

Engineered wood strand erosion control mulch - technical and performance update from 20 years of use



Jim Dooley, Trent Jones, Matt King

Forest Concepts, LLC, Auburn, WA

Mountain Pine Mfg., Craig, CO

Heartwood Biomass, Wallowa, OR

What is Engineered Wood Strand Mulch?

Engineered Wood Strand Mulch is a blend of loose thin wood pieces that are geometrically regular in shape and have a straw like form and function. The long strand material forms a protective matrix when distributed over the soil and helps prevent erosion and promotes revegetation.

Length: 2.5 inch to 10 inch

Width: 3/16th inch

Thickness: 1/10th to 1/7th inch



Traditional Erosion Control Products



Ag Straw



Rolled Erosion Blankets



Hydro Mulch

Why the need for a new mulch?

In 2002, US Forest Service called for development of an all-wood alternative to agricultural straw for use on FS lands for road and culver projects, abandoned mine lands (AML) restoration, and wildfire sites.

Ag straw was widely used for erosion control and revegetation mulch –

BUT WITH LOTS OF PAIN POINTS

- Noxious and farm weeds
- Short functional life – 3 months to 2 years
- Not wind stable – blows away at less than 15 mph
- Mats to prevent broadleaf seedlings from emerging
- Absorbs and evaporates rainfall during spring/summer showers
- Dusty during application by hand or blowers

Development partnership



Forest Concepts proposed a wood-strand analog of straw that addressed known issues with straw mulch

- USDA NIFA SBIR program supported Forest Concepts
- US Forest Service provided support to their RMRS erosion research lab in Moscow, ID to support Forest Concepts
- Interagency BAER team leaders from FS, BLM, NPS, DOD... provided guidance
- Washington Technology Center supported wind erosion research at Washington State University
- USDA ARS contributed use of their soil wind tunnel at Pullman, WA
- Plus, many public and private landowners contributed test sites across the West

Design objectives for wood-strand mulch

Functional and Engineering Design Objectives

- Intercept rainfall – reduce rain drop impact soil mobilization
- Increase infiltration – create mini check-dams to pond water
- Trap & store sediment – physical matrix with high ground contact
- Stop rill formation & growth – minimize flow length before obstacles
- Create soil organic matrix as it decays – readily colonized by microbes
- Trap seed & provide seed bed – airborne seed fall and sediment cover
- Enable seedling emergence – no crusting potential and open matrix
- Reduce surface wind velocity – wind-stable 3-5 strand matrix above soil
- Wind-stable to 35mph – stable at maximum 2-day wind event in Interior
- Applicable to steep slopes – stable on 30% slope with 2 in/hr rainfall
- Last 4 years in Western U.S. – slowly colonized and decay by organisms
- Inherently weed-free and without chemical additives – meet USDA BioPreferred criteria



OBTW* - Additional objectives for wood-strand mulch

Functional Objectives

- Intercept rainfall
- Reduce soil mobilization
- Increase infiltration
- Trap & store sediment
- Stop rill formation & growth
- Create soil organic matrix
- Trap seed & provide seed bed
- Enable seedling emergence
- Reduce surface wind velocity
- Wind-stable to 35mph
- Applicable to steep slopes
- Last 4 years in Western U.S.

Operational Objectives

- Pure wood material – no additives
- Bale, truck, and handle like straw mulch
 - 50 lb bale and 600 lb bale
- Apply by straw blowers, hand, helimulch
- Store and apply wet or dry
- Palletized for handling



* OBTW – Oh, by the way...

