COVER CROPS AND NUTRIENT CYCLING

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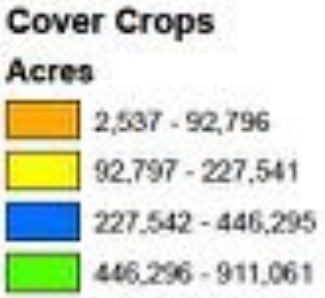
- Megan Chawner – UW Discovery Farms
- Wisconsin Fertilizer Research Council
- SARE
- UWEX
- Wisconsin Farmers

OUTLINE

- Cover crop use in the US
- The long-term benefits of cover cropping
- The short-term benefits of cover cropping

406,000 ac of cover crop in MN (6th)

553,000 ac of cover crop in WI (3rd)



Data Source: NASS 2012 Ag Census Data

INDIANA
STATE DEPARTMENT OF AGRICULTURE

May 2, 2014
Deb Fairhurst, ISDA Program Manager

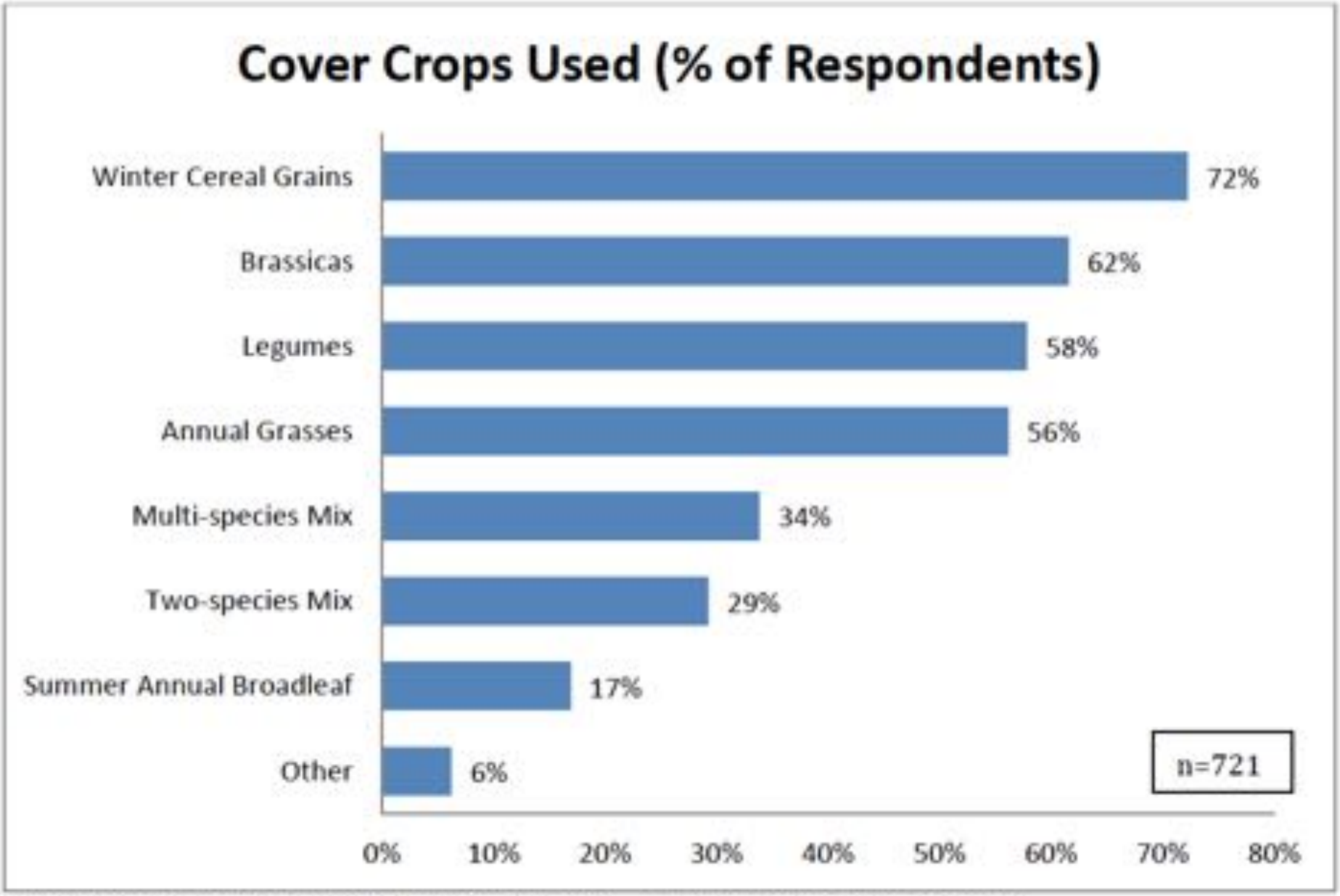


Figure 8. Cover crop species used by survey - percentage of respondents

WHAT DO WE WANT COVER CROPS TO DO?

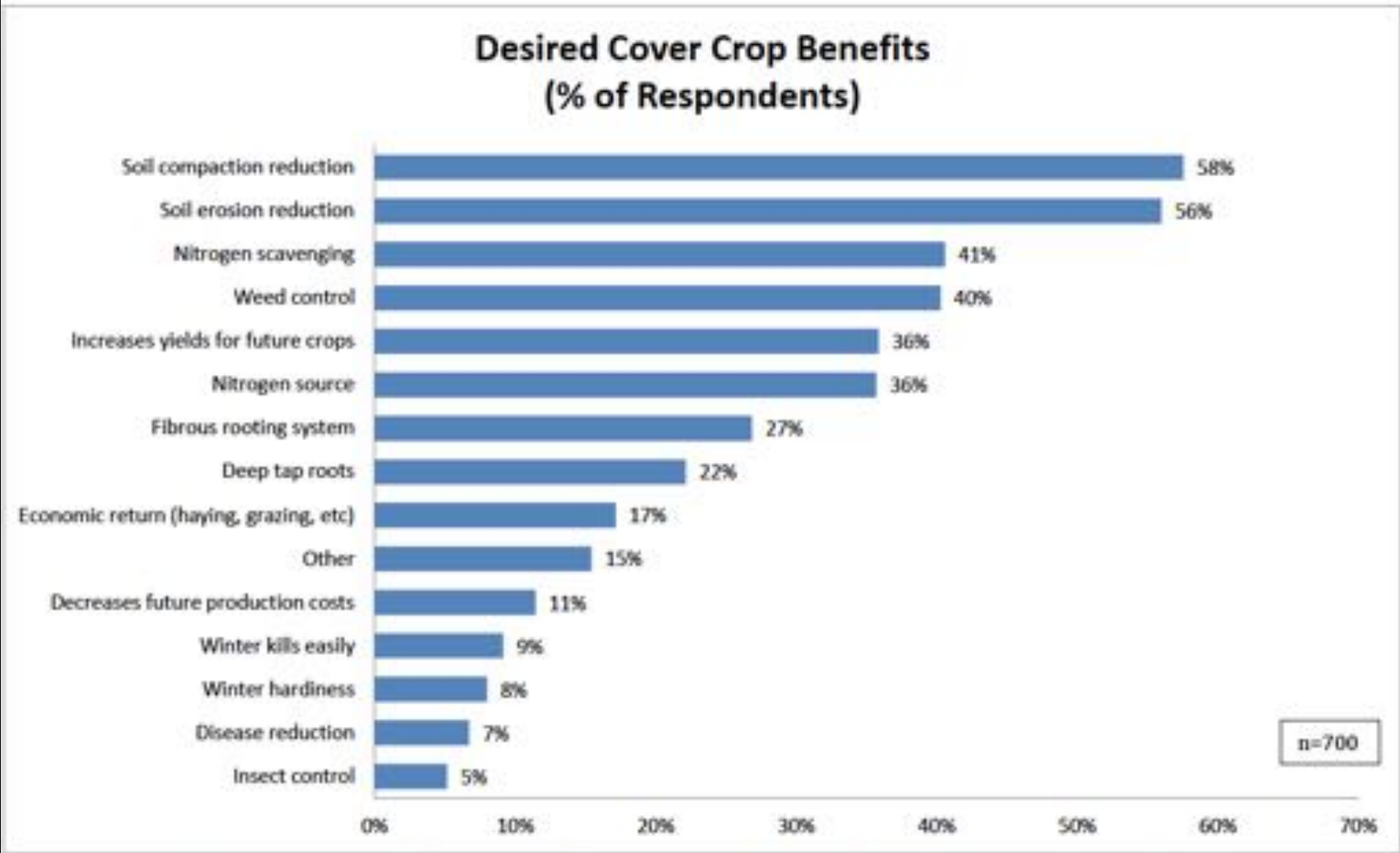
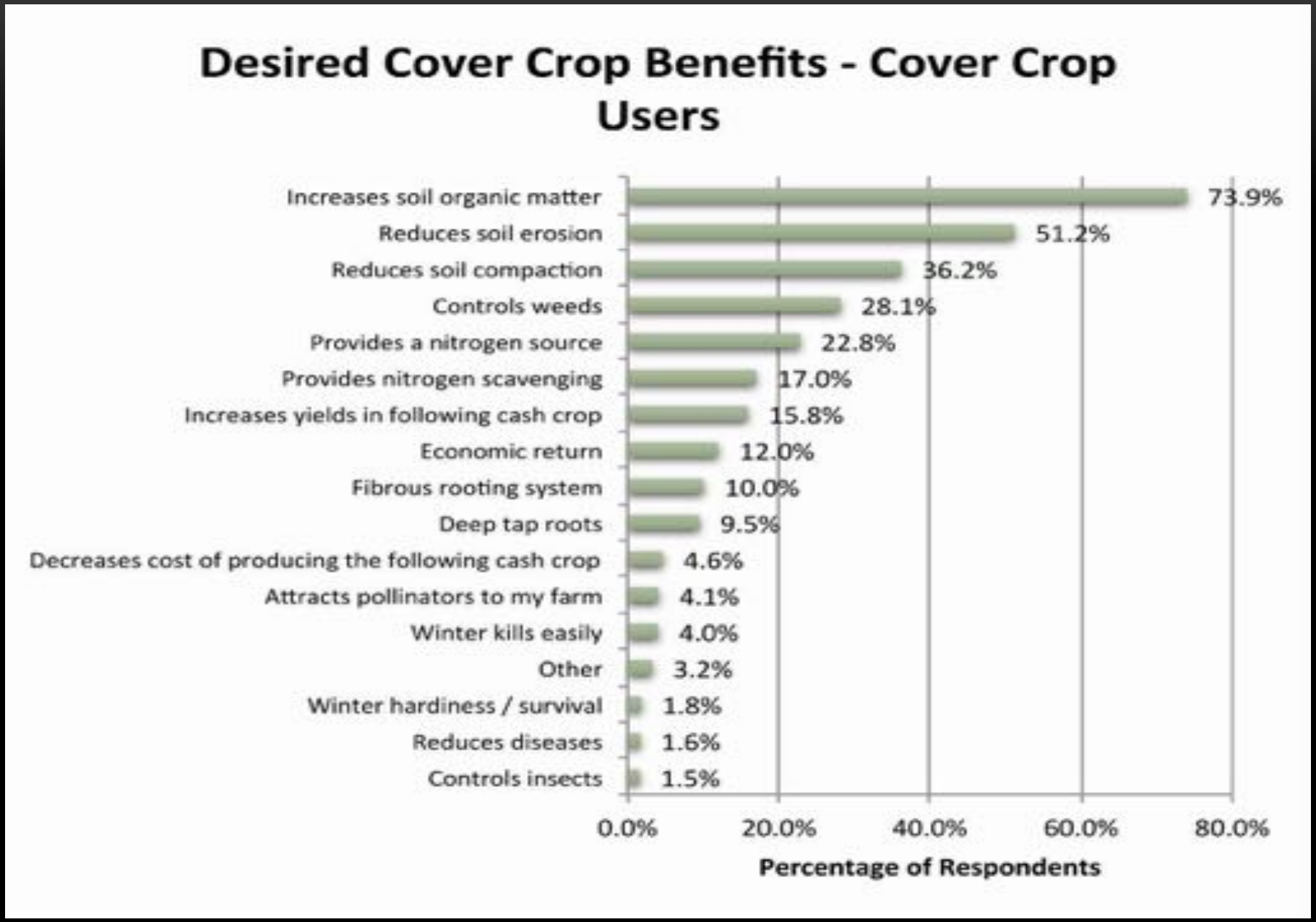


