

Evaluation of Perennial Grasses for Use in Vegetative Barriers: Effect of Soil Sediment Deposition

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Figure 1. Prairie cordgrass control (left) and treatment with 9-inch soil deposition (right).

ABSTRACT

Grasses in vegetative barriers must tolerate the deposition of soil sediment. This study conducted at the USDA-NRCS Rose Lake Plant

Materials Center in E. Lansing, MI observed the response of prairie cordgrass, two cultivars of switchgrass, and two accessions of miscanthus to soil deposition treatments. No adverse effect of deposition of up to nine inches of soil in two years was observed when compared with untreated plants in any accessions in the trial.

INTRODUCTION

Various perennial grasses are used in vegetative barriers (also referred to as grass hedges) for the purpose of reducing erosion, managing water flow, stabilizing steep slopes, and trapping sediment (USDA-NRCS, 2015). Emergence through several inches of sediment or resumption of growth from buried stem nodes, rhizomatous or stoloniferous growth habit, stems that remain intact and erect year round, and tolerance to herbicides used in the cropped field are required characteristics for vegetative barrier use according to conservation practice standard 601.

Tolerance to soil sediment deposition and adaptation for vegetative barrier use of prairie cordgrass (*Spartina pectinata* Bosc ex Link), switchgrass (*Panicum virgatum* L. cv. ‘Northwind’ and *P. virgatum* cv. ‘Heavy Metal’), and miscanthus (*Miscanthus sinensis* Andersson var. *gracillimus* Hitchc. and *M. sinensis*) have not been evaluated in Michigan.

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MATERIALS AND METHODS

Prairie cordgrass, ‘Northwind’ and ‘Heavy Metal’ switchgrass, and two accessions of miscanthus were transplanted from greenhouse-grown cone-tainers to the field in June 2010 at the USDA-NRCS Rose Lake Plant Materials Center. Fifteen-inch diameter black plastic rings (Fig. 1) were installed around each plant. Sandy loam soil was added inside the rings to simulate sediment deposition in April 2011 (3 inches) and in April 2012 (additional 6 inches) around treated plants each of which was paired with a control plant which did not receive soil deposition. Each accession was established as a randomized complete block design with 5 replicates. Data on canopy height, shock circumference at 1 ft above original soil surface, aboveground fresh weight of canopy above 1 ft, achievement of 0.05 and 0.10 Vegetative Stiffness Index (USDA-NRCS, 2015), and plant encroachment into adjacent plots were collected and analysis of variance was performed on height, circumference, and fresh weight.

RESULTS AND DISCUSSION

All trial entries achieved vegetative barrier functionality (Vegetative Stiffness Index ≥ 0.10) by the end of the establishment year. At the end of the second year no treatment differences within accessions were observed in height. At the end of the third year (2012) no within accession treatment differences were observed in canopy height, shock circumference, and fresh weight (Table 1), i.e., all accessions tolerated soil sediment deposition as imposed in this study. Achievement of vegetative stiffness index minimums and tolerance of soil sediment deposition are necessary traits of acceptable species for vegetative barriers (USDA-NRCS, 2015; USDA-NRCS, 2013) and were demonstrated by all entries in this trial.

Another necessary trait of acceptable species for vegetative barriers is noninvasivity (USDA-NRCS, 2015; USDA-NRCS, 2013). Encroachment into borders and other plots was observed in this trial as a proxy for invasivity. Due to prairie cordgrass’ extensively creeping rhizomes (Hitchcock, 1950) it encroached into adjacent borders and other plots but switchgrass and miscanthus did not. While *Miscanthus sinensis* is listed by USDA-NRCS (2013) as having desirable characteristics for vegetative barriers, at least 13 states which have listed *Miscanthus sinensis* as invasive (The University of Georgia - Center for Invasive Species and Ecosystem Health, 2015).

CONCLUSION

Switchgrass cultivars ‘Northwind’ and ‘Heavy Metal’ tolerated soil deposition and as such are supported by this study for use in vegetative barriers in Michigan. Due to its observed encroachment into adjacent borders and other plots prairie cordgrass is not recommended and due to its potential for invasiveness *Miscanthus sinensis* is not recommended for vegetative barriers in Michigan.

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Table 1. Plant response to 9 inches of soil sediment deposited in 2 years.
 USDA-NRCS Rose Lake Plant Materials Center. 2012.

Treatment	Height (ft) [†]	Circumference (in) [‡]	Fresh weight (lbs) [§]
<u>prairie cordgrass</u>			
Control [¶]	4.3	10.0	0.6
Deposition ^{††}	4.3	12.6	0.7
Significance	ns ^{‡‡}	ns	ns
<u>'Northwind' switchgrass</u>			
Control	5.4	16.6	2.8
Deposition	5.3	16.8	3.0
Significance	ns	ns	ns
<u>'Heavy Metal' switchgrass</u>			
Control	4.4	18.4	2.4
Deposition	4.5	16.8	1.7
Significance	ns	ns	ns
<u><i>Miscanthus sinensis var. gracillimus</i></u>			
Control	4.8	24.2	4.1
Deposition	4.8	24.4	5.4
Significance	ns	ns	ns
<u><i>Miscanthus sinensis</i></u>			
Control	4.6	25.4	4.8
Deposition	4.7	19.4	3.7
Significance	ns	ns	ns

[†]Height of canopy above original soil surface.

[‡]Circumference of shock in barrel at 1 ft above original soil surface.

[§]Fresh weight of canopy above 1 ft.

[¶]Control, without soil deposition.

^{††}Deposition of 3 inches of sandy loam in April 2011 and 6 inches in April 2012.

^{‡‡}ns, nonsignificant at $p \leq 0.05$