Material design experiments

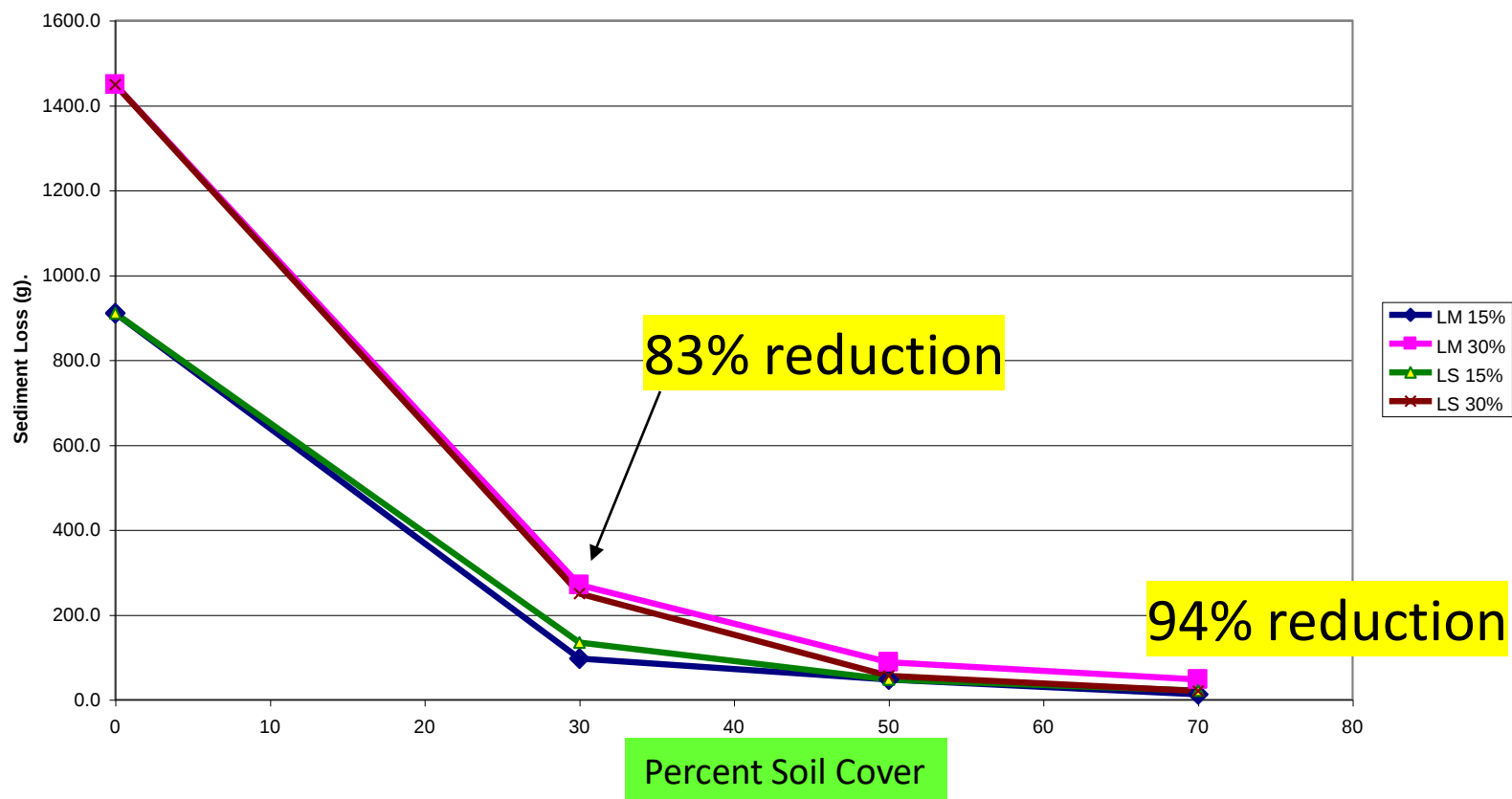
- Wood Strand Blends (152 experiments at USFS Moscow, ID)
 - Lengths, widths, application rates
 - Two slopes, two soil types
- Effect of material thickness
 - 1mm, 2mm, 4mm thickness
 - Three slopes, one blend
- Spreading methods – uniformity
 - Machine blowing, hand spreading, helicopter drop
- Wind mobility
 - Washington Technology Center / WSU / ARS
 - MS student research - July 2006



