

The Missoula Equipment Development
Center Reforestation Program
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Introduction

The Missoula Equipment Development Center is one of two Development Centers in the Forest Service. The mission of Forest Service Equipment Development is the systematic application of scientific knowledge to create new or substantially improved equipment, systems, materials, processes, techniques and procedures that will perform a useful function and be suitable to meet the objectives of advanced forest management and utilization.

The Missoula Center was established in the early 1950's to develop and test equipment for forest fire control. In recent years the emphasis has shifted to resource management and especially to timber management. This morning I'd like to briefly talk about a few of our reforestation projects and a few of the projects in our Cooperative Forestry Program.

The reforestation program is primarily aimed at solving equipment problems in the National Forest system. The cooperative forestry program is aimed at helping state and private forestry organizations with their equipment problems.

TECHNICAL SERVICES, TIMBER MANAGEMENT

In both programs, we have a technical services project to help field personnel with routine equipment problems. This project also helps us keep current with real field needs. We periodically use surveys to determine these needs and help us put priorities on equipment needs as well as formulate development schedules. A recent survey of timber management personnel on all National Forests showed that harvesting cones and seeds is their most pressing problem.

TECHNICAL SERVICES, NURSERIES

Our cooperative forestry technical services nursery projects gives engineering help to state and private nurseries. In 1973 we surveyed all federal, state and private forest tree nurseries to determine their needs. The results helped direct our work. The main thrust of this project for the next few years will be to make engineering drawings of custom built nursery equipment to enable nurseries to reproduce this equipment.

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PRECISION NURSERY SEEDER

Nursery bed sowing is a high priority problem.

What may look like good spacing and density control from a distance, is not under close scrutiny. We began this project by evaluating numerous existing seeders in the lab and in the field.

We also looked at new concepts such as the 8 row tape seeder. We had a prototype gravity seeder built under contract. Our tests indicated and the nurserymen agreed that the Norwegian-built Øyjord seeder would best meet the industries' immediate needs. In addition to placing the seed as desired, the machine is designed to use with small seed lots and is easy to clean and calibrate. The Center has worked with a Washington State manufacturer to make the seeder available in this country.

INTENSIVE NURSERY CULTURE

Nurserymen are always looking for ways to improve their product and at the same time keep their costs down. In the last 10 years, the concept of growing containerized seedlings in greenhouses has become popular in some parts of the country because close environmental control can be achieved. However, the practice can be very expensive. Costs of over \$100 per thousand are reported. Bareroot stock is usually much less expensive, but the crop is vulnerable to adverse weather and to insect and disease attack.

Center engineers are working with researchers like Dr. Tinus of the Shelterbelt Laboratory in Bottineau, N.D., to evaluate a system that incorporates some of the advantages of the greenhouse without all of its costs. Dr. Tinus, with the help of Coeur d'Alene Nursery personnel is evaluating the growth potential and the economics of the so called "bedhouse" concepts. The idea is to start the crop 6 to 8 weeks early under cover and then remove the cover when protection is no longer needed. Only time will tell if this method of growing seedlings will catch on in this country as it has in northern Europe.

EQUIPMENT FOR PROCESSING SMALL SEED LOTS

With the tree improvement program gaining momentum across the country, foresters are looking for equipment better suited for treating small seed lots. A catalog was assembled to show available small seed lot processing equipment. In the process of assembling the information, we found that there was a need for a small seed lot dewinger. The Missoula dewinger features soft rubber flaps that significantly reduce mechanical seed damage. The machine is available from several commercial shops or can be built from drawings available from MEDC.

MONITORING GREENHOUSE ENVIRONMENTS

Growing trees in greenhouses gives the nurseryman a real opportunity to control growth of his crop. However, he must know what environment affects his plants. Center engineers have worked with Oregon State University to design and build a greenhouse monitoring system. Sensors that measure conditions such as temperature, soil moisture, and PH have been mated with a small computer to measure

the various parameters on tape at any desired frequency. The computer can be used to analyze the data to regulate the greenhouse environment. This project will be completed this year with reports available at the Center to describe the system.

