Illinois Fertilizer & Chemical Association

Supply • Service • Stewardship

Est. 1965

IFCA's Mission Statement: **To assist and represent the crop production supply and service industry while promoting the sound stewardship and utilization of agricultural inputs**

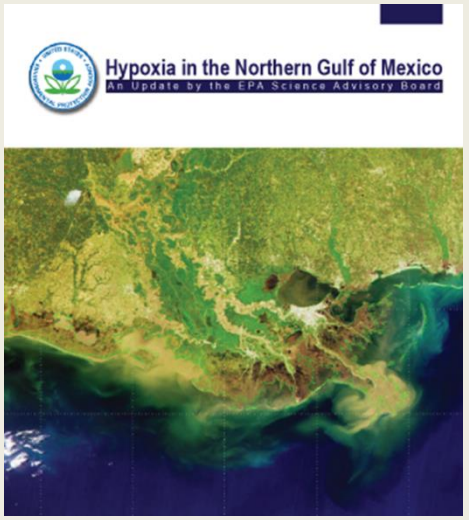
1,100+ members statewide including:

- Ag Retailers
- Fertilizer & Pesticide Manufacturers and Distributors
- Equipment Suppliers
- Input Transporters

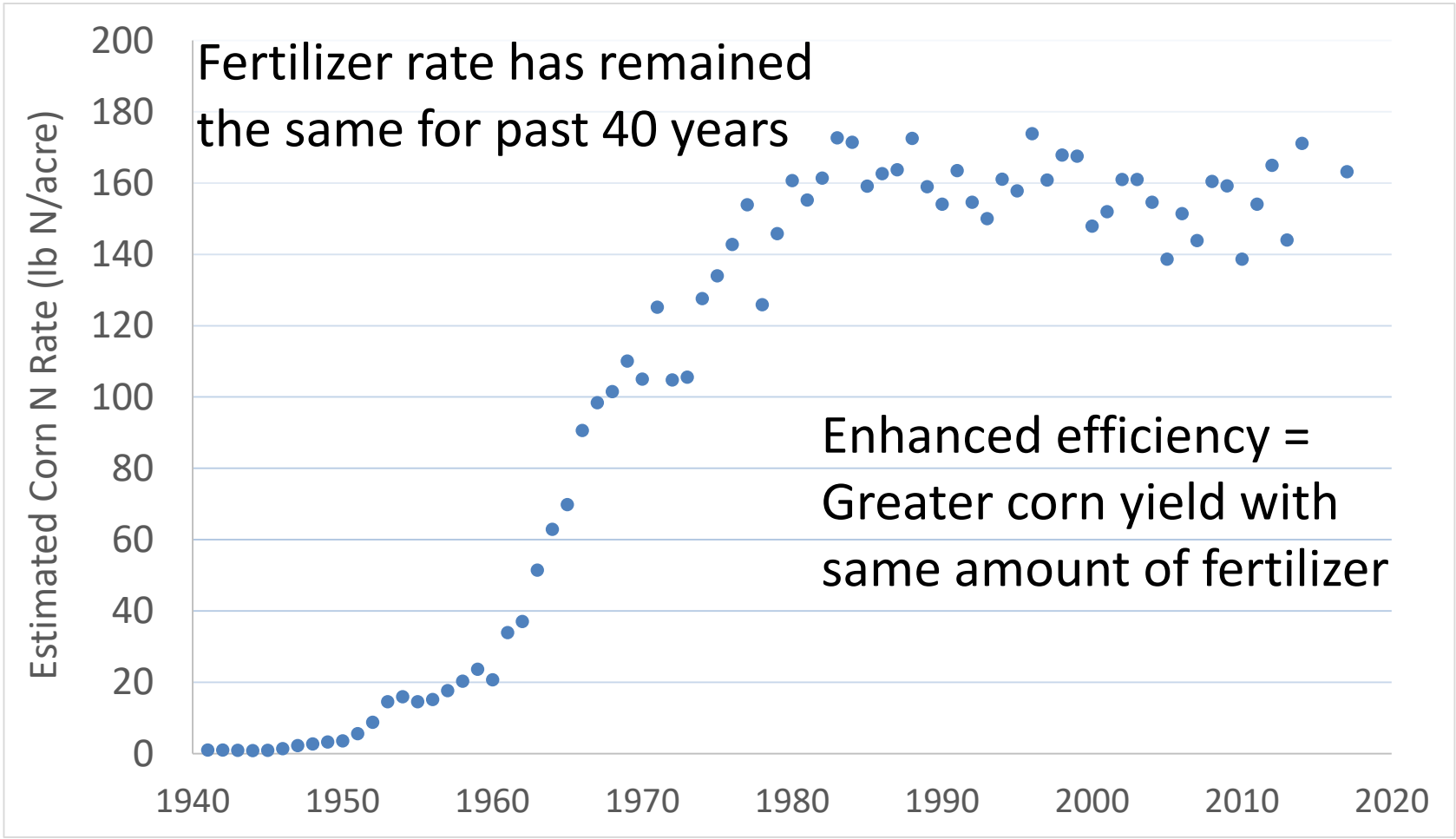
Illinois Ammonia (NH3) Distribution System
Pipeline, River and Rail

Water Quality Challenges

- Gulf of Mexico Hypoxia
- Surface Water Drinking Supplies – High Nitrates when N Utilization is Poor
- Pressure to Ban Fall Applied Nitrogen Assuming it is Major Source of Loss (50% fall applied)
- Weather Impacts Everything

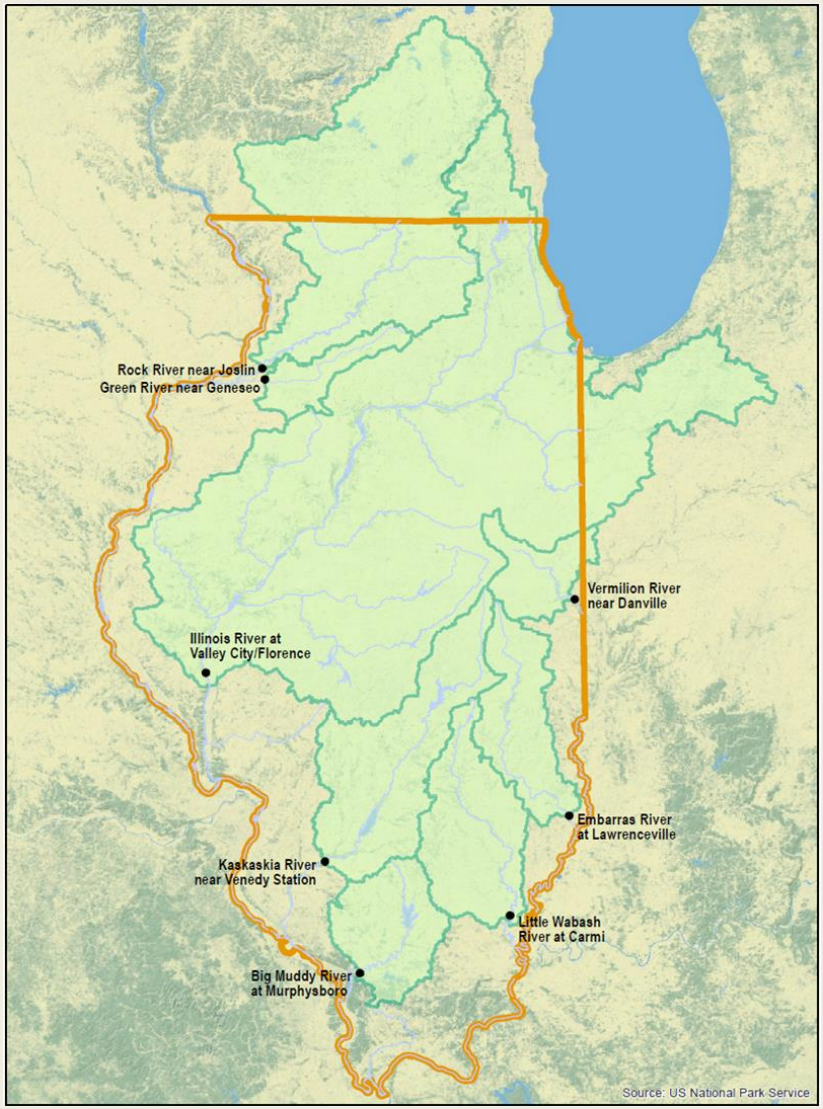


Illinois Nitrogen Fertilizer Use



Adapted from IL Department of Agriculture

Real-time Monitoring
-Flow
-Nitrate
-Total Phosphorus



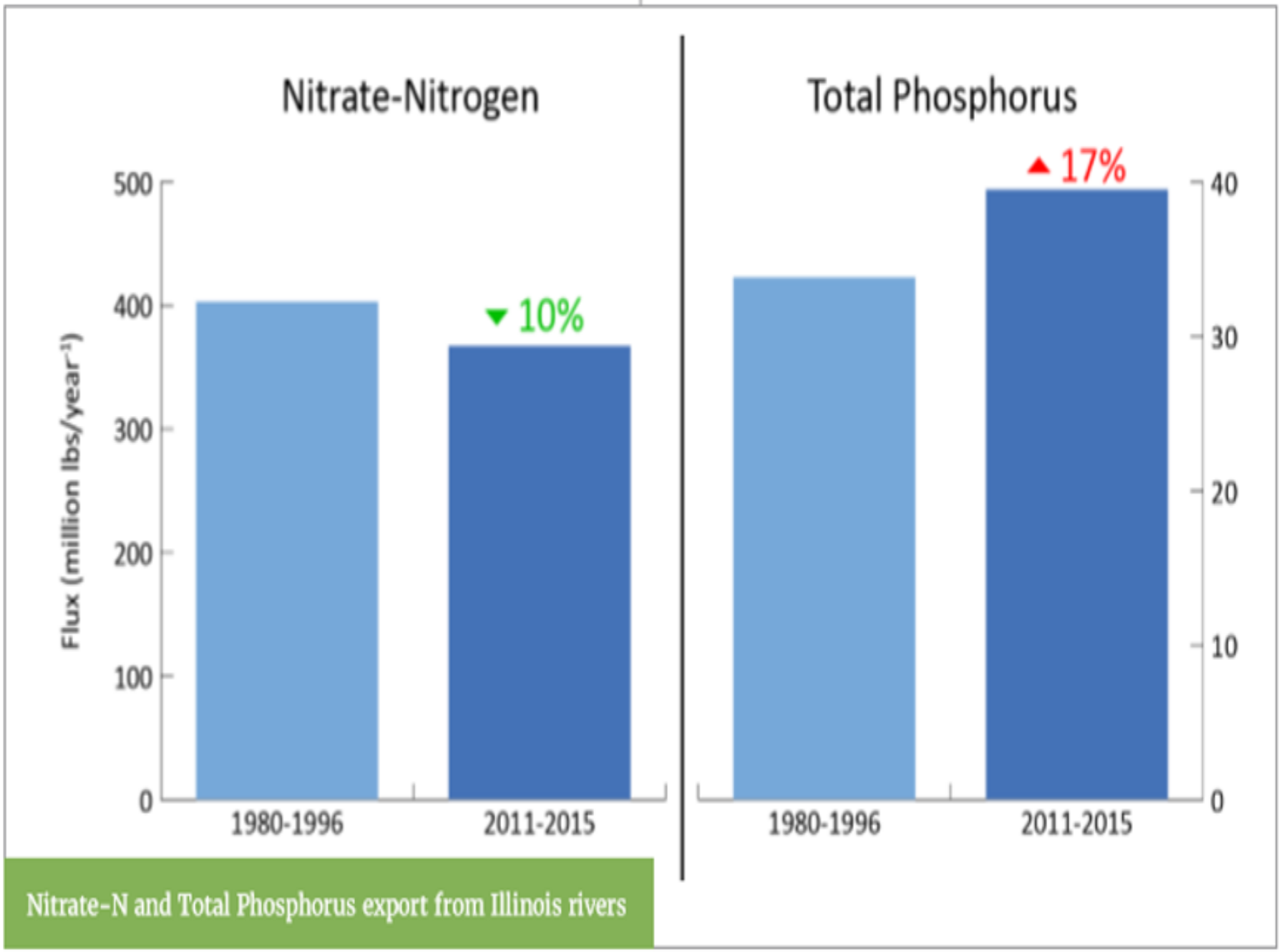
By 2025: We Must Reduce Nitrate Losses by 15% and P Losses by 25%

Agriculture's 15% N reduction equates to:

*** 50 million lbs of N or 25,000 tons N;**

*** To meet P reduction goal is approximately 2,000 tons P**

The 4Rs are showing promise in reducing losses to water when voluntarily adopted over many acres.



