The Use of Inoculants in Grassland Restoration

Wendy Leonard, City of San Antonio Natural Area Division of Parks and Recreation

Kelly Lyons, Assistant Professor, Trinity University

wendy.leonard@sanantonio.go
Kelly.Lyons@trinity.edu

Abstract

Phil Hardberger Park is 311 acre park in the heart of San Antonio. In Spring 2009, a 3 acre tract was targeted for grassland restoration. Woody species, mainly Texas persimmon (*Diospyros texana*) and Ashe juniper (*Juniperus asheii*), were removed. In September 2009 over 40, 000 plugs of big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), sideoats grama (*Bouteloua curtipendula*), Upland switch grass (*Panicum virgatum*), Eastern gama grass (*Tripsacum dactyloides*), and Inland seaoats (*Chasmanthium latifolium*) were planted. Native prairie seed mixes, including numerous wildflower seeds, were also applied to the site. The 3 acres set aside for grassland restoration were divided into 10 plots. Half of these plots were inoculated with soil microbes and nutrients from a climax grassland community, and half of the plots were not. Soil samples from the plots were taken in February 2010 and sent for analysis. The amount of nutrients as well as bacteria and fungi were tested. No general trends or differences were found among the inoculated plots and the un-inoculated plots. A second round of soil sampling will be conducted in October 2010 to see if the inoculants sprayed in May increased the amount of nutrients, bacteria, and fungi in the soil. The vegetation was sampled in April to see if there was a significant difference in vegetation between the plots. No significant difference was found between the inoculated and un-inoculated plots. This survey will be replicated Fall 2010 to see if the inoculants sprayed in May had any significant difference in plant growth and response.

Purpose (Objective, Aim, Goal)

The goal is to see how the grasses and wildflowers (both planted on the volunteer day and seeded before and after the volunteer day) respond to these inoculants and if future grassland restoration projects would benefit from this type of application.

Introduction (Background)

Restoration projects can be enhanced by adding fertilizers and chemical amendments to the soils but little work has been done with manipulating or adding soil inoculants to improve restoration success (Heneghan et al 2008). Many restoration ecologists are aware of the benefit of taking the physical and chemical aspect of soils into consideration when working on a project (Heneghan et al 2008). However, recent studies have shown that soil microbes can benefit plant diversity, biomass, and even succession partly by reducing dominant species and promoting less dominant species (DeDeyn et al 2004; Van der Heijden et al 1998). Soil microbes and inoculants can increase biological activity in the soil thus increasing the productivity and fertility of the system (Potthoff et al 2005). The City of San Antonio is monitoring potential benefits of adding microbes and inoculants to grassland restoration plots in a City owned Park.

Methods

In the Spring and Summer of 2009, City of San Antonio staff removed woody vegetation from a 3 acre tract targeted for grassland restoration within Phil Hardberger Park in San Antonio. This 3 acre area was planted with over 40, 000 native grass plugs in September (Fig. 1). Half of these plugs were inoculated with microbes. The seeds of the plants to be inoculated were first coated with BioGensis III™ SD seed coating material before they were planted in the 15.24 cm tubes. Once planted in the tubes, the grasses that contained the seed coating material were sprayed with Pepzyme G 1A foliar spray. The inoculated plants were evenly divided between the 1B-5B plots (Fig. 2) where "B" signifies the inoculated plant side. Side "A" contained no inoculated plants. The site was also seeded with a native prairie mix both before and after the planting of these grasses. Half of the native grass plugs.

In February of 2010, soil samples were taken in each of the plots. Fourteen samples in each of the ten plots were taken 15 cm deep. Two samples each containing 470ml of soil were placed into two zip lock bags. This was repeated for each of the 10 plots. One sample for each plot was sent off to Soil Foodweb™ and the other was sent to Crop Services International.

In April 2010, students from Trinity University completed a vegetation survey. Five quads, 1 m X 1 m were set up in each of the 10 plots (Fig. 3). Percent cover and number of different species was assessed. In May, plots "B" were sprayed with inoculants from a native grassland community as well as organic fertilizers (Fig. 4).

Figure 1. Native grass plugs ready to be planted. Half of the total number of plugs were inoculated with BioGensis III™ SD seed coating material and Pepzyme G 1A foliar spray.

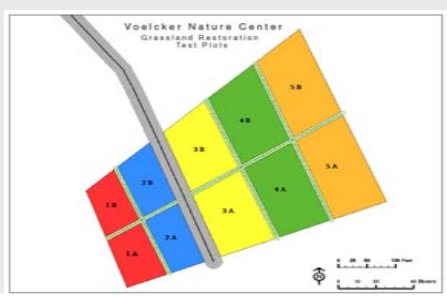

Figure 2. Three acres grassland restoration site divided into 10 plots. Side "B" inoculated with soil microbes, side "A" not inoculated.

Methods (con't)

Figure 3. Dr. Lyons students completing vegetation survey in April 2010. Frames 1 m X 1 m. Percent cover and species recorded.

Figure 4. Plots 1B-5B sprayed with inoculants from a native grass community and organic fertilizers.

Results

No significant differences were found in the soil samples and vegetation surveys among the inoculated (A) and un-inoculated (B) plots.

Table 1. One-Way Analysis of Variance revealed no significant difference between the A and B plots for the parameters tested. Alpha=.05.

	Inoculated side (A) mean	Un-inoculated side (B) mean	AxB mean square	degrees of freedom	p value
total bacteria (µg/g)	582.2	525.4	8065.6	1	0.627
active bacteria (µg/g)	61	56.9	41.6	1	0.228
total fungi (µg/g)	939.2	900.8	3686.4	1	0.577
active fungi (µg/g)	23.6	14.6	200.7	1	0.113
flagellates (#/g)	845.4	2788.2	9436179.6	1	0.227
amoebae (#/g)	3867.6	6462.8	16837657.6	1	0.462
total nematodes (#/g)	2.5	2.4	0.0372	1	0.914

Results (con't)

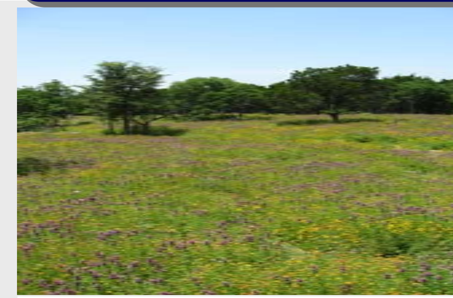

Figure 5. Picture looking out over A and B plots in May 2010. wildflowers seeded, grasses seeded and planted.

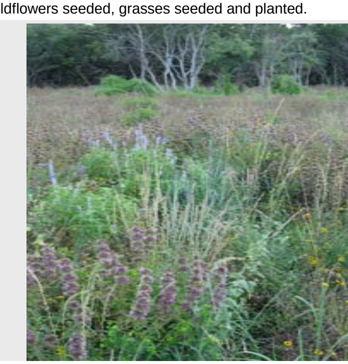

Figure 6. Picture looking out over part of B plots. Taken in September 2010.

Conclusions (Summary)

- No differences have been found among the plots (soil and vegetation)
- More time and studies are needed to adequately assess the benefits of adding soil inoculants to grassland restoration efforts
- Seeds responded better and grew quicker than plants

References

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