USFS RMRS rainfall simulator results

Sediment / Erosion Control Performance of Two Candidate Blends of Strands

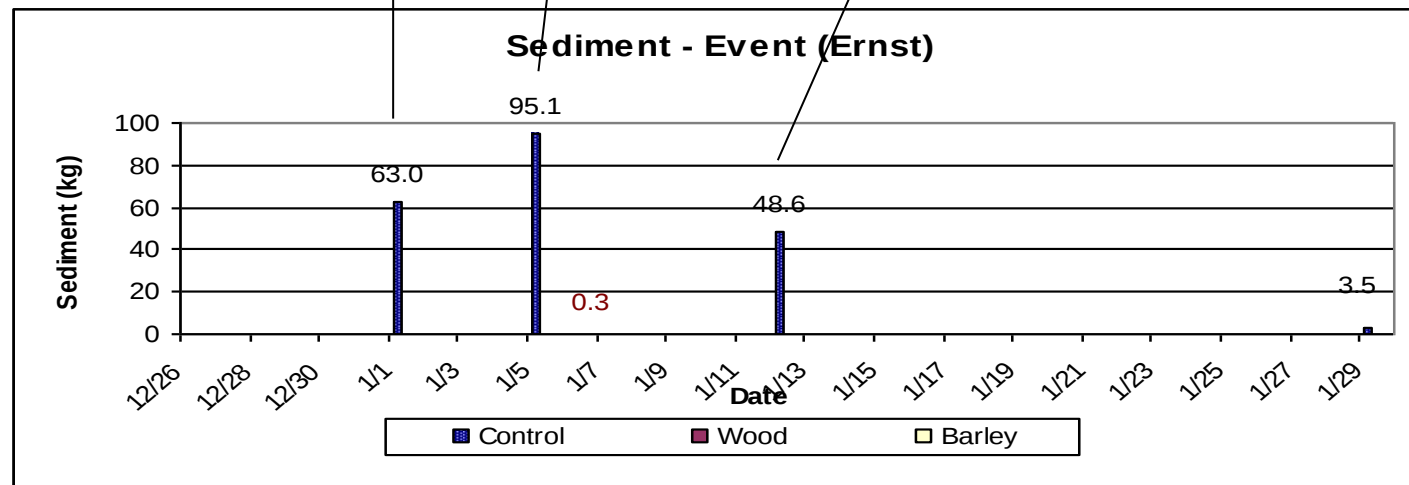
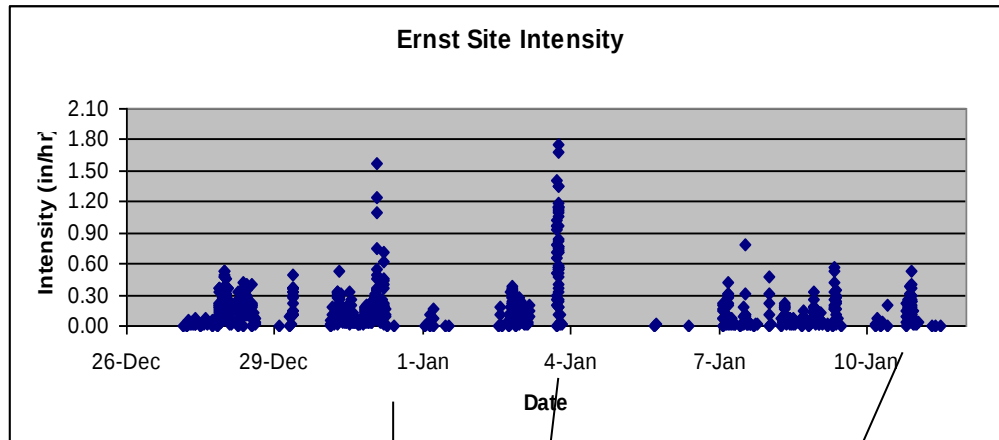
Sediment from Rain + 1st Flow



