

Conserving Residual N with Cover Crops

Aug. 29, 2012



USDA-ARS
National Laboratory
for Agriculture and
the Environment
Ames, Iowa

Tom Kaspar
Jack Meisinger

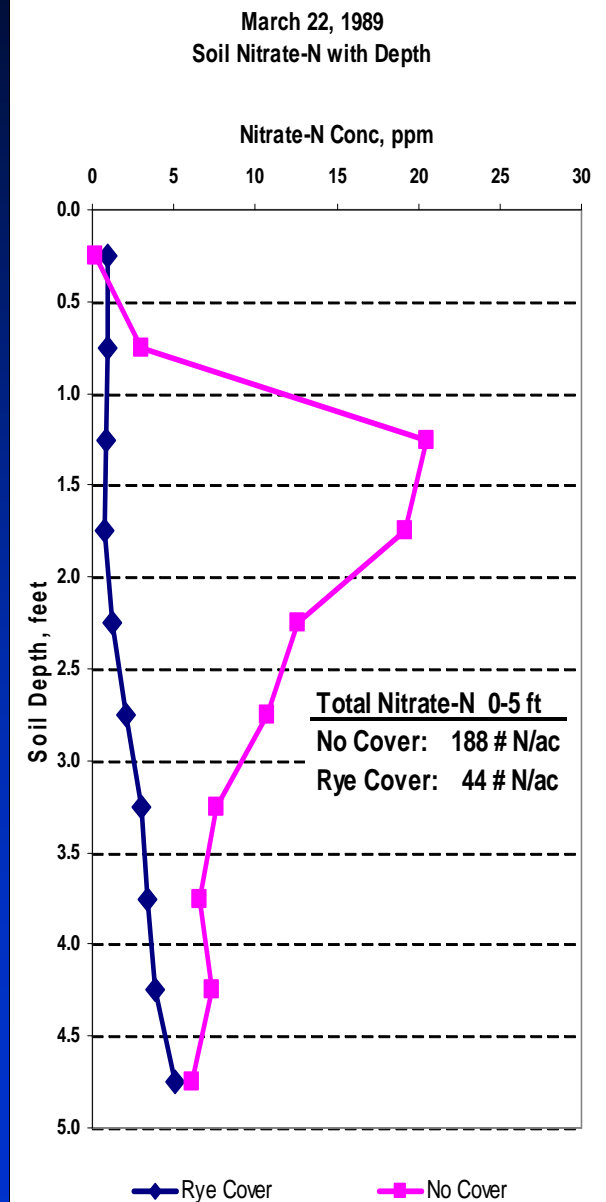
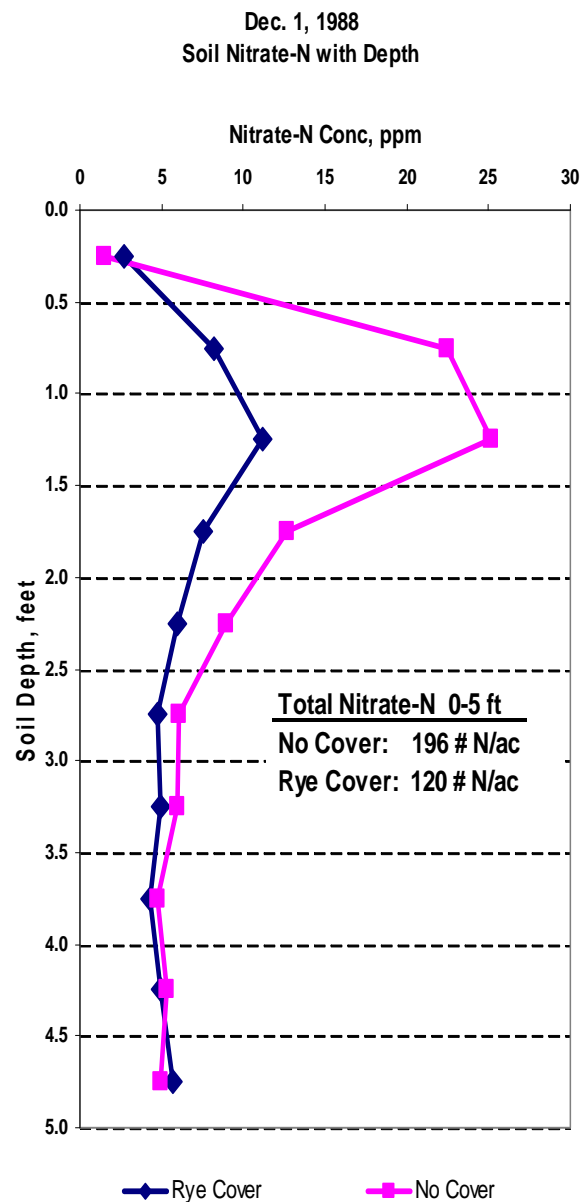
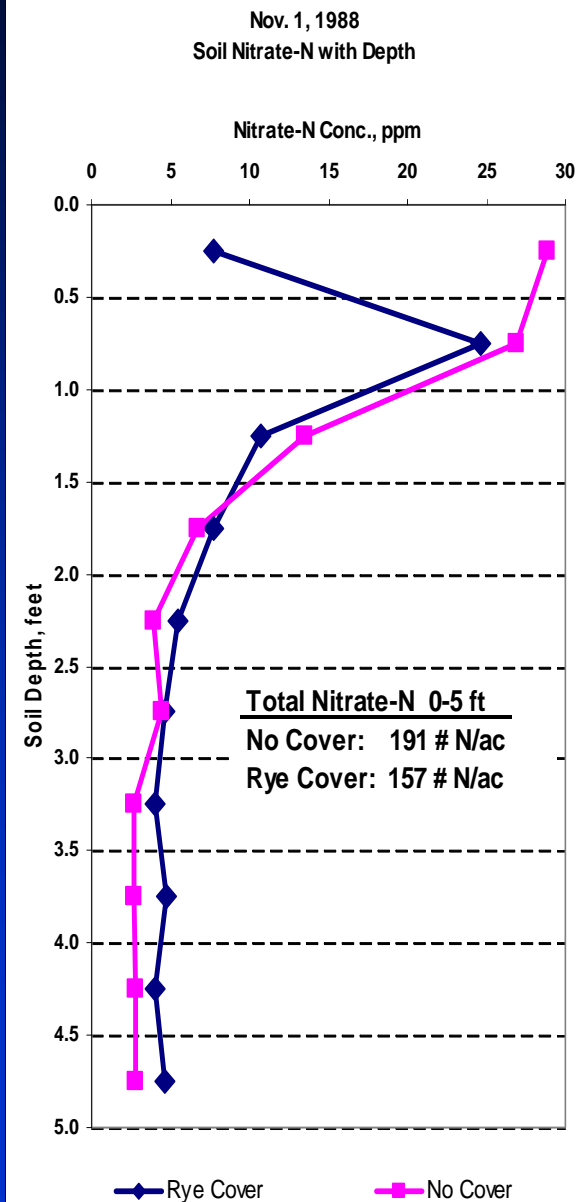


Why is Residual Nitrogen a Concern in a Dry Year?

