# Conifer Seedling Propagation and Production©

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The basics are the same when producing conifer seedlings. We start with high-quality, clean seed. We prepare the seed for sowing and sow at the appropriate time and under the proper conditions. We irrigate as necessary, fertilize when needed, and protect our young plants from pests that could inhibit their growth. We do these things in our conifer nursery, as I am sure you all do in your various production settings.

When I was a youngster in Pittsburgh, both of my grandfathers were avid gardeners. They lived near one another and would have a friendly competition each year to see who could produce the earliest ripe tomato and the year's biggest watermelon.

My paternal grandfather liked to grow his annual flowers from seed sown directly into his annual flowerbeds. Each year in late spring he would thin his beds to give the remaining plants room to grow and develop the optimum flower display. The surplus plants that were removed from the beds were carefully wrapped in wet newspaper and given to me to plant at home in my youth garden.

After receiving these thinned plants from my grandfather for a few years, I began to notice that the plants with the best root systems were the ones that did best in my transplant garden. They consistently produced the largest plants with the biggest and largest flowers. This was a lesson I've carried with me to this day.

In 1909, the U.S. Forest Service established the Wind River Nursery in Carson, Washington. This was the first nursery dedicated to conifer production for reforestation.

These early pioneers of conifer nursery production had the same growing methods as I mentioned earlier. They collected seed and stratified the seed (early on it was fall sown and seed was stratified naturally in the beds). They sowed, irrigated, fertilized, and protected the young plants from pests for the 2 years that the seedlings were in the nursery.

Something, unfortunately, was missing. Success was not always what they achieved. Some plantations were total failures while others were mediocre at best. Clearly the above cultural practices were not enough to produce the vigorous conifer seedling that was needed to successfully reforest our forestland.

As time went on, seed drills were developed for use with conifer seed. These allowed the nursery to put the seed in rows on the beds. This gave a bit more control over plant density, but thinning was still a common and labor-intense process. Early nurserymen began experimenting with fixed-blade root pruners to improve seedling root quality. Plant survival increased with these developments and rose steadily as cultural methods were refined.

Now I'd like to discuss the equipment we are using at Silver Mountain Nursery to sow and prune roots in our nursery beds. For the past 20 years Silver Mountain has been building three pieces of equipment that we feel have been essential to our success as a conifer nursery.

The first tool is the Silver Mountain precision vacuum seeder. This machine allows precise placement of individual seeds in a row on a bed. The vacuum drum's

precision sows a wide range of seeds regardless of their shape. It provides accurate placement of seed along, across, and beneath the surface of the bed. A computer senses the forward movement of the seeder and powers the seed drum at exactly the right speed to maintain a constant spacing between seeds. The drum's holes are individually drilled to fit your individual nursery needs.

Changing seed spacing is extremely simple and fast. The nursery operator needs only to enter into the computer keypad the number of seeds s/he wishes to plant per foot for one row, and when s/he hits "Enter" on the computer the exact spacing is instantaneously obtained.

The operator's platform is strategically placed so s/he can monitor computer and seeder functions, make adjustments whenever necessary of the furrow depth, the depth of soil covering, and the pressure desired on the rear roller. From the operator's seat one can observe the operation of the seed drum, refill the seed hopper while "on the move," and keep a constant check on the singulation of the seeds being planted.

One of the most unique advantages to the vacuum drum seeder as opposed to a disk or plate seeder is that within the drum there is a pin in each hole that comes out to push the seed from the drum providing a mechanical break from the vacuum stream and ensuring precision placement of the seed. The metal pins coming through the drum seed holes also clean the holes of any trash or debris that may be present.

Not only can the seed drums be drilled for any number of rows on the bed, they also come in a variety of hole sizes and configurations. The smallest is a 1-mm hole, normally used for things such as black or white spruce (*Picea mariana* and *P. glauca*), small *Eucalyptus* seed, as well as a large variety of plants that have a very high seed count per pound. The standard hole size is 1.5 mm, which takes care of a large number of hardwoods as well as most conifer seed. There is also available an acorn drum that will effectively sow about 70% of the various types of oaks (*Quercus*) produced throughout the U.S.A.

Our second tool is the reciprocating undercutter/wrencher. This rugged machine is capable of undercutting everything from tiny 1+0 conifer seedlings at a depth of 3–4 inches to heavy 2-year-old oak seedlings with a caliper nearing an inch. The secret to this machine's extreme versatility is its thin reciprocating blade that operates at 1,000 strokes per minute. This sawing action, coupled with the serrated blade, simply cuts the roots and will not sweep or drag the plants. The unique self-cleaning undercutter blade is made from the finest high carbon steel available.

By simply changing blade and blade holders you can convert to a very effective wrenching machine. The wrenching blade gives a 15° angle that helps to loosen the plants from the soil and tends to bring them into an earlier dormancy.

Conifer-nursery managers know that undercutting causes a proliferation of lateral root development. One unintended consequence of this is the tangling of roots between the rows of seedlings in the bed. This tangling leads to more difficult lifting and unwanted damage to roots as they are stripped and/or broken in the lifting process.

The third piece of equipment was designed to address this problem by pruning roots that have grown between the rows. The 20-inch coulters of the lateral root pruner are staggered in their positions so as to eliminate soil and plant roll up, i.e., the rear coulters are exerting a downward pressure as the blades go into the ground,

while at the same time the forward set of coulters are coming up out of the ground. The coulters can be easily adjusted side-to-side for precise placement. The trailing arms are pivoted in the front so that the coulters are self-aligning. The entire coulter assembly can be removed from the outer frame so as to provide a steerable tool bar for cultivation, precision spraying, or other nursery uses. The steerable-tool bar is controlled through a hydraulic valve at the operator's seat, allowing him to shift the tool bar 6 inches in order to compensate for the tractor alignment and still allow a precise cut of the lateral branching roots, or careful cultivation between rows.

At Silver Mountain Nursery, we have found these three tools to be essential to our quest for the highest possible quality conifer seedling for our customers. By paying attention to the development of high-quality root systems in our nursery, we can give our customers seedlings that are more able to overcome the stresses of lifting, processing, storing, and planting.