

COVER CROP RESEARCH

UPDATE:

RYE AND RADISH EFFECTS ON SOIL NITROGEN



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BENEFITS OF COVER CROPS

Long-term vs. Short-term

■ Long-term

- Improve condition of soil (reduction in erosion, increase in SOM, improved soil structure)

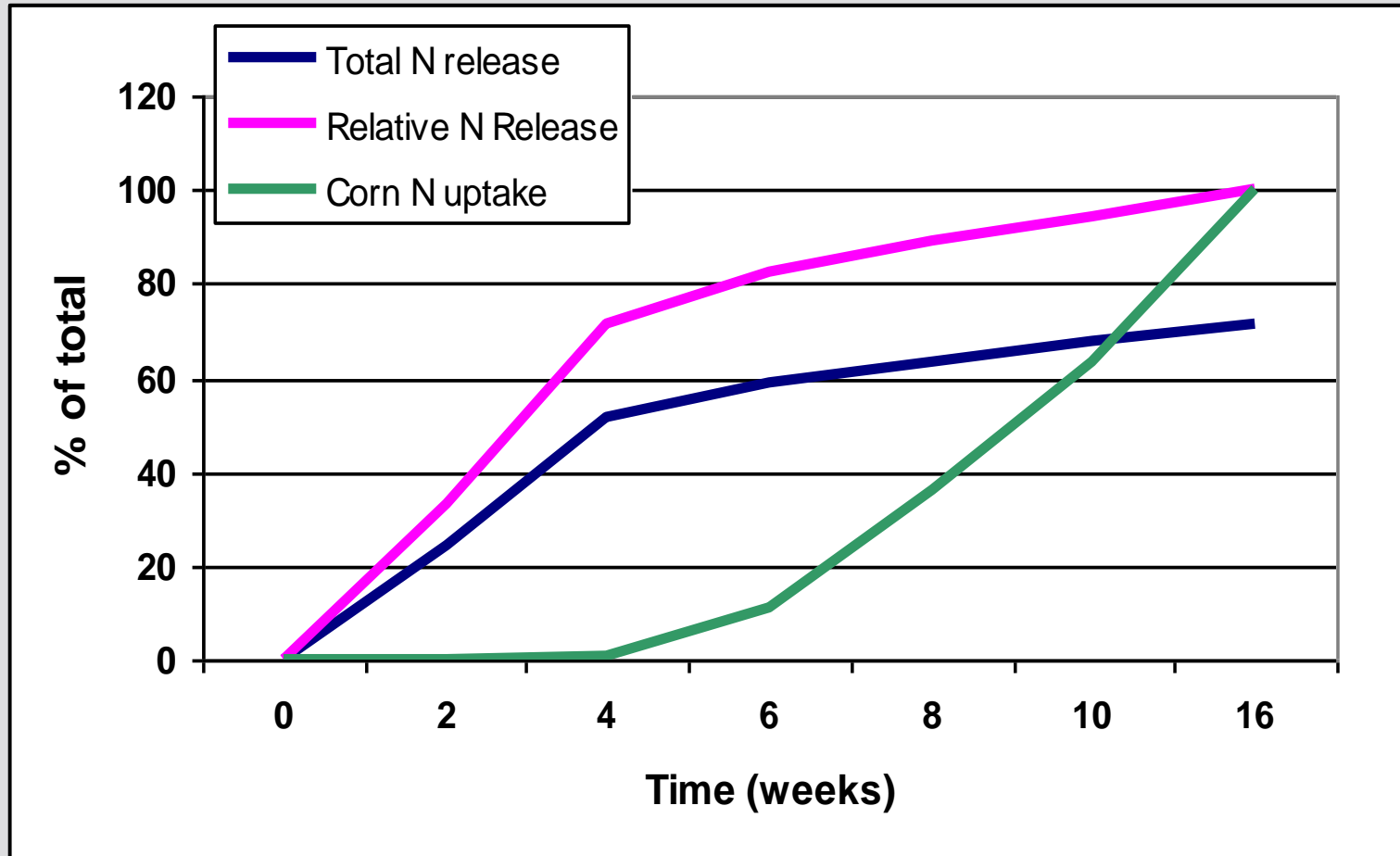
■ Short-term

- The things that make you money (i.e. increase yields or apply less N)

FOCUS ON NON-LEGUMES

- Cover crops that can be planted after winter wheat or corn silage harvest.
- Grasses (rye) and brassicas (radish) that can take up large amounts of residual N.
- The big question: do the cover crops release the N in time for corn to use it?

RED CLOVER RELEASES N WITH CORN UPTAKE...WILL OTHER CROPS?



Adapted from Stute and Posner, 1995, Agron. J. 1063-1069

COVER CROP PROJECTS

1. Winter rye after corn silage

- Columbia County

2. Radish after winter wheat (w/ manure)

- Washington County

3. Radish after winter wheat (no manure)

- Rock County

WINTER RYE AFTER CORN SILAGE

QUESTIONS

- What is the impact of growing winter rye as a cover crop or forage crop in a no-till corn silage-corn silage rotation?
- Does planting winter rye after fall liquid dairy manure application increase the N availability of manure?