Nitrate-N and Total Phosphorus export from Illinois rivers

IL Nutrient Science Advisory Committee

Recommendations for numeric nutrient criteria and eutrophication standards for Illinois wadeable streams and rivers

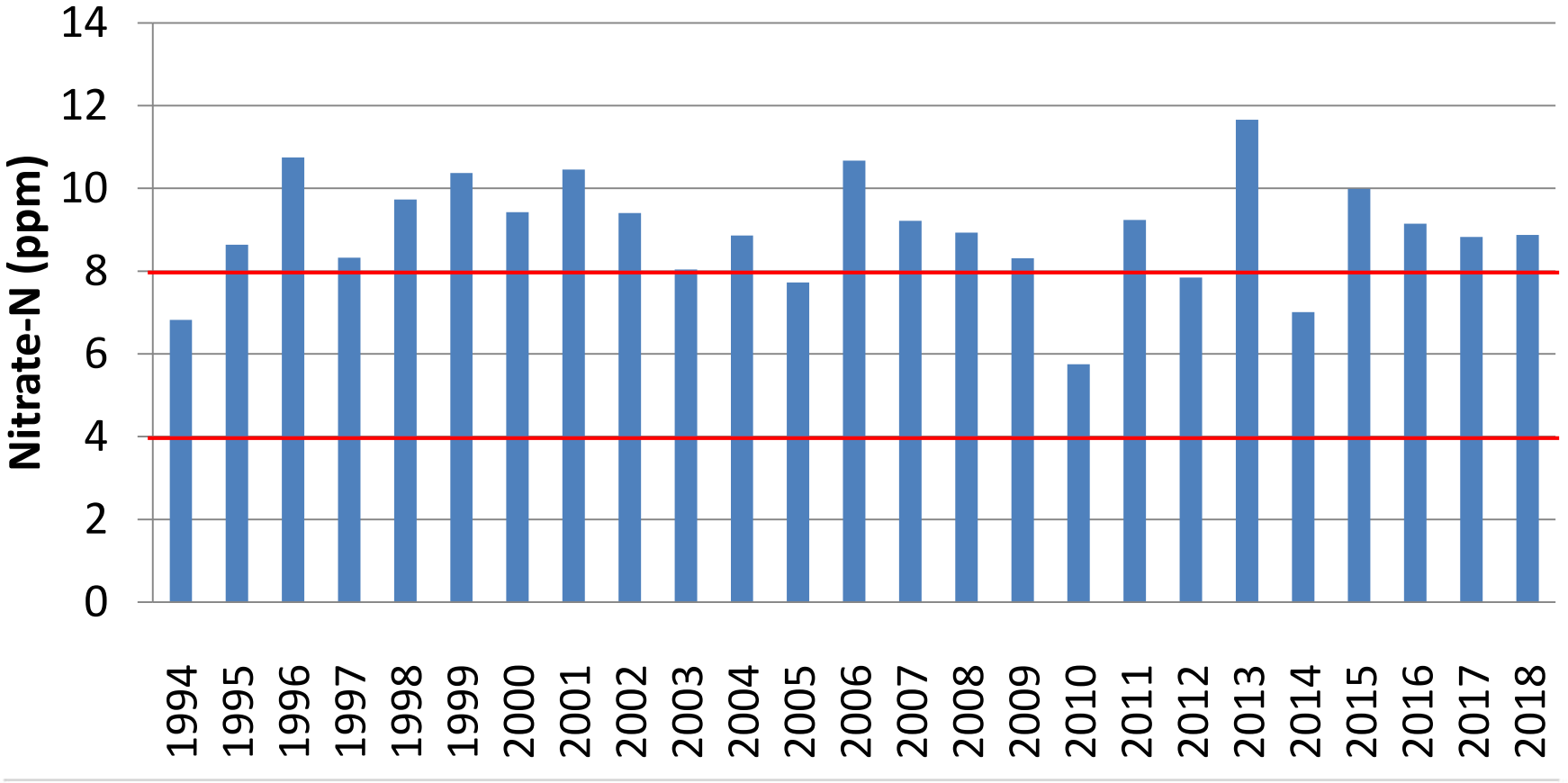
	Total Phosphorus (µg/L)			**Total Nitrogen** (µg/L)	
	North Ecoregion	South Ecoregion		North Ecoregion	South Ecoregion
Numeric Criteria	113	110		3979	901
Lower 95 % CL	33	18		-78†	256
Upper 95 % CL	193	202		8036	1546

† the negative concentration is a statistical artefact and can be interpreted as zero.

Flow-Weighted Mean of Nitrate Conc.

(Upper Embarras R. for past 25 years)

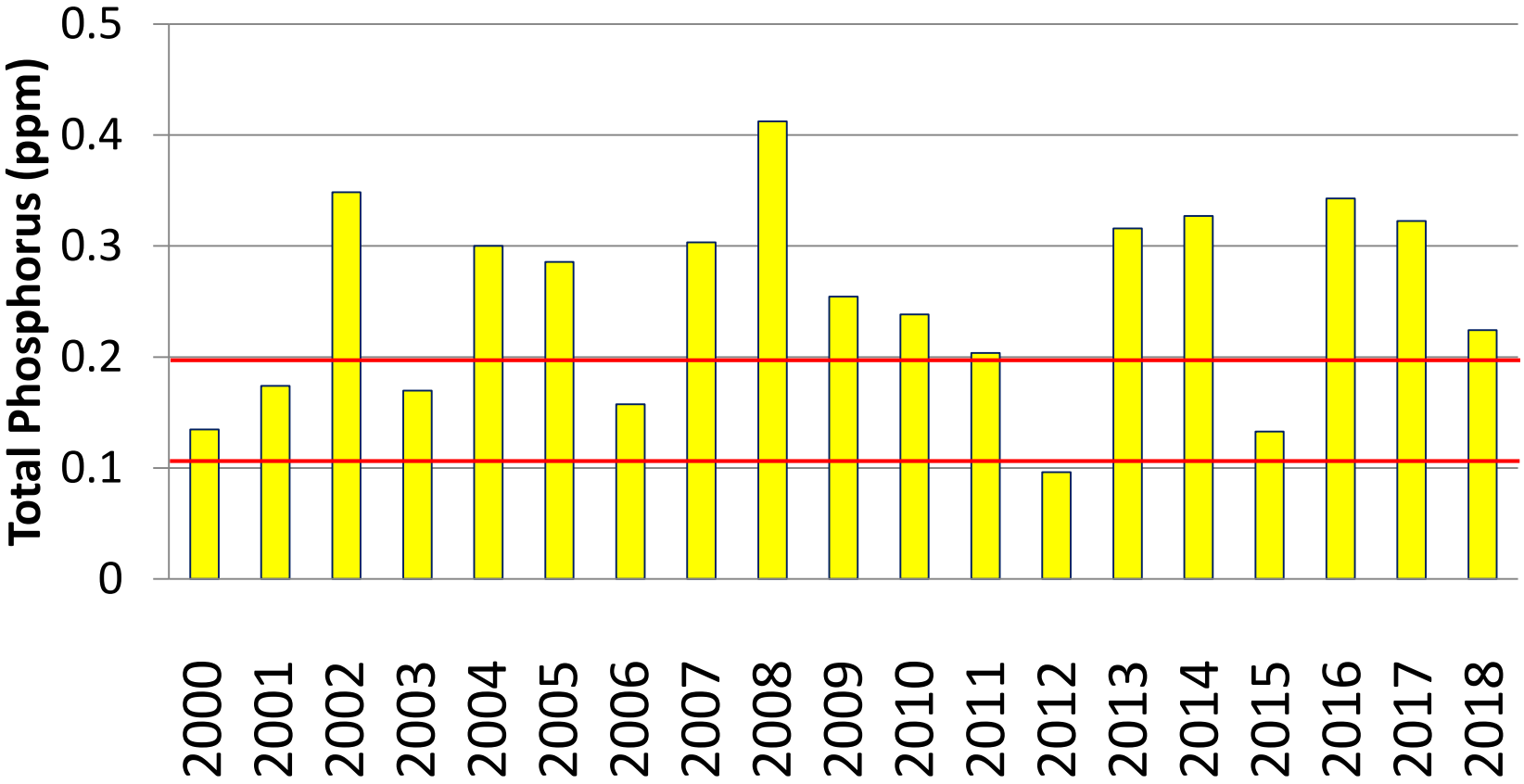
(Average FWM of nitrate = 8.96 ppm)



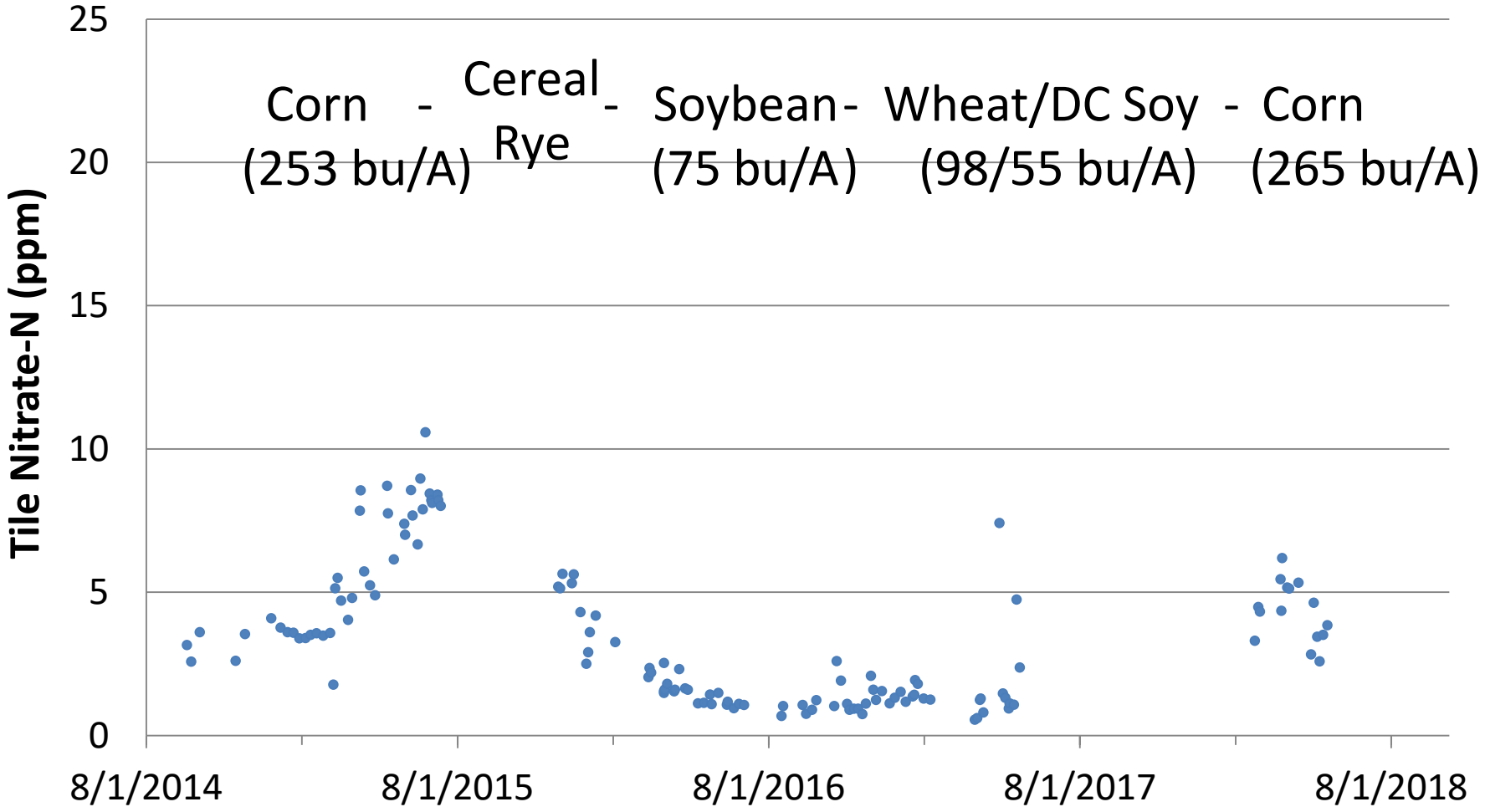
Flow-Weighted Mean of TP Conc.

