MOUNTAIN PINE

MANUFACTURING

WWW.MPINEM.COM

Benefits of Woodstraw – VIDEO

WoodStraw® vs. Hydromulch

WOODSTRAW® really is a powerful new technology.

In field testing and project sites it is impressive how much better WoodStraw® is performing than traditional products.

Scientific Testing

A number of studies have been performed/written looking at the effectiveness of WoodStraw for erosion control.

View these studies on our website mpinem.com

Lets look at a few interesting or unique findings ...

Catena Study

that the contribution of the treatment mulch to total ground cover varied by mulch type over time. The wood strand mulch was the most long-lived of the mulch treatments and was observed in ground cover assessments throughout the study period (4 and 7 years) at two fires. The wheat straw mulch decreased nearly twice as fast as the wood strand mulch, and no hydromulch was detected after the first post-fire year on either fire where it was tested.

Mulch treatment effectiveness varied when data were analyzed separately for each fire. Wood strand mulch reduced sediment yields at both fires where it was tested, wheat straw mulch reduced sediment yields at 2 of the 4 fires where it was applied, and the hydromulch tested at 2 fires did not reduce sediment yields on either. When data were normalized and analyzed by treatment across all fires, wood strand mulch reduced sediment yields for the first four post-fire years, but wheat straw mulch and hydromulch did not significantly reduce sediment yields in any post-fire year. The greater variability in the combined data resulted in fewer statistically significant treatment effects being observed as compared to the individual fire analyses. We believe the fire-specific results pro-

ments for post-fire erosion mitigation. Hubbert et al. (2012) studied hydromulch effectiveness in decreasing hillslope sediment yields following the 2003 Cedar fire in southern California. Hillslope plots were established on two soil types in areas burned at high severity. The ground cover provided by the hydromulch decreased rapidly and was mostly gone within months of its application; no effect on sediment yields was detected (Hubbert et al., 2012). In a study done after the 2002 Hayman fire in central Colorado, Rough (2007) established paired swales up to 0.5 ha in size on hillslopes burned

that the contribution of the treatment mulch to total ground cover varied by mulch type over time. The wood strand mulch was the most long-lived of the mulch treatments and was observed in ground cover assessments throughout the study period (4 and 7 years) at two fires. The wheat straw mulch decreased nearly twice as fast as the wood strand mulch, and no hydromulch was detected after the first post-fire year on either fire where it was tested.

Mulch treatment effectiveness varied when data were analyzed separately for each fire. Wood strand mulch reduced sediment yields at both fires where it was tested, wheat straw mulch reduced sediment yields at 2 of the 4 fires where it was applied, and the hydromulch tested at 2 fires did not reduce sediment yields on either. When data were normalized and analyzed by treatment across all fires, wood strand mulch reduced sediment yields for the first four post-fire years, but wheat straw mulch and hydromulch did not significantly reduce sediment yields in any post-fire year. The greater variability in the combined data resulted in fewer statistically significant treatment effects being observed as compared to the individual fire analyses. We believe the fire-specific results pro-

USDA Nitrogen Study

USDA United States Department of Agriculture

Post-Fire Erosion Control Mulches Alter Belowground Processes and Nitrate Reductase Activity of a Perennial Forb, Heartleaf Arnica (*Arnica cordifolia*)

Erin M. Berryman, Penelope Morgan, Peter R. Robichaud,
and Deborah Page-Dumroese

Abstract

Four years post-wildfire, we measured soil and plant properties on hillslopes treated with two different mulches (agricultural wheat straw and wood strands) and a control (unmulched, but burned). Soil total N was about 40% higher and microbial respiration of a standard wood substrate was nearly twice as high in the mulched plots compared to the unmulched plots. Greater respiration was tied to increased substrate moisture underneath mulch compared to bare soil. Nitrate reductase activity of a common forb (Arnica cordifolia) was about 30% higher on the wood strand plots than either the wheat straw or the unmulched plots. Mulch applications after wildfire may enhance N availability by increasing soil moisture, promoting microbial N mineralization, or by increasing biological nitrogen fixation. Because inference is limited for this case study, we call for additional replicated experiments investigating effects of mulch treatments on soil carbon and nitrogen cycling with links to plant regeneration.

Keywords: *soil rehabilitation, restoration, fire effects, respiration, nitrogen*

Berryman, Erin M.; Morgan, Penelope; Robichaud, Peter R.; Page-Dumroese, Deborah. 2014. **Post-fire erosion control mulches alter belowground processes and nitrate reductase activity of a perennial forb, heartleaf arnica (*Arnica cordifolia*)**. Res. Note RMRS-RN-69. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 10 p.

Table 1—Average soil characteristics under the two mulch treatments and the unmulched control 4 years following wildfire and mulch application on the School Fire, eastern Washington.

