

# Redefining the Field Edge

## Progress report for LNC18-409

Project Type: Research and Education

Funds awarded in 2018: \$199,351.00

Projected End Date: 09/30/2022

Grant Recipient: Iowa State University

Region: North Central

State: Iowa

Project Coordinator:

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## Project Information

### Summary:

Iowa State University's Conservation Learning Group seeks to reevaluate the traditional "field edge," investigating the long-term productivity and profitability of in-field low lying depressional areas. While traditionally planted to agricultural row crops, in the majority of years these marginal areas require significant inputs resulting in only modest crop yields and returns on investment. Can these marginal land areas be taken out of row crop production and transitioned to perennial vegetation to increase the return on investment with fewer acres and less risk? In addition, what benefits can be realized for water quality, soil health, and wildlife habitat?

This hybrid research and demonstration project seeks to work with five farmers to evaluate the feasibility of planting edge-of-field depressional areas to perennial vegetation, investigating the related agronomic, economic, water quality, soil health, and wildlife implications. Further, the project team will conduct an in-depth social science assessment to better understand the attitudes and perceptions of farmers and landowners towards conservation practices and alternatives to traditional grain crops, specifically looking at barriers to adoption and measuring how attitudes change in the five farmers over the course of the project. Project findings will be presented in a comprehensive, engaging, and accessible case study format (including printed publications, infographics, video, and audio components), which will be broadly distributed to farmers, landowners, agricultural and natural resource professionals, and college students via the Conservation Learning Group, Iowa State University Extension and Outreach, and additional conservation partners across the North Central Region.

### Project Objectives:

Participating farmers and users of educational materials will learn how to make informed decisions regarding implementation of land use change through multi-year analysis of in-field productivity and profitability. Learning outcomes include an

increased understanding of agronomic, economic, environmental, and wildlife benefits of transitioning small edge-of-field depressional areas out of row crop production. The anticipated action outcome is for high risk, low profitability field areas to be converted from annual row crop production to perennial vegetation, minimizing risk and maximizing farmer profits, while realizing water quality, soil health, and wildlife benefits provided by targeted plantings of diverse perennial vegetation.

## Introduction:

The prairie pothole region runs from central Iowa north and west into Minnesota, South Dakota, North Dakota, and across the plains of Canada, covering nearly 173 million total acres. The region is characterized by abundant prairie potholes, small depressional wetlands that can be permanent, semi-permanent, seasonal, or temporary. Row crop intensification and drainage systems in the late 19<sup>th</sup> and early 20<sup>th</sup> centuries gave rise to a dramatic decrease in wetlands in the region by an estimated 95 to 99% (Bishop, 1981; Bishop and van der Valk, 1982; Bishop et al., 1998). By the early 1980s, the area of wetlands in Iowa's prairie pothole region was less than 30,000 acres, down from an estimated 1.3 million acres historically (Bishop et al., 1998; Miller et al., 2009).

In recent years, precision technologies, big data decision support tools, and equipment advancements have made it easier than ever to identify high risk/low productivity and low sustainability areas that can be converted from annual row crop production to perennial vegetation, and easily farmed around when converted areas are near field edges. Couple these abilities with efforts to improve soil health and reduce nutrient losses, and fine-scale, targeted land use change to perennial vegetation offers great potential to improve overall field profitability and provide wildlife habitat while reducing risk profiles associated with poor return on investment, nutrient losses, and soil degradation (e.g., Schulte et al. 2017). Brandes et al. (2015) speculates that planting low-input perennial vegetation into low-yielding areas of fields would increase overall cropland profitability by 80% while possibly providing large ecosystem services such as wildlife, pollinator, and monarch habitat.

One of the major constraints of converting prairie potholes from row crop production to perennial vegetation is location within the field. Prairie potholes along a field edge can be farmed around relatively easily with precision technology and machinery advancements. However, farming around prairie potholes in the middle of the field presents difficulties and inefficiencies associated with farming around small areas. The true opportunity lies in identifying and converting prairie potholes along the field edge where the potential for sediment and nutrient loss is greater, as well as potentially impacting lower yielding areas associated with end rows. Field edges also facilitate access for easier establishment, maintenance, and potential use of perennial vegetation for haying or grazing.

## Cooperators

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## Research

### Hypothesis:

By using within field profitability analysis the whole field profitability will be increased when less profitable field areas are transitioned from row crop production to perennial species.

### Materials and methods:

The Conservation Learning Group project team approaches this project with four objectives:

- Partner with five farmers to identify management practices and inputs from fields containing farmed potholes/depressions.
- Evaluate the feasibility of establishing diverse perennial vegetation stands in high risk/low profitability areas at the field edge and make recommendations on best management practices.
- Establish land use change demonstrations of perennial vegetation in depressional areas following best management practices from objective 2.
- Assess attitudes and perceptions of farmers and landowners towards perennial vegetation and alternative crops.

(Objective 1) The project team will work closely with five farmers to collect historic agronomic and economic data, including field management practices, seed and fertilizer inputs, grain yields, and revenue. The evaluation of these data will be conducted using SMS Advanced from Ag Leader Technology to generate profit zones within each field for the current management scenario. This objective is driven by the farmer partners' willingness to provide yield monitor files, crop production practices, and crop input costs. The project team assisted the farmer partners with by developing the within in field profitability to identify low profit field areas.

