Late Summer Cover Crops after Small Grains or Vegetables

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Webinar Outline

Moving Toward Soil Health – Maximizing the Growing Season

Jamie Patton – NPM

Cover Crops Following Short Season Crops – Common Species, Mixes, Management Tips

Daniel H. Smith – NPM

The Power of Legumes

Mike Ballweg – Extension Sheboygan County

Small Grains for Forages and Covers – Management, Varieties and Yields

Kevin Shelley – NPM

Moving Towards Soil Health – Maximizing the Growing Season

Jamie Patton

University of Wisconsin – Madison, Nutrient and Pest Management Program

Late Summer Crop Harvest…

The Potential

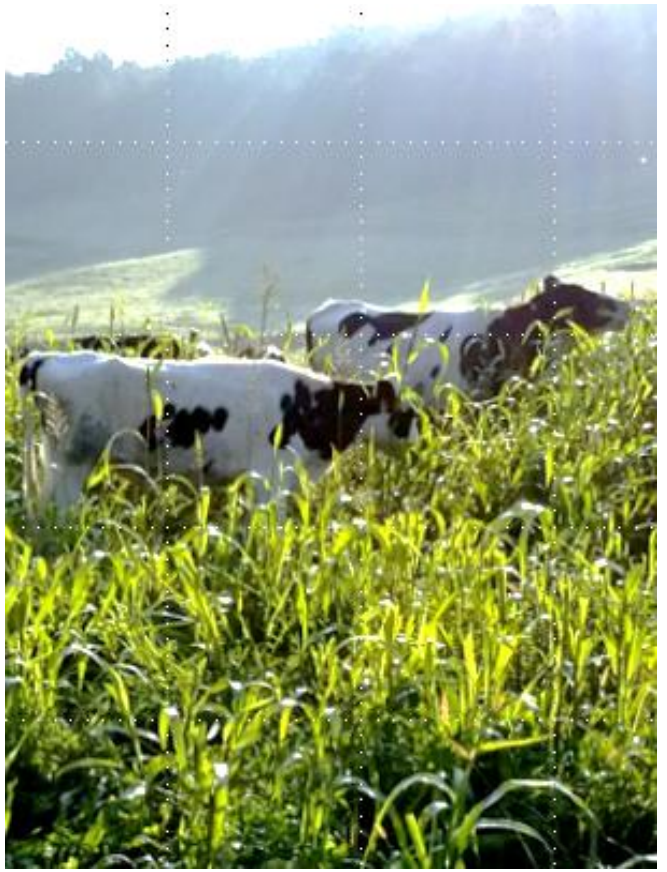
- The potential of bare soil…

Photo credit – Brad Rybicki

Late Summer Crop Harvest…

The Potential

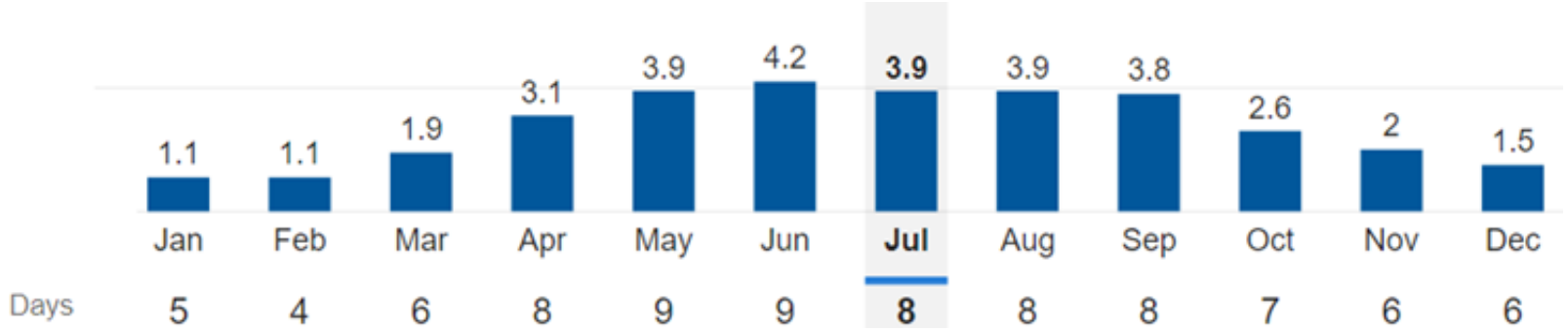
- The potential of late summer cover crops…



Plenty of Precipitation to Come…

Protect and Store

Average Monthly Rainfall (inches) – Stevens Point, WI



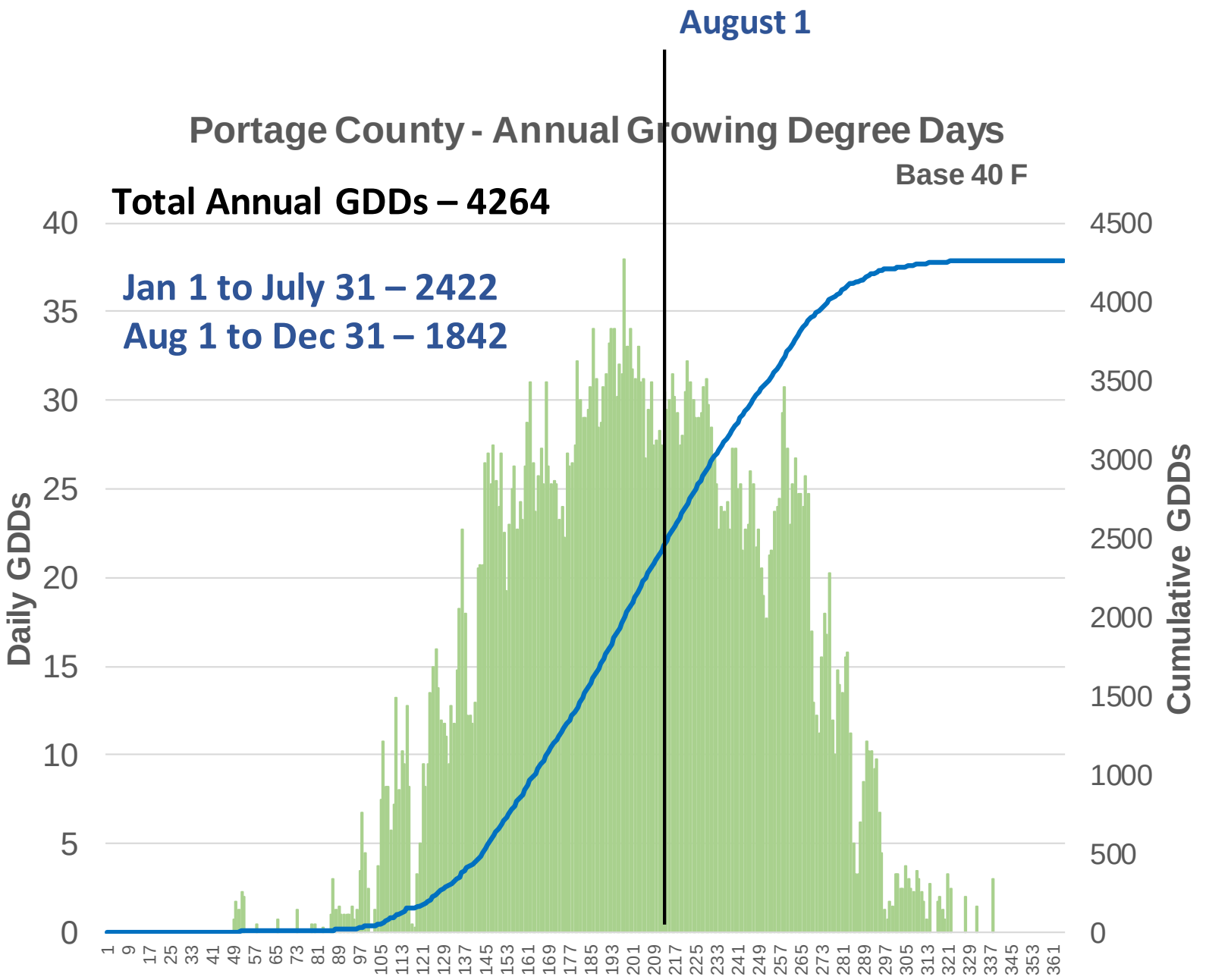
Total average rainfall – 33 inches

Jan 1 to July 31 – 19.2 inches
Aug 1 to Dec 31 – 13.8 inches

Aug 1 to May 1

21 inches of precipitation
58 events

Average Monthly Rainfall Totals – Stevens Point, WI - NOAA



GDDs Base 40 for (44.4, -89.5) – Average 2016-2019, https://agweather.cals.wisc.edu/thermal_models/degree_days

Cover Crops Following Short Season Crops – Common Species, Mixes, Management Tips

Jamie Patton and Daniel H. Smith

University of Wisconsin – Madison, Nutrient and Pest Management Program



So Many Cover Crop Species…

What do I Plant?

