Midwest Cover Crops Council

February 23, 2021

Illinois Report

Illinois Extension

Research

- Illinois Nutrient Research & Education Council
  - Tile drainage/water quality
  - Insect pest management
  - Phosphorus runoff
  - Nutrient application timing in corn after cereal rye
  - Nutrient scavenging by cover crop termination timing

ILLINOIS NREC

Illinois Farm Bureau – Nutrient Stewardship Grants

- Funding to support individual county projects in areas across the state.
- IL FB has provided over $550,000 for this program since 2015
- Supports on-farm research and farmer outreach

The Goldilocks Zone of Cereal Rye Biomass in Corn-Soybean Rotations

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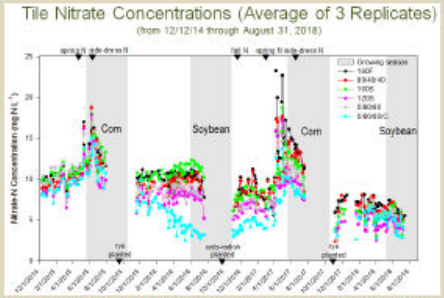
Abstract ID 128312

Cereal Rye Reduces Tile Nitrate

Using our replicated tile drainage study in central Illinois, we can clearly demonstrate the effectiveness of cereal rye as a scavenger of soil N. Light blue dots represent the average tile nitrate concentrations of three replicate plots planted with cereal rye in 2015 and 2017 and an oat and radish mixture in 2017.



Tile nitrate concentrations from plots containing 6 N treatments in a randomized complete block design with 3 replicates in a C-S rotation.

Overall Experimental Design

- 36 monitored tile lines (18 corn and 18 soybean)
- Average plot area is 4.2 acres and is 100 ft wide (50 ft on either side of a 5-inch lateral)
- Randomized complete block (6 N treatments with 3 replicates)

Six N Treatments	
160F	160 lb/acre in fall
80/40/40	80 lb/acre in fall, 40 at planting, and 40 side-dressed
160S	160 lb/acre in early spring
120S	120 lb/acre in early spring (reduced rate)
0/80/80	80 lb/acre in spring and 80 side-dressed
0/80/80/C	80 lb/acre in spring and 80 side-dressed + cover crop

Only one N treatment (0/80/80/C) had a cover crop which was cereal rye planted following corn and an oat and radish mixture following soybean.

This amount of cereal rye (1.25 tons/acre) steadily decreased tile nitrate concentrations throughout the late winter and spring of 2016.

Compared with only the companion treatment (0/80/80), tile nitrate was reduced by 9 lbs/acre (43% reduction in tile nitrate load). The beneficial effect of lower tile nitrate concentrations carried over into the next drainage season even though oat and radish production was negligible in fall of 2016. Interesting to note that the cold spring of 2018 produced less than 0.5 tons/A of cereal rye and we saw little change in tile nitrate concentration compared with all the other plots in the study.

How much biomass is enough?

With 27 cover crop/tile monitoring observations across 5 farms during the past 8 years, we have concluded that approximately 0.5 tons/A (1 Mg/ha) of above-ground cereal rye biomass is needed to measurably detect an associated decrease in tile nitrate concentration. We used paired, adjacent pattern drained fields or replicated tile drainage studies for this assessment.

This photo shows the amount of biomass accumulation (0.5 tons/A) that represents the minimum amount of above ground cereal rye biomass needed to reduce tile nitrate concentrations.

This cereal rye stand was produced from broadcasting seed into standing corn. The plant stand was variable, but because of the earlier cover crop planting date (as compared to drilling cover crop seed after row crop harvest), the minimum amount of biomass was achieved.

A closer look at 0.5 tons/A of cereal rye production shows that stems are about 6-8 inches long with a canopy at 10 to 12 inches tall. Greater cereal rye production levels can reduce annual tile flow weighted mean nitrate concentrations below 2 mg/L.

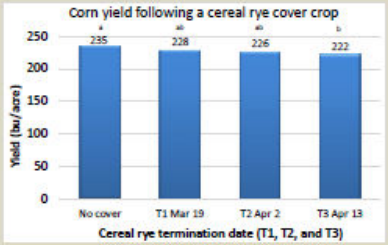
Cereal rye ahead of soybean

This photo shows us planting green into 3 to 4 feet tall cereal rye Roller crimpers on the planter would help create a residue mat.

There is great flexibility when deciding to terminated cereal rye ahead of soybean. During the past 2 years, we planted cereal rye "green" into standing soybean with above ground biomass of approximately 2.5 tons/acre (5.6 Mg/ha). Soybean yields were excellent with 75 bu/A and 73 bu/A in 2019 and 2020, respectively.