EXPERIMENTAL DESIGN

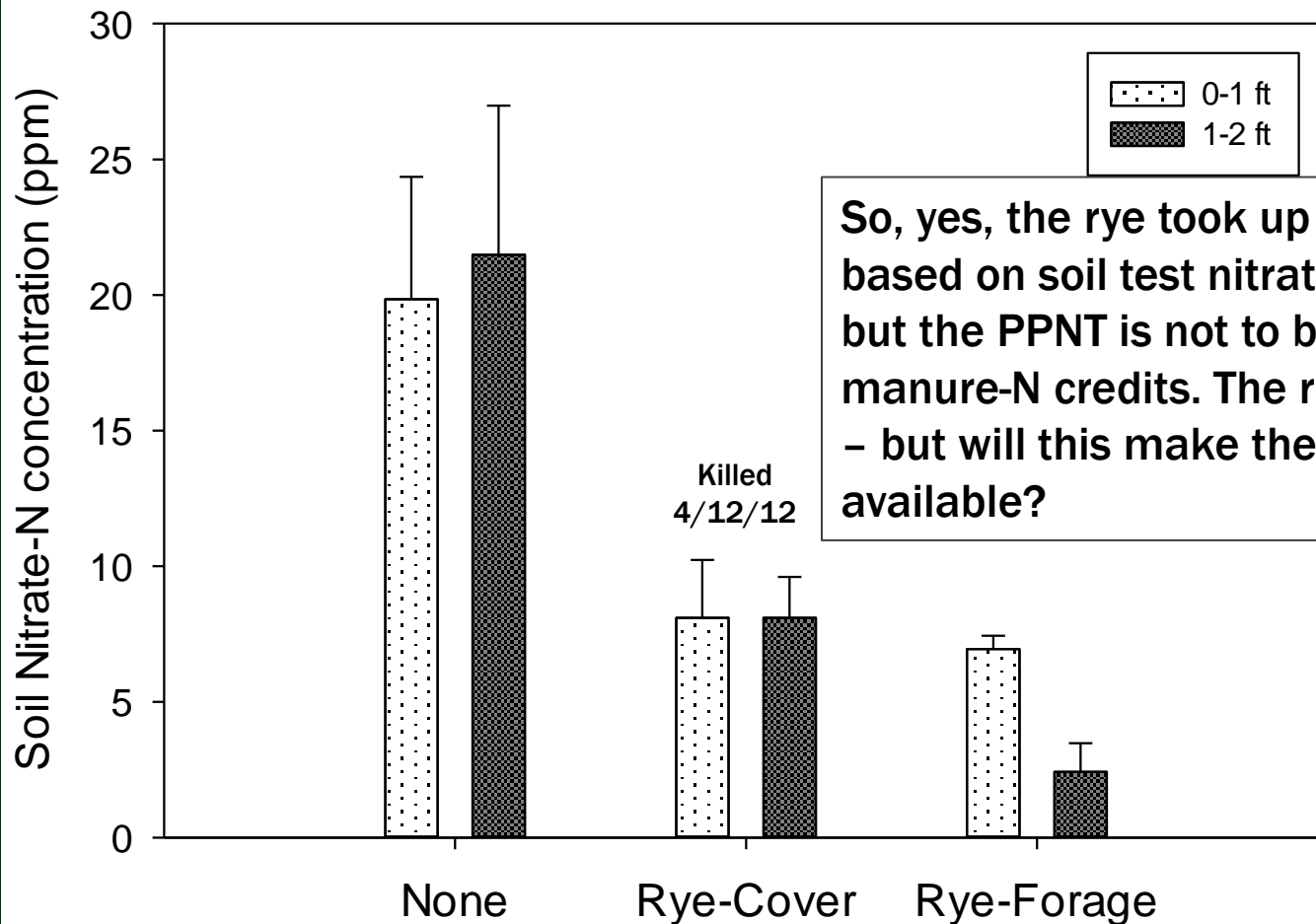
- **2011:** No-till corn silage, after harvest (9/9/11) we applied 9,700 gal/ac of liquid dairy manure (9/23/11) (64 lb/ac of available N).
- **2011:** Three systems: no cover crop, winter rye cover crop, or winter rye forage crop.
 - Rye planted at 140 lb/ac (3/4" depth) (10/5/11)
- **2012:** PPNT & PSNT, sidedress application of 60, 100, or 160 lb/ac of N as ammonium nitrate. (6/5/12)

EXPERIMENTAL DESIGN

- 160 lb/ac represents if there is no manure-N credit (i.e. the rye made manure-N less available).
- 100 lb/ac represents the recommended N rate w/ the recommended manure-N credit.
- 60 lb/ac represents a reduction in the recommended rate (i.e. the rye made the manure-N more available).

2012 PPNT (4/30/12)

Error bars = Standard deviation



So, yes, the rye took up the fall applied N – based on soil test nitrate concentrations in April, but the PPNT is not to be used to confirm manure-N credits. The rye took up the manure N – but will this make the manure-N more or less available?

N IN SOIL VS. N IN PLANT

Treatment	Total N applied in fall	Available N applied in fall	Nitrate-N in 2' of soil @ planting	N uptake of rye (AGB)
	lb/ac			
None	213	64	165	–
Rye - Cover 1.5 ton/ac	213	64	65	115
Rye - Forage 2.5 ton/ac	213	64	38	125

