

Design, Development, and Field Experience with Wood- Strand Erosion Control Mulch for Mine and Pipeline Projects



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Commercially available from:

Forest Concepts - Auburn, WA

Mountain Pine Mfg. - Steamboat Springs, CO

Why a New Mulch?

- The Issues with Agricultural straw:
 - Invasive weed species
 - Farm weeds
 - Short functional life – 3 months to 2 years
 - Not wind stable at less than 15 mph
 - Mats to prevent broadleaf seedlings from emerging
 - Absorbs/adsorbs rainfall during spring/summer showers
 - Dusty during application by hand or blowers
 - Certified “Weed-free” requires use of herbicides
- In 2002, US Forest Service called for development of an all-wood alternative to agricultural straw for use on FS lands

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
- USDA Forest Service provided support to their RMRS erosion research lab in Moscow, ID in collaboration with 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 contributed test sites across the West

Design 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 as it decays
 - 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.

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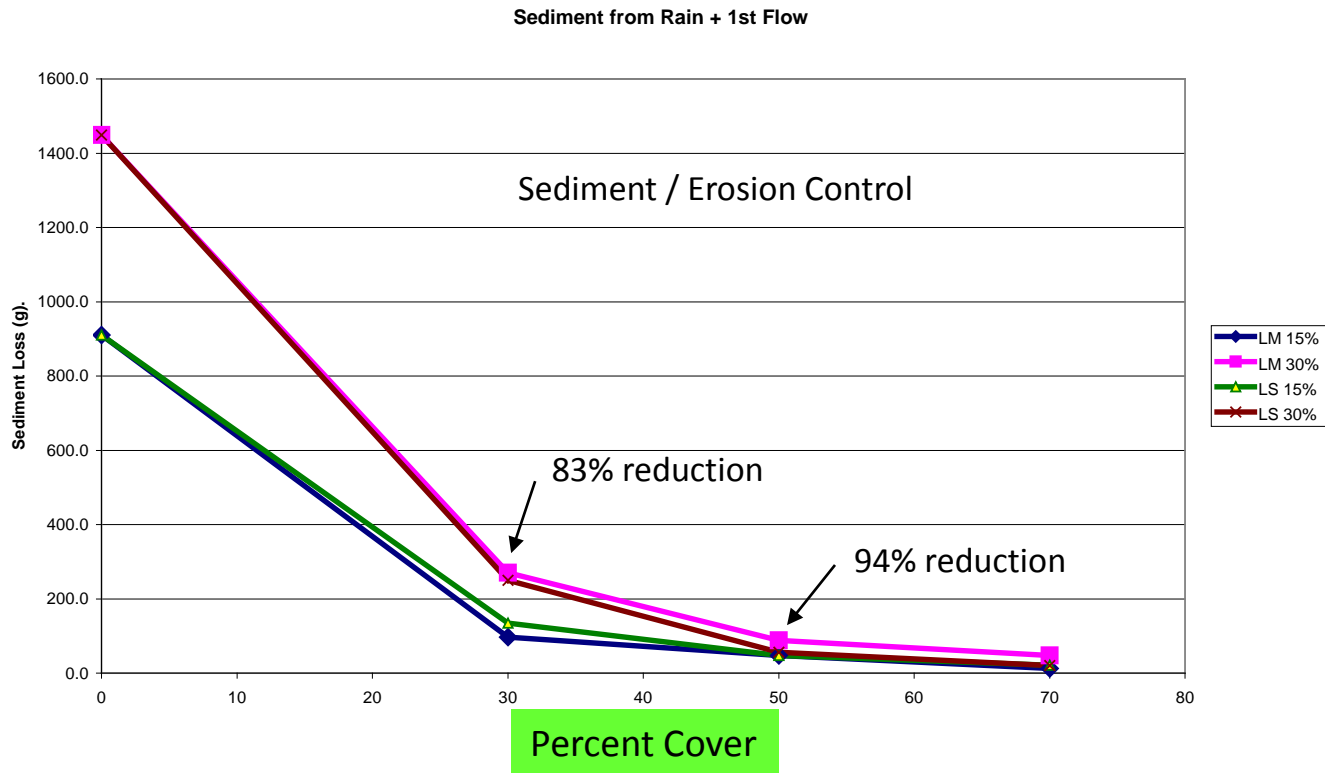
● Operational Objectives

