

## A Unique Approach to Mass Propagation

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At Bailey Nurseries, West Coast Division, we are faced with propagation challenges that mandate a "unique approach to mass propagation". We are asked to propagate over 420 different taxa of woody plants, collect and stick 3-1/2 million softwood cuttings, and accomplish this task inside a very short window of time. We normally start around May 15 and end around August 15. This means we will stick approximately 45,000 cuttings per day. We stick 1 million hardy shrub roses of 90 different cultivars, 2 million shrubs of 200 taxa, 1/2 million trees of 100 taxa, and 30 taxa of vines. This obviously requires a great deal of scheduling, planning, orchestrating, managing, and communicating. Attention to detail, patience, and good humor hold it all together.

The system we use was in large part developed by Mr. Jim McConnell, long time I.P.P.S. member and propagation manager at Yamhill for the past 15 years. It is his knowledge and insight that has allowed our program to grow and evolve into what it has become today.

The vast majority of our cuttings come from our own fields and containers. This practice ensures that our sources maintain their juvenility, a factor that we feel is partly responsible for consistently high rooting percentages. With the exception of our virus-indexed material, very little comes from stock blocks. We maintain two full-time cutting crews of 10 to 15 people, one at our Sauvie Island location and one at Yamhill. We attempt to make the desired cutting in the field at the time they are taken. By minimizing the number of times cuttings have to be handled we speed up the process of getting them into the greenhouse. We also receive unfinished cutting material taken from plants that are limbed up, pruned, or cut back. This material is then processed into usable cuttings. As with all propagation, timing is critical, so a considerable amount of time is spent in the fields deciding when particular plants are ready to cut. Cultural practices are reviewed with farm foremen to ensure that our best cuttings are not left laying on the ground behind a pruning crew.

The cutting crews take, prepare, and count the cuttings, place them in plastic boxes with drain holes, label them with date, plant name, source, count, and keep them wet until they can get to the cooler. Our ultimate goal is to get the cuttings from the field to the greenhouse as quickly as possible. While it is most ideal to stick cuttings within a day or two of being taken, realistically it can easily be 7 days before some are actually stuck. As long as the cuttings are kept moist and cold, we notice little adverse effects associated with waiting.

Using our cooler as a staging area for the cuttings and always being mindful of processing the oldest cuttings first, we determine the order plants will be handled, the appropriate rate and type of rooting hormone (IBA, KIBA, or Wood's Rooting Hormone) to be used, and the order they will be planted. While it is not always practical, we try to keep "like rooting" plants together in the greenhouses. It's definitely worth the effort when it comes to Greenhouse management. Another criteria for grouping plants in the greenhouse is whether or not they are scheduled to be dug dormant. If they are to remain in the greenhouse for early summer field



planting or containerizing we attempt to keep them together. This practice minimizes the amount of greenhouse space that is tied up into June. It is essential for us to have as many houses as possible available for the beginning of the season.

We propagate in hoop houses, 30 ft × 148 ft, in ground beds of pumice. We currently have 38 greenhouses totaling about 4-1/2 acres under poly. All of our houses are equipped with mechanical irrigators manufactured by Growing Systems. We feel it is the mechanical boom that is the key element of our system allowing us to propagate such a diverse group of plants. It is not uncommon for us to have 30 to 40 different crops in the same greenhouse, each requiring a different misting regimen. We have continued to use the Growing Systems booms because of its relatively simple design and ease of maintenance. It is also our belief that one system is easier to manage than a mixture.

Prior to planting, all of our houses are fumigated, rototilled, and watered. We utilize a 55% shade cloth to keep the house cool while the crew is working and leave it on the newly stuck house for up to 3 days after finishing. This provides the plants a low stress time to acclimate to the new environment. To facilitate the planting of our cuttings into the greenhouses quickly, we utilize two sticking crews for most of the summer. We have one crew made up of local high school and college students that work mid-June until mid August, and one crew from the Nursery labor pool that will be with us from start to finish. A crew consists of 8 stickers and one person to water-in, count, and keep the crew supplied with cuttings. There are two people per bed, 4 beds per house. The crew starts at the end of the house closest to the irrigation boom and plant evenly across. Keeping the plants in even blocks across the house allows the grower a way, through the use of actuator switches on the boom, to skip over fast rooting plants while maintaining the mist on the slower rooting varieties.