Rye cover = 3.5% N; Rye forage = 2.5% N

Rye as cover crop

No cover crop

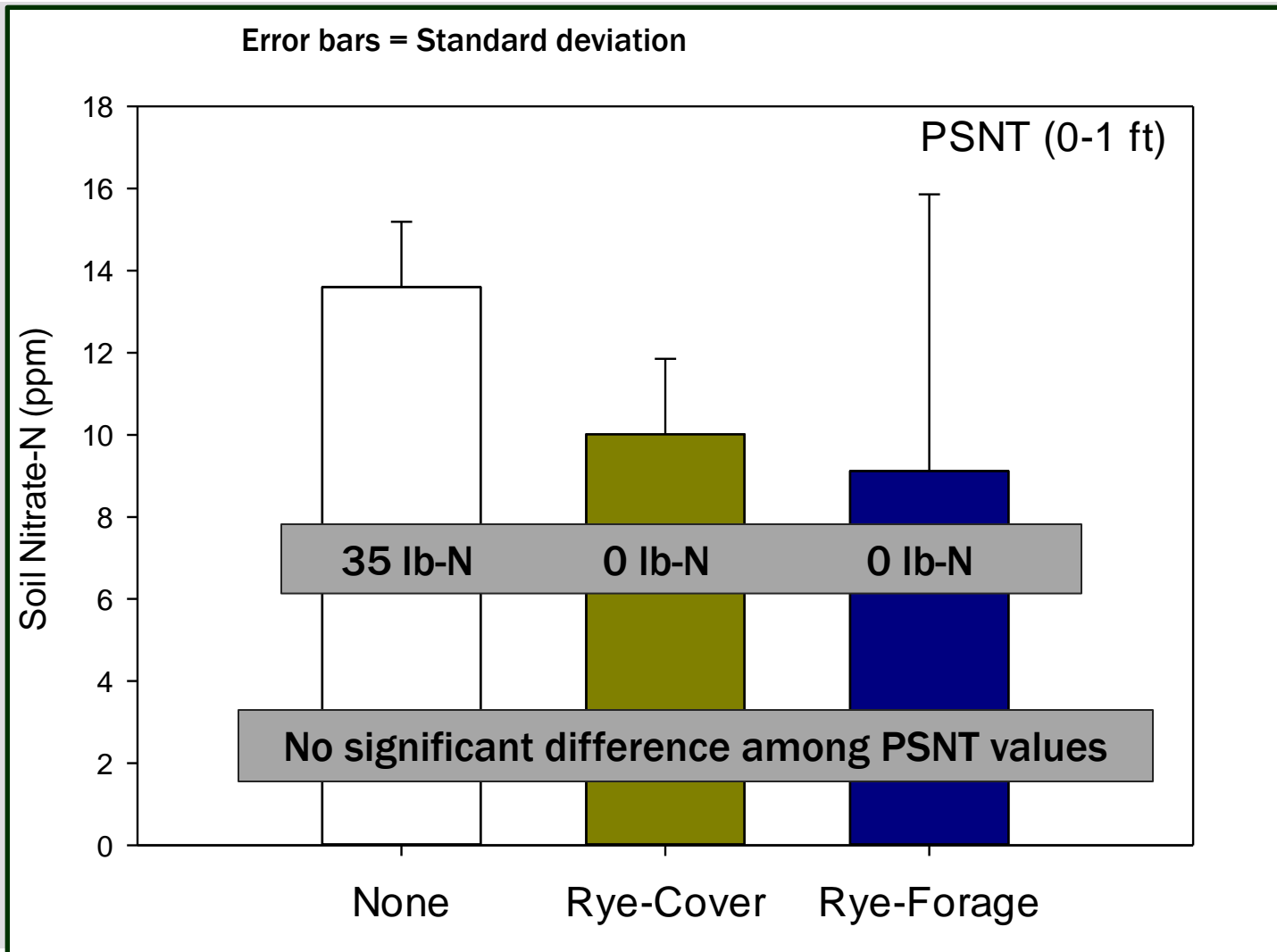


Rye as forage crop

Rye as cover crop



2012 PSNT (6/5/12)



- Large amount of variation in PSNT.
- Too variable to know if there is a real difference in PSNT values.

