Results from On-farm N Rate Response Trials

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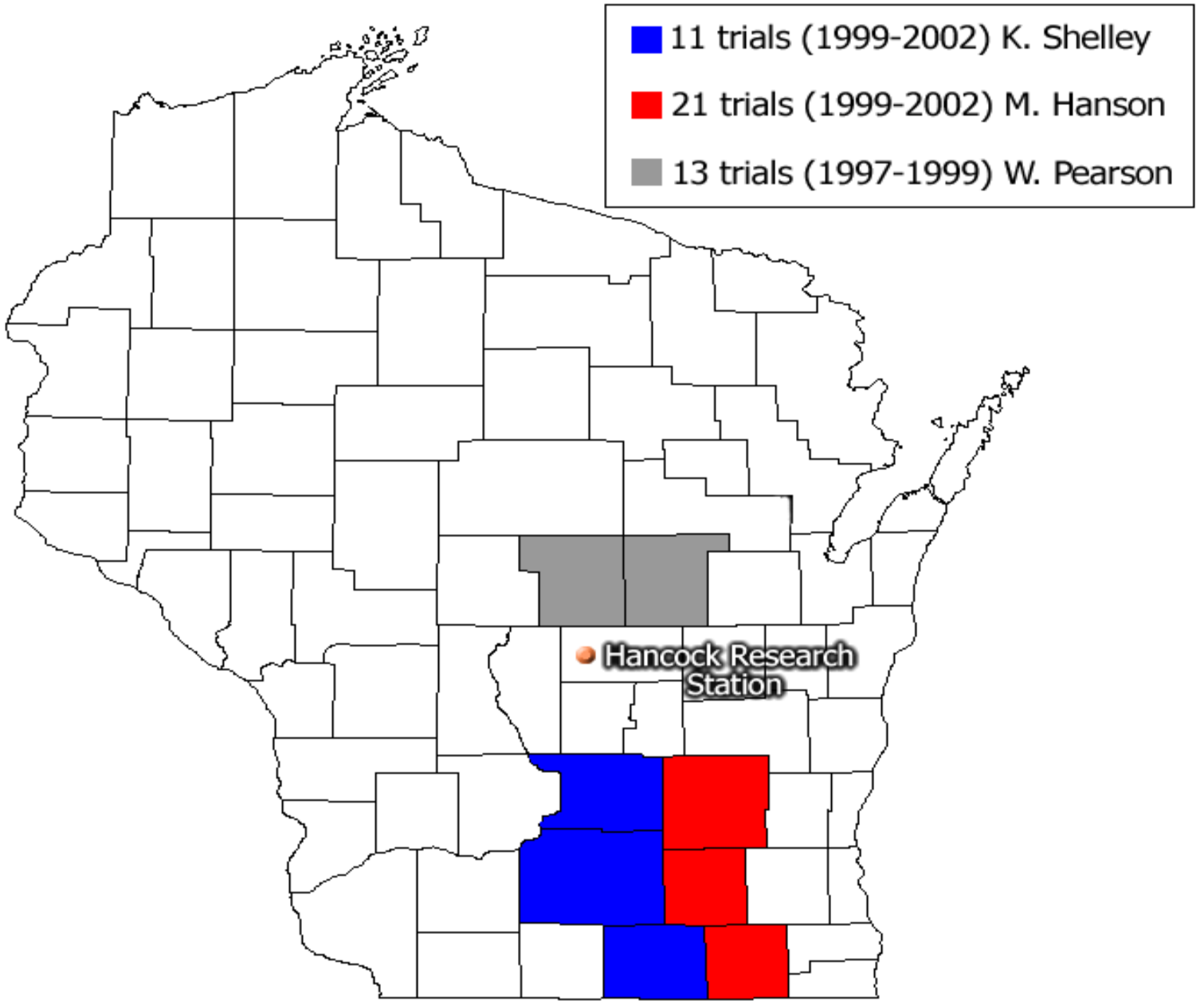
Questions?

- Are N rate recommendations too low?
- High yield producers use higher rates.
- Are yields held back by N rates that are too low?

Nitrogen Rate and Timing Studies - Wisconsin

- Jefferson, Dodge, Walworth Cos.- Matt Hanson
  - Silt loam soils
  - 21 expts. 1999-2002, Soybean/corn, corn/corn
- South Central Wis. – Kevin Shelley, NPM program
  - Silt loam soils
  - 11 trials, 1999-2002, Soybean/corn, corn/corn
- Portage & Waupaca Cos. – Bill Pearson
  - Sandy loam soils
  - 13 Expts. , 1997-1999, Alfalfa/corn; corn/corn

Locations of on-farm nitrogen rate response experiments



Nitrogen Recommendations for Corn

Organic matter	Sands & loamy sand		Other soils	
			Yield Potential	
	Irrigated	Non-irrigated	Med/low	Very high/high
---%---	----------lb N/acre----------			
<2	200	120	150	180
2-9.9	160	110	120	160
10-20	120	100	90	120
>20	80	80	80	80