Figure 18. Cover crop benefits desired by cover crop survey respondents (percentage of respondents).

Source:
2013-2014 SARE/CTIC Cover Crop Survey



LONG-TERM BENEFITS

- Reduction in soil erosion
- Long-term improvement in the soil condition that leads to:
  - Increased yields
  - Reduction in N fertilizer need
  - Higher yields in years with environmental stresses

COVER CROPS AND SOIL LOSS

- Can use RUSLE2 to do simulations to evaluate the potential benefit of cover crops in reducing soil loss
- The magnitude of the reduction will be dependent on:
  - Crop rotation
  - Soil type
  - Tillage

COVER CROPS AND SOIL LOSS

- Edmund Clay Loam, 4% slope
- T = 2 ton/ac/yr
- Continuous corn silage rotation
- Cover crops (rye) drilled in October
- Cover crop (rye) aerially applied in September
- No-till vs. spring chisel

Tillage	Cover Crop	Soil Loss (ton/ac/yr
No-till	None	2.1
	Aerially-applied	0.1
	Drill-seeded	1.1
Chisel plow	None	5.4
	Aerially-applied	1.5
	Drill-seeded	2.2

MAKING COVER CROPS PAY (SHORT-TERM)

- Providing a nitrogen credit (green manure)
- Increasing subsequent crop yield (most likely corn)

Three types of cover crops have been evaluated in WI:

- Legumes (for the N credit)
- Grasses (for a yield bump)
- Radish (for an N credit or a yield bump)

GREEN MANURE & N CREDITS

Table 9.5. Green manure nitrogen (N) credits.

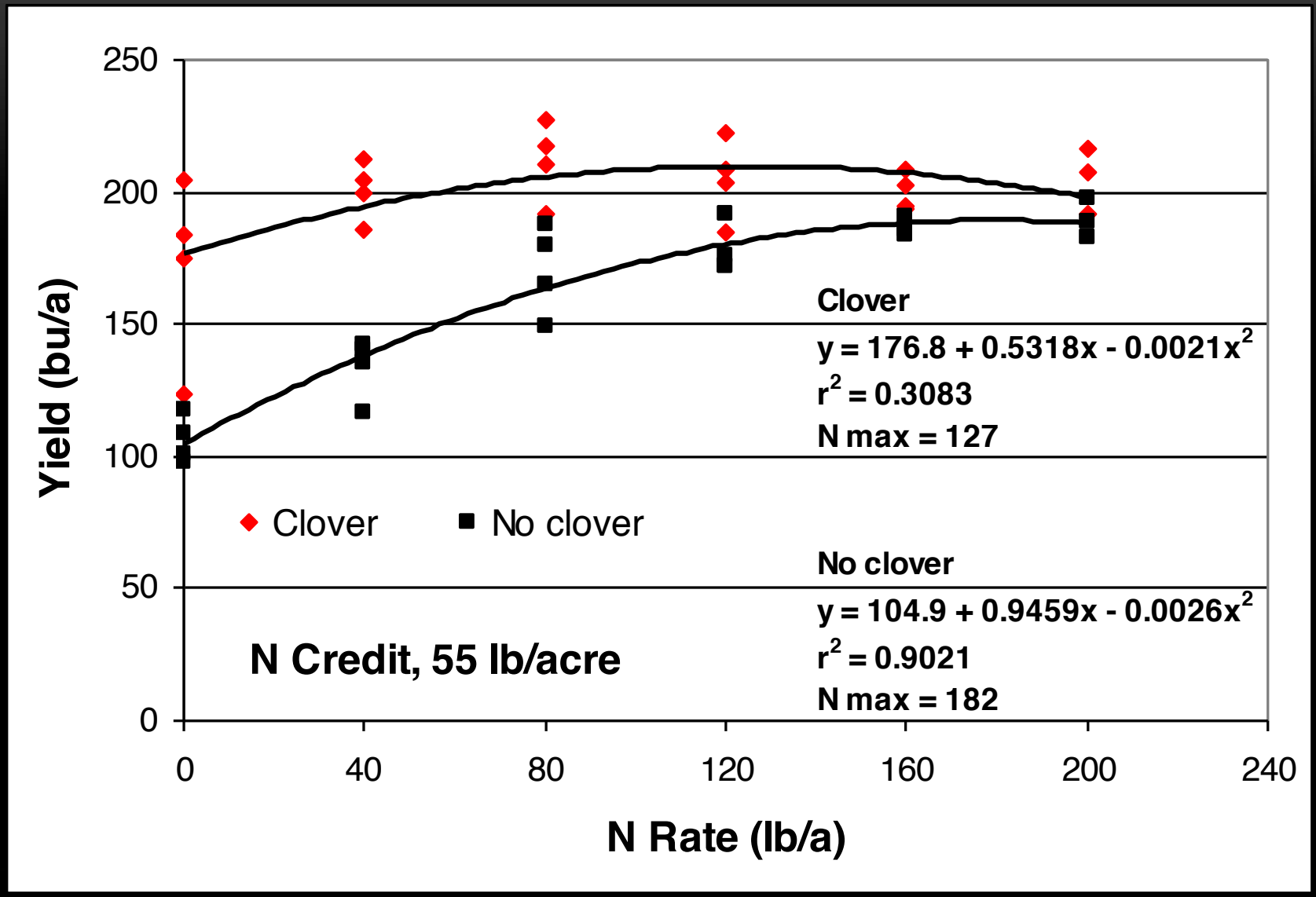
Crop	< 6" growth	> 6" growth
	lb N/a to credit	
Alfalfa	40	60–100[a]
Clover, red	40	50–80[a]
Clover, sweet	40	80–120[a]
Vetch	40	40–90[a,b]

[a] Use the upper end of the range for spring-seeded green manures that are plowed under the following spring. Use the lower end of the range for fall seedings.

