

# **Evaluation of Traditional and Novel Species for Reducing Sediment Loss in North Central Indiana**

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## **Objectives**

- Phase 1: Identify alternative and novel vegetation for use in low-maintenance utility areas (e.g. outer golf course rough areas and buffer strips) that establish quickly, have excellent winter persistence and require little supplemental maintenance (e.g. mowing) for the upper cool-humid region of the United States.
- Phase 2: Quantify sediment losses from sloped areas during seedling establishment for selected promising vegetation that consist of various differential growth habits, canopy architectures across several seasonal seeding dates.

## **Rationale**

There are increasing environmental concerns regarding the amounts of sediments, nutrients, and pesticides that are being found in our surface waters. The golf course industry has been identified as potential contributors to this growing problem because golf courses are managed intensively with fertilizers and pesticides. This problem is further intensified because golf courses are often constructed around open water sources such as oceans, seas, lakes, ponds, rivers, streams or ditches where sediment, fertilizers, and pesticides, can enter our water sources by surface runoff. To reduce this problem, current research has focused on the use of mature vegetative buffer strips near water sources that act as filters. These buffer strips have been shown to decrease contaminate losses in surface runoff. However, little scientific information exists identifying which turfgrass species and natural vegetation used in low-maintenance areas such as golf course roughs and buffering areas are effective at decreasing sediment, nutrient, and pesticide losses in surface runoff. Previous research is also limited regarding erosion control products currently available that claim to control sediment losses during the construction and establishment process.

## **How it was done**

### **Phase 1(2005): Species Evaluations**

Twenty-eight species were planted at the W.H. Daniel Turfgrass Research and Diagnostic Center, West Lafayette, IN. Since sediment loss is a constant problem and many construction schedules do not always permit seeding during “optimum seeding windows”, three seeding dates were evaluated (May 15th, July 15th, and Sept. 15th). A starter fertilizer was applied at seeding at a rate of 74 kg ha<sup>-1</sup> to enhance germination and establishment. Plots were not supplementally irrigated following the initial establishment period (60-90 days). For species evaluations, establishment rates and percentage green cover were quantified every week after seeding with visual ratings (0 to 100% linear scale). Mature plant height was quantified in five locations within each plot on three dates to measure canopy height. Stand persistence which can be correlated to winter-hardiness will be quantified by using spring green up ratings in April. The experimental design was a randomized complete-block with three replications of each species on each date and a plot size of 1.83 by 1.22 m.

## **Phase 2(2006): Quantifying Sediment and Nutrient Runoff Losses**

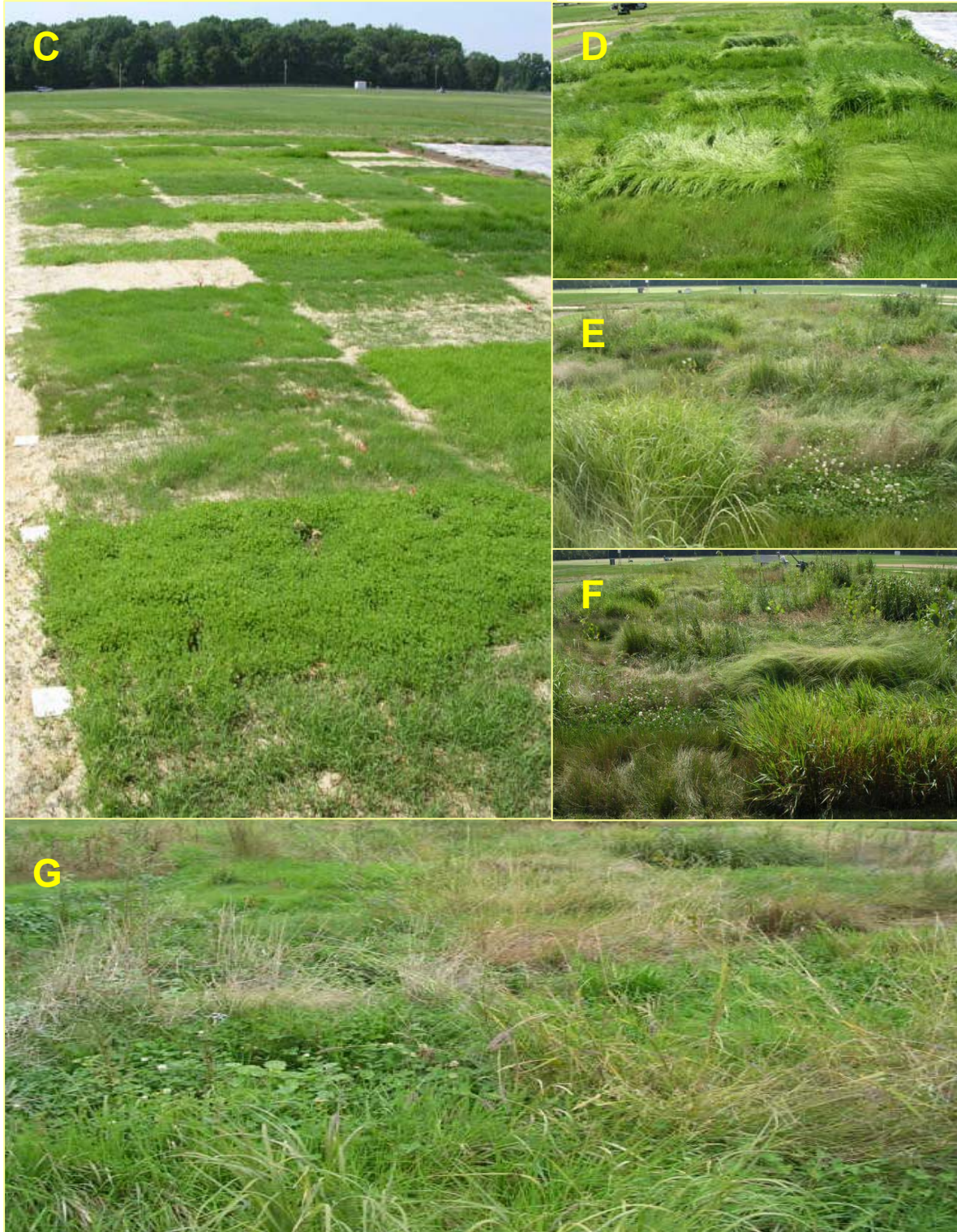
Surface water contamination from sediment is most severe during seedling establishment due to the lack of ground cover, slopes and potentially heavy and abrasive rainfall. Therefore, promising vegetation identified in year one will be planted on sloping soils to evaluate methods and technologies to minimize soil erosion and maximize species establishment.

