
Small Changes, Big Impacts Prairie Conservation Strips

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Restoring the Balance

Agriculture in Iowa owes its immense productivity to an extreme trade-off. Once, perennial prairie covered 85 percent of the state, and its deep root network built and held together a fertile topsoil layer many feet deep. Now, more than 85 percent is in agricultural production, with the majority in row crops. However, shallow-rooted annual crops such as corn and soybeans cannot reproduce the soil-building capacity of a perennial prairie system. Other agricultural practices need to be implemented to keep soil, moisture and nutrients on the field. Without such practices, over half of the prairie-built topsoil of Iowa has been lost in the past 50 years, along with nutrient runoff and pollution of waterways. The large-scale conversion to row-crops also has drastically reduced native habitat and biodiversity. But agriculture in Iowa does not need to compromise between production and conservation. Scientists from the STRIPS research team (Science-based Trials of Row-crops Integrated with Prairie Strips) have shown that by strategically converting as little as 10 percent of a row-cropped field to perennial prairie—in narrow patches along contours and foot slopes—farmers

and landowners can reduce sediment movement off their field by 95 percent, total phosphorus loss by 90 percent, and total nitrogen loss by nearly 85 percent. Establishing prairie strips involves minimal farmland conversion at relatively low cost, while offering multiple farmland and environmental benefits. The patches of prairie create landscape diversity that supports wildlife such as birds and pollinators, recreation, grazing, as well as other multifunctional purposes. Prairie strips promise to be an innovative and effective conservation practice that sustains both Midwestern farming and its natural resources. In other words, small patches make a big difference.

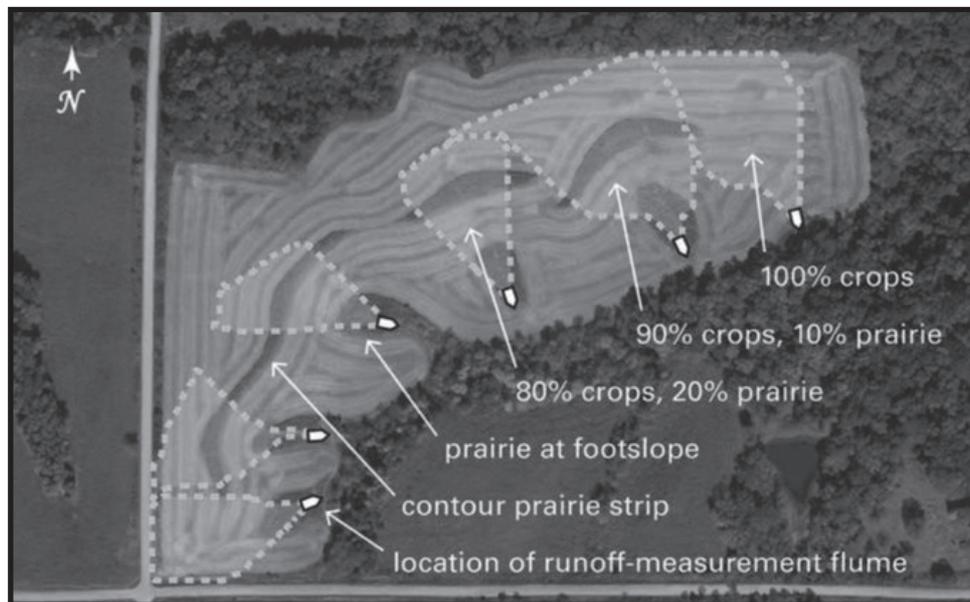
From experiment to practice STRIPS in Iowa

The STRIPS research team established experimental study sites in central Iowa at the Neal Smith National Wildlife Refuge in Jasper County in 2007—twelve small watersheds of 1 to 8 acres, annually producing corn or soybeans on slope inclines between 6 and 10 percent. The researchers monitored each watershed for sediment, water, nitrogen and phosphorus movement off the field, greenhouse gas emissions, as well as plant, insect and bird biodiversity.

Some of these watersheds were planted with tallgrass prairie vegetation in one or two contour strips among row crops, with separate prairie plantings at the footslope. The total land planted with prairie vegetation in a row-cropped watershed was either 0 (100 percent of the field in row crops), 10 or 20 percent. During 2007 to 2012, the STRIPS team found that watersheds with only 10 percent prairie reduced sediment export by 95 percent, total phosphorus export by 90 percent and total nitrogen export by nearly 85 percent when compared to losses from the 100 percent row-crop (no-till) watersheds. Meanwhile, financial assessment studies show that prairie strips are one of the most affordable conservation practices

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available to landowners. Based on these results, farmers have increasing interest in implementing this practice on farm fields in Iowa. The STRIPS research team and Iowa Department of Agriculture and Land Stewardship (IDALS) are establishing STRIPS demonstration sites on farms throughout Iowa. In December 2012 the STRIPS team worked with the first private adopter in Taylor County, southwest Iowa, to flag the boundaries of strips planted in June 2013. In addition to private land locations, STRIPS demonstration sites are planned for implementation at several ISU research farms. Field days will be held at all of these sites during which anyone interested in the practice can view the fields and interact with the landowners and land managers.