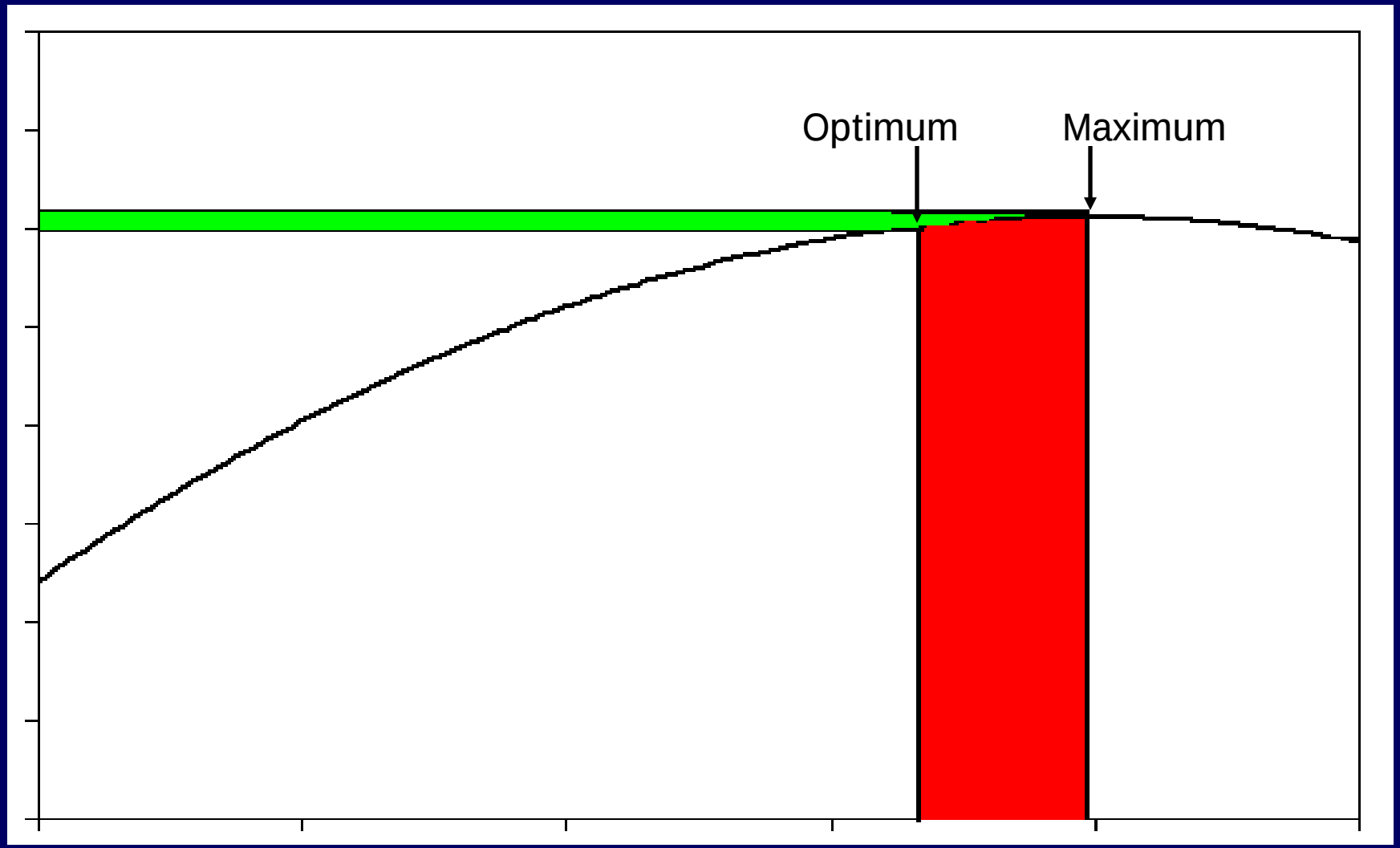
Optimum N Rate for Corn

- Soil-specific characteristic
- Not affected by annual variations in yield
- Year-specific adjustments for soil nitrate and organic N inputs needed

