PRODUCING CONTAINERIZED TREE SEEDLINGS AT THE WOOD NURSERY 1/

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Abstract.--Approximately eleven million containerized conifer seedlings are produced annually in greenhouses at the Wood Nursery in western Oregon. Seedlings are grown in a medium of ground bark, sand, and peat moss in black, 6-inch long, polyethylene tubes which are filled and sown by machine. Water and fertilizer are applied through a moving spray system, and seedlings are removed from containers and placed in plant holders for shipment to the field.

Wood Nursery is a wholly-owned subsidiary of Crown Zellerbach Corporation which purchased the nursery approximately three years ago for the purpose of having containerized reforestation material readily available. Prior to that time, we were completely engaged in producing containerized ornamental stock. Ornamentals now comprise approximately 60 percent of our production. We now grow approximately eleven million containerized tree seedlings annually. We produce for many independent companies as well as for government agencies. Our principal species is Douglas-fir, but in addition, we also grow Sitka spruce, noble fir, ponderosa pine, and western hemlock.

Seedlings for reforestation are grown in a high density polyethylene tube formed in units of 100 (fig. 1). This gives us a density of approximately 130 seedlings per square foot. For many species this density is all right, but for better quality Douglas-fir, the density should be closer to 100 per square foot. We are having a container unit built to provide this density. The individual tube is approximately 6 inches long, 3/4 of an inch wide and holds about 3 cubic inches of media. For our potentially dry planting sites, we feel the 6-inch depth gives the seedling more access to moisture. One other problem with our present mold is the offset alignment of tubes; we feel if the tubes were in line there would be better aeration at the seedling level. From past experience, we expect to grow a minimum of 5 crops in this container unit.

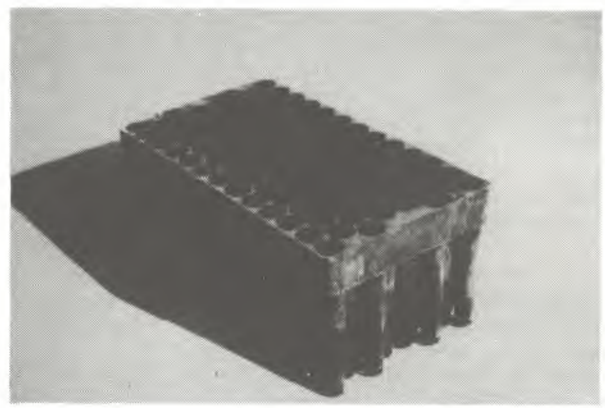

Figure 1.--Tree seedlings are grown in molded units of black, polyethylene tubes.

Our media is composed of ground Douglas-fir bark, sand, and peat moss. The Douglas-fir bark is screened through a 1/4-inch screen. The peat moss is used for moisture and for cation exchange capacity. An 80-cubic-foot-capacity premix box is used to hold the various mix components in proper ratio. This box can be filled while the large concrete mixer is blending the prior batch; the mixer is automatically refilled by conveyor from the premix box (fig. 2).

For filling tubes, we use a conventional Royer Flat Filler. The changes we had to make were relatively simple; one was the addition

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Figure 2.--A premix box (left) and mixer (right) are used to blend the growing medium of ground bark, sand, and peat moss.

of arms moving across the tubes as they are being filled to prevent the mix from bridging on top of the containers. Also, we have an adjustable pneumatic hammer to insure even compaction of the media while filling the tubes. Another pneumatic hammer adds a final compaction after the tubes have been filled. From this point the tubes are carried on trailers to the greenhouses where they are seeded.

Seeding is done with a Fricke Vacuum Seeder from Germany (fig. 3). Alteration of the number and spacing of seed delivery tubes had to be made on the seeder as well as increasing the vacuum. Although this machine does not apply perfectly the number of seed desired per tube, it is one of the best even-bulk applicators we have seen. We achieve the proper number of seed by individual inspection of the tubes.

Handling of the containers in the greenhouse is accomplished with a Portaveyor system. A one-horse power unit will carry the containers at least 150 feet. This is a very easily assembled system of 5 and 10 foot sections and has greatly facilitated the handling of units in our production line.

The seed is covered after the units are placed on the benches. We use the same mix for covering the seed as for filling tubes to avoid an interface problem. This is done by simply dumping quantities of the mix on top of the units and filling the cavities by spreading the mix with a lath.

Watering is done with a moving spray boom (fig. 4). The boom moves at the rate of 8 feet per minute and delivers by dial selector one of four different quantities of water. These are accomplished by choice of two water pressures, with water applied in either one or two passes. The first quantity applied after seeding is 2/100 of a gallon per square foot of area. This ensures that the seed keep moist without getting the total mix too wet. A 4/100 of a gallon rate may be achieved by setting the dial for two passes. After the plants are larger and the water requirements greater, we can apply 2/10 of a gallon per square foot with one pass or 4/10 with two passes. The boom can be raised as the seedlings grow. All nozzles are individually adjustable, having on-off valves.

Fertilization and disease control are accomplished by injecting solutions through the watering system. Plants are fed every time they

Figure 3.--Containers are seeded a unit at a time with a modified Fricke Vacuum Seeder.

Figure 4.--A spray boom moves along tables to irrigate and fertilize seedlings.

are watered. Fungus and other controls are applied as needed.

Our schedule calls for a January or February seeding date and delivery from October to early spring, as desired. I feel this growing period gives us a large enough, as well as mature enough, seedling for outplanting under our conditions.

Most of our tree seedlings are grown in a series of six greenhouses under one roof (fig. 5). The dimensions of this unit are 250 feet wide by 440 feet long. In this space, we can seed approximately eleven million tubes. Ventilation is step-controlled by a continuous vent on the west side of the building. Air movement is achieved by a bank of exhaust fans on the opposite side. Heat is supplied by two natural gas forced-air heating units per house. The heat is distributed through two poly tubes the length of each house. These are thermostatically controlled by the step-control unit. We feel this combination of heating and ventilation control gives us a uniform temperature gradient.

Figure 5.--Western hemlock seedlings growing in one section of the greenhouse. Hose loops of an irrigation system and a deflated heat distribution tube are visible at upper left.

Plants are boxed and distributed to planting areas by truck. The plug seedlings are removed from individual tubes at the greenhouse and replaced in a light, vacuum-formed mold which holds six plants. This holder facilitates seedling handling by the planters. The holders are carried in small bags fastened to a web belt. This method of carrying is obviously necessary when you view the terrain on which many of our trees are planted. Both hands are needed for climbing and for balance. Planting is accomplished by making a hole with a steel dibble slightly larger than the diameter of the plug.

For some specific locations, we are investigating the use of a larger tube. We identify this large container as a Dee-Pot. It is 2-1/3 inches in diameter and 10-inches deep, holding approximately 40 cubic inches of media. Seedlings are grown for two seasons; using a smaller plug seedling as a transplant into the Dee-Pot. We originally developed this container for use in our Christmas tree growing program. In areas of heavy grass competition, we feel the 10-inch-deep root system will be below the competitive root zone of most grasses, eliminating the necessity of herbicide use and possible occurrence of erosion. Also, larger trees more quickly overcome vegetative competition of such rapidly growing shrubs as salmonberry. We hope use of large trees will cut down the forest's growing cycle.

Although I have seen many methods, containers, soil mixes, and growing regimes all over the world, I feel our system is close to being right for our species and climatic conditions. I believe the thing to remember with the multiplicity of choices offered to us in growing containerized reforestation material. is that each of us faces completely different species, planting times, soils, and climates and we have to pick the system that best suits our individual needs.