Cereal rye ahead of corn

Our studies indicate that soil N mineralization is an important source of tile nitrate, especially following soybean. However, cereal rye ahead of corn has proven to be challenging and can lead to yield decreases. Crandall, Ruffo, and Bollero (2005) demonstrated that cereal rye must be terminated 2 weeks before corn planting to minimize the risk of N deficiency and decreased corn yields. We conducted a study with 3 termination dates for cereal rye ahead of corn. We aimed to terminate with glyphosate 4 weeks, 2 weeks, and the day before corn planting. Although no-till soybean into cereal rye is effective, corn greatly benefits from fall strip-till through the cereal rye. This does, however, reduce cereal rye biomass production by nearly 33%.



Only corn plots planted the day after cover crop termination led to a significant yield decrease; however, the trend was negative.

On this day (April 13), cereal rye was terminated, and corn was planted the next day. This much biomass (as much as 1.6 tons/A) produced a 6% yield decrease compared to no cover plots.

This is what we are looking for ahead of corn: strip-tilled cereal rye with biomass of 0.5 tons/A and terminated two weeks before corn planting; however, not always easily achieved.

Summary

- The Goldilocks zone of cereal rye biomass ahead of no-till soybean is 0.5 to 2.5 tons/A (1 to 5.6 Mg/ha) without a yield drag. Weed suppression improves above 0.5 tons/A which can partially offset the cost of cover cropping by eliminated post emergence herbicide application.
- The Goldilocks zone is razor thin for cereal rye ahead of strip-tilled corn at an estimated 0.4 to 0.6 tons/A with termination at least 2 weeks ahead of planting.

Cover Crops and Insects

- Dr. Nick Seiter– University of Illinois
  - "Insect Management in Cover Crop Systems" – January 2019-December 2021
    - Develop initial insect pest management recommendations for systems that include cover crops
    - New M.S. student
  - "Pest and Beneficial Insects in Illinois Cover Crops" – 2019-2020
    - Characterizing pest and beneficial insect complex in cover crops

Observing pests and beneficial insects in rye cover crops

- Sampled 38 commercial soybean fields following cereal rye in central and southern Illinois from 2019-2020
  - Paired with 35 nearby fields that had no cover crop
- Fields visited approximately weekly
  - Target: 3 weeks before & 3 weeks after planting
  - Actual: as many as 9 weeks before planting
- Compare pest and beneficial populations, damage to crop
  - Armyworm
  - Cutworm
  - Slugs
  - Stink bugs
  - Ground beetles
  - Lady beetles
  - Etc.

Preliminary Results

- Out of 74 soybean fields sampled:
  - 0 reached an economic threshold for insects
  - One cereal rye field was sprayed due to high armyworm populations (note: armyworms do not develop on soybean)
  - One cereal rye field was replanted due to combination of poor (wet) conditions and slug damage
    - Paired control field also had substantial slug damage


Slug damage to soybean cotyledon


Armyworm larva

Summary of Results So Far

- Incidence of economic damage following a cover crop is relatively uncommon (at least in Illinois)
- Additional insect management risks of a cereal rye-soybean system appear to be minimal
  - Potential for other pests, e.g. voles
- Potential for issues is greater in corn, though we did not observe economic damage in our limited corn trials
- Still working through identification of the pest and beneficial insect community inhabiting cover crops in Illinois

Big Picture:

- Make your cover crop decisions based on nutrient/erosion management needs
- Scout for insects/slugs and control them as needed
- Most insect management issues that have occurred in Illinois are not specific to cover crops
  - However, some cover crops can elevate the risk of certain pests
- Corn following rye and/or soybean following legumes pose increased risks
  - Still manageable; scout accordingly!

Cover Crop & No-till in Tomato & Pepper Produciton

Illinois Extension

Cover Crops in Southern Illinois

- Dr. Karla Gage, Dr. Jon Schoonover, Dr. Karl Williard, Dr. Amir Sadeghpour

SIU CARBONDALE Southern Illinois University

Cover Crops in Southern Illinois

- Cover crop management for weed control/herbicide interference
- Soil & Water quality influences of cover crops
- Intercropping of winter wheat with soybeans for weed suppression

SIU Southern Illinois University
CARBONDALE

Virtual Extension & Outreach

- "5-min CropCentral" instructional YouTube video: Insect management following a rye cover crop. https://www.youtube.com/watch?v=1651eYu420E
- The University of Illinois Dudley-Smith Farm Winter Meeting was held virtually February 9, 2021.
  - Integrating cover crops in grain and beef cattle operations for soil-livestock synergies (Dan Shike)
  - Current status of cover crops and grazing in Illinois
  - Incorporating cover crops into tile drainage research (Laura Christianson)
- Jo Daviess Soil and Water Health Coalition
  - 3 virtual field days