(Objective 2) The project team will investigate 10 potholes currently planted in perennial vegetation as a result of enrollment in the Conservation Reserve Program (CRP). These potholes were grouped into 2 clusters in Boone and Story County, Iowa. Field vegetation sampling routines will be conducted through late spring and summer of 2020 to assess vegetation diversity and gauge establishment success. Additional bird, monarch, and milkweed surveys will be conducted to assess habitat

success. As part of this objective a listening session or survey will be held to gain insights into the successful establishment of diverse perennial vegetation.

(Objective 3) In consultation between the farmer partners and the project team, 3-5 field areas will be converted from annual row crop production to perennial vegetation based on the within field profitability analysis. Each field area selected for conversion will be 1-3 acres in size. The project team will work closely with each farmer to target conversion areas to be located near a field's edge so regular field operations can proceed either around or through the area with minimal disruption. Field assessment will be conducted in Years 2 and 3 of the project to determine and document agronomic, economic, and environmental viability. In-field assessments will compare field areas of land use change with similar areas that remain in row crop production through a paired comparison approach. Soil health will be assessed in Year 3 of the project via chemical analysis of the soil, combined with the Solvita and Haney tests evaluating respiration and other soil health metrics. Soil nitrate samples will be collected and assessed at the 0-1 and 1-2 foot soil depths in 6- to 8-week intervals throughout the growing season, providing a temporal picture of soil nitrate availability and nitrate loss potential over the course of the growing season. Perennial plant establishment and diversity will be assessed in the spring, summer, and fall following establishment through the end of Year 3.

(Objective 4) An in-depth social science assessment will be conducted, utilizing such techniques as participant observation, interviews, and the Rapid Needs Assessment and Response technique, to evaluate attitudes and barriers to conservation practice adoption and alternative cropping systems. In the first year of this project, the Conservation Learning Group team will conduct three Rapid Needs Assessment and Response (RNR) workshops in order to assess the attitudes and perceptions of farmers and landowners toward perennial vegetation and alternative crops. These workshops will be held at different locations throughout Iowa with a goal of 25-30 participants per workshop. We plan to give the farmers a journal and camera so that they can record their observations and the changes to the converted field. We will also do pre-, mid- and post-assessment interviews with the 5 farmers to be able to understand changes in understanding over the course of the project and also to obtain feedback in terms of how their neighbors might be viewing this project—in other words, what are they hearing in the “coffee shop” regarding transitioning those areas away from row-crop farming. Through detailed evaluation of field days and workshops, we will also assess attitude and perceptions of the farmers and landowners in attendance. We are anticipating 160+ farmers will attend our four field days.

#### Research results and discussion:

Farmers interviews were conducted from February to April 2019. Two of the initial cooperators did not have qualifying field areas for the field profitability and transition to perennial species. One replacement cooperator was identified and interviewed in August 2019. A fifth cooperator was not identified. Field profitability analysis was completed using SMS Advanced coupled with the cooperators yield monitor files and site interviews. Sites were identified with each cooperator for replacing row crop production with a perennial seed mix. All cooperators choose a CP23 Flood Prone species mix after a consultation with E. Heaton, A Janke, and IDNR wildlife biologist. Perennial seed was purchased for all locations; however, no fall seeding was completed due to late corn harvest, wet fall conditions, and earlier cold temperatures. Essentially, fall conditions were not conducive to seeding, germination, and emergence. In consultation with the Iowa Department of Natural Resources biologist, spring seeding will be suitable and would allow for additional

preplant weed control. Cooperators were provided field notebooks for recording notes and other observations. Grassland vegetation was mapped in Story and Boone County; two clusters were identified. The grassland vegetation clusters were used for three rounds of bird, monarch, and milkweed surveys as an indication of vegetation quality. The 2020 vegetations will include cover mapping of dominant vegetation.

Farmers interviews were conducted in July and August of 2020 for the mid-assessment by J. Benning and J. Comito. Field profitability analysis was completed using SMS Advanced coupled with the cooperators yield monitor files for 2019 and 2020 growing seasons. Because no fall seeding was possible in 2019, the spring of 2020 was used to seed the perennial CP23 mix. This was completed for all four sites by the end of May. Soil nitrate samples were collected from June through October of 2020 from the perennial seeded area plus the adjacent row crop area. For nearly all sampling periods and locations, soil nitrate values were lower where the perennial mix was planted. Interestingly, at two locations, soil samples were not able to be collected from the adjacent row crop field due to drought conditions in July and/or August however soil samples were possible in the perennial seeded area. Additionally, grassland vegetation was mapped in Story and Boone County similar to 2019. The grassland vegetation clusters were used for three rounds of bird, monarch, and milkweed surveys as an indication of vegetation quality. And the 2020 vegetation assessment included cover mapping of dominant vegetation.

Research conclusions:

none yet

### **Participation Summary**

**7** Farmers participating in research

## Project Activities

[Perennial vegetation survey instrument](#)

## Educational & Outreach Activities

**10** Consultations

**3** Published press articles, newsletters

**1** Webinars / talks / presentations

**3** Workshop field days

### **PARTICIPATION SUMMARY:**

**90** Farmers

**62** Ag professionals participated

## Education/outreach description:

Rapid Needs, Assessment and Response workshops were conducted on 6/13/19 (Smeltzer Farm, Otho, IA; 27 attendees), 6/18/19 (Spirit Lake, IA; 36 attendees), and 7/9/19 (Whiterock Conservancy, Coon Rapids, IA; 26 attendees).

Mid-assessment interviews were conducted by J. Benning in July and August. An infographic has begun to provide guidance on planting of warm season mixes to interested farmers. Case study development is underway. Participants were the 4 farmer partners.

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