(Upper Embarras R. for past 19 years)

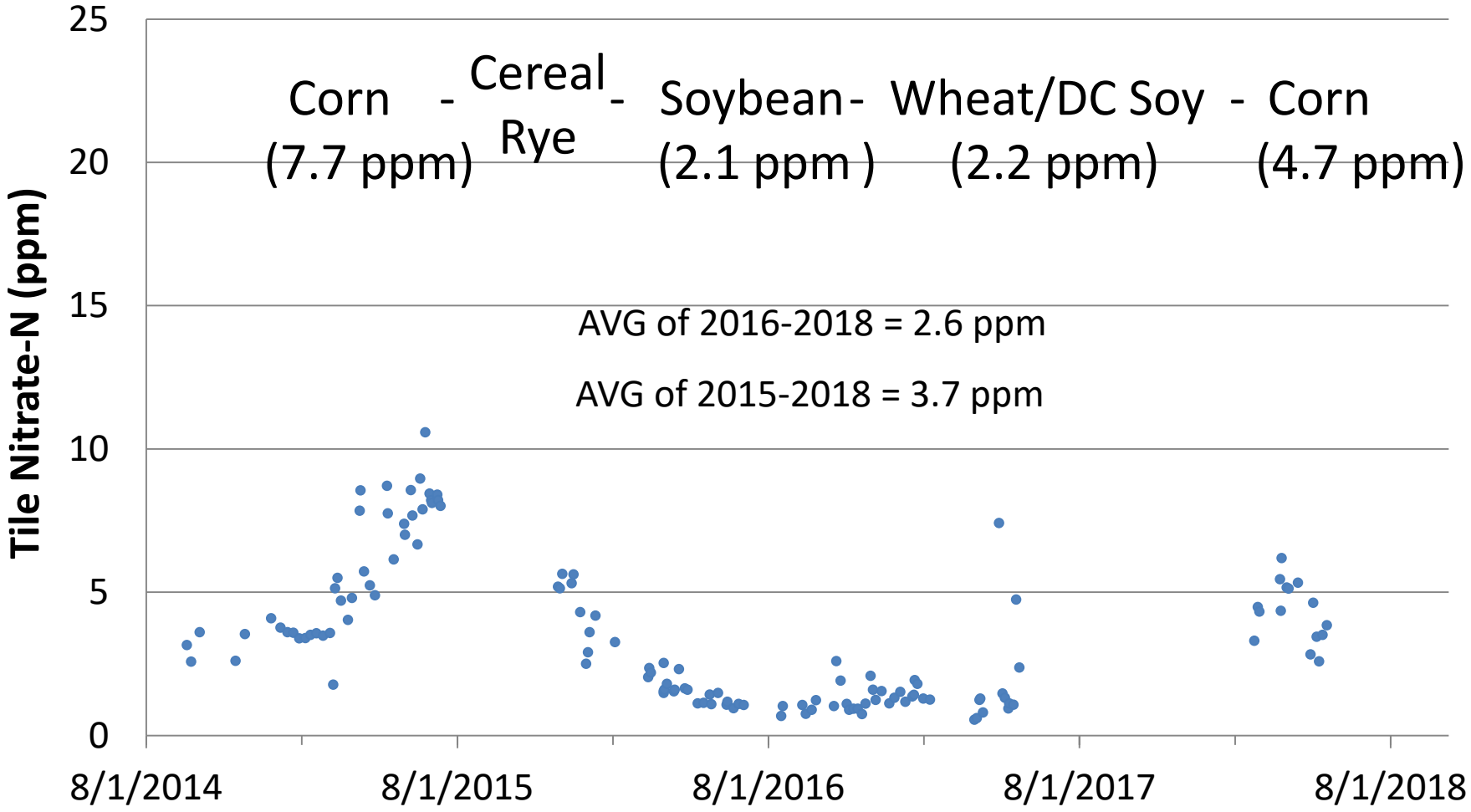
(Average FWM of total phosphorus = 0.25 ppm)



Tile Nitrate Concentration from C-S-W



FWM of Tile Nitrate Conc. from C-S-W



Illinois' Cropping System Makes Controlling Nutrient Losses Challenging

Tile drainage: Prerequisite for high yields

Tiles are the major source of nitrate to streams.

INLRS: The Easy Buttons

Includes Many of the 4Rs:

- Maximum Return To Nitrogen Calculator
- Use of Nitrification Inhibitors
- Strip-Till Deep Placement
- No Frozen Snow Covered P App
- Filter-strips and Buffers

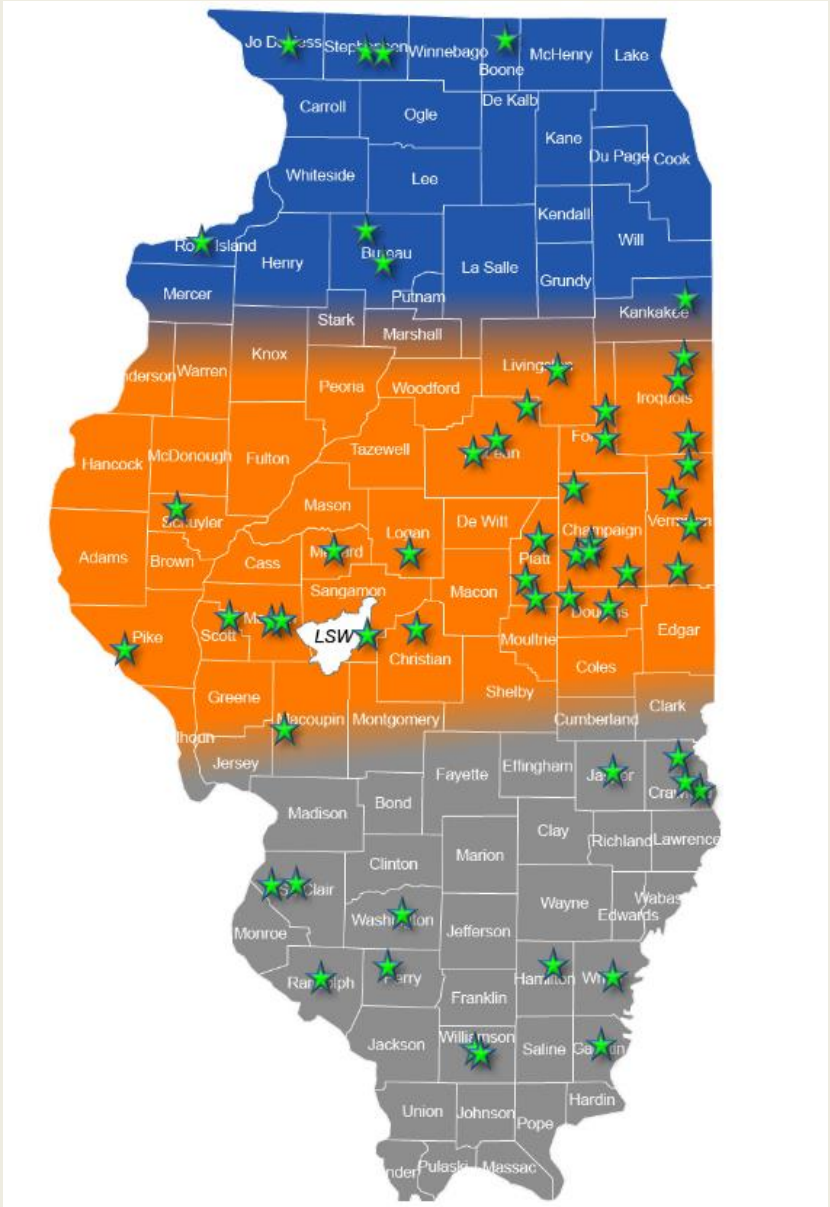
Other Recommendations: Wetlands, Bioreactors on Field Tiles, Cover Crops, Growing Perennial Crops