The Illinois Nutrient Loss Reduction Podcast

32 episodes to date on agricultural conservation practices

Custom cover crop interseeder used for early-season seeding of cover crops in corn (Andy Hawley and sons of Stockton, IL)

Advanced Soil Health Trainings

- Program originally started by American Farmland Trust
- Tri-State ASHT completed in August 2020 in southern IL, southwest IN, & western KY – 22 participants
  - University of Illinois Extension, Illinois Sustainable Ag Partnership, The Zea Mays Foundation, The Nature Conservancy
- Next round in Bi-State area (IL & IA) was slated to start in 2020, delayed due to COVID-19

ILLINOIS Extension

ILLINOIS SUSTAINABLE AG PARTNERSHIP

The Nature Conservancy

THE ZEA MAYS FOUNDATION

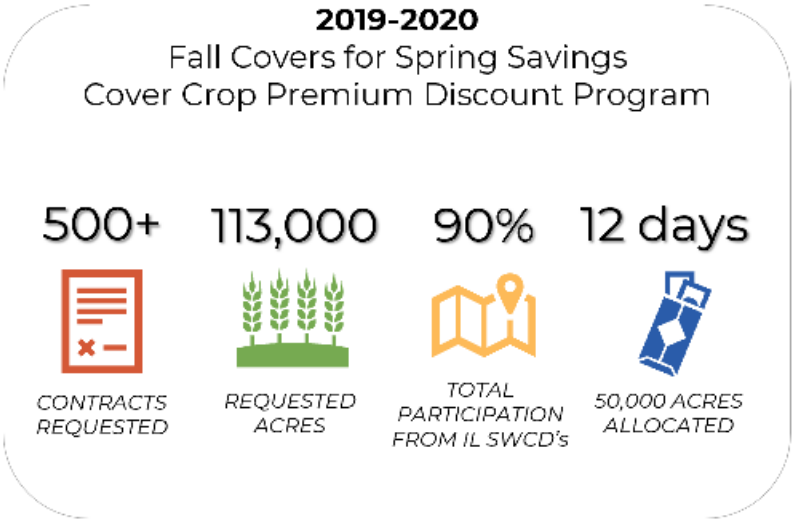
Fall Covers for Spring Savings

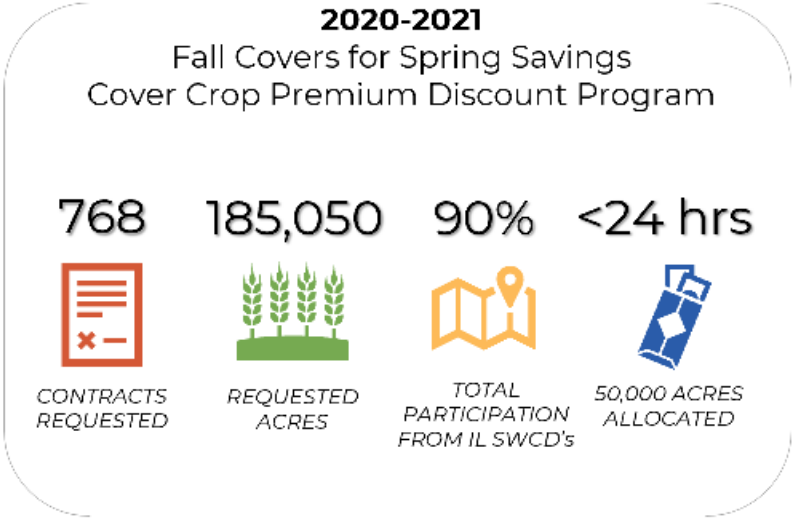
2020 outcomes

- 306 applications from 212 operators on 50k acres were submitted by December 17th, 2019
- Total acres applied for = 113,000
- Total applications received = 700 +
- 70% of approved acres were new

