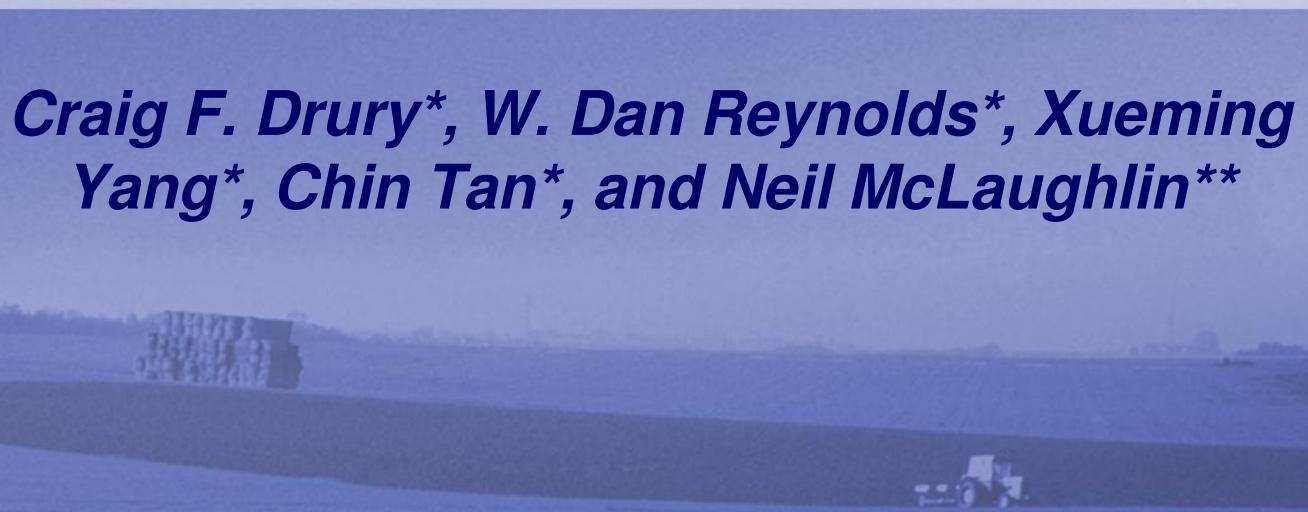




Agronomic and Soil Quality Benefits of Cover Crops



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OUR GOAL

Manage agricultural land to:

- **Optimize crop yield and quality**
- **Minimize environmental N losses**
- **Maintain and/or improve soil quality**

Canada



Cover Crops

Benefits:

1. Increased crop yields.
2. Ability to capture residual N.
3. Ability to add N to soils through nitrogen fixation.
4. Improved physical quality (water storage, transmission).



