

MISSOULA EQUIPMENT DEVELOPMENT CENTER - REFORESTATION PROGRAM

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The Missoula Equipment Development Center (MEDC) 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.

Today I would like to briefly tell you about some of the development projects in our Reforestation Program. Many of these projects are directly or indirectly tied to nursery production.

Cone and Seed Harvesting Equipment

In a Servicewide survey of problem areas in timber management that could be solved by new or improved equipment, cone and seed harvesting to meet increasing reforestation needs was most often mentioned. The tree improvement program is having a significant impact on forestry and its success depends on a growing supply of high-quality seed.

To help supply this seed, the Center has worked on a number of devices for harvesting seed and cones in recent years. First efforts centered around evaluating tree shakers in southern tree orchards. These machines are now operational. The Center also joined with industry in the South to evaluate a vacuum pickup machine for harvesting loblolly pine seed from orchard floors. Center engineers worked with the Georgia Forestry Commission to improve its plastic netting system for collecting seeds from orchard floors.

After field evaluation at the Arrowhead Seed Orchard in Georgia, design changes were made to net handling equipment and to the seed separation unit. Final testing of the net system was completed in Georgia in the fall of 1980. The netting system will be turned over to the Forest Service's Southern Region for operational use. A Project Record, specifications of the netting; retrieval equipment, and an article for Tree Planters' Notes will document this work. (MEDC 2670)

Cull Seedling Grinder

Forest nurseries have the problem of disposing of cull seedlings. Most current disposal methods are expensive because of handling and are wasteful because the seedlings' organic matter is not recycled. To remedy the situation, the Center was asked to make available a grinding system that could efficiently reduce wet, muddy cull seedlings to segments less than 1 inch long. In FY 1980 a market search was conducted to determine what equipment is available. In FY 1981 the most promising grinder was purchased and plants for testing were prepared. The grinder will be tested at several Forest Service nurseries under varying conditions. (MEDC 1E02E83)

Electronic Guidance for Nursery Equipment

Nurserymen attempt to sow tree seed in straight rows to make it easier to accomplish vertical root pruning, between-row cultivation, and other cultural practices. Straight rows also help achieve more uniform growing space for seedlings and enhance the appearance of the nursery. Stringlines require substantial labor and can be unsatisfactory. The goal is to make available a system that enables nurserymen to operate equipment over nurserybeds with greater precision.

Center engineers conducted a market and literature search to determine which commercially available laser guidance system is best suited for nursery operations. Several of the most promising systems were tested at Forest Service nurseries. Laser guidance proved accurate but expensive for nursery use. An article is planned for Tree Planters' Notes to complete the project. (MEDC 9111)

Band-Planting, Equipment

Most tree planting on National Forest land is done with handtools because of the rough, steep terrain. The goal is to make available a catalog of hand planting tools.

A market and literature search was conducted to determine what tools are commercially available. The Center surveyed about 100 Ranger Districts to learn about current planting equipment and what is needed. The survey was tabulated early in FY 1980. Results showed that no need exists for an equipment development effort, but information on available handtools must be distributed. As a result, a catalog of handtools and their advantages and limits is being prepared, which will complete this project. (MEDC 9123)

Low-Energy Cone-Drying Kiln

Several years ago, Center personnel conducted an investigation of forest nurserymen's equipment needs for processing small seedlots. One of the problems was the lack of an energy-efficient, versatile cone-drying kiln. Because most nurseries were built when energy was cheap and seedlot size was large, oil or gas-fired drying kilns were built for large-scale drying. In recent years, the trend has been to smaller seedlots, and fuel costs have soared. The old kilns are expensive to operate and inefficient. The goal is to make available a low-energy kiln to dry cones for small seedlots.

The Center worked with the National Tree Seed Laboratory at Macon, Ga., to determine the exact costs involved in drying cones at more than 20 seed extractories throughout the country. When the survey is complete and an analysis made, Center engineers will be able to decide what design changes should be made to improve cone drying efficiency. As part of the project, Center engineers have designed and will install a monitoring system for the solar heated seed-processing plant at the new Forest Service nursery at Albuquerque, New Mexico. (MEDC 8E02E50)

Mycorrhizae Inoculum Applicator

The symbiotic relationship of mycorrhizae fungi with tree seedling feeder roots is well established. Scientists now recognize that mycorrhizae are a key element in the health and growth of most plants. In recent tests one fungus was artificially introduced in a nurserybed. Seedling size doubled compared to control seedlings. Although this information is available to nurserymen, the benefits of artificial inoculation of mycorrhizae are not being realized because of the lack of proven techniques and equipment. The goal is to help make equipment and equipment-use techniques available to nurserymen to enable them to artificially inoculate their nurserybeds with mycorrhizae fungi to enhance seedling growth and vigor.