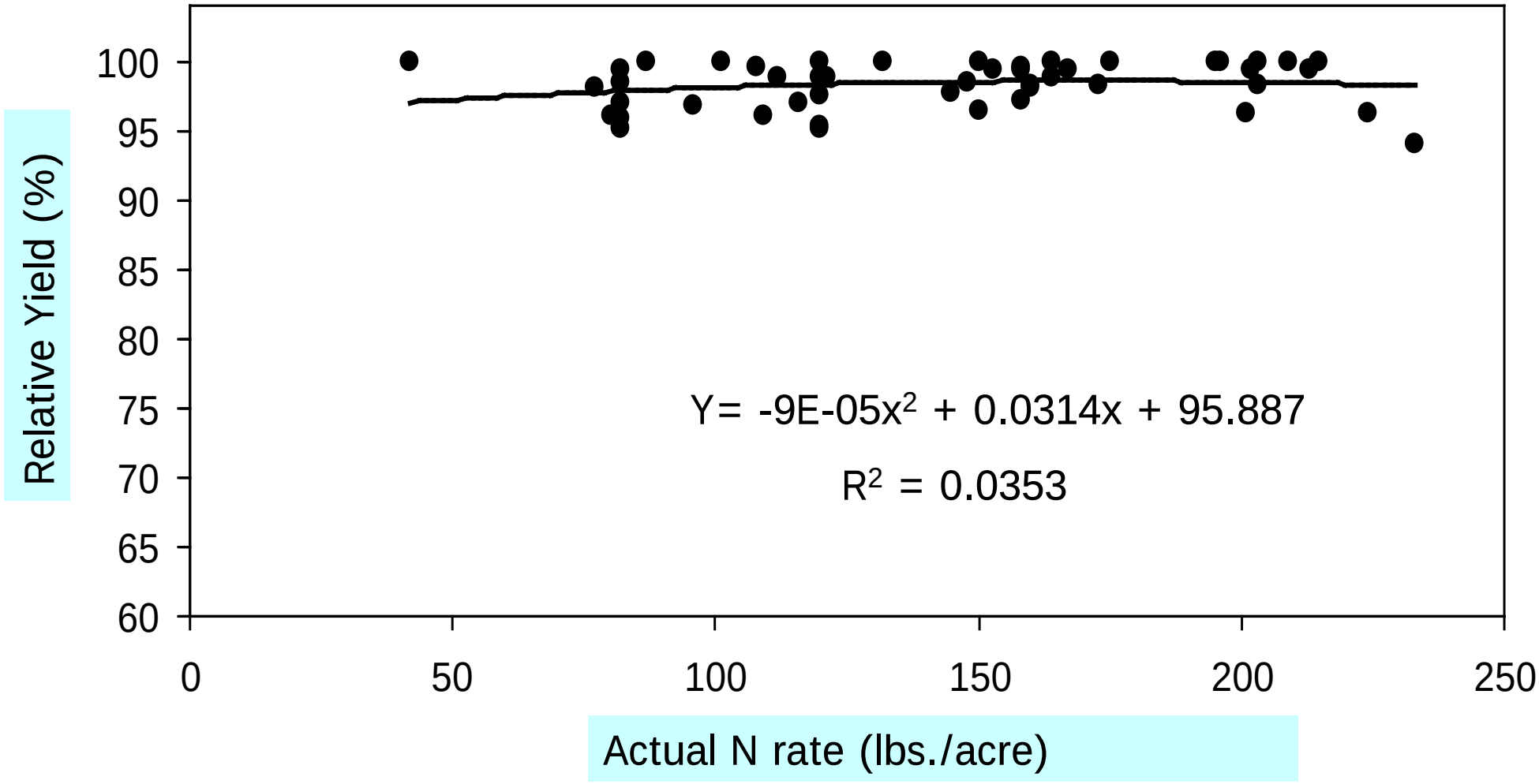
Adjustments to Base N Rates

- Nitrogen Credits
  - Legumes
  - Manure
- Soil nitrate tests
- Tillage/residue adjustment

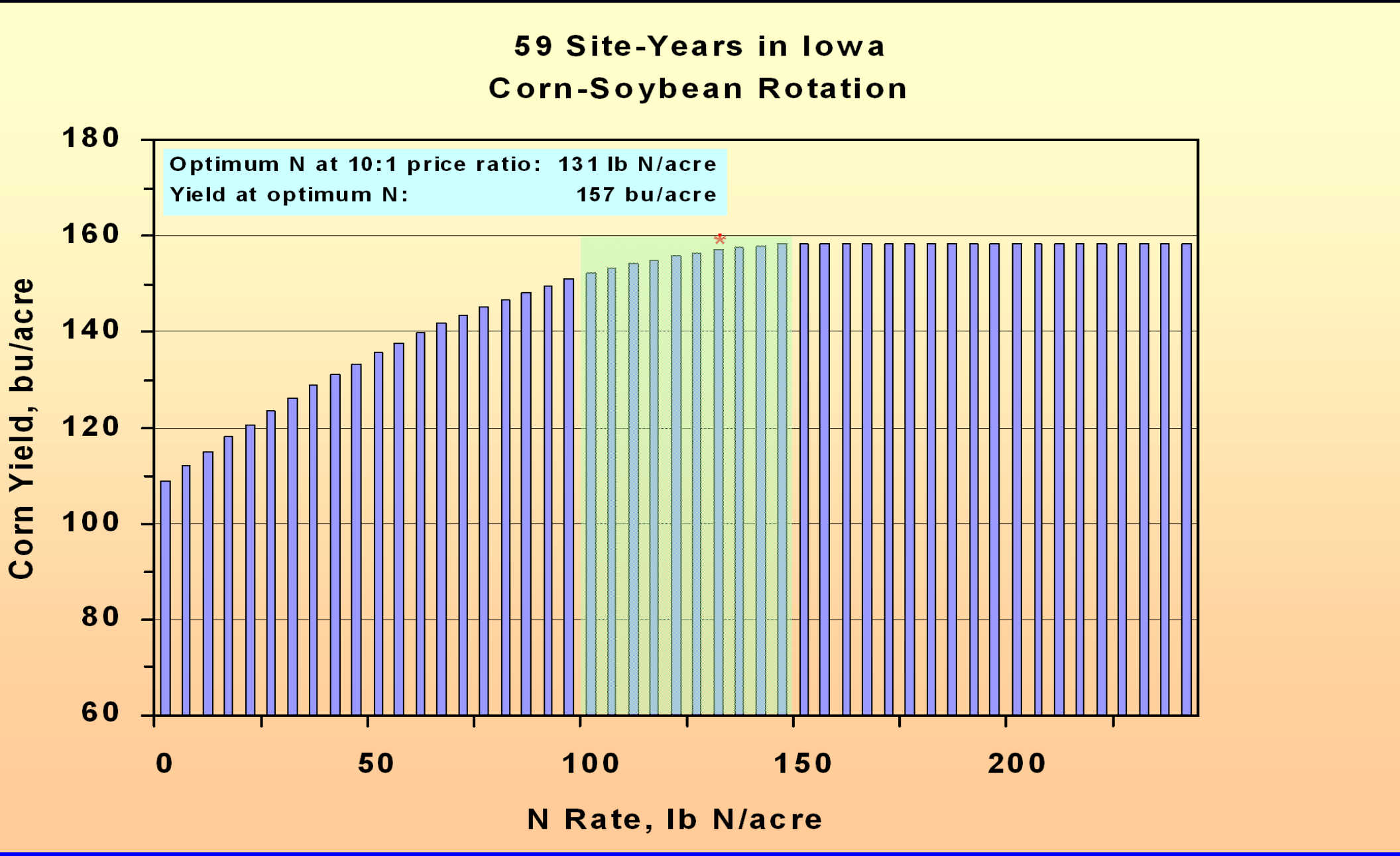
Maximum and optimum levels for yield response to applied N



Nitrogen rate effects on corn relative yield following soybean. 12 trials, Dodge, Jefferson, Walworth Cos., 1999-2001.



