Herbicide Considerations for Cover Crops

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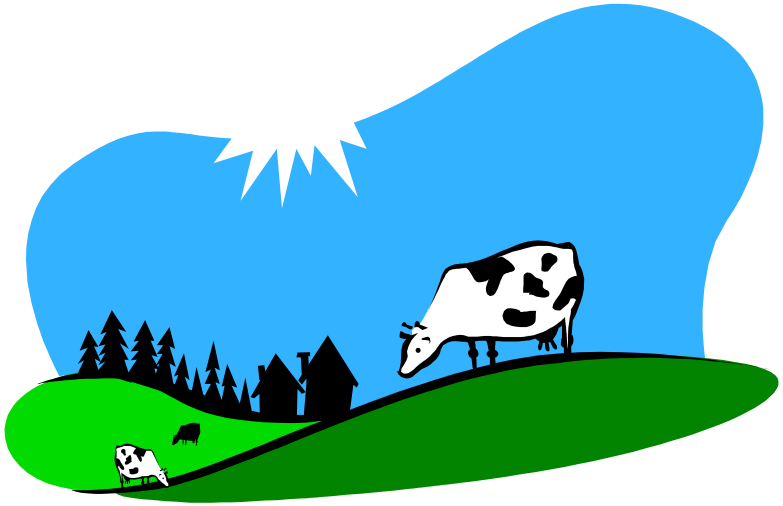
Department of Agronomy

What is the difference between a cover crop and a forage crop?



Herbicide Rotational Restrictions for Cover Crops

Most herbicides do not have rotational restrictions for cover crops

Exception:

- Harness and Harness Xtra, only non-food winter cover crops
- Hornet, 10.5 months
- Python WDG, 9 months

Rotational Restrictions for Forages

ROTATIONAL CROP RESTRICTIONS

Rotational crops vary in their response to low concentrations of CAPRENO® Herbicide remaining in the soil. The amount of CAPRENO® Herbicide that may be present in the soil depends on soil moisture, soil temperature, application rate, elapsed time since application and other environmental factors. When CAPRENO® Herbicide is used in combination with other products, always follow the most restrictive rotational crop requirements.

The following rotational crops may be planted after applying CAPRENO® Herbicide in corn:

Minimum plant back intervals for various crops following CAPRENO® Herbicide

Rotational Interval (elapsed time)	Crop	Minimum precipitation requirement[1]
0 Months[2]	Field corn (yellow dent)	None
4 Months[2]	(Wheat, triticale)	None
10 Months[2]	Barley, Soybean, Cotton, White corn[3], Sweet corn[3], Popcorn[3], Sorghum[3, 4], Spring Oats, Spring Seeded Alfalfa[3, 5], Rice, Cotton	15 inches of cumulative precipitation from application to planting of rotational crop
11 months	Peanut	15 inches of cumulative precipitation from application to planting of rotational crop
12 months	Tobacco	15 inches of cumulative precipitation from application to planting of rotational crop
18 Months[2]	Alfalfa, Green and Dry Beans, Oats, Sunflower, Canola, Potato, Sugar beet and All other crops	30 inches of cumulative precipitation from application to planting of rotational crop

[1] The amount of cumulative precipitation required before planting a rotational crop is in addition to the required rotational interval given in months. Furrow or flood irrigation should not to be included in total. No more than 7 inches of overhead irrigation should be included in total.

[2] Crop varieties planted back at intervals of one year or less should not have known acute sensitivity to ALS-inhibiting and/or SU herbicides.

[3] When soil pH is 7.5 or above crop plant back should be delayed to the next interval, and to 24 months for crops listed in the 18-month interval above.

[4] Rotation to sorghum should be delayed to the next interval when the total seasonal rate of CAPRENO® Herbicide exceeds 3.0 fl oz per acre or the total from all sources of Thiencarbazone-methyl exceeds 0.014 pounds of active ingredient per acre per season.

[5] For a planned crop rotation to spring seeded alfalfa/spring oats following corn, **make only one application** of CAPRENO® Herbicide to the corn crop **and do not** exceed a total of **3 fl oz** of product/A per 365 day period. The interval between application of CAPRENO® Herbicide to corn and spring planting of the alfalfa/spring oats rotational crop must be equal to or longer than **18 months** when the total thiencarbazone-methyl application rate from all sources exceeds 0.013 lb ai/A per season or when soil pH is 7.5 or above, crop plant back should be delayed to the next interval.

OTHER CROPS

All other crops may be seeded only after the completion of a successful field bioassay after a CAPRENO® Herbicide application. Refer to the "Field Bioassay" section.

FIELD BIOASSAY

A field bioassay must be completed before rotating to crops other than those specified in the Rotational Guidelines section of this label. To conduct an effective field bioassay, grow strips of the crops you intend to grow in the following season in a field previously treated with CAPRENO® Herbicide. The test strip should include low areas and knolls and included variations in soil such as type and pH. Crop response to the bioassay will determine if the crop(s) grown in the test strips can be grown safely in the areas previously treated with CAPRENO® Herbicide.

