Interseeding Cover Crops

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Cover crops are planted to cover the soil between harvest and planting of the primary crops for some of the following purposes:

- Protect soil from erosion
- Reduce nutrient losses
  - Preventing runoff
  - Scavenging residual nitrogen
- Nitrogen fixation- legumes
- Suppress weed growth
- Insect support/suppression
- Soil conditioning/improve soil health
  - Add soil organic matter
  - Enhance soil biology
  - Alleviate/prevent compaction
- Supplemental forage production

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In Season Establishment Timing

- Broadcast
- Apply with Nitrogen and/or Herbicide Application
- Specialized Equipment
- Modified no-till Drill
- Soybeans?

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Interseeding or Overseeding

Apply with Nitrogen/Herbicide Pass

- Save Trip Across Field
- Broadcast and Airflow Application Equipment
- Blended Applications?
- Liquid vs. Dry N Applications?

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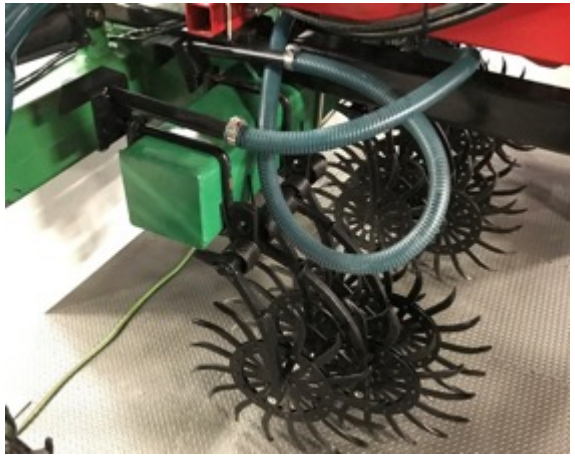
Specialized Equipment



https://www.certifiedcropadviser.org/science-news/machine-gives-winter-cover-crops-summer-jumpstart

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Why Use a No-till Drill?

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Drill Modification

4 row units and no-till coulters removed to allow drill to travel between 30 in. rows

Drill Modification

7.5 in.

15 in.

4 row units and no-till coulters removed to allow drill to travel between 30 in. rows

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Why Not to Use a No-till Drill?

Broadcast Seeding

Herbicide Persistence/Carryover

Herbicide Persistence/Carryover

Herbicide	Product Rate	Label Rate	App Timing	Annual Ryegrass	Red Clover	Grass-Legume Mix
ALS Inhibitors (2)						
Resolve 25 DF	0.5 oz	1/2x	PRE	L	L	L
Resolve 25 DF	1 oz	1x	PRE	L	L	L
Photosystem II Inhibitors (5)						
Atrazine (4L)	1 pt	1/2x	PRE	L	M	M
Atrazine (4L)	2 pt	1x	PRE	M	M	M
Atrazine (4L)	3 pt	1.5	PRE	H	H	H
Metribuzin 75 WG	4 oz	1X	PRE	H	L	M
Long-chain Fatty Acid Inhibitors (15)						
Dual II Magnum 7.64 EC	1.67 pt	1x	PRE	H	M	H
Zidua 85 WG	2.5 oz	1X	PRE	H	M	H
Harness 7 EC	1 pt	1/2x	PRE	M	L	M
Harness 7 EC	2 pt	1X	PRE	M	L	M
Outlook 6 EC	½ pt	1/2x	PRE	L	L	L
Outlook 6 EC	1 pt	1x	PRE	M	L	M

Source: Evaluation of Residual Herbicides for Interseeding in Corn: Penn State Extension: John Wallace and Willian S. Curran

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Herbicide Persistence/Carryover

