Comparison of Five Hydromulches and Polyacrylamide to Straw for Erosion Control and Vegetation Establishment on Steep Slopes

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Introduction

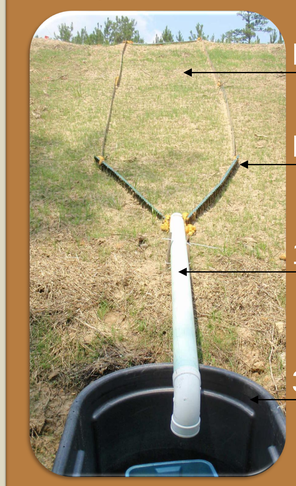
Soil erosion and sediment pollution can be a major issue in and around construction sites due to land disturbing activities and unprotected soil during active construction. Establishing vegetation to control erosion on these sites can be difficult due to poor soil, steep slopes, and no irrigation. Our study was conducted to evaluate different erosion control treatments on steep slopes for erosion control and vegetative establishment.

Objectives of this study

1. To evaluate different types of hydromulch for erosion control and vegetation establishment under different conditions around NC.
2. To establish when, where and which type of hydromulch would be cost effective compared to straw or straw + polyacrylamide (PAM).

Methods and Materials

Our study was conducted on four construction sites in North Carolina.
Site 1 was located in the mountain region, while sites 2, 3 and 4 were located in the Piedmont region.
Sites 1 and 3 were cut slopes, sites 2 and 4 were fill slopes.
Sites 1 and 3 were monitored during cool season, site 2 and 4 during warm season.
On all sites the area was divided into 20 plots, site 2 had plots 3 m wide and 6 m long and sites 1, 3 and 4 had plots 3 m wide and 9 m long.



Collected runoff was tested for turbidity and total suspended solids.

	Straw	Straw +PAM	FGM	SMM	BFM	WCB	WFM
Site 1	x	x	x	x	x	-	-
Site 2	x	x	x	x	x	-	-
Site 3	x	x	x	-	-	x	x
Site 4	x	x	-	x	-	x	x

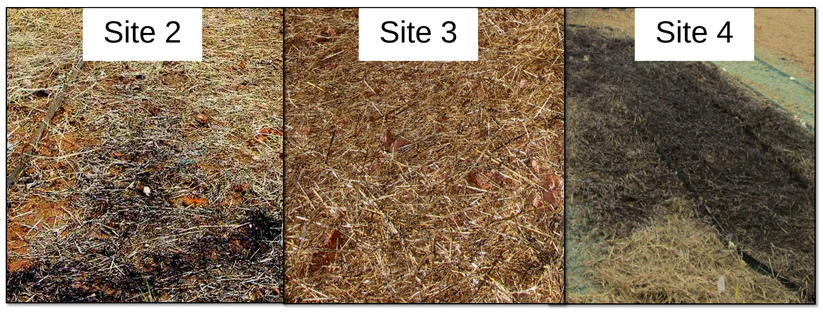
Note: PAM=Polyacrylamide. FGM=flexible growth media. SMM=stabilized mulch matrix. BFM=bounded fiber matrix. WCB=70:30 wood/cellulose bland. WFM=wood fiber mulch.

Results

Runoff volume (% of precipitation)

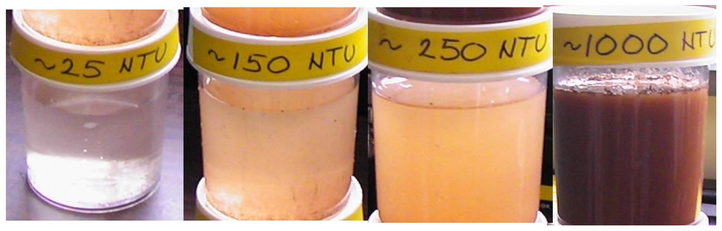
	Site 1	Site 2	Site 3	Site 4
Straw	1.5a	23.6a	3.1c	12.9b
Straw+PAM	0.9a	18.8ab	3.5bc	15.6ab
SMM	1.1a	15.3bc	NA	20.2ab
BFM	1.3a	16.6ab	NA	NA
FGM	0.9a	11.1c	7.9a	NA
WFM	NA	NA	9.0a	23.4ab
WCB	NA	NA	7.2ab	29.4a

At site 1, there were no differences between treatments most likely due to the combination of sandy soil texture and relatively light rainfall events that occurred there. On site 2 general trend of hydromulch covers having lower runoff volumes compared to straw was present. In contrast, on sites 3 and 4 general trend of hydromulch covers having higher runoff volumes compared to straw. This was most likely due to lower straw cover on site 2 (~75%) compared to sites 3 and 4 (>95%).



Turbidity (NTU)

	Site 1	Site 2	Site 3	Site 4
Straw	43a	1,247a	450c	410b
Straw+PAM	42a	1,222a	265d	365b
SMM	47a	777a	NA	463ab
BFM	55a	888a	NA	NA
FGM	50a	389b	592b	NA
W	NA	NA	938ab	1,765a
WC	NA	NA	1,018a	1,212a

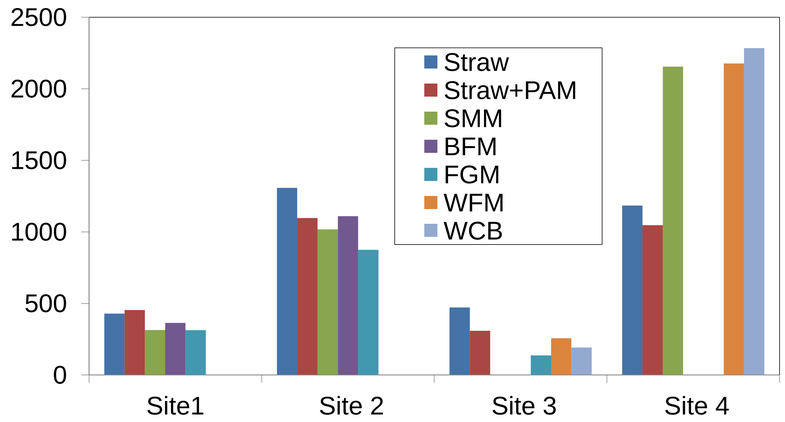


Total Suspended Sediment (mg L^{-1})

	Site 1	Site 2	Site 3	Site 4
Straw	355a	3,3034a	801ab	1,520ab
Straw+PAM	225a	1,812a	373b	1,104b
SMM	346a	1,579ab	NA	1,670ab
BFM	319a	2,297a	NA	NA
FGM	382a	655b	1,113a	NA
WFM	NA	NA	1,722a	4,127a
WCB	NA	NA	1,977a	4,561a

The same trend of hydromulche cover having lower erosion rate compared to straw on site 2 was present. In contrast on sites 3 and 4 hydromulch cover had higher erosion rate compared to straw.

Biomass (kg ha^{-1})



Sites 1 and 3 that were cut slopes monitored over the cool season had low above ground biomass while sites 3 and 4 had much higher above ground biomass. On site 4 hydromulch cover resulted in more biomass compared to straw, probably due to excess tackifier applied to the straw (see photos left).

Conclusion

- No clear advantage of any mulch type was found. Performance of any mulch types depended on specific site conditions, but was largely determined by the weather.
- More economical hydromulches (WFM and WCB) were less effective in erosion control than straw and FGM on 2:1 slopes.
- Straw application rate is very important.
- PAM did not improve grass establishment compared to straw alone but in some cases it did have good impact on erosion control.

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