- Crop takes up less N – reduced growth and early maturity
- Fertilizer N rate applied is based on a “normal” corn crop
- Soil N mineralization continues especially when soil is rewetted
- Not much N has been lost through leaching or denitrification

Early planted rye - effects on soil nitrate

Brinsfield & Staver 1991



Dry Conditions are not the only Cause of a Reduced Crop or Early Maturity

- Prevented planting
- Flooding
- Hail or Wind damage
- Disease causing early termination

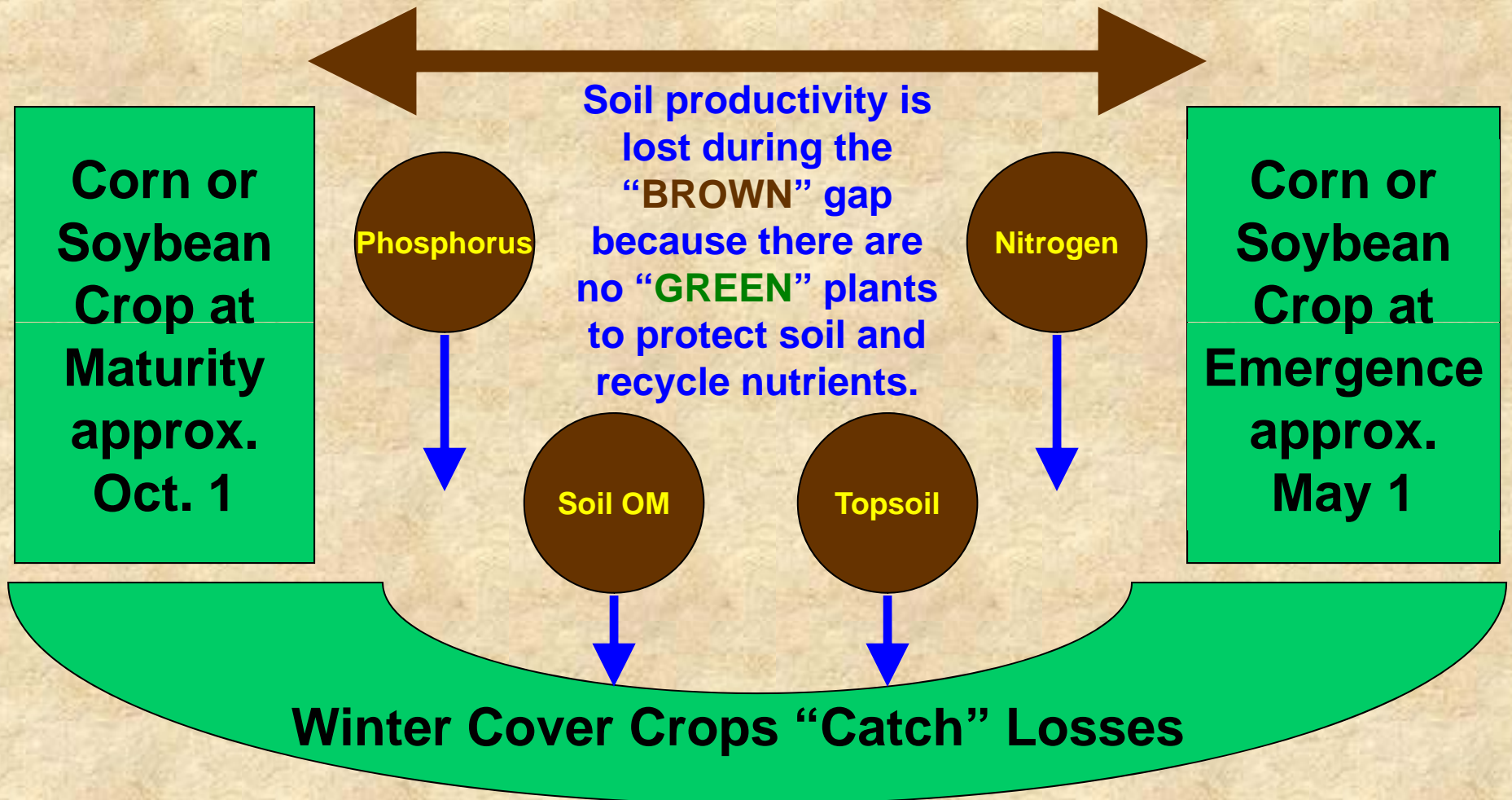
Soil N is Present Between Maturity and Canopy Development Every Year

- After soybean crops
- Extended warm falls/early springs
- Manured soils
- Fall fertilization – also DAP/MAP
- High soil organic matter
- Normal management and weather

Other Factors Affecting Amount of N Lost

- Drainage/Precipitation between maturity and canopy development
- Flooding or ponding
- Saturated soils
- Length of time soil is frozen – also depth