Data from M..Hanson, Jefferson Co.

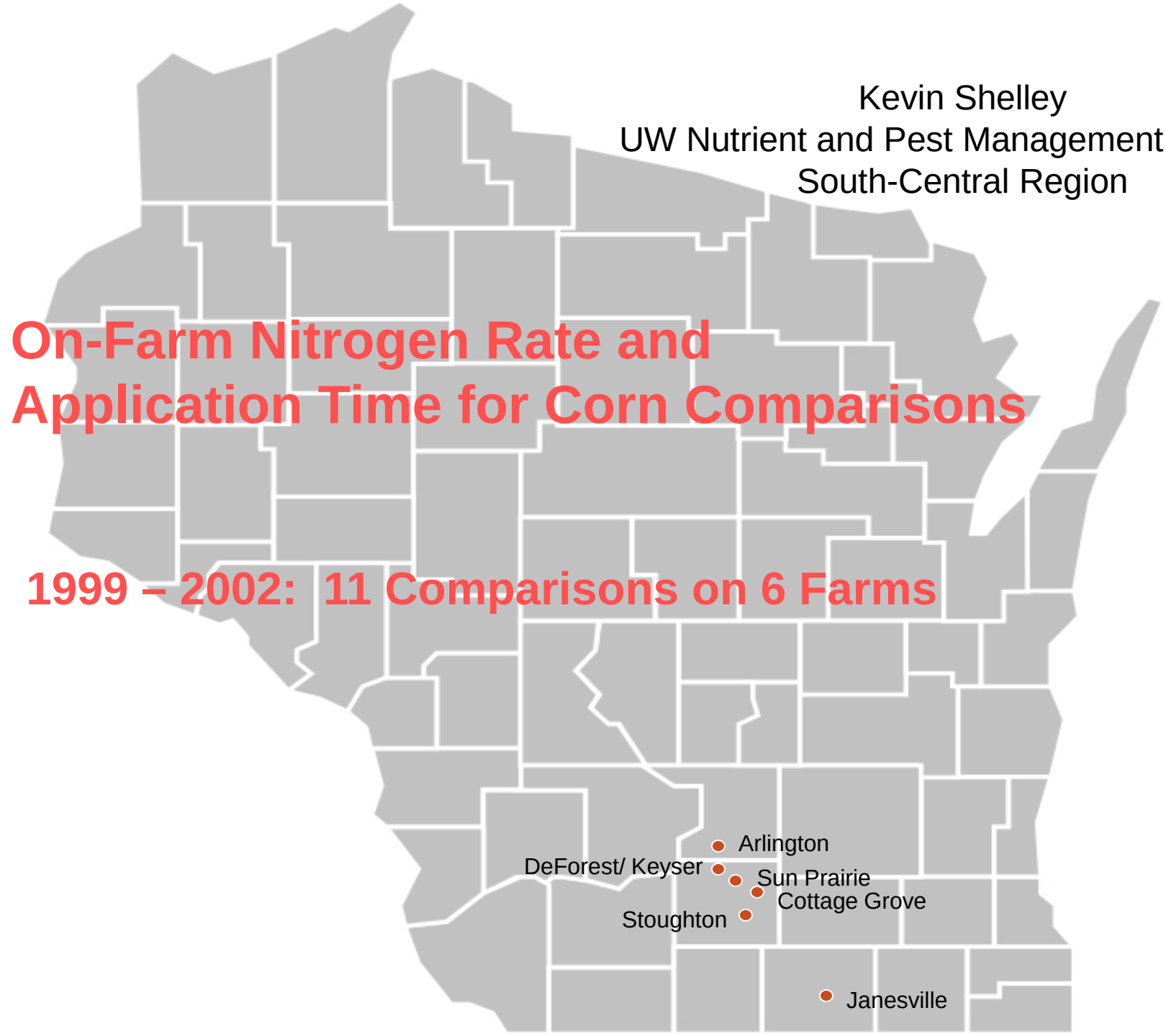


J.E. Sawyer, Iowa State Univ., 2003

Kevin Shelley
UW Nutrient and Pest Management Program
South-Central Region

On-Farm Nitrogen Rate and Application Time for Corn Comparisons

1999 – 2002: 11 Comparisons on 6 Farms



Corn response to preplant and sidedress N, Sun Prairie, 2001. Corn after soybeans

Reps	Preplant N (82-0-0)	Sidedress N (28% UAN)	Total N (lbs/acre)	Average Yield (bu/acre)	Marginal* Return ($/acre)
2	0	120	120	215	370.12
2	0	150	150	210	352.00
3	150	30	180	207	341.85

* Corn price = $1.90/bu; N = $.23/lb (82-0-0), $.30/lb (28% UAN);
Preplant N application = $5/acre; sidedress N application at cultivation = $2/acre ; Ringwood silt loam, 3.2% OM

Corn response to N rates and timing, Stoughton, 2002 . Corn after corn.