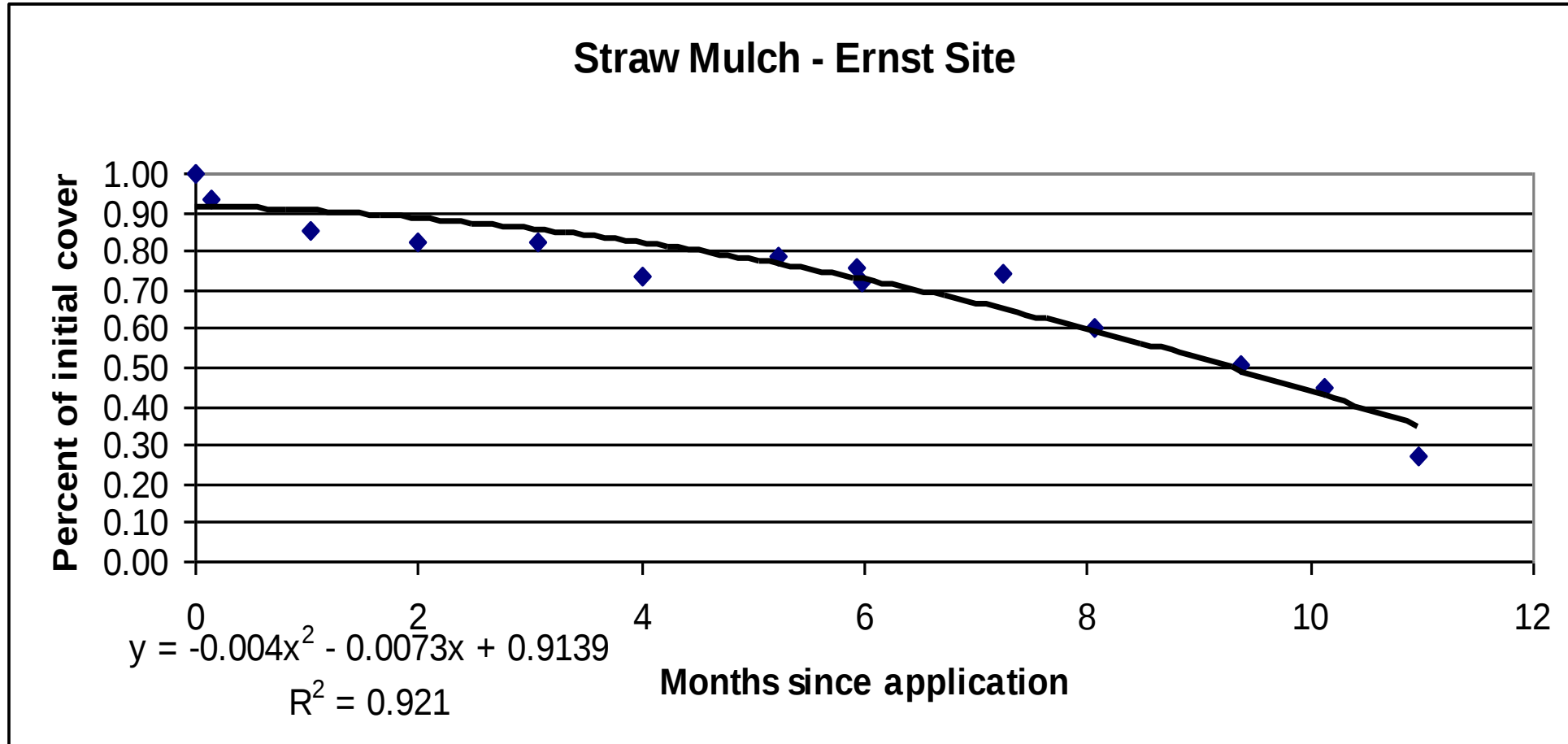
Conclusions

- Performance at 30% slope and 2 in/hr rainfall rate achieves USFS targets
- Blend of 150mm + 50mm strands is better at lower soil cover
- No difference in cost of production