- Matches goals for:
  - Economic outlay
  - Cost share requirements
  - Cover cropping goals
  - Management options
    - What equipment do you have?
    - Are you going to use herbicides for termination?
    - How much time for management do you have?
    - How comfortable are you with risk?
    - Do you have manure to apply?
    - …

Plenty of Water and GDDs…

Opportunity for Diverse Mixes

- Soil cover during April-June

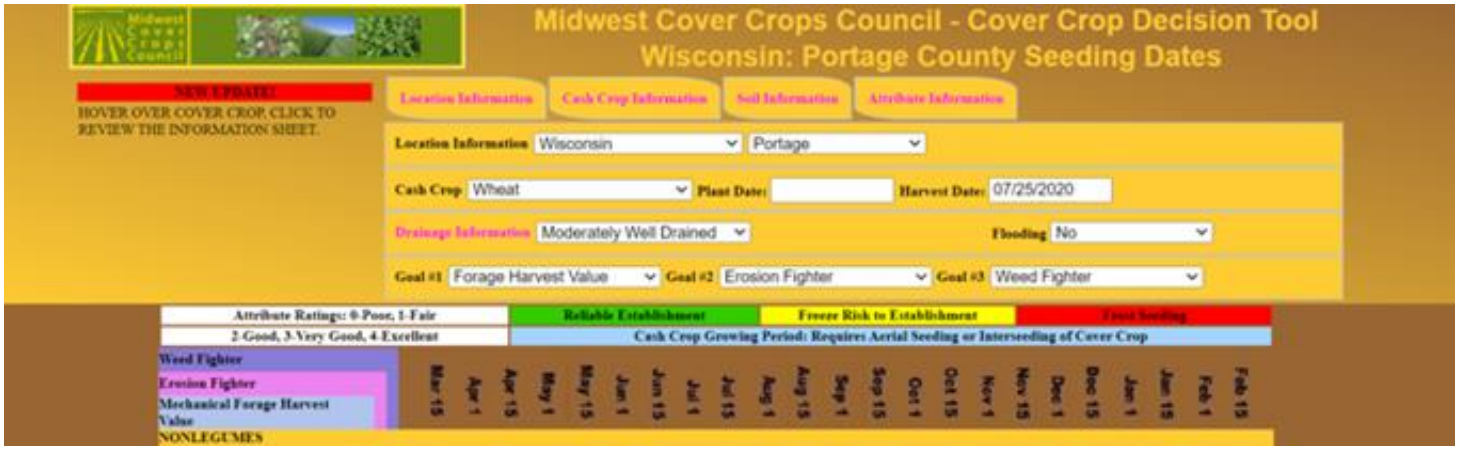
- Diversity in:
  - Root architecture
  - Plant exudates
  - Temporal growth
  - C:N ratios

- Grasses
  - Cereal grains
  - Grasses
- Legumes
  - Clovers
  - Vetch
  - Peas/beans
- Broadleaves
  - Brassica
  - Sunflowers

Get the Basics Right…

Use Your Resources

- Extension
- Demo Farms/Farmer-led Watersheds
- Agronomists
- Co-op/Seed Representatives
- Midwest Cover Crop Council
  - http://mccc.msu.edu/covercroptool/covercroptool.php



Cover Crop Seeding Methods

After Small Grains

Photo: Ted Bay

Seed as Soon as Possible

Watch Seeding Depth!

Photo: Ted Bay

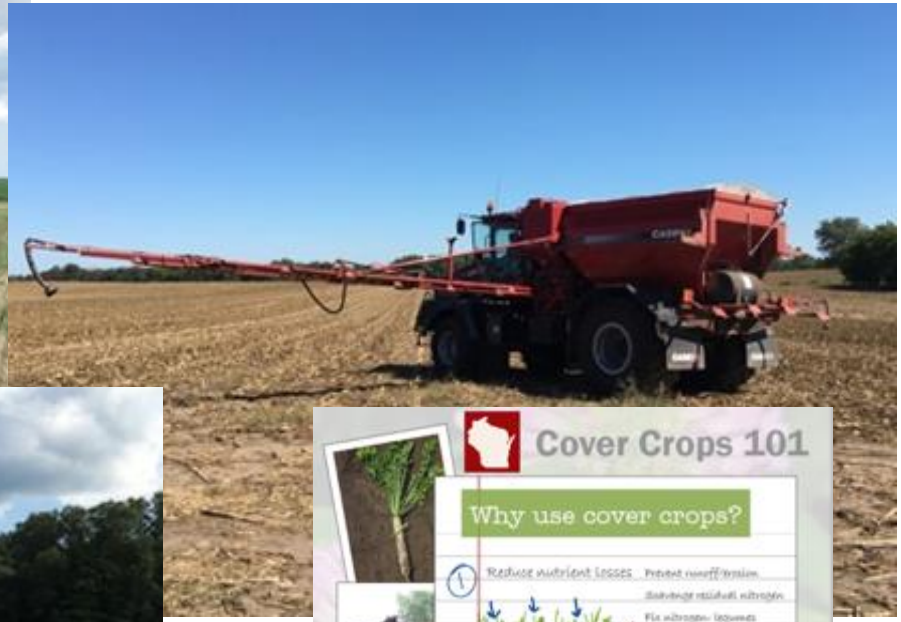
A Month After Seeding

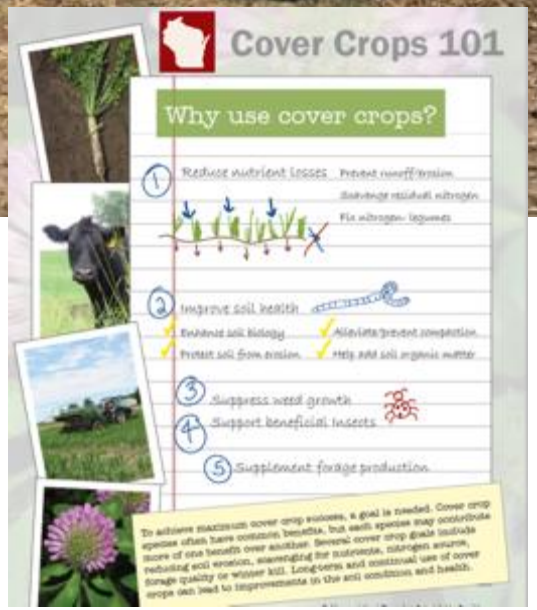
Volunteer wheat control may be desired (alternative: use volunteer wheat as part of cover crop mix). However, we do not recommend waiting for volunteer wheat emergence and termination to seed a cover crop.

Volunteer wheat may be a challenge!