Herbicide	Product Rate	Label Rate	App Timing	Annual Ryegrass	Red Clover	Grass-Legume Mix
Microtubule Inhibitors (3)						
Prowl H20 3.8 CS	1.5 pt	1/2x	PRE	L	L	L
Prowl H20 3.8 CS	3 pt	1x	PRE	H	M	H
PPO Inhibitors (14)						
Sharpen 2.85 SC	1.5 fl oz	1/2x	PRE	L	L	L
Sharpen 2.85 SC	3 fl oz	1x	PRE	M	M	M
HPPD Inhibitors (27)						
Balance Flex 2 SC	5.3 fl oz	1x	PRE	M	M	M
Callisto 4 SC	5.4 fl oz	1x	PRE	L	H	H
Impact 2.8 SC	0.75 fl oz	1x	POST	M	H	H
Mixtures						
Keystone LA NXT	2 pt	1/2x	PRE	L	L	L
Prowl + Atrazine	1.5 pt + 1 pt	1/2x	PRE	M	M	M
Harness + Resolve	1 pt + 0.5 oz	1/2x	PRE	L	L	L
Verdict 5.57 EC	8 oz	1/2x	PRE	L	L	L
Lumax EZ 3.67 SE	1.35 qt	1/2x	PRE	H	H	H
Acuron 3.44 SC	1.25 qt	1/2x	PRE	H	H	H

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Source: Evaluation of Residual Herbicides for Interseeding in Corn: Penn State Extension: John Wallace and Willian S. Curran

Organic Production and Interseeding

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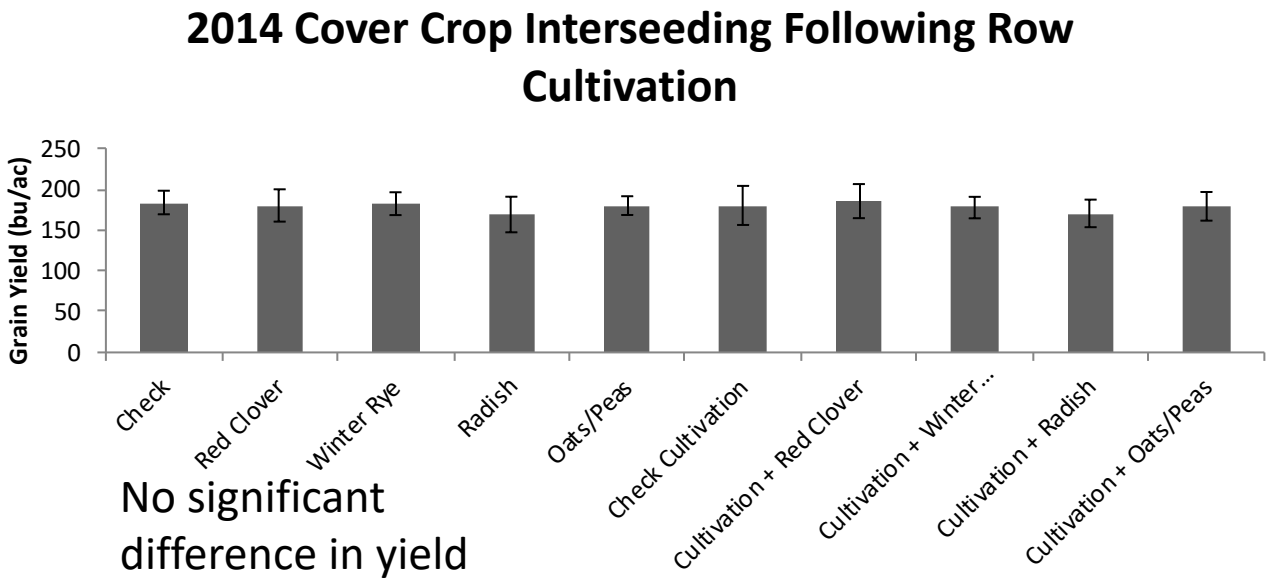
Organic Production and Interseeding

- Interseeded following last cultivation pass
- Broadcast seeding options
- Tillage may make seeding depth inconsistent



No significant difference in yield

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Species Selection

Species Selection- Tried and Failed

- Residual Herbicides- No, weeds controlled using only glyphosate
- Berseem and Crimson Clover
- Oats and Peas
- Radish (Establishes and grows all season, however very little below ground biomass)
- Weather*