June 29, 2012

Rye as cover crop

No cover crop



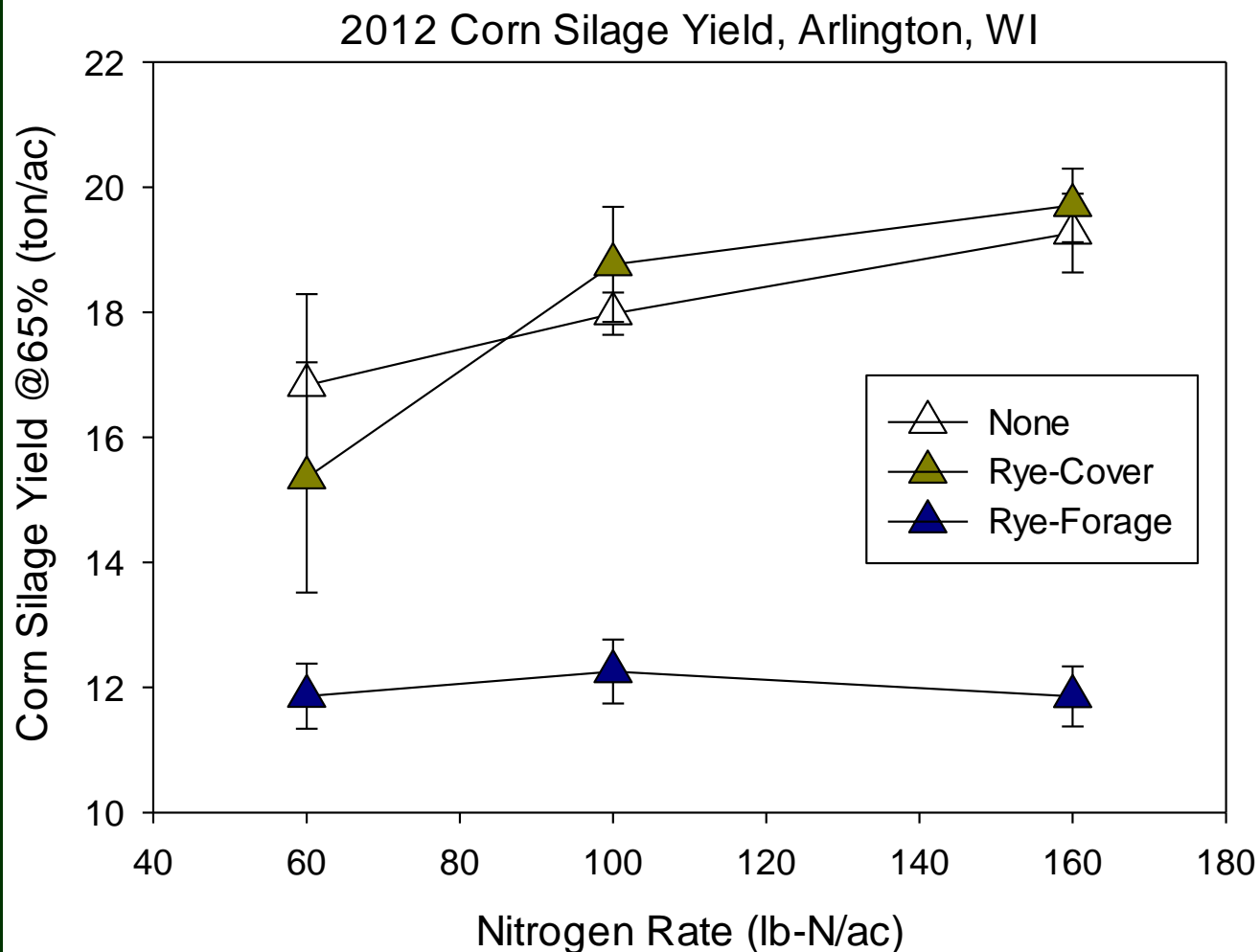
June 29, 2012

Rye as forage crop

No cover crop



CORN SILAGE YIELD



Optimal yields did not occur with lower N rates (utilization of rye did not make manure N more available – but it did not make it less available either).

Trying to get another forage crop was a net zero sum game. Rye forage yielded 2.5 ton DM (7.1 ton/ac yield @65%).

FUTURE CONSIDERATIONS

- Rye, when seeded after fall manure application, changes soil nitrate concentrations – this could impact the interpretation of the PSNT.
- We will evaluate this for multiple years to investigate year-to-year effects.
- We will interpret corn silage quality analysis to look at total silage quality, not just quantity.



**RADISH AFTER WINTER
WHEAT + MANURE**

WASHINGTON COUNTY, WI

- **Determine if there is a nitrogen credit for radish**
- **Following winter wheat harvest and 4,800 gal/ac of liquid dairy manure (worked in with turbo till).**
 - ~30 lb-N/ac manure credit
- **Radish planted in 30' strips (radish winterkills)**
- **6 strips of radish, 3 strips no radish, 3 strips no radish with tillage**
- **Corn planted in 2012 with six N rates**
 - 0, 100, 125, 150, 175, 200 lb/ac