Reps	Fall N (82-0-0)	Spring PrepInt N (82-0-0)	Sidedress N (28% UAN)	Total N* (lbs/acre)	Average Yield (bu/acre)	Marginal** Return ($/acre)
2	0	170	0	175	195	411.75
2	0	170	40	215	194	399.78
2	180	0	0	185	183	376.10
2	180	0	40	225	186	373.58

* 5 lbs N credited from starter

** Corn price = $2.25; N = $.15/lb (82-0-0), $.21/lb (28% UAN);

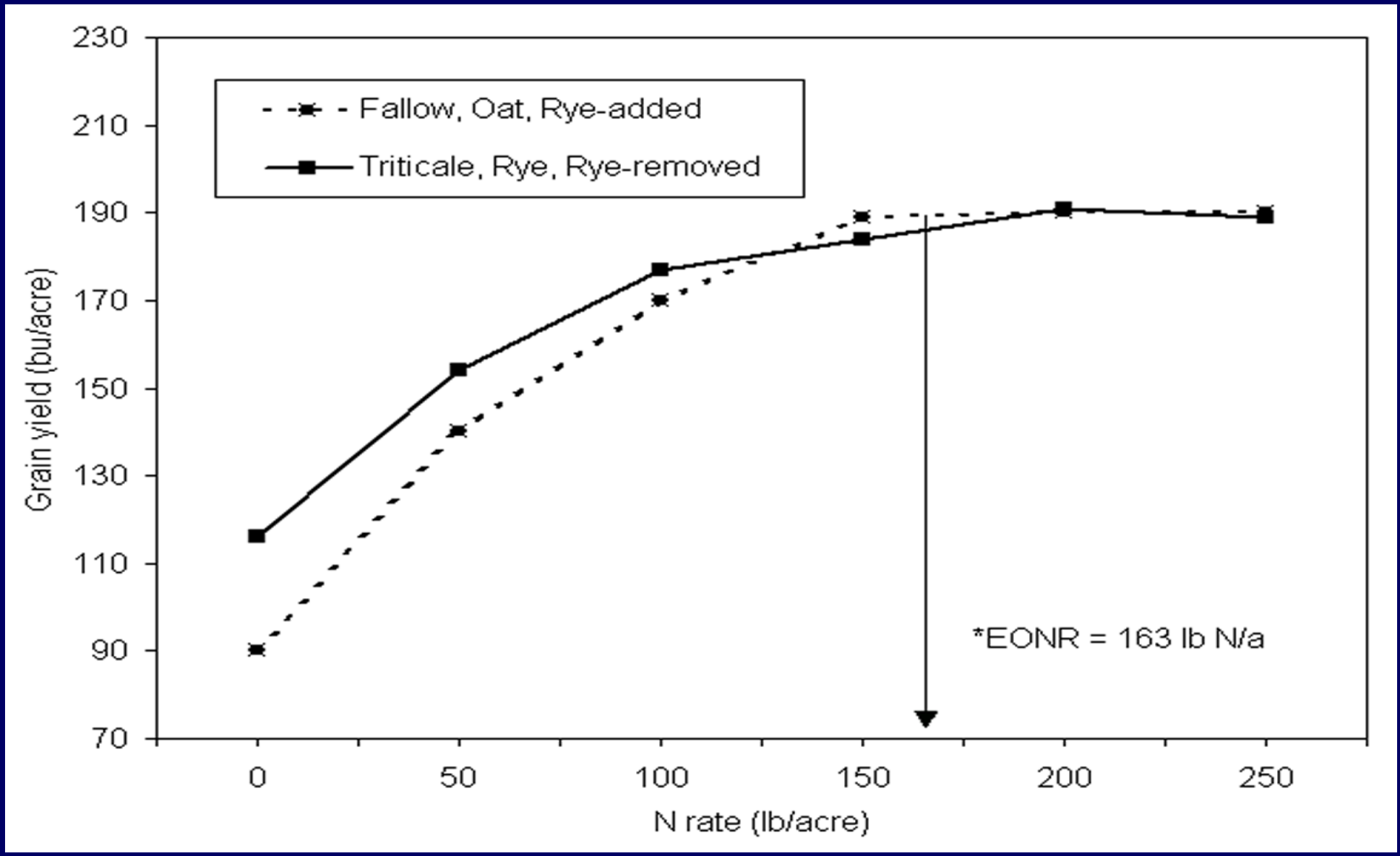
Sidedress N application at cultivation = $2/acre. Plano silt loam = 2.9% OM

Optimum N rates and corn yields at six locations on sandy loam soils, Waupaca & Portage Cos. 1998-99