A Few More Considerations

Seeding, Tillage, Manure





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A Few More Considerations

Herbicide Persistence/Carryover

- **May result in cover crop damage and stand failure**
- **Can be avoid by careful selection of herbicides**

Influence Factors

- Chemical properties of the herbicide
- Rate of application
- Soil pH
- Organic matter content
- Amount of surface plant residue
- Temperature
- Rainfall
- Microbial degradation


Herbicide Rotational Restrictions for Cover and Forage Cropping Systems

Herbicide Carryover

Cover Crop vs. Forage Crop

Nontreated

Example of herbicide carryover

Citation: Walsh, Joseph D., Michael S. Defelice, and Barry D. Sims. "Soybean (*Glycine Max*) Herbicide Carryover to Grain and Fiber Crops." *Weed Technology* 7 (1993): 625-32

A Few More Considerations

Termination

		Winterkill	Crimping	Mowing	Tillage	Herbicide
Brassica	Canola/Radish	Maybe	No	No	Yes	Glyphosate
Legume	Red Clover	No	No	No	?	Glyphosate + dicamba or 2,4-D
	Crimson Clover	Maybe	No	No	Yes*	
	Berseem Clover	Yes	No	No	Yes*	
	Winter Pea	Maybe	No	Yes	Yes*	
	Sweet Clover	Maybe	No	No	?	
	Hairy Vetch	No	Yes	No	Yes*	
Grasses/ Small Grains	Annual Ryegrass	Maybe	No	No	Yes*	Glyphosate 4.5 lb ae per gal, 16-32 fl oz per acre
	Spring Barley	Yes	No	Yes	Yes	
	Winter Wheat	No	Yes	Yes	Yes*	
	Winter Rye	No	Yes	Yes	Yes*	

Tillage Note- May require multiple passes and tillage should fully incorporate cover crop to prevent regrowth.

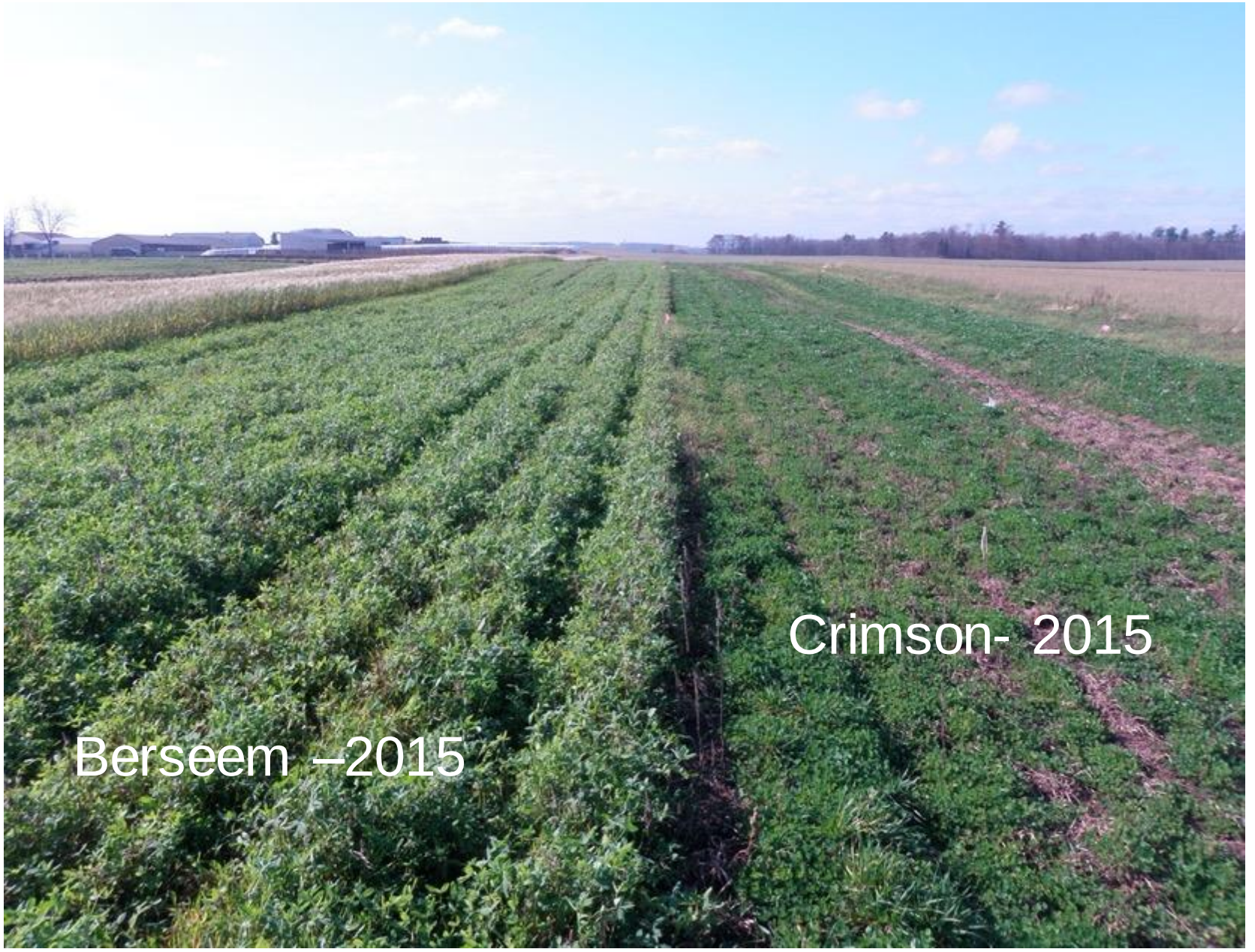
The Power of Legumes After Short Season Crops

Mike Ballweg
University of Wisconsin – Madison, Division of Extension, Crops and Soils Educator Sheboygan County

Matt Ruark
University of Wisconsin – Madison Soil Science Department

Berseem, Crimson Clovers, Barley & No Cover Crop
3 year study – Sheboygan County

- **Soil – Kewaunee Silt Loam**
- **Planting Dates: August 12 - 15, 2014, 2015, 2016**
  - **Berseem clover – (10 – 12) lbs./ac**
  - **Crimson clover - (10 -12) lbs./ac**
  - **Barley - 60 lbs./ac**
- **Sethoxydim application to clover and no cover treatments**
- **Biomass harvesting – early November all years (after a hard freeze - end of growth)**
- **Nitrogen fertilizer, broadcast urea with Agrotain®**
  8 N rates (0, 40, 80, 120, 160, 200, 240, 280 lbs./ac
- **Solid stands to help understand the contribution to cropping system**