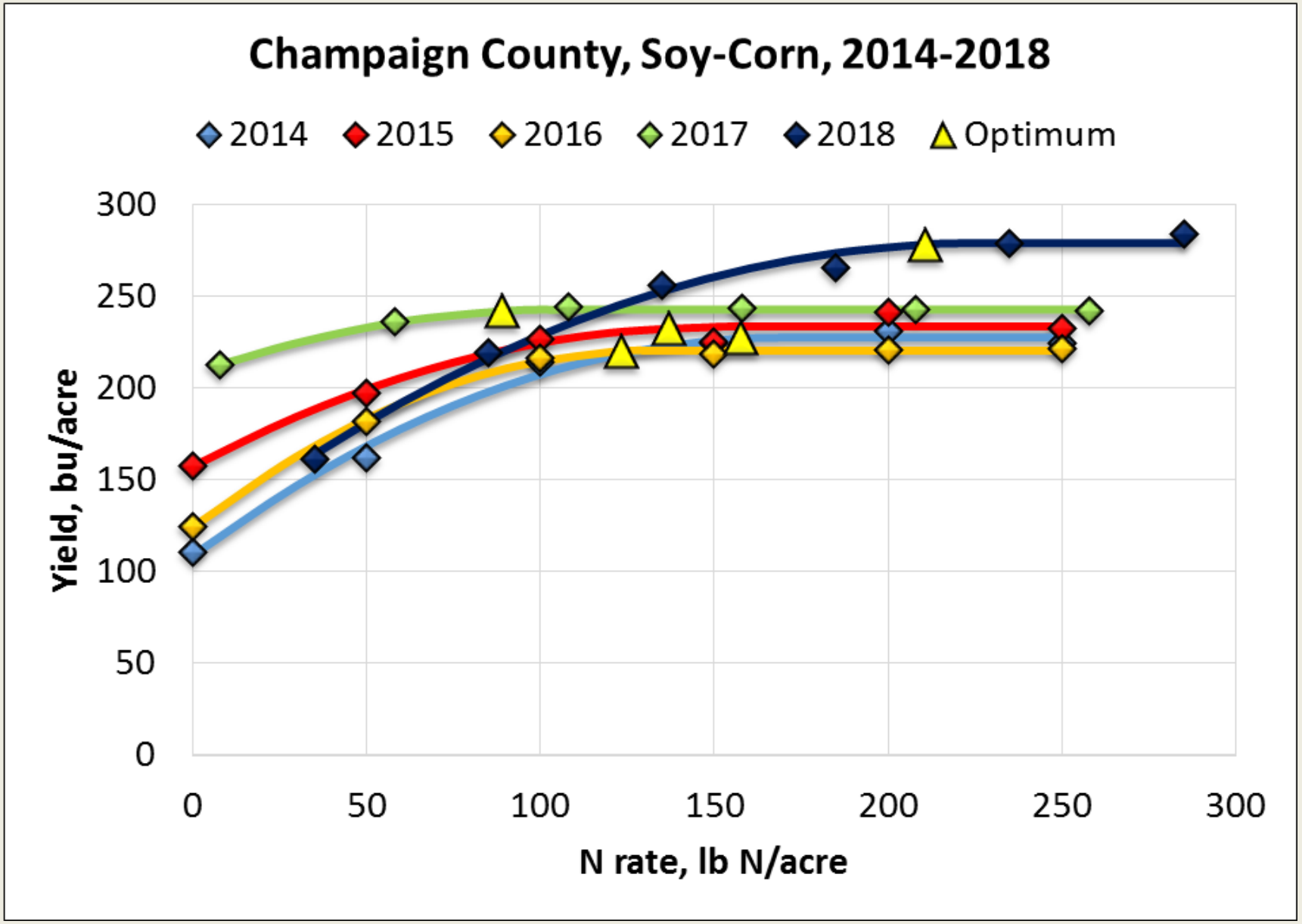

INHALATION HAZARD
ANHYDROUS AMMONIA

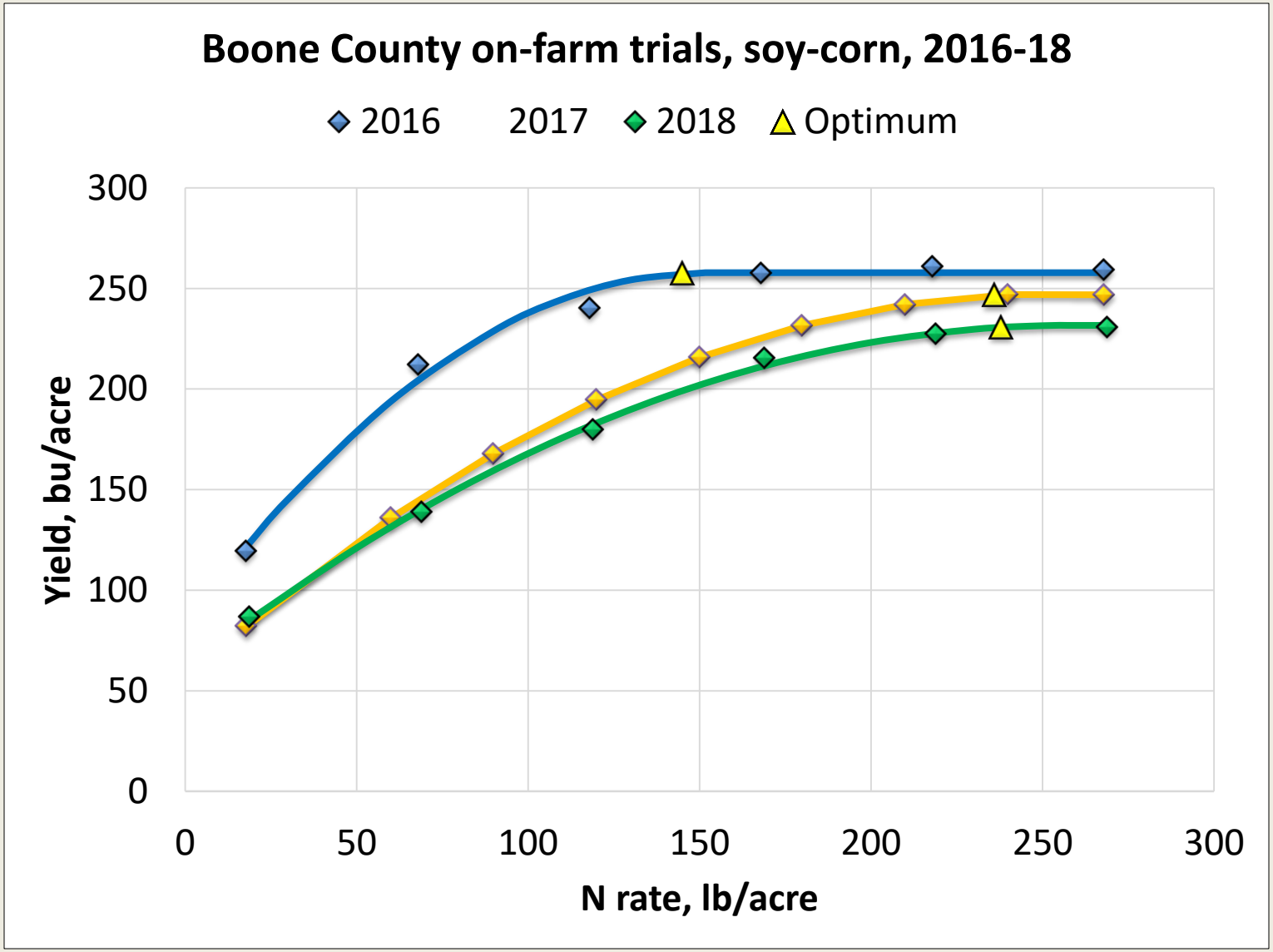
4RS: The Right Rate

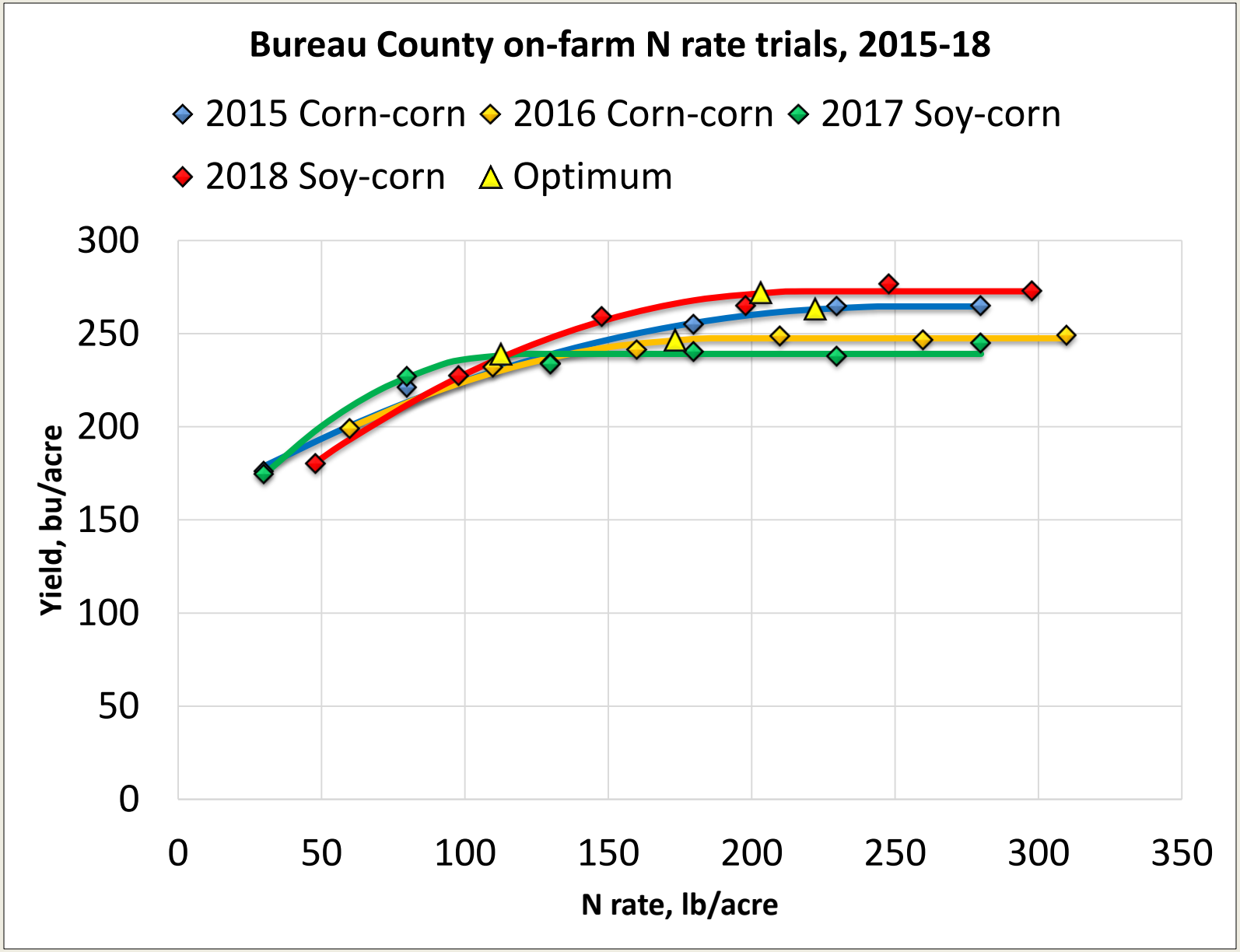
MRTN N-rate Trial Locations 2018

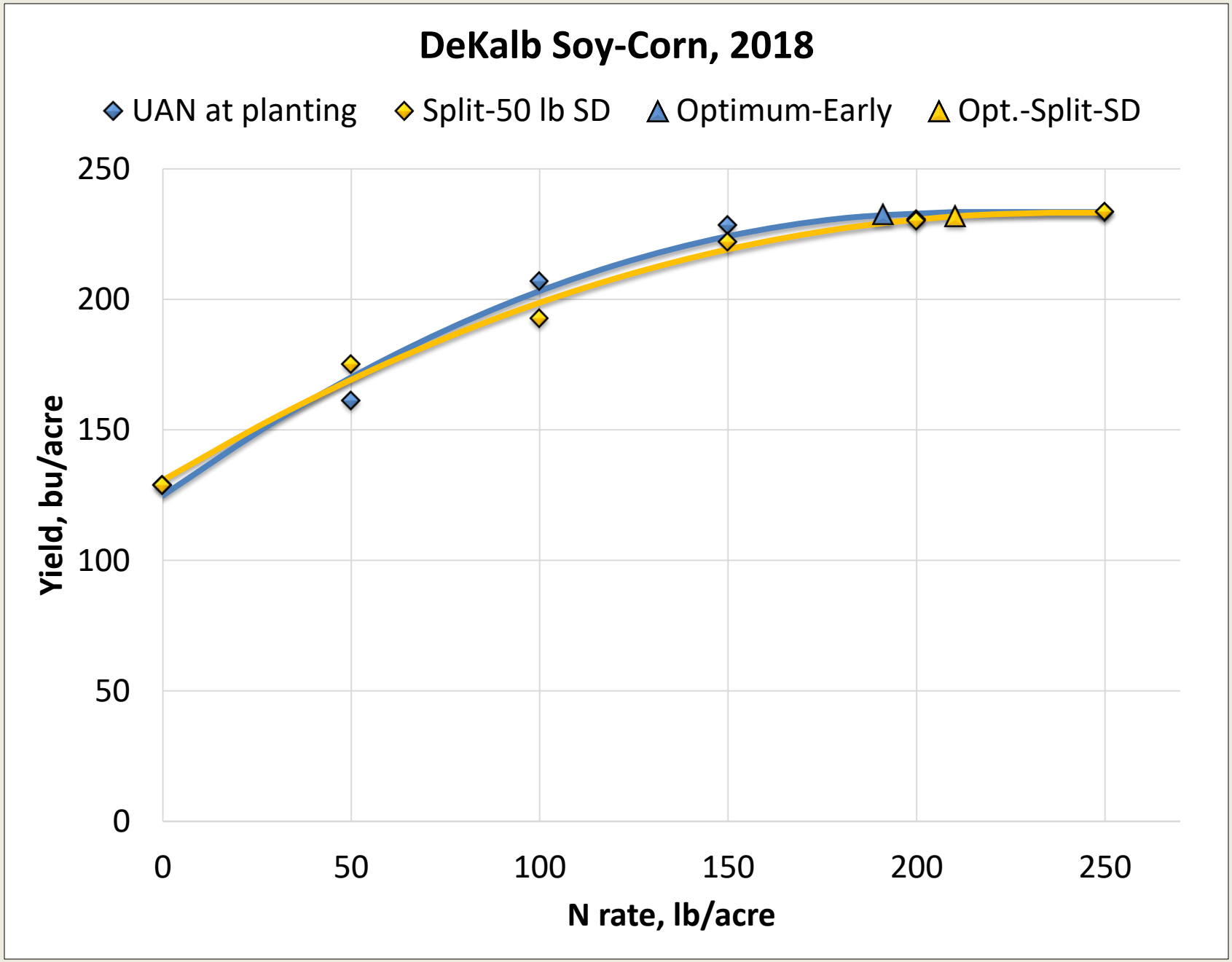
- 8 Northern IL Trials
- 31 Central IL Trials and in Priority Watersheds
- 15 Southern Trials
- Lake Springfield has its own nitrogen recommendation