Site treatment	pH	Organic Matter	Carbon	Nitrogen
		Percent		
Wheat straw	6.6 (0.18)[a]	7.5 (1.8)	3.07 (0.91)	0.184 (0.036)a
Wood strands	6.4 (0.03)	8.3 (0.4)	3.40 (0.27)	0.224 (0.020)a
Burned control	6.8 (0.13)	5.7 (0.1)	2.39 (0.12)	0.158 (0.011)b

[a] Values in parentheses are standard error of the mean. Different letters within a single column indicate significantly different treatment effects (*P* < 0.01; n = 3 composite samples).

the amount of N added by mulch may have exceeded that lost during the fire. Original aerial mulch application rates for the School Fire are estimated at 2.2 Mg ha^{-1} for wheat straw and 4.5 Mg ha^{-1} for wood straw, which would have potentially added 1.89 and 0.75 g N m^{-2} to the soil surface. Comparatively, forest floor N loss from burned forests in the Inland Northwest may range from 7.7 to 20.9 g N m^{-2} (Page-Dumroese and Jurgensen 2006), suggesting that organic N delivered via mulch may offset 10 to 25% of wildfire losses from the forest floor. However, this effect depends strongly on mulch decomposition and incorporation rates of N into the mineral soil. Future work needs to characterize decomposition rates of mulch in order to understand the potential contribution of mulch-derived N to mineral soil N. Replacing fire-induced losses of organic N via mulch may increase substrate for N mineralization, aiding forest productivity, influencing plant regeneration and ecosystem recovery (Pastor et al. 1984; Chapin and Matson 2011). The fate of mulch-delivered N in post-fire ecosystems needs to be fully assessed, together with the erosional mitigation impact of mulching on post-fire N retention and potential effects of mulch on BNF inputs.

1 *

Mulch cover reduces soil water evaporation and affects soil aggregate stability and porosity, thereby changing nutrient and water relations within the soil profile (Mulumba and Lal 2008). By increasing substrate moisture at a time when it would otherwise be low (typical of late summers in the Inland Northwest), surface mulch applications create an environment that promotes soil microbial activity, thereby altering long-term soil sustainability through the breakdown of OM, nutrient flux control, soil C sequestration, decomposition, mineralization, and immobilization (Nannipieri et al. 2003). Microbial turnover of soil C, measured as respiration from buried loblolly pine stakes, strongly co-varied with stake moisture content (Figure 1, Table 2). All stakes with moisture contents in the top 50th percentile were harvested from mulched areas rather than from the control. Thus, lower moisture in the control plots probably restricted microbial respiration there. Our results suggest that by altering the soil environment surrounding microorganisms, surface mulch applications may alter soil nutrient transformations with potential feedbacks to vegetation. Future work should resolve mulch effects on soil temperature as well as moisture effects in areas with different climate regimes.

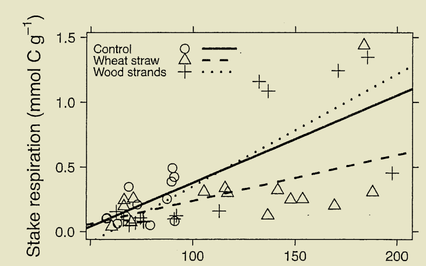


Figure 1—Stake respiration (mmol C g^{-1}) as related to stake moisture content (% w/w) at the time of stake retrieval 17 June 2009, with least squares linear regression lines for each mulched hillslope.

moisture at a time when it would otherwise be low (typical of late summers in the Inland Northwest), surface mulch applications create an environment that promotes soil microbial activity, thereby altering long-term soil sustainability through the breakdown of OM, nutrient flux control, soil C sequestration, decomposition, mineralization, and immobilization (Nannipieri et al. 2003). Microbial turnover of soil C, measured as respiration

USDA United States Department of Agriculture

Post-Fire Erosion Control Mulches Alter Belowground Processes and Nitrate Reductase Activity of a Perennial Forb, Heartleaf Arnica (*Arnica cordifolia*)

Erin M. Berryman, Penelope Morgan, Peter R. Robichaud, and Deborah Page-Dumroese

Abstract

Four years post-wildfire, we measured soil and plant properties on hillslopes treated with two different mulches (agricultural wheat straw and wood strands) and a control (unmulched, but burned). Soil total N was about 40% higher and microbial respiration of a standard wood substrate was nearly twice as high in the mulched plots compared to the unmulched plots. Greater respiration was tied to increased substrate moisture underneath mulch compared to bare soil. Nitrate reductase activity of a common forb (Arnica cordifolia) was about 30% higher on the wood strand plots than either the wheat straw or the unmulched plots. Mulch applications after wildfire may enhance N availability by increasing soil moisture, promoting microbial N mineralization, or by increasing biological nitrogen fixation. Because inference is limited for this case study, we call for additional replicated experiments investigating effects of mulch treatments on soil carbon and nitrogen cycling with links to plant regeneration.