Herbicide Rotation Restrictions in Forage and Cover Cropping Systems

Designing effective herbicide programs while following pesticide label restrictions can be challenging in any cropping system. With rotations that include forage and cover crops, the challenge can be increased—especially when a planned cover crop might be needed as supplemental or emergency forage. In this case, the best approach is to be aware of crop rotation restrictions ahead of time and plan the most effective solution for all possible scenarios.

Herbicide label rotational restrictions

Once a herbicide is used in a cropping system, the restrictions on that label must be followed for the original crop it is used on AND the succeeding crops until all restrictions on that label have been surpassed. These rotational restrictions exist for two reasons:

1. To protect humans and animals from herbicide residues that a succeeding crop may accumulate at elevated labels prior to entering the feed or food chain.
2. To ensure good establishment for the following crops by avoiding herbicide carryover injury.

An EPA registered pesticide label is a legal document and the instructions must be followed to avoid violating Federal law. Always check the herbicide label for crop rotational restrictions (http://www.cdms.net/LabelsMsds/LMDefault.aspx). Each crop will have a rotational planting interval stated in days or months. If a rotational restriction is not listed for a specific crop, follow the maximum interval. Pay careful attention to any listed exceptions.

What is the difference between a forage crop and a cover crop?

Simply put, a forage crop is planted for animal feed, which can be either grazed by animals or harvested from the field. A cover crop is planted for a variety of reasons—improving soil health, adding nutrients, suppressing weeds—and is not harvested. Typically, the cover crop's biomass stays in the field and may be incorporated into the soil.

In the legal sense, once the biomass of a cover crop is removed from the field for feed (grazed or harvested), it is considered a forage crop or more precisely a crop, according to the EPA registered pesticide label. It is important to note that even in situations where cover crops are allowed to be grazed or harvested within a crop insurance or cost-share program, the label restrictions must still be followed.

Months to plant forage crops after herbicide application on corn

		NON-LEGUME FORAGE CROPS										LEGUME FORAGE CROPS					
		ANNUAL RYEGRASS	BARLEY	BUCKWHEAT	CEREAL RYE	OATS	PEARL MILLET	SORGHUM	TRITICALE	WHEAT	RADISH	ALFALFA	CLOVER	COWPEA	FIELD PEA	VETCH	MAX ROTATION (a)
PRE/PLANT-INCORPORATED	Acetochlor (Harness)	18	18	18	18	18	18	18	18	4	18	9	9	9	9	9	18
	Dual II magnum	12	4.5	(b)	4.5	4.5	12	12	12	4.5	2 (c)	4 (c)	9 (c)	12	12	12	12
	Outlook	(b)	4	(b)	4	4	(b)	(b)	(b)	4	(b)	(b)	(b)	(b)	(b)	(b)	(b)
	Zidua	(e)	(e)	(e)	(e)	(e)	(e)	(e)	(e)	(e)	12	(e)	(e)	(e)	(e)	(e)	12
PREEMERGENCE HERBICIDES	Acetanillide+atrazine premix (Harness Xtra)	18	18	18	18	18	18	18	18	4	9	9	9	9	9	9	18
	Acetochlor (Surpass EC)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	4	(d)	(b)	(b)	(b)	(b)	(b)	(b)
	Atrazine	(f)	(f)(g)(h)	(f)	(f)(g)(h)	(f)(g)(h)	(f)	(b)	(f)	(f)(g)(h)	(f)	(f)	(f)	(f)	(f)	(f)	(f)
	Anthem (c)	18	18	18	18	18	18	18	18	6	18	10	18	11	11	18	18
	Callisto (i)	18	4	4	4	0	0	0	4	4	18	10	18	18	18	18	18
	Dicamba (Clarity) (c) (j)	(k)	(k)	4	(k)	(k)	(k)	(k)	(k)	(k)	4	4	4	4	4	4	4
	Dual II magnum	12	4.5	(b)	4.5	4.5	12	12	12	4.5	2 (c)	4	9	12	12	12	12
	Fierce	(e)	(e)	(e)	(e)	(e)	(e)	(e)	(e)	(e)	12	(e)	(e)	(e)	(e)	(e)	12
	Hornet WDG	10.5	4	26	4	4	26	26	26	4	26	10.5 (l)(m)	26	26	10.5,18 (c)	26	26
	Instigate	18	4,9 (g)	4,9 (g)	4,9 (g)	4,9 (g)	4,9 (g)	10 (l)	4,9 (g)	4,9 (g)	18	10 (l)	18	18	18	18	18
	Lumax (h)	18	4.5	(b)	4.5	(b)	(b)	18	18	4.5	18	18	18	18	18	18	18
	Outlook	(b)	4	(b)	4	4	(b)	(b)	(b)	4	(b)	(b)	(b)	(b)	(b)	(b)	(b)
	Princep 4L	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)
	Prowl H2O	10, 12 (h)	4 (l)	12	12	12	12	10, 12 (h)	12	4 (l)	12	12	12	0	12	12	12 (c)
	Python WDG	9	4	9	4	4	9	9	9	4	26	4	26	26	4	26	26
	Resolve Q (c)	18	9	9	9	9	9	10,18 (l)	9	3,9 (g)	18	10,18 (l)	10,18 (l)	18	10	18	18
	Sharpen (c) (j)	6	0	6	0	0	0	0	0	0	6	6	6	6	3	6	6
	Surestart	26 (n)	(b)	26 (n)	(b)	(b)	26 (n)	12	26 (n)	4	26 (n)	18 (b)(l)(m)	18 (b)(l)(m)	(b)	(b)	18 (b)(l)(m)	26 (n)
	Valor (c)	6, 12 (l) (p)	4	6, 12 (l) (p)	4	5,10 (p)	6, 12 (l) (p)	1 (l)	6, 12 (l) (p)	2 (l)	6, 12 (l) (p)	5,10 (p)	5,10 (p)	6, 12 (l) (p)	4	6, 12 (l) (p)	6, 12 (l) (p)
	Verdict	(b)	4 (g)	(b)	4 (g)	4 (g)	(b)	(b)	(b)	4 (g)	(b)	(b)	(b)	(b)	(b)	(b)	(b)
	Zemax	18	4.5	18	4.5	4.5	18	18	18	4.5	18	18	18	18	18	18	18
	Zidua	(e)	(e)	(e)	(e)	(e)	(e)	(e)	(e)	(e)	12	(e)	(e)	(e)	(e)	(e)	12

