Cover Crops — You know the basics, now what? Cover Crops 2.0

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Cereal rye, SE Indiana

Rationale for cover crops

- A living, growing plant at times of year when we normally have nothing growing.
- Capture sunlight, feed soil organisms, sequester carbon, trap and recycle nutrients, improve soil health
- Make better use of the resources and time available!

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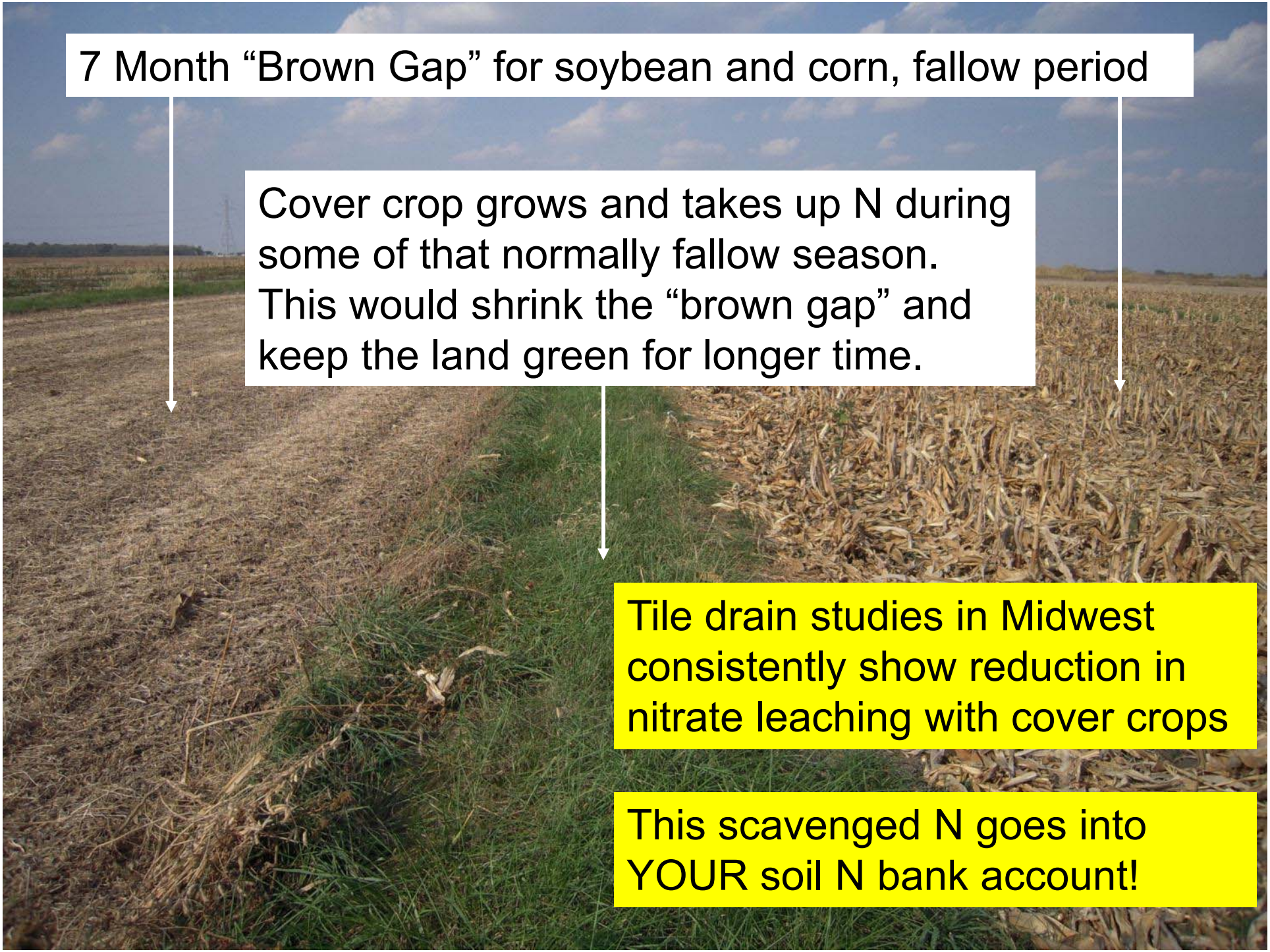
7 Month “Brown Gap” for soybean and corn, fallow period
Cover crop grows and takes up N during some of that normally fallow season. This would shrink the “brown gap” and keep the land green for longer time.
Tile drain studies in Midwest consistently show reduction in nitrate leaching with cover crops
This scavenged N goes into YOUR soil N bank account!