Corn and Soybeans have a 7 Month “BROWN” Gap

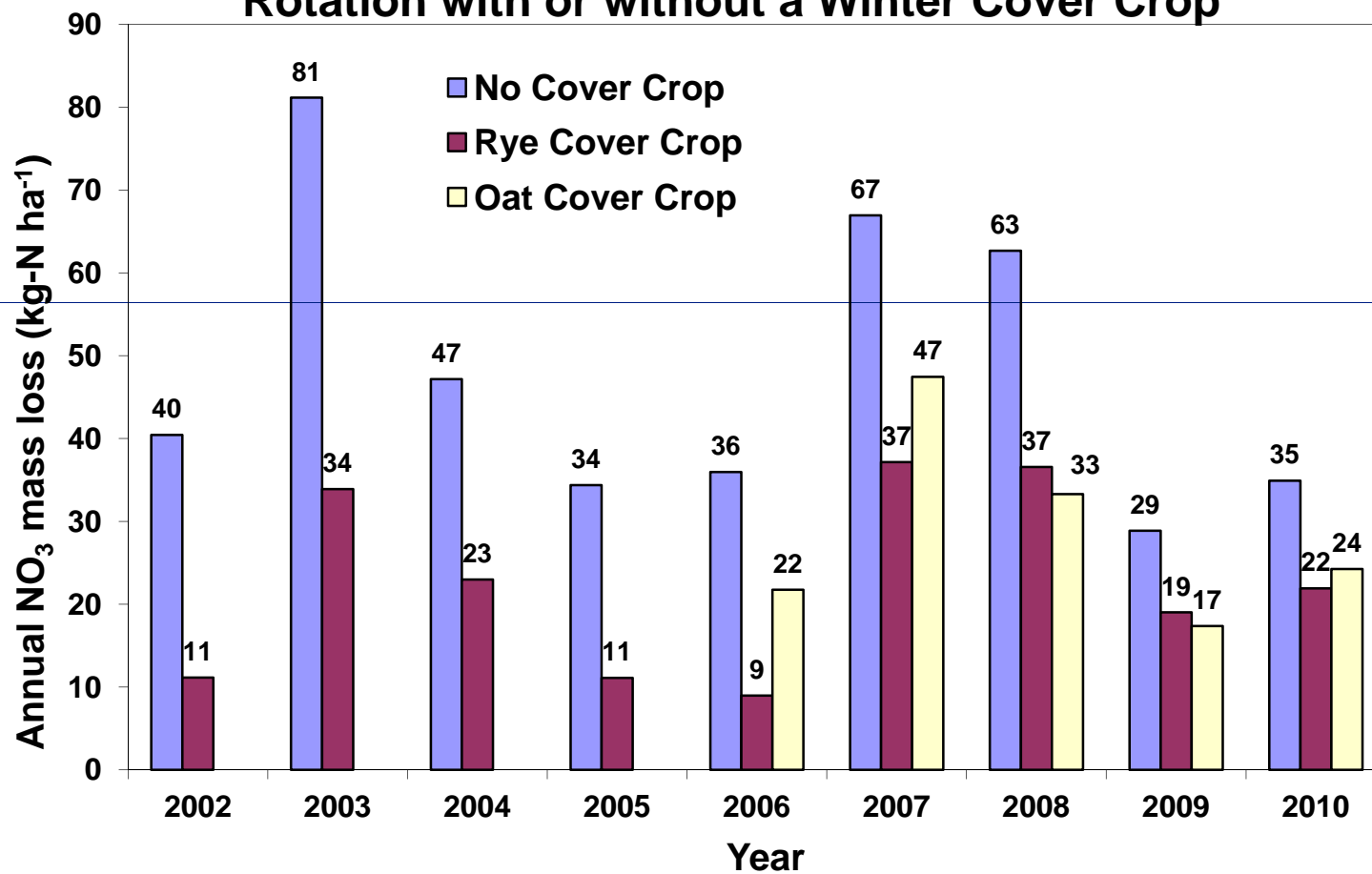


Cover Crops Fill the “BROWN” Gap with “GREEN” Plants

Nitrate Loss in Tile Drainage



Annual N Loss in Tile Drainage for a Corn-Soybean Rotation with or without a Winter Cover Crop



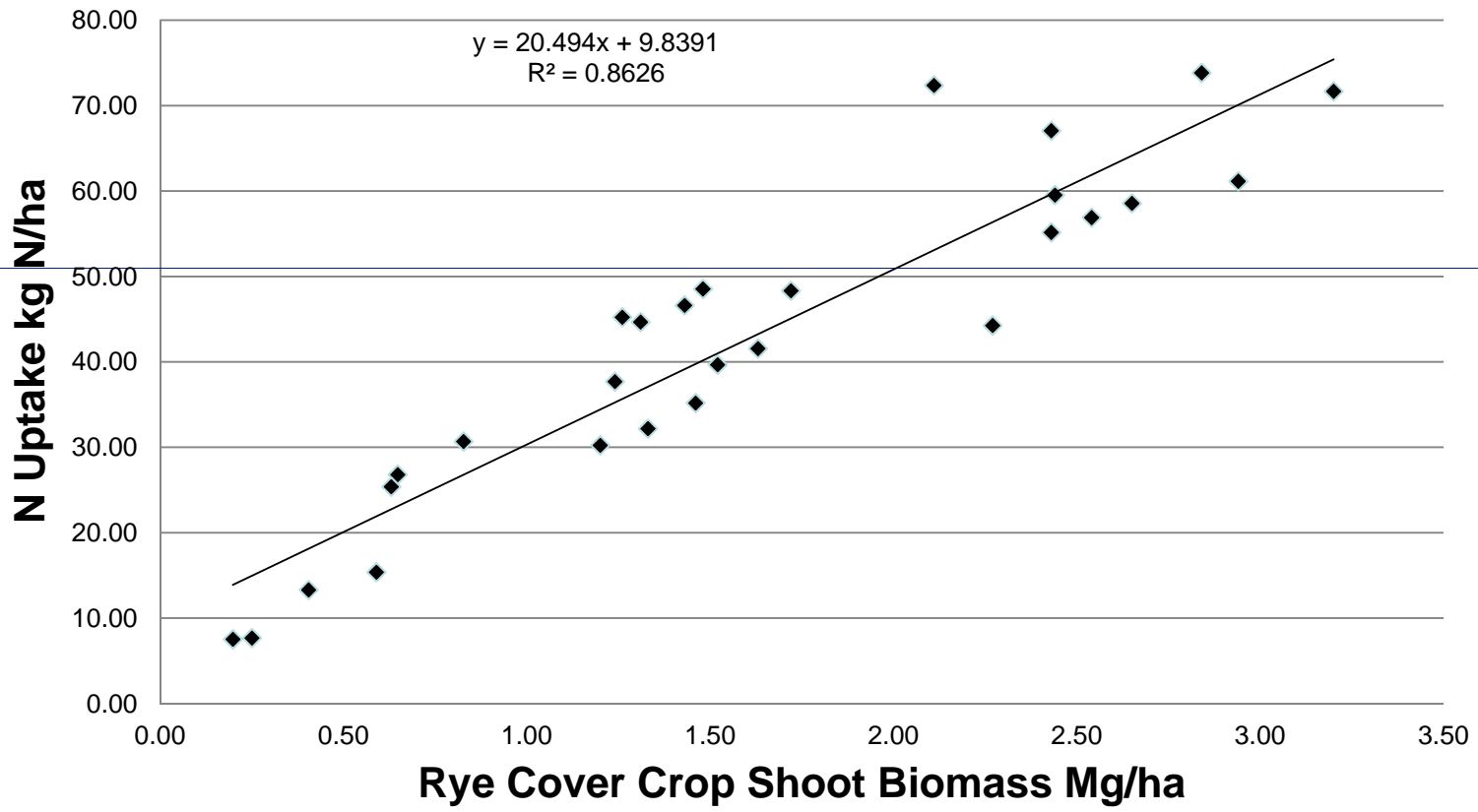
Total Nitrate-N Lost 2002-2010

Treatment	Nitrate-N lost	
	9-yr total lbs/acre	9-yr avg lbs/acre
Corn-soybean	386	43
Corn-Soyb w. Rye	<u>181</u>	<u>20</u>
Reduction	205	23
% Reduction	53%	