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March 2014

Forage Herbicide Quick Sheet

Spring-Seeded Forages after Corn

		BARLEY	OATS	TRITICALE	FIELD PEAS
PREPLANT-INCORPORATED	Acetochlor (Surpass EC)	X	X	X	X
	Dual II Magnum	X	X		
	Outlook	X	X	X	X
PREEMERGENCE HERBICIDES	Acetochlor (Surpass EC)	X	X	X	X
	Callisto	X	X	X	
	Dicamba (Clarity)	X	X	X	X
	Dual II Magnum	X	X		
	Hornet WDG	X	X		
	Instigate	X	X	X	
	Lumax	X	X		
	Outlook	X	X	X	X
	Prowl H2O	X			
	Python WDG	X	X		X
	Sharpen	X	X	X	X
	Surestart	X	X		X
	Valor	X	X		X
	Verdict	X	X	X	X
	Zemax	X	X		

This Quick Sheet is intended to give a fast overview of the rotational restrictions for **spring seeded forage crops (barley, oats, triticale, field peas) after a corn harvest.**

When seeding a mix, the crop with the most restrictive cropping interval must be followed.

Refer to the "Herbicide Rotation Restrictions in Forage and Cover Cropping Systems" and the product label for specific rotational restriction intervals. The product information compiled here is intended to be as accurate as possible at the time of printing.

Always follow the product's current label restrictions and instructions.

PLEASE CONSULT THE FACT SHEET AND THE PESTICIDE LABEL FOR PRECISE INTERVALS AND EXCEPTIONS

DRAFT
March 2014

Forage Herbicide Quick Sheet

Spring-Seeded Forages after Corn

		BARLEY	OATS	TRITICALE	FIELD PEAS
POSTEMERGENCE HERBICIDES	2,4-D Lo-V 6E	X	X	X	X
	Accent Q	X	X	X	
	Basagran	X	X	X	X
	Basis Blend	X			
	Buctril	X	X	X	X
	Cadet	X	X	X	X
	Callisto	X	X	X	
	Callisto Xtra	X			
	Glyphosate (Roundup Weathermax)	X	X	X	X
	Halex GT	X	X		
	Harmony SG	X	X	X	X
	Hornet WDG	X	X		
	Impact	X	X		
	Laudis	X	X		
	Liberty 280 SL	X	X	X	X
	NorthStar	X			
	Option	X	X	X	X
	Realm Q	X			
	Resource	X	X	X	X
	Status	X	X	X	X
	Steadfast	X	X		
	Stinger	X	X		
	Yukon	X	X	X	

PLEASE CONSULT THE FACT SHEET AND THE PESTICIDE LABEL FOR PRECISE INTERVALS AND EXCEPTIONS

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March 2014

Forage Herbicide Quick Sheet

Cereal Rye for Forage after Corn Silage

		CEREAL RYE
PREPLANT-INCORPORATED	Acetochlor (Surpass EC)	
	Dual II Magnum	X
	Outlook	X
PREEMERGENCE HERBICIDES	Acetochlor (Surpass EC)	
	Callisto	X
	Dicamba (Clarity)	X
	Dual II Magnum	X
	Hornet WDG	X
	Instigate	X
	Lumax	X
	Outlook	X
	Prowl H2O	X
	Python WDG	X
	Sharpen	X
	Surestart	
	Valor	X
	Verdict	X
	Zemax	X

This Quick Sheet is intended to give a fast overview of the rotational restrictions for **double-cropping cereal rye as a forage after a corn silage harvest**.

When seeding a mix, the crop with the most restrictive cropping interval must be followed.

Refer to the "Herbicide Rotation Restrictions in Forage and Cover Cropping Systems" and the product label for specific rotational restriction intervals. The product information compiled here is intended to be as accurate as possible at the time of printing.