- Pure wood material
- Bale, truck, and handle like straw mulch
 - 50 lb and 600 lb bales
- Apply by straw blowers, hand, helimulch
- Store and apply wet or dry
- Naturally weed-free
- Palletize for easy handling

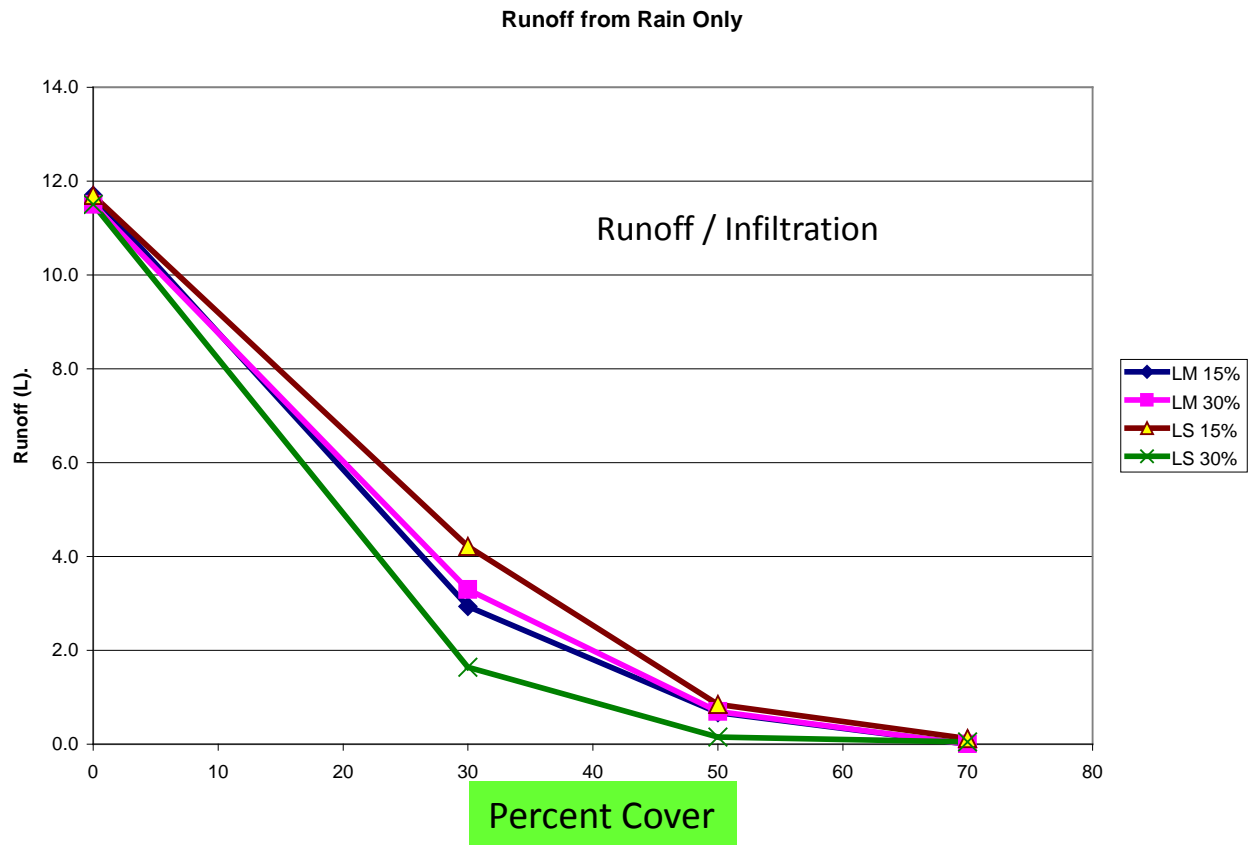
Material Design Experiments

- **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
 - Results in July 2006