2021 applications

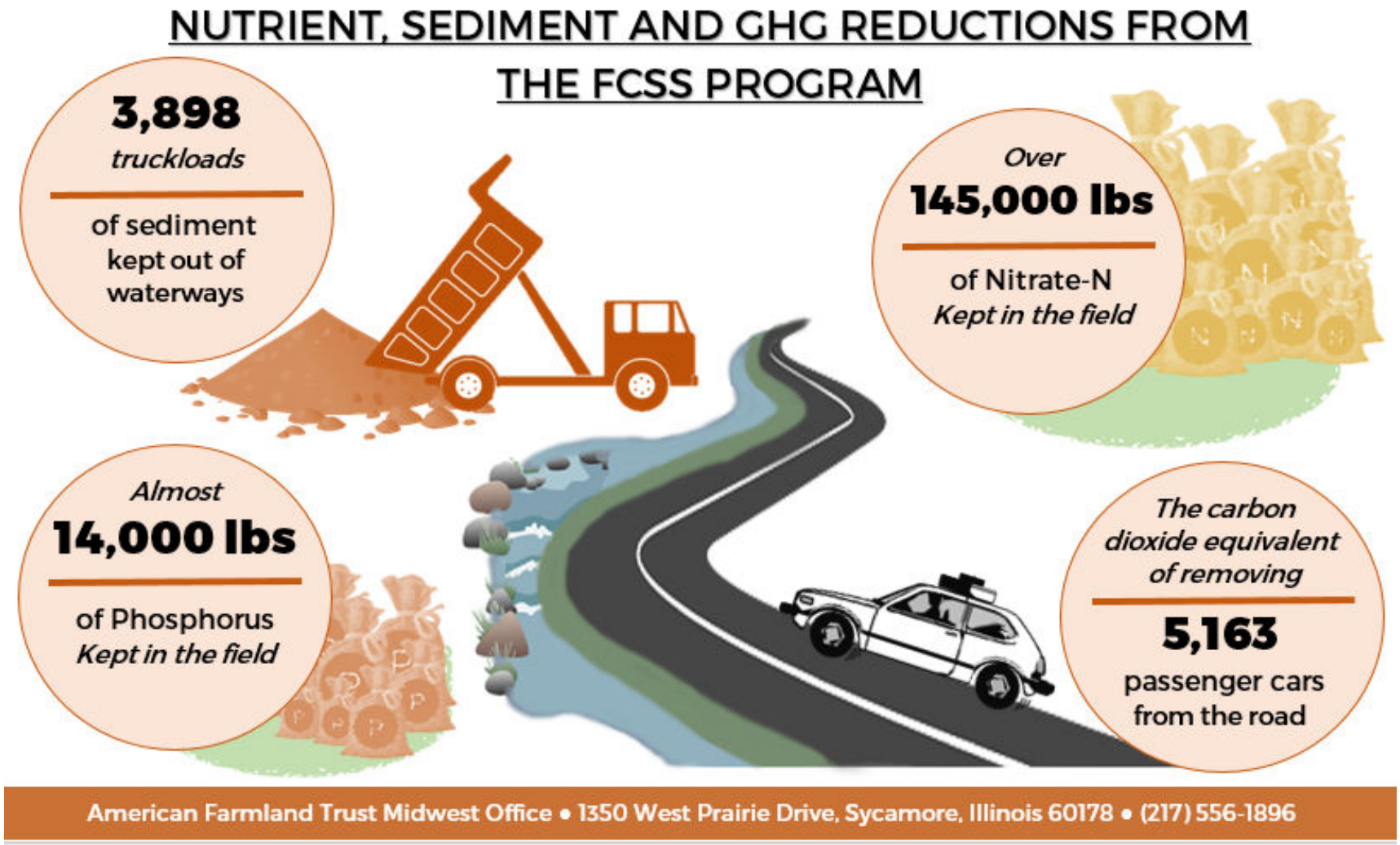
- 50,000 acres submitted on first day of signup
- 185,000 total acres requested by January 15th
- 85 counties represented
- 768 total applications





****Data as of 2/11/2021*

Fall Covers for Spring Savings



Gaining Ground…

- According to the 2017 Census of Ag Data (Summary of data by R. Myers, 2019)
  - 122.2% increase in cover crop acres in Illinois for 2017 compared to 2012
  - 2017 – 708,105 acres; 2012 – 318,636 acres
- NASS conducted a survey that was included in the 2019 Illinois Nutrient Loss Reduction Strategy Biennial Report

Table 4.22. Cover crop questions for tiled and non-tiled acres

	Acres
Corn/soybean acres planted to cover crops after the 2011 crop season on tiled ground.	220,000
Corn/soybean acres planted to cover crops after the 2011 crop season on non-tiled ground.	380,000
Corn/soybean acres planted to cover crops after the 2015 crop season on tiled ground.	490,000
Corn/soybean acres planted to cover crops after the 2015 crop season on non-tiled ground.	630,000
Corn/soybean acres planted to cover crops after the 2017 crop season on tiled ground.	290,000
Corn/soybean acres planted to cover crops after the 2017 crop season on non-tiled ground.	420,000

Figure 4.28. Cover crop acres in Illinois, with data from NASS and the Census for Agriculture.

Thank You!

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