Champaign County, Soy-Corn, 2014-2018
2014
2015
2016
2017
2018
Optimum
300
250
200
150
100
50
0
Yield, bu/acre
0
50
100
150
200
250
300
N rate, lb N/acre


Boone County on-farm trials, soy-corn, 2016-18
2016
2017
2018
Optimum
300
250
200
150
100
50
0
Yield, bu/acre
0
50
100
150
200
250
300
N rate, lb/acre


Bureau County on-farm N rate trials, 2015-18
2015 Corn-corn
2016 Corn-corn
2017 Soy-corn
2018 Soy-corn
Optimum
Yield, bu/acre
300
250
200
150
100
50
0
0
50
100
150
200
250
300
350
N rate, lb/acre

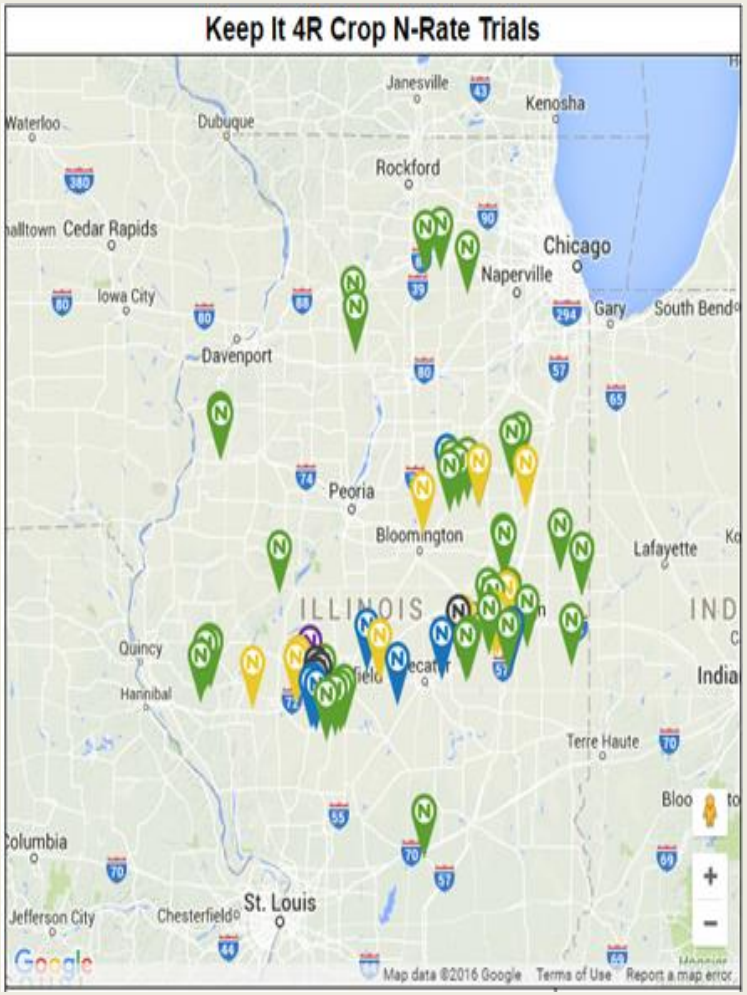

DeKalb Soy-Corn, 2018
UAN at planting
Split-50 lb SD
Optimum-Early
Opt.-Split-SD
Yield, bu/acre
250
200
150
100
50
0
0
50
100
150
200
250
N rate, lb/acre

Current MRTN N rate guidelines from the N rate calculator, Fall 2018

- Based on NH_3 price of $525/ton ($0.32/lb N) and corn price of $3.50/bu

IL region	Soy-corn	Corn-corn
North	161 (77)	205 (78)
Central	178 (267)	203 (145)
LSW	173 (28)	207 (10)
*South	186 (117)	198 (38)

*Fall N not appropriate in S IL – spring 2019 will bring new #s


Keep It 4R Crop N-Rate Trials
Janesville
Kenosha
Waterloo
Dubuque
Rockford
Cedar Rapids
Chicago
Naperville
Iowa City
Gary
South Bend
Davenport
Peoria
Bloomington
Lafayette
ILLINOIS
Quincy
Hannibal
Terre Haute
Columbia
Jefferson City
Chesterfield
St. Louis
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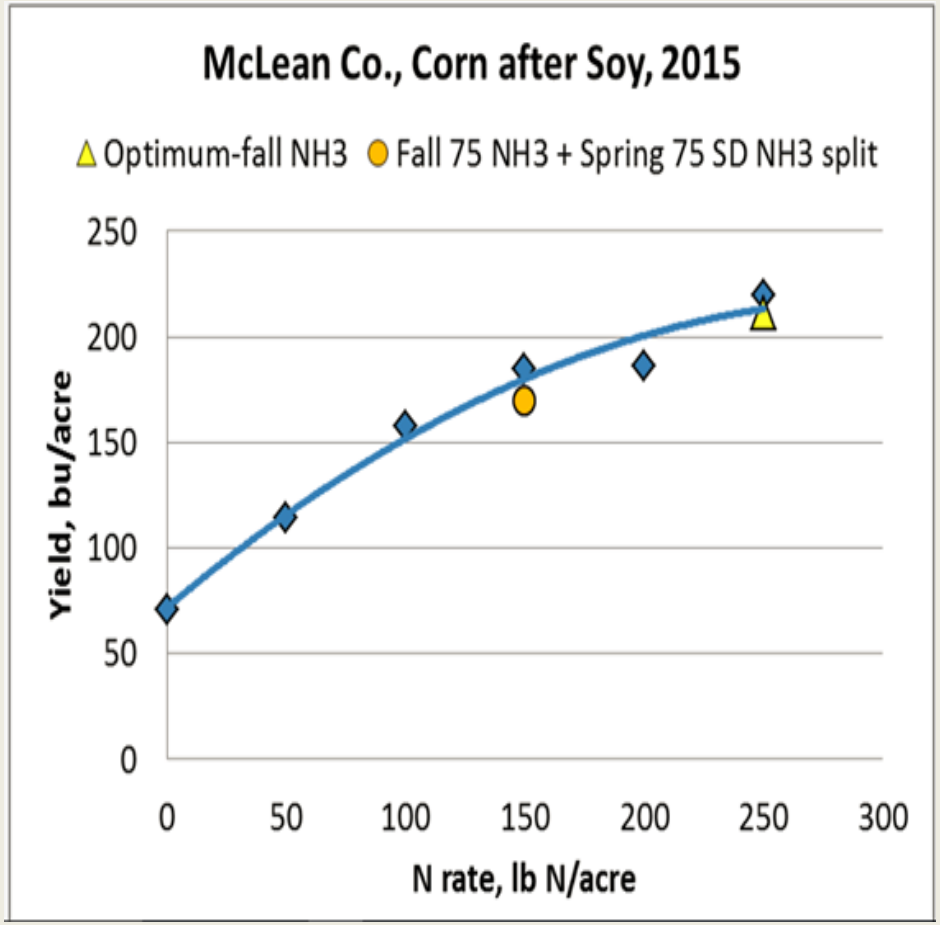
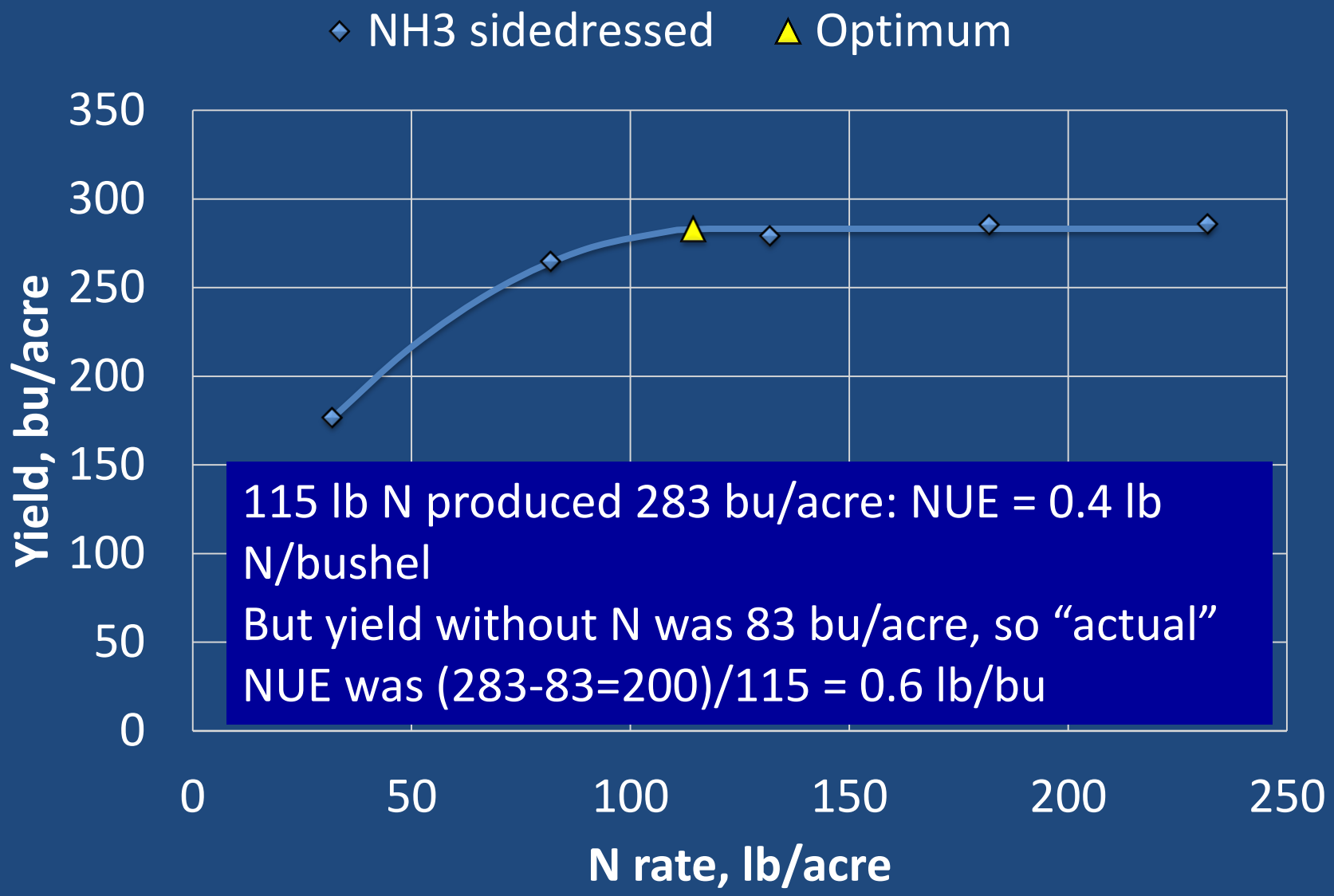
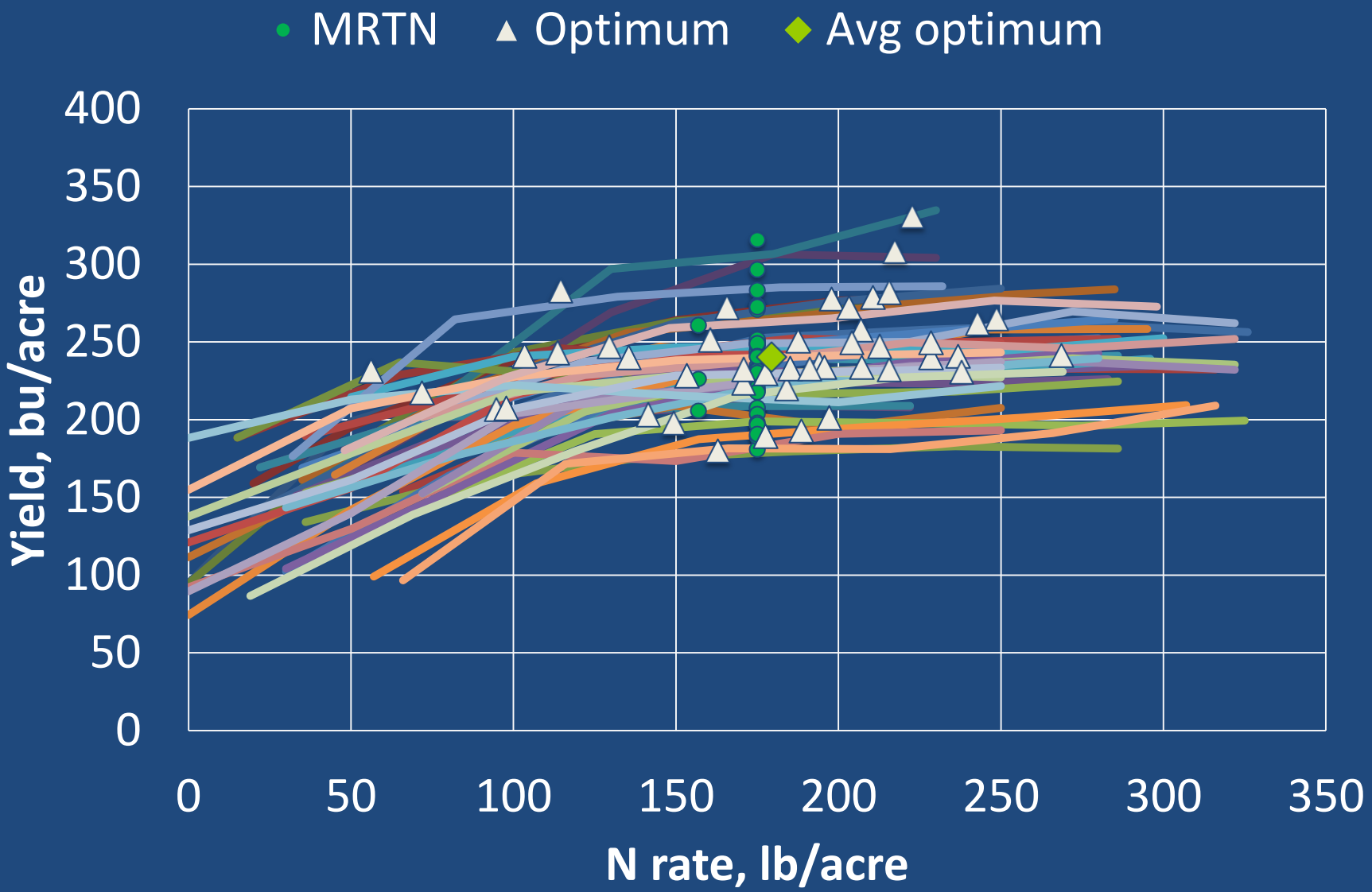

