

# A Status Report on Nursery and Reforestation Projects at the Missoula Technology and Development Center<sup>1</sup>

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Abstract.--This paper presents an overview of work underway in the nursery and reforestation program at the Missoula Technology and Development Center. Projects include the Seedling Counter, Seeders, Seedling Handling Equipment, Root Regeneration Chambers, a Stake Driver, an Improved Planting Auger, and Field Storage.

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## INTRODUCTION

The Missoula Technology and Development Center (MTDC) has a long history of development in nursery and reforestation work. Current projects at MTDC are indicative of a continued commitment to improve Forest Service reforestation and nursery programs. The status of current projects follows:

Nursery Technical Services.--Our goal in this project is to provide engineering assistance to Forest Service nurseries and to disseminate information to help nursery managers keep current with technological advances. Under this project, we maintain drawing files on nursery equipment and send them to nursery managers and others on request. In FY 1987 MTDC built 14 Root Growth Chambers and drawings were prepared based on Dr. Tinus and Dr. Reinfelt's design. In addition, electrical protection was provided for 44 weather stations associated with the Reforestation Improvement Program. Detailed construction plans for two sizes and types of Root Growth Chambers are available on request.

Seedling Counter.--Forest Service nursery managers must have an accurate and current count of their seedling crop by age and seedlot for inventory, planning, and scheduling. Our goal is to provide a fast, accurate, and inexpensive system for counting seedlings in the nurserybed. After analyzing current technology, Center engineers decided that an optical-electrical approach was the most feasible. A contract was awarded to Dr. Glenn Kranzler at Oklahoma State University to continue his work on seedling counting. Dr. Kranzler performed laboratory tests that provided information Center engineers used to design a prototype counting system. The counting system uses laser beams with linear array detectors and light emitting diodes with linear array detectors. Preliminary tests at Lucky Peak Nursery in Boise, Idaho, showed promise. Further tests and refinements of the counter will continue in 1988.

Seeders.--Uniformly spaced seed in the nurserybed helps determine the quality of stock produced. Nursery managers need a precision seeder to accomplish this. MTDC continues to monitor industry to determine the state-of-the-art in precision seeders. We are particularly interested in high speed transplanting equipment used in row crops. In 1988, Center engineers will conduct lab tests on at least two precision seeders to determine their applicability for sowing longleaf pine seed. MTDC engineers will also design, fabricate, and test an improved hand seeder for sowing small progeny seed lots.

Seedling Handling Equipment.--As the direct result of a survey of Federal nursery managers, MTDC designed, fabricated, and tested a prototype box pickup and conveyor system for moving tubs full of trees from the ground to a trailer for transporting to the packing shed. Design, fabrication, and initial testing will be completed by the end of 1987. Information and drawings of this system will be available in the spring of 1988.

Stake Driver.--A three-point hitch-mounted stake driver was designed, built, and transported to Bend Pine Nursery for use in installing netting that protects seeds from birds. This stake driver was used in the spring of 1987 with excellent success. Drawings are available.

Improved Planting Auger.--The Intermountain Forest and Range Experiment Station experimented with varying the shape of planting holes to improve seedling establishment and growth. They found that cone-shaped hole, appear best suited for bareroot seedlings. MTDC was asked to design and build several styles of cone-shaped augers for evaluation. Six prototype augers were built and evaluated in the Intermountain and Pacific Northwest Regions. Personnel selected a prototype design that creates a 4-inch diameter hole. Its bottom 6 inches is tapered to about 1 inch. Ten of these augers are being field tested. MTDC will refine the augers in 1988.

Field Storage.--The nursery manager must protect seedlings from injury and damage from the time they emerge until they reach their shipping destination. Nursery managers usually have the equipment, materials, and trained personnel to provide the necessary protection, but field units that take possession of the planting stock often cannot provide protection. Portable pick-up sized cold transport units are

needed. In FY 1987, center personnel contacted field units to define the requirements for such transport and storage units. One manufacturer sent a proposal for a unit using the truck 12-volt system, batteries, solar panels, and eutectic cold plates for refrigeration. The proposal has been sent to 15 field units for their comments. MTDC will analyze these comments and base further work on the results of this analysis.