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Cover Crop Establishment

Cover Crops 8/27/14

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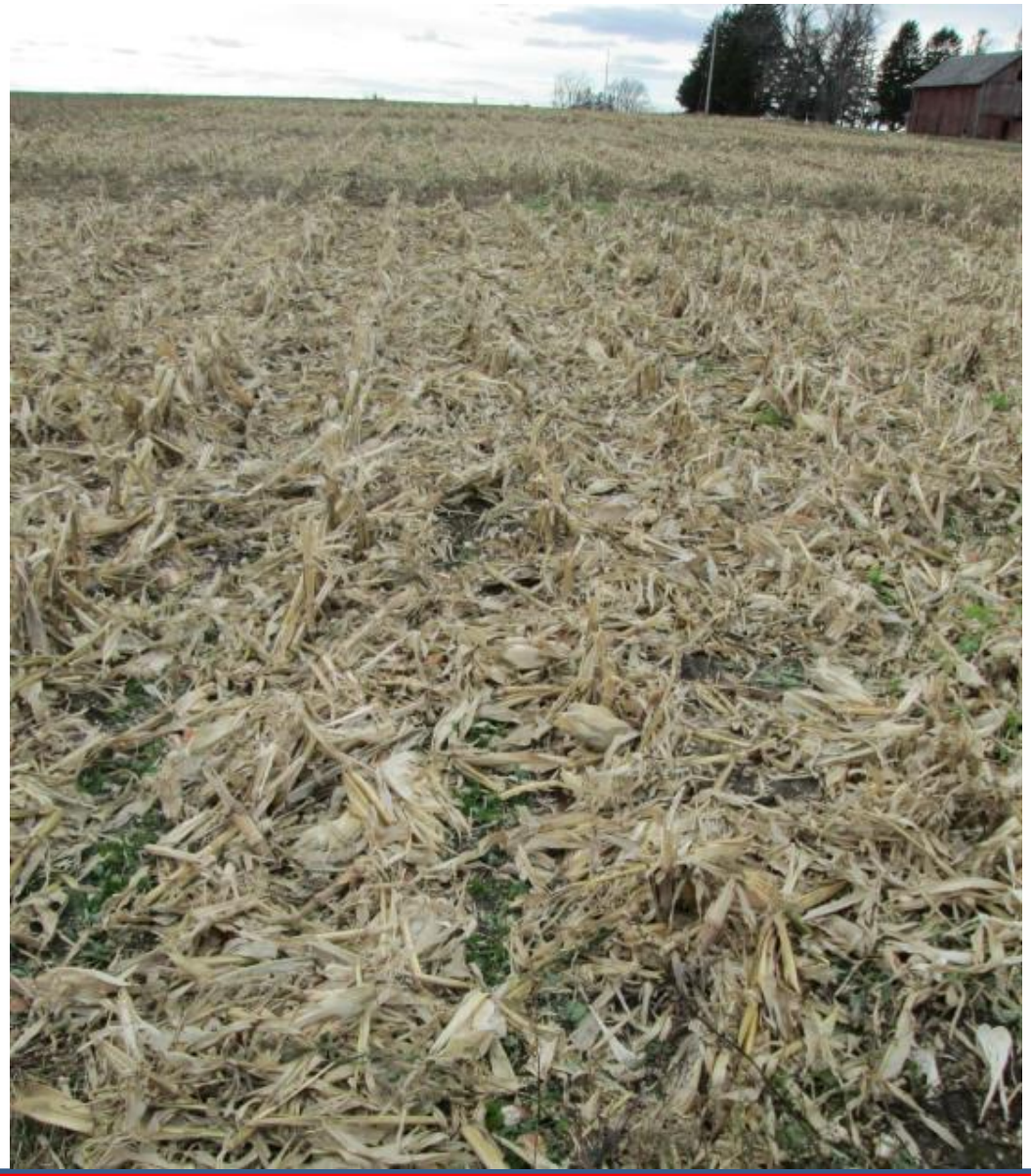
Post Harvest 11/8/14