Outline

- Review a few basics
- Cover crop systems beyond the basics
  - Why?
  - When, how?
  - Concepts, research results, farmer practice

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Cover crops are part of a system!

- Different potential benefits and challenges for each type of cover crop
- Must adapt cropping system, including nutrient mgmt, NT (tillage) system, manure, pest mgmt, crop rotation
- Learning curve—need to do homework!

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Why are you planting a cover crop?

- What is the main purpose?
- What are the resource concerns?

- The main purpose(s), affect:
  - Selection of cover crop(s)
  - Management of cover crop(s)

What are the potential benefits? (What are your main goals?)

- Nitrogen scavenger
- Nitrogen producer (legume)
- Reduce erosion
- Improve soil health– aggregation, infiltration, soil biological activity, rooting
- Increase soil organic matter (sequester C)
- Conserve soil moisture
- Recycle nutrients
- Weed control, pest suppression, extra forage
- **Increase crop yields over long-term, and decrease year-to-year variability in yields**

How select cover crops?

- What is your main purpose?
- What is your cropping / tillage system?
  - Current cash crop and next cash crop?
  - No-till, strip till, or other systems?
- What time windows are available?
- How will you seed the cover crop?
- Soil types, climate, drought, manure, herbicide carryover, or other local considerations?

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MCCC tool can help with these!

Grasses

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Brassicas

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Legumes

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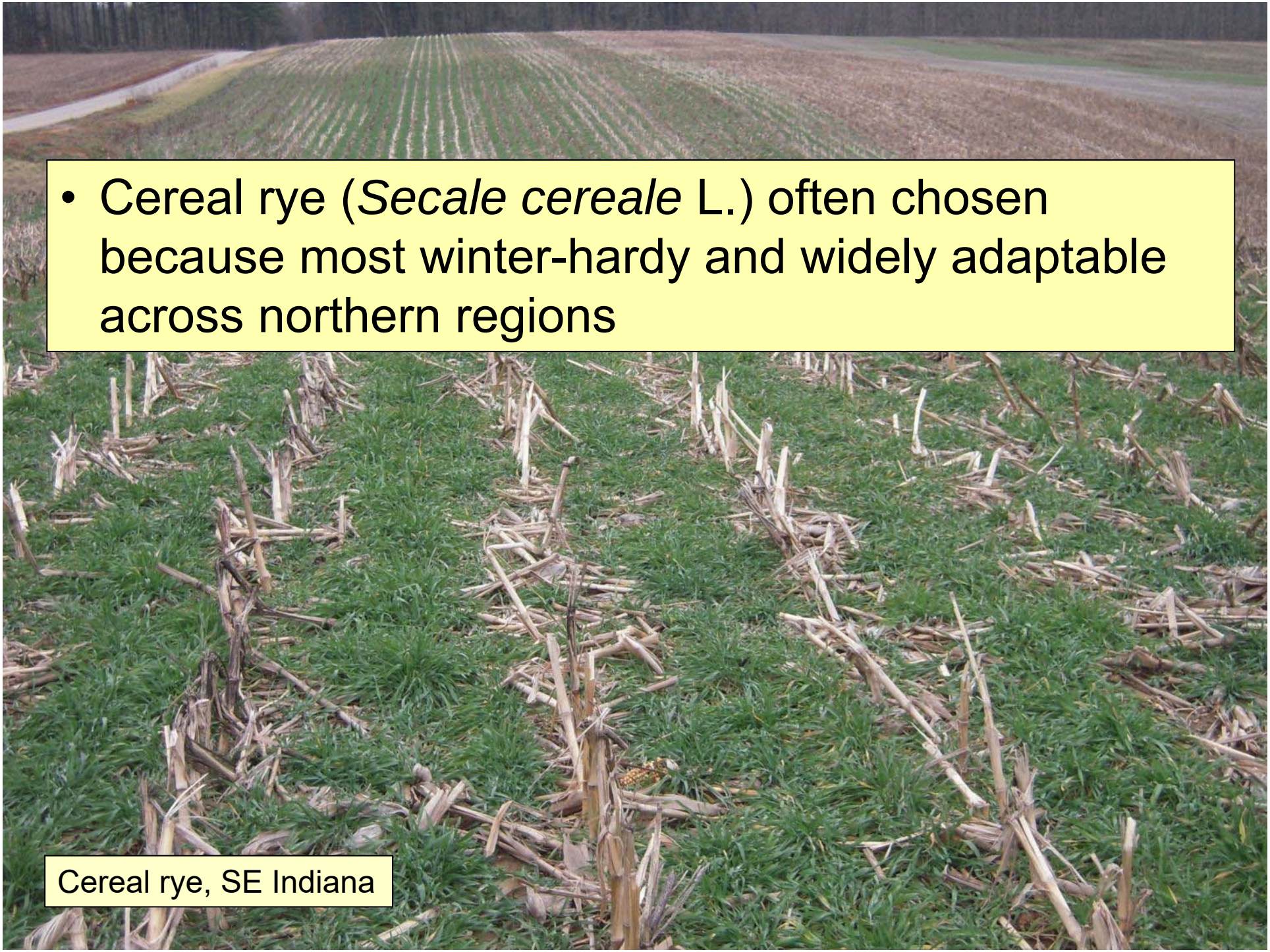