October 4, 2011



October 4, 2011



April 11, 2012



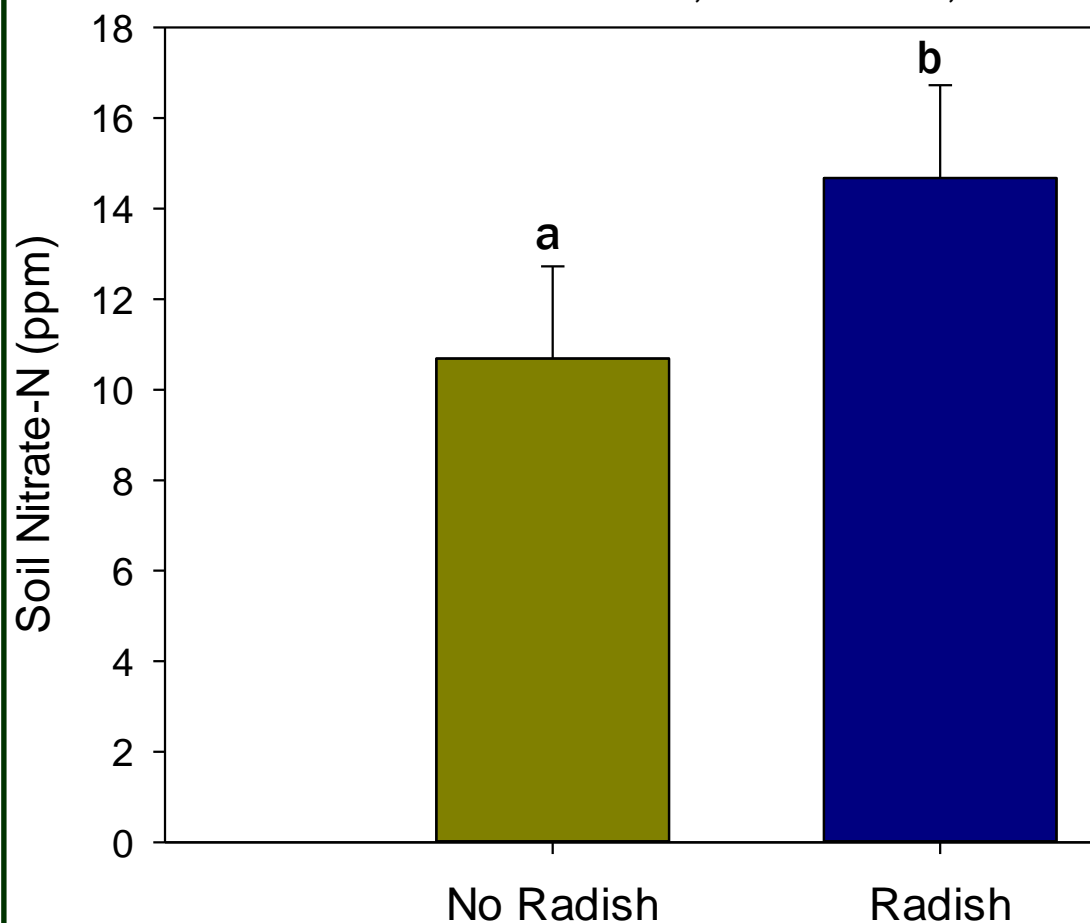
April 11, 2012



PSNT – WASHINGTON COUNTY

Error bars = standard deviation

2012 PSNT, West Bend, WI



No radish

Average concentration: **11 ppm**

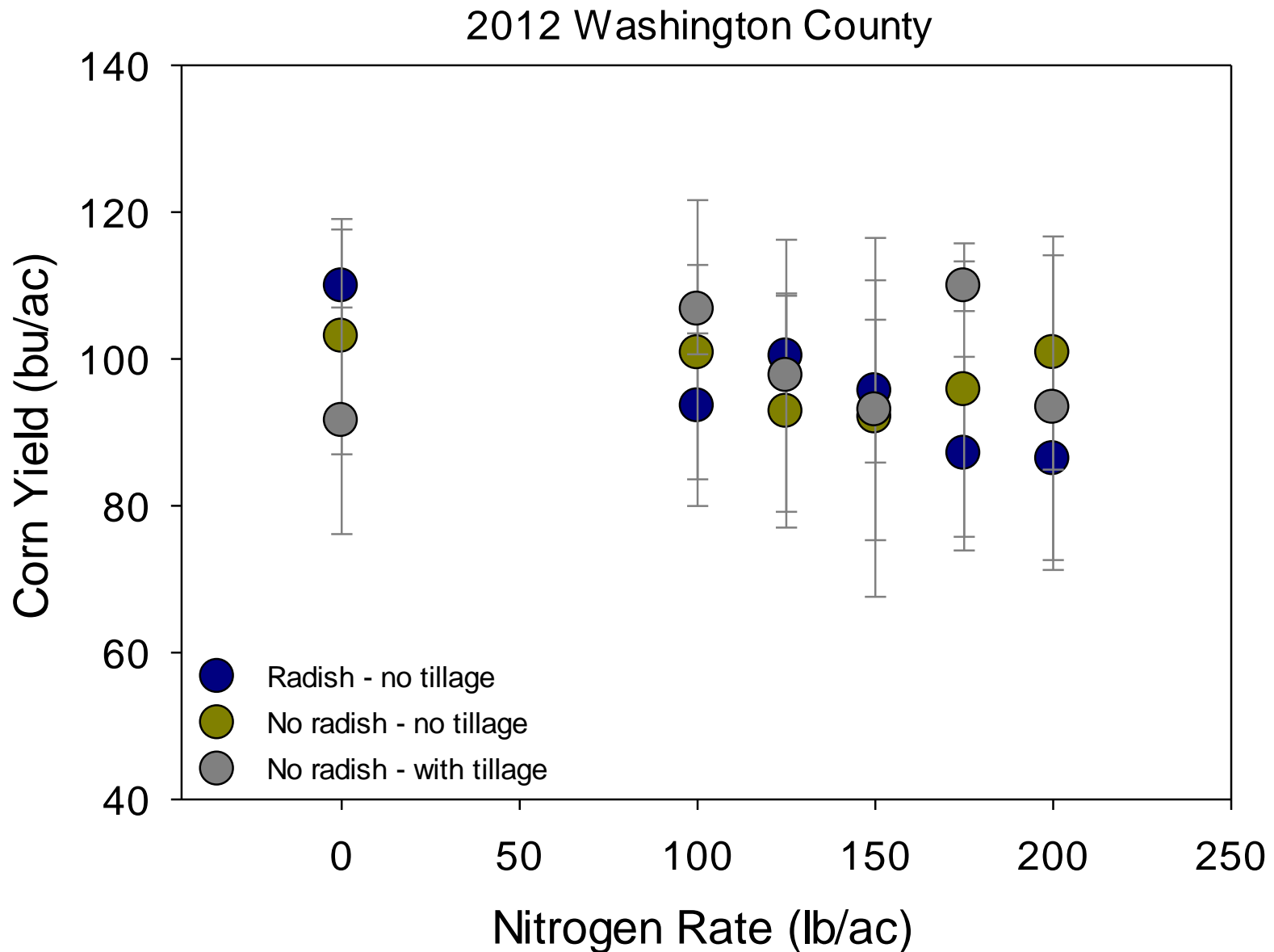
Average N credit: **10 lb/ac**

Radish

Average concentration: **15 ppm**

Average N credit: **60 lb/ac**

2012 CORN YIELDS



CONCLUSIONS & FUTURE CONSIDERATIONS

- Radish affected the PSNT value, but not response to N
- Lack of response to N – effect of drought (?)
- Another site in Sheboygan County.
- New trials have begun with same cooperating growers.