### **Results to Date (Species Evaluations)**

- Three weeks after the 15 May seeding, several species had achieved 50% cover or better (Table 1): Crested wheatgrass, Dryland and Idaho bentgrass, Creeping and Meadow foxtail, K-31 tall fescue and Grande II all fescue, Hard fescue, Reed canarygrass, Canada and Foul bluegrass, as well as Weeping alkaligrass. Among these species, Crested wheatgrass, Meadow foxtail, K-31 tall fescue and Birdsfoot trefoil had achieved > 89 % cover (Figure 1).
- As expected, the slowest species to establish for the 15 May seeding were some of the warm-season species including Zoysiagrass, Little bluestem, and Switchgrass.
- Six weeks after the May seeding, all the species had achieved 80% cover or better except for Zoysiagrass.
- For the 15 July seeding, most species achieved 50% six weeks after seeding cover or better. However, American sloughgrass, Tufted hairgrass, Sheep, Chewings, and Hard fescue, Prairie junegrass, Kentucky bluegrass, and Nuttall alkaligrass had not achieved even 35 % cover by this time.
- For the 15 July seeding, species such as Crested wheatgrass, Meadow foxtail, American sloughgrass, Blue grama, Canada and Foul bluegrass, and Nuttall and Weeping alkaligrass deteriorated in quality during the summer stress period. Even ten weeks after seeding, these species never achieved 50 % cover.
- For the 15 September seeding, most of the species had achieved greater than 50 % cover after 4 weeks. However, warm-season species such as Sideoats grama, Blue grama, and Switchgrass were slower to establish than during the July seeding. Zoysiagrass never established after the 15 September seeding date.
- Cool-season grass species' Kentucky bluegrass, American sloughgrass, and Prairie junegrass were again slower to establish in the September seeding as in the previous seeding dates (15 May & 15 July) but did reach 50 % cover within 6 weeks.
- Although the autumn months of 2005 were warmer than normal for the region, the warm-season grass species exhibited a decline in percentage ground cover and quality by the November rating date as the air and soil temperatures decreased.
- For all three seeding dates, canopy heights were taken approximately 80 d after seeding (Figure 2). All of the species achieved their greatest canopy height during either the May or July seeding date. Big bluestem, Weeping lovegrass, and Switchgrass achieved the greatest canopy heights of 90 cm or better during the 15 May seeding date.

### **Acknowledgements**

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**Figure 1.** These photos are taken from the May 15, 2005 seeding date. Photo C was taken June 1, 2005, two weeks after planting. Photo D was taken July 1, 2005, six weeks after planting. Photo E was taken August 25, 2005, 14 weeks after planting. Photo F was taken September 1, 2005, 16 weeks after planting. Photo G was taken October 12, 2005, 21 weeks after planting.

**Table 1.** Establishment rate of twenty eight traditional and novel species for use in low-maintenance utility areas in North Central Indiana when seeded on three contrasting dates.