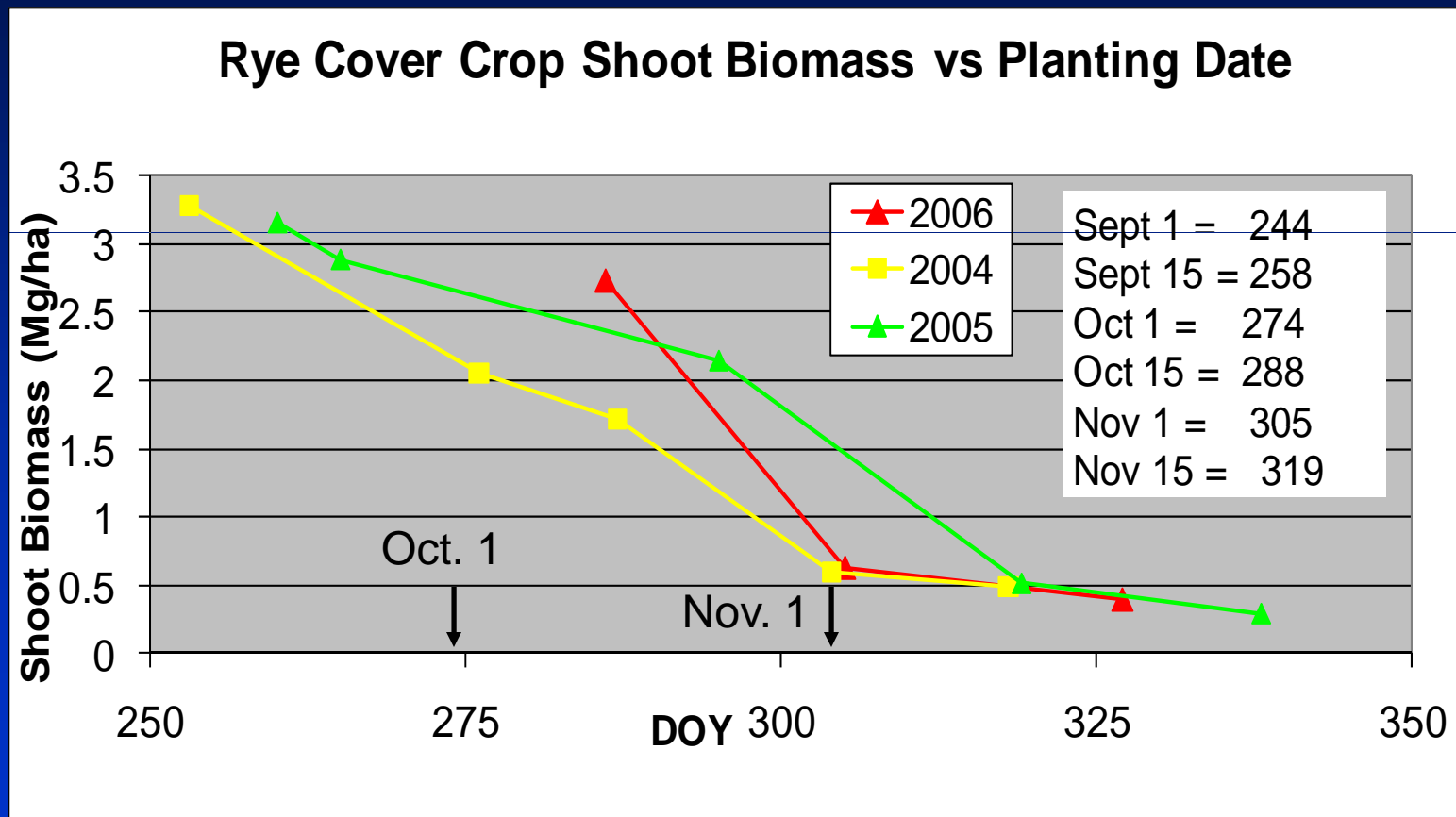
What Determines How Much N a Cover Crop Takes Up?

- Amount of growth
- Time to grow
- Rooting depth
- Tissue N concentration
- Cold Tolerance
- Winter Hardiness