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Spring 2015

Winter rye survived winter 2014-2014 . Photo taken 5/12/15

Summer 2015

Winter Rye

Radish

Red Clover

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Oat Pea Mixture did not consistently germinate in 2015

Harvest 2015

Winter Rye

Radish

Red Clover

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Arlington Corn Grain Yield

Cover Crop	2014[1]	2015	2016
	bu ac^{-1}		
Winter Rye	**182**	**216**	224*
Red Clover	**180**	**208**	**240**
Radish	**169**	**196**	**234***
Oat Pea Mixture	**180**	205	242
None	184	229	249

*Indicates statistical significance from the untreated control.
Bold test indicates cover crop was still viable at harvest.

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Arlington Dry Cover Crop Biomass Weight At Grain Harvest

Cover Crop	2014[1]	2015	2016
	lb ac^{-1}		
Winter Rye	210 (102)	487 (345)	-
Red Clover	230 (62)	513 (318)	589 (375)
Radish	904(783)	638 (411)	161 (66)
Oat Pea Mixture	201 (205)	22 (6)	-

[1]Biomass weight (standard deviation in lb ac^{-1})

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Arlington Dry Cover Crop Biomass Weight At Spring Termination

Cover Crop	2015[1]	2016
	lb ac^{-1}	
Winter Rye	1437 (978)	-
Red Clover	1285 (413)	304 (59)

[1]Biomass weight (standard deviation in lb ac^{-1})

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Lancaster Corn Grain Yield

Cover Crop	2016[1]	2017
	bu ac^{-1}	
Check- No Cover Crop	250	239
Interseeded- V5		
Winter Rye	235	**226**
Red Clover	**218**	**238**
Radish	**231**	**229**
Berseem Clover	209	-
Crimson Clover	232	**246**
Annual Ryegrass	-	**225**
Broadcasted- V8		
Annual Ryegrass	-	**256**
Red Clover	-	**254**
Winter Rye	-	**244**
Crimson Clover	-	237
Overseeded- R6 (simulated aerial application)		
Oats	-	**260**
Winter Rye	-	**255**
Radish	-	**236**
Annual Ryegrass	-	**233**
Crimson Clover	-	224
Red Clover	-	203

Bold test indicates cover crop was still viable at harvest.

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No Significant Difference In Yields!

Lancaster Fall Dry Biomass Weights

Cover Crop	2016[1]	2017
	lb ac^{-1}	
Interseeded- V5		
Winter Rye	-	**393 (189)**
Red Clover	**238 (454)**	**667 (635)**
Radish	**1131 (859)**	**202 (90)**
Berseem Clover	-	-
Crimson Clover	-	60 (103)
Annual Ryegrass	-	**595 (180)**
Broadcasted- V8		
Annual Ryegrass	-	**536 (373)**
Red Clover	-	**238 (273)**
Winter Rye	-	**155 (144)**
Crimson Clover	-	-
Overseeded- R6 (simulated aerial application)		
Oats	-	**274 (74)**
Winter Rye	-	**619 (180)**
Radish	-	**155 (135)**
Annual Ryegrass	-	**595 (495)**
Crimson Clover	-	107 (90)
Red Clover	-	24 (41)

[1]Biomass weight (standard deviation in lb ac^{-1})

Bold test indicates cover crop was still viable at harvest.