Treatment	Common Name	Scientific Name	Cultivar	Seeding Rate (kg ha <sup>-1</sup> )	May Seeding Date			July Seeding Date			September Seeding Date		
					Percent Ground Cover (%)			Percent Ground Cover (%)			Percent Ground Cover (%)		
					30 days	45 days	60 days	30 days	45 days	60 days	30 days	45 days	60 days
1	Crested wheatgrass	<i>Agropyron cristatum</i>	Kirk	343	92.7	94.3	99.3	96.0	98.7	100.0	92.7	100.0	98.3
2	Dryland bentgrass	<i>Agrostis castellana</i>	Highland	49	89.7	100.0	100.0	93.3	99.3	100.0	97.0	100.0	100.0
3	Idaho bentgrass	<i>Agrostis idahoensis</i>	GolfStar	49	81.0	93.3	100.0	85.0	98.7	100.0	81.0	97.7	86.7
4	Creeping foxtail	<i>Alopecurus arundinaceus</i>	Garrison	147	100.0	100.0	100.0	68.3	86.0	98.3	96.0	100.0	100.0
5	Meadow foxtail	<i>Alopecurus pratensis</i>	VNS	196	99.3	100.0	100.0	96.0	100.0	100.0	99.3	100.0	100.0
6	Big bluestem	<i>Andropogon gerardi</i>	Kaw	392	91.0	100.0	100.0	100.0	100.0	100.0	63.3	93.7	88.3
7	American sloughgrass	<i>Beckmannia syzigachne</i>	VNS	49	23.3	98.0	100.0	0.0	15.0	28.3	16.7	50.0	40.0
8	Sideoats grama	<i>Bouteloua curtipendula</i>	Pierre	343	91.7	100.0	100.0	100.0	100.0	100.0	22.7	41.7	16.7
9	Blue grama	<i>Bouteloua gracilis</i>	Bad river	147	84.3	99.3	100.0	100.0	100.0	100.0	45.0	51.7	48.3
10	Tufted hairgrass	<i>Deschampsia caespitosa</i>	SR 6000	49	75.0	99.3	99.3	9.3	30.0	40.0	48.3	80.0	65.0
11	Weeping lovegrass	<i>Eragrostis curvula</i>	VNS	49	95.0	100.0	100.0	100.0	100.0	100.0	46.7	81.7	66.7
12	Tall fescue	<i>Festuca arundinacea</i>	Kentucky	392	100.0	100.0	100.0	97.7	89.3	95.3	100.0	100.0	100.0
13	Tall fescue (rhizomatous)	<i>Festuca arundinacea</i>	Grande II	392	95.3	100.0	100.0	91.0	93.7	100.0	98.7	100.0	100.0
14	Sheep fescue	<i>Festuca ovina</i>	MX-86	294	54.7	88.3	99.3	6.7	35.0	60.0	60.0	93.3	76.7
15	Chewings fescue	<i>Festuca rubra</i>	SR 5100	245	84.3	99.3	100.0	17.3	63.3	90.3	68.3	97.0	91.7
16	Hard fescue	<i>Festuca trachyphylla</i>	Rescue	294	76.7	86.7	99.3	7.0	26.7	36.7	36.7	76.7	60.0
17	Prairie Junegrass	<i>Koeleria macrantha</i>	VNS	49	53.3	80.0	100.0	3.7	15.0	16.7	28.3	66.7	30.0
18	Birdsfoot trefoil	<i>Lotus corniculatus</i>	Norcen	343	100.0	100.0	100.0	80.0	100.0	100.0	86.0	98.7	98.3
19	Switchgrass	<i>Panicum virgatum</i>	Shawnee	245	38.3	100.0	100.0	96.0	100.0	100.0	28.3	36.7	21.7
20	Reed canarygrass	<i>Phalaris arundinacea</i>	Palation	196	95.3	100.0	100.0	98.7	99.3	100.0	81.7	98.3	98.3
21	Canada bluegrass	<i>Poa compressa</i>	Reubens	98	91.0	97.7	100.0	63.3	58.3	63.3	96.0	99.3	100.0
22	Foul bluegrass	<i>Poa palustris</i>	VNS	49	96.7	100.0	100.0	68.3	67.7	82.7	73.3	97.0	88.3
23	Kentucky bluegrass	<i>Poa pratensis</i>	Sonic	123	85.0	97.0	100.0	5.3	18.3	26.7	41.7	93.7	81.7
24	Nuttal alkaligrass	<i>Puccinellia airoides</i>	Quill	49	91.0	90.0	100.0	31.7	36.7	9.0	68.3	92.7	86.7
25	Weeping alkaligrass	<i>Puccinellia distans</i>	Fults	98	90.0	99.3	100.0	60.0	73.3	90.3	98.7	100.0	100.0
26	Little bluestem	<i>Schizachyrium scoparium</i>	Blaze	245	43.3	90.0	100.0	82.7	95.3	97.7	53.3	51.7	33.3
27	Indiangrass	<i>Sorghastrum nutans</i>	Tomahaw	398	93.3	99.3	100.0	100.0	100.0	100.0	68.3	94.3	88.3
28	Zoysiagrass	<i>Zoysia japonica</i>	Zenith	98	1.0	40.0	100.0	88.3	99.3	100.0	0.0	0.0	0.0
<b>LSD<sub>0.05</sub></b>					<b>19.1</b>	<b>7.4</b>	<b>0.7</b>	<b>21.7</b>	<b>16.2</b>	<b>17.2</b>	<b>14.1</b>	<b>16.8</b>	<b>16.5</b>

**Figure 2.** Species canopy heights for the twenty eight species seeded on three seeding dates approximately 80 days after seeding.