Crimson- 2015

Berseem –2015

Crimson Clover

Crimson Clover—Spring Residue


Berseem Cover Crop
Mike Ballweg
UWEX - Sheboygan County
November 9, 2016

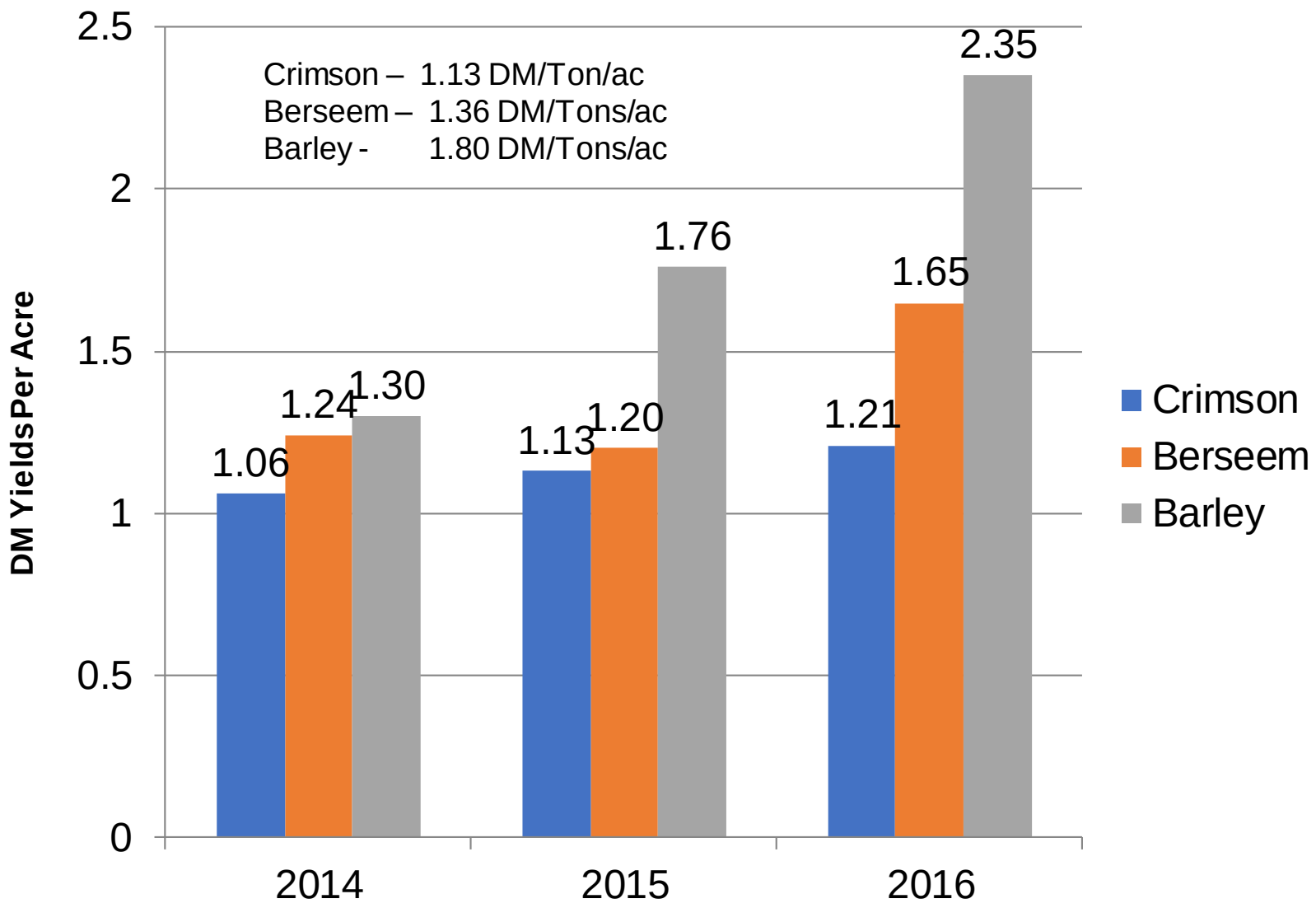

Berseem Cover Residue
Mike Ballweg
UW/EX - Sheboygan County
April 12, 2012


November 5, 2015


Barley Residue
Mike Ballweg
UWEX - Sheboygan County
April 12, 2017


Barley Crop Residue
No Cover Crop
April 30, 2015

Cover Crop DM Yields After Wheat




Berseem Clover
81 lbs -N/ac in AGB
C:N 11


Crimson Clover
70 lbs-N/ac in AGB
C:N 13

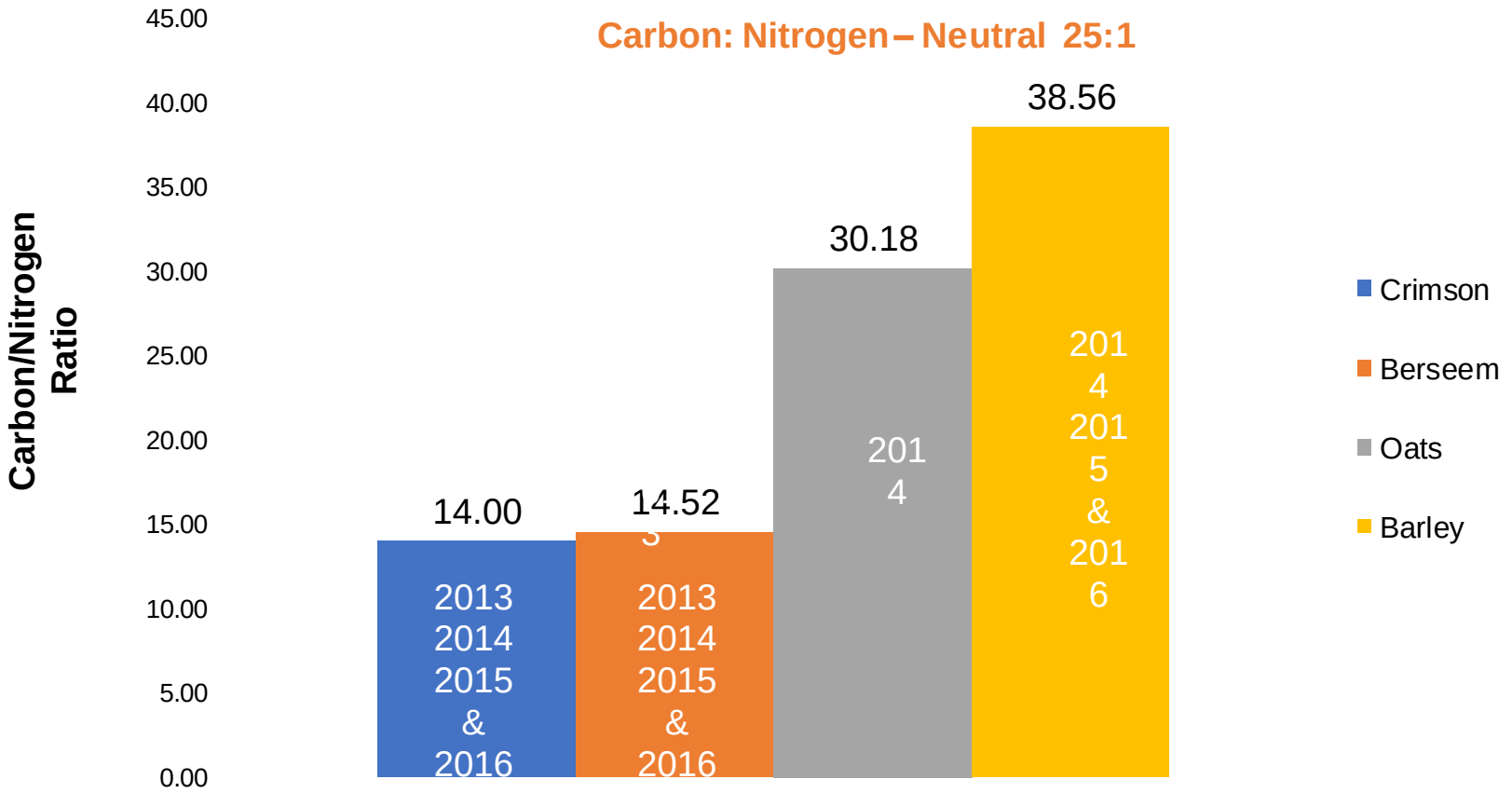
Barley Cover Crop

Barley
40 lbs – N/ac in AGB
C:N 35

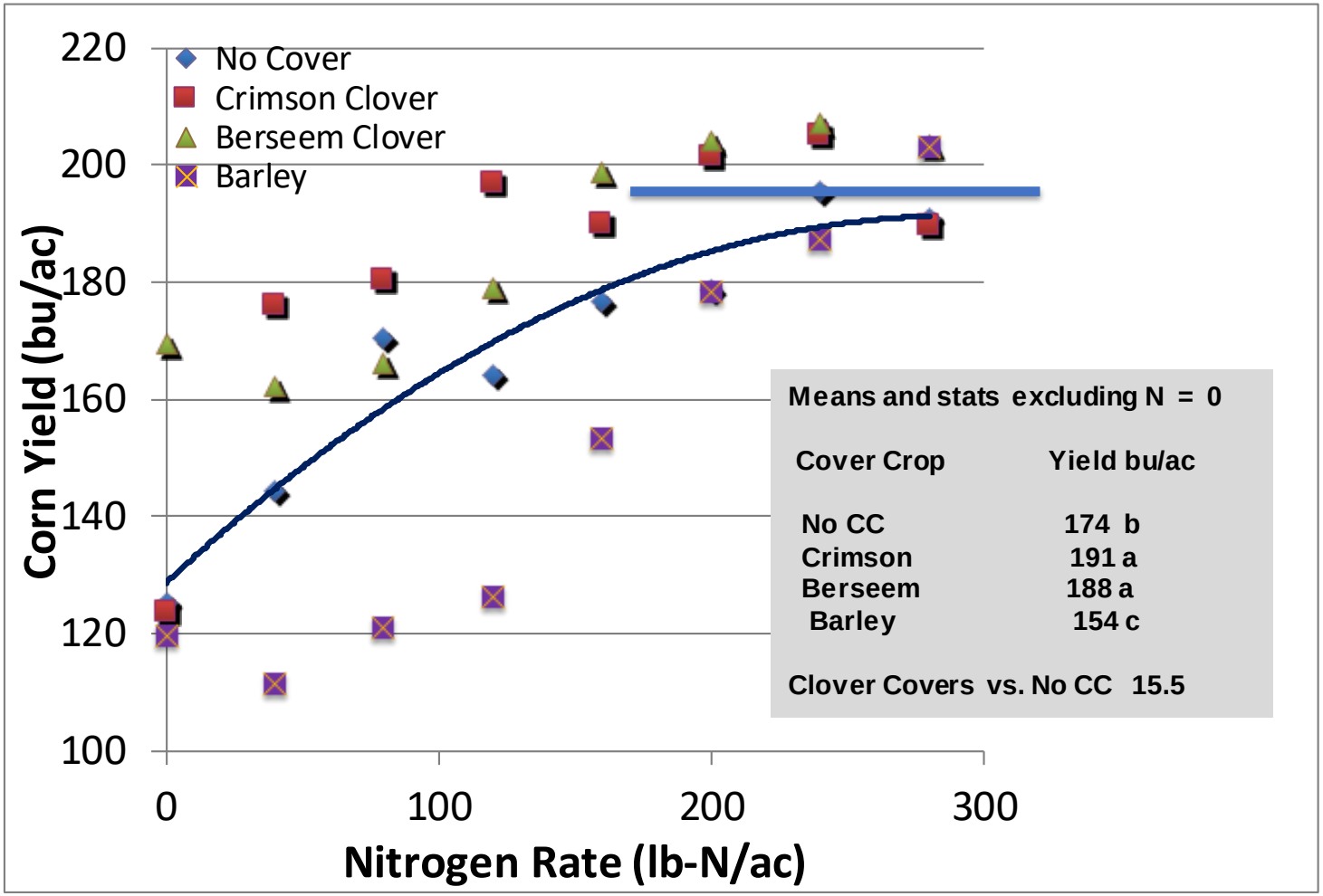
Mike Ballweg
UWEX - Sheboygan County
November 9, 2016