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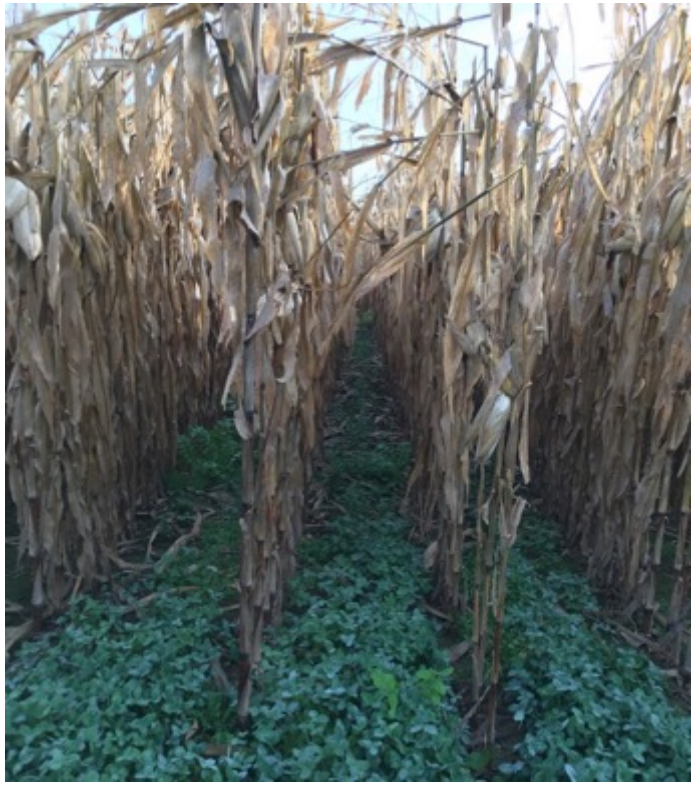
2016 Red Clover at Lancaster



Pre-Harvest

1 Month
Following Harvest

Spring 2017

454 lb/ac Dry Biomass

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Red Clover Interseeded into Silage Corn

9/26/2016

~1 Ton/ac Red Clover Dry Biomass

5/4/2017

Checklist for Interseeding

- Weed Control-
  - Herbicide Selection
  - Cultivation Timing
- Weather
  - Precipitation
- Cover Crop Species
  - Red Clover
  - Maybe winter rye or annual ryegrass
- Seeding Method
  - Modified Equipment- V5
  - Broadcasting- V5-V8

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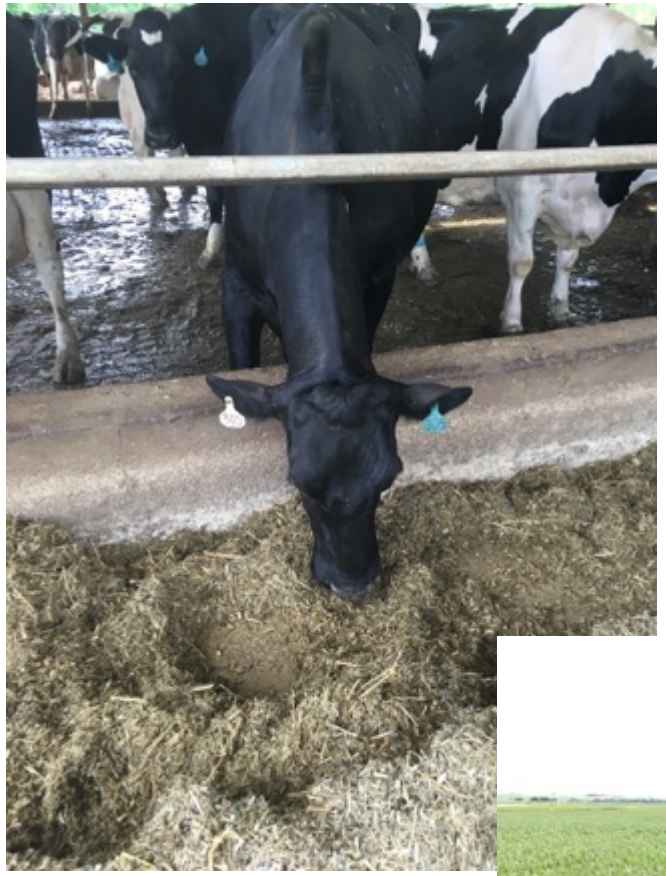
Soybeans?