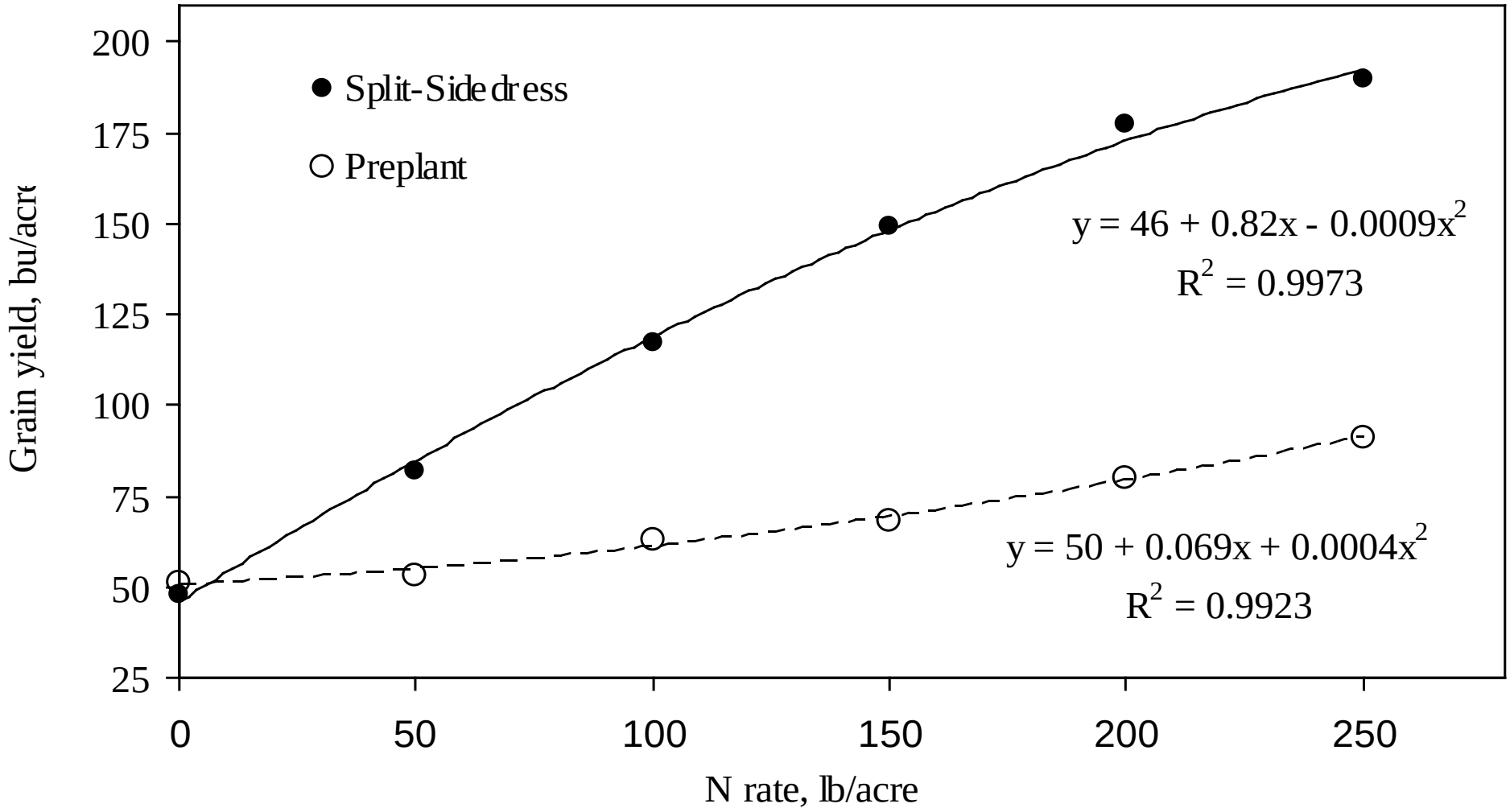
Year	Recom.	EONR	Yield @ ONR
	---------- lb N/acre ----------		bu/acre
1998 (I)	200	142	192
1998 (I)	200	200	208
1998	120	137	178
1999	120	86	168
1999	120	141	166
1999	120	58	167

All sites corn/corn; (I) = irrigated; N applied sidedress. Data from Bill Pearson

Corn yield response to N rate , Hancock, 2001. (EONR=economic optimum N rate)



Effect of N timing on the relationship between N rate and corn grain yield, Hancock 2002.



N Source/timing and N rate effects on corn grain yield at Hancock, WI, 2003

N source	N timing	N rate, lb/acre 100	150	200	250	Mean
		----- grain yield, bu/acre -----				
PCU	PP	203	199	208	219	208
	PP + 4 wk	183	203	206	198	198
Am. Sulfate	4 wk & 8 wk	175	184	204	189	188
	Mean	187b	195ab	206a	202a	

No N control = 107 bu/acre

EONR = 188 lb N/acre, Yield @ EONR = 206 bu/acre

Recommended Timing of Nitrogen Applications for Corn

Soil	Fall	Preplant	Sidedress
Medium/Fine Texture Well-Drained	OK*	Optimum	OK
Medium/Fine Texture Poorly Drained	No	OK	Optimum
Coarse texture	No	No	Optimum