USFS RMRS Lab Results



USFS RMRS Lab Results



WoodStraw® - Application Rates



40% coverage

80 Regular Bales/Acre
7 Large Bales/Acre
Slopes < 5%



50% coverage

150 Regular Bales/Acre
13 Large Bales/Acre
Slopes <33%



70% coverage

276 Regular Bales/Acre
24 Large Bales/Acre
Slopes >33%

Chambers Creek Quarry

Tacoma, WA

~ 35" Rainfall Per Year



Site 1 – 14% slope
WoodStraw – 50% cover
Ag Straw – 90% cover



Site 2 – 58% slope
WoodStraw – 50% cover
Ag Straw – 75% cover

UW - Pack Forest

Eatonville, WA

~ 50 in. annual rainfall



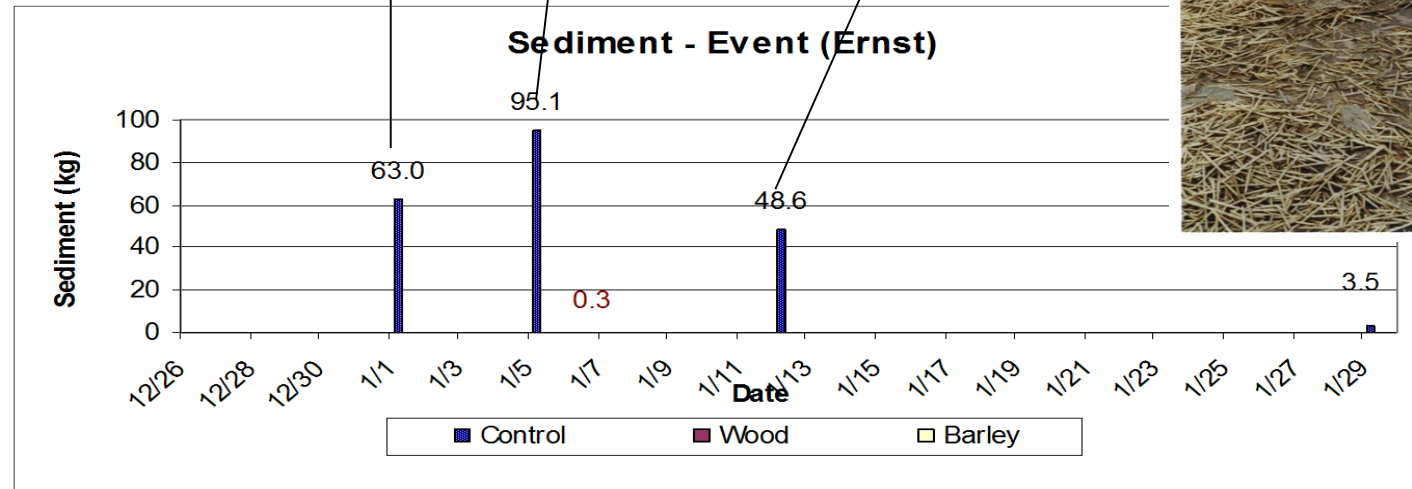
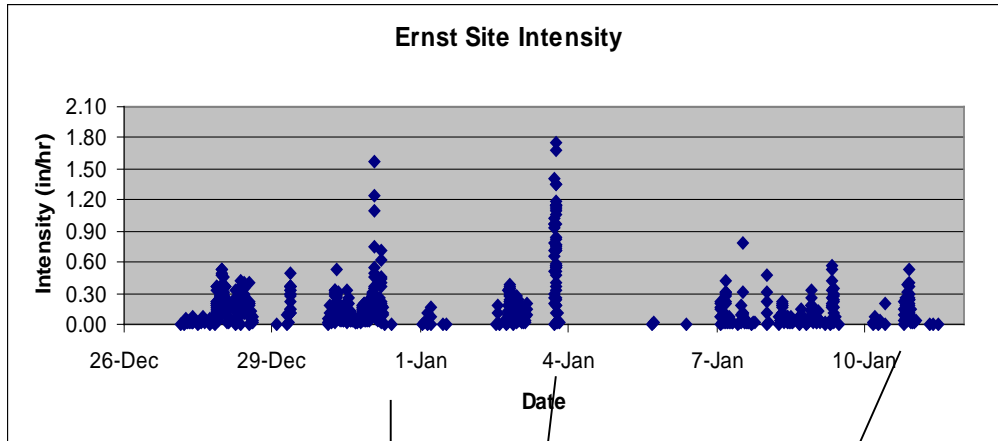
Ernst Ranch

