PROGRESS REPORT

MISSOULA EQUIPMENT DEVELOPMENT CENTER

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ED&T MISSION STATEMENT

The Forest Service Equipment Development and Test (ED&T) Program 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.

"Application of scientific knowledge" are the key words in that statement: Application of technology developed through research in engineering, forestry, and other disciplines and application of knowledge from government agencies, universities, research organizations, and private industry. Equipment development is a dynamic and responsive program applying its capabilities to solving the problems of today's resource managers.

The Forest Service operates Equipment Development Centers at San Dimas, Calif., and Missoula, Mont. In addition, an equipment development engineer at the Southern Region performs and coordinates Regional ED&T activities and maintains liaison with the Centers.

Proposals for project work may originate from any level within the Forest Service or from other organizations. They are evaluated and funded in accordance with National Goals and Priorities with inputs from Regional and functional groups. Review and actions are coordinated through the Equipment Development and Test Board. This Board is chaired by an Associate Deputy Chief of National Forest Systems and is comprised of representatives from Research, State and Private Forestry, Administration, and National Forest Systems staff. Recommendations for action on ED&T policy, program and facilities are made by the Board to the Chief.

CURRENT PROJECTS

ED&T 1420 – Technical Services, Timber Management

ED&T 2522 – Precision Nursery Seeder

ED&T 2547 - Intensive Nursery Culture

ED&T 2548 – Equipment for Processing Small Seed Lots

ED&T 2549 – Monitoring Greenhouse Environments

ED&T 2614 – Handclippers for Precommercial Thinning

ED&T 2670 - Cone and Seed Harvesting Equipment

ED&T 7086 – Instrumentation to Measure Seedling Dormancy

ED&T 1420 - Technical Services, Timber Management

Problem

The Missoula Equipment Development Center (MEDC) is often called on to review new equipment and to provide information concerning equipment available in timber management. The problem is to stay current with field needs and to monitor the development of equipment that might help field units in their timber management activities. Work performed includes: writing papers, reports, and articles; acting on routine inquiries concerning equipment problems; and meeting with committees, associations, and individuals to plan equipment development activities in timber management. By these means, areas where the Center can work effectively to help solve problems with equipment and technology are investigated. Project proposals are then submitted for new projects resulting from these efforts.

Project Objective

The objective is to provide prompt technical services on request and coordination and program planning support to the sponsoring Washington Office Unit.

Work Accomplished to Date

In FY 77 a major effort was to finish a Servicewide survey to identify equipment problems in timber management. The responses from the Forest level were sent to Regional Offices to be ranked for importance. The results of the survey were reported in a Project Record and copies sent to all Regions, Forests, and Stations. An especially interesting study was conducted on the potential of heating western U.S. greenhouses with geothermal energy. Another project was to aid Regions 6 and 10 with initial planning of their respective greenhouse designs. Assistance was given to Region 3 for a seed extractor, as well as MEDC personnel serving on the Region's Advisory Awards Board Team. Consulting services were provided to numerous Forest Service nurseries, and drawings of cone tray design were furnished to the Cone and Seed Harvesting Task Force, as well. Finally, the Center submitted proposals for equipment development to the Timber Management Staff.

Future Work

In FY 78 we plan to work with members of the Forest Regeneration Committee on the problems the group will address. We anticipate that beginning in FY 78 a separate technical services program will be initiated jointly between Timber Management and State and Private Forestry to work specifically on the equipment problems of forest nurserymen. In FY 78, FY 79, and FY 80, under this program, we plan to carry on the work of investigating field needs in timber management and to coordinate the Timber Management Program at the Center.

ED&T 2522 - Precision Nursery Seeder

Problem

Present seeding equipment in tree seedling nurseries sows an erratic bed density. The number of seeds sown per square foot can vary from 20 to 100 when 40 per square foot is desired. A precision seeder is needed to more efficiently sow the genetically improved tree seed becoming available. Present sowing methods produce 15 to 25 percent cull trees while packing. Research has shown uniform bed densities can produce a better and more uniform tree. A better tree increases outplanting survival, reduces the trees needed to plant each acre, and reduces the amount of replanting needed. Nurserymen would be able to make a better estimate of area needed for sowing, thus avoiding the expense of preparing beds that will not be sown.