McLean Co., Corn after Soy, 2015
Optimum-fall NH3
Fall 75 NH3 + Spring 75 SD NH3 split
Yield, bu/acre
250
200
150
100
50
0
0
50
100
150
200
250
300
N rate, lb N/acre

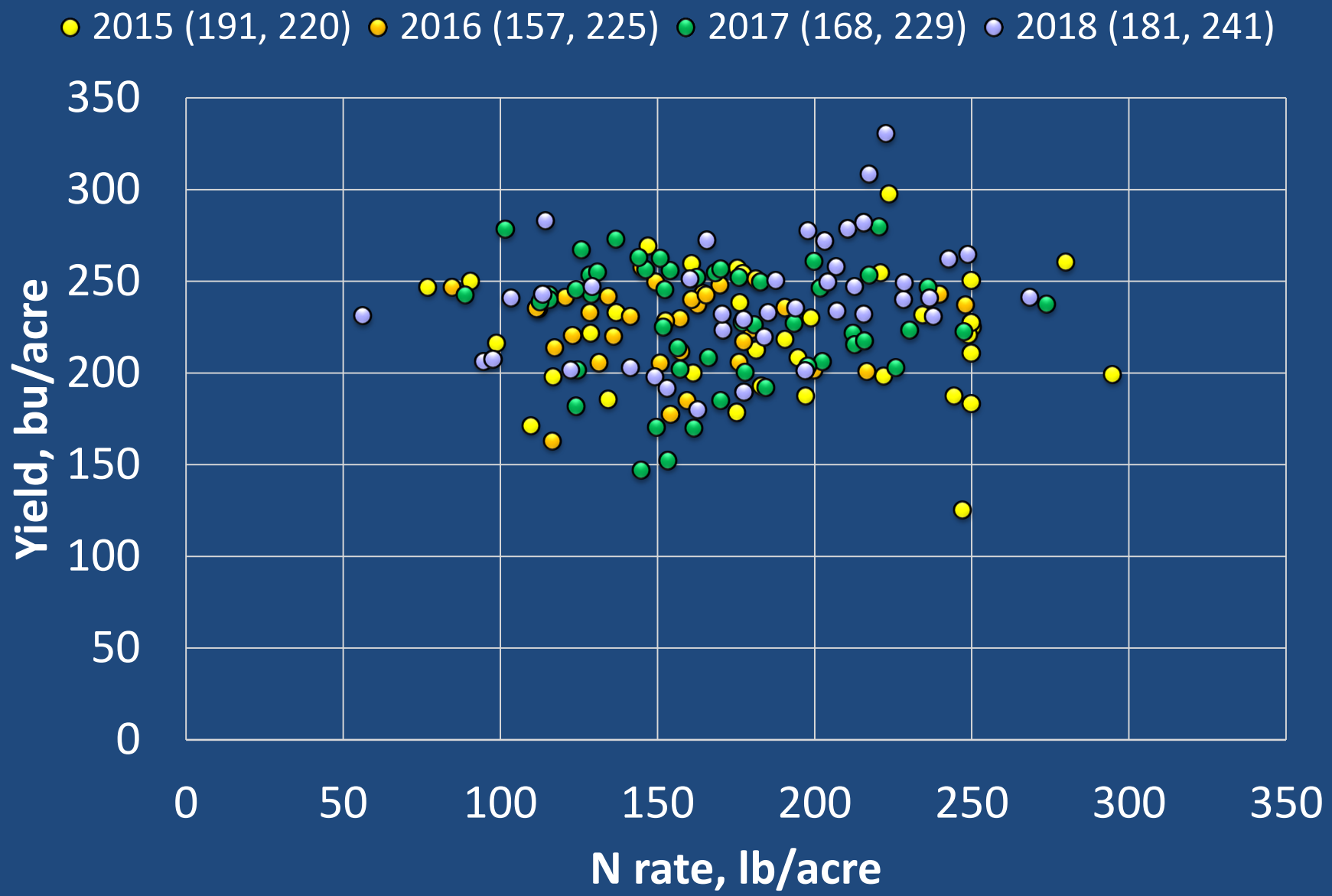
Piatt County Soy-Corn 2018



45 on-farm N trials, soy-corn, 2018



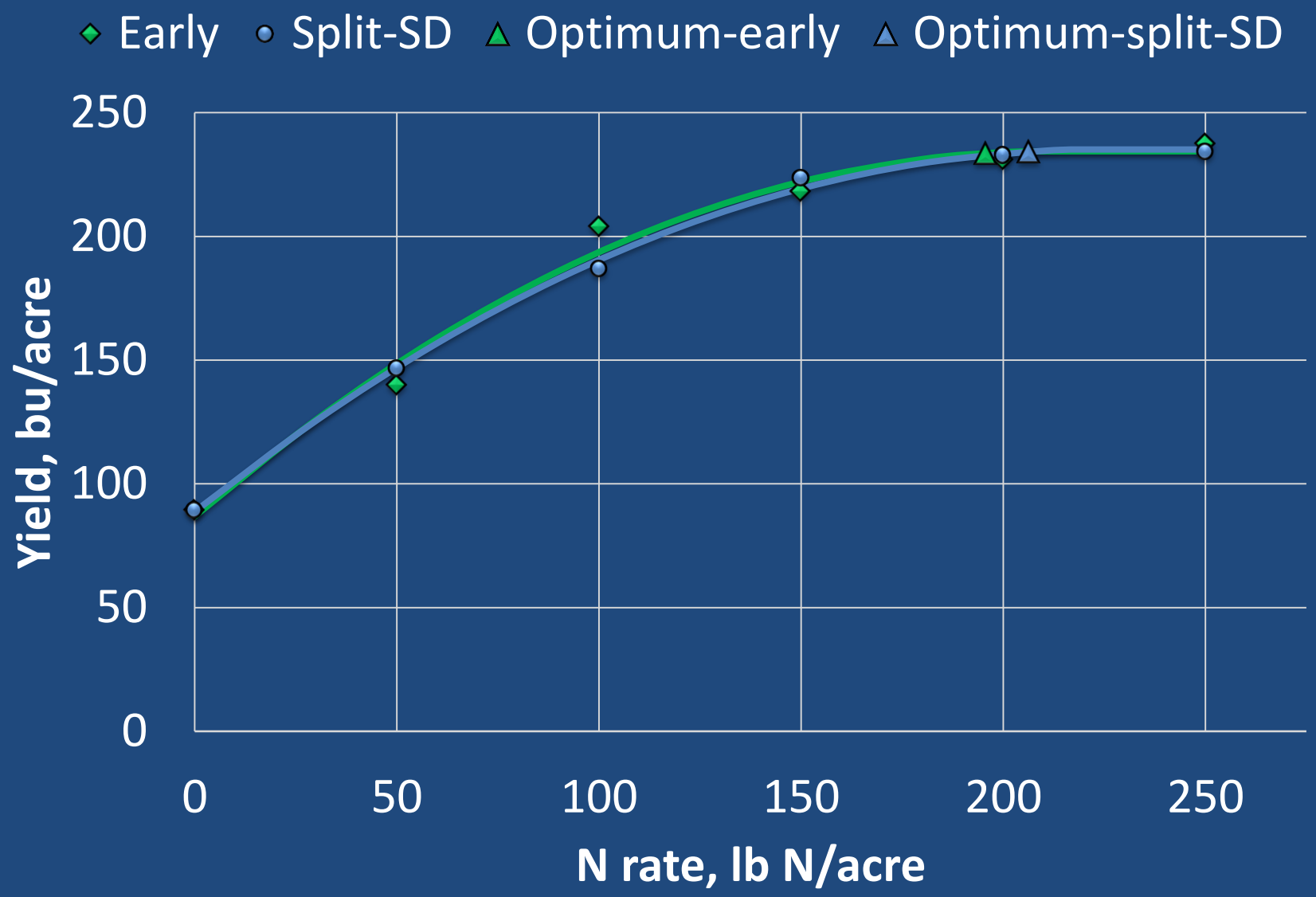
Optimum N rates and yields, on-farm trials, 2015-18