Livestock Rotation



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Grain Rotation

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A3XXX

Interseeding cover crops in row-cultivated corn

Extension
UNIVERSITY OF WISCONSIN-MADISON

Daniel H. Smith, Virginia M. Moore, Matt Ruark, Erin Silva

Key facts

- Interseeding involves planting a cover crop while a cash crop is still growing in the field.
- It can be challenging to establish cover crops after corn harvest, but interseeding allows for earlier planting (before corn is harvested).
- Wisconsin research has demonstrated red clover, winter rye, and radish established well in an interseeding system.

Why interseeding?

There are many known benefits of including overwintering cover crops in a crop rotation. Cover crops can have positive impacts on soil and water quality as well as nutrient and pest management (Clark 2007, Curran et al. 2018, Reicosky and Forcella 1998). However, in the Upper Midwest it can be challenging to establish cover crops due to the lack of growing degree days after corn is harvested. This late planting window also limits the diversity of cover crop species that can be used (Curran et al. 2018, NCR SARE and CTIC 2016, Singer 2008, Wayman et al. 2017). Interseeding provides a way to establish cover crops earlier in the growing season by planting cover crops when corn is still growing.

Interseeding methods

Planting methods

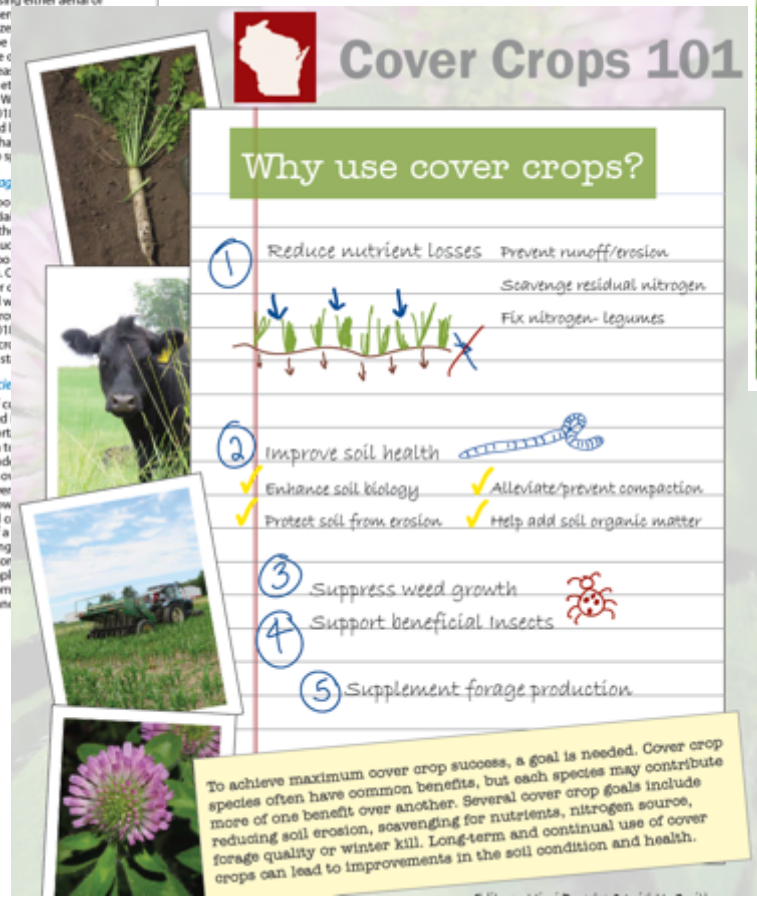
Cover crops can be interseeded into corn during the growing season by broadcasting, using either aerial or ground equipmen
broadcast fertilize
crops can also be
a high-clearance
drill, which increa
contact (Curran et
land et al. 2018, W
Noland et al. (201
interseeding had
establishment tha
most cover crop s

Corn growth stag

If interseeded too
have the potentia
yields. On the oth
crops may not suc
if interseeded too
canopy closure).
found that cover
affect corn yield w
at the V4 corn gro
Noland et al. (201
establish cover cr
V7 corn growth st

Cover crop specie

A wide range of c
have been tested
systems. It import
species that can t
environment und
py and that can o
climate. The cover
have limited grow
canopy to avoid
corn. Success of a
in an interseeding
depend on seasor
tions – for exampl
may increase com
the cover crop an