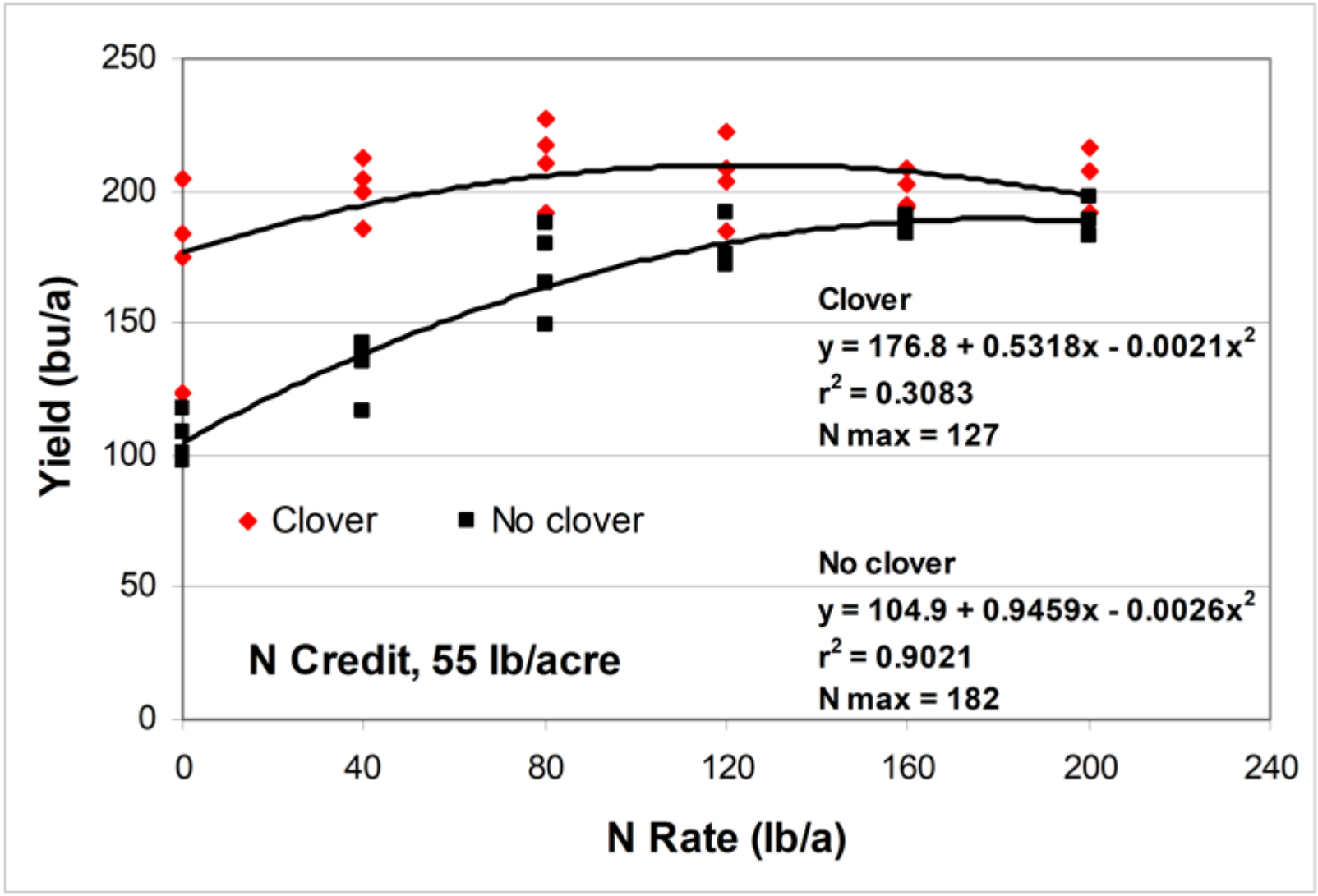
Carbon/Nitrogen Ratio

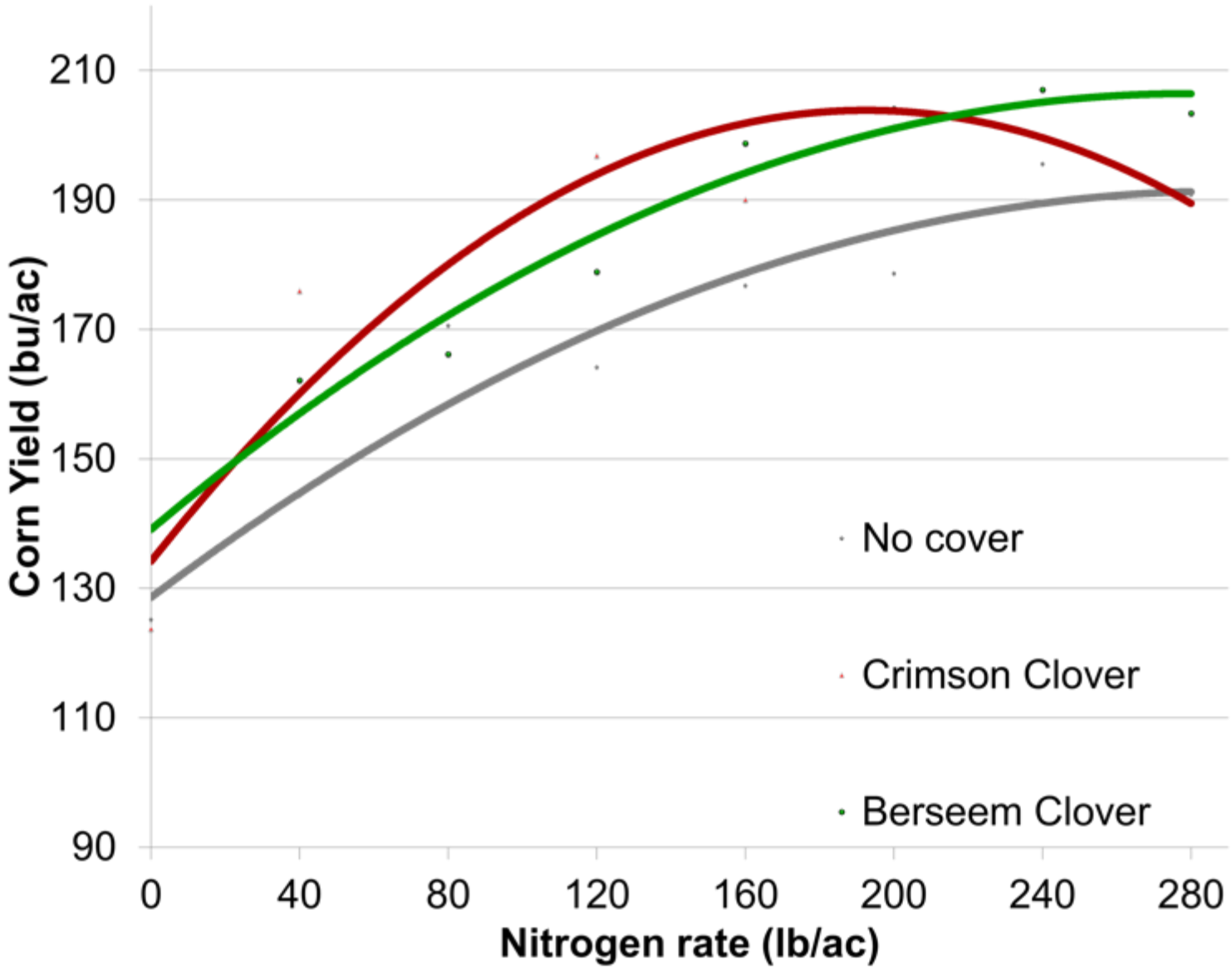
November Biomass Harvest

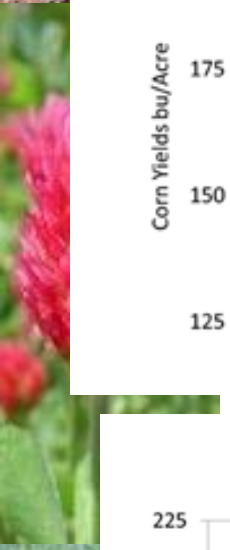


Both crimson and berseem clovers provide yield benefits -2015 - Sheboygan County

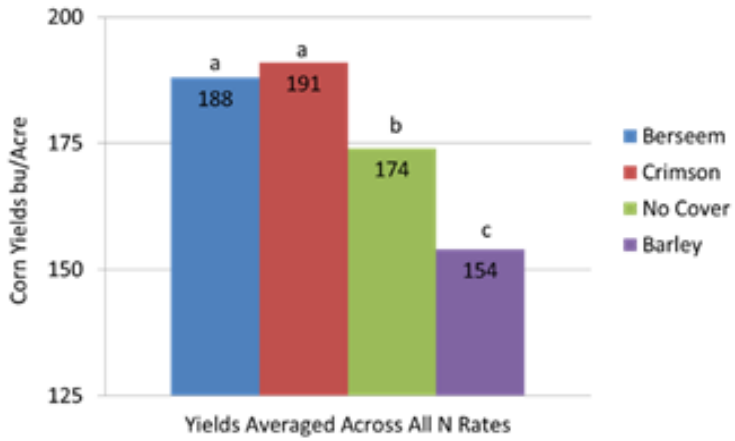



250
200
150
100
50
0
Yield (bu/a)
0
40
80
120
160
200
240
N Rate (lb/a)
Clover
No clover
N Credit, 55 lb/acre
Clover
y = 176.8 + 0.5318x - 0.0021x2
r2 = 0.3083
N max = 127
No clover
y = 104.9 + 0.9459x - 0.0026x2
r2 = 0.9021
N max = 182

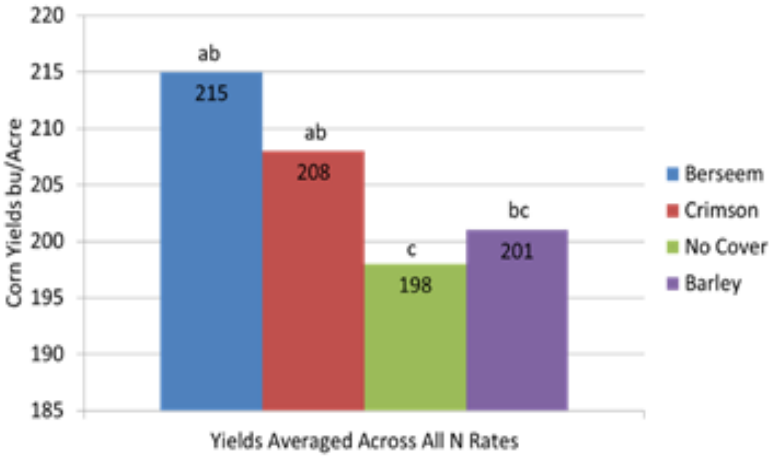

Corn Yield (bu/ac)
210
190
170
150
