

Small Changes, Big Impacts: Prairie Conservation Strips



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.**

INSIDE THIS DOCUMENT:

[Dive into the anatomy of a prairie conservation strip \(page 2\)](#)

[Let the numbers do the talking, for costs and benefits \(page 3\)](#)

FLIP TO THE BACK:

[To find STRIPS demonstration sites and other resources \(page 4\)](#)



"Want to stem biodiversity loss, enhance fresh water supplies, curtail climate change AND improve people's lives? Then enhance modern agriculture with perennials and partnerships."

- Lisa Schulte Moore,
STRIPS researcher



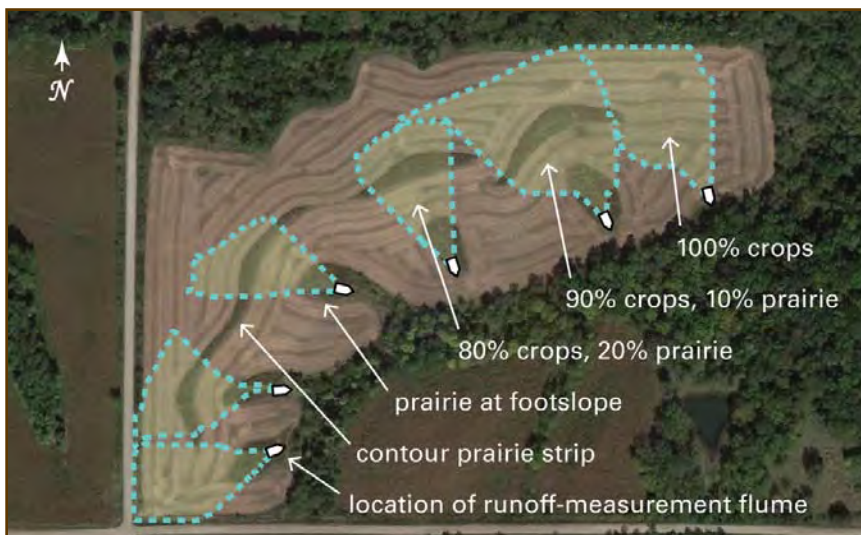
"This is the kind of agriculture I love, to talk about the soil, about sustainability, about production. Will I be able to say that I left the land better than I found it? That's what matters to me."

- Seth Watkins,
STRIPS practitioner

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.

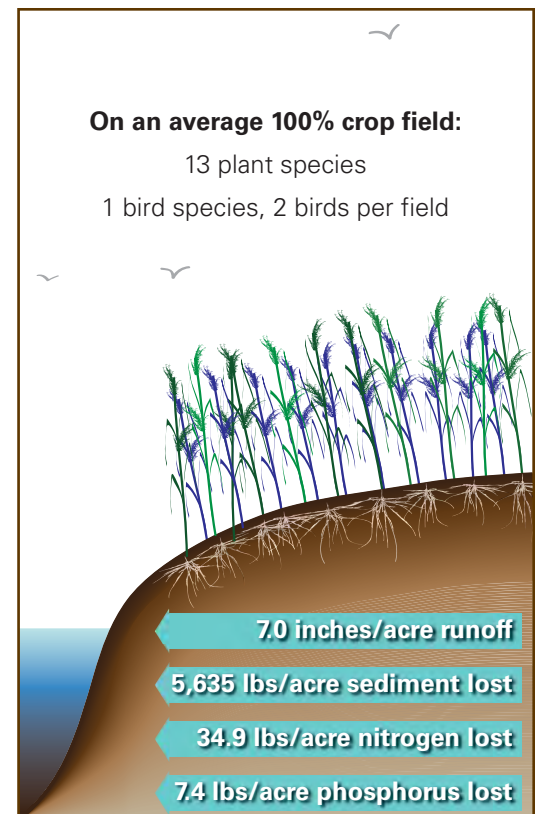


Catchment boundaries of six STRIPS watersheds after crop harvest, with bands of prairie left standing. Flumes measuring runoff are marked in white.

