

**“Vegetative Rehabilitation of Highway Cut Slopes”
Contract # 3459013317, Job Piece 01946(52)**

**ANNUAL REPORT FOR FY 2009
Item Number 2188**

Submitted to:

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Fiscal Year 2009 Progress Report
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Problem Statement:

Areas of moderate to severe erosion are occurring on highway rights of way in eastern Oklahoma. The silt from this erosion is filling ditch bottoms causing drainage problems. It is very expensive for ODOT to remove and dispose of this material, only to have to do it again in the future. The answer to this problem is to research techniques to permanently vegetate the erosive areas so that the soil remains on the slope and out of the drainage system.

The USDA-NRCS Booneville Plant Materials Center (PMC) specializes in critical area treatment. The PMC has researched and developed Critical Area Vegetation Specifications for the Bureau of Mines, Office of Surface Mines, Corps of Engineers, Arkansas Highway and Transportation Department, Arkansas Game and Fish Commission, US Forest Service, et al.

Scope of work: Heavener and Poteau

The Heavener site was prepared and planted April 17, and 18, 2007. The Poteau site was prepared and planted on April 19, and 20, 2007. Site preparation was tillage (8' tractor mounted tiller was used) of half of each plot (300' X 60'). A mixture of 'Cheyenne' indiagrass, 'Kaw' big bluestem, 'Aldous' little bluestem, and 'Alamo' switchgrass was applied by means of a hydro-seeder. The seeding rate was: big bluestem @ 2 lb Pure Live Seed (PLS)/acre, switchgrass @ 2 lb PLS/ac, indiagrass @ 2 lb PLS/ac and little bluestem @ 2 lb PLS/ac. The sites were mulched immediately after seeding, with ½ ton, and 1 ton, of wood fiber mulch. Each mulch treatment was replicated 3 times at each site, on both tilled and non tilled plots.

Scope of Work: SH-128 (Sugar Creek)

The PMC staff performed site characterization on SH-128 at Sugar Creek, during October 2007. Soil samples were collected at the site and analyzed by the University of Arkansas, Fayetteville. There was no recommendation for lime, based on species to be planted, but phosphorus and potassium were required for each site. These elements were to be applied in the spring of 2008, when seed germinated.

The PMC staff laid out the research area (approx. 600' X 100'). Supplies (seed, fiber mulch, soils amendments, etc.) were purchased for the research plot in October. On November 5, 6, 7, and 8, the entire slope was hydro-seeded with 3 lb/ac 'Alamo' switchgrass, 3 lb/ac 'Kaw' big bluestem, 3 lb/ac 'Aldous' little bluestem, and 3 lb/ac 'Cheyenne' indiagrass. The top 20' of the site was mulched with wheat straw at a rate of 1.5 tons/ac, while the lower 80' of the slope was hydro-mulched, at a rate of 1 ton/acre.

Results: Heavener and Poteau

The PMC staff visited the Heavener and Poteau sites on 10 day intervals (for 1 month, post planting) to record germination dates, plant vigor, and stand percentages.

The native grasses germinated (in tilled plots) within 15 days of planting. The stands averaged 85% on the tilled plots. Germination took 25 days in no-till plots. The grasses in the tilled plots have grown at twice the rate of plants in the no-till plots. This is a function of inter-species competition for light, moisture, and nutrients.

The PMC staff evaluated these plots 12 times during October, November, and December, 2007. The fall evaluations produced data that indicated medium to high success for tilled treatments, and zero to poor success where seed was applied no-till. Stand success for native warm season grasses is measured by plant density.

The Heavener and Poteau plots received phosphorus and potassium fertilizer (200 lbs/ac of 0-60-60) in April of 2008. These plots were evaluated by PMC staff 10 times during March, April, May, and June of 2008. The tilled plots are consistently producing 80-85% cover while the no-till treatments have only 0-5% cover. Competition from weed species has contributed to the failure of the no-till treatments. Weed species are present in the tilled treatments, but over the next 2-3 growing seasons, the native grasses will eliminate most competition without herbicide treatment. Evaluations (7) conducted between August 1, and September 30, 2008, indicate native grasses at both Heavener and Poteau (tilled plots) have matured to the point of producing seed. This seed germinated in the spring of 2009 and increased the stand density significantly (5-10%).

The native species grasses broke dormancy several weeks prior to weed seed germination, allowing the grasses to suppress weed infestation. On May 12, 2009 a complete fertilizer (13-13-13) was applied at rates of 100, 200, and 300 lb./acre, replicated three times at each site to plots that were established on tilled seedbeds. Evaluations were made during June and July (Table 1) to determine what effect, if any, the added fertility had on grass density, soil protection, and weed populations.

Table 1: Effects of Fertilizer Application on Stand Density



Fertilizing Slope

Heavener Site			
		June-July 2009	
		Plant Density %	
	Rep 1	Rep 2	Rep 3
Treatment			
100 lbs.	88	81	83
200 lbs.	87	90	86
300 lbs.	92	90	94
Poteau Site			
100 lbs.	80	78	84
200 lbs.	83	86	79
300 lbs.	90	97	88



Sugar Creek prior to Spring 2009 planting



Sugar Creek slope failure

Results: SH-128 Sugar Creek

This planting was deemed a failure in early April 2008, due to torrential rains in late winter. Seed and mulch were washed from the slope. A contract modification for FY 2009 allowed the PMC to re-establish this planting. Fall 2008 evaluations of SH-128 indicate germination and survival of planted native grass species along the top of the slope on the west end of the plot. This area was also hydro-seeded, but mulched with wheat straw instead of wood fiber hydro-mulch. The wheat straw survived the rains of spring 2008. This is the reason for germination and survival of the grasses planted near the top of the slope.

The PMC staff hydro-seeded the slope again in the spring of 2009 with drought tolerant grass and legume species, and used grass hay mulch at a rate of 2 tons per acre over the entire area. The grass hay mulch was treated, after placement, with a 'tacking' substance to insure it remained in place until the seed had time to germinate. Seeding rates were increased to 5 pounds PLS per acre for the 2009 planting. Materials planted included: sericea lespedeza, bahiagrass, crown vetch, switchgrass, indiagrass, and big bluestem. Spring temperatures were cooler than normal, and germination took longer than predicted. Germination was rated fair to good on all species with the exception of crown vetch, three weeks after seeding. Crown vetch has a high percentage of "hard seed", meaning a significant amount of the seed has a thick seed coat, slowing penetration of moisture needed for germination. Evaluations 4, and 6, weeks after planting averaged nearly 5% per week improvement in ground cover (germination). Approximately 8 weeks after planting, the slope failed destroying 1/3 of the planting. A decision by ODOT is pending as to the future of the Sugar Creek planting.



Hydroseeding Sugar Creek



Mulching Sugar Creek



Sugar Creek slope failure after Spring 2009 seeding

Submitted by James R. King, Manager Booneville PMC