Work began on the project when Center personnel designed and built a mycorrhizae applicator to field test four methods of incorporating mycorrhizae fungi into nurserybeds. The machine was tested at nurseries in the Southeast in 1980. The best method was selected and an operational applicator incorporating that method was fabricated. The machine is being tested in the Southeast. (MEDC 9235)

Seedbed Thinning Equipment

Field personnel involved in reforestation work are asking for larger diameter tree seedlings with better developed root systems. This requires less dense growing conditions in the seedbed. Seedling density is sometimes higher than desired because of incorrect germination data or higher than expected

survival. By thinning, density is controlled and uniform spacing is achieved. But most thinning is done by hand, which is expensive. The goal is to make available equipment to nurserymen that will enable them to thin seedbeds effectively and economically.

Center engineers consulted nurserymen to determine requirements for seedbed thinning equipment. A market search revealed one commercially available thinner that potentially could be modified to thin seedling beds.

A commercially available beet thinner was purchased, modified, and tested in 1980. Additional modifications were made in 1981 and testing was continued. Initial results indicate that if conditions are right, the mechanical thinner can do a good job at a cost substantially lower than by hand. Hand operated thinning equipment also has been developed under this project. Additional testing is scheduled for both thinning systems. (MEDC 9E92E87)

Spot Site Preparation Equipment

In 1976 the Center conducted a survey to identify timber management equipment needs. The lack of equipment for removing competing vegetation on selected spots on steep slopes ranked as one of the top five problems. Accomplishing spot site preparation on steep slopes has become a serious problem because aerial logging methods have made it more feasible to work on such slopes. Also, land managers are increasingly concerned about compaction caused by the heavy ground equipment used for site preparation. The land manager faces a dual problem: 1) Getting less site preparation done in the timber harvesting process than when crawler tractors moved over a sale area skidding and piling slash and 2) having fewer suitable tools to do the site preparation job than before. The goal is to make available the equipment timber management personnel need to do spot site preparation on steep slopes.

In FY 1980 a selected group of Forest Service timber management personnel met to define the problem and set development criteria. A market and literature search was conducted to determine the availability of commercial equipment that would be used for site preparation. Typical problem areas were visited to verify development criteria. The types of site preparation equipment the Center will attempt to develop will include handtools and bigger machines for mounting on crawler tractors and cable yarders. A contract was awarded at the end of FY 1980 for the construction of a lightweight truck-mounted yarder. The yarder will become part of a cable site preparation system.

In FY 1981 the Center took delivery of the yarder. Two cable-operated scarification implements were built. Testing of the cable site preparation system is planned for the latter part of the fiscal year. Also during F1' 1981, three dozer-mounted spot

site scarification implements were designed and tested. The most promising implement will be modified and retested. Two hand-scarification tools were also built and are now being tested. (MEDC 0E02E84)

Tree-Planting Slide Tape

The Center has conducted several surveys of equipment needs in the Forest Service. These surveys have shown that land managers are often unaware of existing equipment. A case in point is hand planting equipment. In each area of the country, a certain tool has become the standard. It may not be the best tool for the site, but its use has become established. Tree planting is one task that could be improved by crews having access to the tools best suited for the particular job. The goal is to help train employees who will serve as contracting officer representatives on Forest Service hand planting contracts by acquainting them through a slide-tape program with the best hand planting equipment and use techniques.

We consulted reforestation personnel in developing the script, which includes the principles of proper handling, storage, and planting. The work began in 1980 and was completed in 1981 when the slide-tapes were sent to Forest Service units. (MEDC 0406)

Wildland Cone Harvesting Equipment

To meet expanding reforestation programs, new equipment and techniques are needed. One of the greatest needs is to provide seed stocks that are adapted to the sites to be reforested. To provide the greatest compatibility between seed stock and site conditions, harvesting cones in wildlands is often the only alternative. Rough terrain, thick underbrush, steep slopes, and the widely dispersed and hard-to-reach nature of the cone crop make wildland cone harvesting difficult. The goal is to develop safe, efficient methods of harvesting cones in wildlands and report these methods to field reforestation personnel.

Center personnel met with an ad hoc committee representing reforestation experts from various Forest Service units. The committee laid out the project goals and prepared a development schedule. For situations where only backpack equipment can be used, a cable snap system is under development. Where a crawler tractor can be operated, a tree shaker was mounted on a D-6. This unit was successfully tested on the Winema National Forest, Oregon, in September and October 1980. The tree shaker is being modified to extend the reach of the shaker head. Plans are also being prepared to develop a telescoping shaker for truck-mounted roadside shaking. We anticipate an expanding testing program as the project continues. (MEDC 9E92E86)