N rate, central/northern Illinois

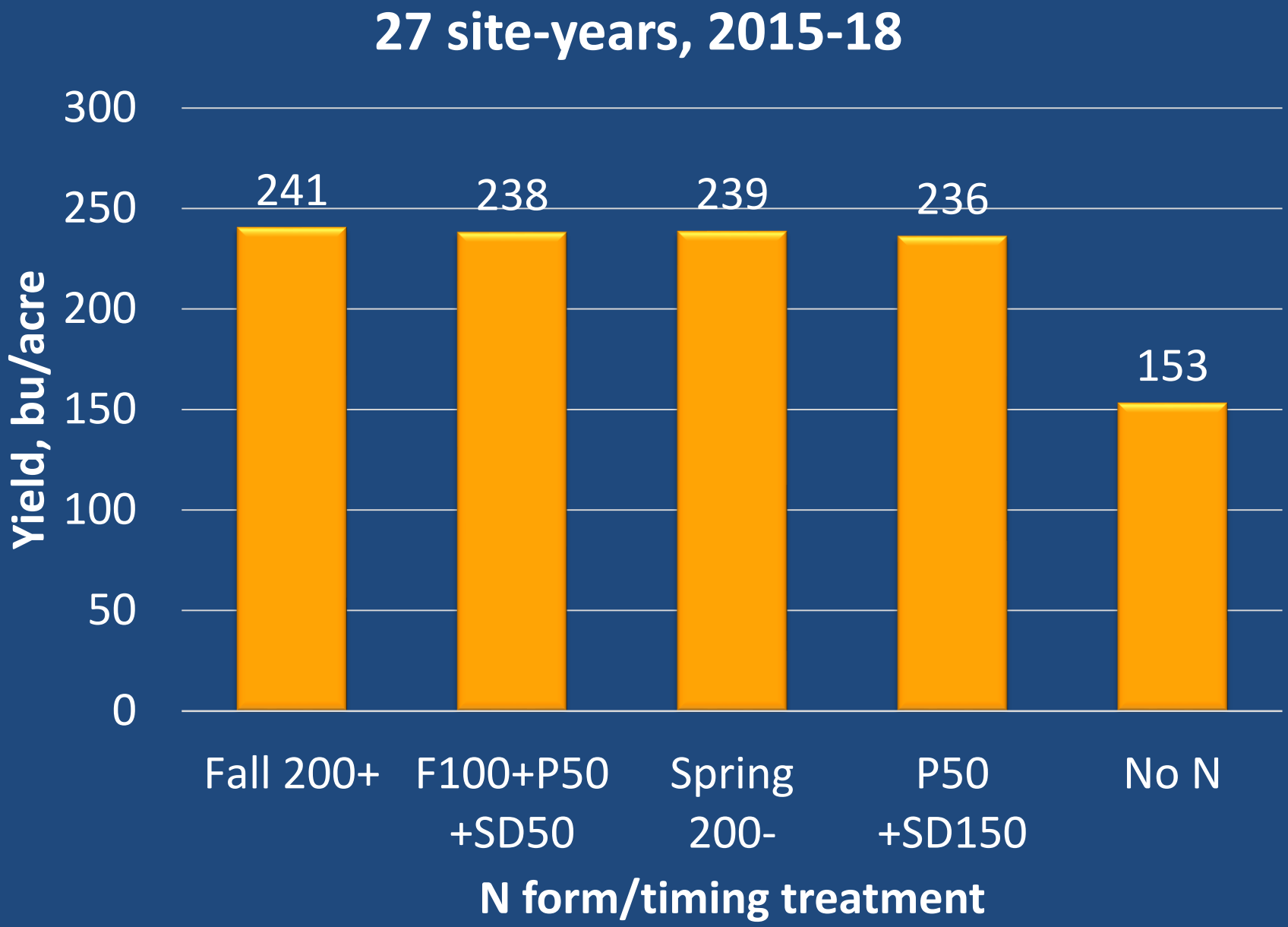
- While some trials showed the need for high N rates to produce (high) SC yields in 2018, on average the numbers in central/northern Illinois were not too unusual
  - MRTN numbers are unlikely to change much from adding 2018 numbers; dropping older data may have some effect
- N responses in corn following corn continued the recent trend of showing optimum N rates less than the MRTN

Urbana REC Soy-Corn 2018

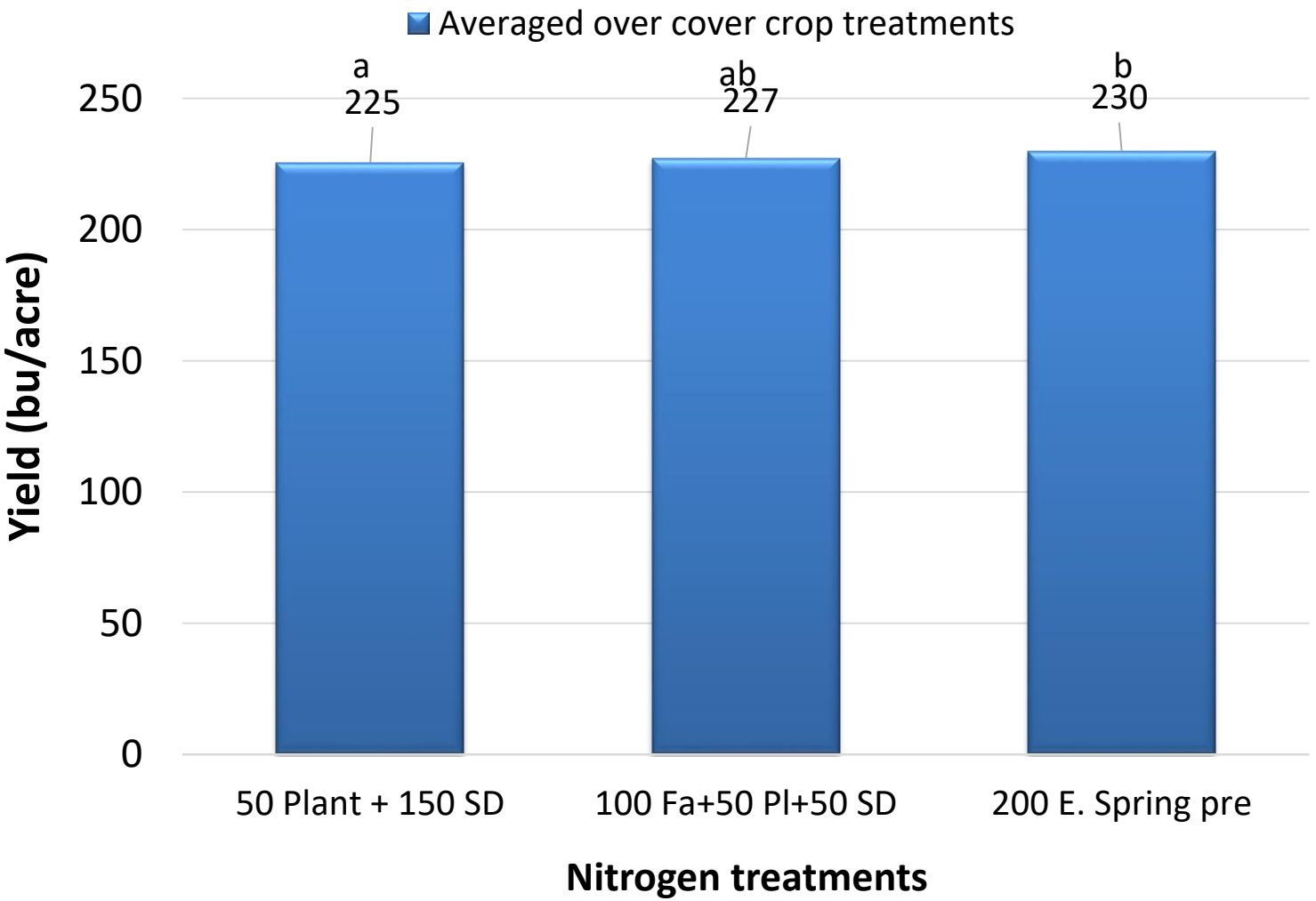


Late-split N

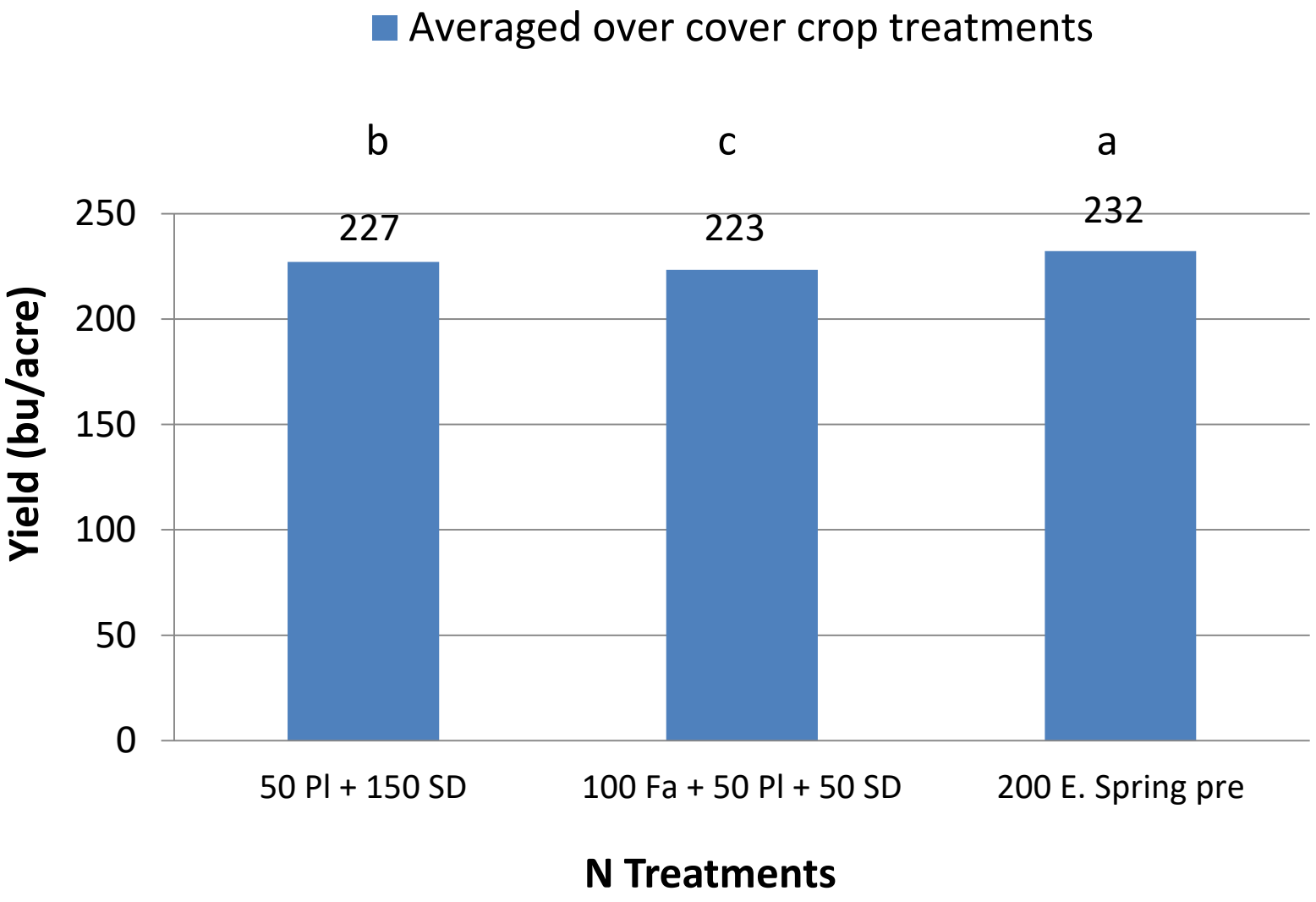
- We found no advantage in yield or optimum N rate from keeping 50 lb N back to apply with in-row surface banding at tassel
- All-early application sometimes produced higher yields at low N rates, but using MRTN N rates (175 for SC/210 for CC) would have produced identical yields at every site
- Subtracting the cost of late application would have made late-split N unprofitable