Herbicide Rotational Restrictions for Cover and Forage Cropping Systems

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This publication is intended to be a starting point when considering using cover crops while utilizing herbicides in the cropping system. This publication does not replace the herbicide label. This publication outlines rotational intervals for many commonly used herbicides in Wisconsin. The rotational interval is the required amount of time from herbicide application to subsequent crop establishment for forage or harvest value. Example- A herbicide is applied to soybeans with a 10 month rotational interval for winter rye. Winter rye could be established 10 months after the herbicide application for food or feed value. This rotational interval is legally required prior to crop harvest for feed or forage. Cover crops intended for forage value must follow the rotation interval. Cover crops utilized for soil building do not need to follow the rotational interval, however, they may still be prone to herbicide injury. This herbicide injury is often attributed to herbicide carryover and the chances of injury can be better understood after a field bioassay. The herbicide label must be referenced prior to making any management decisions. The rotational intervals stated below are the maximum rotational restriction taken from the most current herbicide label available at time of printing.

Herbicide Carryover

For cover crops to accomplish their intended goals, they must establish well; establishment of cover crops can be compromised by use of residual herbicides, those have activity in the soil for a period of time after application, applied to the preceding cash crop. The persistence of these residual herbicides is what will affect the cover crop establishment later in the growing season and can be affected by a wide range of management (tillage, application rate, and herbicide application method) and soil properties (moisture, temperature, soil colloid properties, chemical reactions, pH, microbial population, soil texture and organic matter) (Krausz et al., 1992). Cover cropping and using residual herbicides is not impossible but is challenging. Herbicide resistant weed management should be considered when planning herbicide applications. The cost of herbicide program, cover crop benefits, and resistance management should all be considered.

Cover Crop vs. Forage Crop

A crop is classified as a cover crop when no biomass is harvested. A cover crop is established for benefits to the soil, cropping system, and environment. A cover crop becomes a forage crop when biomass is harvested for feed. This includes harvesting the crop via grazing or mechanical collection. A cover crop can be used for forage; however, most pesticide labels do not provide the plant back restriction time required from pesticide application to grazing or harvest for cover crops, only forage crops. Therefore, requiring the maximum rotational restrictions be utilized. If these restrictions are not followed, harvesting a cover crop for forage value is illegal. Crop rotation restrictions will vary in length and should be examined for all pesticides and crops in the rotation. A cover crop that will not be harvested for any value can be legally established following any herbicide application, however, the grower takes all responsibility for cover crop injury or failure that may re-