130
110
90
0
40
80
120
160
200
240
280
Nitrogen rate (lb/ac)
No cover
Crimson Clover
Berseem Clover



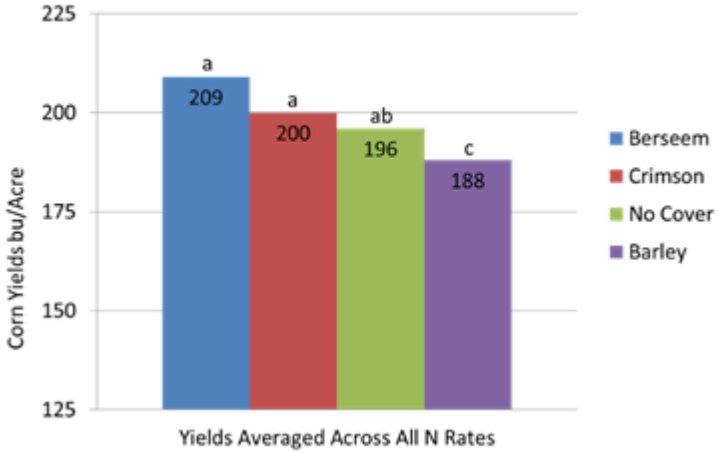
2015 Corn Yields Following Covers



2016 Corn Yields Following Covers



2017 Corn Yields Following Covers



2015 corn yields showed an increase of 9% (15.5 bu./ac) when following Berseem and Crimson Clovers compared to no-cover crop

2016 showed a very similar yield trend with a 7% (13.4 bu./ac) increase when corn followed clovers as compared to no cover crop.

The 2017 yield advantage when corn followed clovers was 4.3% (9 bu/ac) when compared to not covers.