[b] If top growth is more than 12 inches before tillage, credit 110–160 lb N/a.

OPTIONS FOR CLOVERS IN WINTER WHEAT

Corn response to nitrogen, Janesville 2010



Stute and Shelley, unpublished

UW Extension Cooperative Extension

Pictures taken October 1, 2013

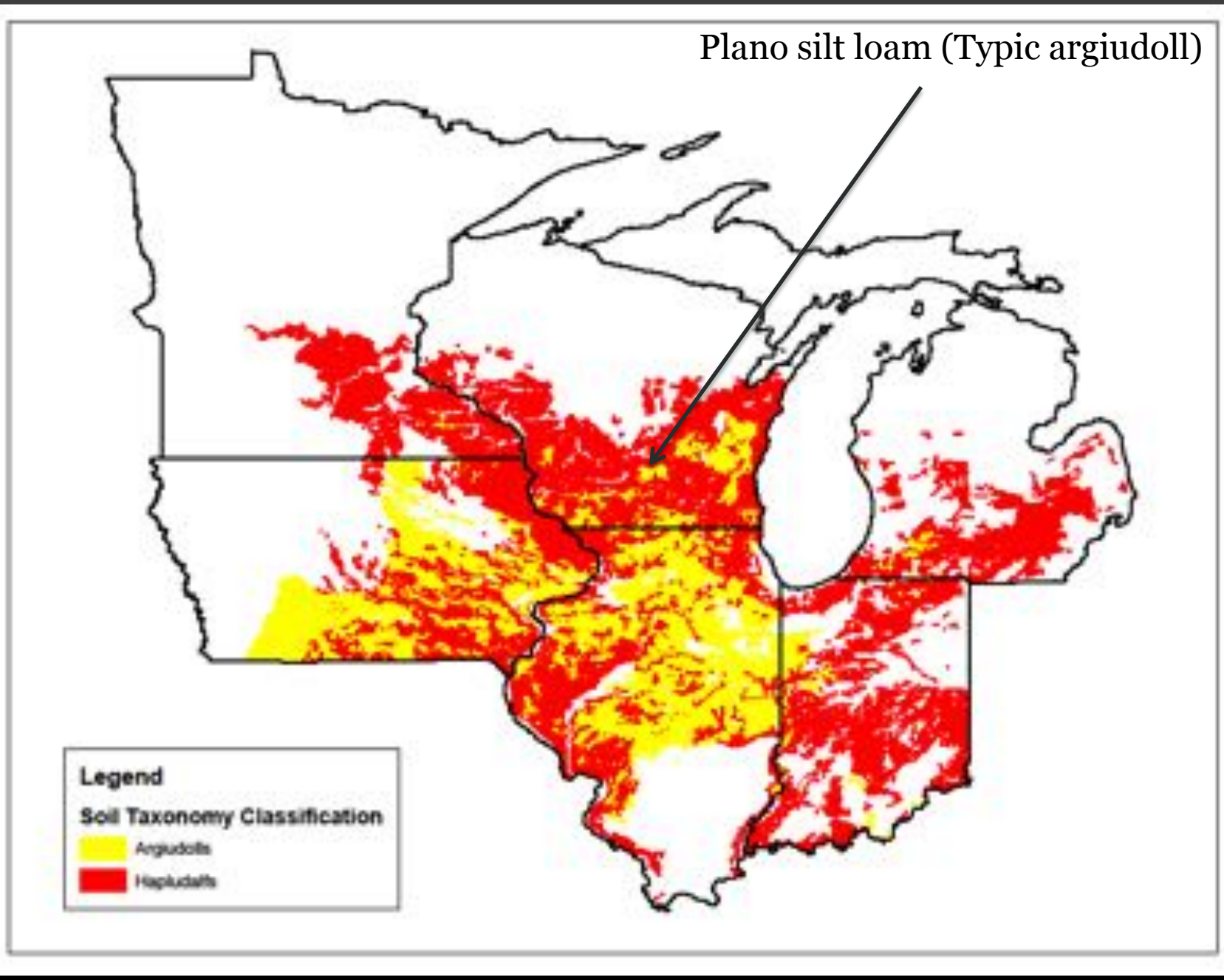
SUMMER SEEDED LEGUMES

Berseem

Crimson

GRASSES

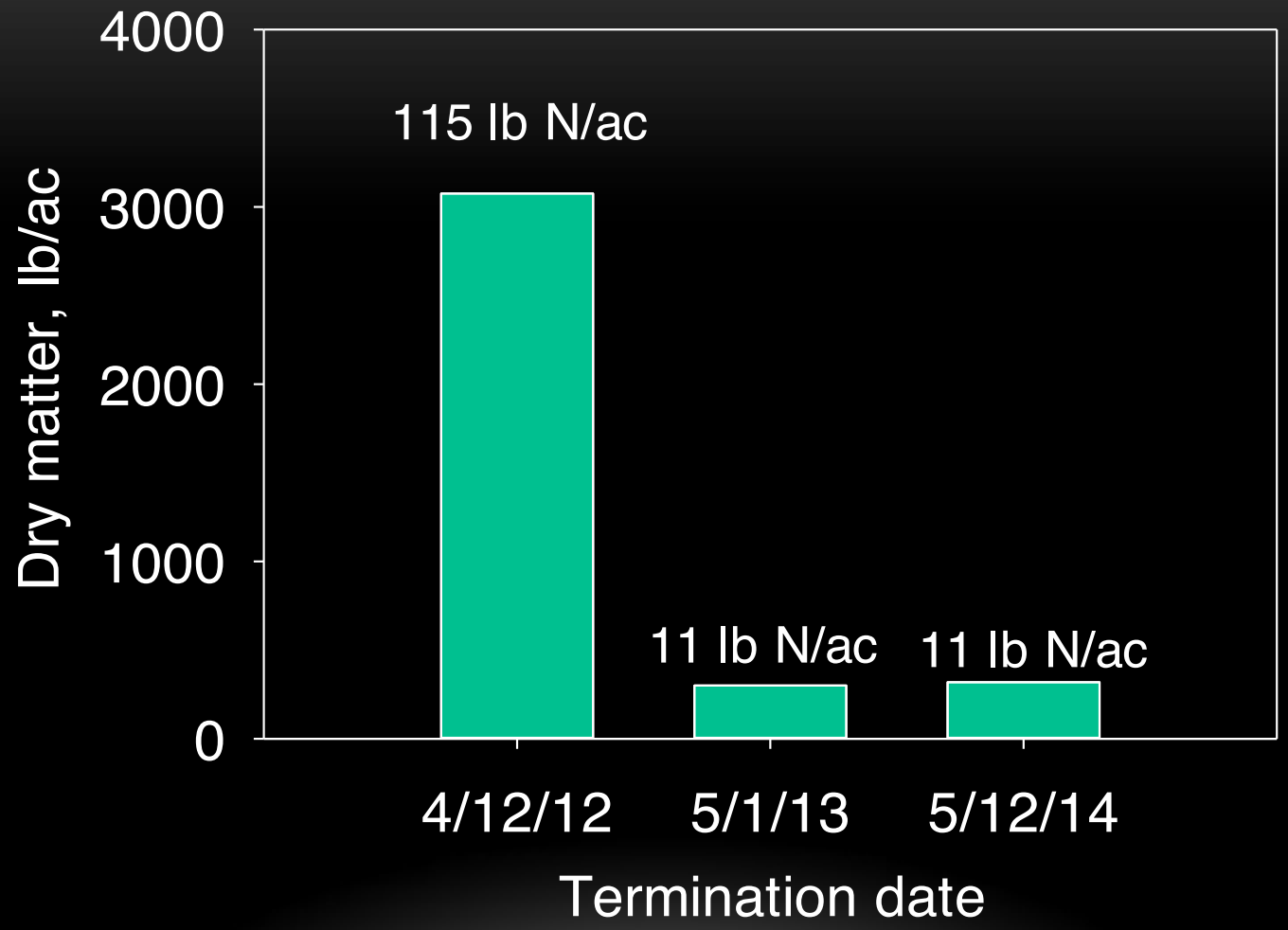
- Reduces soil erosion
- Reduces nitrate leaching
- Potential to use as a forage crop