Rotational Restriction Intervals for Labeled Herbicides in Wisconsin

			COMMON WI CROPS			SMALL GRAINS/GRASSES						BRASSICAS			LEGUMES						page 5
Herbicide- Trade Name	Bromoxynil or Bicyclopyrone	Cover Crop Language	CORN (field & silage)	SOYBEAN	ALFALFA	WHEAT	OATS	WINTER RYE	WINTER TRITICALE	BARLEY	ANNUAL RYEGRASS	RAPESEED	TURNIPS	RAPESEED	BERSEEM CLOVER	CRIMSON CLOVER	RED CLOVER	VETCH	FIELD PEAS	COWPEA	Max Rotation
2,4-D Amine 4, Shredder	n/a	n/a	14 D	30 D	30 D	30 D	30 D	30 D	30 D	30 D	30 D	30 D	30 D	30 D	30 D	30 D	30 D	30 D	30 D	30 D	30 D
2,4-D EH Shredder	n/a	n/a	14 D	30 D	30 D	30 D	30 D	30 D	30 D	30 D	30 D	30 D	30 D	30 D	30 D	30 D	30 D	30 D	30 D	30 D	30 D
Aatrex	n/a	n/a	0	12 M	24 M	24 M	24 M	24 M	24 M	24 M	24 M	24 M	24 M	24 M	24 M	24 M	24 M	24 M	24 M	24 M	24 M
Accent Q	n/a	n/a	0	0.5 M	12 M	4 M	4 M	4 M	18 M	4 M	18 M	18 M	18 M	18 M	18 M	18 M	12 M	18 M	10 M	10 M	18 M
Acuron	n/a	n/a	0	10 M	18 M	4 M	18 M	4 M	18 M	4 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M
Acuron Flexi	n/a	n/a	0	10 M	18 M	4 M	18 M	4 M	18 M	4 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M
Affinity Broadspec	n/a	n/a	1.5 M	1.5 M	1.5 M	0	1.5 M	0	0	0	1.5 M	1.5 M	1.5 M	2 M	1.5 M	1.5 M	1.5 M	1.5 M	1.5 M	1.5 M	1.5 M
Afforia	yes	n/a	14 D	0	10 M	2 M	10 M	4 M	12 M	4 M	12 M	12 M	12 M	12 M	10 M	10 M	10 M	10 M	4 M	10 M	12 M
Aim	n/a	n/a	0	0	0	0	0	0	0	0	12 M	0	0	0	0	0	0	0	0	0	12 M
Ally XP	yes	n/a	34 M	34 M	34 M	1 M	10 M	34 M	34 M	10 M	34 M	34 M	34 M	34 M	34 M	34 M	34 M	34 M	34 M	34 M	34 M
Alphanex	n/a	n/a	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
Anthem	n/a	n/a	0	4 M	10 M	6 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	8 M	18 M	18 M
Anthem ATZ	n/a	n/a	0	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
Anthem Flex	n/a	n/a	0	4 M	10 M	6 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	8 M	18 M	18 M
Anthem Maxx	n/a	n/a	0	4 M	10 M	6 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	4-8 M	18 M	18 M
Armezon	n/a	n/a	0	9 M	9 M	3 M	3 M	3 M	3 M	3 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	9-18 M	18 M	18 M
Armezon Pro	n/a	n/a	0	9 M	9 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	9-18 M	18 M	18 M
Assure II	n/a	n/a	120 D	0	120 D	120 D	120 D	120 D	120 D	120 D	120 D	120 D	120 D	120 D	120 D	120 D	120 D	120 D	0	120 D	120 D
Authority Assist	yes	n/a	10 M	0	12 M	4 M	10 M	4 M	10 M	9.5 M	10 M	10 M	10 M	10 M	10 M	10 M	10 M	10 M	10 M	10 M	10 M
Authority Elite	yes	yes	10 M	0	12 M	4.5 M	12 M	4.5 M	4.5 M	4.5 M	12 M	12 M	12 M	12 M	12 M	12 M	12 M	12 M	12 M	12 M	12 M
Authority First	yes	yes	18 M	0	12 M	4 M	12 M	12 M	30 M	12 M	30 M	30 M	30 M	30 M	30 M	30 M	30 M	30 M	30 M	30 M	30 M
Authority Maxx	yes	yes	18 M	0	18 M	4 M	18 M	4 M	36 M	4 M	36 M	36 M	36 M	36 M	18 M	18 M	18 M	18 M	36 M	36 M	36 M
Authority MTZ	yes	n/a	10 M	0	12 M	4 M	18 M	18 M	18 M	4 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M
Authority Supreme	yes	n/a	4 M	4 M	10 M	6 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M
Authority XL	yes	yes	10 M	0	12 M	4 M	12 M	4 M	36 M	4 M	36 M	36 M	36 M	36 M	18 M	18M	18 M	36 M	36 M	36 M	36 M
Autumn	yes	n/a	30 D	90 D	18 M	8 M	9 M	4 M	18 M	8 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M	18 M

Restrictions assume cover crop planted in summer/fall shown in months; the most restrictive data is shown.

D=days; M=months; NL= not listed; 0= typically a labeled crop with no plant-back restriction FY= full year

The product information compiled here is intended to be as accurate as possible at the time of printing. Refer to product label for more detailed restriction information. **Always follow the product's current label restrictions and instructions.**

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Questions?

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