Paso Robles, CA

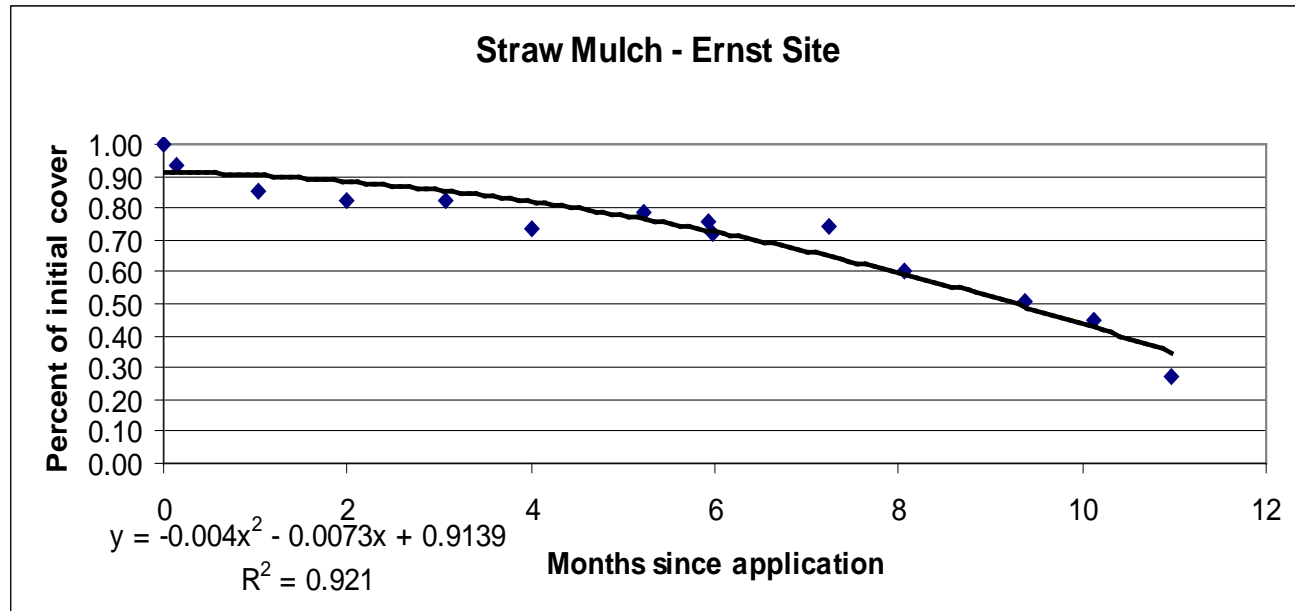
~ 8 in. annual rainfall



Ernst Ranch



Straw Decomposition Curve



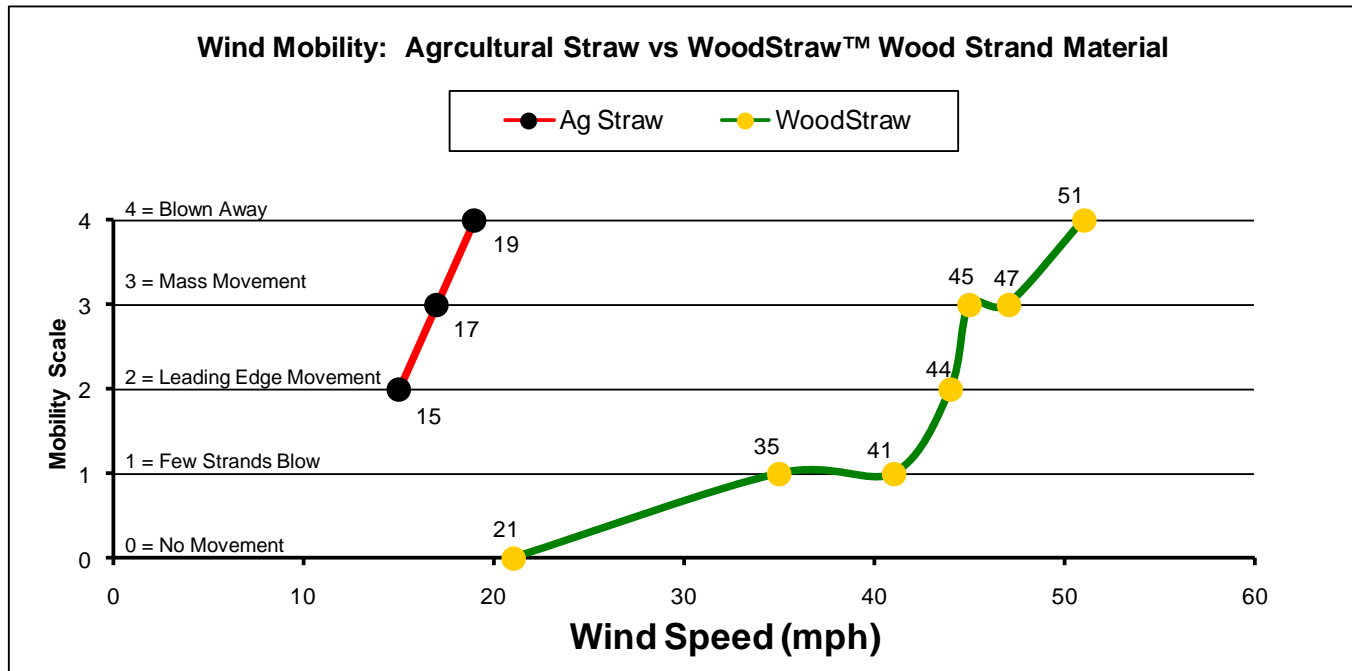
Field Trial Conclusions

- Wood-strand mulch performed in the field the same as in the lab
- Initial sediment reduction for wood strands applied at 70% cover is equal to straw at 90%
- Wood-strand mulch does not decay or move in first year after application while barley straw cover reduced to less than 30%