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Brookston clay loam soil



Crop Rotations

Continuous crops

Corn

Soybean

Winter Wheat

Winter Wheat + Red Clover

2 year Rotations

Corn-Soybean

Winter Wheat-Soybean

Winter Wheat+Red Clover –Soybean

3-year Rotations

WW-Corn-Soybean

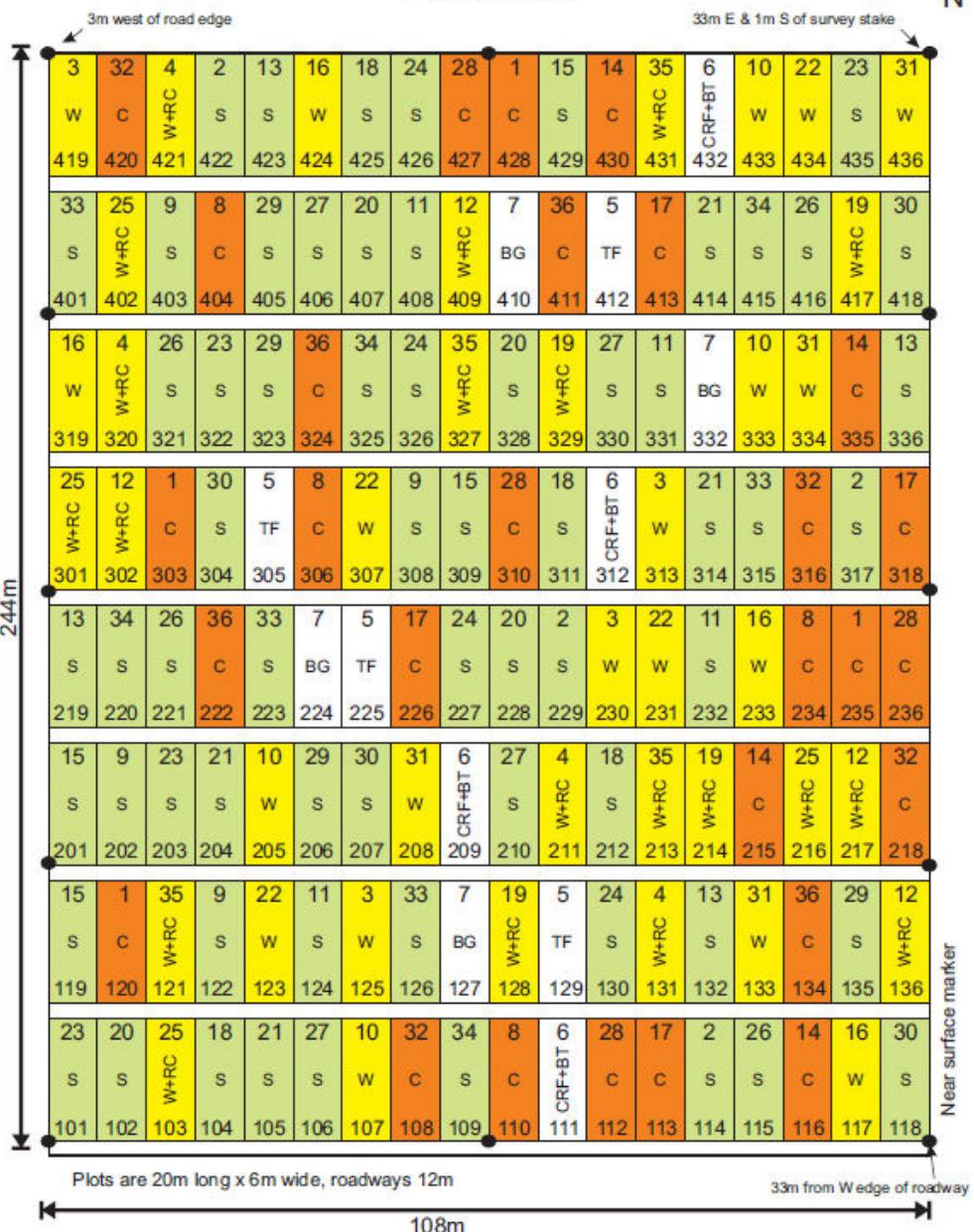
WW+RC-Corn-Soybean

Corn-Soybean-Soybean

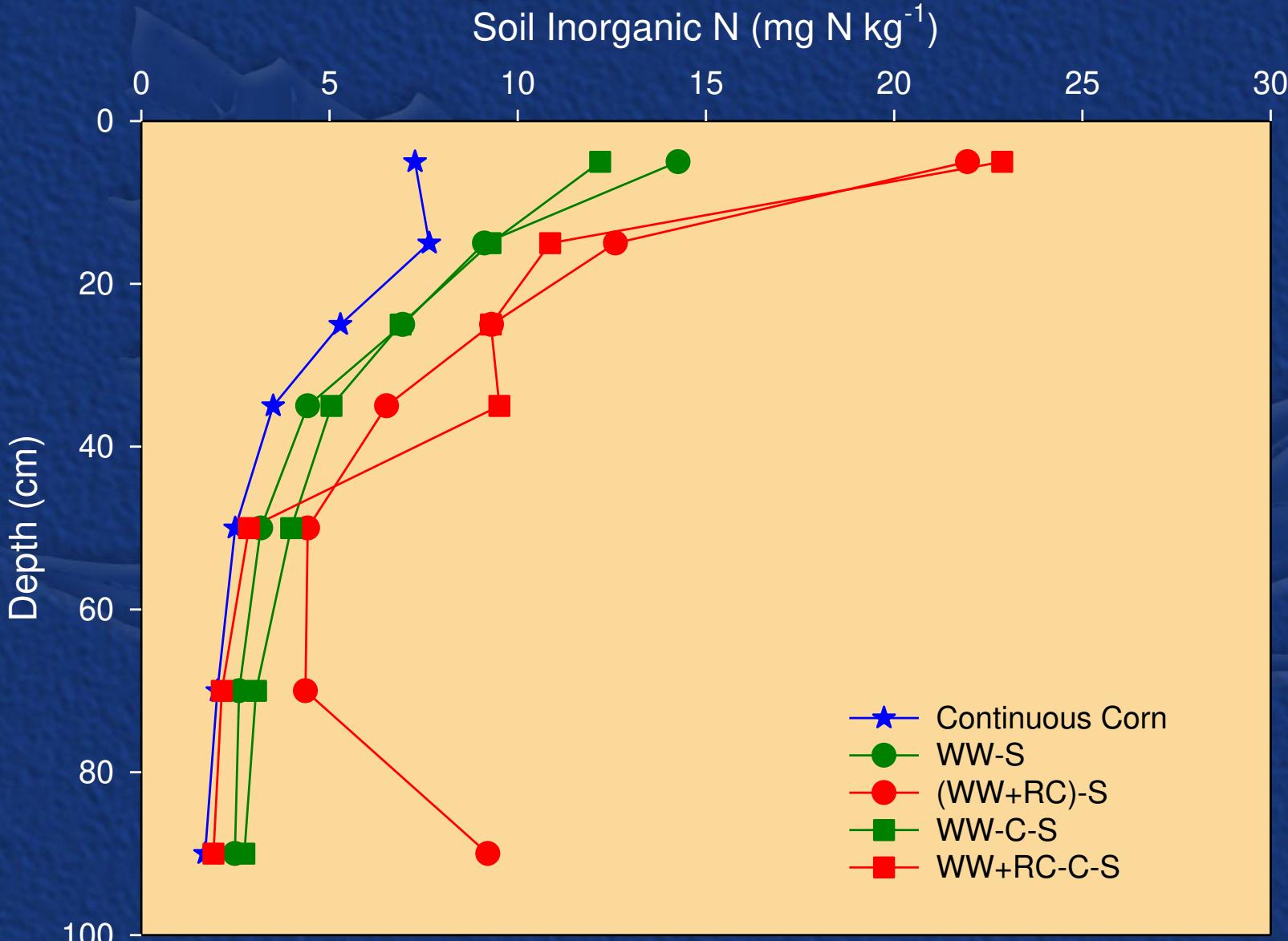
4-Year Rotations

WW-C-S-S

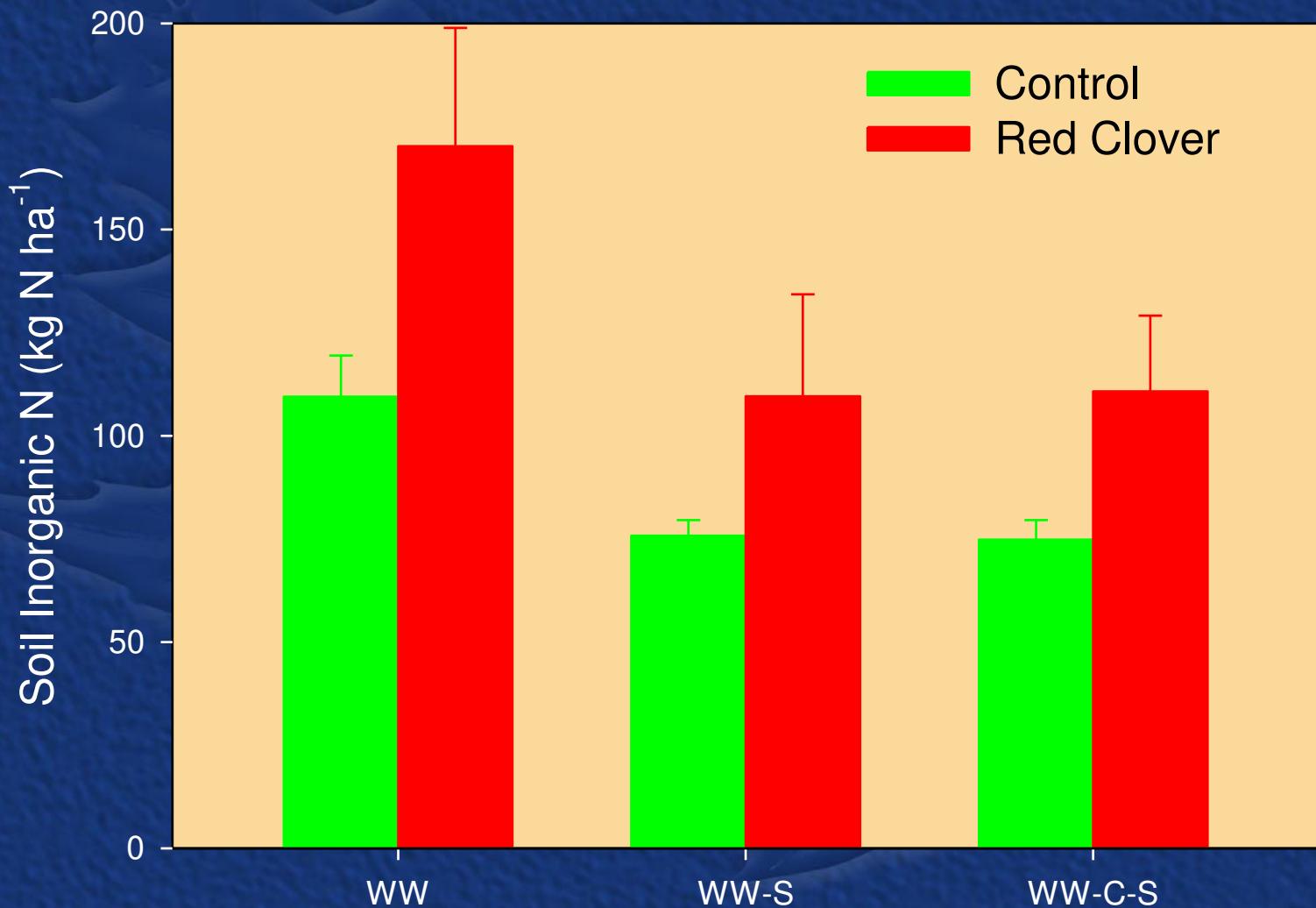
WW+RC-C-S-S



Soil Inorganic N - Spring 2012



Soil Inorganic N – Spring (0-60 cm depth)