Berseem, Crimson, Barley Mix

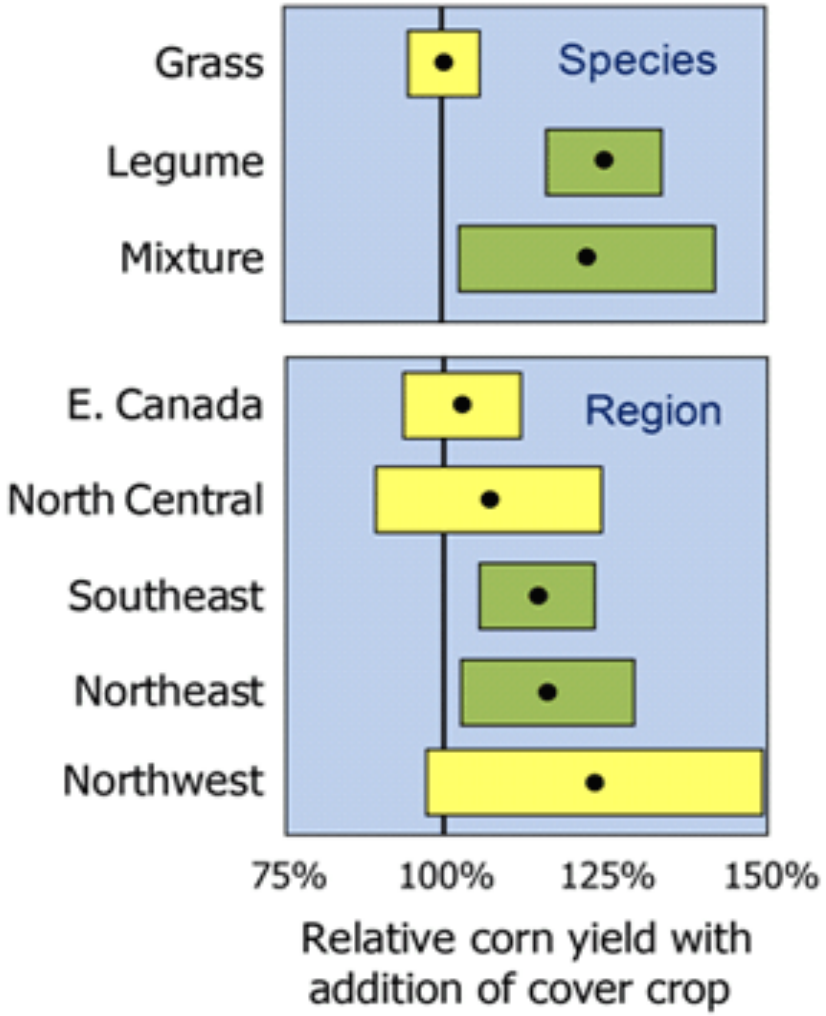
Berseem: 4 lb /ac
Crimson: 4 lb/ac
Barley: 40 lb/ac

Planted 8/15/2014
DM on 11/12: 1.6 ton/ac

Berseem and Crimson Mix

Berseem: 6 lb/ac
Crimson: 6 lb/ac

Planted 8/15/2014
DM on 11/12: 1.4 ton/ac



Corn yield response to winter cover crops based on cover crop species and region. Miguez and Bollero (2005). Results adapted by: Heggenstaller, DuPont Pioneer



In Summary - Things to consider

- Corn following annual clovers yielded 10 – 15 bu/ac (6.8%) more than no cover crop…rotational benefits.
  - studies show ~ a 10% yield increase when corn follows alfalfa due to rotational benefits
- Corn yields following barley were lower yielding 2 of 3 years. N immobilization
- Greater amounts of carbon (biomass) may result in immobilization of N thus requiring additional N for optimal yields.
- N immobilization (following barley) may have been lessen if no-tilled into the barley residue….no data


Remember
the
Inoculant

Thank You

Acknowledgments

- Matt Ruark, UW-Madison, Soil Science Department
- Jamie West, Research Specialist, UW-Madison Soil Science Department
- Richard Proost, UW-Madison, NPM
- Many UW-Madison students

Summer Planted Spring Cereal Grains for Fall Cover and Forage

NPM

Extension
UNIVERSITY OF WISCONSIN-MADISON

Kevin Shelley

University of Wisconsin – Madison, Nutrient and Pest Management Program

Summer Planted Spring Cereal Grains for Fall Cover and Forage

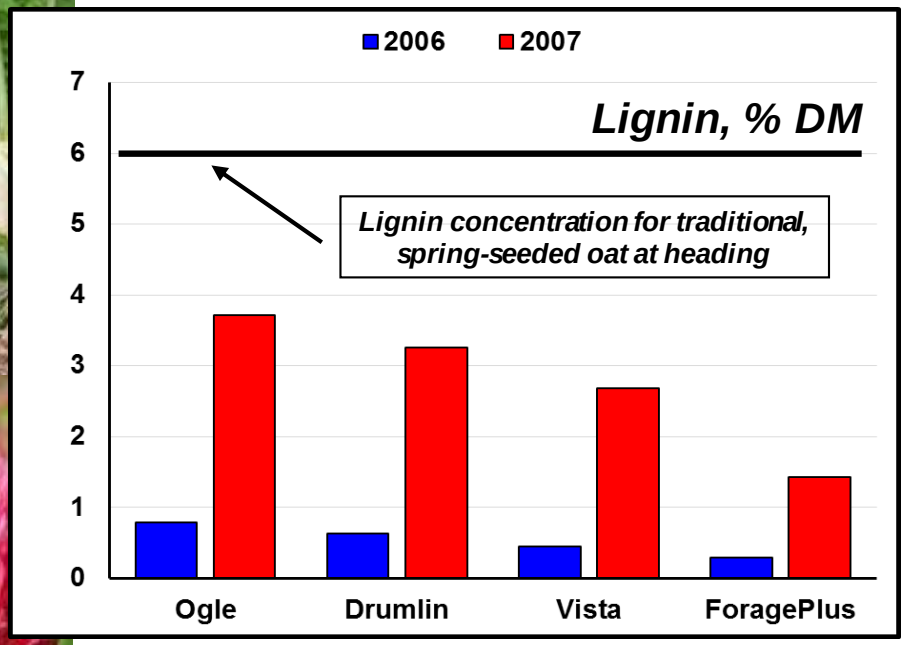
- Winter cereal grains (rye, wheat, triticale)
  - Winter hardy with rapid spring growth
  - Vernalization required for stem elongation
- Spring grains yield more for fall harvest
  - Stem elongation occurs
  - Growth continues well into October
  - But they will not over-winter
- Forage yields (biomass) highest in WI forage trials = oats or barley
  - 1.5 to 3.0 TDM per-acre biomass/forage yield

Spring planted cereal grains

Table 2. Average forage quality values for oats harvested at different maturity stages.

Harvest Stage	Crude Protein	NDF
Boot	16-18	52-54
Heading	14-16	56-58
Milk	12-14	59-61
Dough	10-12	59-61

- Fast early-season growth through vegetative stages
- Long-day photoperiod induces flowering
- Yield and nutritional quality optimized at "boot stage," after which there is rapid:
  - Decrease in protein, energy and digestible fiber
  - Increase in un-digestible fiber
  - Increase in yield (of lower quality forage)
- Harvest window = narrow



Source: Coblentz, Wayne, USDA ARS Dairy Forage Research Center

Summer planted spring cereal grains

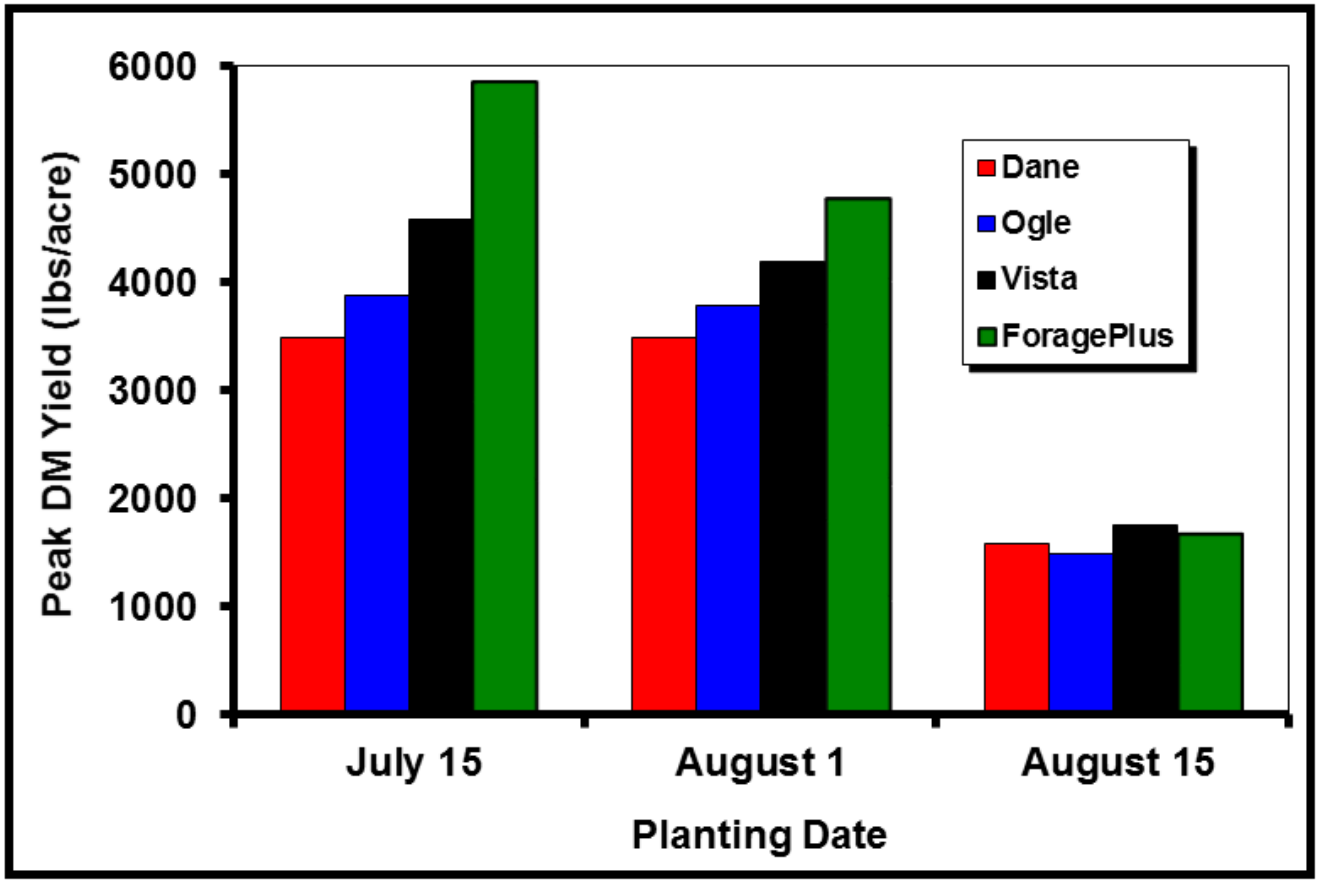
- Slower growth through vegetative stages
- Long-day requirement for flowering disrupted
- Cereals undergo hardening process as winter approaches
  - Cellular accumulation of sugars
  - More stable concentrations of fiber (NDF) and energy (TDN)
- Wider harvest window

