

PACKING SYSTEM OF THE VIRGINIA DEPARTMENT OF FORESTRY
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This paper is about the packaging system used in the nursery and grading plants operated by the Virginia Department of Forestry(VDF). Under the VDF's system, the seedling lifting and grading jobs require different materials. Each of the jobs is briefly described in this paper. Information contained in this paper was collected from various people involved with Virginia's nursery, seedling research, and reforestation programs. I would like to recognize the following people for contributing to this article. They are: Thomas Dierauf, Chief of Applied Research, Occasional Report #43 entitled "Effect Of Time In Cold Storage"; Wayne McBee, Superintendent of Nurseries; Dwight Stallard, Superintendent of Garland Gray Forestry Center; and Jim Starr, Assistant Chief of Forest Management.

The Virginia Department of Forestry uses a dual material packaging system for its nursery seedlings. Just after seedlings are pulled from the nursery beds, they are wrapped snugly inside a canvas wrapper. This material allows moisture to enter or escape. Workers usually pack about 1,000-1,500 seedlings in each package. The number of seedlings varies because of different bed densities and seedling sizes. Later on each seedling package is opened and workers grade and count each seedling. Once the seedlings are counted, roots are dipped in clay and placed in two layers of paper- a white table cloth-type paper on the inside and a waterproof paper on the exterior. Seedlings are then cold stored for various periods of time.

The field work of lifting seedlings can be subject to extreme weather conditions. Days can be beautiful with a mild temperature or the weather can be harsh and cold. Seedlings are lifted and packaged in both kinds of weather. Workers, on the eight row lifter, pack seedlings in a canvas cloth towel measuring 51" x 25". Attached hooks are locked into place after the towel is wrapped around the seedling so that only the seedling tops are exposed directly to the weather. This is called a seedling "bundle". Bundles of seedlings are dropped from the lifting machine onto the ground, or conveyed from the machine to a holding box or pallet. Seedlings which are dropped onto the ground are later picked up and placed onto a pallet; these pallets are loaded onto trucks. The trucks or wagons are brought into the cold storage.

Prior to grading and counting, seedlings may be in cold storage for a few hours to a few days. The temperature is kept at 33 F to 38 F. The relative humidity is kept as high as possible, usually 90-100%. Seedlings lifted in dry field conditions are sprinkled down with water to keep seedling roots moist. After three to five days inside the canvas, wet seedlings dry out and must also be watered.

The seedlings are brought in from cold storage rooms to heated rooms for grading, counting, and repackaging. Workers cull seedlings which are too small, damaged, or extremely large. The good seedlings are counted into little bundles of tens, fifties, and thousands. The Department of Forestry sells units of one thousand. The root systems of fifty seedling bundles are dipped into a kaolin clay and water solution. Twenty of these little fifty seedling bundles are placed inside of two layers of paper. The exterior paper is a waterproof paper of high wet bursting strength, the interior is a lightweight, highly absorbent, white table cloth paper. Together, these papers form a water holding medium for the seedling roots which can store well for two months in well maintained cold storages. Two thin veneer pieces of wood, measuring 21"x6" x.1", are used on each package to give it rigidity. Plastic or metal strapping is used to bound the seedlings and materials together as a package.

Seedlings are then placed in boxes, pallets, or Jarke racks for storage and shipment. During the cold storage periods, the temperature and humidity requirements above are maintained. Water is never applied directly to the package though. For certain intrastate shipments, boxes of seedlings are transported from nursery cold storages to regional offices. Ungraded seedlings wrapped in canvas are shipped in boxes between grading stations. Trucks generally carry 450,000 to 500,000 ungraded seedlings between grading stations. Fully loaded lowboy trucks can carry up to 765,000 graded seedlings to regional stations. A pulp and paper company transports seedlings, on Jarke racks, inside refrigerated box trailers from the state's nursery to their regional offices.

Nursery, state regional personnel, and company personnel try to maintain control over environmental conditions affecting the seedlings. The Department's packaging materials were used in Tom Dierauf's study which showed that dormant seedlings stored for 3.5 months and nondormant seedlings stored for 2 months without a loss in survival. Seedling exposure is also great during shipment and while on the planting tract. Workers expose seedlings to many elements on the planting site, yet, the Department can show an average survival rate of 80% under the most droughty conditions.