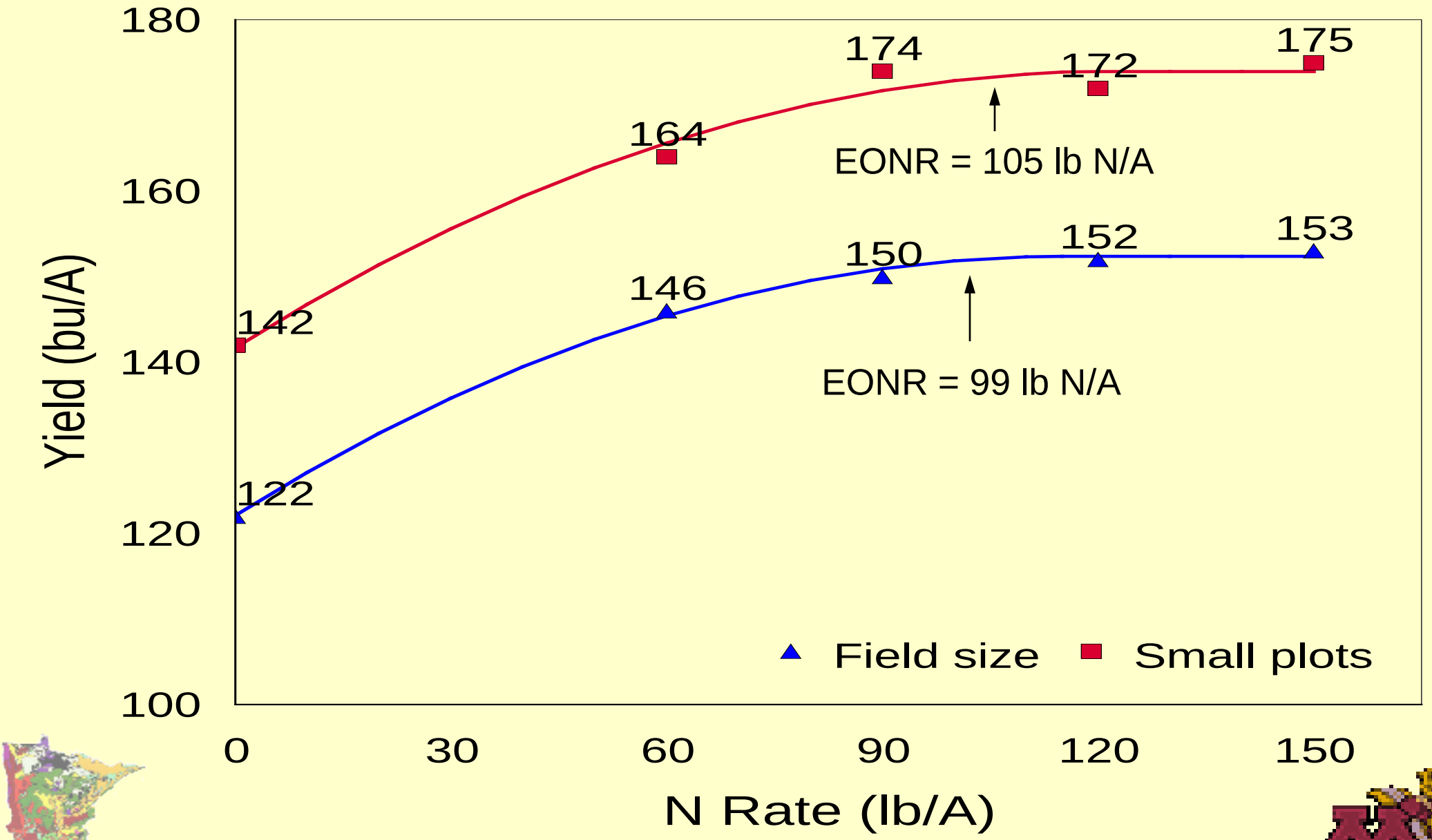
*Includes use of BMPs for fall-applied N.

Minnesota on-farm N response trials

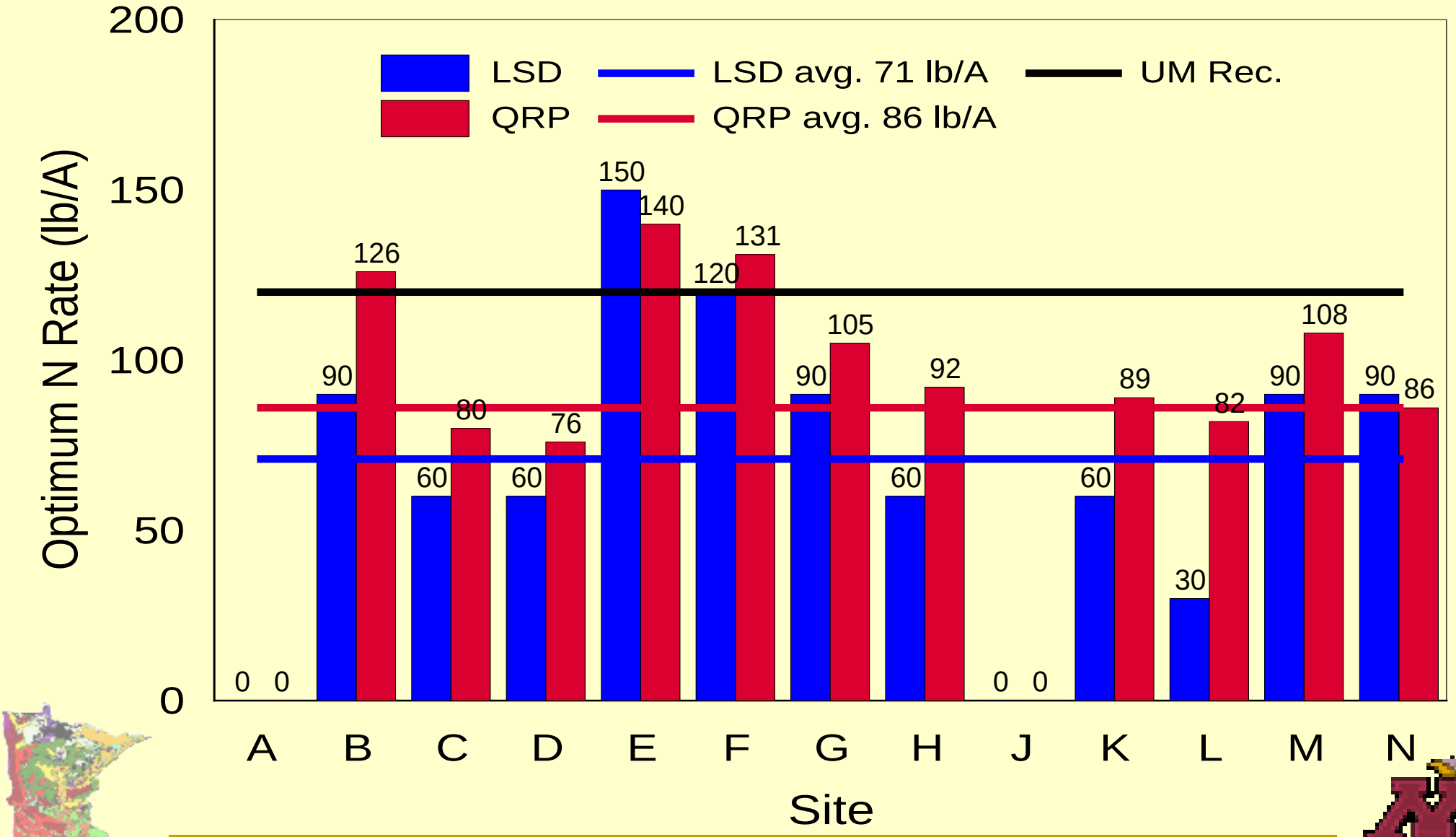
- N rates (7) 0-180 lb N/acre
- Small plot trials (14) 1989-1999
  - Corn after soybean
  - SE & SC Minnesota
- Field-size strip studies (15) 1997-2001
  - Corn after soybean
  - SC Minnesota