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 available to landowners (page 3).

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.



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. Compare this figure to the one on page 3.

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.

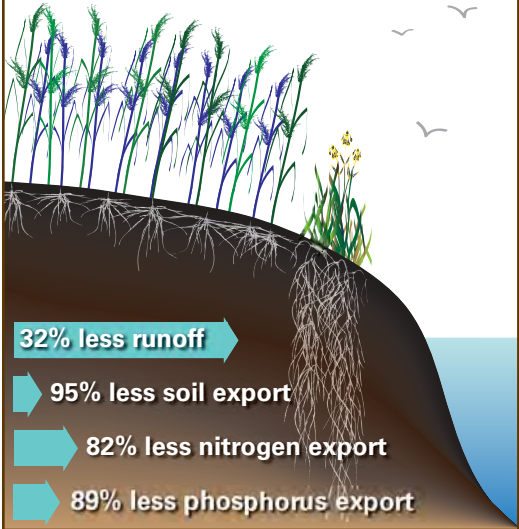


These flumes measure runoff from the STRIPS watersheds. Note the amount of sediment displaced from a 100% no-till crop field (left) compared to a field enhanced with 10% prairie (right).

What 10% in prairie strips can do:

Four-fold increase in plant species

Twice the bird species,
three times the abundance



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.

Diversity: More than just “more”

Prairie strips, with multiple plant species, have an advantage over similar conservation practices such as contour buffer strips or filter strips, which often are planted in a single species of grass. Plant diversity lets a prairie thrive under a variety of climatic conditions. Even if an individual species performs poorly because of yearly nutrient or water fluctuations, the ecosystem as a whole

thrives, staying resilient to climate extremes.

A diverse plant mix also supports a diversity of unique animals, insects and birds that are only found in the central United States. A diverse ecosystem supports multiple land uses, for example bird watching, honey production, hunting and grazing.



A flume measuring outflow from a 100% prairie field. Note the absence of sediment.

Biodiversity by the 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. 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.

Top ten priorities for agricultural policies and programs

Preliminary data from the STRIPS team

Priority	Addressed by STRIPS
1. Drinking water quality	✓
2. Water quality for aquatic life	✓
3. Rural job opportunities	✓
4. Flood control	✓
5. Water quality for recreation	✓
6. Game wildlife habitat	✓
7. Reducing greenhouse gases	✓
8. Tourism opportunities	✓
9. Crop production	✓
10. Non-game wildlife habitat	✓

STRIPS researchers asked more than a thousand Iowans to rank a list of benefits that could be derived from agriculture, and thus be promoted by policies and programs. Drinking water quality topped the list. More than just crop production (which ranked 9th on the list), respondents valued agricultural practices that improved water quality, rural livelihood and wildlife habitat, and reduced greenhouse gas emissions and flood risk. Agriculture enhanced by prairie strips addresses all 10 top priorities for Iowans.

VISIT STRIPS in Jasper County:

Neal Smith National Wildlife Refuge
9981 Pacific Street, Prairie City, Iowa
(515) 994-3400, NealSmith@fws.gov

FIND more resources on the web:

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/rips-research-team.

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 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.



Project partners include the U.S. Fish and Wildlife Service, Neal Smith National Wildlife Refuge, Leopold Center for Sustainable Agriculture, Iowa Department of Agriculture and Land Stewardship, U.S. Department of Agriculture, U.S. Forest Service Northern Research Station, Iowa State University, National Science Foundation and Trees Forever. Document written by: Mary Harris, ISU Natural Resource Ecology and Management, and Geetha Iyer, Leopold Center. Production: Geetha Iyer, Laura Miller, Leopold Center. Graphics by: Geetha Iyer. Photo credits: Amy Mayer/Harvest Public Media (Watkins, page 1), Sarah Hirsh, Anna MacDonald, the STRIPS team and the Leopold Center.

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