Plano silt loam (Typic argiudoll)
Legend
Soil Taxonomy Classification
Argiudolls
Hapludalfs

STUDY DESIGN

- Continuous corn silage w/ fall manure application (10,000 gal/ac of liquid dairy manure)
- Fall-planted winter rye (90 lb live seed/ac)
  1) No cover crop
  2) Winter rye as a cover crop
  3) Winter rye as a forage crop (ryelage)

RYE COVER CROP ABOVEGROUND BIOMASS



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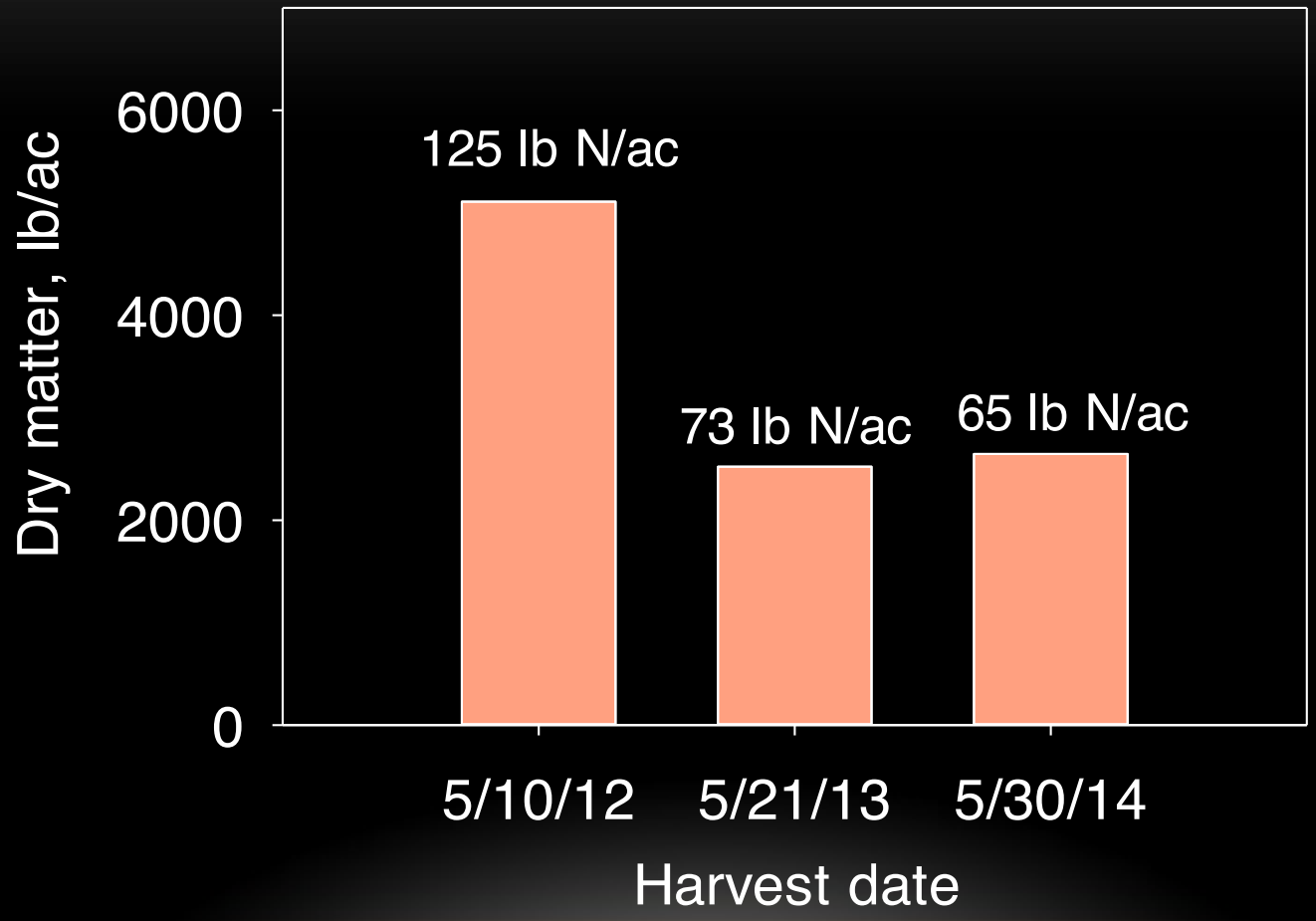
RYELAGE ABOVEGROUND BIOMASS



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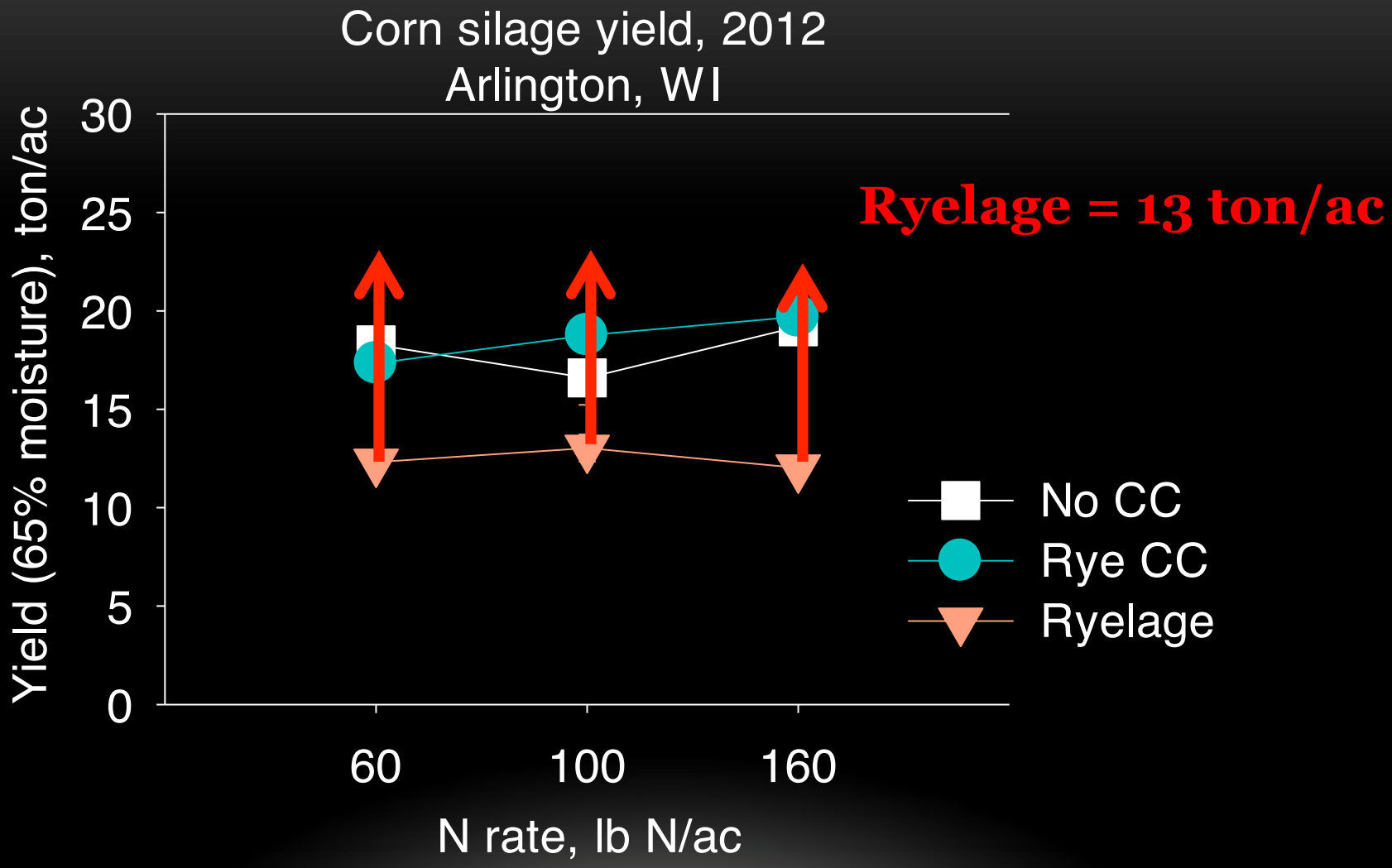
RESULTS