Randall et al., 2003

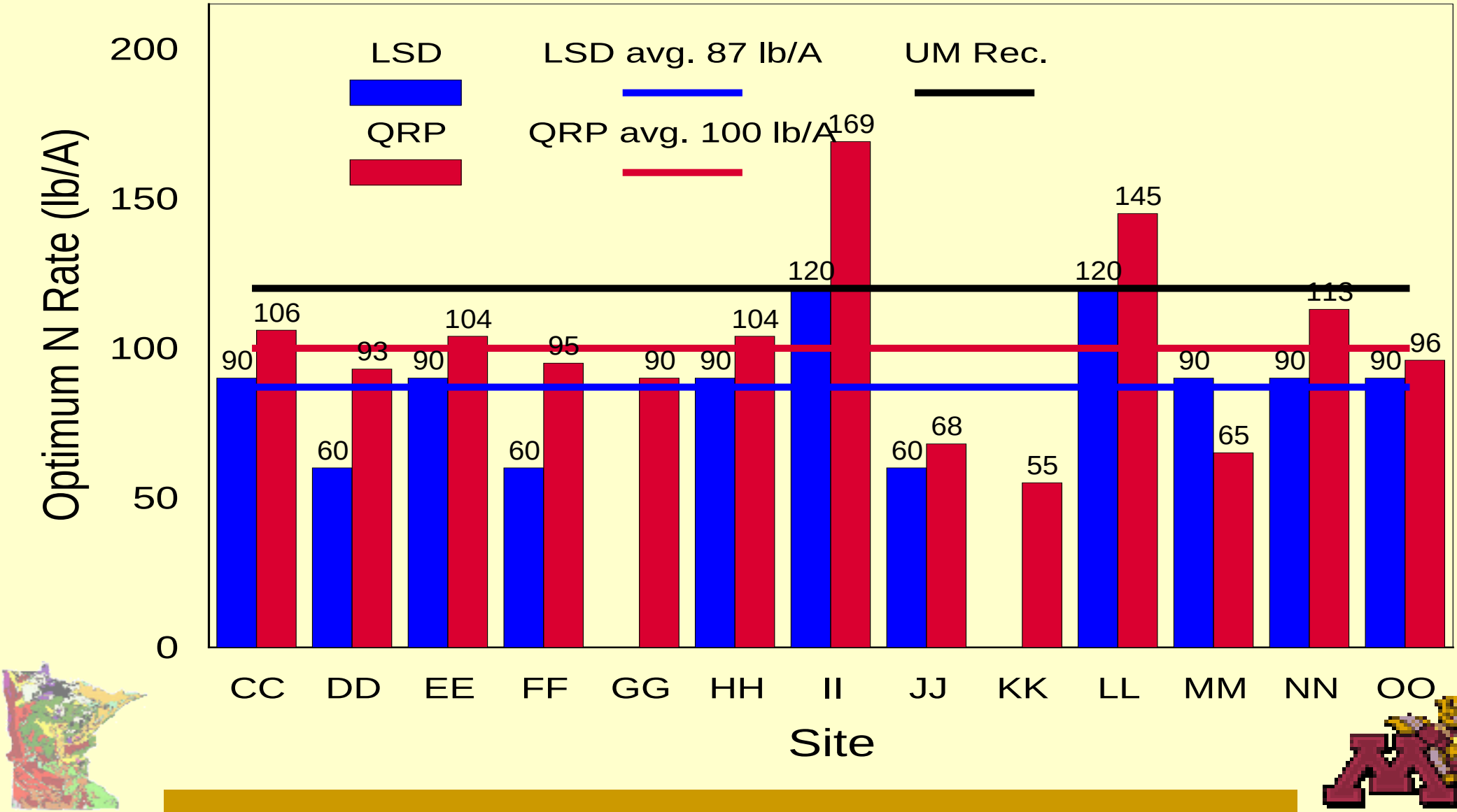
EONR from 13 small-plot and 13 field-size studies.



Optimum fertilizer N rates using the LSD (0.10) and QRP statistical models for 13 small-plot sites.



Optimum fertilizer N rates using the LSD (0.10) and QRP statistical models for field-size sites.



Summary

- On farm N response trials in Wisconsin support current N recommendations
- Response data indicate recommended rates are usually higher than observed optimum
- Similar findings in IA and MN

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