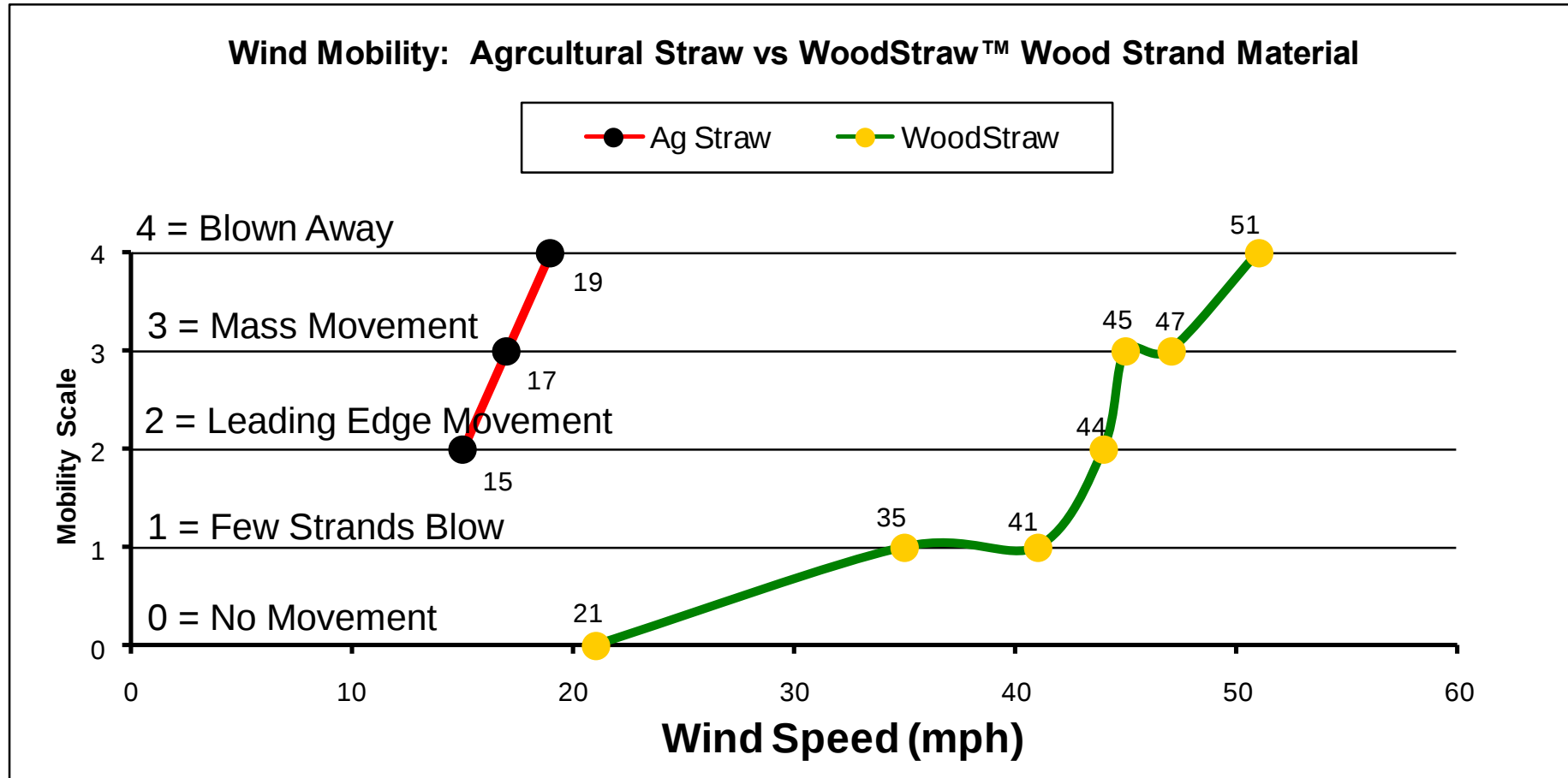
Field trials confirm lab results



Straw decomposition (loss of cover)



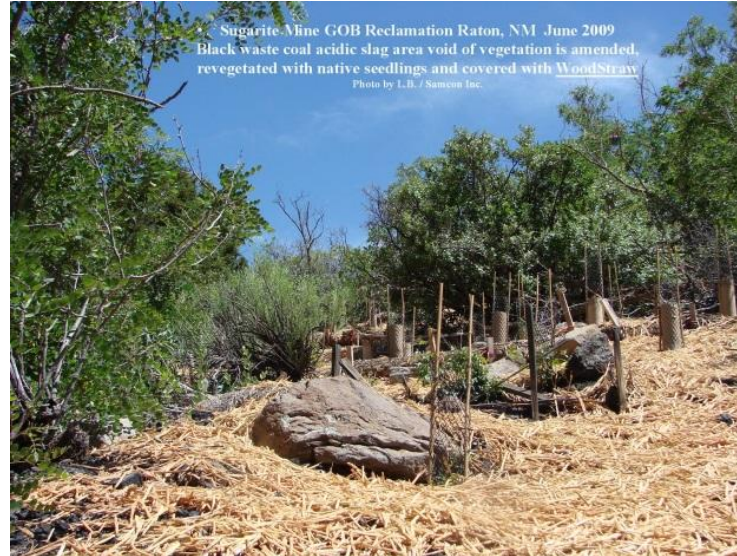
Wind resistance research data



2006 Washington State University - N. Copeland

Mines, pipelines, & powerlines early adopters

Ruby Pipeline
Sugarite Mine
Crandall Canyon Mine
Rio Puerco Mine
Miami Globe Mine



What's new since our 2013 ASMR presentation?