Ryelage = 13 ton/ac

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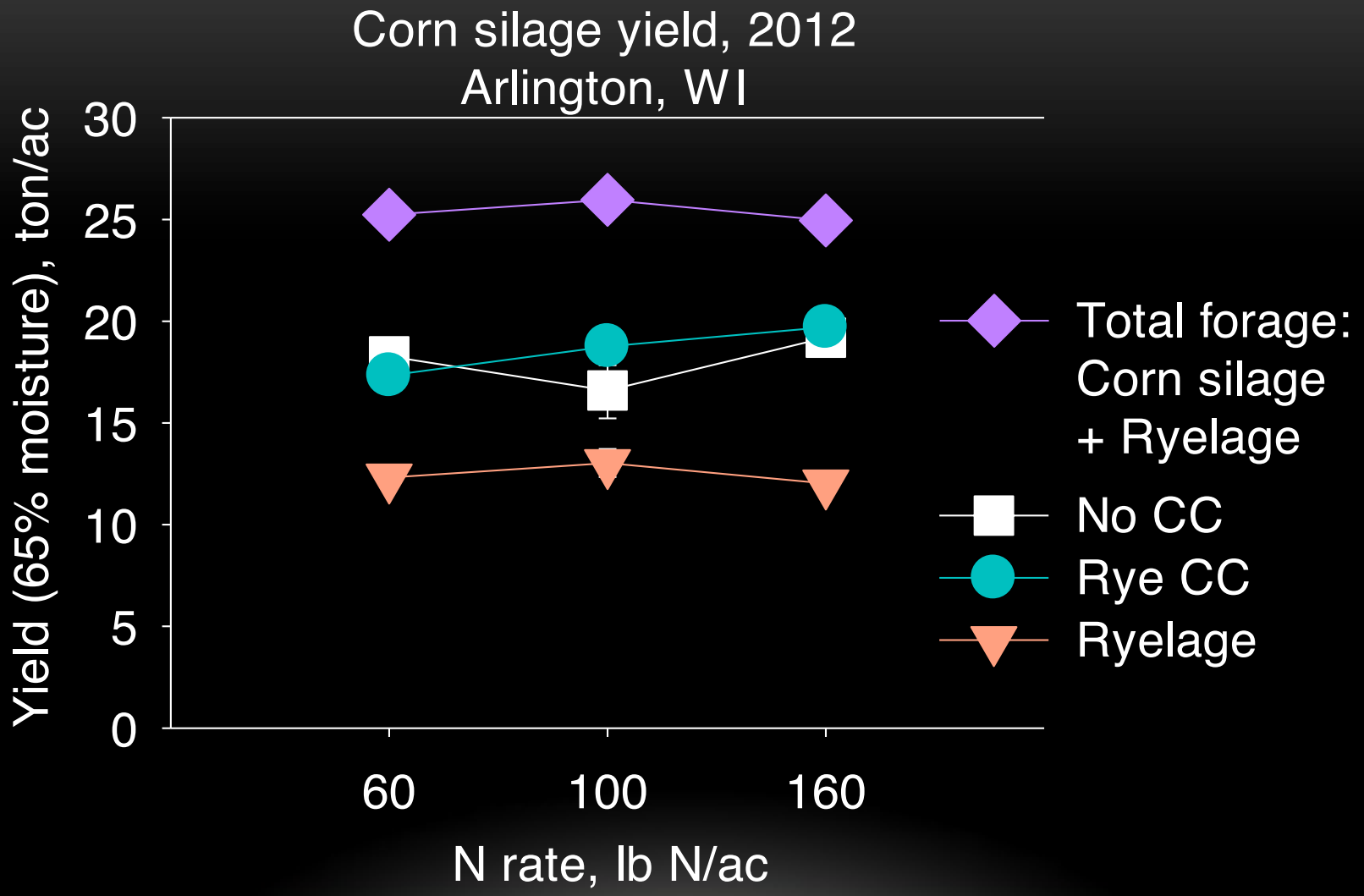
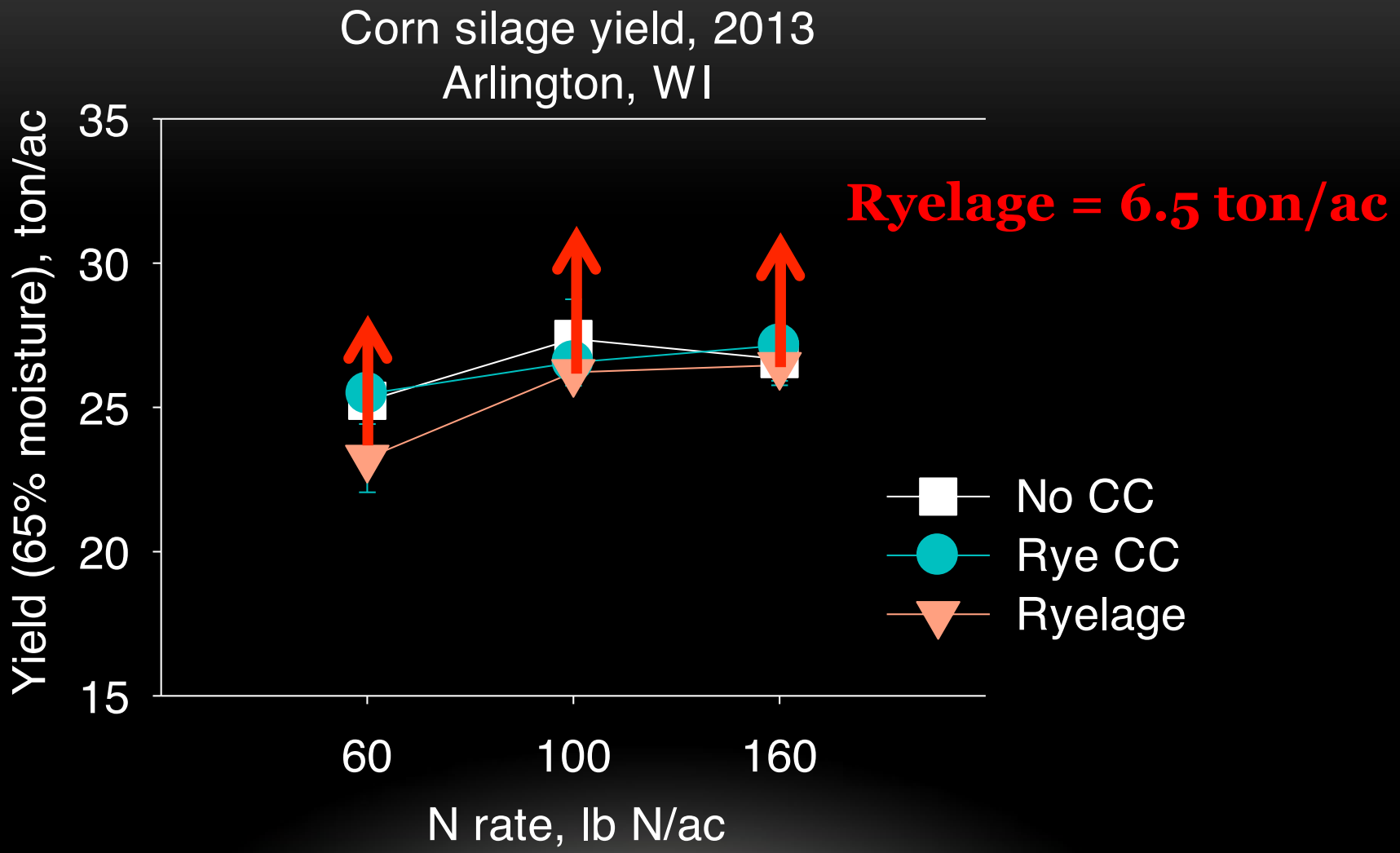
RESULTS