Our greenhouses are monitored sun-up to sun-down, 7 days a week, all summer. Misting frequency is totally dependent on the weather. Because we close the greenhouse doors during the rooting process, it is not uncommon on hot days to run the mist continuously. Ideally, the mist is set according to the weather conditions to provide the least amount of water possible to maintain the turgidity of the cuttings. Keeping the cuttings from wilting without making them too wet is the biggest challenge for the greenhouse monitors. Frequency of misting is more important than quantity of mist. The general rule of thumb is “just enough” but “not too much”. It is critical that the greenhouse monitor walk through every house, as often as possible, to inspect all of the crops in the houses. High temperatures combined with high relative humidity results in fast rooting. The flip side of the coin is, high temperatures combined with inadequate moisture result in large brown spots in the greenhouse. These are not desirable. One advantage we have is consistently cool, calm nights. This allows us to open the doors of all the houses at night. No matter how much water you have to use during the heat of the day, this gives the plants a chance to “dry down”. The real advantage here is the virtual non-use of fungicides.

As the plants root, they are slowly weaned from the mist. Misting frequency is gradually reduced until it is no longer needed. It is during this weaning process that our fertilization program is started. When the majority of the cuttings in the house have initiated roots, we feed the entire house a starter fertilizer (4N-16P-3.2K-2.1S) in liquid form directly through the boom at about 200 ppm N. We use a portable injector of simple design, for our “starter” solution. It is easy to use and was relatively inexpensive to build. We follow 10 days later with a growth fertilizer (8N-4P-8K-

5.4S) in liquid form, at 400 ppm N, and then every 10 days until the house has had three applications of the growth solution. We have a central injector we use for the 2 : 1 : 2 so we can fertilize two houses at the same time, making scheduling easier. Because our goal is to be finished fertilizing by the 31st of August, some of the cuttings in the "late stuck" houses do not get the full treatment. These houses all get at least one application of the "starter" followed by 0N-30P-30K sometime in Sept./Oct. to help with hardening off and over wintering. In the spring, we will continue the fertilizer schedule for the crops that are overwintered in the greenhouse, until a total of three applications of the 2 : 1 : 2 is provided.

The obvious result of an intensive fertilization program is increased growth. This in turn requires more maintenance. We maintain uniform size and shape through the use of a mowing system. A Honda mower was chosen for its ability to remove the cut debris. By selecting cutting heights, we can either have short, multi-branched shrubs or tall single-stemmed tree liners. Our goal is to have large caliber liners, with fibrous root systems of uniform size.

Pesticide use is minimal, usually spot applications when needed. Our two worst pests are aphids and spider mites. Solo backpacks are used for spot sprays and a 50-gal sprayer is available for whole-house treatments. When we do spray, every attempt is made to comply with the federal "Worker Protection Standards".

We make use of a computer-aided inventory system, custom designed for our use. It is absolutely essential that we have a reliable method of tracking the plant material. This becomes very apparent at digging, grading, storing, and shipping time. Final destinations for our rooted cuttings include our own West coast dormant and green plantings, Minnesota plantings with a small percentage destined for sales. Cuttings that are dug dormant are graded, root-pruned, if appropriate, counted into lots of 100, labeled, and "jelly-roll" wrapped. They are then either stored frozen in our cooler or sent back to Minnesota for planting or for sales.

In conclusion, let me reiterate that our system has been developed based on our own unique needs to meet our goal of producing the best possible liner material for an incredibly diverse range of woody plants.

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## "Cuttings" Question-Answer Period

**Margorie Sweeney:** Where do you get your cuttings from?

**Chris Santana:** Almost everything is from stock in the field.

**Robert Abe:** What fungicides do you use as a cutting dip?

**Chris Santana:** We use several different rooting hormones, such as Dip-N-Grow, Hormodin, and Hormex. We steam pasteurize our beds between crops. We use small quantities of Subdue on an "as needed" basis.

**Anonymous:** How do you use ozone? Have you noticed an improvement in rooting from ozone-treated cuttings?

**Tom Fessler:** We use a little swimming pool ozonator. Cuttings are dipped in an ozone-rich solution. We have noticed improved rooting and are very pleased with the ozone-treatment techniques.