Integrating Strips of Native Prairie into Rowcrop Agriculture Fields

RFR-A1572

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Introduction

Tallgrass prairie once covered over 85 percent of the total land area of the state of Iowa. Currently, less than .01 percent of the original ground cover remain. The remnant prairies largely exist in small blocks along railroad right-of-ways, cemetery edges, and other marginal locations. Prairie is a diverse ecosystem consisting of grasses, legumes, sedges, and non-legume forbs. In addition to the plant communities, prairie provides habitat for a wide range of native birds, mammals, and beneficial insects. In 2016, the dominant land use in Iowa is agriculture with over 75 percent of the total area of the state planted to corn and soybeans. STRIPS (Science-based Trials of Rowcrops Integrated with Prairie Strips) seeks to integrate conservation and rowcrop production.

Materials and Methods

The experiment was set up at the Armstrong farm as a paired-comparison trial. A treatment field was selected as a location for the prairie strips. Similarly, a control field, with similar land characteristics, same crop, and same management conditions was chosen.

A native prairie has hundreds of species. Due to availability, cost, and practicality, this experiment seeks to mimic the natural system, rather than re-create it. At the Armstrong Research Farm, a mix of 40 native prairie species was seeded. A seed drill was used to directly seed the native species into the field stubble on November 11, 2014. A nurse crop of winter rye was seeded with the prairie species to provide faster, more substantial growth in the strips and reduce competition from noxious weeds. The seed drill was rented from Potawattamie County Conservation and was operated by the Armstrong Research Farm staff.

Following the seeding, instrumentation to measure water and runoff and populations of native species were installed. The largest piece of equipment on site is the Hydrologic flume (H-flume). The H-flume was installed at the base of the watershed where flow of water is concentrated and an autosampler captures and retains water samples before these exit the field. Groundwater wells were installed at a depth of one meter in various locations throughout the field to monitor shallow groundwater flow. Cover boards have been installed to monitor presence of snakes, reptiles, and amphibians. Automated recording units (ARUs) are deployed throughout the field, which activate for three hours at dusk and dawn to record all nearby audio. The ARUs are analyzed to determine bird populations in and around the strips. The control field, located near the prairie strips field, has been outfitted with the same instrumentation. Both fields have similar slope, soil type, are planted to the same crop, and are under the same management conditions. Research and monitoring will continue for 10 years.

Results and Discussion

The deep roots, stiff-upright plant stems, and diversity of species within prairie make it uniquely well suited to filter water and trap sediment before it has a chance to reach surface water. Using a combination of in-field

contour strips and a filter strip at the field edge, other long-term experiments conducted by the research team have yielded encouraging results. Converting 10 percent of the tillable area of a field into prairie will reduce nutrient and sediment export. Research at the Neal Smith National Wildlife Refuge in Jasper County has shown the amount of key nutrients, nitrogen, and phosphorous, travelling out of the field in surface water are reduced by 84 percent and 89 percent, respectively. Sediment export is reduced by 90 percent, and overall water retained is increased by 40 percent.

Native prairie takes time to reach full maturity. During the first two years after seeding, prairie plants use most of their energy to create underground biomass in the form of eight- to 10-ft deep roots. The third year after seeding is when the plant community begins to reach maturity, and many of the prairie plants will bloom for the first time. These strips were seeded in the winter of 2014 and research on their effect is ongoing.

Agriculture is an essential component of Iowa's present and future. Prairie strips are a conservation tool that can be used to increase biodiversity, create habitat, and reduce nutrient and sediment runoff, while simultaneously retaining high productivity of rowcrop land.

Acknowledgements

This project is the product of the ongoing dedication and expertise of numerous professors and technical staff at Iowa State University, including Matt Helmers, Matt Liebman, and Lisa Schulte-Moore. Other primary partners and funders include U.S. Forest Service, U.S. Fish and Wildlife Service, Leopold Center for Sustainable Agriculture, National Science Foundation, Iowa Department of Agriculture and Land Stewardship, Iowa State University, The Walton Family Foundation, Farm Service Agency, The McKnight Foundation, and the National Institute of Food and Agriculture.

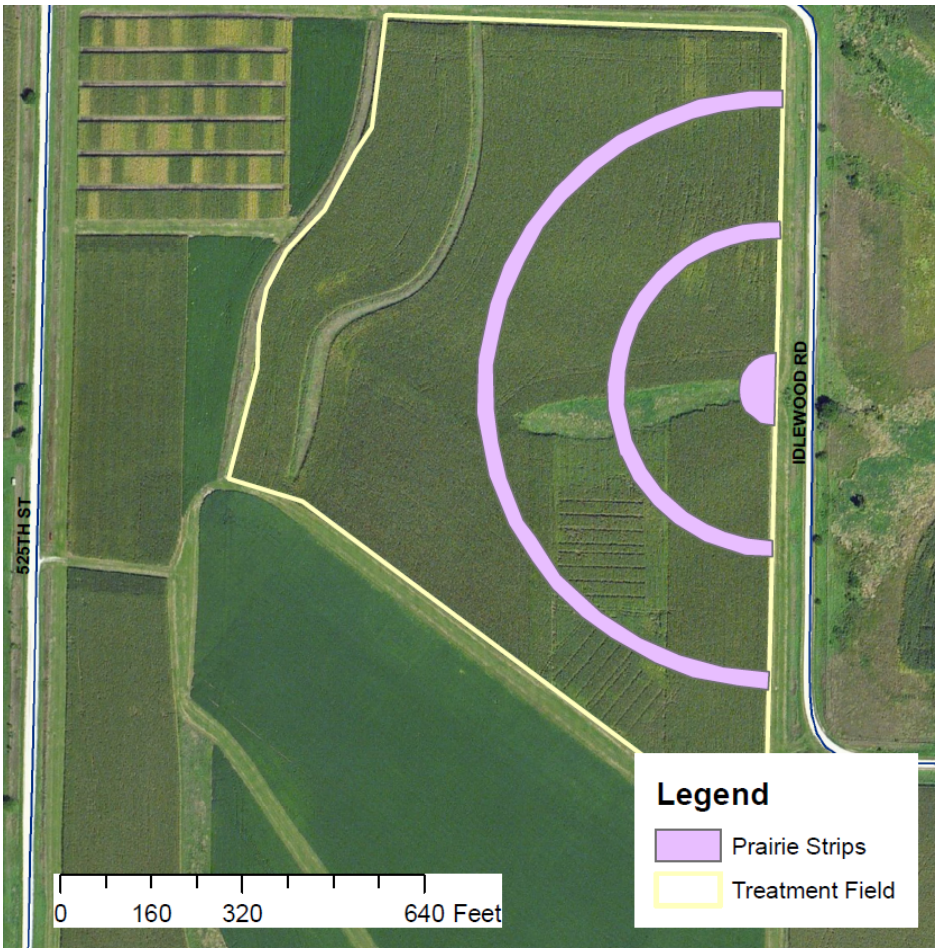

Figure 1. Prairie Strips at ISU Armstrong Research Farm. Treatment field is 20 acres with 1.86 acres converted from rowcrop to prairie strips (9.3%). Strips are 30 ft wide and spaced at intervals of 200 ft.