

Production Scheduling of Cuttings

Christine Santana

Monrovia Nursery Company, 13455 SE Lafayette Highway, Dayton, Oregon 97114-8699

Monrovia Nursery Company was founded on a 10-acre site in Monrovia, California, in 1926 by Harry E. Rosedale. Today, the nursery produces approximately 42 million plants on 1300 acres using 1700 employees. Currently there are three locations, Azusa, and Visalia, California, and Dayton, Oregon, that ship throughout the United States, Canada and some foreign countries. We grow 1300 different taxa of shrubs, trees, perennials, vines, and topiaries all in a range of sizes creating multiple propagation techniques and finish dates.

Propagation at Monrovia Nursery includes 19 acres of greenhouse between Azusa and Dayton (Visalia at this time has no propagation facility) that produce 33 million rooted cuttings annually. The different methods of propagation include: rooted cuttings, tissue culture, seeds, division, grafting and air layering. Rooted cuttings comprise 90% of our production; seed approximately 7%; and tissue culture, dividing, grafting, and air layering at 3%.

I started my career at Monrovia Nursery in 1987 after completing a 10-week internship with the nursery. For the first 4 years I ran the liner division then became the assistant propagator and finally ended where I am today as propagation manager in the Oregon location. The nursery was approximately 360 acres back then and has grown since to 565 acres with 300 additional acres due to be completed within 3 years. With this type of rapid expansion, propagation has gone through many changes. It is my responsibility to propagate quality plants, on schedule, in the right quantities, and most importantly to make a profit for the nursery.

In the 1980s when the propagation department in Oregon began to produce cuttings, all plants were rooted in flats. Once the cuttings rooted they were transplanted into liner pots until they were of size to be canned into 1-gal containers. An index card file was kept that had all pertinent information, such as rooting hormone, cutting type, propagation soil type, mist requirements and any other key information. Once out of propagation, plant production followed a seasonal schedule, but no records were kept. It was a seller's market so if the timing was off on a particular item we would still be able to sell it.

In the 1990s things for the nursery began to change. We were getting bigger. With three locations, 1700 taxa in production, growing as many as five sizes, and labor becoming in short supply we had to prioritize our production through scheduling. In the past we relied on more seasonal schedules. It was a buyers' market and the competition was stiff. Our customers were managing their inventories by ordering smaller quantities more frequently. We realized we had to be able to grow plants better, faster, and cheaper. Our customers were indicating when they wanted their plants ready and what plants we should be growing. The scheduling of production to meet our customers' demand was necessary to stay competitive in the marketplace.

So how do you begin to get the nursery experience that is in everyone's head down on paper? We began by writing down crop times for the 1-, 2-, 5-, and 7-gal sizes. Once we got this together our sales force gave us projections on when our customers wanted their plants ready. We call these projections ready dates. Now we had the finishing times on crops and the ready dates. From this point we worked backwards

to adjust when a crop needed planting to be ready for sale. For example, if a 1-gal *Juniperus × media* 'Monlep' Mint Julep™ juniper was needed for March, 1996 sales, it needed to be planted from a liner into a 1-gal container in September 1994 (wait times during the winter months were factored in). The liner size takes 12 months to finish, they needed to be potted from rooted cuttings into liners in September 1993. The cuttings take 8 months to finish; they needed to be cut in January 1993.

While production was working on getting schedules finished for all sizes and taxa of plants, our computer needed programming to handle all of the information being generated. Once the programming was finished we were ready to input schedules with planting dates and ready dates into the computer. This process has taken 2 years and as we learn more about crop finishing times we are continuously adjusting schedules. Now we are able to print planting schedules by month for all sizes—that enables us to better calculate (juggle) our labor, material, space, and time requirements.

Labor is one of the factors that influences our propagation schedules. There are some things at the nursery that must be done on schedule, such as shipping (March through May), and winter protection (November and February.) In June, after our busy shipping season, we generally lose employees to other agricultural industries and during the winter months, from December 1 to February 15, our company policy allows employees to take up to 8 weeks unpaid leave. All of these factors influence our propagation schedules.

We are able to help our vendors in their effort to supply us with materials. The monthly schedules give us information, such as how many containers are needed, how much soil needs to be mixed, and how many canning machines will be used during the course of a month.

Space, next to labor, can be a stumbling block in keeping plants on schedule. If a crop is slow to finish, has disease problems, or isn't in demand by our customers space for new canning can get tight. Our propagation facility has 80 mist beds that turn over 4 times each year. I need approximately 300 mist beds per year to propagate cuttings on schedule. This number is increasing as the use of plug trays increases. Turning over our mist-bed space four times per year may not seem like a lot but consider our conifer crop sits in the mist for 4 to 6 months. The remaining 6 months, each bed is used 3 times. Our softwood cuttings root under mist and get moved out of mist in short order.