**RADISH AFTER WINTER
WHEAT – NO MANURE**

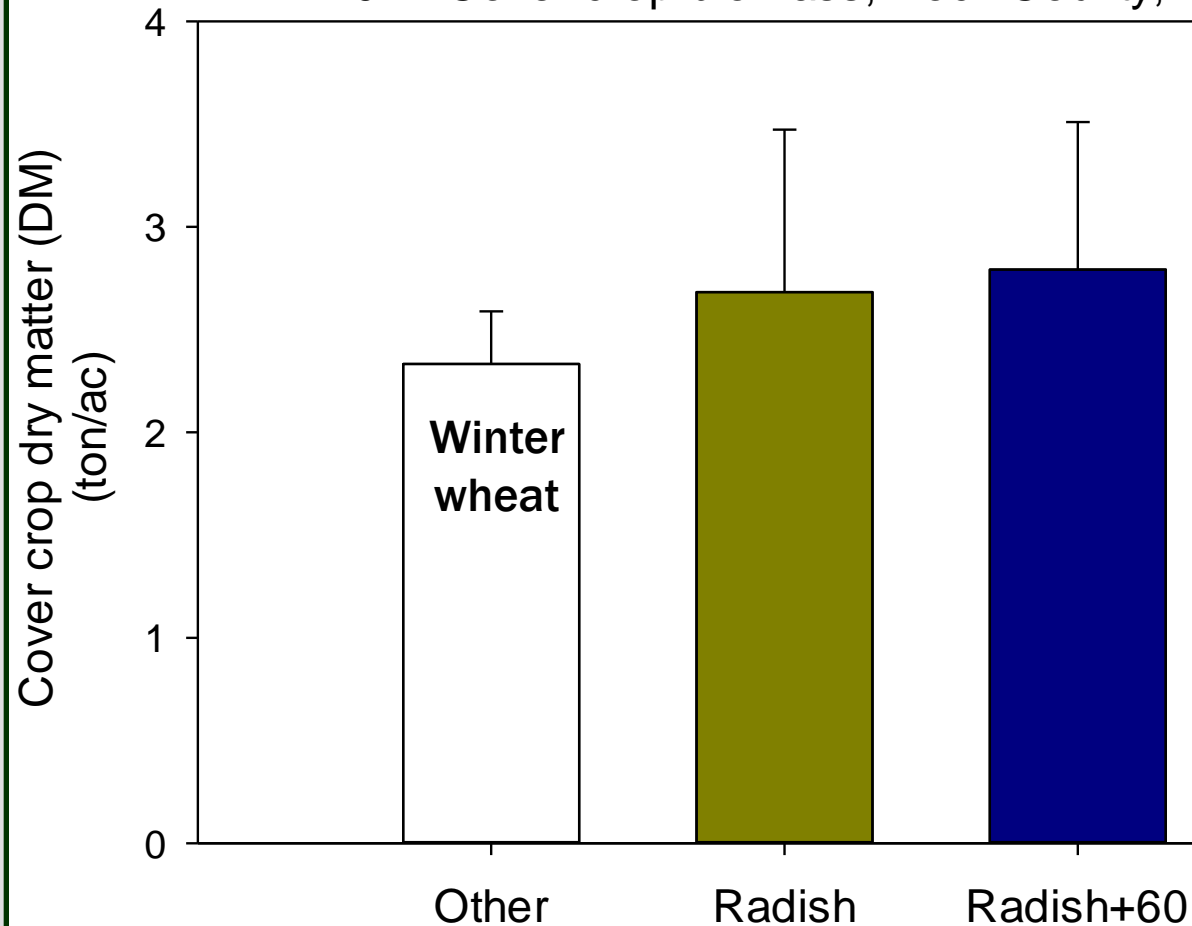
RADISH – ROCK CO.