RESULTS



Ryelage = 6.5 ton/ac

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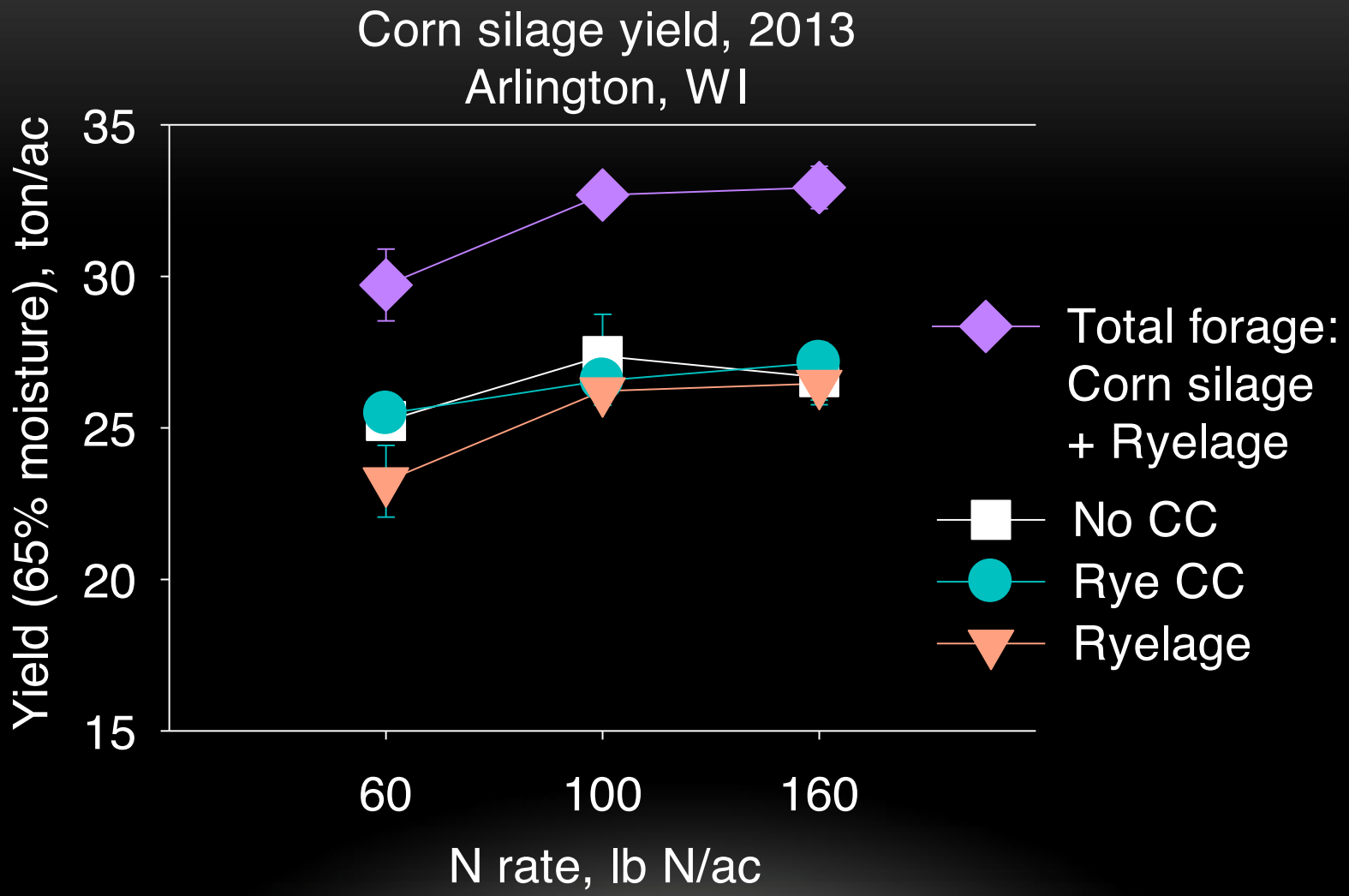
RESULTS



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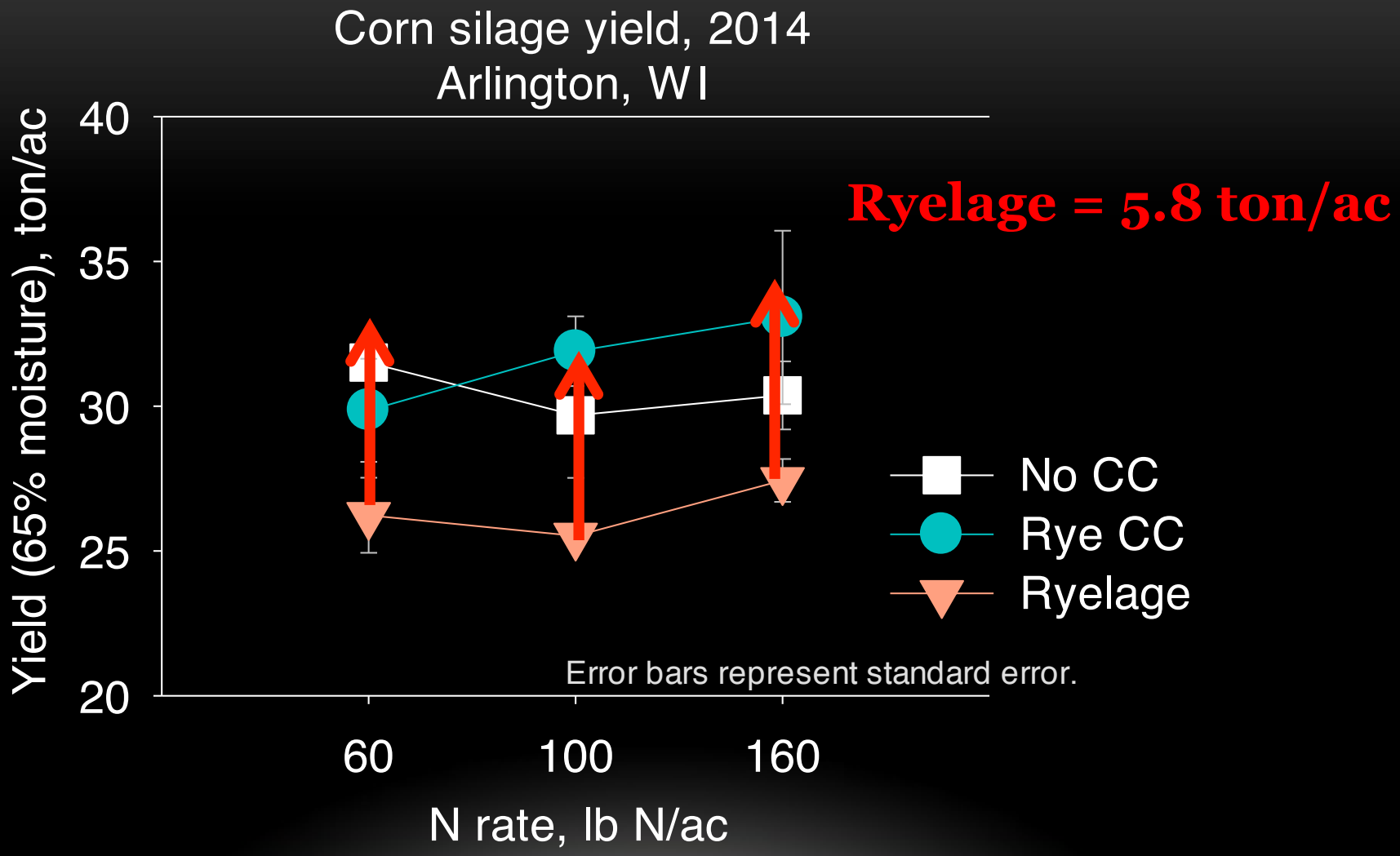

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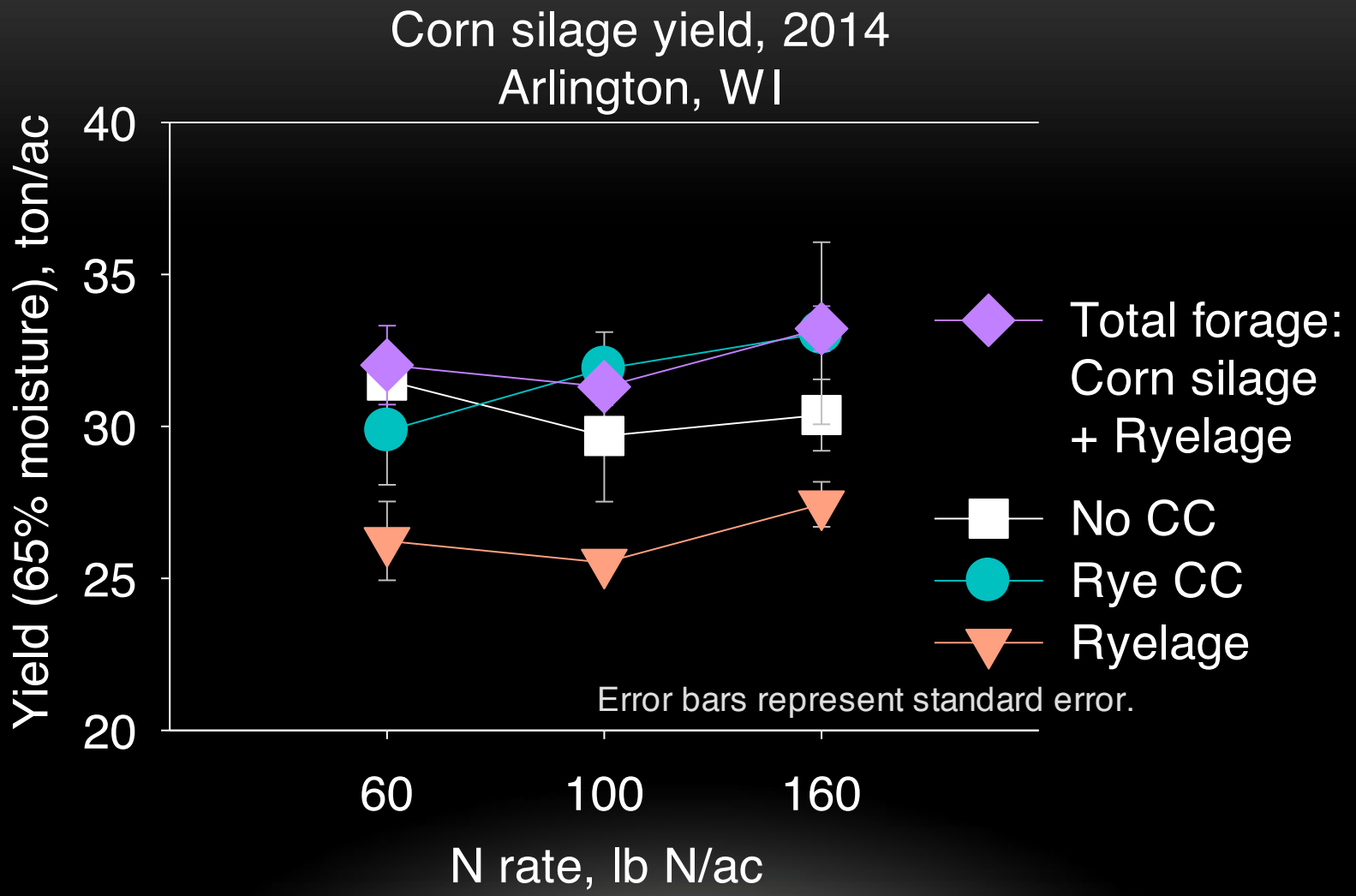