- Many more peer reviewed journal articles and field studies
 - Licensee production in Oregon and Colorado
 - Expanded use by local agencies, contractors, federal agencies
 - Approvals by state DOTs and Ecology departments
 - Straw issues with Clopyralid and other herbicide carryover limit revegetation with legumes, forbs, and other broadleaf seeds
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- Straw mulch is still the predominant strand-type mulch
 - Shredded wood is often substituted
 - (with generally poor performance due to inadequate soil cover/application rates)
 - Confirmation that minimum soil cover for shallow slopes is +/- 40% and +/- 70% for steep slopes with either engineered wood strand or shredded wood

Recent projects using WoodStraw® ECM



More Projects Using Wood Strand Mulch



WoodStraw® ECM production sites

Mountain Pine Manufacturing – Colorado

Heartwood Biomass - Oregon



DOT Approvals – Wood Strand Mulch

COLORADO DOT ITEM
#213-00007

IDAHO DOT SECTION
612

OREGON DOT

WASHINGTON DOT
9-14.4 (4)

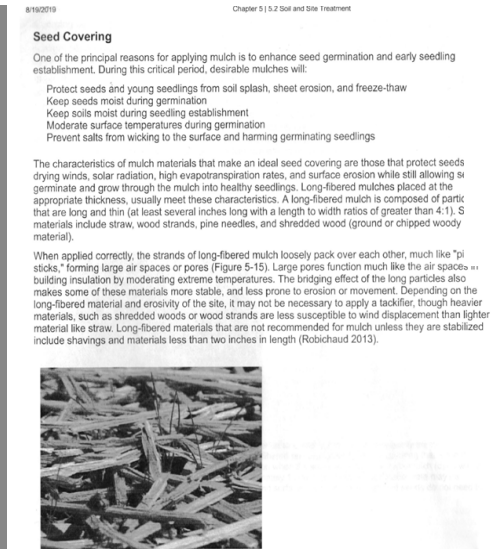
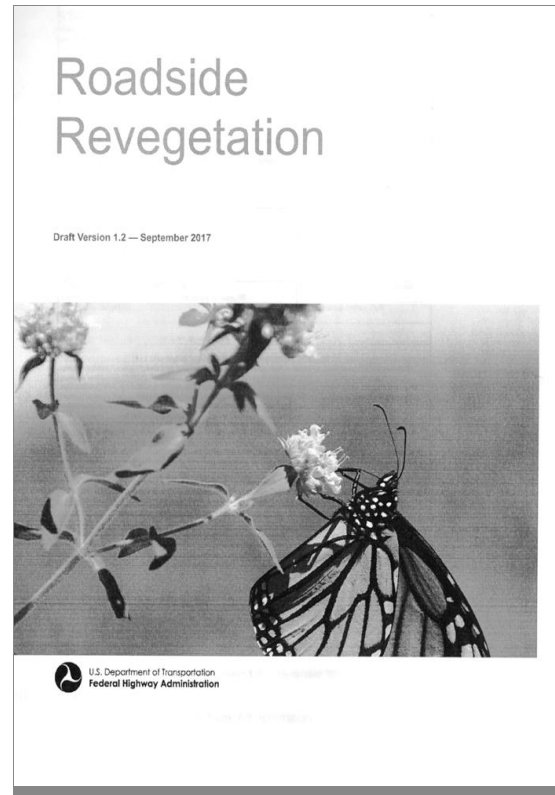


Figure 5-15-1 Long-fibered mulches
Long-fibered mulches, such as the wood strands shown below, create a good growing environment because

Wood strands shown above, create a good growing environment because the seedlings are protected from excessive drying during germination.

Thank You!

Mountain Pine Manufacturing

Trent Jones

970.846.5719

trent@mpinem.com

www.mpinem.com

Heartwood Biomass

Matt King

matt@heartwoodbiomass.com

www.heartwoodbiomass.com

Forest Concepts

Jason Perry

jerry@forestconcepts.com

www.forestconcepts.com

www.woodstraw.com

