Plant Community and Soil Functional Characteristics of Prairie Conservation Strips

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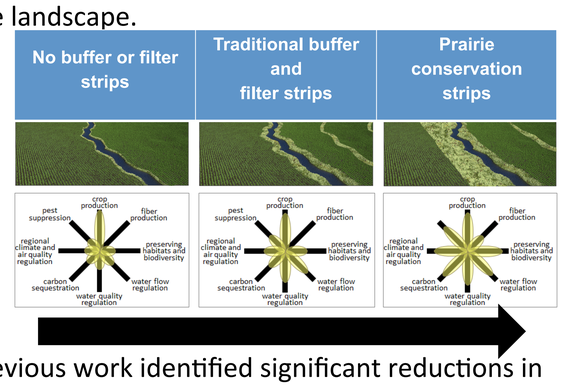
Introduction

Intensive row-crop agriculture in the US Corn Belt produces high yields of grain that provide food, feed, and fuel to our economy. The landscape alteration and simplification supporting this productivity have significantly reduced many of the ecosystem services the land would otherwise provide in exchange for crop production, including loss of wildlife habitat, increased soil erosion, and nutrient loss from fields into our waterways. The STRIPS research project (Science-based Trials of Row-crops Integrated with Prairie Strips) addresses the question of whether we can achieve conservation goals on production acres by strategically placing native prairie vegetation strips in the landscape.



Previous work identified significant reductions in water, soil, and nutrient loss from watersheds; increased native species abundance and diversity; and improved soil function in the footslope position. The work described here was designed to determine whether middle backslope prairie strips contribute ecosystem services beyond habitat, biodiversity, and water flow regulation within 10 years of establishment.

Objectives

- Identify and compare species diversity and cover of prairie plants between the upper edges, center, and lower edges of mid-slope prairie strips
- Identify and compare soil functional characteristics between crop areas, crop areas immediately outside mid-slope prairie conservation strips, and the upslope, center, and downslope areas within prairie strips.

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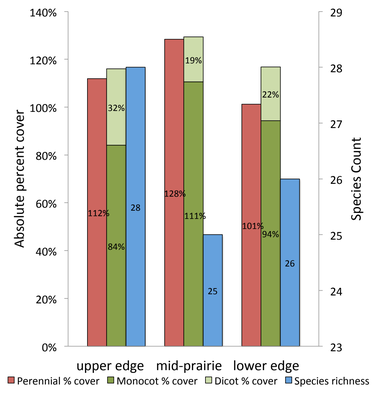
STRIPS research team

% Cover of Perennials, Monocots and Dicots, & Species Richness




View across prairie strip


Plant surveys


Hand probe soil collection

Species with Greater Than 10% Cover

Up-slope prairie edge

Species	% cover
*Poa compressa/pratensis**	39.2%
*Bromus inermis**	23.2%
Solidago canadensis	14.4%

Mid-prairie

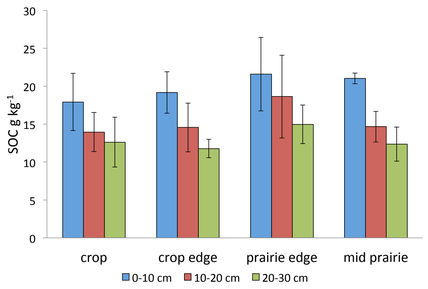
Species	% cover
*Poa compressa/pratensis**	37.8%
*Bromus inermis**	25.8%
Schizachyrium scoparium	12.2%
Sorghastrum nutans	12.0%
Bouteloua curtipendula	12.0%