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DRAFT
March 2014

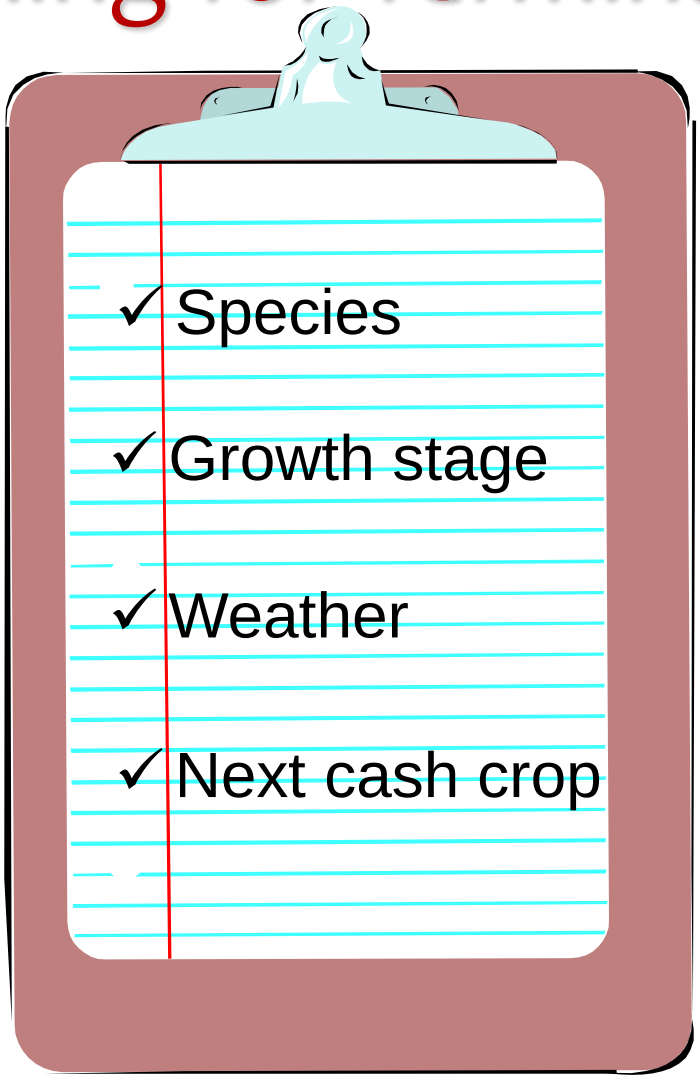
Forage Herbicide Quick Sheet

Cereal Rye for Forage after Corn Silage

		CEREAL RYE
POSTEMERGENCE HERBICIDES	2,4-D Lo-V 6E	X
	Accent Q	
	Basagran	X
	Basis Blend	X
	Buctril	X
	Cadet	X
	Callisto	
	Callisto Xtra	
	Glyphosate (Roundup Weathermax)	X
	Halex GT	
	Harmony SG	X
	Hornet WDG	
	Impact	X
	Laudis	
	Liberty 280 SL	X
	NorthStar	X
	Option	X
	Realm Q	
	Resource	X
	Status	X
	Steadfast	
	Stinger	
	Yukon	X

PLEASE CONSULT THE FACT SHEET AND THE PESTICIDE LABEL FOR PRECISE INTERVALS AND EXCEPTIONS

Planning for Termination



Termination Methods

Rolling-Crimping

Source: Midwest Cover Crop Council

Winterkill

Source: Kansas State University

Herbicides

Source: www.farmprogess.com

Cover Crops for Winterkill

a reason to love Wisconsin's winter weather. . .

What are some advantages?

Simplifies spring scheduling

Eliminates water use in the spring

Cover Crops for Winterkill

a reason to love Wisconsin's winter weather. . .

Non-legumes:

- Annual ryegrass*
- Buckwheat
- Millet
- Oats
- Sorghum-sudangrass
- Sudangrass
- Spring wheat
- Spring barley

Legumes:

- Berseem clover
- Crimson clover
- Field pea*
- Cowpea

Brassicas:

- Canola*
- Turnip*
- Radish*

***May not winterkill**

Annual Ryegrass

ONE OF THE 11 BIGGEST HERBICIDE RESISTANCE THREATS

In Wisconsin, annual ryegrass does not reliably winterkill.

Spring termination is a serious issue.