Project Objective

The objective is to help make available to the Forest tree nurserymen a seeder that will permit precision sowing of tree seed in nursery beds.

Work Done to Date

Field tests and an analysis of various commercial precision seeders, including the testing of biodegradable tape, were completed in FY 77. Data were compiled and published in a MEDC Project Report, "Evaluating Precision Seeders for Tree Seedling Nurseries."

Oyjord Seeder, currently manufactured in Austria, proved to be the best overall seeder of those tested.

An American manufacturer is attempting to secure commercial manufacturing rights to the Oyjord Seeder; the Center will aid in technical input, design, and use. A Forest Service nursery will also study optimization of design for possible implementation. Future developments in sowing equipment will continue to be monitored. Project will be completed with an article in Tree Planter's Notes.

ED&T 2547 - Intensive Nursery Culture

Problem

Two distinct methods of producing forest tree seedlings exist in the United States. Greenhouse production of containerized stock now accounts for approximately 5 percent of the industry's annual production. This percentage undoubtedly will increase as the system is perfected. However, bare root stock production from conventional nursery beds is likely to provide the bulk of planting stock in this country for the foreseeable future.

With rising fuel and electrical costs, many nurserymen are taking a hard look at greenhouse seedling production. At the same time, they need to produce trees more precisely tailored to their customer's needs in an environment that is largely beyond their control. One question that comes to mind when these two systems are compared is, can some of the advantages of each be used to create a third system? Can a new method be devised that combines some of the environmental control benefits of greenhouse growing without losing the economy of conventional bare root stock production

Project Objective

The objective is to provide the engineering expertise necessary to the development of equipment and techniques to help nurserymen achieve intensive nursery culture.

Work Accomplished to Date

During FY 77, MEDC personnel visited Weyerhaeuser's operations at Rochester, Wash. to study firsthand reported success with a nursery bedhouse experiment. Findings indicate that it is possible to raise 1-0 bare root nursery stock that meets grading standards that outdoor 2-0 seedlings normally meet. Equipment and materials were purchased for Lucky Peak and Coeur d'Alene nurseries for future experiments. Funding for testing has been provided to the Coeur d'Alene nursery. Monitoring of experiment will continue through FY 77.

Future Work

Because of the absence of conclusive results, plans for FY 78 will be determined by this year's experiments.

ED&T 2548 – Equipment for Processing Small Seed Lots

Problem

Because of a rapidly expanding tree reforestation program and more attention being paid to seed zones, nurserymen must process a greater number of small seed lots each year. Most nurseries have equipment geared for handling large seed loads and have found this equipment unsuitable for the efficient processing of small lots. One problem is the difficulty of cleaning the large equipment between batches. Another is that some large processing equipment such as brush dewinger may not work effectively with small lots. As a result of these problems, most Federal nurserymen contacted in a recent questionnaire replied that there is a need for developmental work in this area.

Project Objective

The objective is to help make available to nurserymen reliable equipment suitable for processing small seed lots in high output nursery operations.

Work Accomplished to Date

After testing several concepts, Center personnel settled on a "rubber flap" mechanism for a dewinger. In FY 77, a "rubber flap" dewinger was designed, built and tested at the Wind River Nursery, Carson, Wash. It dewinged most of the seed from that nursery cone crop of over 11,000 bushels. Although nursery personnel reported that they were favorably impressed with the dewinger, they suggested several minor modifications to improve its performance.

Future Work

In FY 78, a second prototype dewinger will be designed to incorporate recommended changes. It is planned to test this model at the Coeur d'Alene Nursery. A Project Record will be written as well as an article for Tree Planter's Notes. It is planned to work with an American manufacturer to make the dewinger commercially available. This will complete the project.