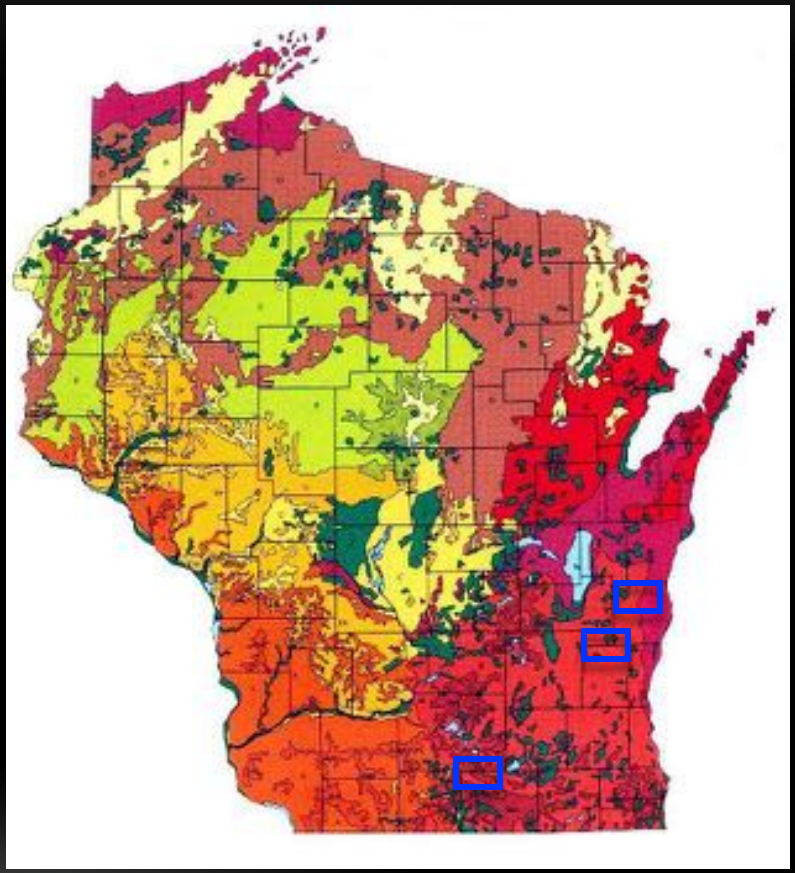
CONCLUSIONS

- Winter rye as a cover crop did not affect corn silage yield
- Winter rye as a forage crop reduced corn silage yield in 2 of 3 years.
  - Led to greater total production in 2 of 3 years and the same amount of total production in 1 of 3 years

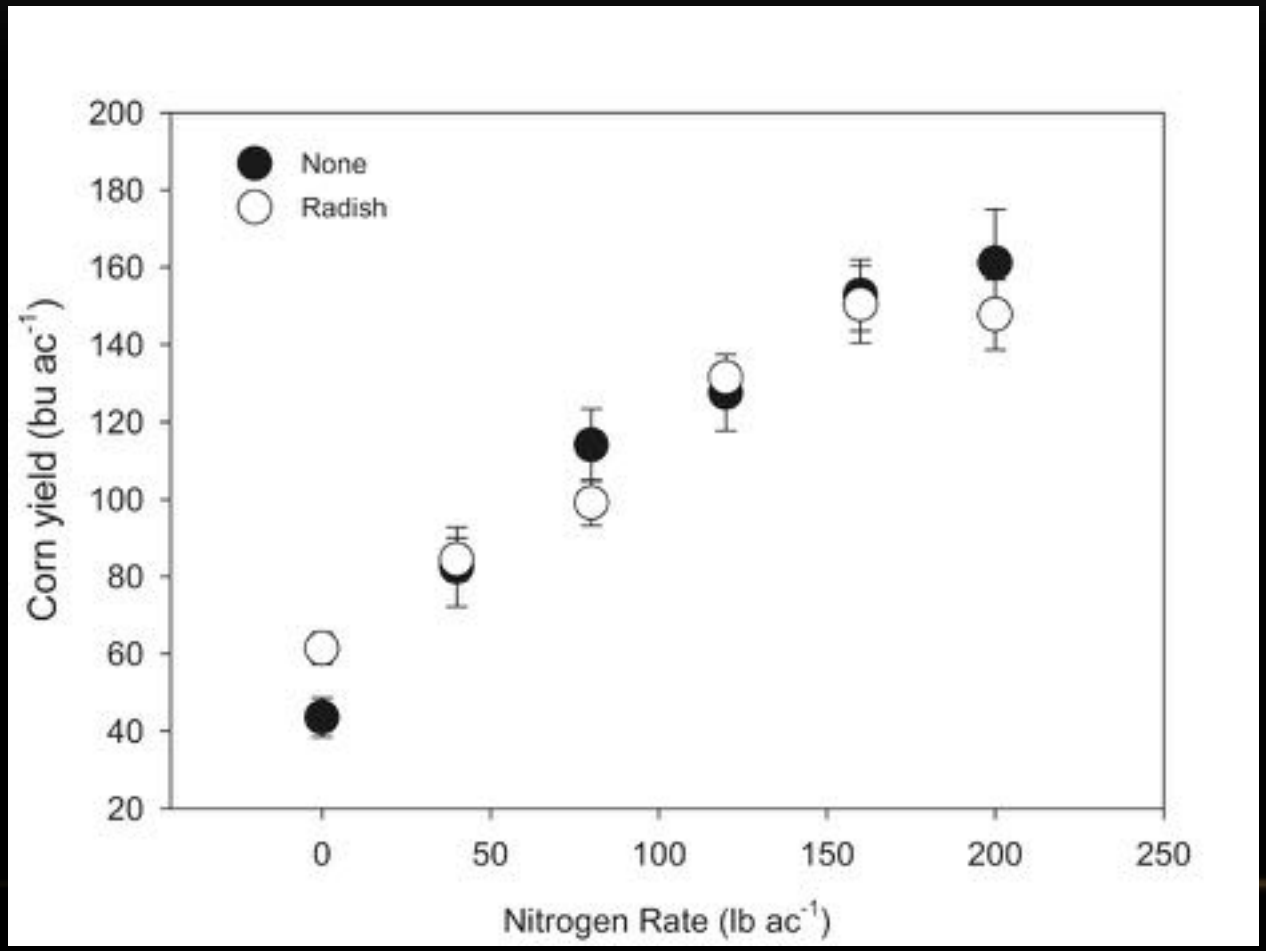
- Future research
  - Compare rye to ryegrass and spring barley