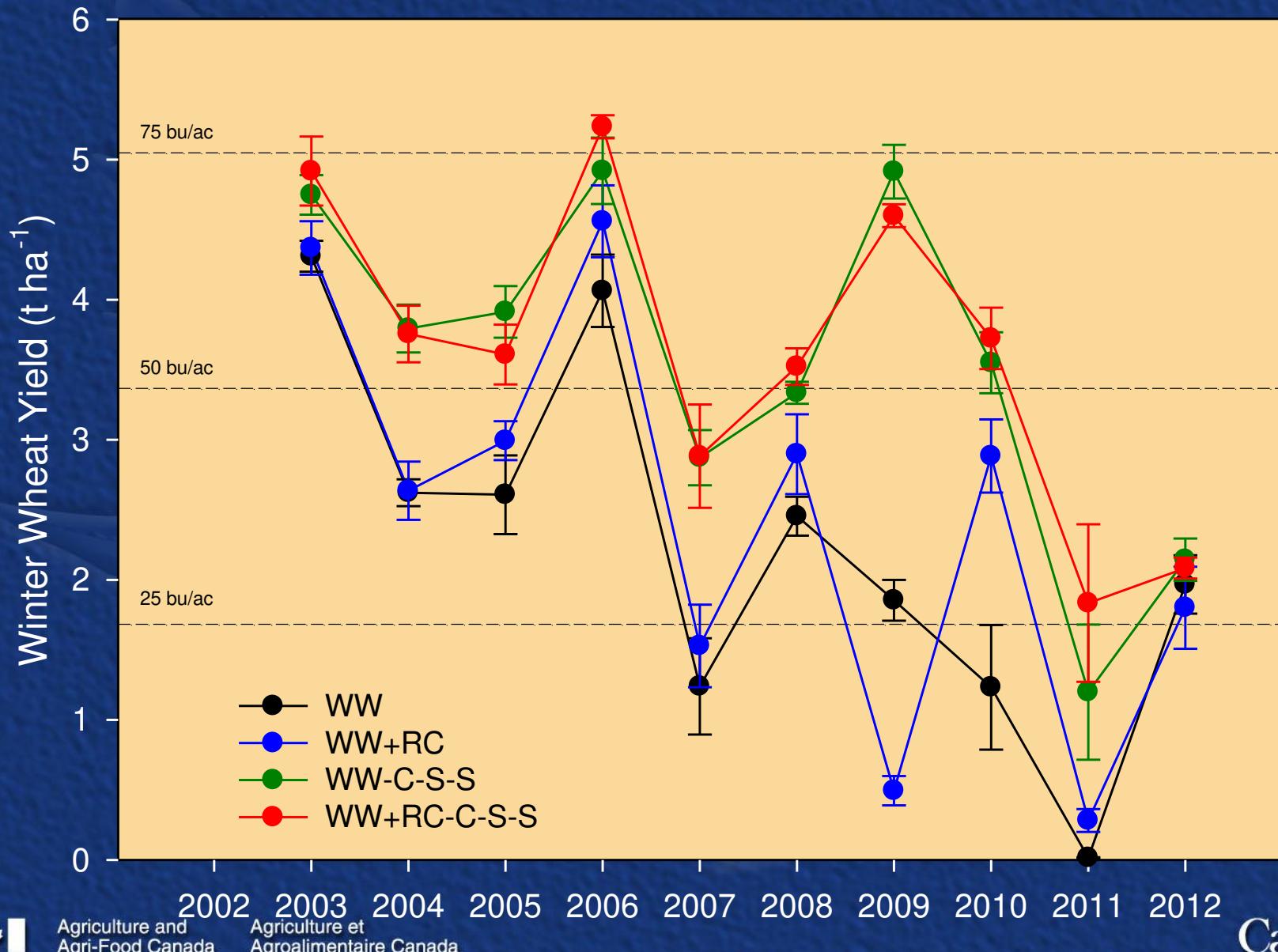


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Winter Wheat Yields

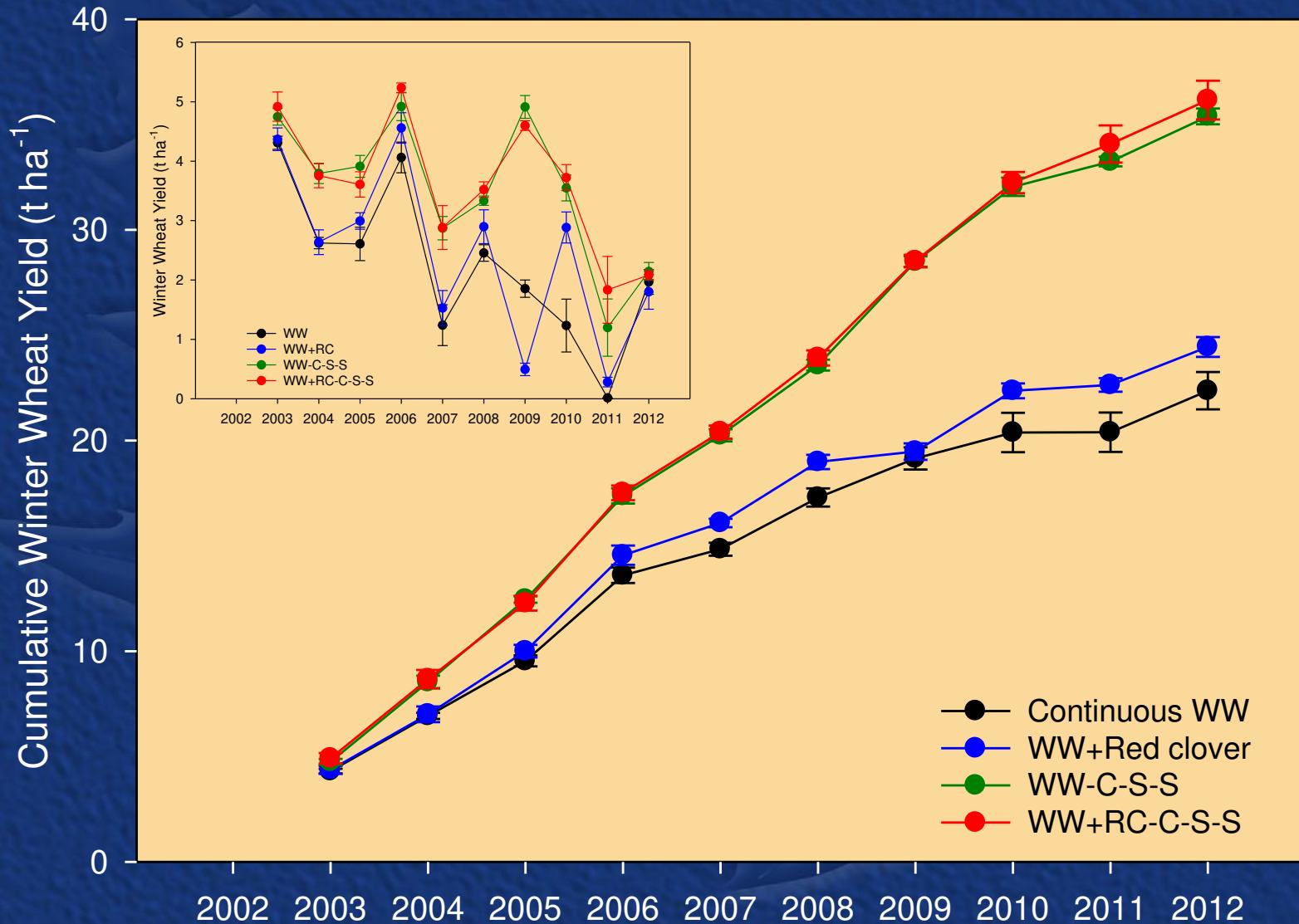


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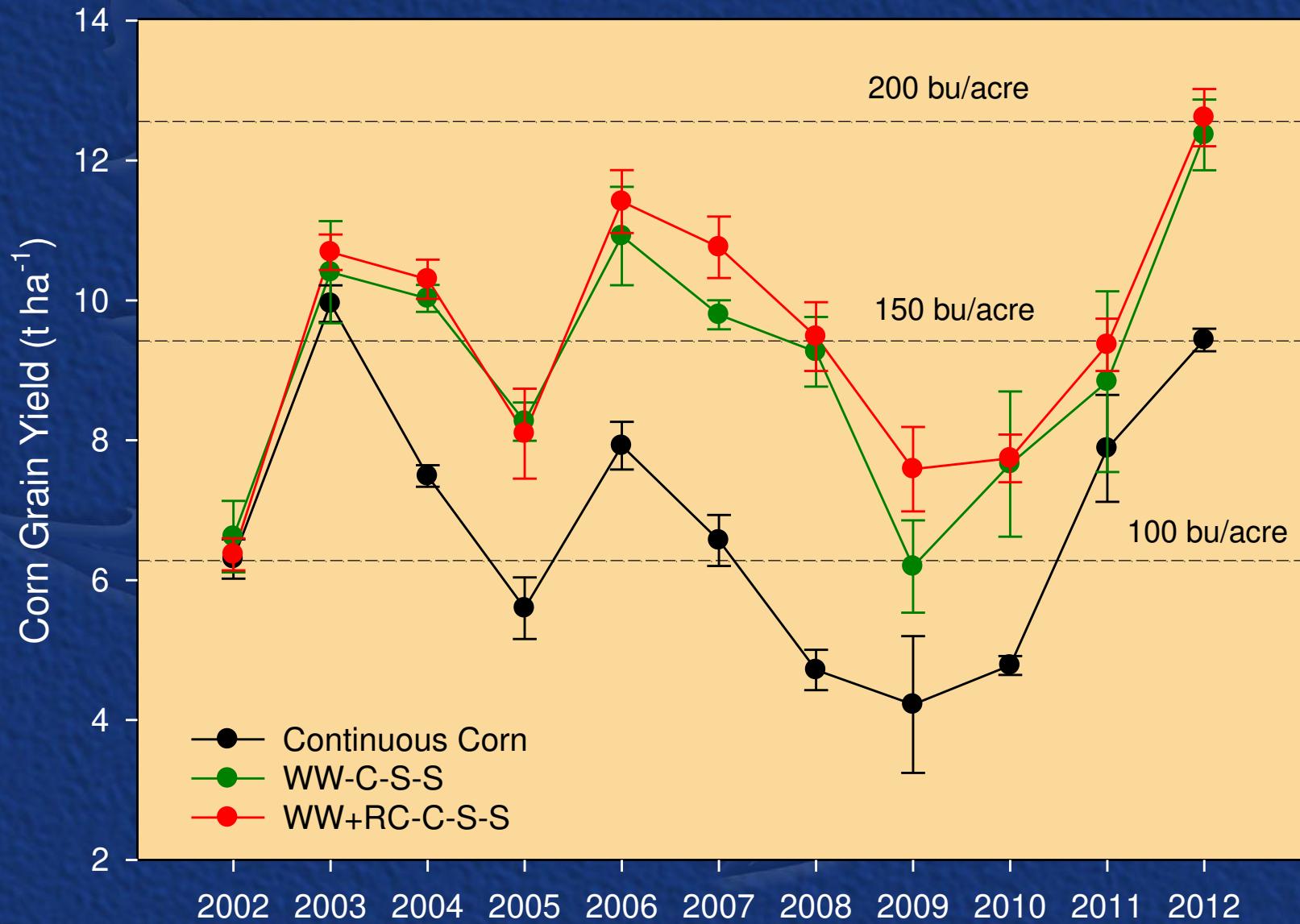
