

Mechanized Seedling Production at Bailey Nurseries[©]

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Consistently producing line-out stock for species shrubs and trees and understocks for budding have been a part of Bailey Nurseries, Inc. since the beginning. It is great to be a part of that tradition of starting durable and dependable seedling line-outs. Most of those line-outs are developed solely for bare-root field planting, sales and for container planting. At the propagation facilities in Cottage Grove, Minnesota (MN), the seedling department is a small dedicated operation that focuses on cost effectively managing the production of roughly one million seedling line-outs in single year production cycle. What follows is a description of what we do to make that happen.

At our Minnesota seedbeds we are growing 80 species of trees and shrubs from seed. Seedling crops are regularly monitored in the seedbeds throughout the growing season to evaluate acceptability for continued use as a seed source for the future. Sugar (*Acer saccharum*) and red (*Acer rubrum*) maple are plants that we have made several selections from (MN) originated sources for superior plant growth characteristics. Two or more selections of each maple have been cloned and lined in our orchards in Sunnyside, Washington (WA), to rear the highest quality seed and seedlings for Bailey Nurseries bare-root production. Around 30% of our annual seed needs are supplied by our orchard at Sunnyside, WA, and that percentage is growing. Roughly 40% of our annual seed needs are hand collected from trees and shrubs located around the greater Twin Cities (MN) area as well as a select few from northern MN. Scouting for superior landscape adaptable plants becomes as much of a past-time as it is a component of routine trips to check on the current years seed crop.

We currently operate on a parcel of land with 31 tillable acres. At our current production levels we are annually planting 17 acres of land in seedbeds. Postharvest we rip each field in the fall to a 24-in. working depth and chisel plow and lightly cultivate in the spring to plant a cover crop of Glyphosate[®] resistant corn or daikon radish depending on the most persistent field issue. Post cover-crop each field will be chopped, chisel plowed and cultivated to a finished bedding condition for bed forming. Fields are bedded 4 to 6 weeks in advance of planting to manage weed pressure before and if possible after crop sowing.

We currently mechanically sow around 90% of our annual seedling production schedule. We utilize a common hopper gravity-fed vegetable planter. This seed planter is capable of sowing seed from the size of *Populus tremuloides* to *Prunus americana*. With this equipment we can uniformly apply seed sowing densities in rows at planting depths of our choosing or surface scattered. We have found that six, double-shoe planted rows works the best for our situation. A uniform seed flow rate is critical to achieve consistent densities. When necessary, pre-moistened seeds are sown with a light coating of talc powder or powdered graphite. After sowing we cover each bed with a $\frac{3}{8}$ - $\frac{1}{2}$ in. of coarse grade sand.

Weed control is paramount in consistently producing a high quality seedling crop in a single growing season. Common groundsel (*Senecio vulgaris*) and purslane (*Portulaca oleracea*) are our top weed issues in the seedbeds. In an effort to reduce the economic impact of hand-weeding labor costs we utilize charcoal and herbicide banding on row sown beds. These are liquid applications that are applied at the time of sowing and are then covered with a layer of sand. Application rates of herbicide will vary with the timing of sowing, but the charcoal layer is consistent. Careful attention to irrigation volume is needed to promote activity of the herbicide between the rows and to prevent lateral migration of herbicide in the bed profile. This technique continues to be a work in progress, but is currently applied to approximately 60% of all of our row-sown crops.

Minnesota winters can be a harsh environment for growing in seedbeds. The months of cold are not as critical as long as there is enough snow. We tend to have poor germination where the seedbeds are exposed to the harsh winter with little snow cover. A uniform stand of seedlings is best achieved in a cool and evenly moist seed stratifying bed. In Minnesota we use an even layer of rye or wheat straw at a depth of 3 in. over every surface of the bed. That straw is windrowed on each bed. Each bed is then spread via a tractor drawn hydraulically operated rake. The rake has two multi-axis articulating drums that operate perpendicular to the bed for covering the bed evenly in a single pass. For uncovering seedbeds in the spring the drums move the straw from the bed to the furrow when each drum is turned at 45° to the length of the bed. This single pass covering and uncovering allows for timely and cost effective winter protection of Minnesota seedbeds.

Bailey Nurseries success in growing is based on building and establishing a good root system. Our growing and plant cultivation strategies are dedicated to building a high quality root system. For the crops that we have undercut, root pruning timing is what makes the difference. If the plant is severed later in the growing season size yields are certainly going to be reduced and the recovery period is long. We look to head the root radical back when the plant is young and the roots are fleshy. Small cuts made in the earlier part of the season still have an effect on size yields, but not as much time passes waiting recovery from the procedure. Ground moisture is important to reduce excessive plant and soil shifting, but is balanced against the potential for soil glazing from the passage of the blade.

Grading seedlings at Bailey Nurseries is still done in a similar format to the way we've graded for the last 30 years. One grader is responsible for every grade. Each plant type is graded in order of the most prevalent size relative to the order on hand. We only process as many seedlings as we have orders. Each plant type is graded, prepared for planting or sales, and packaged away for winter storage in a single handling. Plants are held at varying storage conditions based on what works most successfully for our own needs.