RADISH STUDIES

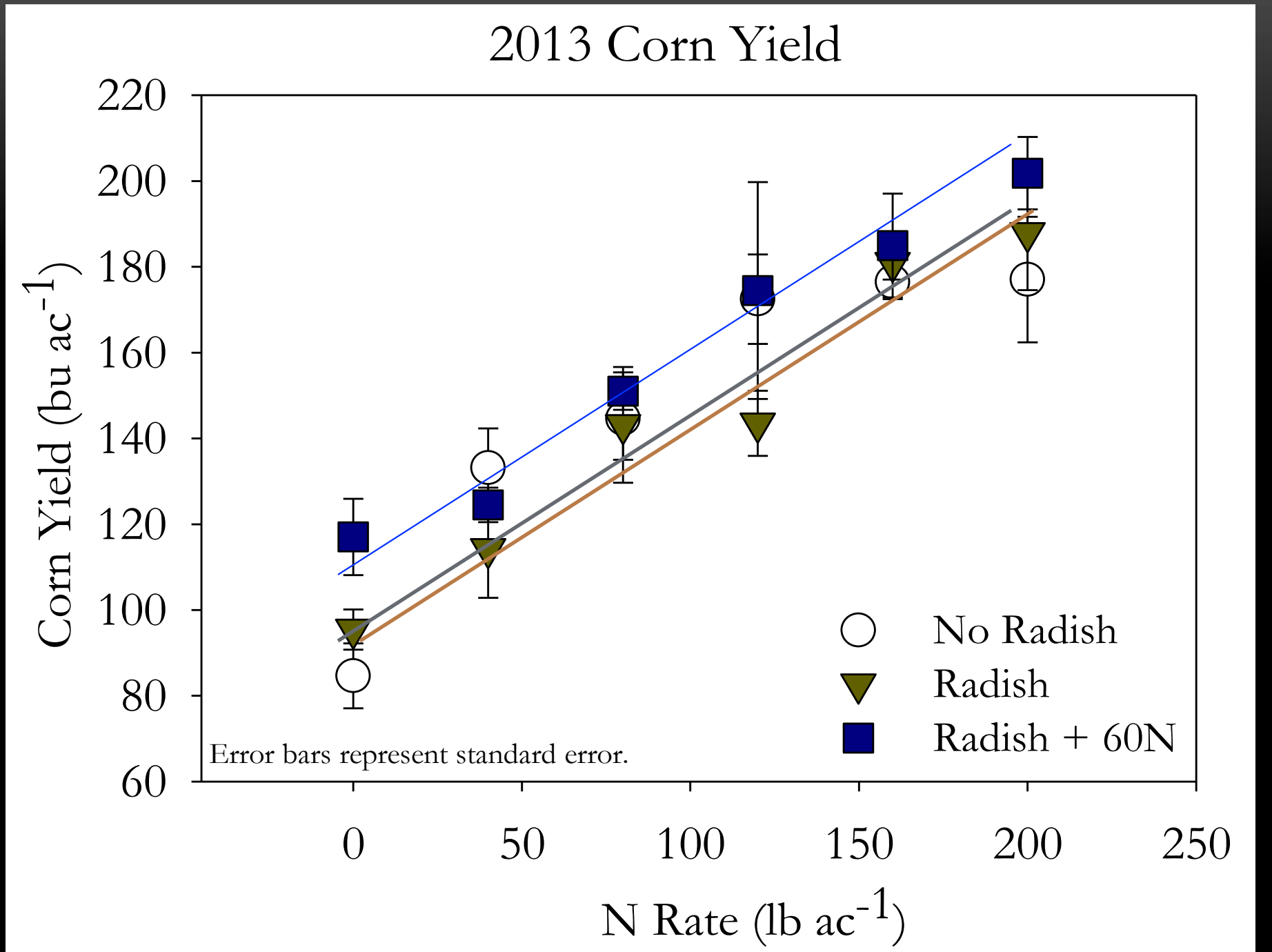
- Three locations in WI
- Radish vs. no radish following winter wheat
- Objective: determine if there is a nitrogen credit for radish



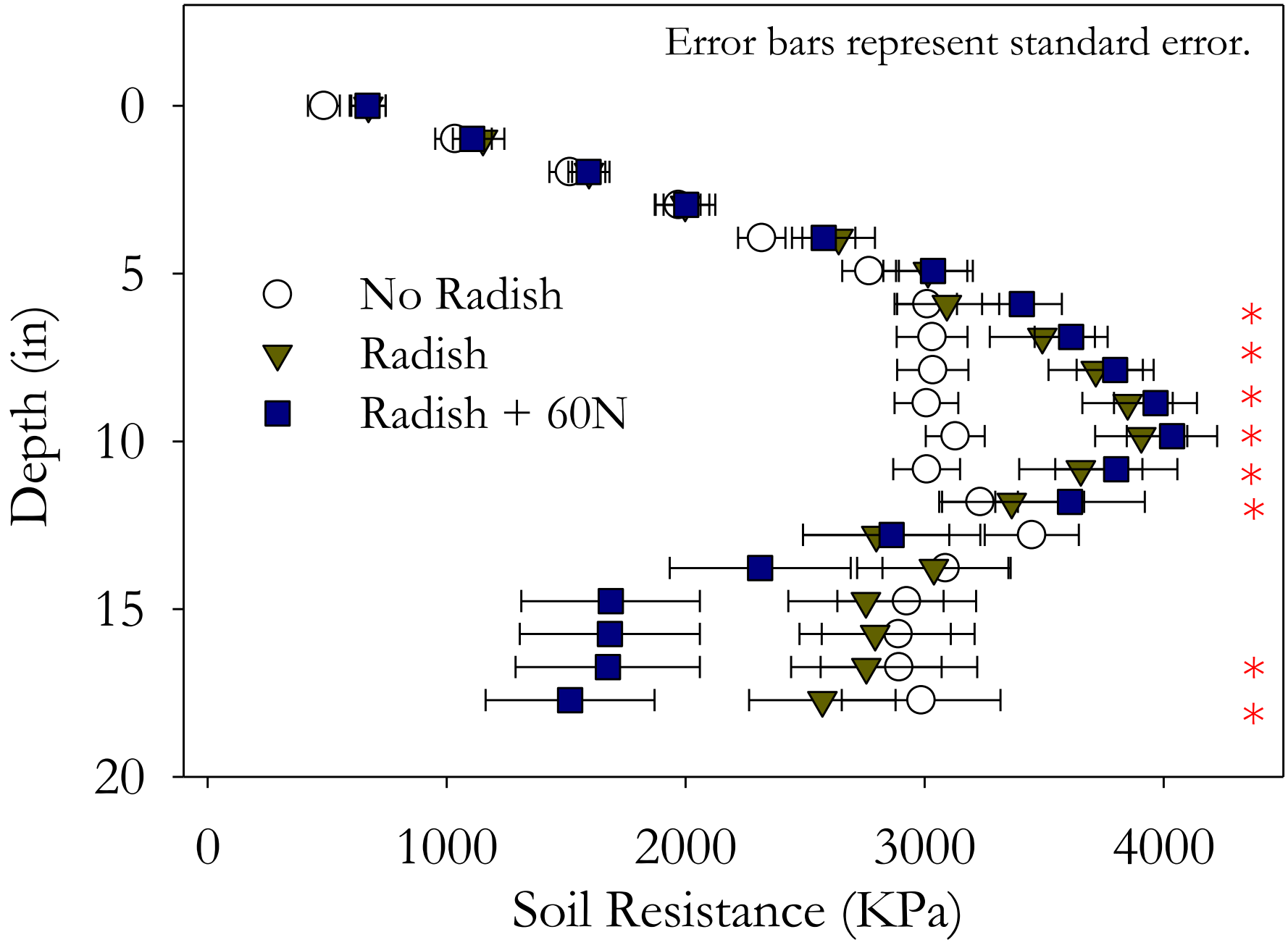
2013 CORN YIELDS
WASHINGTON COUNTY, WI
NO-TILL CORN FOLLOWING WINTER WHEAT



No effect of radish on yield or response to N in 2012 as well.


2013 Corn Yield
Corn Yield (bu ac-1)
220
200
180
160
140
120
100
80
60
0
50
100
150
200
250
N Rate (lb ac-1)
No Radish
Radish
Radish + 60N
Error bars represent standard error.

Penetrometer Data (August 16, 2013)



RADISH CONCLUSIONS

- Across six site years, we have not been able to determine a nitrogen credit from radish with N response yield data.

- Is it really beneficial for reducing soil erosion?
- It's doing something to the soil – how often will this result in a yield increase?
- The future of radish as a cover crop will be as part of a mixture.

CAN WE GET COVER CROPS INTO CORN AND SOYBEAN FIELDS THIS FAR NORTH?

- Yes.
- But unclear how much benefit we are going to get from them.

WAYS TO GET COVER CROPS INTO CORN AND SOYBEAN FIELDS

- Interseeding at V8-V10
- Late-season applications

LATE SEEDING

- Corn (grain)
  - Plant dried up to the ear
  - 50% of ground has sunlight
- Corn (silage)
  - Less than two weeks prior to harvest
- Soybean
  - Between 50% senescence and 50% leaf drop

- Drawbacks
  - Higher seeding rates
  - Mixtures are not feasible

Annual ryegrass seeded into soybean

SUMMARY

- Clovers
  - Provide a nitrogen credit, but need to be planted in summer
- Radish
  - No nitrogen credit, but may have some soil benefits.
- Grasses
  - Good for erosion control, but need to kill early in spring
  - The only option for planting a cover after Sept. 1.

MIDWEST COVER CROP COUNCIL

www.mccc.msu.edu

QUESTIONS?
COMMENTS?
CONCERNS?