Annual Ryegrass

ONE OF THE 11 BIGGEST HERBICIDE RESISTANCE THREATS

- 1 ACCase inhibitors
- 2 ALS inhibitors
- 9 EPSP synthase inhibitor
- 10 Glutamine synthetase inhibitor
- 15 Long-chain fatty acid inhibitors

Annual Ryegrass

ONE OF THE 11 BIGGEST HERBICIDE RESISTANCE THREATS

- **1** Poast, Select Max, Fusilade DX
- **2** Pursuit, Raptor, Classic, Firstrate
- **9** Glyphosate
- **10** Glufosinate (Liberty)
- **15** Degree, Harness, Surpass, Zidua, Dual Magnum

Annual Ryegrass

Less than 6 inches in height
During active growth
Day/Night temps above 55/40 F
4 hours before sunset

Plan for at least 2 applications
Use the full rate for every application

Image source: www.ipcm.wisc.edu

Cover Crops for Overwintering

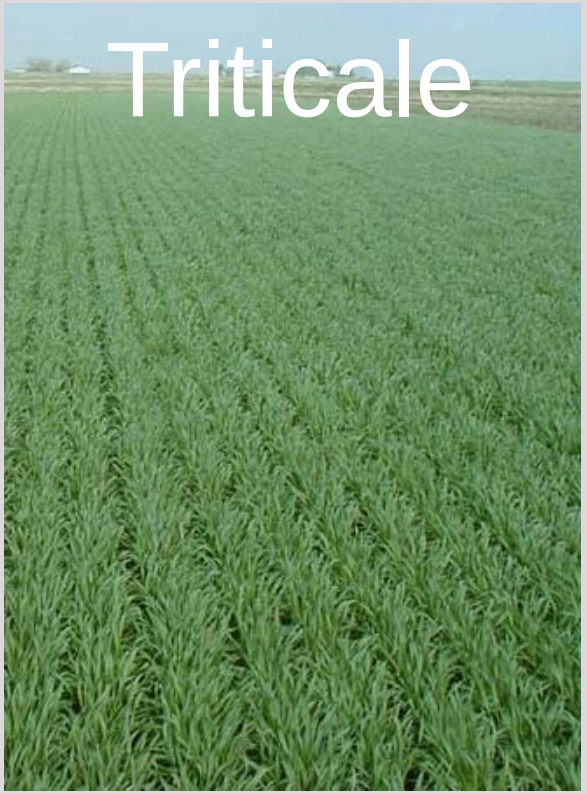
Advantages . . .

- ✓ year-round soil cover
- ✓ additional biomass
- ✓ water holding

Winter Cereals

Source: www.uwex.edu

Source: Greg Roth, Penn State



Source: www.mccc.msu.edu

Winter Cereals

Prior to boot stage, up to 18 in tall

Glyphosate 4.5 lb ae/gal formulation
22 fl oz/acre

Legumes

Source: www.mccc.msu.edu

Legumes

HV: 2 weeks before planting, pre-bloom or mid-bloom
RC: during bloom

Combination of glyphosate with 2,4-D or dicamba

Ongoing Research

- Herbicide Carryover
  - Fall 2013 and Fall 2014
- Termination of Cereal Rye and Annual Ryegrass Varieties
  - Spring 2014
- Summer Annual Weed Suppression in Soybean
  - Fall 2014
- Badger Plot Cover Crop Project in Dodge County
  - Fall 2013 and Fall 2014

Herbicide Carryover

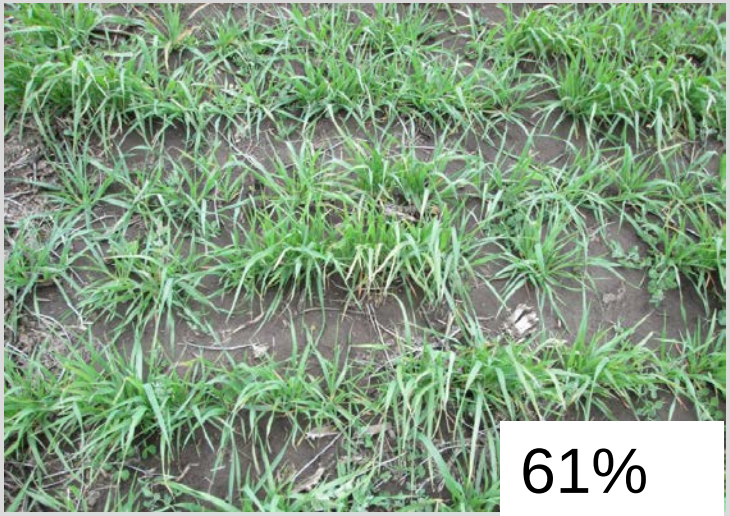
Treatments

- Control
- S-metolachor . . .(Dual Magnum)
- Imazethapyr . . . . . (Pursuit)
- Flumioxazin . . . . . .(Valor)
- Pyroxasulfone . . . . . .(Zidua)
- Flumetsulam . . . . . .(Python)
- Sulfentrazone . . . . . (Spartan)
- Fomesafen . . . . . (Flexstar)

