Engineering Tech Tips

United States Department of Agriculture
Forest Service
Technology & Development Program
September 2004
7100 0471–2335–MTDC

Shredding Small Trees To Create Mulch for Erosion Control

James "Scott" Groenier, Project Leader, and Charlie Showers, Program Leader

The USDA Forest Service needs to reduce erosion during road construction, road removal, site restoration, fire rehabilitation, and in other situations. In addition, trees cleared from road rights-of-way need to be burned or chipped to reduce fire hazard. The USDA Forest Service's Technology and Development Program was asked to determine whether small-diameter trees cleared from road rights-of-way could be shredded and used as a mulch for erosion control. Generally the trees being shredded are smaller than 6 inches in diameter, although the equipment reviewed can shred much larger trees.

Wood shavings, shredded wood, and excelsior were considered as alternatives to chips for erosion control. Shredding may be the best alternative because shredding machines can handle the soil and rocks found in slash material and because bark does not have to be removed from the slash. The long fibers of shredded wood interlock, helping the shredded wood stay in place. Because shredded wood (figure 1) is heavier than straw or hay, it does not need to be crimped into the soil to keep it from blowing away.

Figure 1—This burned slope on the Clearwater National Forest was mulched using shredded trees that had been removed to reduce hazardous fuels.

Using Shredded Wood for Erosion Control

A few reasons for using shredded wood for erosion control include:

- Straw and hay bales used for erosion control have to be certified "weed free." Trees shredded onsite won't introduce new weeds or require the expense of certification.
- Material cleared from rights-of-way can be mulched instead of burned, reducing air quality concerns.
- Using small-diameter material as mulch will reduce hazardous fuels.
- Pine cones ground up in the shredded material may reseed roadway fills and burned areas.
- Shredding may be an alternative to chipping small-diameter material during thinning projects to reduce fire hazard in urban-wildland interface areas.
- The cost of transporting hay and straw bales could be eliminated.

Shredding Equipment Reviewed

We looked for shredders or grinders in the Missoula, MT, area that could produce shreddings from $\frac{1}{6}$ to $\frac{1}{8}$ inch thick, $\frac{1}{4}$ to 2 inches wide and 8 to 16 inches long. The shredder had to be portable and mounted on tracks to reduce the pressure on the ground, limiting soil compaction. Three machines that met our criteria were: a Bandit 3680, a Rawlings Manufacturing Grinder, and a Universal Refiner PDR–80–63.

For additional information, contact: *Scott Groenier, project leader; USDA Forest Service, MTDC; 5785 Hwy. 10 West; Missoula, MT 59808–9361. Phone: 406–329–4719; fax: 406–329–3719; e-mail: jgroenier@fs.fed.us*

Here is some information about each of those machines:

Bandit 3680 with Blower—The Bandit 3680 (figures 2 and 3) is a remote-controlled cutter head grinder with a 560-horsepower engine mounted on Caterpillar 325 hydraulic tracks. The shredder is remotely operated from a track-mounted excavator with a grapple head. The grapple drops trees into the shredder. The 62-horsepower centrifuge blower, an optional attachment, distributes the shredded wood. Buttons on the side of the grinder control the blower's direction. If the blower is removed, the conveyor belt can be used to pile material for storage.

Owner: Johnson Brothers Contracting, Inc.

Web site: *http://www.banditchippers.com/*

Contact: Craig Thomas 406–543–5355

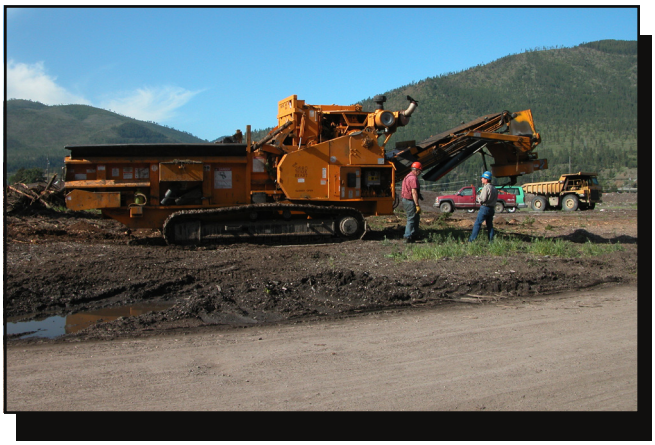

Figure 2—The Bandit 3680 was used to shred small-diameter material during a demonstration at Bonner, MT.

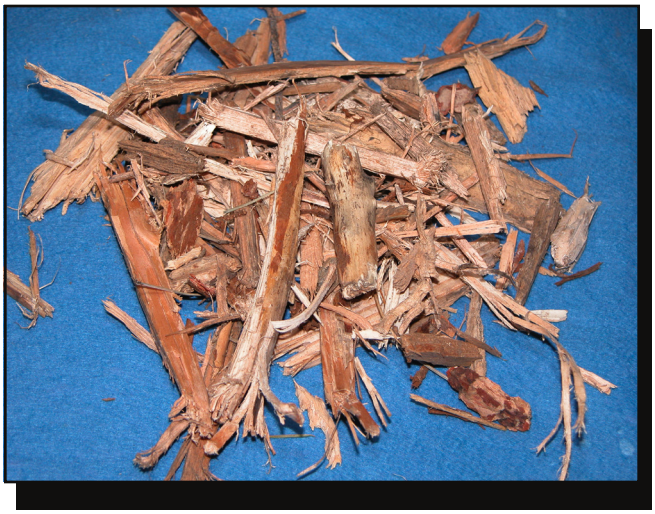

Figure 3—Sample shreddings from the Bandit 3680.