ED&T 2549 - Monitoring Greenhouse Environments

Problem

In the past 5 years, there has been a dramatic increase in the number of greenhouses built to produce tree seedlings. Many improvements have been made in structures, covering, and accessory equipment. If one area has been relatively neglected, however, it is the monitoring of greenhouse environments. To date, many greenhouse operators have been too busy with the routine activities of their operations to concern themselves with optimizing environmental control. Researchers, especially those engaged in greenhouse production of horticultural crops, have demonstrated that the selection and maintenance of proper growing environments can markedly improve crop performance. The key to maintaining the optimum growing regime is good instrumentation. A properly instrumented greenhouse can permit a grower to produce the best possible crop in relation to money invested for rising costs of fuel, electricity, and related expenses.

Project Objective

The objective is to make available to greenhouse growers of tree seedlings equipment and techniques that will allow them to monitor all major aspects of the greenhouse environment.

Work Accomplished to Date

During FY 77, a contract awarded to Oregon State University was granted additional funding to design and build a greenhouse monitoring system at the Suislaw National Forest's Beaver Creek Greenhouse. The system monitors 10 greenhouse environmental factors. Some modifications have already been made from the preliminary design. The OSU final report will be completed and submitted to the Center in the summer of 1977.

Future Work

During FY 78, the OSU system will be monitored, findings analyzed, and, if necessary, required modifications implemented. An Equip Tips and article for Tree Planter's Notes will be written, as well as a detailed photo record of the system produced.

ED&T 2614 Hand Clippers for Precommercial Thinning

Problem

Thinning young, overstocked stands of timber is perhaps the biggest single job facing timber management personnel in the United States. Since much of the area to be precommerically thinned each year is on terrain unsuited for heavy equipment, chainsaws, bowsaws, and circlesaws are commonly used. However, thinning with these tools can be both expensive and dangerous. In addition, it is often difficult to cut below the lowest whorl or cut small seedlings with a powersaw.

Project Objective

The objective is to make available to timber management personnel a safe, efficient handtool for precommercial thinning.

Work Accomplished to Date

In FY 75 Center personnel worked with the Bitterroot National Forest, Region 1, to evaluate eight different commercially available handclippers. The results proved promising enough that forest crews are now routinely using clippers. However, it became evident that there is a need for a clipper to handle trees in the 2- to 3- inch range. Arrangements were made with a California manufacturer to develop a prototype model to fit this need. Ten prototype models will be received in time for summer testing in five locations ranging from Alaska to the southeast U.S.

Future Work

After test results are in and any necessary modifications made, drawings, specifications, procurement arrangements and a report will be scheduled to complete the project.

ED&T 2670 Cone and Seed Harvesting

Problem

In FY 77, Center personnel conducted a Servicewide survey to identify problems in timber management. In reforestation, the number one problem, by a wide margin, was cone and seed harvesting. Increasingly, foresters want seed from known sources. This often requires that seed be harvested from marked trees. In some cases, seed is gathered from trees in seed orchards where the task may be fairly easy; in others, especially in the West, the seed must be collected from seed production areas or from wild stands. In most cases, however, there is not adequate equipment to make seed harvesting from selected trees safe and efficient.

Project Objective

The objective is to make available to timber management personnel cone and seed harvesting equipment to enable them to meet the collection needs.

Work Done to Date

In the past, the Center worked with tree shakers and various cone pickup machines. Most of this work was done in the Southeast in southern pine orchards. In FY 76, work on this project was renewed when Center personnel helped evaluate a Bowie vacuum pickup machine in loblolly pine orchards. After the evaluation, Center personnel participated with others to make recommendations to the manufacturer for the improvement of the seed harvester. In FY 76 the Center purchased a Bowie Vac-U-Seed harvester. The machine was evaluated by Region 8 and Center personnel. We found that modifications were needed before acceptable performance could be achieved. The machine was modified according to recommendations made from the testings experience and is ready for a new test in late FY 77 .

Future Work

In FY 78 the evaluation of the Bowie Vac-U-Seed Harvester will be completed. The evaluation of cone pickup equipment will begin. Also in FY 78 we anticipate that Center personnel will begin work on starting to solve some of the cone and seed harvesting problems of the West.