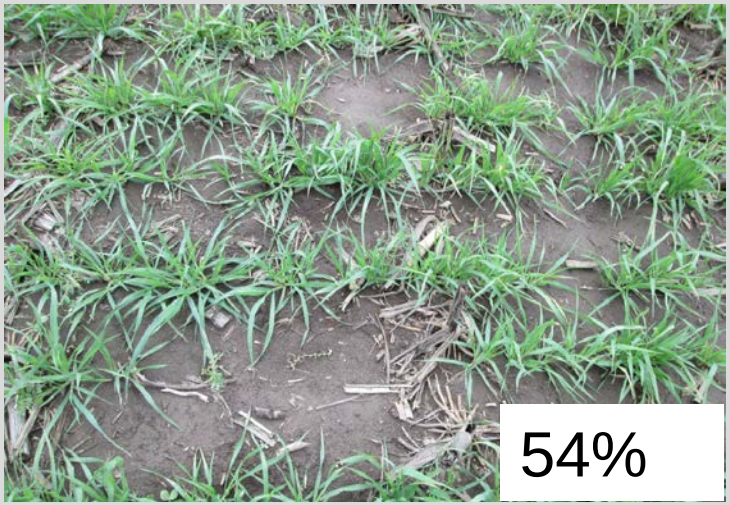
Ranking by # of herbicides with a carryover effect

1. (0) Cereal Rye
2. (2) Crimson clover
3. (4) Oat-Pea Mix = Tillage Radish = Annual ryegrass tetraploid
4. (5) Annual ryegrass 'King' and 'Bruiser'

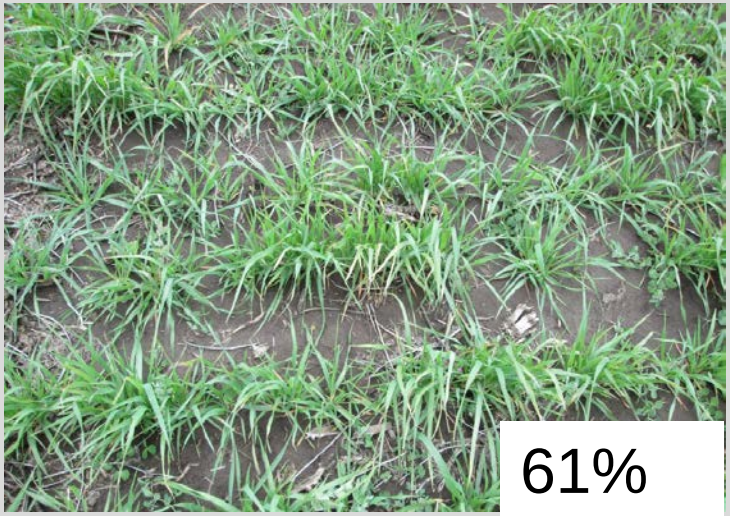
Graduate Research Assistant: Dan Smith
Project profile at http://wcws.cals.wisc.edu/research/



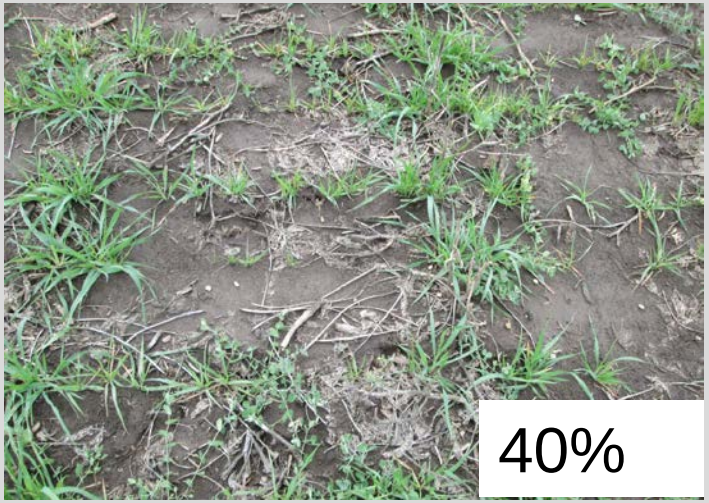
Oat-Pea Mix
Non-treated control



Oat-Pea Mix
Dual II magnum (s-metolachor)
Group 15
Long-chain fatty acid inhibitor



