



Using Scarification, Wood Shreddings, and Seeding To Rehabilitate Disturbed Sites

James Scott Groenier, MTDC Project Leader, and Arne "Skip" Rosquist, Hydrologist, Lolo National Forest

The Lolo National Forest asked the Missoula Technology and Development Center (MTDC) for suggestions about mitigating soil compaction at a hot, dry area that was salvage logged during 2004 after a 2003 wildland fire. By 2005, the area had compacted soils, piled wood waste, and very little vegetation (figure 1).

Highlights...

- Soil compaction can occur during fire activities and salvage logging.
- Hot, dry areas burned by wildland fires may benefit from a combination of scarification (loosening of compacted soil) and application of wood shavings, followed by fertilization and seeding.
- This tech tip includes photographs of four sites that were salvage logged at the Lolo National Forest in Montana. Three sites were rehabilitated and one site was not rehabilitated.



Figure 1—Before rehabilitation, site 1 had compacted soils, piled wood waste, and little vegetation.

Logging skid trails and landings were rehabilitated on a portion of the salvage project. Treated sites were on a relatively flat, broad ridge oriented east to west. Soils are volcanic ash-influenced loess (fine, windblown silt) overlaying weakly weathered metasedimentary rocks. The area, which is at 5,400 feet elevation, receives an average of about 40 inches of water per year, primarily as snow. Natural vegetation is mixed forest, dominated by lodgepole pine and western larch.

This project provides a nonscientific assessment for land managers. It shows the results of combining light scarification, shredding, fertilization, and seeding for rehabilitating compacted sites. Controlled scientific studies would be needed to confirm these results.



Rehabilitation Methods

A trackhoe with a slash-buster mechanical head and thumb attachments (figure 2) was used to rehabilitate the sites. The trackhoe was selected because its thumb could scarify the top 3 to 4 inches of compacted soil and spread the



Figure 2—A Komatsu trackhoe with a slash-buster mechanical head and thumb attachments was used for rehabilitation.

woody debris. The trackhoe's slash-buster mechanical head shredded the woody debris. The target shredding coverage rate was about 60 to 70 percent. That coverage would provide adequate cover for erosion control while allowing grass to grow in the openings. After the wood was shredded, the sites were fertilized and seeded with a mixture of grasses.

The decision to use wood shreddings for erosion control was based on the assumption that:

1. Woody material was readily available for shredding.
2. Wood shreddings provide shade and help keep soil temperatures cooler.
3. Shade and cooler soil temperatures help retain soil moisture.
4. Wood shreddings prevent the wind from drying out the soil and blowing away seeds.
5. Seed germination would increase because of assumptions 3 and 4.

Additional information on wood shreddings and erosion control is available in tech tips by Groenier and others (2005) and Groenier and Showers (2004).

Test sites were photographed before rehabilitation in 2005 (figure 3), after rehabilitation (figure 4), after two growing seasons (2007, figure 5), and after three growing seasons (2008, figure 6).



Figure 3—Site 2 before rehabilitation.



Figure 4—Site 2 after rehabilitation was complete.



Figure 5—Site 2 after two growing seasons.



Figure 6—Site 2 after three growing seasons.

Results

The sites were visited in 2007 and 2008, allowing several growing seasons for vegetation to become established. The results are evident in photographs taken of site 3 (figures 7, 8, and 9) and of site 1 (figures 10, 11, 12,

and 13) before and after rehabilitation. Plants did not grow as well in the wheel tracks because compaction was deeper. More scarification would be needed to break up compaction in these places. Some places were covered completely with wood shavings, which hindered grass growth.



Figure 7—Site 3 before wood shredding.



Figure 8—Site 3 after two growing seasons.



Figure 9—Site 3 after three growing seasons.



Figure 10—Site 1 before rehabilitation.



Figure 11—Site 1 after wood shredding was completed.



Figure 12—Site 1 after two growing seasons.



Figure 13—Site 1 after three growing seasons.

An adjacent site that had burned during the same fire and was logged at the same time was not rehabilitated. That site was photographed in 2008 (figure 14).



Figure 14 – An untreated site adjacent to the test sites shows lack of revegetation 4 years after salvage logging.

Summary

The anecdotal evidence shows that using wood shavings for controlling erosion and rehabilitating compacted soils shows promise. All compacted areas need to be scarified and protected with wood shavings for rehabilitation to be fully successful.

References

Groenier, James “Scott”; Foltz, Randy; Showers, Charles. 2005. Using rainfall simulators to test wood shavings for erosion control. Tech Tip 0571–2329–MTDC. Missoula, MT: U.S. Department of Agriculture Forest Service, Missoula Technology and Development Center. 6 p.

Groenier, James “Scott”; Showers, Charles. 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.



About the Authors

James Scott Groenier began working for MTDC in November 2003 as a civil engineering project leader. Groenier earned a bachelor's degree from the University of Wisconsin at Madison and a master's degree from Montana State University. He worked for the Wisconsin and Illinois State Departments of Transportation before beginning his Forest Service career as the east zone structural engineer for the Eastern Region. Later, he became a civil engineer for the Ashley and Tongass National Forests.

Arne "Skip" Rosquist began working as the forest hydrologist for the Lolo National Forest in 1997. Rosquist received a bachelor's degree in aerospace engineering from Virginia Polytechnic Institute and State University. After spending 5 years in the U.S. Air Force, he earned a master's degree in watershed science from Utah State University. He worked for the Atomic Energy Commission as an environmental engineer and for the Forest Service's Rocky Mountain Region as a water quality hydrologist.



Acknowledgments

MTDC would like to thank Susan LeVan of the Forest Service's Forest Products Laboratory for funding this project.



Library Card

Groenier, James Scott; Rosquist, Arne "Skip." 2008. Tech Tip 0871-2346-MTDC. Using scarification, wood shreddings, and seeding to rehabilitate disturbed sites. Missoula, MT: U.S. Department of Agriculture, Forest Service, Missoula Technology and Development Center. 8 p.

This tech tip includes photos of three sites that were burned by a wildland fire during 2003 and salvage logged during 2004. Soils were compacted at the hot, dry sites, making revegetation difficult. During 2005, a trackhoe with a slash-buster mechanical head and thumb attachments was used to scarify the top 3 to 4 inches of compacted soil and to shred woody debris left at the sites. The sites were fertilized and seeded. Photos show the vegetation recovery at three rehabilitated sites after several growing seasons and the lack of recovery at a similar site that was not rehabilitated.

Keywords: biomass, compaction, reforestation, rehabilitation, scarification, trackhoes



For additional information about wood shreddings, contact Scott Groenier at MTDC:

USDA Forest Service, Missoula Technology and Development Center

5785 Hwy. 10 West

Missoula, MT 59808-9361

Phone: 406-329-4719

Fax: 406-329-3719

E-mail: jgroenier@fs.fed.us

Electronic copies of MTDC's documents are available on the Internet at:

<http://www.fs.fed.us/eng/t-d.php>

Forest Service and Bureau of Land Management employees can search a more complete collection of MTDC's documents, CDs, DVDs, and videos on their internal computer networks at:

<http://fsweb.mtdc.wo.fs.fed.us/search/>



The Forest Service, United States Department of Agriculture (USDA), has developed this information for the guidance of its employees, its contractors, and its cooperating Federal and State agencies, and is not responsible for the interpretation or use of this information by anyone except its own employees. The use of trade, firm, or corporation names in this document is for the information and convenience of the reader, and does not constitute an endorsement by the Department of any product or service to the exclusion of others that may be suitable.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.