What is the effect of radish on corn yield and optimum N rate

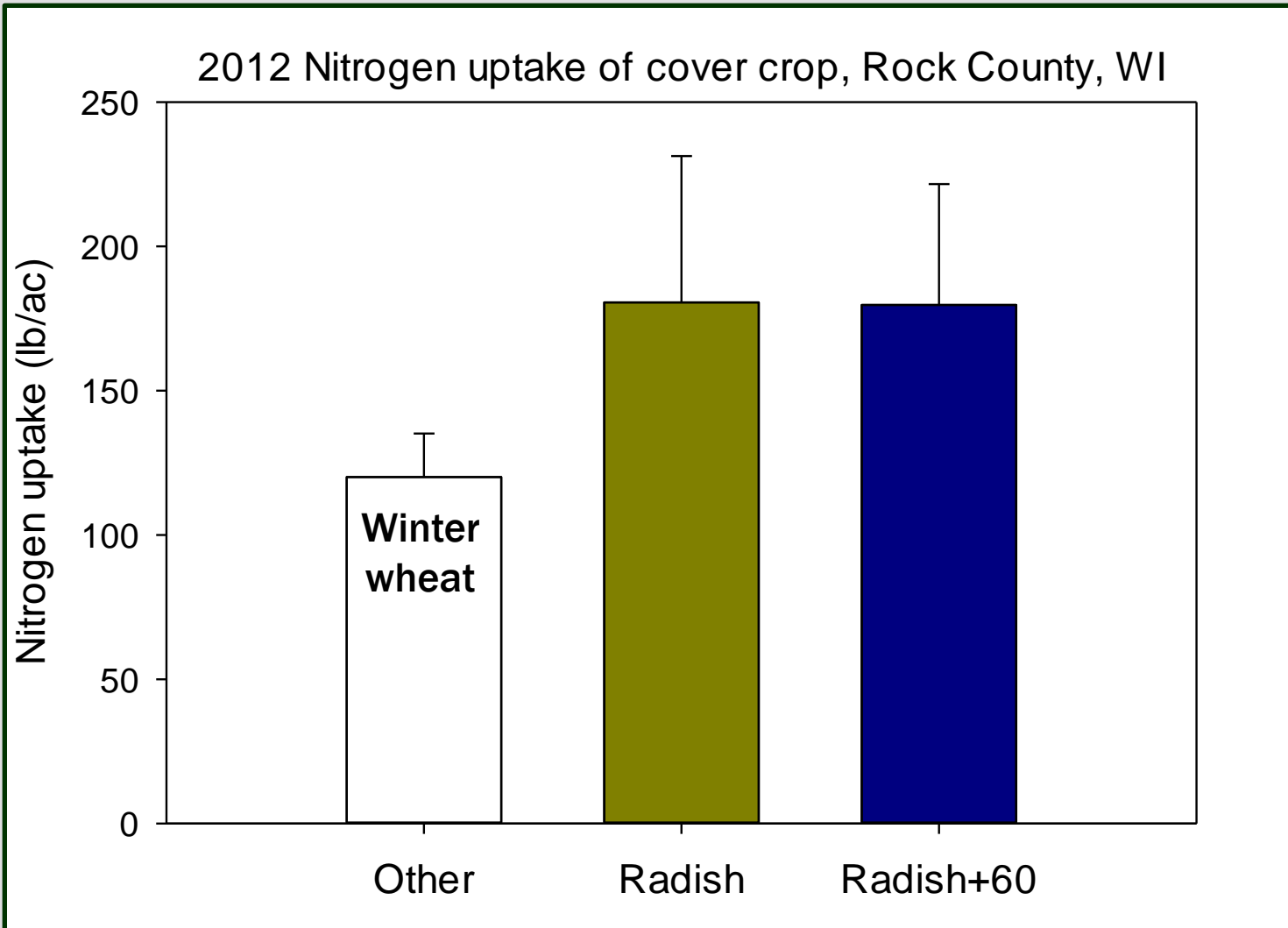
- **Three cover crop treatments: None, Radish, & Radish + 60 lb-N/ac**
- **Radish seeded at 10 lb/ac**
- **Six N rates on corn: 0, 40, 80, 120, 160, 200 lb-N/ac**

RADISH STUDY – ROCK CO.