Manufacturing

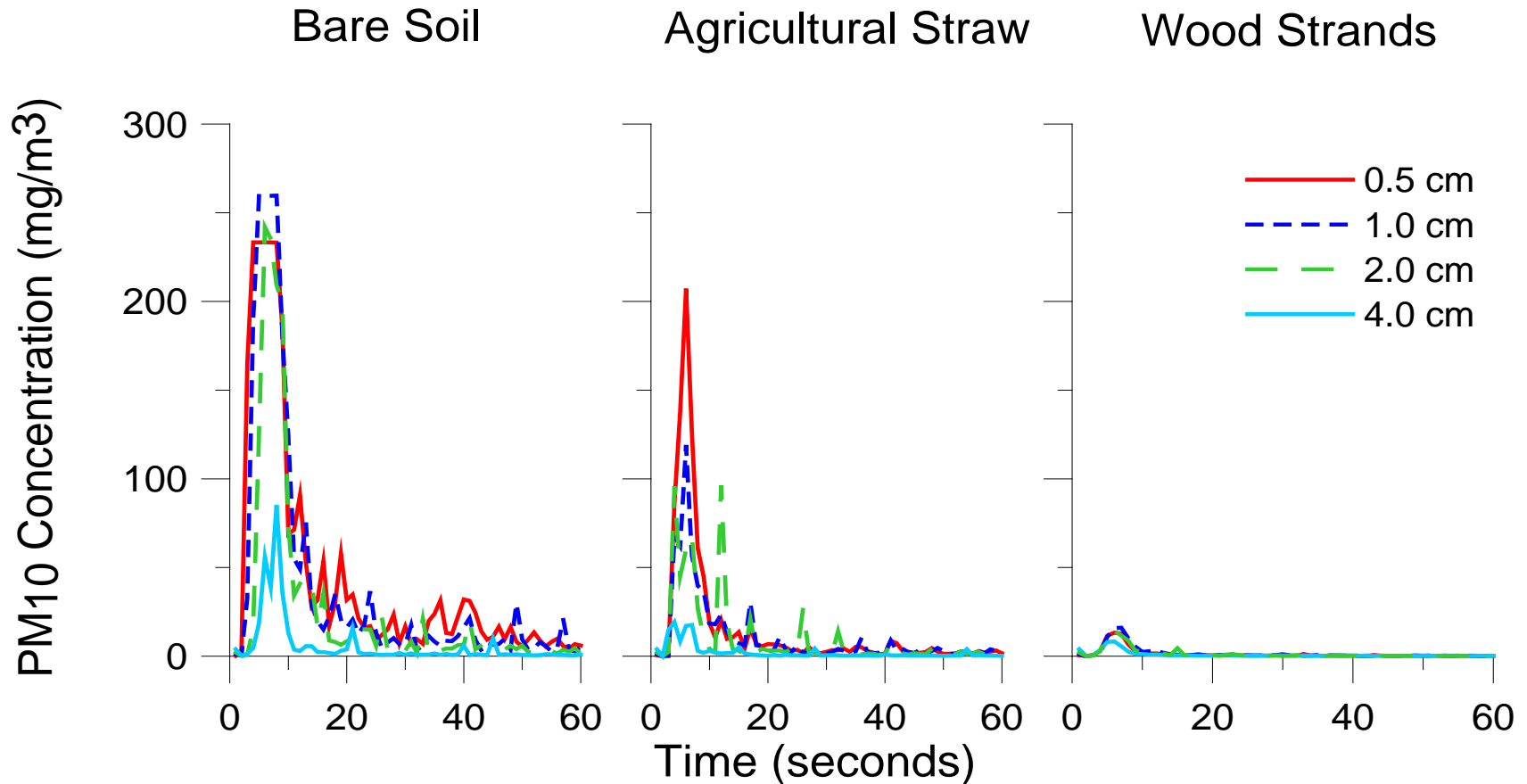


Wind Resistance Research Data



2006 Washington State University - N. Copeland

Wind Erosion & Dust Control Capability



PM10 concentration over time for a free stream velocity of 18 m/s.

2007 Washington State University - N. Copeland

Mines, Pipelines, & Powerlines

Ruby Pipeline



Sugarite Mine GOB Reclamation Raton, NM June 2009
Black waste coal acidic slag area void of vegetation is amended,
revegetated with native seedlings and covered with WoodStraw
Photos by L.R. Channing Inc.



Sugarite Mine

Crandall Canyon Mine



Miami Globe Mine



DH 18366

Rio Puerco Mine



Survey of Users – Dec. 2012

- Survey Monkey – 20 invitations/6 respondents
 - 3 Project Managers & 3 Contractors
 - 4 Federal & 2 State
 - All <100 acres with most 1-10 acre
 - 3 Mines, 1 Pipeline & 2 Watershed Protection Projects
 - Site Conditions:
 - 3 were mixed slopes, 1 moderate & 2 steep slopes (~70%)
 - Soils moderately to highly erosive
 - 4 used hand crews to apply, 2 straw blower & 1 helicopter
 - 50% application coverage for 5 & 70% coverage for 1
 - Had Considered Using Alternative Solutions:
 - Ag Straw (3)
 - Hydroseed (1)
 - Rolled Erosion Blankets (1)
 - Wood Chips (1)

Survey of Users – Dec. 2012

(Cont.)

- Primary Reasons for Use of Wood-strand Mulch
 - Erosion Control Performance
 - Resistant to High Winds
 - Long Life & Durability
 - No Invasive Species
- Ease of Application for Wood-strand Mulch
 - Easy - 1
 - Moderate - 2
 - Somewhat Difficult - 3
 - Difficult - 0

Survey of Users – Dec. 2012

(Cont.)

- Overall Performance of Wood-strand Mulch
 - Excellent - 3
 - Good - 1
 - Moderate - 1
 - Poor - 0
 - To recent to evaluate - 1
- Was Wood-strand Mulch Worth the Cost?
 - Yes - 5
 - No - 1
- Would They Consider/Recommend Wood-strand Mulch?
 - Yes - 6
 - No - 0



Thank You!

