



GIZMOS

ABSTRACT

USDA Forest Service's Missoula Technology and Development Center (MTDC) develops new equipment, produces training materials, conducts field evaluations, and initiates product searches for Forest Service employees and cooperators. Several recent projects of interest to nursery and reforestation employees include a shielded herbicide sprayer, an ATV-mounted native grass seeder, electric and plastic fences that exclude wildlife, a new seed scarifier, and an evaluation of reusable toweling for wrapping seedling roots. Here I provide details on these projects, including how to obtain additional information.

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KEY WORDS

seed treatment, restoration, browse control, bareroot seedlings, herbicide

NOMENCLATURE

USDA NRCS (2006)

Photos by USDA Forest Service

USDA FOREST SERVICE TECHNOLOGY AND DEVELOPMENT PROGRAM

Since 1953, Missoula Technology and Development Center (MTDC), along with its sister center at San Dimas, California, has provided practical solutions to problems identified by USDA Forest Service employees and cooperators. The equipment, training materials, field evaluations, and product searches we complete help the Forest Service do its work effectively, safely, and efficiently.

MTDC does not have a research orientation. Instead, its engineers, fire specialists, resource professionals, photographers, and publications staff focus on providing practical field assistance to Forest Service employees throughout the country. Many of these applications are useful to other agencies, cooperators, and the public, so we like to share them.

The Nurseries and Reforestation Program at MTDC has a long tradition of providing technical assistance to nursery and reforestation employees. In the summer 2006 issue of *Native Plants Journal*, we reported on modifying the

Woodward Flail-Vac Seed Stripper to improve seed collection efficiency (Kees 2006) and thought that some of our other recent projects, large and small, may also be useful to you.

SHIELDED HERBICIDE SPRAYER



Figure 1. The MTDC shielded herbicide sprayer has adjustable spray hoods and a tiller steering system.

Nurseries find it challenging to control weeds in hardwood seedling beds because herbicides that kill weeds can also kill hardwood seedlings. MTDC was asked to devise a simple, affordable, her-



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bicide applicator that would apply glyphosate herbicide, such as Roundup, on the leaves of weeds between rows and along the edges of 4- or 5-row hardwood seedling beds. Project leader Keith Windell developed a shielded herbicide sprayer that is compatible with standard nursery tractors and is adjustable to accommodate plant and row spacing (Figure 1). The report on this project also includes information about other shielded herbicide sprayers available commercially or designed and fabricated by nurseries for their own use. Shop-quality fabrication drawings are available (Table 1). Our prototype shielded herbicide sprayer is available for physical inspection at the Augusta Forestry Center, Virginia Department of Forestry, Crimora.

ATV-MOUNTED NATIVE GRASS SEEDER



Figure 2. Truax Seed Slinger has separate hoppers for fluffy seed and for small flowable seed.

The Umatilla National Forest in Oregon asked MTDC to evaluate a seeder able to handle fluffy native grass seeds. The seeder would mount on the back of an all-terrain vehicle (ATV), and it would be used to reseed reclamation sites and old roadbeds that were decompacted with a dozer ripper. Umatilla botanist Scott Riley found an off-the-shelf product, the Truax Seed Slinger, that worked well (Figure 2). The Seed Slinger features dual seed compartments—a 1-ft³ section for fluffy seed and a 1-gal section for small flowable seed. An

auger agitator and picker wheels handle the fluffy seeds, and a 10 in (254 mm) diameter disk disperses seeds uniformly on the soil surface. An electric motor powers the agitator, picker wheels, and seed slinger disc, and the unit has universal mounting arms to fit ATV accessory racks. There was no positive shutoff to close the fluffy seed hopper, so some seeds dribbled out when the seeder was not operating. Although we used the electric model on the ATV, the Seed Slinger is also available in a handheld, hand-operated model. To lightly cover seeds as they were spread from the seeder, a flexible harrow (Figure 3) was added to the ATV. See Table 1 for more information on this project.



