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Prairie Strips for Sediment and Nutrient Control and Biodiversity

Abstract

Installation of prairie strips is a new conservation best management practice (BMP) that involves using a species-rich mix of native prairie grasses, forbs, and legumes. "Prairie strips" are planted along the contours of an agricultural field at the 10% level to manage potentially polluting runoff and are promising for control of nitrogen and phosphorus. Researchers used whole watersheds to replicate findings, providing a high degree of rigor in the study of this new BMP. Moreover, cooperating farmers and landowners have successfully used farm programs to subsidize prairie strip plantings. Besides sediment and nutrient control, an additional benefit is high plant biodiversity, which leads to more diverse and healthier wildlife and pollinator populations.

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Introduction

Installation of prairie strips is a new conservation best management practice (BMP) that provides greater sediment and nutrient control and enhanced levels of biodiversity when compared to many BMPs. Prairie strips establishment involves planting grasses, legumes, forbs (composed of wildflowers and sedges), and other prairie species native to the U.S. Midwest in a crop field, in swaths at least 20 ft wide. The prairie strips are seeded in rows that are perpendicular to water flows, enabling enhanced filtering of water and the contaminants that may accompany it. Special attention is paid to planting a section at the low end of a slope (the "foot slope") where water accumulates. A combination of several in-field prairie strips, as well as prairie strips at the foot slope and other edge-of-field locations, is typical of designs of prairie strips installations. Prairie strips are projected to be relatively affordable, at \$35 per treated acre per year (Tyndall & Roesch, 2014). Extension educators in midwestern states and other regions will benefit by being prepared to answer questions and make referrals related to this new BMP.

Prairie Strips Research

Development of the use of prairie strips began in 2007 with a watershed-scale experiment involving corn and soybean row-crop fields and carefully designed native prairie plantings (Asbjornsen et al., 2013). This experimental prairie strips research project was conducted by partners from the U.S. Fish and Wildlife Service, the U.S. Department of Agriculture (USDA) Forest Service, the Leopold Center for Sustainable

Agriculture at Iowa State University, academic departments within Iowa State University, and the USDA Agricultural Research Service's National Laboratory for Agriculture and the Environment. The interdisciplinary research team (with members from agricultural engineering, agronomy, entomology, natural resources ecology and management, sociology, and agricultural education, and others) added a broader research and demonstration phase in 2014, newly enlisting the participation of Iowa farmers and landowners, Extension educators, greater numbers of university faculty and staff, and more cross-agency personnel. Between the start-up phase of research and expansion to development of prairie strips, the team supported annual advisory meetings of a cadre of Iowa-based stakeholders from nonprofit agricultural, environmental, and general farm organizations.

Benefits of Prairie Strips

As indicated previously, the installation of prairie strips results in greater sediment and nutrient control and enhanced levels of biodiversity.

- *Sediment and nutrient control.* Growing prairie strips on 10% of a field reduces sediment loss by more than 90% and reduces 84% of total nitrogen in surface runoff. Surface water phosphorus loss is lessened by 89%. Other BMPs have provided comparable choices for sediment control, but prairie strips provide improved concomitant control for nutrients, a benefit highly sought by those seeking to remediate surface water quality.
- *Biodiversity.* Biodiversity is low in row-cropped areas of the Midwest, where corn and soybeans are grown almost exclusively. Compared to existing conservation BMPs, installation and management of prairie strips increases plant biodiversity by 15 to 80 species, a much higher range than achieved through the use of grassed waterways and vegetative filter strips, which typically contain only a couple of species. Also, bird populations in prairie strips are double in both species and number as compared to populations in crop fields (Schulte, MacDonald, Niemi, & Helmers, 2016). In addition, the flowering of forbs and legumes over the course of the season makes prairie strips attractive to pollinators.

Extension and Outreach

Multiagency Coordination

Extension professionals regularly partner with colleagues in agencies and nonprofits to urge uptake of conservation BMPs (Baumgart-Getz, Prokopy, & Floress, 2012; Bridges, 2010; Smart et al., 2015), and this practice holds true for prairie strips development. Coordinated multiagency education works best in the conservation arena when it is long term (Smart et al., 2015). Conservation payments are likely to play an important role in funding prairie strips development, thereby increasing uptake. Farmers and landowners who establish prairie strips can be eligible for subsidies from government conservation programs, local or regional watershed programs, or nonprofits. Farmers can receive financial and/or technical assistance from the USDA Farm Service Agency through the Conservation Reserve Program (practice codes listed in Table 1) (U.S. Department of Agriculture, Farm Service Agency, n.d.) or through the USDA Natural Resources Conservation Service Environmental Quality Incentive Program (practice codes listed in Table 2) (National Resources Conservation Service, n.d.). It is important to direct the client to work carefully with the designated practitioner for detailed site analysis, advice on fitting this BMP to the land, eligibility, and options for

Table 1.

Farm Service Agency's Conservation Reserve Program Practice Codes

Code	Practice standard	Description
CP-15a	Grass contour strips	In field, along contour, legumes allowed
CP-21	Grass filter strips	Edge of field, near water
CP-33	Upland bird habitat buffers	Edge of field, 30–120 ft buffers
CP-42	Pollinator habitat establishment	Edge of field

Note. "Codes" is the term used by Farm Service Agency. Examples, not official.

Table 2.

U.S. Department of Agriculture Natural Resources Conservation Service's National Conservation Practice Standards

Code	Practice standard	Description
332	Contour buffer strips	Narrow vegetative cover near hill slope and on contour
393	Filter strip	Vegetation that interrupts overland flow
342	Critical area planting	Permanent vegetation on sites with high erosion
327	Conservation cover	Permanent vegetative cover

Note. "Standards" is the term used by Natural Resources Conservation Service. Examples, not official.

Resources

The prairie strips research team produced a series of Extension materials. Often used by newcomers is the "Frequently Asked Questions" document, which provides practical guidelines that are regularly updated (<https://www.nrem.iastate.edu/research/STRIPs/FAQ2>). A video is available (Leopold Center for Sustainable Agriculture, n.d.), and individuals can connect through social media at Twitter @prairiestrips. Also, a brief handout is available (Lamberton, Neal, & Miller, 2014), and technical articles have been published in scientific journals.

Challenges

Experience thus far with prairie strips suggests that their use raises concern because it takes land out of production. This concern has been voiced by stakeholders as well as by producers through evaluations of meetings and workshops. Research project directors argue, however, that in many cases, substituting prairie strips for crops on compacted, poorly drained acreage could be beneficial to the soil and financially beneficial

to the operation. There are also establishment challenges with prairie strips. It is essential to consider carefully the prior use of herbicide on a field when planning the timing of a prairie strips installation. Depending on the formulation and rate of application of an herbicide, there can be label restrictions for up to 10 months. A final challenge is the 3-year time period from installation to near-full growth, when the stand is vulnerable to weeds and washout. Some farmers, landowners, and Extension educators must also learn for the first time how to analyze the quality of first- and second-year growth. Perennial-based and multispecies plantings progress differently from monocrops, hay, or low-diversity Conservation Reserve Program plantings.

Conclusion

Prairie strips, composed of native species, form the basis for a promising conservation BMP. The native seed mix should thrive under many soil conditions, especially in regions that supported prairie historically. This BMP's efficacy is high for managing water flows, sediment, and nutrients. Research in the future likely will focus on the effects of prairie strips on soil quality, the potential for prairie strips to serve as a reservoir for natural enemies of crop pests, and effects on the integrity of the pollinator population.

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