Wastepro 460HZX with Conveyor Belt—The Wastepro 460HZX (figures 4 and 5) is remote controlled with an 800-horsepower horizontal grinder. Although this machine normally is mounted on wheels, Rawlings Manufacturing, Inc., of Missoula, MT, is modifying their machine so it can be mounted on tracks. The method of operation would resemble that described for the Bandit 3680.

Owner: Rawlings Manufacturing, Inc.

Web site: *http://www.rawlingsmanufacturing.com/*

Contact: John Rawlings 406–728–6182

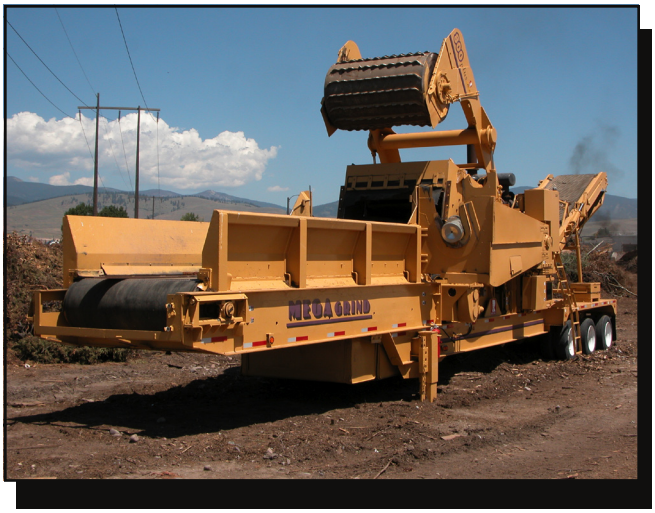

Figure 4—The Wastepro 460HZX manufactured by Rawlings Manufacturing. Although this machine is on wheels, it can be mounted on tracks.

Figure 5—Sample shreddings from the Rawlings Wastepro 460HZX.

Universal Refiner PDR–80–63 with Conveyor Belt— The Universal Refiner PDR-80-63 (figures 6 and 7) is a fully remote-controlled belt-driven grinder with a 475-horsepower engine mounted on hydraulic tracks. The method of operation would resemble that described for the Bandit 3680.

Owner: Fire Solutions, Inc.

Web site: *http://www.universalrefiner.com/default.htm*

Contact: Levi Cheff 406–728–1890

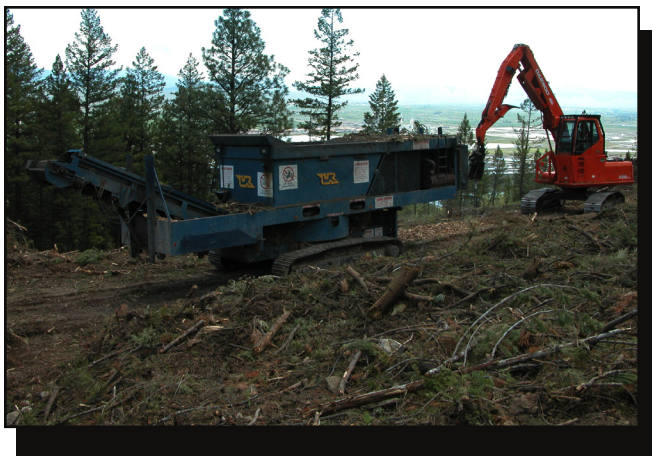

Figure 6—The Universal Refiner PDR–80–63 being used near Missoula, MT.

Figure 7—Sample shreddings from the Universal Refiner PDR–80–63.

Clearwater National Forest Right-of-Way Cleanup— During the fall of 2003, material removed from the right-of-way on the Granite Pass Road (595) in the Clearwater National Forest was shredded for mulch. Johnson Brothers Contracting, Inc., used the Bandit 3680 with a blower attachment to spread the shredded material.

The Clearwater National Forest personnel were pleased with the project. The Bandit 3680 shredded a giant windrow of small trees (figures 8 and 9) that fire crews had piled alongside the road. The shredded material was blown up to

Figure 8—Hazardous fuel piled along the shoulder of the Granite Pass Road on the Clearwater National Forest.

Figure 9—The hazardous fuel has been removed from the shoulder of the Granite Pass Road, shredded, and applied as mulch along the roadside.

50 feet onto cut slopes (figure 10) and into the woods on both sides of the road. The layer of shredded material (figure 11) was thin, which prevented it from suffocating the existing vegetation. Neither the shredder nor the track hoe damaged the surface of the Granite Pass Road.