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Cumulative Winter Wheat Yields



Corn Grain Yields

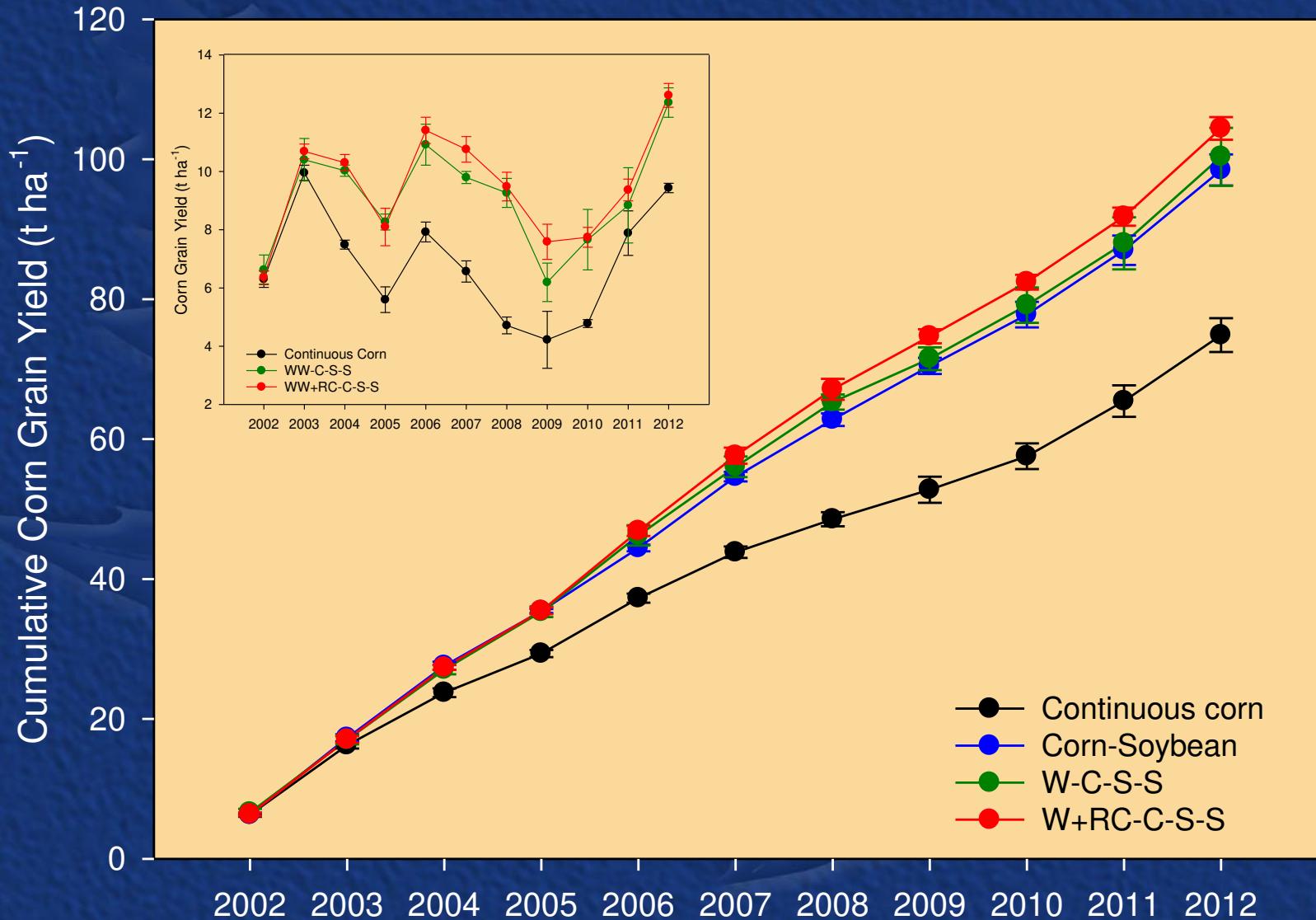


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Cumulative Corn Grain Yields