Figure 3. Adding a flexible harrow helps to cover the seed with soil in a one-pass operation.

TABLE 1

MTDC reports

Project title	Number	Contact person	Internet URL	Fabrication drawings	Username and password
Shielded herbicide sprayer for hardwood nursery seedling beds	0624-2827-MTDC	Keith Windell 406.329.3956 kwindell@fs.fed.us	http://www.fs.fed.us/t-d/pubs/htmlpubs/htm06242827/index.htm	http://www.fs.fed.us/t-d/dwf/MTDC-1031	t-d
ATV-mounted native grass seeder		Dick Karsky 406.329.3921 rkarsky@fs.fed.us			
Fencing out wildlife: plastic mesh fences and electric fences monitored by satellite telemetry	0424-2838-MTDC	Gary Kees 406.829.6753 gkees@fs.fed.us	http://www.fs.fed.us/t-d/pubs/htmlpubs/htm04242838/index.htm	available on request	t-d
Manual post drivers for 8- to 10-foot-long (2.4-m to 3.0-meter) metal posts	0324-2340-MTDC	Gary Kees 406.829.6753 gkees@fs.fed.us	http://www.fs.fed.us/t-d/pubs/htmlpubs/htm03242340/index.htm		t-d
Improved whitebark pine seed scarifier	0524-2331-MTDC	Andy Trent 406.329.3912 atrent@fs.fed.us	http://www.fs.fed.us/t-d/pubs/htmlpubs/htm05242331/index.htm	available on request	t-d
Reusable toweling for wrapping tree seedlings	0524-2323-MTDC	Brian Vachowski 406.329.3935 bvachowski@fs.fed.us	http://www.fs.fed.us/t-d/pubs/htmlpubs/htm05242323/index.htm		t-d

FENCING OUT WILDLIFE



Figure 4. Six ft tall (1.8 m), high-tensile steel electric fences and polyrope electric fences were charged with a battery and solar panels.

MTDC was asked to evaluate various fence materials and configurations that would exclude elk and moose from plantations, riparian areas, and aspen regeneration sites. Our goal was to design a reasonably priced fence that would last up to 8 y and be easy to install or remove when it was no longer needed. Project leader

Gary Kees led the evaluation of 3 types of fences—plastic mesh, polyrope electric, and high-tensile electric steel—near the Continental Divide between Montana and Idaho. The batteries for the electric fence were recharged using solar panels (Figure 4). We also tested the reliability and affordability of remotely monitoring electric fences. The test involved sending voltage signals by satellite and recording them on a website. In addition to the electric fences, we evaluated a 7.5 ft (2.3 m) tall plastic mesh fence at the Continental Divide site and around a moose enclosure at a lower elevation site near Philipsburg, Montana.

During 2 y of evaluation, the high-tensile steel electric fence proved to be almost maintenance free. The polyrope electric fence, installed with metal posts because of the fence's height and the heavy snow loads on the Continental Divide, sagged and shorted out many times. The plastic

mesh fence proved to be effective and reliable in both locations (Figure 5). Monitoring the electric fences remotely by satellite has not proved reliable so far, although the technology to do so continues to improve and the cost to do so is dropping. As an offshoot to this project, we evaluated methods of driving extra-long steel fence posts into the ground by



Figure 5. Plastic mesh fence, 7.5 ft tall (2.3 m), is supported by steel T-posts and high-tensile wire.

hand. Some commercial drivers are available, and we also designed one that can be easily fabricated (Figure 6). See Table 1 for obtaining information on these projects.



Figure 6. This fence-post driver designed by MTDC helps workers install 10 ft long (3 m) posts without using ladders.

WHITEBARK PINE SEED SCARIFIER



Figure 7. Seeds in the whitebark pine seed scarifier swirl across sandpaper that lines each of the four cans.