ED&T 7086 - Instrumentation to Measure Seedling Dormancy

Problem

In the early days of reforestation in this country, nurserymen were not overly concerned with the physiology of the seedling they grew because they could do little to alter growth process in the plant. Today the situation is changing. By using greenhouses or various other environmental modification structures, and by using advanced cultural techniques, the quality and quantity of seedling growth can be influenced. As in the past, however, the biological process of seedling dormancy is of paramount importance to the tree seedling grower. Both greenhouse growers and bare root stock nurserymen depend increasingly on controlling the dormancy of their crop for cultural objectives and for improved handling and shipping.

Project Objective

The objective is to aid tree seedling growers in improving their equipment for determining the exact degree of dormancy of their crop.

Work Accomplished to Date

At the beginning of FY 77 MEDC personnel met with Forest Service Research plant physiologists to set the goals for the project. Four different designs for a prototype model were proposed after examining the feasibility of each. One prototype was chosen and built. It is a lightweight, gunlike device that has wires attached to a small meter. The meter has three separate lights, to indicate if a seedling is dead, dormant, or active.

Ten prototypes of this design were built and sent to plant physiologists throughout the United States for field testing. The meter will be tested under a variety of conditions and uses. Results of these tests will establish if there exists a correlation between instrument indications and actual seedling condition.

Future Work

During FY 78, test results and other pertinent input from the dormancy meter prototype's users will be evaluated. Design modifications, if any, can be made, and further testing resumed. Once the dormancy meter is perfected, a source of supply will be obtained, and the project would be completed with publication of a final report.

PLANNED (FY 78) PROJECTS

ED&T 1452 – Technical Services, Nurseries

ED&T 2217 – Plastic Tube Seedling Protectors

ED&T 7076 – Planting Auger

ED&T 8013 – Equipment Catalog for Containerized Tree Seedlings

ED&T 8014 – Electronic Fumigation

ED&T 8024 – Reforestation and TSI Equipment Handbook

ED&T 8040 – Investigation – Seedling Handling Problems

ED&T 8049 – Nursery Equipment Specifications

ED&T 1452 - Technical Services, Nurseries

Problem

Of all reforestation activities, the one operation that lends itself to mechanization best is the nursery operation. Whereas many reforestation tasks are carried out in remote locations, on rough, steep terrain, most nurseries are located where equipment can readily be used. Since World War II, mechanization of most forest nurseries has substantially reduced the amount of labor needed. Much of the mechanization has been accomplished through the efforts of individual nurserymen, with little coordination of information within the nursery industry. Nurserymen as a group are resourceful and have solved many of their own equipment problems. However, as the equipment becomes more sophisticated and as development costs grow, nurserymen should be provided with engineering assistance to solve their equipment problems.

Project Objective

The objective is to provide engineering assistance to forest nurserymen (Federal, State, and private), to solve both general and individual problems and to disseminate information to help nurserymen keep up with current equipment development advances.

Prior Development

For the last 10 years Center personnel have been in contact with nurserymen on various nursery equipment projects. In the course of doing project work at nurseries, Center engineers have been asked for their assistance on other engineering problems. This expressed need has grown to the point where a portion of FY 77's ED&T 1420 Technical Services, Timber Management funds were programmed for just this use. At a June 1976 meeting of Federal nurserymen in Portland, Oreg., one of the recommendations of the group was to start a nursery technical service project at MEDC. Forest Service, State and Private personnel and the meeting also concurred.

Project Goals

The specific objectives of this technical service project will be determined at the next Forest Regeneration Committee Meeting scheduled for November 1977.

ED&T 2217 - Plastic Tube Seedling Protectors

Problem

Deer often do considerable damage to tree seedlings on National Forest lands. In some areas it is impossible to get regeneration because of deer browsing. Fencing to exclude deer from research plots in the hardwoods has proved effective, but with prices ranging between $2,000 and $4,000 per mile, it would not be economically feasible to enclose large areas.

The original goal was to find fencing material and erection equipment for Forest use, to reduce the cost of fencing out deer from areas up to 300 acres. Our work in FY 72 revealed that plastic mesh tubes placed around individual tree seedlings proved far superior to fencing. Although the plastic tubes provide better protection at less cost, stakes or other support members are needed to keep the plastic protectors in place and upright.