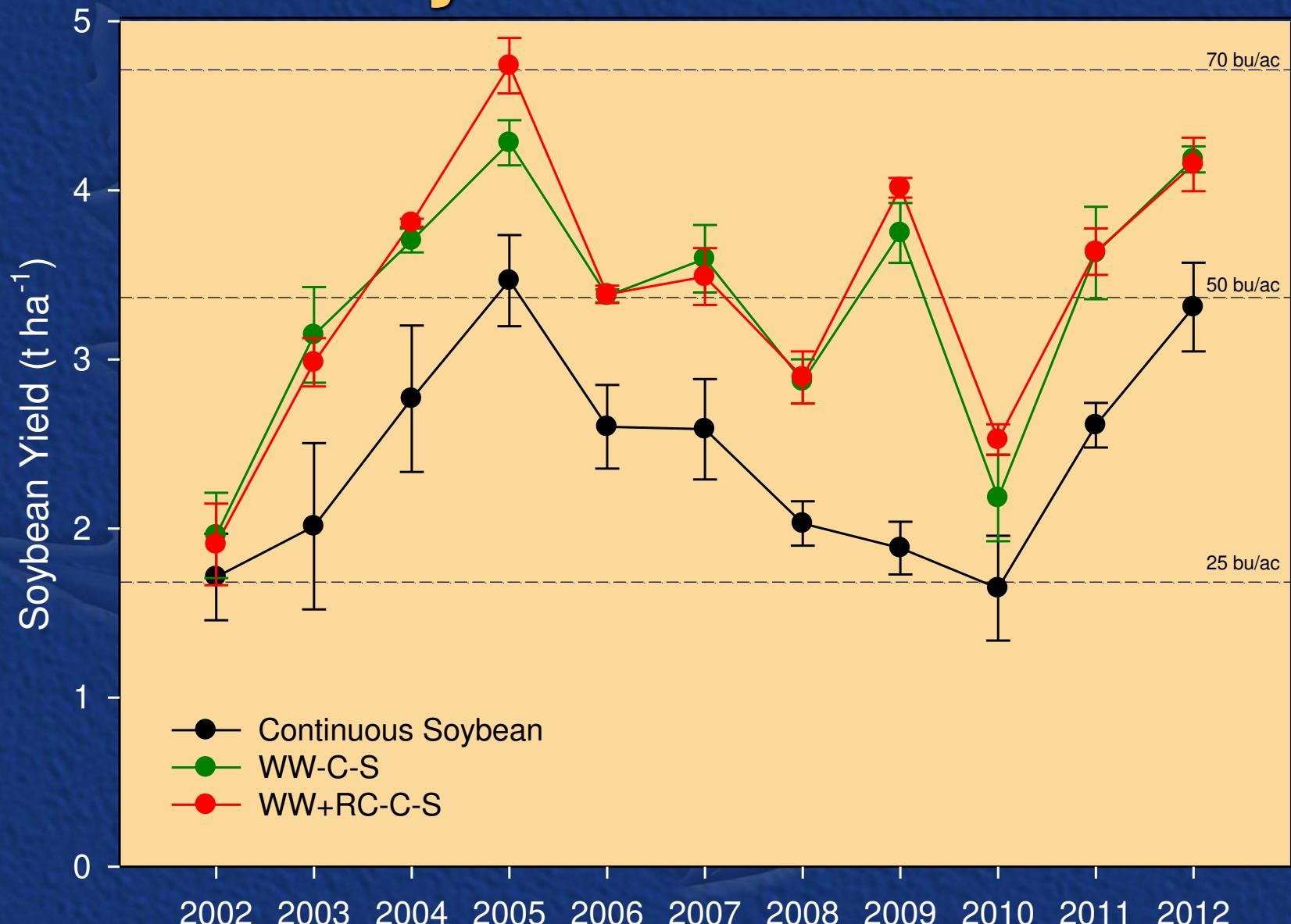


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Soybean Yields

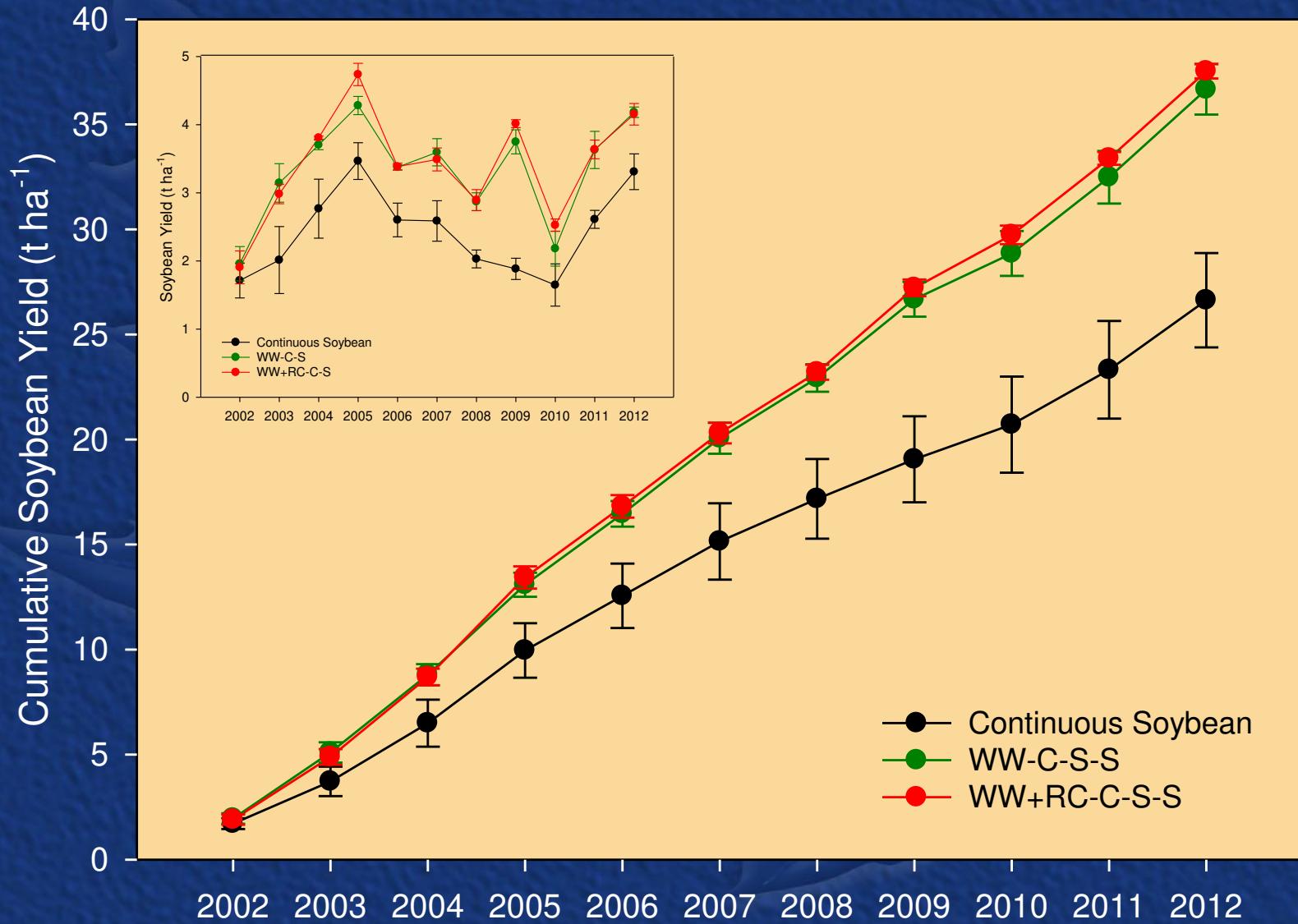


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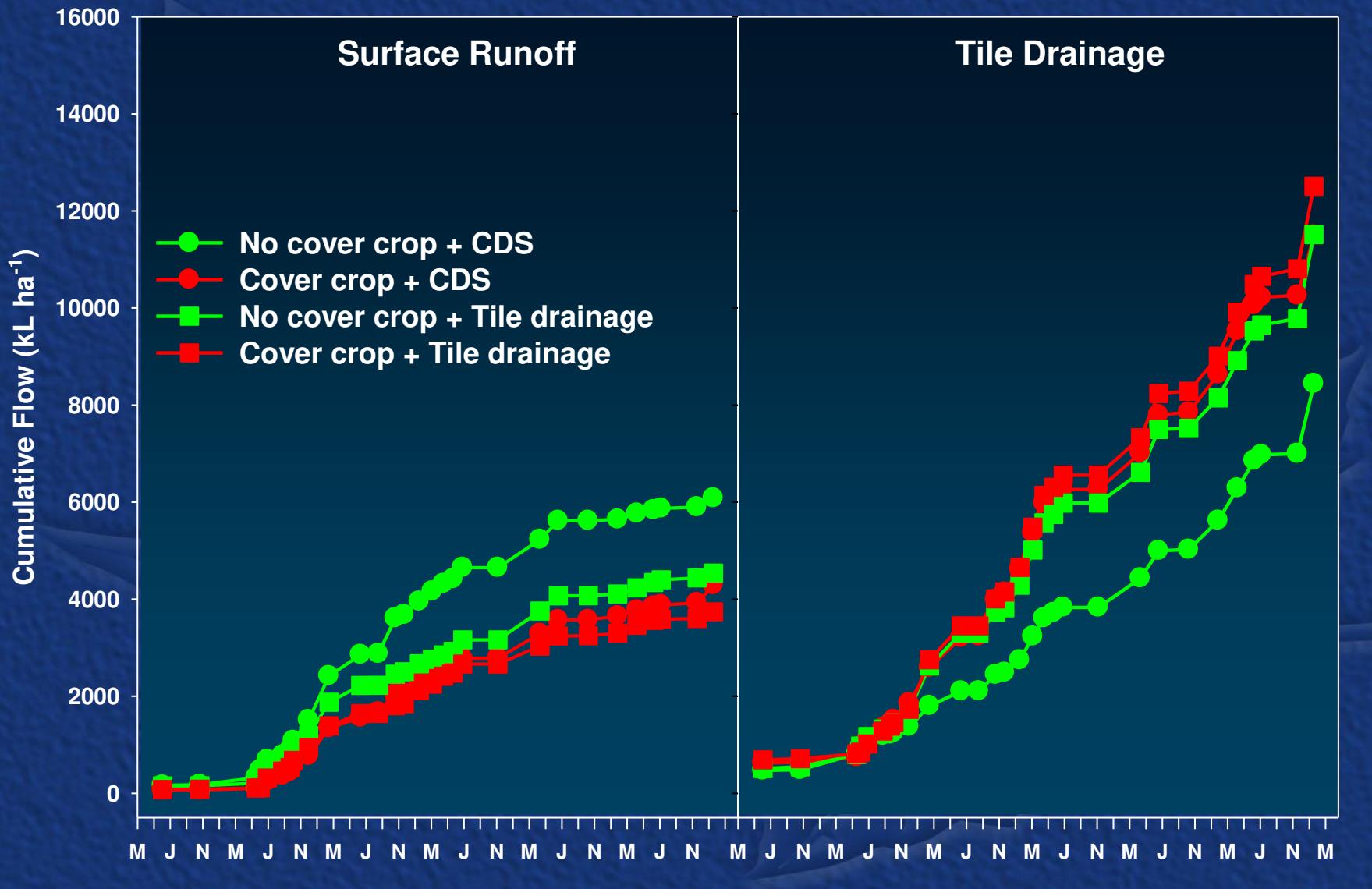
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Cumulative Soybean Yields