Biomass vs N uptake

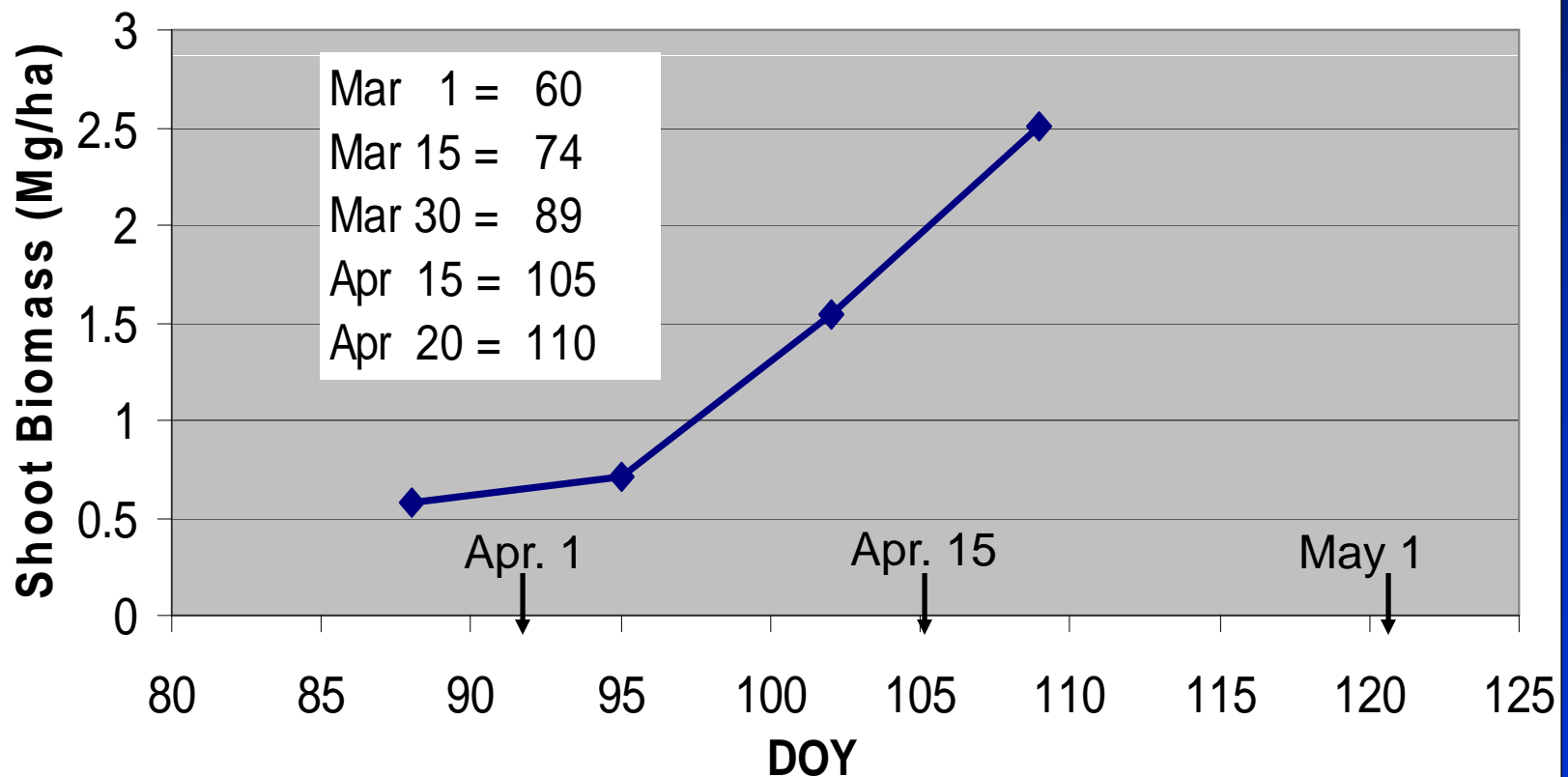


Cover Crop Planting Date



Cover Crop Kill Date

**Rye Cover Crop Shoot Biomass vs Kill Date
Planted Sept. 30, 2005**

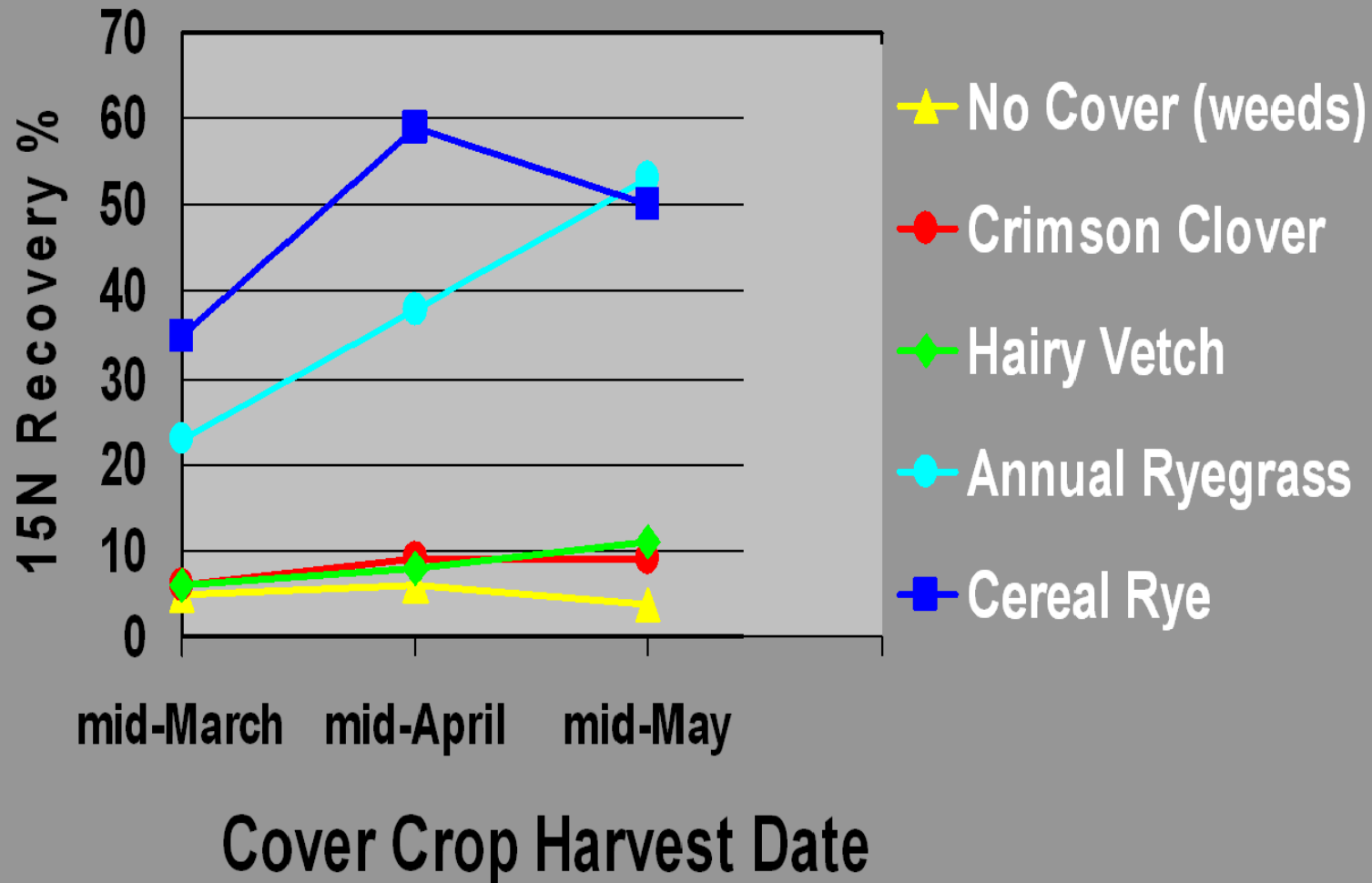


Rye Cover Crop Root Weight and Rooting Depth in the Spring

Year	Root Dry Weight	Rooting Depth
	(lbs/acre)	(in)
2004	294.4	38.0
2005	642.3	32.7
2006	606.7	45.8
2007	458.3	36.4
2008	388.1	38.8
Avg.	478.0	38.2

Which Cover Crops Conserve Residual N after Corn?

(Shipley, Meisinger, Decker - 1992)



Selecting a Cover Crop for Iowa

- What is your cash crop rotation?
- Where are you in the state?
- Does the cover crop overwinter in Iowa?
- How are you going to establish the cover crop?
- What is the seed cost/acre?

Possible Cover Crops for Iowa

- Small grains – oats, cereal rye, wheat
- Brassicas – radishes, turnips, mustard
- Forage grasses – annual ryegrass
- Legumes – hairy vetch, red clover
- Others – sorghum-sudangrass, buckwheat, millet

Guesses for Planting Dates before 28°F Frost Date in Iowa

- Winter Hardy Small grains – 0 d
- Non-winter Hardy Small grains – 35 d
- Brassicas – 42 d
- Annual ryegrass – 42 – 49 d
- Legumes – 42 – 49 d

		Frost Date	DOY	0 days before	28 days before	42 days before
Rock Rapids, Lyon Co.						
	50% 28°F	10/6/2012	280	10/6/2012	9/8/2012	8/25/2012
	90% 28°F	10/22/2012	296	10/22/2012	9/24/2012	9/10/2012
Ames, Story Co.						
	50% 28°F	10/14/2012	287	10/14/2012	9/16/2012	9/2/2012
	90% 28°F	10/28/2012	301	10/28/2012	9/30/2012	9/16/2012
Fort Madison, Lee Co.						
	50% 28°F	10/29/2012	302	10/29/2012	10/1/2012	9/17/2012
	90% 28°F	11/14/2012	318	11/14/2012	10/17/2012	10/3/2012