Project Objective

The objective is to help make available to timber management personnel an effective method of protecting individual seedlings from browsing animals.

Prior Development

In FY 72, under ED&T 2217 - Deer Enclosure, MEDC personnel investigated the problem of finding better fencing materials to exclude browsing animals such as deer from forest plantations. The investigation revealed that in most situations, it is better to provide individual protection for seedlings rather than fence the entire plantation. Plastic mesh tubes placed over the seedling held the most promise. The drawback was that in many instances the 3- to 4-foot tube had to be support with stakes that made the cost too high for many potential users. This project was inactive in FY 73 and FY 74. It was activated in FY 75 to work on the problem of making the plastic tube protectors selfsupporting. Numerous types of supporting devices (metal, plastic, and wood) were fabricated and sent to the U.S. Fish and Wildlife Service's Animal Damage Control Laboratory in Olympia, Wash., for field evaluation. The evaluation of the supporting devices began in FY 76 and will be continued through FY 77.

Project Goals

In FY 78 a final evaluation of the Pacific Northwest Region's test plots will be conducted. It is also planned to prepare a final report and drawings and specifications of the supporting devices.

ED&T 7076 - Planting Auger

Problem

There has been a trend in recent years to use bigger planting stock on harsh sites. Experience has shown that in most cases, seedlings and transplants with large, fully developed root systems, have a better chance for survival than do smaller trees. The problem is that it is very difficult to properly plant a tree with a long, full root system with conventional planting equipment. For that reason, many reforestationists have begun to use planting augers for larger trees. While the auger does prepare an adequate hole, the equipment is heavy, often hard to handle, and can be dangerous to operate. In MEDC's recent Servicewide survey to determine equipment needs in reforestation and timber stand improvement, augers ranked as the 9th highest priority problem. Regions 3, 5, 9, and 10 ranked it as a high priority problem.

Project Objective

The objective is to help make useful planting augers available to timber management personnel.

Prior Development

A number of U.S. companies manufacture planting augers. They are basically similar. Through the years field units have made attempts to modify augers to their needs. But as far as is known, no resource agency has made an effort to provide a better planting auger to its field units.

Project Goals

In FY 78 an investigation will be made into the use of planting augers in the Forest Service. A market search will be conducted to determine the characteristics of available augers. The most promising augers will be field tested to determine what modifications are needed to increase auger safety and efficiency. In FY 79, modifications will be designed and implemented and retesting done. In FY 80 a report with drawings and specifications will be prepared to complete the project.

ED&T 8013 - Equipment Catalog for Containerized Tree Seedlings

Problem

The equipment developed by individuals and by various manufacturers for containerized tree seedlings (CTS) operations has proliferated in recent years. Some of this equipment is complex and expensive; some is simple and inexpensive. Some is tailored for certain types of tree seedling containers, while other implements can be used with many container types. Equipment is available from various manufacturers and distributors. Often these firms are small and not well known.

Nursery-built CTS equipment is widespread and varies in effectiveness and quality. But some nursery-built equipment is effective and needs to be documented so others can duplicate it for their use. A nurseryman entering the CTS business must find out about these equipment alternatives by word of mouth or by personal visits to nurseries or manufacturers having the items. Before buying, he must make comparisons of equipment types he sees and these are usually quite subjective, based on biased opinions of the users. Such equipment includes: growing-medium mixers; CTS container fillers, packers, compressors, and seeders; seed covering-medium spreaders; conveyors for moving containers to and from the greenhouse; nutrient injectors; special irrigation equipment; benches, instrument shelters; etc.

Furthermore, the prospective CTS nurseryman should acquire a number of basic instruments to monitor and control his operation. They include hygrothermographs, pH meters, electrical conductivity meters, moisture scales, bimetallic moisture probes, flow meters, thermometers, photometers, recording voltmeters, etc. The nurseryman needs to know the best features and types to buy for CTS operations, where they are available, and what price ranges can be expected.

Project Objectives

The objective is to provide growers of containerized tree seedlings with detailed information about equipment and instrumentation to meet their needs.