Whitebark pine (*Pinus albicaulis* Engelm. [Pinaceae]) seed germination improves dramatically if the seeds are scarified. Workers at the Forest Service's Coeur d'Alene Nursery in Idaho used scalpels to

nick each seed by hand—a slow, tedious process that sometimes resulted in the workers nicking themselves instead of the seed. Horticulturist Karen Burr thought that sanding the seeds might achieve the same result as nicking and asked MTDC to devise a machine to do so.

Project leader Andy Trent and engineer Tyler Kuhn developed a scarifier that swirls the seeds in sandpaper-lined coffee cans (Figure 7). Four cans, lined with 60-grit sandpaper, are attached to an 18 in (457.2 mm) diameter disk. An electric motor rotates the disk, while a chain-and-sprocket system keeps the orientation of the cans fixed relative to their starting position. Speeds can be adjusted from 0 to 140 revolutions per min.

High-speed photography showed that 110 revolutions per min (which corresponds to 80 on the motor's speed controller) provided the best motion to scarify the seed. After stratifying some seed samples, Karen Burr scarified the seed for differing time periods and found that 180

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min resulted in a germination rate of 72%, just lower than the 73% germination rate for handnicked seed. See Table 1. Fabrication drawings are available on request.

Although the scarifier was only evaluated for whitebark pine seed, it might be equally useful for other species that need scarification, such as legumes. Some additional testing and calibration would be needed.

REUSABLE TOWELING FOR WRAPPING TREE SEEDLINGS



Figure 8. A roll of tree seedlings wrapped in DuPont's Sontara fabric.

Traditionally, sheets of wet burlap have been used to wrap bundles of seedlings into "jelly rolls" carried in tree planters' bags. Because burlap becomes heavy when wet, holds dirt, is difficult to rinse clean, and harbors plant pathogens, it has been largely replaced with reusable sheets of polypropylene- or cellulose-based fabric, at least in the Northern Rockies and parts of the northwestern US. A once-popular product, Kimtex, is no longer being produced in the 19.5 in (495.3 mm) wide rolls preferred for tree wrapping, so MTDC was asked to evaluate other suitable and reasonably priced products.

Several fabrics and products were evaluated for absorbency, reusability, stability, and cost. No specialized product for tree wrapping was found, so we focused on products made for other purposes, such as cleaning or absorbing spills.

Spun-woven Sontara, manufactured by DuPont, worked best in our limited field evaluations (Figure 8). The Sontara class of fabrics that were most effective for wrapping seedlings were the absorbent, cellulose-based style typically used in the

cleaning industry and as disposable car-wash towels. One supplier, American Supply Corp, agreed to custom cut and stock 22-in x 200-yd (558.8-mm x 182.9-m) rolls of the material for orders from the Forest Service. We also discovered that Nu-Towel Blue car-wash towels are made of the same material and offer an alternative as long as the precut, unfolded, 22-in x 24-in (558.8-mm x 609.6-mm) sheets are the right size for the seedling stock. Our field evaluators found them to be about 6 in (152.4 mm) too short for the jelly-roll size they prefer. See Table 1 for obtaining project information.

PLEASE VISIT US ON THE INTERNET

We encourage you to visit our Internet site (URL: <http://www.fs.fed.us/eng/t-d.php>), where you can find detailed reports about most of these projects, plus others that have been completed in the past. Our Internet site provides access to fabrication drawings for nursery equipment that has been developed over many years (URL: <http://www.fs.fed.us/t-d/dwf/nurseries> [username and password: t-d]). Of course, we also welcome your telephone calls and e-mail inquiries (Missoula Technology and Development Center, Missoula, Montana; 406.329.3900). Paper copies of our reports and drawings are available on request.

OTHER USEFUL CONTACT INFORMATION AND INTERNET SITES

Autodesk® DWF™ Viewer.
URL: <http://usa.autodesk.com/adsk/servlet/index?siteID=123112&id=2404513>

Truax Company
4300 Quebec Avenue North,
New Hope, Minnesota 55428;
763.537.8353.
URL: <http://www.truaxcomp.com>

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