Surface Runoff & Tile Drainage Volume

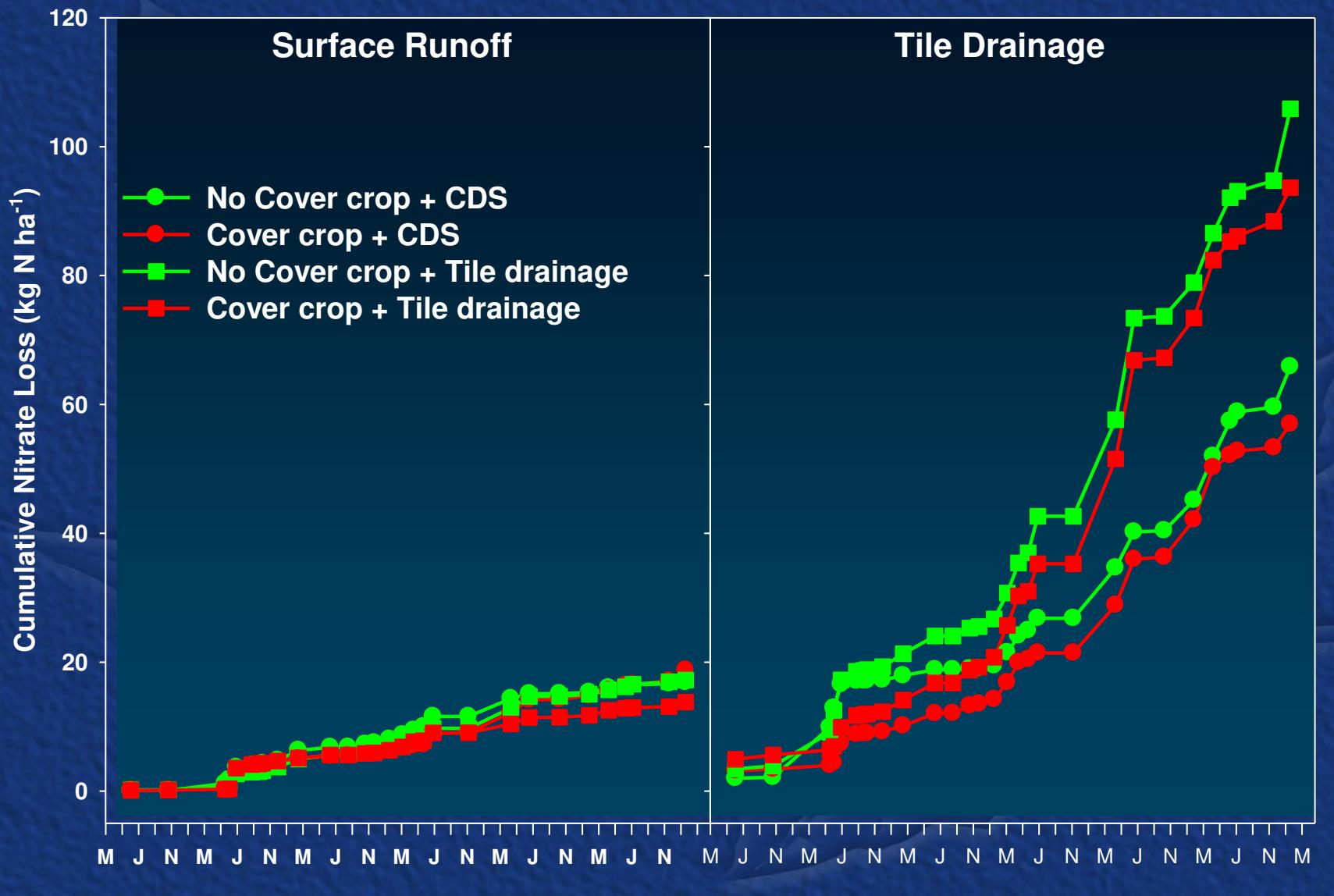


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Nitrate Loss

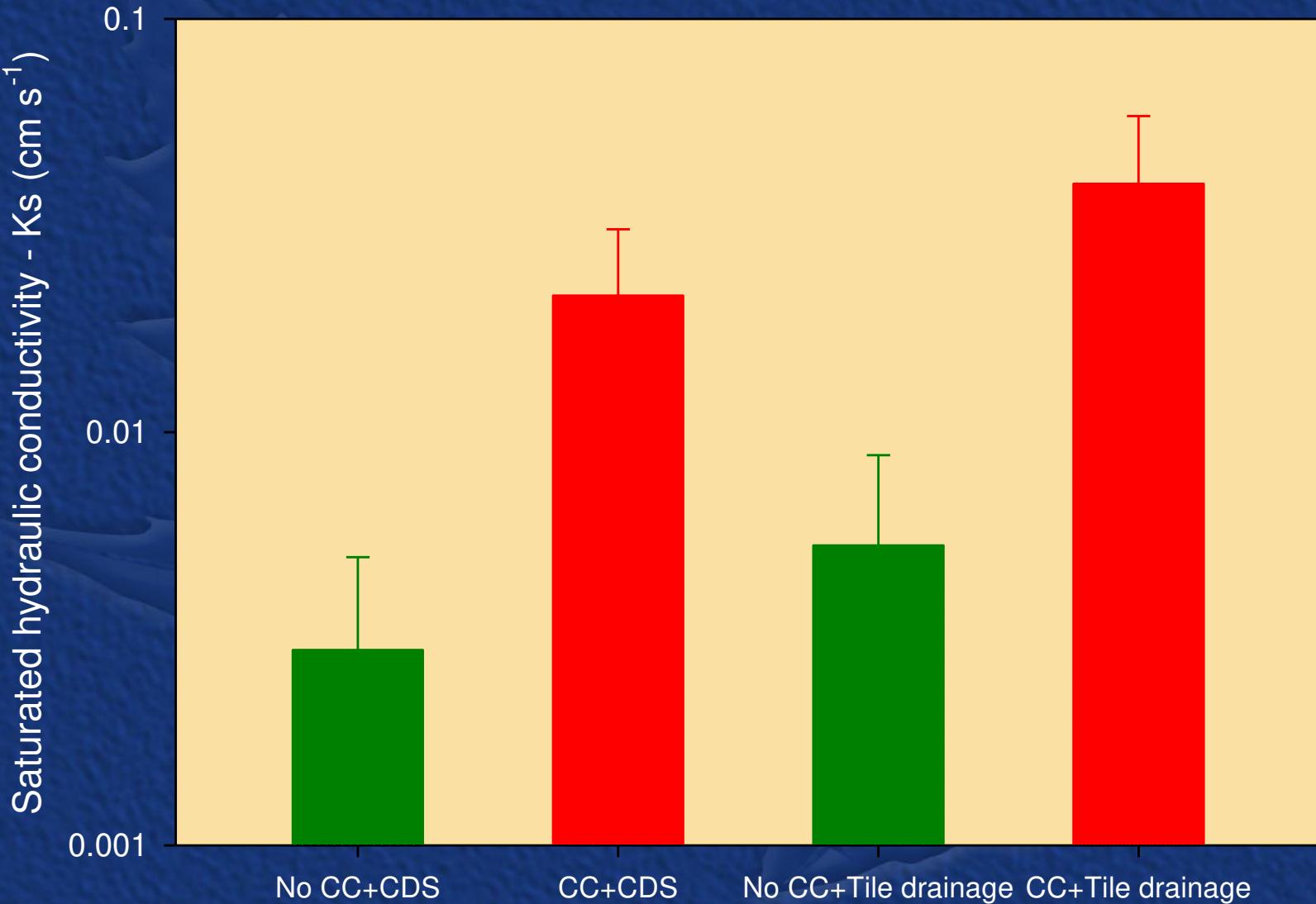


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Saturated Hydraulic Conductivity (k_{sat})

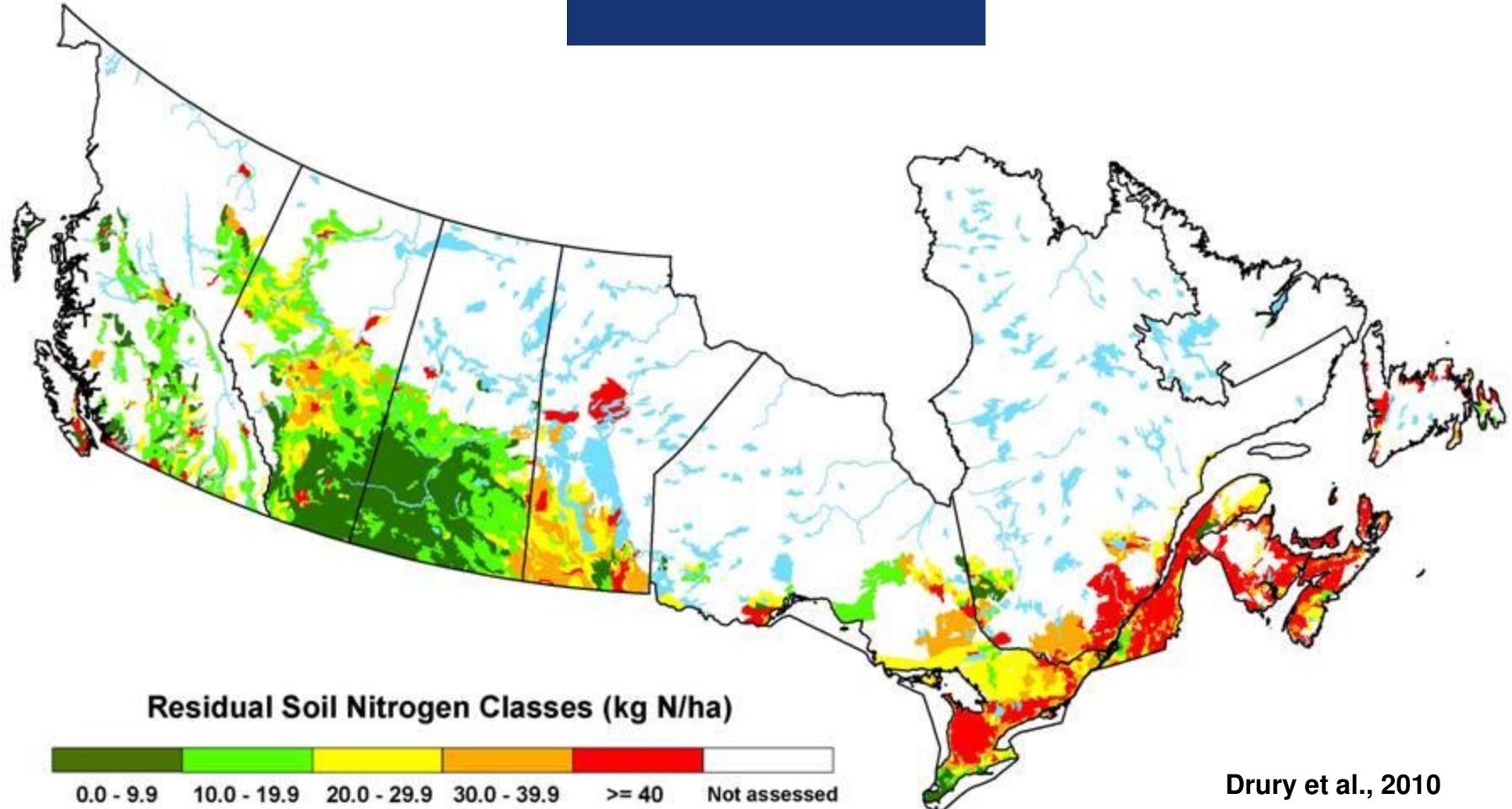


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Residual Soil Nitrogen (2006)



Drury et al., 2010



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Cover crop study (2012)

Treatments

- Control (no cover crop)
- Oats (56 lbs/ac)
- Nitro radish (12 lbs/ac)
- Oilseed radish (12 lbs/ac)
- Yellow mustard (12 lbs/ac)