Prior Development

Center personnel have worked on various aspects of CTS nursery development in a technical advisory capacity for years, and have produced a number of related publications. In 1976 the Center published a a comprehensive catalog of equipment for bare root nurseries. The Center is probably better equipped by experience than any other unit, public or private, to do this work.

Project Goals

In FY 78 MEDC personnel will meet with State and Private Forestry personnel to outline requirements and goals of the project. A market and literature search will be made and assembling the catalog will begin. In FY 79 the catalog will be put in rough draft form and reviewed with the sponsor. Then, the catalog will be put in final form, printed, and distributed. An article will be written for Tree Planter's Notes to make readers aware of the document.

ED&T 8014 Electronic Fumigation

Problem

In 1974 MEDC conducted a survey of all forest nurserymen in the United States to determine their equipment needs. The 4th highest priority problem concerned equipment for fumigating nursery soils. Shank injection and liquid application of fumigants are the most common methods. Also, tarps are often used in conjunction with these methods for ground cover to keep the bases in the soil. The problems nurserymen face using these techniques are high labor, chemical, and material costs. In addition, some of the chemicals are highly toxic and can leave dangerous residues in the soil long after the treatment is over.

Project Objective

The objective is to help nurserymen reduce the cost of fumigation and at the same time attempt to improve the safety aspects and the effectiveness of the treatment.

Prior Development

Oceanography International Corp., College Station, Tex., with assistance initially from Texas A&M University, began to experiment several years ago with microwaves to control soil organisms. Microwaves are a form of radio waves (UHF) that can be transmitted through the soil and absorbed by seeds, weed seeds, and soil pests. When they are absorbed, the molecules rotate or twist rapidly, causing mortality to the organism's internal structure. The killing is physical, not chemical. The treatment has been used in conjuction with growing cotton, soybeans, alfalfa, sugar beets, and other crops. MEDC personnel have had OIC test the effect of microwaves on rangeland invaders such as rabbitbrush with good results. OIC has developed a number of prototype "zappers," in an effort to reduce treatment costs.

Project Goals

In FY 78 a visit will be made to Oceanography Corp. to investigate the potential for using microwave for nursery use. A test will be arranged to evaluate the concept for growing coniferous seedlings. in FY 79 the test will be monitored, additional test plots established, and an economic feasibility study begun. In FY 80 the results of the tests will be evaluated and the economic feasibility study of the microwave treatment in a forest nursery completed. A report will be written describing the results of the tests and the feasibility study. Recommendation for future actions will be made.

ED&T 8024 – Reforestation and TSI Equipment Handbook

Problem

In the past several years, the Missoula Equipment Development Center has conducted a number of surveys to determine equipment needs in resource management. The latest survey focused on timber management equipment needs. A common problem these surveys reveal is the on-the-ground land manager's lack of awareness of what equipment is available to help him do his job. Those engaged in professions less broad in scope often have complete catalogs of lab tools, accessories, and instruments; engineers in every field have many sources of reference for their equipment needs. But the forester uses tools and equipment from many sources to do his job, and he does not have one source to turn to for reference.

Project Objective

The objective is to provide timber management personnel engaged in reforestation and TSI work with a handbook of needed equipment.

Prior Development

Through the years, organizations like FAO in Rome have published writeups describing various kinds of reforestation equipment. Some State agencies and Forest Service Regions have also published a variety of small handbooks and booklets in an attempt to disseminate this kind of information. However, we know of no attempt to assemble a comprehensive handbook of equipment for reforestation and timber stand improvement. MEDC's recent nursery equipment catalog may be the closest comparable publication of this type.

Project Goals

In FY 78 the goal is to determine what range of subject matter should be included in the handbook. Once an outline is prepared, information will be gathered worldwide. The handbook will then be put in rough draft format and reviewed by the sponsor and others. In FY 79 comments from the reviewers will be incorporated and the handbook put in final form, printed, and distributed.