- Cereal rye (*Secale cereale* L.) often chosen because most winter-hardy and widely adaptable across northern regions

Cereal rye, SE Indiana

In eastern Cornbelt, other “basic” options

- Slightly longer growing season, gives a few more options than just cereal rye
- When beginning, still want to minimize management challenges, to ensure success
- Suggested plan includes winter-kill cover crops before corn, as detailed next…….

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An Introduction to Integrating Cover Crops Into a Corn-Soybean Rotation

- Take a long-term view
- Do your homework and start slowly
- Adjust your planter and practices
- Scout for insects
- Be timely
- Use good quality seed

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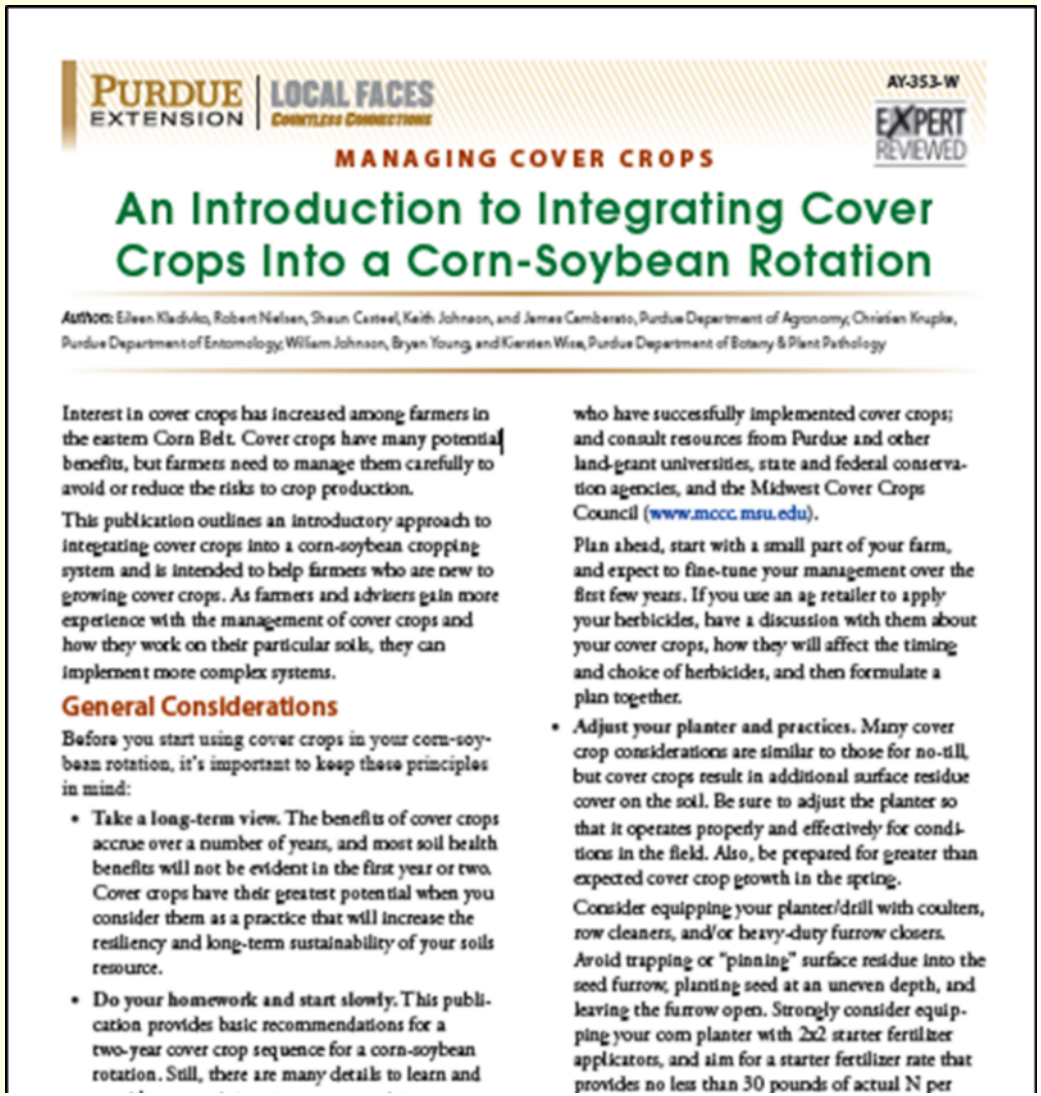