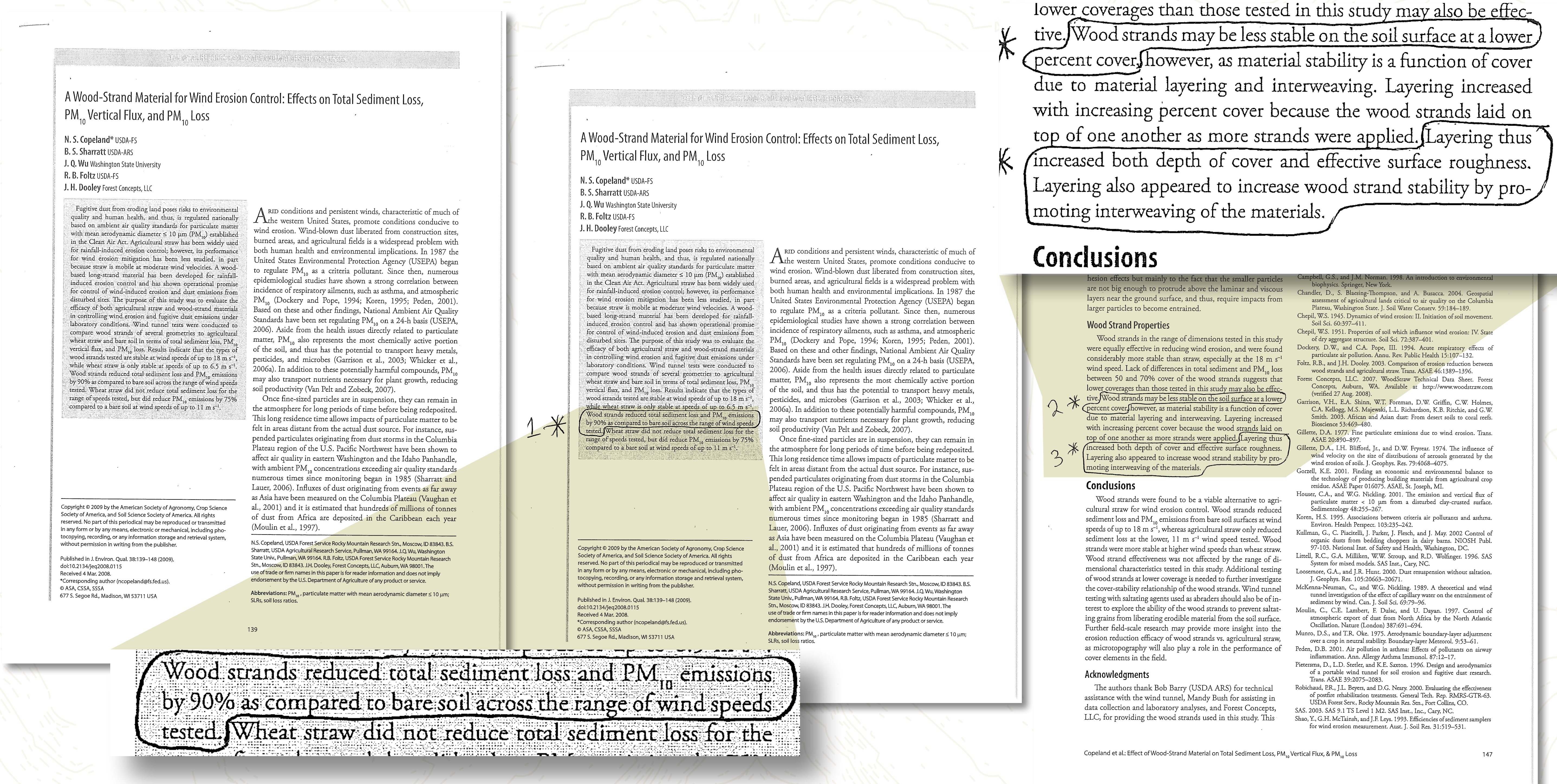
Keywords: *soil rehabilitation, restoration, fire effects, respiration, nitrogen*

Berryman, Erin M.; Morgan, Penelope; Robichaud, Peter R.; Page-Dumroese, Deborah. 2014. **Post-fire erosion control mulches alter belowground processes and nitrate reductase activity of a perennial forb, heartleaf arnica (*Arnica cordifolia*)**. Res. Note RMRS-RN-69. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 10 p.