ED&T 8040 - Investigation - Seedling Handling Problems

Problem

Three areas in forest nursery operations account for most of a nursery's operational budget: lifting, weeding, and handling (all activities between lifting and outplanting). Much progress has been made in recent years to reduce the problems associated with lifting and weeding. Mechanical lifters are becoming common, so the cost of lifting is being greatly reduced. Mechanical cultivators and improved herbicides are making the job of weeding less expensive also. But the cost of handling the stock after lifting remains a major problem. The way seedlings are graded, culled, counted, packed, shipped, and stored has changed little compared to other nursery operations.

Project Objective

The objective is to help forest nurserymen reduce the cost of seedling handling with new equipment and techniques.

Prior Developments

In the past few years MEDC personnel have visited many forest nurseries while working on nursery projects. They have observed many attempts to improve certain aspects of the seedling handling process. However, this portion of the nursery operation remains the most labor-intensive. We are unaware of any attempt to analyze the problem to significantly improve the process.

Project Goals

In FY 78 an engineering and economic analysis of the seedling handling problem will be made. Then, findings and recommendations will be put in a report to be reviewed with the sponsor and others of his choosing. The future course of the project will be decided at a review meeting. Development work will begin in FY 79 and continue into FY 80 based on the outcome of the analysis and meeting.

LD&T 8049 Nursery Equipment Specifications

Problem

At last count, there were about 175 forest tree nurseries in the United States. In addition, there is a growing number of greenhouse operations and countless smallscale bare root nurseries. Most nurserymen and greenhouse managers take great pride in their work and are constantly striving to improve their operations. One of the best ways to improve these energyintensive operations is to reduce labor costs through mechanization. But it is difficult for nurserymen to stay abreast of what equipment is available.

Project Objective

The objective is to make information concerning nursery and greenhouse equipment available to those who need it.

Prior Developments

In 1976 MEDC assembled and distributed a catalog of nursery equipment. The 20chapter catalog covers cone and seed collection to seedling packaging. To improve the usefulness of the catalog, engineering drawings of custom-built equipment are added periodically. To date, about 15 pieces of equipment have been drawn up and added.

Project Goals

In FY 78 MEDC personnel will meet with Steve McDonald, State and Private Forestry, Western States Nursery Specialist, and others to schedule the work in this project for the next several years.

MEDC REPORTS

Investigation of Equipment Needs in United States Nurseries, Sept. 1914

Investigation – Small Seed Lots Processing Equipment, Aug. 1974

Catalog – Equipment for Processing Small Seed Lots, May 1975

Catalog – Nursery Equipment, Oct. 1976

Greenhouses: A Survey of Design and Equipment, Dec. 1973

A Tree Seedling Greenhouse: Design and Costs, June 1973

Potential for Heating Western Tree Seedling Greenhouses with Geothermal Energy, Nov. 1976

Site Preparation Machine, Phase I – Investigation, May 1974

Site Preparation Machine, Phase II – Development, May 1974

Dormancy Meter to Determine Physiological Activity of Nursery Stock, Feb. 1977

Evaluating Precision Seeders for Tree Seedling Nurseries, Aug. 1976

Evaluation of the New Zealand Root Pruner, June 1972

Redesign of Horizontal Root Pruner, July 1973

Greenhouse Instrumentation Study, Aug. 1975

NURSERY EQUIPMENT DRAWINGS

Title	Available From
Nursery Path Cultivator	Coeur d'Alene Nursery
Box Storage Rack and Conveyor and Set Up	Coeur d'Alene Nursery
Dewinger (Coeur d'Alene)	Coeur d'Alene Nursery
Seedling Storage and Hauling Trailer	Lucky Peak Nursery
Seedling Packing Carrousel	Lucky Peak Nursery
Tractor-Mounted Irrigation Pipe Hauling Rack	Lucky Peak Nursery
Seedling Hauling Trailer - Field Type	Lucky Peak Nursery
Root Cut Off Saw	Lucky Peak Nursery
Vertical Root Pruner	Lucky Peak Nursery
Cart Bench (Greenhouse)	Shelterbelt Laboratory
Nursery Cultivation	MEDC
Horizontal Root Pruner	MEDC
Cone Inspection Table	MEDC

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Coeur d'Alene, ID 83814

USDA Forest Service
Shelterbelt Laboratory
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USDA Forest Service
Lucky Peak Nursery
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