- Seed oats at 2.5 to 3 bu/acre (80 – 100 lbs/acre)
  - $25 - $45 per-acre seed cost
- Drill 1-2” deep or broadcast and lightly till-in.
- Requires **40-60 lbs N**, 20 lbs P_2O_5, 90 lbs K_2O
  - $25 - $35 per acre fertilizer N cost, or
  - Manure application 5000-7000 gal or 25 tons per-acre

Summer planted spring cereal grains



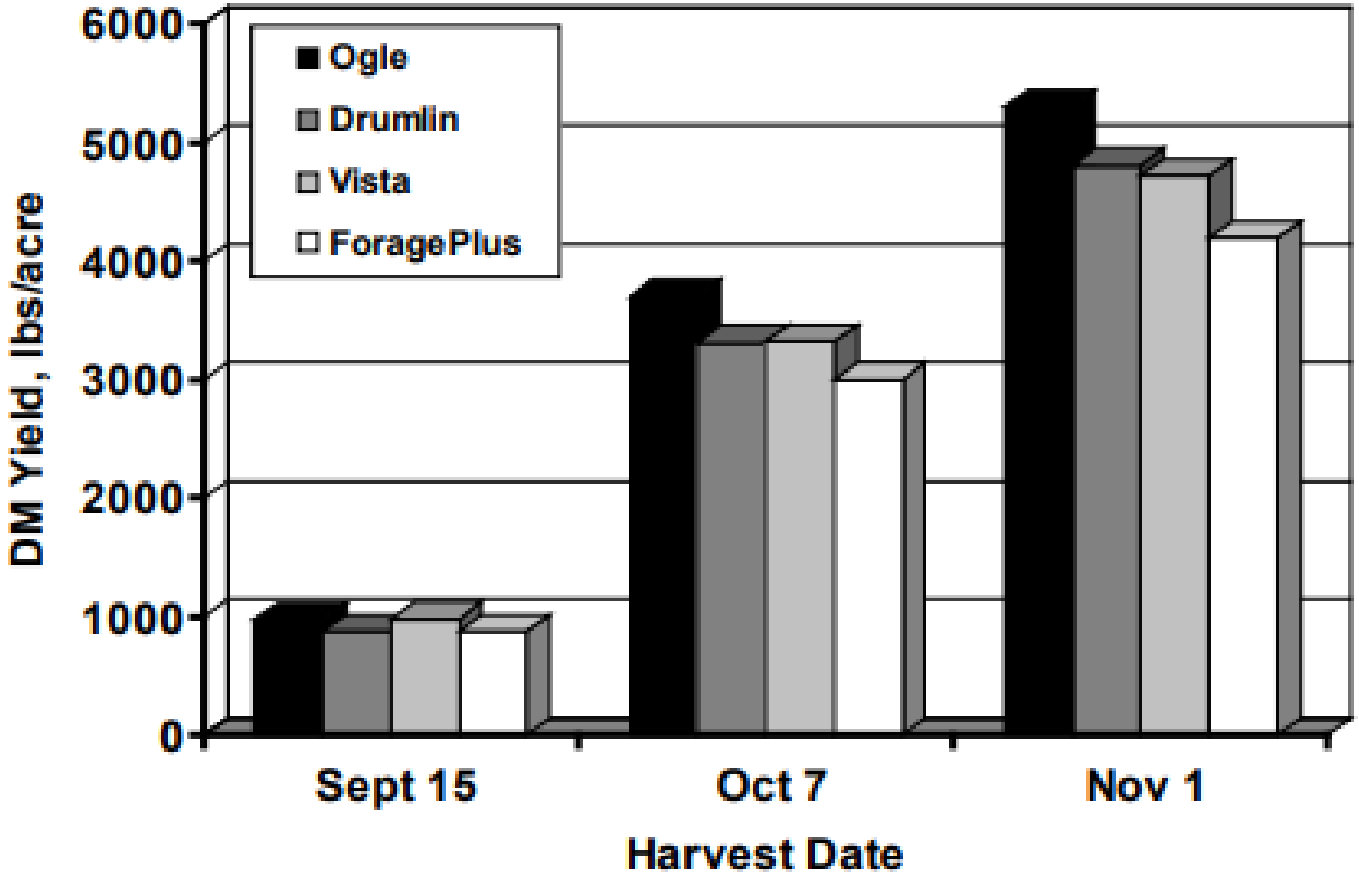
Effect of planting date and variety on yield of fall-grown oat (Marshfield, WI; 2007-2009)



Source: Coblentz, Wayne, USDA ARS Dairy Forage Research Center

Oat cultivar yields from mid-August planting: 2-year means at Prairie du Sac, WI

Coblentz, Wayne and Mike Bertram, 2012. Fall grown oat forages: Cultivars, planting dates and expected yields.



Variety according to planting date

- Objective: maximize forage/biomass yield, but not heading
- Central WI
  - July 20 to August 5 - late maturing or forage-type varieties.
  - August 5 to 15 – plant earlier maturing grain-type varieties



Fall forage oats – enterprise budgets

Yield TDM/acre	1.5[a]	2.0[a]	2.5[b]	3.0[b]
Value $/TDM	120	120	130	130
Value ($/acre)	**180**	**240**	**325**	**390**
Seed (100 lbs)	28	28	42	42
Planting	20	20	20	20
Nutrient inputs	52	56	60	64
Harvest[c]	70	89	108	127
Interest, pre-feeding[d]	3.39	3.85	4.59	5.05
Cost ($/acre)	**173**	**196**	**234**	**258**
Return $/acre	**7.11**	**43.65**	**90.91**	**132.45**

[a] Mid-maturity, grain type variety
[B] Late maturity, forage type variety
[c] Mowing =$12.50/acre + $38/TDM chopping, hauling bagging
[d] 4% annual operating for 6 mos.



Resources / References

- Ballweg, Michael, 2018. Berseem and Crimson Clovers after Winter Wheat. Cover Crops in Wisconsin – Nutrient Management Research. https://fyi.extension.wisc.edu/covercrop/files/2018/10/WICC-Berseem-and-Crimson-Clovers-After-Winter-Wheat.pdf
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- UW-Nutrient and Pest Management Program Cover Crop Resources https://ipcm.wisc.edu/covercrops/