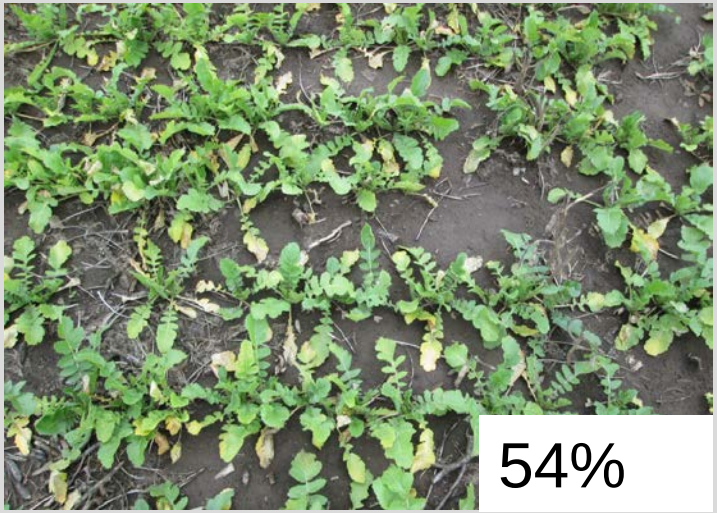
Oat-Pea Mix
Non-treated control



Oat-Pea Mix
Pursuit (imazethapyr)
Group 2
ALS inhibitor

Tillage Radish
Non-treated control

Tillage Radish
Spartan (sulfentrazone)
Group 14
PPO inhibitor



Tillage Radish
Non-treated control

Tillage Radish
Python (imazethapyr)
Group 2
ALS inhibitor

Dodge County Field Day
October 1, 2013

BADGER PLOTS

UW Extension Cooperative Extension

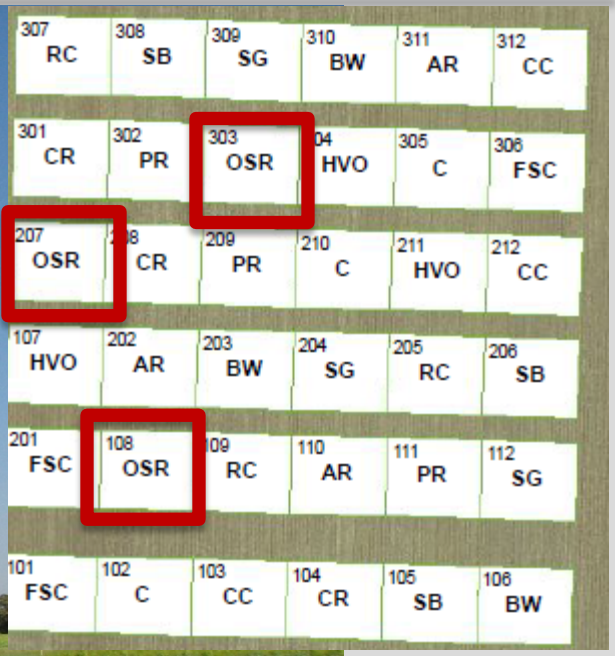
where science meets the field

307 RC	308 SB	309 SG	310 BW	311 AR	312 CC
301 CR	302 PR	303 OSR	304 HVO	305 C	06 FSC
207 OSR	208 CR	209 PR	210 C	11 HVO	212 CC
107 HVO	202 AR	203 BW	204 SG	205 RC	206 SB
201 FSC	108 OSR	109 RC	110 AR	111 PR	112 SG
101 FSC	102 C	03 CC	104 CR	105 SB	106 BW