2 *

Soil total N was about 40% higher and microbial respiration of a standard wood substrate was nearly twice as high in the mulched plots compared to the unmulched plots. Greater respiration was tied to increased substrate moisture underneath mulch compared to bare soil. Nitrate reductase activity of a common forb (Arnica cordifolia) was about 30% higher on the wood strand plots than either the wheat straw or the unmulched plots. Mulch applications after wildfire may enhance N availability by increasing soil moisture, promoting microbial N mineralization, or by increasing biological nitrogen fixation. Because inference is limited for this case study, we call for additional replicated experiments investigating effects of mulch treatments on soil carbon and nitrogen cycling

Wind Study



A Wood-Strand Material for Wind Erosion Control: Effects on Total Sediment Loss, PM_{10} Vertical Flux, and PM_{10} Loss

N. S. Copeland* USDA-FS
B. S. Sharratt USDA-ARS
J. Q. Wu Washington State University
R. B. Foltz USDA-FS
J. H. Dooley Forest Concepts, LLC

1 * Wood strands reduced total sediment loss and PM_{10} emissions by 90% as compared to bare soil across the range of wind speeds tested. Wheat straw did not reduce total sediment loss for the

lower coverages than those tested in this study may also be effective. 2 * Wood strands may be less stable on the soil surface at a lower percent cover, however, as material stability is a function of cover due to material layering and interweaving. Layering increased with increasing percent cover because the wood strands laid on top of one another as more strands were applied. 3 * Layering thus increased both depth of cover and effective surface roughness. Layering also appeared to increase wood strand stability by promoting interweaving of the materials.

Conclusions

Coverage Rate or % Ground Cover

THE MANUFACTURER OF WOODSTRAW® STRONGLY RECOMMENDS A RATE OF 70% GROUND COVER

- Flat Ground
- Moderate 3:1 Slopes
- Steep Slopes

DON'T SKIMP ON COVERAGE

Very important to get adequate cover for reducing sedimentation

Just as important to insure moisture retention

Finally, coveriage is important to ensure protection from wind so it keeps both the WoodStraw® in site as well as revent dust and particulates, and preventing soil loss due to wind.

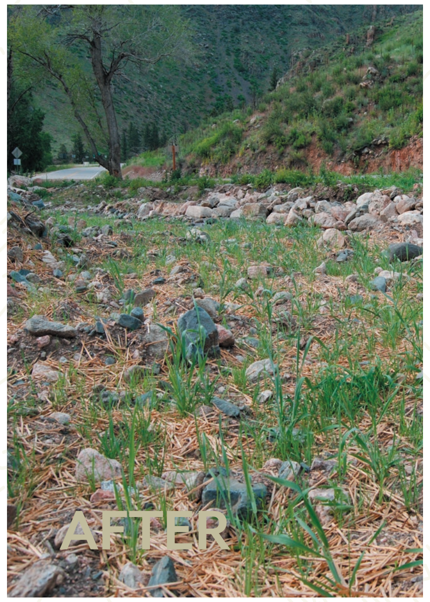
You are buying a premium product, usually for steep slopes. Buying WoodStraw® because Agricultural straw doesn't work, Hydromulch does not last long enough and Rolled Erosion Blankets are too elxensive and too slow.

Tons per acre is not a proper method. A bale can weigh 20 lbs. or up to 85 lbs. depending on water content in the wood particles.

CDOT | Highway 40 – Before and After:

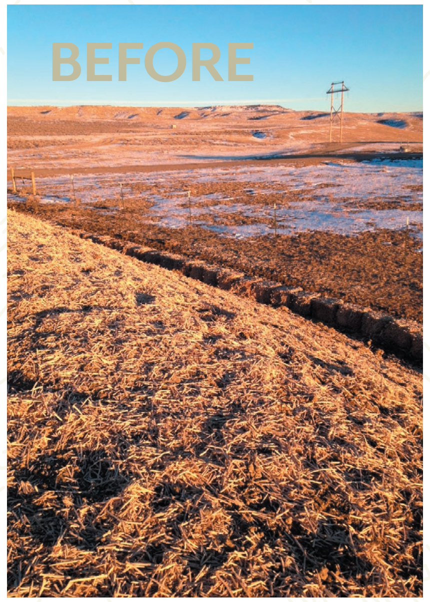
Seneca Channel – Before and After:

Skin Gulch – Before and After:



Black Forest – Before and After:

Oil Pad | Gillette WY – Before and After:



Technical Specs.

Now that you understand the true value of WoodStraw®

Ready to make the change to a better product?

You have a high-value land with steep slopes and you need an erosion control solution that really works and stands the test of time.

LET'S SPEC WOODSTRAW® ON YOUR NEXT PROJECT

MOUNTAIN PINE

MANUFACTURING

Gus Connelly

DIRECTOR OF SALES

970-367-6111

gus@mpinem.com

Trent Jones

PRESIDENT

970-846-5719

trent@mpinem.com

WWW.MPINEM.COM