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EXPERT REVIEWED

MANAGING COVER CROPS

An Introduction to Integrating Cover Crops Into a Corn-Soybean Rotation

Authors: Eileen Kladivko, Robert Nielsen, Shaun Casteel, Keith Johnson, and James Camberato, Purdue Department of Agronomy; Christian Krupke, Purdue Department of Entomology; William Johnson, Bryan Young, and Kiersten Wise, Purdue Department of Botany & Plant Pathology

Interest in cover crops has increased among farmers in the eastern Corn Belt. Cover crops have many potential benefits, but farmers need to manage them carefully to avoid or reduce the risks to crop production.

This publication outlines an introductory approach to integrating cover crops into a corn-soybean cropping system and is intended to help farmers who are new to growing cover crops. As farmers and advisers gain more experience with the management of cover crops and how they work on their particular soils, they can implement more complex systems.

General Considerations

Before you start using cover crops in your corn-soybean rotation, it's important to keep these principles in mind:

- **Take a long-term view.** The benefits of cover crops accrue over a number of years, and most soil health benefits will not be evident in the first year or two. Cover crops have their greatest potential when you consider them as a practice that will increase the resiliency and long-term sustainability of your soils resource.
- **Do your homework and start slowly.** This publication provides basic recommendations for a two-year cover crop sequence for a corn-soybean rotation. Still, there are many details to learn and who have successfully implemented cover crops; and consult resources from Purdue and other land-grant universities, state and federal conservation agencies, and the Midwest Cover Crops Council (www.mccc.msu.edu).

  Plan ahead, start with a small part of your farm, and expect to fine-tune your management over the first few years. If you use an ag retailer to apply your herbicides, have a discussion with them about your cover crops, how they will affect the timing and choice of herbicides, and then formulate a plan together.
- **Adjust your planter and practices.** Many cover crop considerations are similar to those for no-till, but cover crops result in additional surface residue cover on the soil. Be sure to adjust the planter so that it operates properly and effectively for conditions in the field. Also, be prepared for greater than expected cover crop growth in the spring.

  Consider equipping your planter/drill with coulters, row cleaners, and/or heavy-duty furrow closers. Avoid trapping or "pinning" surface residue into the seed furrow, planting seed at an uneven depth, and leaving the furrow open. Strongly consider equipping your corn planter with 2x2 starter fertilizer applicators, and aim for a starter fertilizer rate that provides no less than 30 pounds of actual N per

A Two-year Plan for Corn-Soybean Rotation

- **Step 1: Plant Cereal Rye into Corn Stalks**
  - **drill**
  - **VT w/ air-seeder**

Cereal rye can be planted late, and is the most winter-hardy of covers

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- Step 2: Terminate in Spring
- Step 3: No-till Plant Soybean into Cereal Rye

Consider short-season variety, earlier planting. (Plant your earliest beans early, on fields going to cover.)