CONE AND SEED HARVESTING

As mentioned earlier, the problem of harvesting cones and seeds is perhaps the most critical problem in reforestation today. While the south is far ahead of other sections of the country with its thousands of acres of tree seed orchards, the problem of economically harvesting the persistent loblolly pine cone remains. One approach that is being tried is the vacuum pickup. Private timber companies in the south have financed the development of the Bowie Vacuum Harvester which is designed to vacuum loblolly seed from the orchard floor. Center engineers have participated in the machines evaluation.

The vacuum head sweeps over the orchard floor and picks up the seed as well as most other small material. The seed and other fine material is deposited in the revolving drum located on the side. Pine straw and other large material is walked out the back.

The performance of the machine depends on many factors such as weather, amount of debris on the orchard floor, and operating speed. It appears that this machine may become a useful tool, but only when operating conditions are just right. The Georgia Forestry Commission has been experimenting with plastic netting for collecting loblolly seed at their Arrowhead Orchard. Netting is pulled from a trailer to totally cover the orchard floor. The edges are stapled together to form a solid cover. The netting is kept in place to catch seed shaken from the tree or seed that falls naturally. It can be left in place throughout the seed fall period, then rolled up. The seed and debris are left in a windrow in a road to be processed with a combine.

The Center is working with the Georgia Forestry Commission to design and build a new trailer to deploy and retract the netting as well as separate the seed from the debris through a built-in combine. We plan to have the new equipment ready for testing at Arrowhead this fall. This fall the Center will also begin developing improved equipment for cone collection in the western United States where terrain often limits mechanization. We are preparing a slide-tape series that will help field personnel make the most of available techniques. The three part series will include cone development, which will elaborate on the life-cycle of a cone, inventory techniques, and will describe common collection methods and how they should be employed.

INSTRUMENTATION TO MEASURE SEEDLING DORMANCY

Nurserymen have needed a simple reliable method of determining when their seedlings are dormant.

Plant physiologists have recently found that when electrical impedance through seedling tissue is displayed on a square wave oscilloscope, changes in the trace can be used to estimate the degree of dormancy. Besides being useful

for research, the technique can be used by nurserymen to regulate lifting schedules.

Unfortunately the equipment being used is expensive and bulky. Center engineers are attempting to replace the oscilloscope with a small solid state instrument that would be much easier to use. Ten of these prototype dormancy meters are being evaluated by plant physiologists in this country and Canada.

INVESTIGATION OF SEEDLING HANDLING PROBLEMS

This year we began examining the problems of handling seedlings from the time they are lifted until they are planted. We are concentrating on the problems of the packing shed where culling, grading, sorting, and packing is usually done. Because this is typically a labor-intensive operation, about one-third of the cost of producing a seedling is accounted for here.

A select group of nurserymen and researchers are working with us to find ways of streamlining the operation. The first concept that will be evaluated is a stacked 3-belt seedling grading system that will be tested in California later this year. Other design concepts will be evaluated later.

PLANTING AUGER

Throughout the country there are areas where only hand planting can be done because of terrain. Conventional planting tools are often ineffective because they cannot make a sufficiently deep hole for long-rooted seedlings. To solve the problem, planting augers are being used to plant large bare-root stock. The system has its drawbacks, however, because many of the augers weigh over 50 pounds, and are bulky and hard to handle.

The Center is evaluating some newer lighter machines that generally weigh less than 30 pounds. Lightweight chainsaw engines are hooked to gear boxes with speeds that vary from 200 to 400 RPM. Different speeds are needed in various soil types for each auger. As part of this project we are evaluating new auger designs and new ways to harden augers to make them last longer.

REFORESTATION AND TSI EQUIPMENT HANDBOOK

The last project I would like to touch on today is a reforestation and equipment handbook we are currently putting together. The handbook will be similar to the Nursery Equipment Catalog we recently distributed. It will list equipment available for use in all phases of reforestation and timber stand improvement. It will briefly describe various types of equipment, how to use it, and where the equipment is available. This handbook will be available next summer.