For more information on this project, contact Clearwater National Forest employee Karen Smith (208–935–4252, e-mail: *kasmith03@fs.fed.us*) or Johnson Brothers Contracting, Inc., employee Craig Thomas (406–543–5355).

Figure 10—The Bandit 3680 shredding material to mulch a side slope on the Granite Pass Road.

Figure 11—The side slope after mulching was completed.

Future Work

Now that we have identified three machines that meet our specifications or that can be modified to meet them, we will be looking at collection and distribution systems for the shredded material. The collection system will use nets, bins, bales, or some other system that can transport shredded material. We also will consider distribution systems that can place the material at the site.

Additional Shredding Machines

Manufacturers that make recyclers, grinders, or shredders that meet our requirements or that could be modified to meet our requirements to manufacture shredded wood include:

Bandit Industries, Web site: *http://www.banditchippers.com/*

Morbark, Inc., Web site: *http://www.morbark.com/*

Rawlings Manufacturing, Inc.
Web site: *http://www.rawlingsmanufacturing.com/*

Trelan, Web site: *http://www.trelan.com/*

Vermeer Manufacturing Co.
Web site: *http://www.vermeer.com/*

Wood/Chuck Chipper Corp.
Web site: *http://www.woodchuckchipper.com/menupage.htm*

Peterson Pacific Corp.
Web site: *http://www.petersonpacific.com/index.htm*

Precision Husky Corp.
Website: *http://www.precisionhusky.com/*

Universal Refiner Corp.
Web site: *http://www.universalrefiner.com/default.htm*

Additional Information

For a more complete listing of mulchers, grinders, and shredders (also known as masticators), refer to the *Understory Biomass Reduction Methods and Equipment Catalog* (0051–2826–MTDC, *http://www.fs.fed.us/eng/t-d.php?link=pubs*, search for *catalog*).

The Rocky Mountain Research Station is investigating using wood strands (4 to 16 millimeters wide and 60, 120, or 240 millimeters long) as an alternative to straw for erosion control. During laboratory tests, the wood strands were statistically equal to straw in reducing runoff and sediment production. See *Wood Strands as an Alternative to Agricultural Straw for Erosion Control* (0423–1302P–SDTDC, *http://www.fs.fed.us/eng/pubs/html/04231302/04231302.html*).

About the Authors

James "Scott" Groenier, professional engineer, began working for MTDC as a project leader in 2003. Scott earned a bachelor's degree in civil and environmental engineering from the University of Wisconsin at Madison and a master's degree in civil engineering from Montana State University. He worked for the Wisconsin and Illinois State Departments of Transportation and with an engineering consulting firm before joining the USDA Forest Service in 1992. He worked as the east zone structural engineer for the Eastern Region and as a civil engineer for the Ashley and Tongass National Forests before coming to MTDC.

Charlie Showers, professional engineer, became engineering program leader at MTDC in the spring of 2002 after serving 2 years as operations program leader. Charlie came to MTDC after 9 years as assistant forest engineer on the Payette National Forest. He began his USDA Forest Service career on the Boise National Forest after completing 8 years as a construction project engineer with the Idaho Transportation Department.

Library Card

Groenier, James Scott; Showers, Charlie. 2004. Shredding Small Trees To Create Mulch for Erosion Control. Tech Tip 0471–2335–MTDC. Missoula, MT: U.S. Department of Agriculture, Forest Service, Missoula Technology and Development Center. 6 p.

Describes the use of shredded wood as mulch for erosion control. The U.S. Department of Agriculture Forest Service clears trees from road rights-of-way. These small trees (6 inches in diameter and smaller) represent a fire hazard and must be chipped or burned. Shredding the trees and spraying the shredded material on adjacent roadsides might provide a good use for the trees. Wood shredded onsite and used for erosion control wouldn't introduce noxious weeds from other areas as could hay or straw used for erosion control. Hay and straw used for such purposes must be certified as free of weeds. Even then, the hay or straw might introduce weeds. The tech tip briefly discusses three shredding machines and describes a successful project on the Clearwater National Forest in which small trees piled along the Granite Pass Road were shredded and sprayed as a mulch along the roadside.

Keywords: equipment, rights of way, rights-of-way, roads, roadsides, shredders, straw, utilization

---

Single copies of this document may be ordered from:
USDA Forest Service, MTDC
5785 Hwy. 10 West
Missoula, MT 59808–9361
Phone: 406–329–3978
Fax: 406–329–3719
E-mail: wo_mtdc_pubs@fs.fed.us

Electronic copies of MTDC's documents are available on the Internet at:
http://www.fs.fed.us/eng/t-d.php?link=pubs

For additional information about shredding trees to create mulch for erosion control, contact Scott Groenier at MTDC.
Phone: 406–329–4719
Fax: 406–329–3719
E-mail: jgroenier@fs.fed.us

Forest Service and Bureau of Land Management employees can search a more complete collection of MTDC's documents, videos, and CDs on their internal computer networks at:
http://fsweb.mtdc.wo.fs.fed.us/search