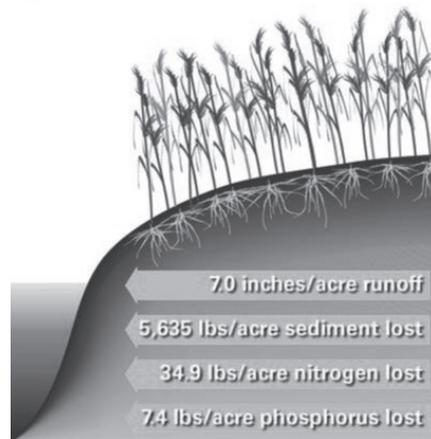
Tallgrass prairie: What roots hold

Tallgrass prairie is a diverse mixture of native grasses and flowering plants (forbs) uniquely adapted to the climate and soils of the central United States. Prairie strips keep vital soil resources in crop fields. Deep-rooted prairie plants increase soil organic matter and improve infiltration of water. The plants' stiff, upright stems slow surface runoff and help hold soil in place during heavy rains.

On an average 100% crop field:

13 plant species

1 bird species, 2 birds per field



STRIPS researchers calculated average values for surface water runoff, soil and nutrient export from a field cropped entirely in corn, as well as various indicators of biodiversity.



These flumes measure runoff from the STRIPS watersheds. Note the amount of sediment displaced from a 100% no-till crop field (left) compared to a field enhanced with 10% prairie (right).

Biodiversity by numbers

The STRIPS watersheds demonstrate substantial biodiversity benefits. On average, 51 plant species were found in areas surveyed within prairie strips as compared to 13 species within all row-crop areas. This native plant diversity provides habitat that fosters conservation of native communities—not only of plants, but birds and beneficial insects such as pollinators and natural enemies of crop pests. STRIPS support several species of insect predators (e.g. lady beetles) that reduce insect pests of corn and soybean. The enhanced floral resources that prairie strips provide throughout the growing season supports a diverse community of pollinators (70 species of native bees along with the European honey bee). Catchments with prairie strips also provide habitat for 118 percent more bird species and 133 percent more total birds than those with 100 percent row-crops. Bird species documented using prairie strips include species of greatest conservation need, including the eastern meadowlark, grasshopper sparrow, field sparrow and dickcissel.

The cost of installing prairie strips

The STRIPS team has calculated that the average annual cost of treating a farm field with prairie strips ranges from \$24 to \$35 per acre. The USDA NRCS offers Conservation Reserve Program (CRP) contracts that can reduce the cost to farmers by more than 80 percent. Costs associated with prairie strips include site preparation, strip establishment and annual and periodic maintenance to prevent weed establishment while the prairie plants take hold.

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The STRIPS team calculates that the annual opportunity cost (of foregone rent or net revenue loss associated with land taken out of crops) represents over 90 percent of the total cost. Overall, it is one of the least expensive conservation practices available to landowners and farmers. The STRIPS team continues to conduct financial assessments of prairie strips. This year they will calculate the monetary value of environmental benefits associated with the conservation practice.

The future of agriculture in Iowa

Agricultural production in Iowa has grown to meet the demand for products that supply food, feed, fiber and fuel. But the continued expansion of row-crop agriculture has been accompanied by a profound loss of natural resources, including nutrient and sediment loss into waterways, as well as a drastic reduction of native biodiversity, especially of those species dependent on prairie habitat. The public as well as local and federal governments increasingly urge for measures that reduce the impacts of agricultural production on grassland biodiversity and water quality—from the Mississippi River Basin down to the Gulf of Mexico. Programs like the USDA's Mississippi River Basin Healthy Watersheds Initiative (MRBI), Iowa Nutrient Reduction Strategy (INRS) and Iowa's Wildlife Action Plan encourage farmers and landowners to voluntarily adopt practices that improve watershed and ecosystem health. The STRIPS study documents a conservation practice that can sustain agricultural production while also providing diverse and extensive benefits across a

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broad range of ecological and economic criteria. Climatic extremes continue to put pressures on the productivity of monoculture cropping systems.

Landscape diversity in the form of prairie strips creates a natural buffer against soil erosion and nutrient loading of streams, and helps water infiltrate soil so it can later be used by crops. It also preserves important habitat for wildlife, including pollinators and natural predators of crop pests. The STRIPS team shows that planting prairie strips is a feasible and effective conservation practice with real benefits for farmers, landowners and society. Prairie strips provide disproportionate, multifunctional benefits that improve farmland and ecosystem health in the Midwest.

The STRIPS research team website includes information on partners and participants, as well as upcoming field days and demonstration site locations. Find more at:

www.prairiestrips.org

The Leopold Center for Sustainable Agriculture has compiled various multimedia resources, including: *A Landowner's Guide to Prairie Conservation Strips* and *The Cost of Prairie Conservation Strips*.

Find more at:

www.leopold.iastate.edu/strips-research-team.



On a 10% strips field, all of the above-measured biological and environmental indicators show improvement. There is no appreciable loss of yield on land that remains in annual crops.