Midwest Cover Crops Council Website

<http://www.mccc.msu.edu/>



The screenshot shows the homepage of the Midwest Cover Crops Council website. At the top, there is a green header with the council's logo on the left, which consists of stylized yellow stalks and the text "Midwest Cover Crops Council". To the right of the logo are three small images: a close-up of green leaves, a field of tall green crops, and a field of purple flowers. Below the header is a navigation bar with links for Illinois, Indiana, Iowa, Michigan, Minnesota, North Dakota, Ohio, Wisconsin, and Ontario. On the left side, there is a vertical menu with a map of the Midwest region above it. The main content area features a "WELCOME TO THE MIDWEST COVER CROPS COUNCIL WEBSITE" section, followed by a "NEWS" section with two articles. The first article is titled "New from Michigan State University Extension- Cover crop choices following winter wheat" and the second is "Presentations just posted from Monsanto Cover Crops Workshop". Below the news section is a "Cover Crops Field Guide" section, which includes a small image of the guide's cover and two bullet points: "About the guide" and "Order your copy now!". At the bottom right, there is a Facebook social media widget for the Midwest Cover Crops Council, showing a "Like" button and the number "96".

Midwest Cover Crops Council

Illinois Indiana Iowa Michigan Minnesota North Dakota Ohio Wisconsin Ontario

Home

About Us

History

Mission and vision

Supporters

MCCC meetings

Cover Crop Resources

Cover crop species

Cover crop selector tools

Innovator profiles

Extension material

Publications

Multimedia

Links

Slurry seeding

Survey...coming soon

Calendar of Events

Upcoming events

Past events

Contact

Executive committee

WELCOME TO THE MIDWEST COVER CROPS COUNCIL WEBSITE

The goal of the *Midwest Cover Crops Council* (MCCC) is to facilitate widespread adoption of cover crops throughout the Midwest, to improve ecological, economic, and social sustainability.

WHO WE ARE?

The MCCC is a diverse group from academia, production agriculture, non-governmental organizations, commodity interests, private sector, and representatives from federal and state agencies collaborating to address soil, water, air, and agricultural quality concerns in the Great Lakes and Mississippi river basins (including Indiana, Michigan, Ohio, Manitoba, Ontario, Illinois, Wisconsin, Minnesota, Iowa, and North Dakota).

WHY COVER CROPS?

Cover crops are an effective tool to reduce soil erosion and increase nutrient recycling on farmlands, thereby also decreasing the soil and nutrient loads entering lakes and waterways. Cover crops can have numerous other benefits including improvement of soil quality, pest management, fertility management, water availability, landscape diversification, and wildlife habitat.

NEWS

New from Michigan State University Extension- [Cover crop choices following winter wheat](#)

Presentations just posted from [Monsanto Cover Crops Workshop](#)

The [Cover Crop Selector Tool for Field Crops](#) has a new look and feel in addition to adding Ontario!

New
Cover Crops Field Guide from MCCC & Purdue University



- [About the guide](#)
- [Order your copy now!](#)

Midwest Cover Crops Council on Facebook

Like 96



Midwest Cover Crops Council - Cover Crop Decision Tool

Note: CTRL F1 Removes Command Ribbon

Indiana: Elkhart County Seeding Dates

Reliable Establishment/Growth

Temp/Moisture Risk to Establishment/Growth

Frost Seeding

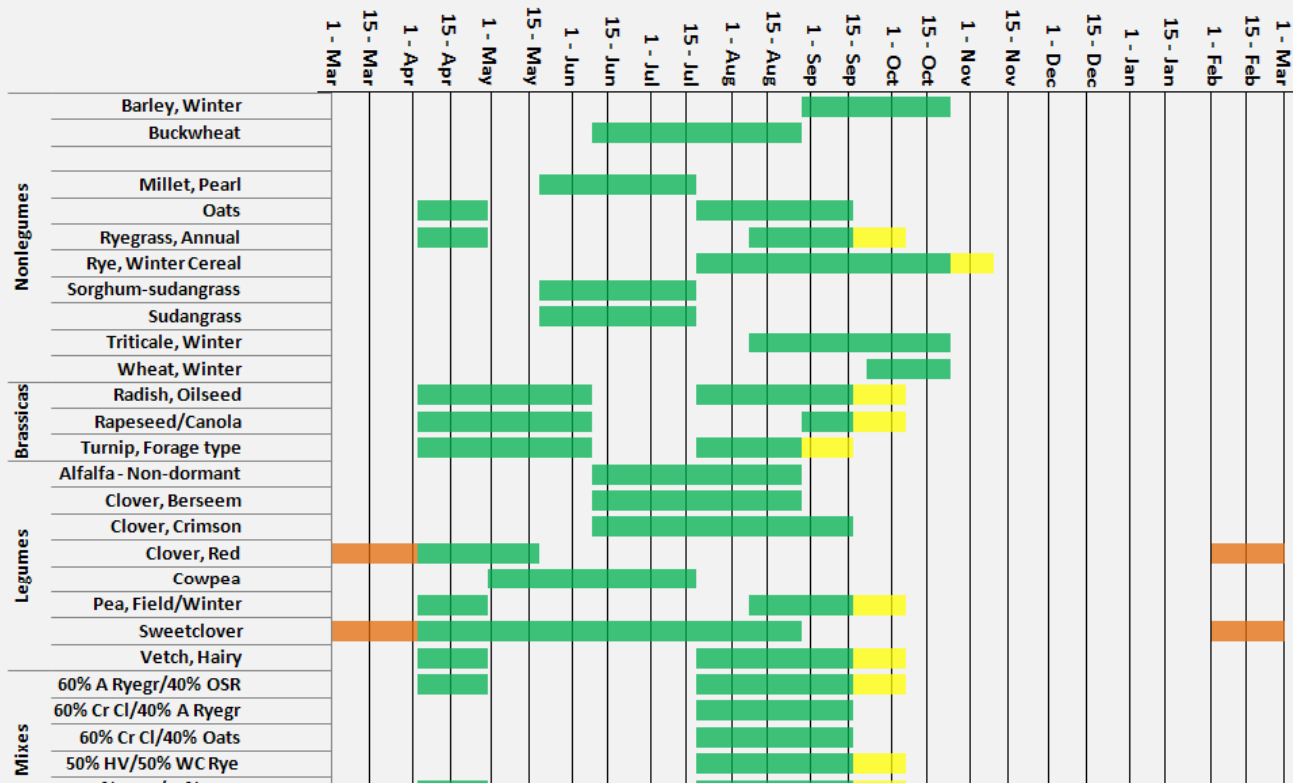
Location Information
 State/Province:
 County:

Cash Crop Information
 Crop:
 Plant Date:
 Harvest Date:

Field Information
 Soil Drainage Class:
 Flooding/Ponding:

Cover Crop Attributes
 #1:
 #2:
 #3:

Select Cover Crop to Create
[Information Sheet](#)





Midwest Cover Crops Council - Cover Crop Decision Tool

Note: CTRL F1 Removes Command Ribbon

Indiana: Harrison County Seeding Dates

Reliable Establishment/Growth
Temp/Moisture Risk to Establishment/Growth
Frost Seeding

Location Information

State/Province

County

Cash Crop Information

Crop

Plant Date

Harvest Date

Field Information

Soil Drainage Class

Flooding/Ponding

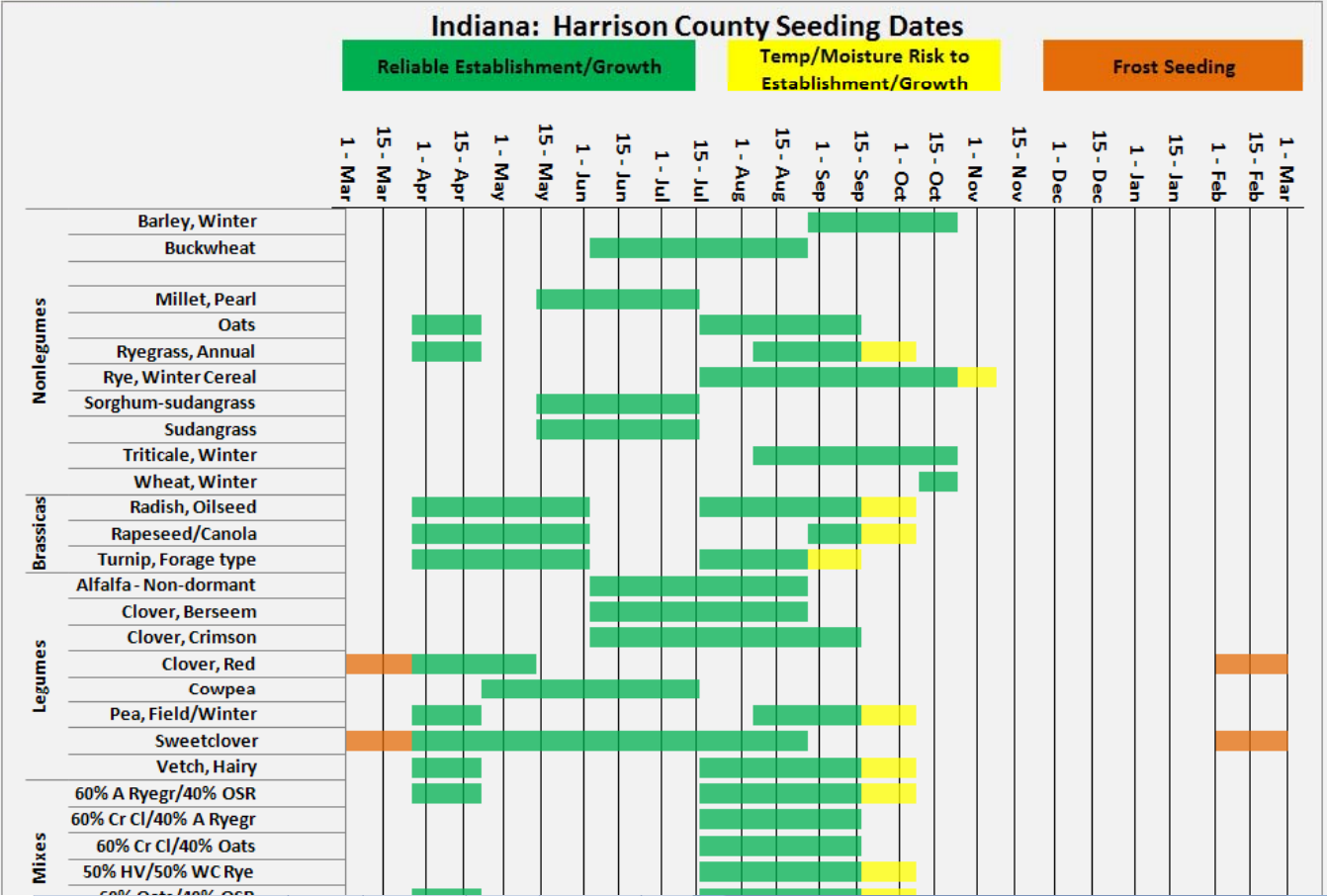
Cover Crop Attributes

#1

#2

#3

Select Cover Crop to Create
[Information Sheet](#)





Midwest Cover Crops Council - Cover Crop Decision Tool

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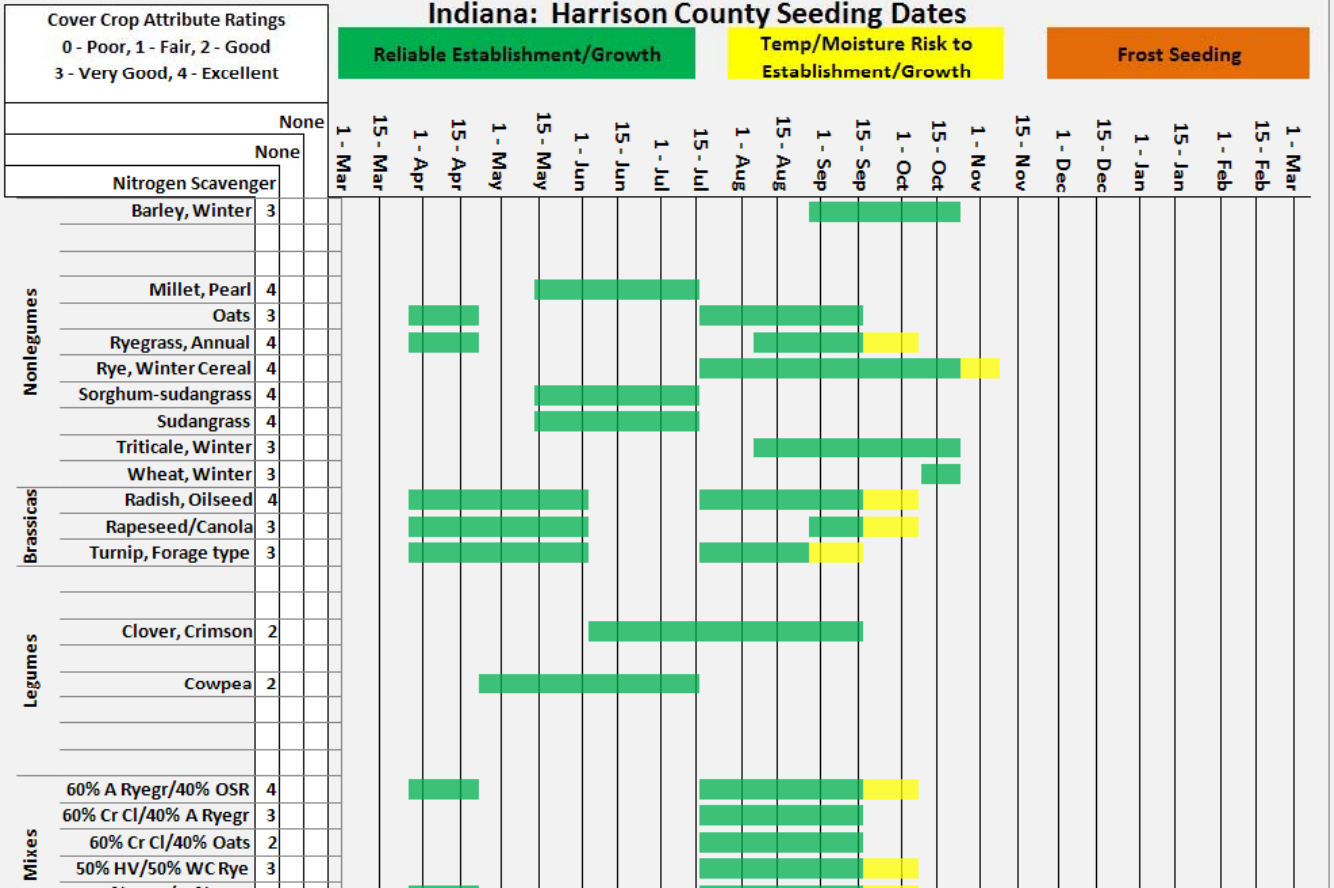
Location Information
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Field Information
 Soil Drainage Class:
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Cover Crop Attributes
 #1:
 #2:
 #3:

Select Cover Crop to Create
[Information Sheet](#)



Establishing Cover Crops with Overseeding

- Soybean – at beginning of leaf yellow, aerial seeding or using tractor broadcast spreader.
- Corn – just before black layer, lower leaves turning brown, aerial seeding or high clearance sprayer
- Watch crop maturity, soil moisture, rainfall, & temps. Adjust timing depending on latitude. More risky.





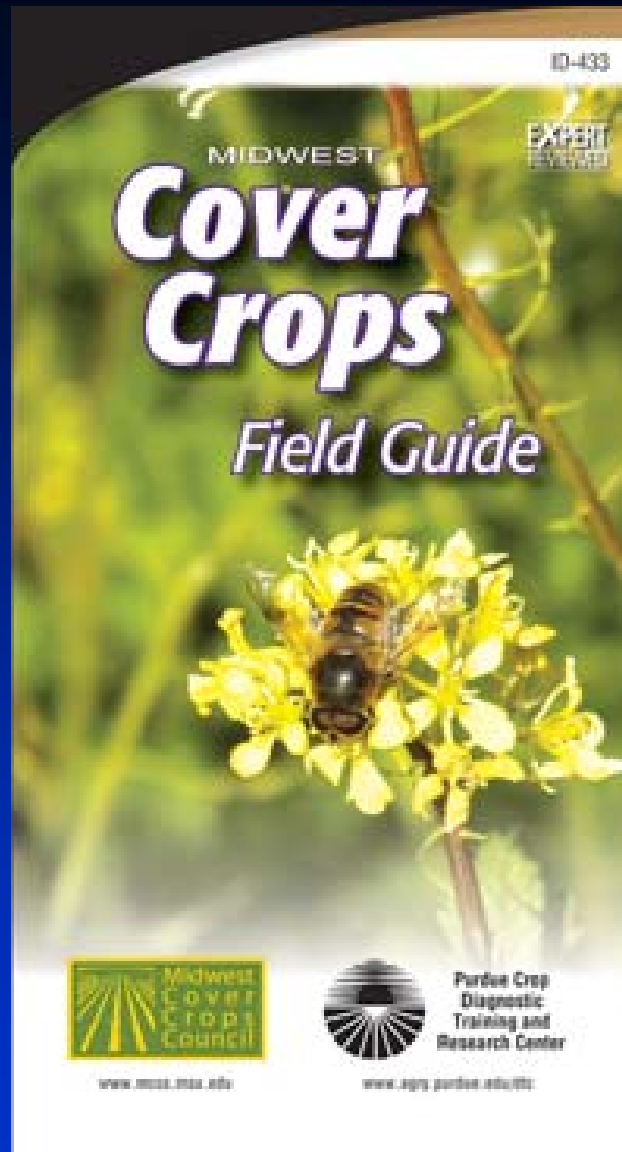
Establishing Cover Crops with a Grain Drill or Shallow Tillage

- Following seed corn, silage corn, early maturing soybean, and early maturing grain corn – usually only winter hardy cover crops
- Lower seeding rate than overseeding
- More reliable stand establishment
- Destroys some surface cover



Managing Small Grain Cover Crops in the Spring?

- Only winter-hardy cover crops need to be killed in spring – advantage & disadvantage
- Watch soil water, rainfall, and cover crop growth
- Before corn kill cover crop 14 days prior to planting
- Before soybean biggest concern is dry conditions, otherwise cover crop can be sprayed 3 days before planting.
- Use tillage or glyphosate BMPs



<http://www3.ag.purdue.edu/agry/dtc/Pages/CoverCropsFG.aspx>

Managing Cover Crops Profitably

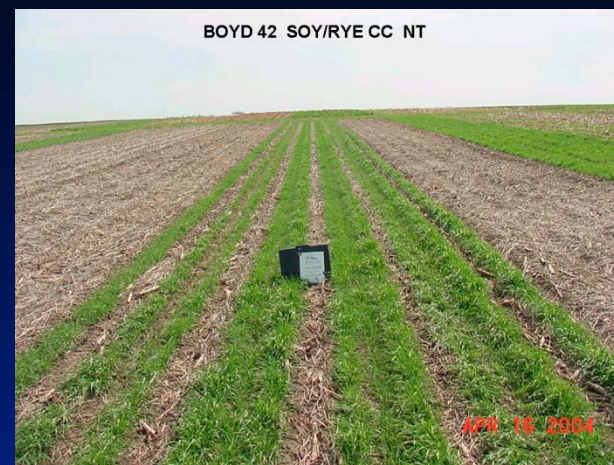
THIRD EDITION



<http://www.sare.org/publications/covercrops/covercrops.pdf>

Take Home Message

- Start Small!! Whatever small is to a given farmer.
- Cover crops take new/different management and there is a learning curve
- Nobody benefits if a farmer is unsuccessful
- Even though there is a lot of N that may be lost this year – Use this year as a learning experience, so we are ready the next time it happens



Questions?
515-294-8873
Tom.Kaspar@
ars.usda.gov

What does 800 lbs/acre of rye shoot dry weight look like?

