Investigation of mycorrhizae fungi establishment in Andropogon gerardii of the tall grass prairie

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Hypothesis:

The mesic prairie, also known as the tall grass prairie, along the Skokie River Corridor has problems keeping native tall prairie grasses established (1). Different hypotheses have been studied in the past to determine what factors might cause Andropogan garardii, big bluestem to die out in the prairie.

Symbiotic relationships between mycorrhizae and grass roots have been known to promote growth and establishment (2). This study investigated whether lack of mycorrhizae were the cause of poor establishment of Andropogon gerardii.

Methods: Soils and Sites

•Five sites in the Skokie River Corridor were chosen as our test sites. Three of the sites were named old "O" soils because they contain soils from when the prairie was engineered in the mid-1960's. The other two sites were named new "N" because they became part of the prairie reconstruction in 1994 when the Garden wall and berm were built. The five sites are distinguished as follows: "GO" "GN"- There have been grasses growing prevalently since 2004.

"NGN" "NGO" - Grasses are no longer present. "PGO" - Although there was once a presence of native grasses, there are no longer grasses growing. •Soil was obtained using a soil core from the sites and was either used for N; P; K analysis, pH and salinity, and bulk density (penetrometer) (Soil physical, chemical, & biological analysis. REU Program. Summer 2009) or mixed with sand to be used as part of the "treatment" to grow Andropogon gerardii and Panicum virgatum seeds in a controlled environment. The soils for the controls were sterilized using the autoclave (Fig. 1).



Figure 3. Veight of dried grass r biomass using scale

Microscope view of hyphae mycorrhizae structure at 20x.

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Methods (cont.): Grasses

·Once the seeds germinated they were fertilized once a week with a weak balanced fertilizer solution. •After 89 days plants were harvested, roots and shoots were separated and placed in oven for drying (Fig. 1, 4). and shoots were weighed to obtain biomass. ots were analyzed for N; P; K (Kansas State Lab) (Fig.

•Roots (pot cultured & in situ) were stained using trypan blue and were mounted on microscope slides (3). •Slides were visually scored with a minimum of 40 views per slide (2 slides/pot X 5 pots/treatment X 5 treatments) (Fig. 3).





References:

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Figure 4. Potted grasses on day of harvesting. Andropogon on the lefts and Panicum on the rights in treated pots Con; GN; GO; NGN; NGO;



Discussion:

Average percent root mycorrhizae colonization (Fig. 5): There was no significant difference in mycorrhizae found at the five sites in the field. The potted study documented the benefits of mycorrihizae associations. The data suggested that very few of the mycorrhizae was adapted to Andropogon and Panicum. Root and shoot biomass: The data showed that there was different growth patterns between Andropogon and Panicum. In non-microbial soils *Andropogon* invested more energy into the root system. Across all treatments the *Panicum* produced more

Soil Nutrient Composition (Tab. 1): There is a major N:P ratio between plots with and without grass. The NGN plot had the highest N:P ratio and the greatest cover of invasive reed canary grass.

Shoot Nutrients Levels (Fig. 6, 7, 8): The shoot uptake of P in both species was highest in all treatments except for the control. Potted pant observations (Fig. 4): There was a visual difference between the grasses growing in the five treatments vs the control

An analysis of the soil physical properties revealed high pH values across all sites. The soils at the five sites fell between the

Conclusion:

The study documented that both species grow better in association with mycorrhizae. Significant amounts of mycorrhizae from the roots of the plants collected at each of the five study sites. It appears that not all of the mycorrhizae that are found at the five sites support Andropogon and Panicum. Significantly higher N:P ratios are characteristic of sites with poor

Andropogon and Panicum establishment. Bulk density, pH and other structural properties of the soil did not vary significantly between the sites.

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