasses.

Grading is done on mechanized grading belts. Prior to using belts all grading was done on tables; use of belts has resulted in 40% to 50% greater efficiency. Seedlings are fed by hand onto the belts; individual graders are responsible to select only one size. Typically the belts are crewed by 6 to 7 persons. Graded seedlings are stored in humidified cold storage at 34 °F. Some are stored at 31 °F to better hold back bud break and reduce storage diseases. Seedlings for sales are stored in pallet racks; for in-house use they are stored in pallets or poly-lined totes.

Container seedling production includes those that are difficult to transplant bare-root, fall-planted seedlings, and grafting understock. Grafting understock, such as *Aesculus*, *Carpinus*, *Ginkgo*, *Corylus colurna*, and *Cornus kousa* are grown in Anderson Die 2⁷/₈-inch bands. Most other seedlings are grown in treepots (2¹/₄ × 2¹/₄ × 5 inches), including items such as *Cercidiphyllum japonicum*, *Styrax japonicus*, *Acer griseum*, *Cladrastis kentukea* (syn. *C. lutea*), etc.

A relatively new method is being evaluated for *Quercus* production, where seedlings are started in 73-cell groove-tube trays (from Growing Systems) and grown to 6 to 12 inches height before being lined out in outdoor raised seedboxes. Air pruning of the taproot results in the development of many root initials at the root's distal end. First described by Mark Krautmann 8 years ago in the Western Region I.P.P.S. meeting in Portland, Oregon, this technique produces a strong liner with a very fibrous, well developed root system, with very low cullage.