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Step 4: Plant Cover Crops that Winter-kill

Oats/daikon radish.

Low C:N ratio.

Winter-kill, so no termination timing issues before corn.

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Step 5: No-till Plant Corn into Dead Cover

- (alternatives of fall strip till; or shallow vertical till in spring)

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Lots of variations on the theme!

- As farmers and advisors gain more experience with managing cover crops on their soils, more complex systems can be implemented.
- If have wheat in rotation and not double-crop, can seed bigger mix ("cocktail mix") after wheat, for great diversity of plants and roots.
- Can add crimson clover, cereal rye, to oats/daikon radish before corn.

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Cover crop mixtures

- Basic concept—more plant diversity provides multi-functionality. Can provide more diverse benefits (functions).
- Plant canopy structure, root form and depth, growth periods.
- Complementary rather than overlapping functions probably more important
- Spreads risk—if one species doesn't grow, perhaps another will.

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Research data?

- Grass—legume mixes
  - Cereal rye—hairy vetch, to manage biomass production, weed control, N scavenging and production
- Larger mixes more complicated
  - Mix of grass, legume, brassica
  - Mix of winter-kill and winter-hardy
  - But is there enough growing season left?

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One example--

- Penn State study w/ 6 species, monoculture and 3-, 4-, 6-way mixes
- Cereal rye, oats, red clover, Austrian winter pea, forage radish, winter canola
- Seeding after wheat (Aug) maintained higher diversity than seeding after corn (Sept-Oct)
- Cereal rye dominated in spring, especially with later planting (ie, mixtures after corn may not be cost-effective)
- Are diverse functions in fall, worth it? Depends……. Much more work needed to systematically test different mixtures, and their impacts on soil and cash crop

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Murrell et al., Agron.J. 109:1-13 (2017)

Considerations for putting together a mix

- Complementarity
  - Growth periods, growth forms
  - N acquisition (scavenger vs. producer)
  - Weed suppression (rapid vs. slow growing)
  - How many species is enough?
  - Termination timing similar, or different?

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See eXtension article, Making the most of mixtures, C.White et al., 2015, Penn State

Examples from eastern Cornbelt

- Daikon radish w/ oats or cereal rye
- Radish/oats/cereal rye/legume (crimson clover or Austrian winter pea or hairy vetch)
- Radish/oats/rapeseed/cereal rye
- Some alternating rows—radish or pea in next yr's corn row, grass between rows (whether 15" split rows or drill rows)
- Some winter-kill, some grow in spring; sometimes terminate grass before legume

How will you seed it?

Conservation Cropping Systems Initiative

Plant it in narrow rows

- **Use existing Bean Planter**
- **Less Seed**
- **Provides Precision row/ plant spacing**
- **Surest results**

Indiana, Shuter farm

Key points

- Cover crops can be very important component of crop productivity, water quality, soil health!
- Details are important!
  - Which cover crops for which purposes
  - How properly manage the system
- R&D is needed in Midwest!
- Education / Technical assistance is key!
- True partnerships are key!