Down-slope prairie edge

Species	% cover
*Poa compressa/pratensis**	28.4%
*Bromus inermis**	42.2%

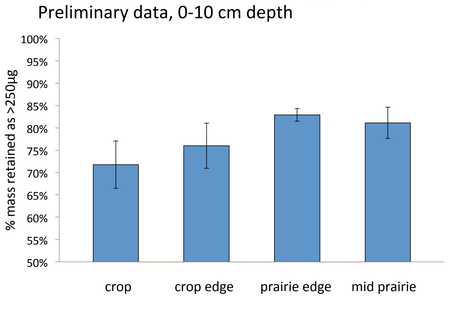
* dominant species

Soil Organic Carbon

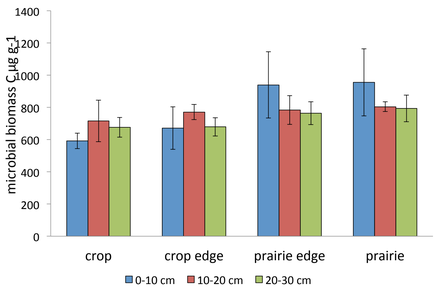


Water Stable Macro-aggregates

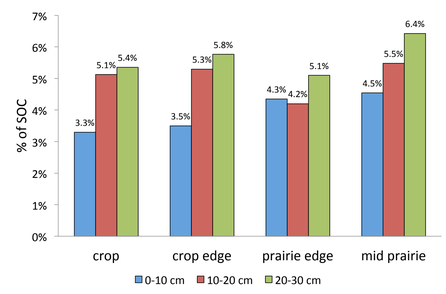
Preliminary data, 0-10 cm depth



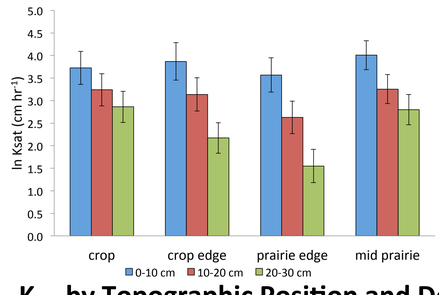
Microbial Biomass



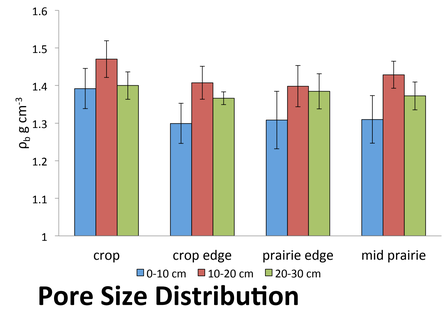
Microbial Biomass C as % of SOC



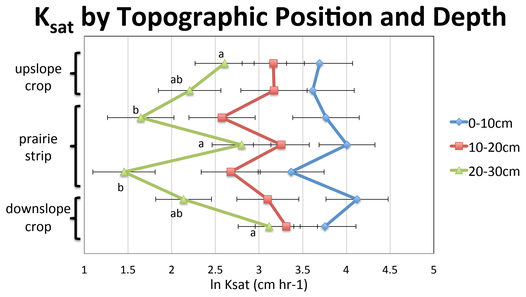
Saturated Hydraulic Conductivity (K_{sat})



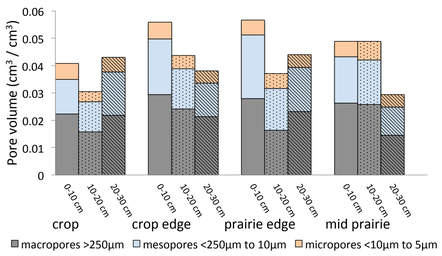
Soil Bulk Density



K_{sat} by Topographic Position and Depth



Pore Size Distribution



All error bars = 1 standard deviation

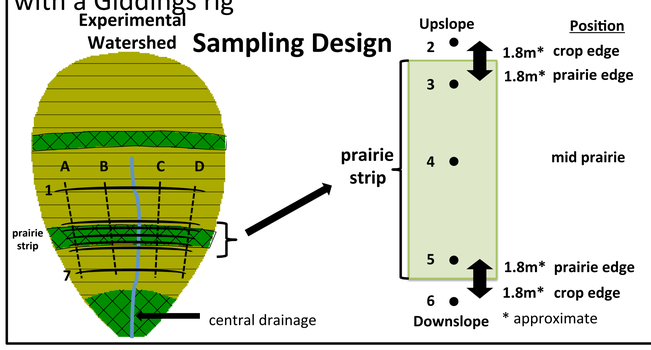
Methods

- 6 experimental watersheds (3 with prairie strips across the middle backslope, 3 control 100% crop)

Experimental watersheds showing sampling positions:


Basswood 3 Interim 1 Orbweaver 2

- Sampling positions placed relative to the center of the prairie strip
- Plant surveys conducted at peak vegetation using 0.5 m^2 quadrats; vegetation identified to species
- 2.5 cm diameter hand probe samples collected during peak vegetation to 30 cm depth
- 7.3 cm diameter intact cores collected to 30 cm depth with a Giddings rig



Results

Plant community

- The middle and upper edges of prairie are more dominated by perennial monocots than the lower edge.
- Edge areas are more species rich.
- % cover is most evenly distributed between species in the midslope position of the prairie strips.
- Non-native perennial monocots dominate after 7 years without burning.

Ecosystem services: Habitat, Biodiversity

Soil Functional Characteristics

- Crop soil trends towards greater density than soil near or inside prairie.
- K_{sat} at the 20-30 cm depth is significantly lower at the inside edges of prairie than in the crop or center of prairie strips, crop and mid prairie areas are equivalent.
- Preliminary data indicates increased macroaggregate stability in the prairie areas relative to crop, and intermediate stability in crop areas just outside the prairie strips.
- Microbial biomass data indicate greater variability within prairie areas and increased MBC within and near prairie.

Ecosystem services: Water regulation, Soil structure regulation