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Integrating strips of native prairie into rowcrop agriculture fields

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Introduction

Tallgrass prairie once covered over 85% of the total land area of the state of Iowa. Currently, less than .01% of that original ground cover remains; the remnant prairies largely exist in small blocks along railroad right-of-ways, cemetery edges, and other marginal locations. As of today, almost 75% of the total area of Iowa is planted to corn and soybeans. Those rowcrop acres are necessary for the economy of the state. Prairie provides necessary ecological benefits for soil retention, water quality, and habitat for a wide range of native birds, mammals, pollinators, and other beneficial insects. STRIPS (Science-based Trials of Rowcrops Integrated with Prairie Strips) seeks to integrate conservation and rowcrop production, using science to understand the effects prairie has on the surrounding cropland.

Materials and methods

The STRIPS experiment began in July of 2007 at the Neal Smith National Wildlife Refuge, east of Des Moines, Iowa. Prairie was seeded within corn and soybean fields in a variety of configurations – both at the foot slope and upslope in contour strips. The experiment was set up as a paired comparison trial; control fields and treatment fields were selected with similar land characteristics and identical crop management conditions. The proliferation of species in a native prairie number in the hundreds of species. Due to availability, cost, and practicality, this experiment seeks to mimic the natural system rather than re-create it. In all prairie strips a mix of thirty-two native prairie species were seeded.

Following the seeding, instrumentation to measure water, erosion, and nutrient runoff, groundwater, and populations of native species were installed in each watershed. The largest piece of equipment on site is the Hydrologic flume (H-flume). The H-flume was installed at the base of each watershed where flow of water is concentrated. An autosampler captures and retains water samples before they exit the field. Ground water 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 (ARU's) are deployed throughout the fields, which activate for three hours at dusk and dawn to record all nearby audio. The ARU's are then analyzed to determine bird populations in and around the strips. The control fields, located near the prairie strips fields, have 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.

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, this experiment has yielded encouraging results. Converting 10% of the area occupied by no-till corn and soybean production to strips of reconstructed prairie led to a 95% increase in soil retention, a 90% increase in total phosphorus retention, an 84% increase in total nitrogen retention, and a 63% increase in rainfall infiltration (Helmers et al., 2012, Hernandez-Santana et al., 2013, Zhou et al., 2014). We also have documented a 3.9-fold increase in plant diversity and a 1.6-fold increase in native bird abundance (MacDonald, 2012, Hirsh et al., 2013).

In 2014, the research team moved beyond Neal Smith and began implementing this practice on private,

commercial farms around the state of Iowa. Through nearly four years of implementation, prairie strips have been seeded on nearly fourty farms. Native prairie takes time to reach full maturity. During the first two years after seeding, prairie plants place most of their energy towards creating underground biomass in the form of deep roots, sometimes going over ten feet into the soil. The plant community begins to reach maturity, and many of the prairie species will bloom for the first time in the third year. Early data suggests a statistically significant link between the presence of prairie strips and a reduction in the amount of topsoil, nutrients, and surface water leaving these newly seeded commercial farms. The research team at Iowa State University will continue to study this and many other aspects of the Prairie STRIPS plantings.

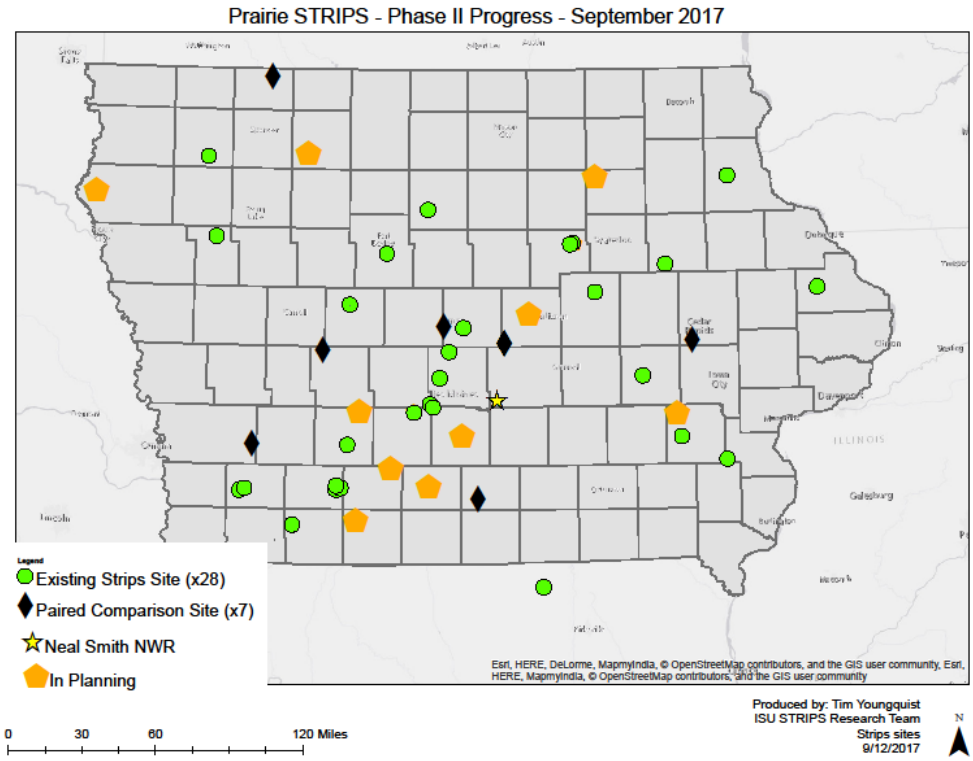

Figure 1. Updated map of all prairie strips demonstration sites on private farms (9-2017).

Agriculture is an essential component of Iowa's past, present and future. Prairie strips are a conservation tool that can be used to reduce erosion, improve water quality, and increase biodiversity, while simultaneously retaining high productivity of our rowcrop land.

Acknowledgements

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Information resources

STRIPS project website: www.prairiestrips.org