So, how does all this affect propagation? We had to look at ideal cutting times and see if these were in sync with our ready dates. In many cases we were pushing seasonal boundaries by balancing ready dates with labor, material, and space needs. Different propagation techniques, such as air layering, tissue culture, and taking cuttings at different times of the year were considered. We also looked at taking some shortcuts in the production cycle, such as direct sticking cuttings into liner pots, taking rooted cuttings into 1 gal, and more recently the use of plug trays on many crops. We found by using some of these shortcuts we were able to cut a year off some crop cycles.

CUTTING CALENDAR

- | | |
|---------------------|-----------------------|
| ■ March | Hardwood cuttings |
| ■ April-September | Softwood cuttings |
| ■ October | Rhododendron cuttings |
| ■ November-February | Conifer cuttings |

We typically prepare and stick cuttings year-round. Our production calendar year starts March 1 (Fig. 1). We are typically busy shipping plants this month and much of the labor force is pulling orders. Hardwoods are usually ready to cut the end of February or early March. We do very few cuttings of this type. Generally, hardwood cuttings supplement our softwood cutting crop. There are a few taxa we do as hardwoods, such as *Populus*, *Salix*, and *Prunus ×cistena*.

Our softwood season runs from April to September and is approximately 7 million cuttings. We prepare a cutting list that includes: stock code number, plant, month to cut, method, amount to cut, amount cut, liner net (this number indicates how many liners we intend to sell as liners,) 1-gal canning maximum (this is the total number of 1 gal we intend to produce for sales and shifting into larger sizes,) and 1 gal canning date or ready date. We keep this list on computer and update it with the cutting production numbers daily. We sort the list by month to cut and distribute to the respective growing areas that will be taking the cuttings. The growing areas coordinate taking the cuttings with our cutting manager. The list enables us to see if our cutting production is on schedule by looking at the total number of cuttings that have been completed for the month. If we are not on schedule, we look at possible reasons and determine how to get back on schedule. Possible reasons for being off schedule might be too little labor, our schedule might not be correct, the cutting wood may not be ready at the projected time, and space or materials limitations. A particular plant may have several entries on the softwood cutting list due to split schedules for the 1-gal sizes, sticking cuttings by different methods, or sticking cuttings for our other locations (Visalia or Azusa).

We have been rooting a large percentage of our cuttings into liner pots (or direct stick). Nearly 80% of the softwood cuttings are direct stick. Until recently, direct stick always meant individual liner pots. In our effort to mechanize the propagation end of the business, we are using plug trays. We are currently doing 75% of our softwood cuttings in plug trays. This not only saves the labor to put pots into flats for direct stick, but also saves labor to grade plants before they go to 1-gal canning. Each time the softwood cutting list is updated, we total the "amount cut" column and compare it with the "amount to cut" column; that gives us an overall picture of our production for that particular cutting season.

Another list we print gives our cutting crew and supervisors important information they need to prepare the cuttings. This list includes the stock code number, plant, month to cut, method, rooting %, hormone, soil type, and key plant (a key plant means our sales staff has put a priority on this plant which helps our supervisors and crew make decisions on prioritizing production.) Both cutting lists are a part of a spreadsheet program in our computer. The supervisor can select what information she/he needs.

Softwood cuttings usually finish mid to late September just in time for our rhododendron cuttings. Our rhododendrons in the field are pruned in June and grow out by September for us to get cutting wood. We produce approximately 750,000 rhododendron cuttings annually. In the 1980s we stuck all of our rhododendron cuttings into flats containing 60% peat moss and 40% perlite. We would transplant into 4-in. liner pots. This process would take 2 years to get a liner ready for 1-gal canning. Often we found we were overgrowing our rhododendron liners. We started to directstick rhododendrons into liner pots in the 1990s. By doing this, we can cut 1 year off our schedule. We direct stick the rhododendron cuttings in October and

they are ready to can into 1-gal in June the following year. By direct sticking our rhododendrons into liners, space in the mist house can be a problem. We went from getting 40,000 cuttings into 1 mist bed to 22,000. By shifting some of the September softwood cutting production to August we were able to come up with enough space to get our rhododendrons into mist beds. Another problem was the coordination of cutting wood. The pruning of the stock plants has to be done on time and the crew selecting the cutting wood must be trained about what ideal cuttings are.

By the end of October the mist house is fairly empty, except for the rhododendron cuttings; we are ready for our conifer cuttings. We produce approximately 6 million conifer cuttings annually. In the past all of the conifer cutting crop was stuck into flats. Over the last 3 years we've been experimenting with direct stick conifers and, more recently, with plug trays. Direct stick and plugs use nearly 4 times more space for rooting than if the cuttings are stuck into flats. Again, with direct stick and plug production we can cut nearly 1 year off our production schedule. The cutting lists for both the rhododendron and conifer cuttings are identical to the softwood cutting list.

At Monrovia Nursery we started scheduling production 5 years ago in an attempt to better serve our customers. Our production scheduling is gradually evolving as we learn more about particular crops and crop timing. As growers and managers at Monrovia Nursery we are constantly learning and gaining knowledge as experts. Our goal is to produce a quality product in a timely manner and produce a profit. We are striving to reach that goal every day.