Strips of prairie plants slow loss of soil, nutrients and water from ag fields, double biodiversity

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Matt Helmers, a professor in Iowa State University's Department of Agricultural and Biosystems Engineering and a principal investigator on "Science-based Trials of Rowcrops Integrated with Prairie Strips," described how strips of

prairie plants have reduced soil erosion and runoff during a tour of a soybean field near Des Moines. Credit: Jane Hodgins, USDA Forest Service

A clean white plastic flume in an Iowa soybean field is testimony to a novel and possibly heretical idea: prairie plants, once plowed under by farmers growing corn and soybeans in the Midwest, yield benefits for farmers as well as the environment when integrated with rowcrops.

The flume is just one of many used on and near the Neal Smith National Wildlife Refuge east of Des Moines, Iowa, over the course of a decade of research called "Science-based Trials of Rowcrops Integrated with Prairie Strips" or STRIPS. Without strips of prairie plants arching down the sloped field of soybeans, the flume would likely have held several inches of soil after a heavy rain.

The STRIPS research team is led by Iowa State University, the USDA Forest Service, Leopold Foundation for Sustainable Agriculture, and the U.S. Fish & Wildlife Service. A paper published today in the journal *Proceedings of the National Academy of Sciences* (*PNAS*) describes research quantifying the effects of integrating strips of native prairie species amid corn and soybean crops, with prairie strips arranged to arrest runoff on sloped catchments. Researchers report that replacing 10-20 percent of cropland with prairie strips increased biodiversity and ecosystem services with minimal impacts on crop production.

"This research has the potential to change the way we do agriculture in the Midwest," said Randall Kolka, a co-author of the PNAS study and a research soil scientist and team leader with the USDA Forest Service's Northern Research Station. "Prairie plants are very effective in keeping soil in place, which helps keep nitrogen and phosphorus from getting into waterways and ultimately to the Gulf of Mexico."

The study includes findings from 12 watersheds at the Neal Smith National Wildlife Refuge. The experimental areas featured corn and soybean fields with strips of prairie integrated into the land at various positions and percentages on the rowcrop landscape. Each prairie strip contained numerous species of perennial grass and wildflowers to slow the movement of water and ensure that plants would be in bloom the entire growing season to provide habitat to pollinating insects.

Research suggests that prairie strips reduce soil and nutrient loss from steep ground, provide habitat for wildlife and improve water infiltration. According to the study published by *PNAS*, converting as little as 10 percent of the cropped area to prairie strips reduced soil loss by 95 percent, phosphorus losses in surface runoff by 77 percent, nitrate concentrations in groundwater by 72 percent and total nitrogen losses in surface runoff by 70 percent, compared with all-crop watersheds. Pollinator and bird abundance more than doubled.

"The strips are designed to act as a speed bump to slow water down and give it time to infiltrate the soil," said Lisa Schulte Moore, the study's lead author and a professor at Iowa State University.

Several farmers in Iowa are using STRIPS as part of their agricultural operation, and research is ongoing.

Researchers estimate that prairie strips could be used to improve biodiversity and ecosystem services across 3.9 million hectares of cropland in Iowa and a large portion of the 69 million hectares planted in rowcrops in the United States, much of it in the Midwest.

More information: Lisa A. Schulte el al., "Prairie strips improve biodiversity and the delivery of multiple ecosystem services from corn–soybean croplands," *PNAS* (2017). www.pnas.org/cgi/doi/10.1073/pnas.1620229114

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