BADGER PLOTS

UW Extension
Cooperative Extension

where science meets the field



On-Farm Research Data

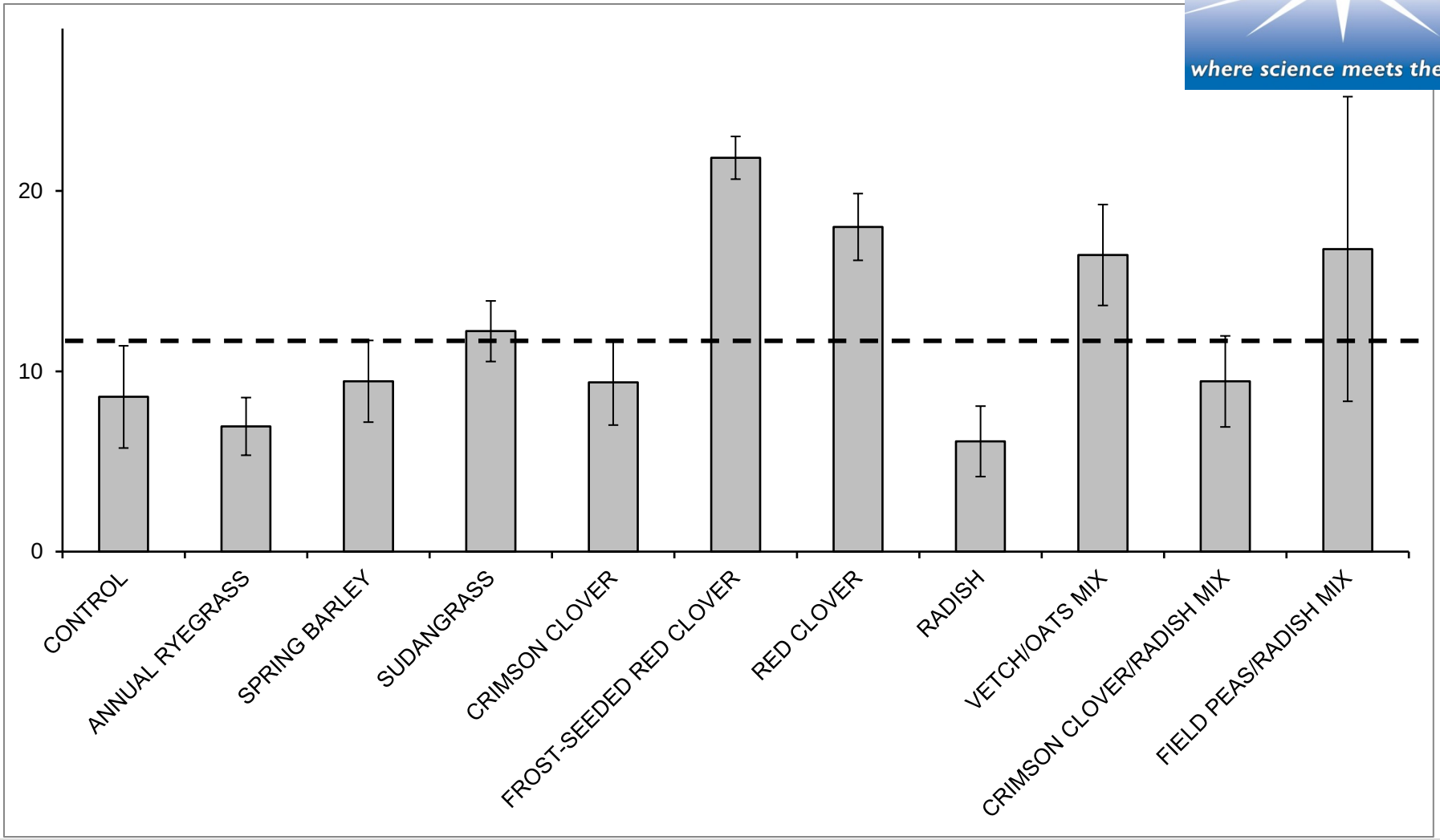
Fall 2013 and Spring 2014

- Characterizing cover crop and weed population

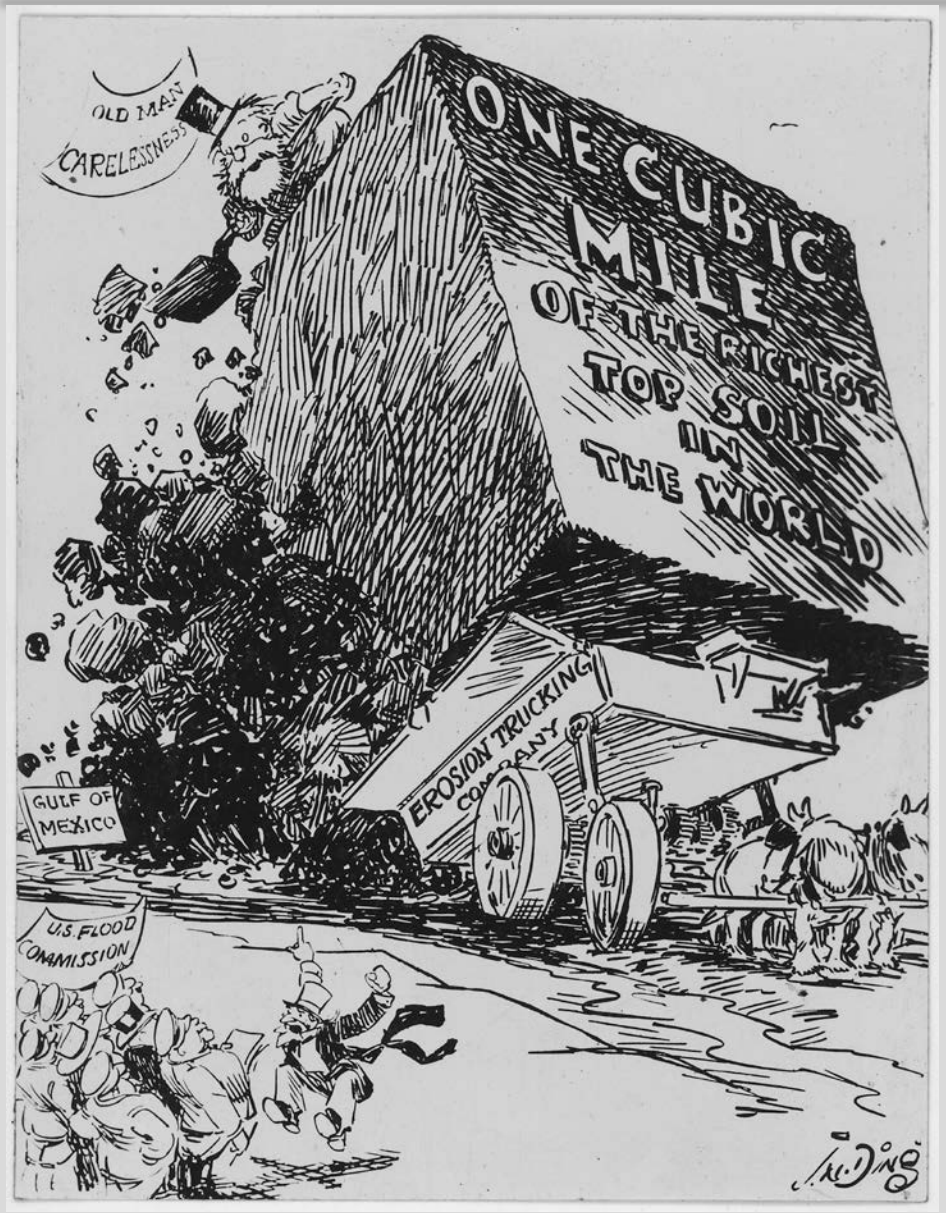
Fall 2014

- Measure yield of corn crop

On-Farm Research Data



Thank you for your attention!



Source: National Archives, ca. 1935