Planting date: Aug. 20, 2012





SAGES
YELLOW
MUSTARD
2012



SAGES
OATS
2012

SAGES
OILSEED
RADISH

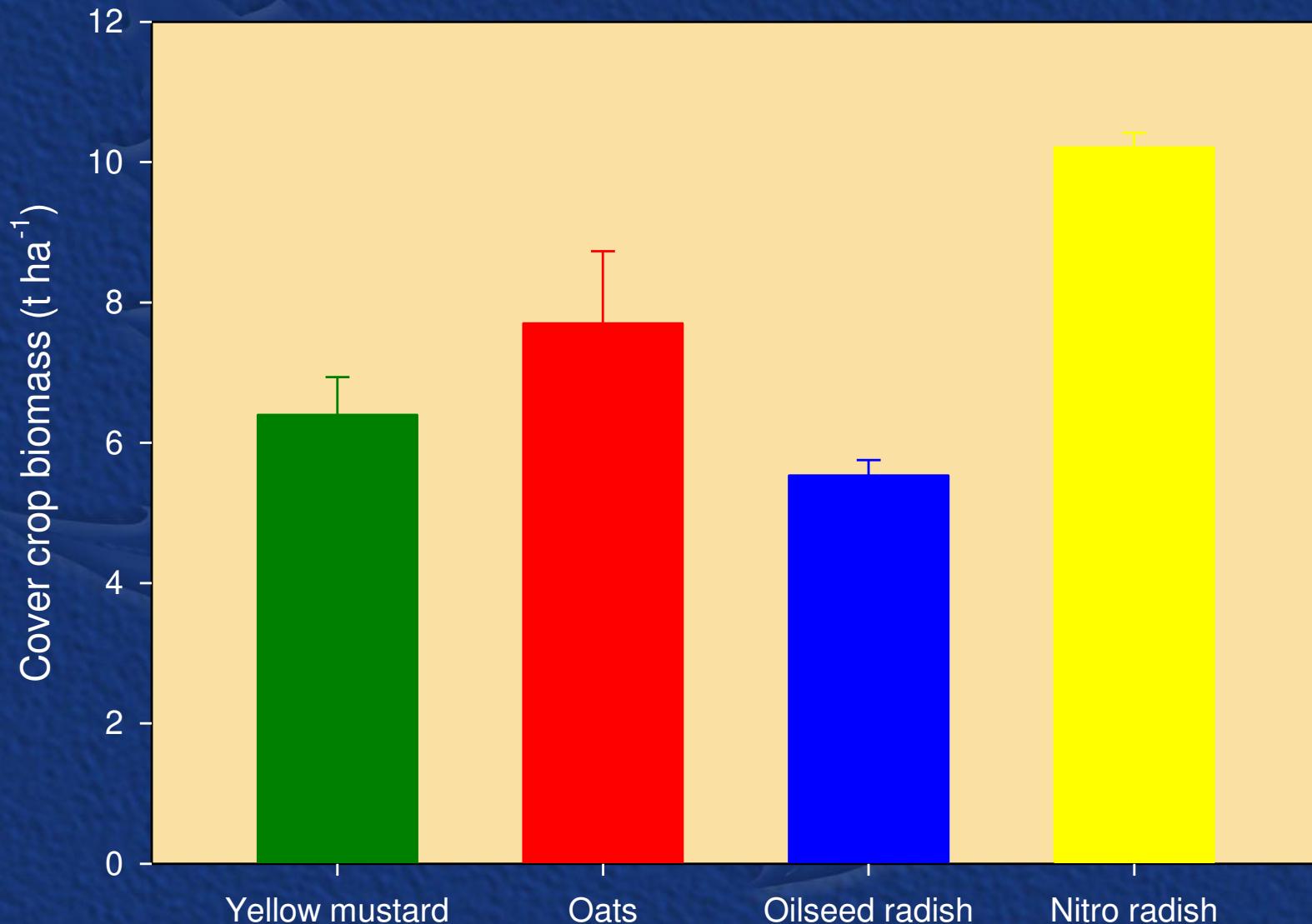
2012



SAGES
NITRO
RADISH
2012

SAGES
NITRO
RADISH
2012

Cover crop biomass - 2012

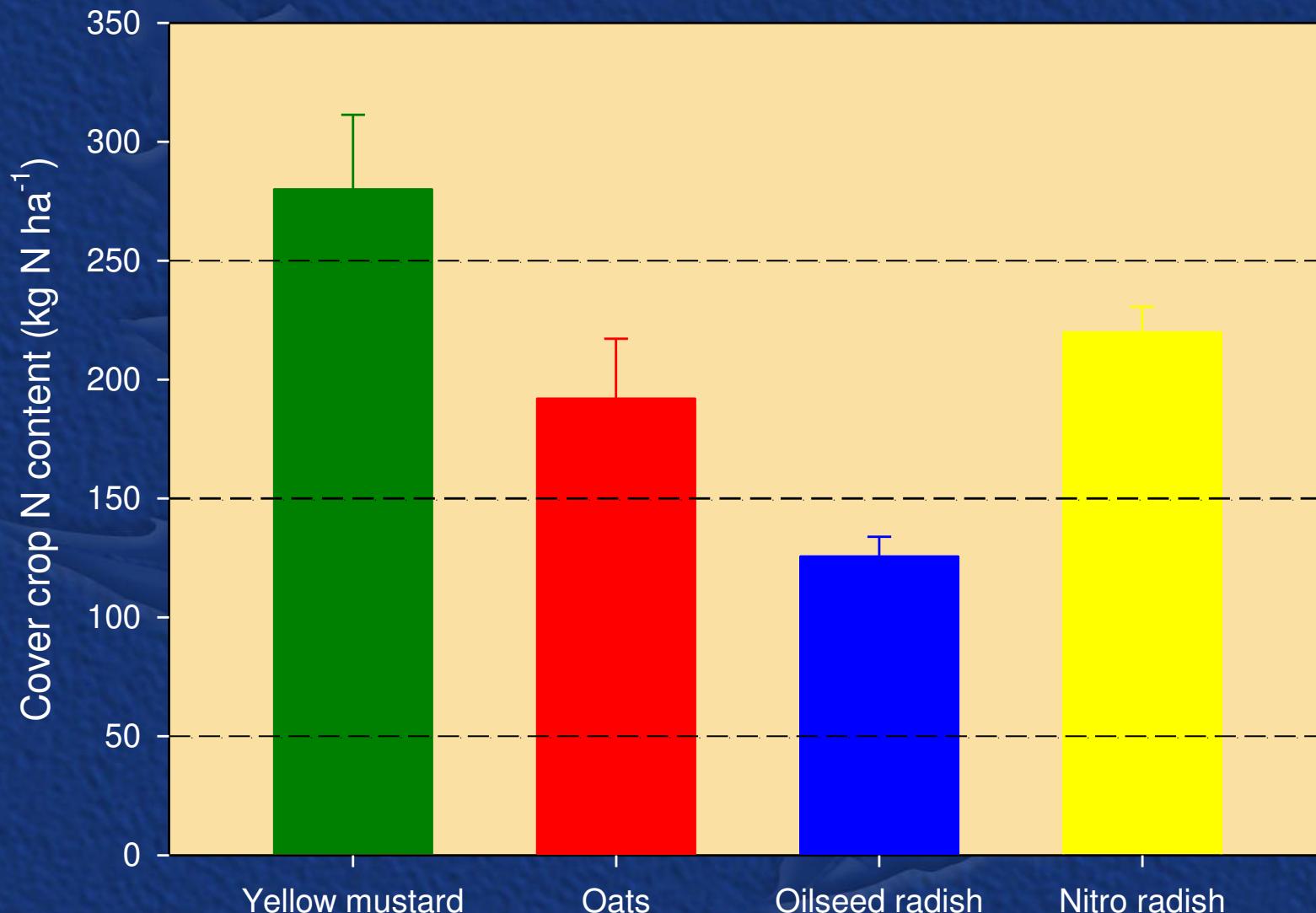


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Cover crop N uptake - 2012



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Cover crop benefits

- ✓ Enhanced crop yields (especially corn)
- ✓ Capture and release of N to the following crop
- ✓ Reduced surface runoff
- ✓ Improved saturated hydraulic conductivity
- ✓ Increased C and N returns to soil
- ✓ Reduced nitrate leaching losses

- ✓ Also note the sizeable benefit of crop rotations in general vs. continuous cropping.



Acknowledgements

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To: Dr. Tom Oloya, John Goerzen, Steve Burtt, Scott Patterson, Joann Gignac for their expert technical assistance.



Thank You!

Future Research

Study 1: Rotations with/without red clover

- Crop yields & N uptake
- Soil organic carbon (SOC)
- Inorganic N leaching/recovery



New Cover Crop Study (2)

Objectives

To determine:

- 1) Crop yields and quality.
- 2) Soil physical quality (soil strength/hardness, soil water storage and transmission, soil aeration, soil physical quality index values);
- 3) SOC & SON amounts, types and profile distributions;
- 4) Nitrate leaching in the soil profile;
- 5) Reductions in synthetic fertilizer requirements;



New Cover Crop Study (2)

Control - No cover crop

Single Species

- Nitro radish (NR)
- Sesbania (SE)
- Phacelia (PH)
- Red clover (RC)

Mixtures

- Nitro radish + phacelia
- Nitro radish + sesbania
- Phacelia + red clover
- Nitro radish + sesbania + phacelia + red clover



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