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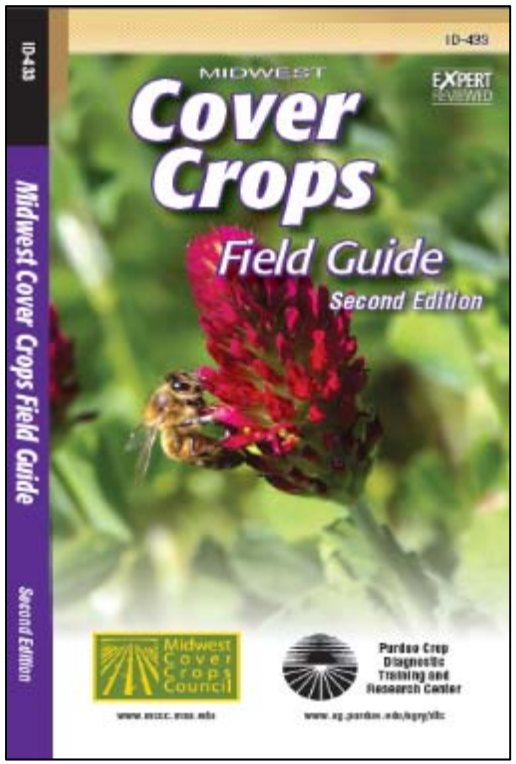
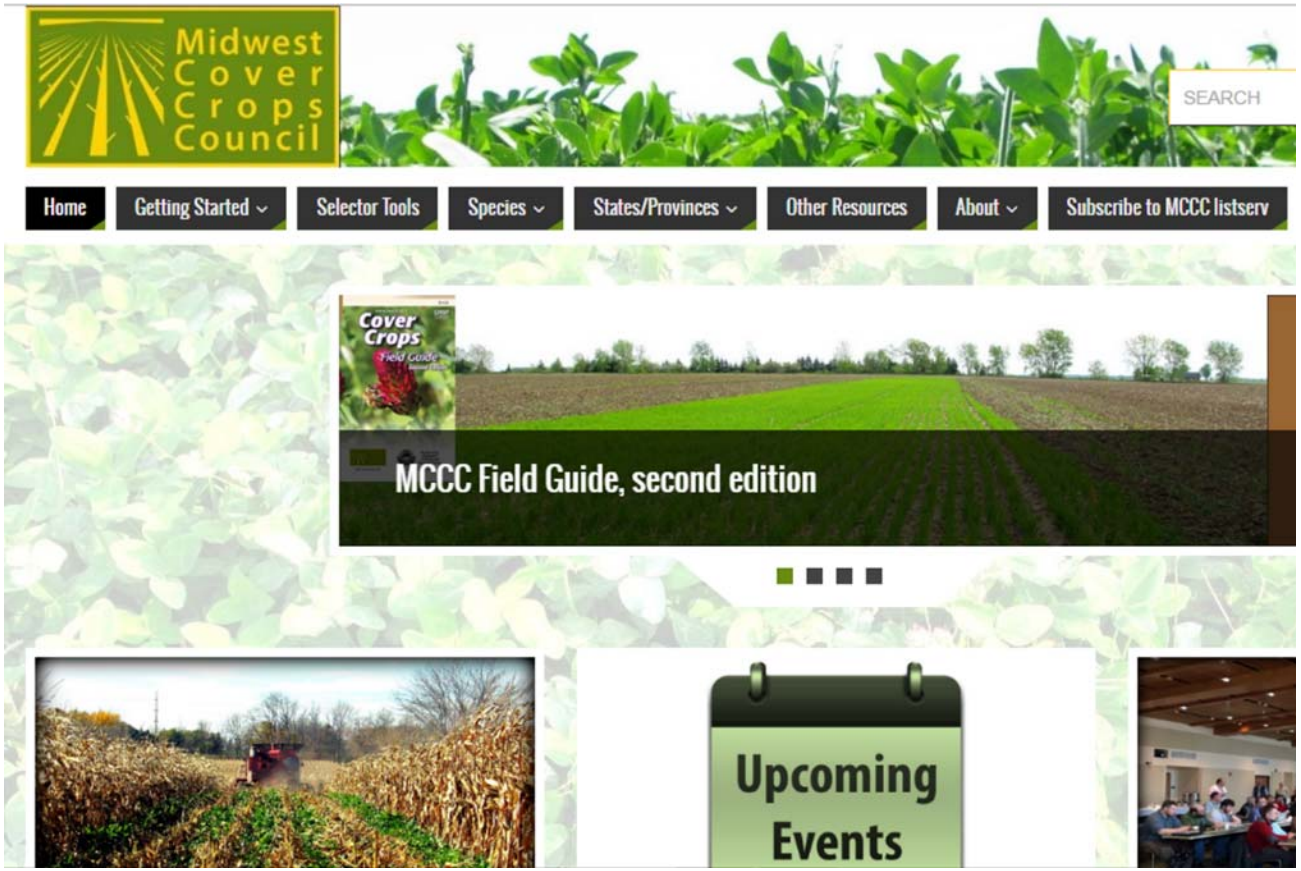
Resources





2nd Edition now available!

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www.mccc.msu.edu

Cover Crop Selector Tools
(link on top menu bars)

Check out our revised web pages!

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