2012 Cover crop biomass, Rock County, WI

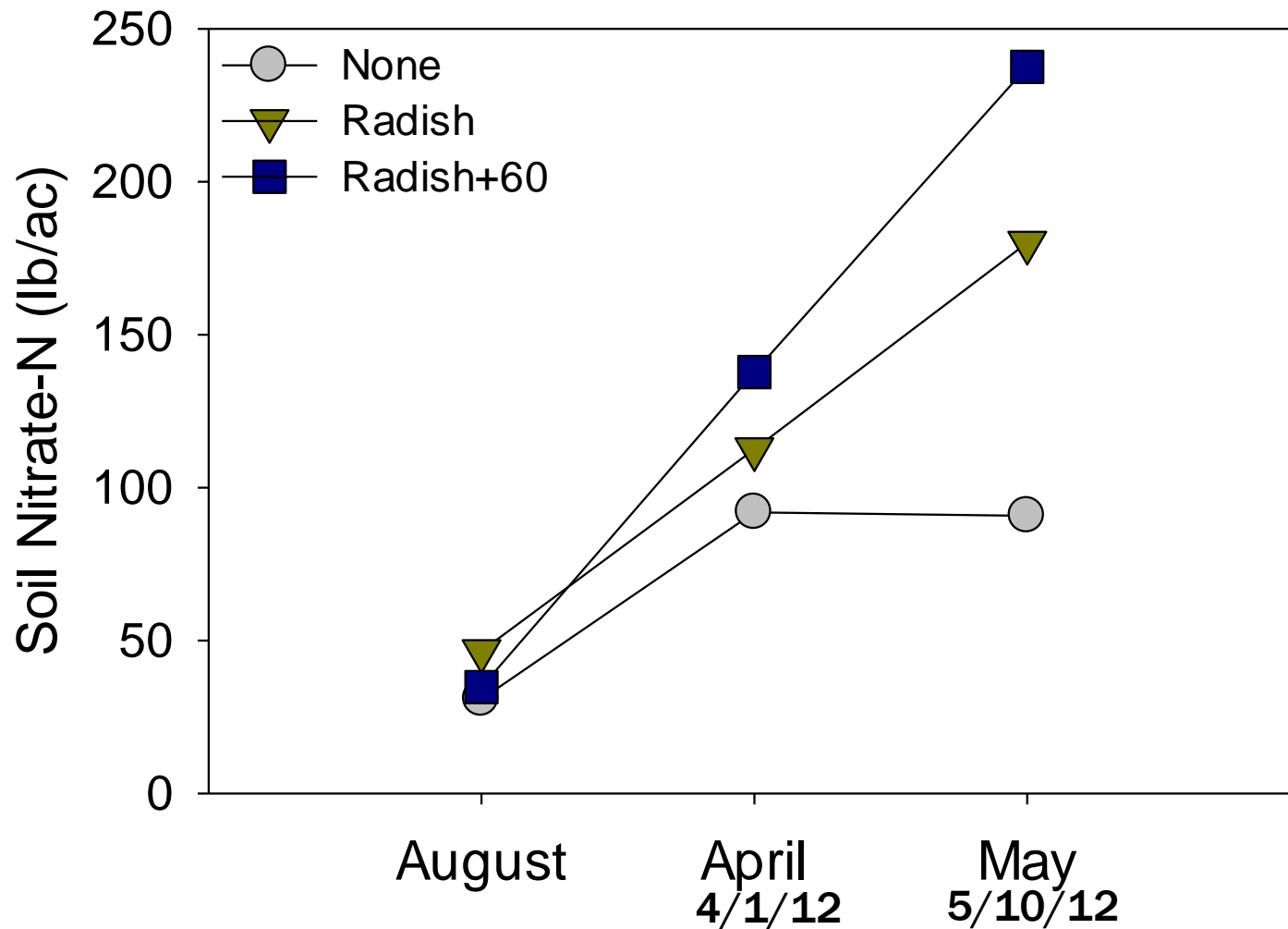


RADISH STUDY – ROCK CO.

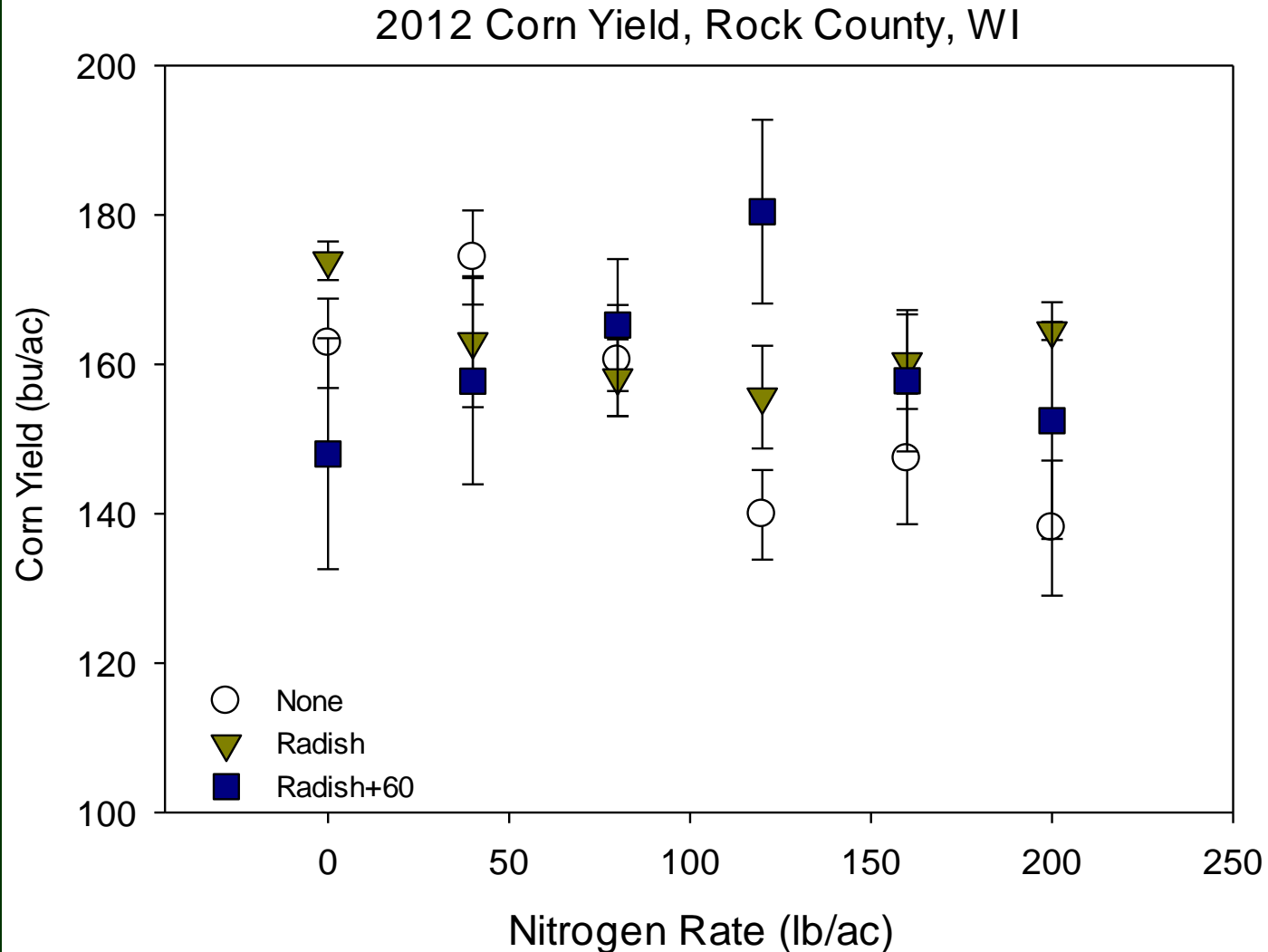


SOIL NITRATE-N

Soil nitrate-N concentrations increased from fall to spring, with radish plots also having an increase in soil nitrate-N between April and May.



RADISH STUDY #1 - YIELDS



CONCLUSIONS & FUTURE CONSIDERATIONS

- Similar to Washington County site, radish affected the soil nitrate, but not response to N.
- Repeated for two more years.

OVERALL CONCLUSIONS

- Double-cropping rye/corn silage has some value (same overall yield, more ground cover).
- Rye cover crop has some value (more ground cover, replace some of the carbon removed, no yield decline).
- Radish does a great job of taking up fall N – we are still unsure if it releases the N in synchrony with corn N uptake.

**QUESTIONS?
COMMENTS?
CONCERNS?**

RADISH STUDY #1 & #2