27 site-years, 2015-18
Yield, bu/acre
300
250
200
150
100
50
0
241
238
239
236
153
Fall 200+
F100+P50 +SD50
Spring 200-
P50 +SD150
No N
N form/timing treatment

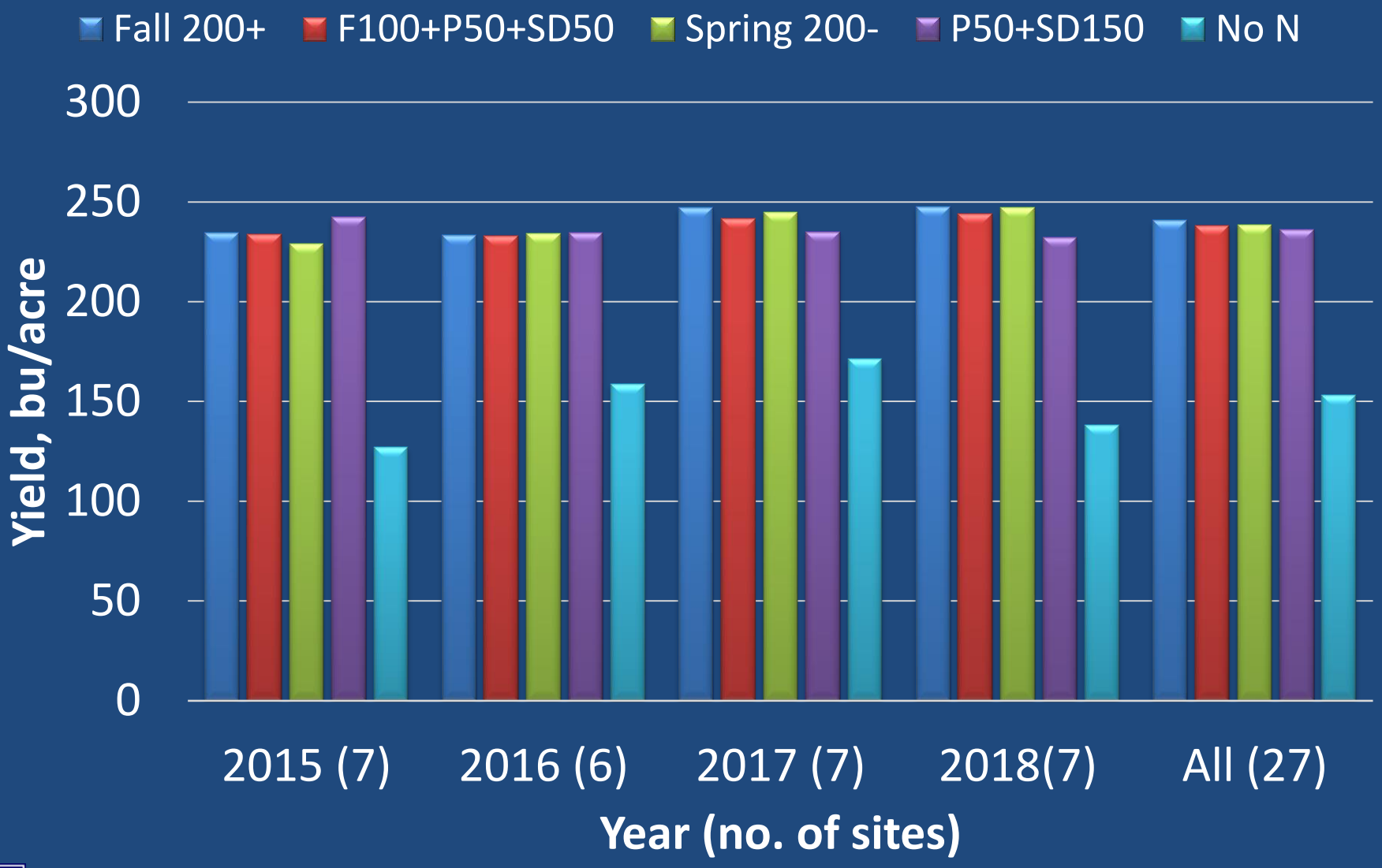
On-Farm Cover Crop x N Trial



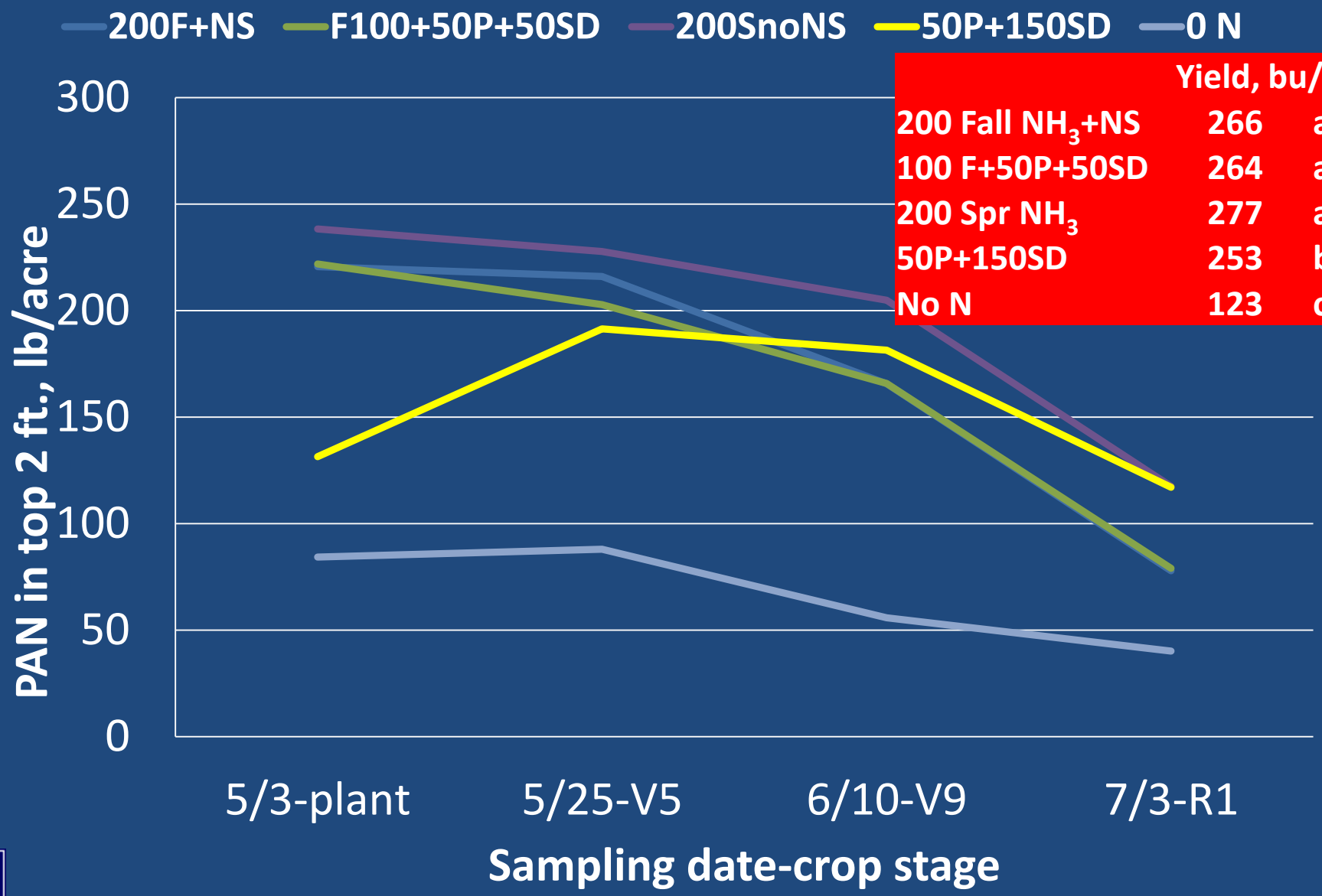
On-Farm Cover Crop x N Trial



N form/timing by year: the rest of the story



On-Farm N-tracking, 2018, avg. 3 sites



	Yield, bu/ac	
200 Fall NH_3+NS	266	ab
100 F+50P+50SD	264	ab
200 Spr NH_3	277	a
50P+150SD	253	b
No N	123	c

Treatment (all 150 lb N)	Rank (1 to 19)					Yield, p=0.1	
	2015	2016	2017	2018	2015-18	bu/acre	
All N applied at planting:	(3)	(4)	(4)	(4)	(15)		
UAN injected mid-row ("check")	7	7	11	15	10	224	bcde
UAN dribbled mid-row	19	13	4	12	15	222	cde
Urea/Agrotain broadcast	9	1	18	13	12	224	bcde
SuperU broadcast	1	2	7	1	1	229	a
ESN broadcast	12	3	19	6	7	225	abcd
UAN/Agrotain broadcast	17	18	1	16	16	221	def
NH_3 injected mid-row	18	11	6	8	13	223	bcde
NH_3/N-Serve injected mid-row	16	15	15	4	14	223	bcde
UAN/Instinct II broadcast	13	16	17	14	17	221	def
Split N application (1st at planting):							
UAN 50 broadcast+UAN 100 injected V5	15	9	13	18	18	220	ef
UAN 100 inj+UAN 50 injected V5	4	14	10	11	9	224	bcde
UAN 100 inj+Urea/AT 50 broadcast V5	5	10	3	5	2	227	ab
UAN 100 inj+UAN 50 dribbled in-row V9	8	5	2	9	3	227	ab
UAN 100 inj+Urea/AT 50 broadcast V9	11	8	5	2	4	227	ab
UAN 100 inj+UAN 50 dribble in-row V5	2	6	14	3	5	226	ab
UAN 100 inj+UAN 50 dribble mid-row VT	14	4	9	10	8	225	bcd
UAN 100 inj+UAN 50 dribble in-row VT	3	12	12	7	6	226	abc
All N sidedressed:							
UAN injected mid-row V5	6	17	8	19	11	224	bcde
UAN dribbled mid-row V9	10	19	16	17	19	217	f

So does it pay to split N or not?

- Not consistently, if conditions (warming soils, lack of heavy rainfall) are good after planting and after applying all of the N early
- Adequate (at leaf half of) the N needs to be present at or soon after planting so the roots can access it
- When it's very wet during vegetative stages, supplemental N may pay
- Lower-OM soils may benefit more; waiting to allow assessment of yield/demand (if that's posible) may make split N pay in such soils

Split N?

- Results in Illinois trials may be affected by high soil productivity, but less early-season N from mineralization in lower-OM soils may make it more risky to delay significant amounts of N in such soils
- Corn grown in very well-drained, very poorly drained, or root-restricting soils is more likely to benefit from splitting N

Or do we need more "complication"?

- The basics—applying the right rate and having enough N available in the soil early—do not in principle require multiple applications of N
- But if conditions are less than ideal for supplying N to the crop—too cold, too wet, too warm and wet, delays—we need to be ready to come back and fix things
- N management programs?
  - Most focus on when more N might be needed, and their effectiveness and cost-effectiveness are questions
- N management approaches need to pay their cost

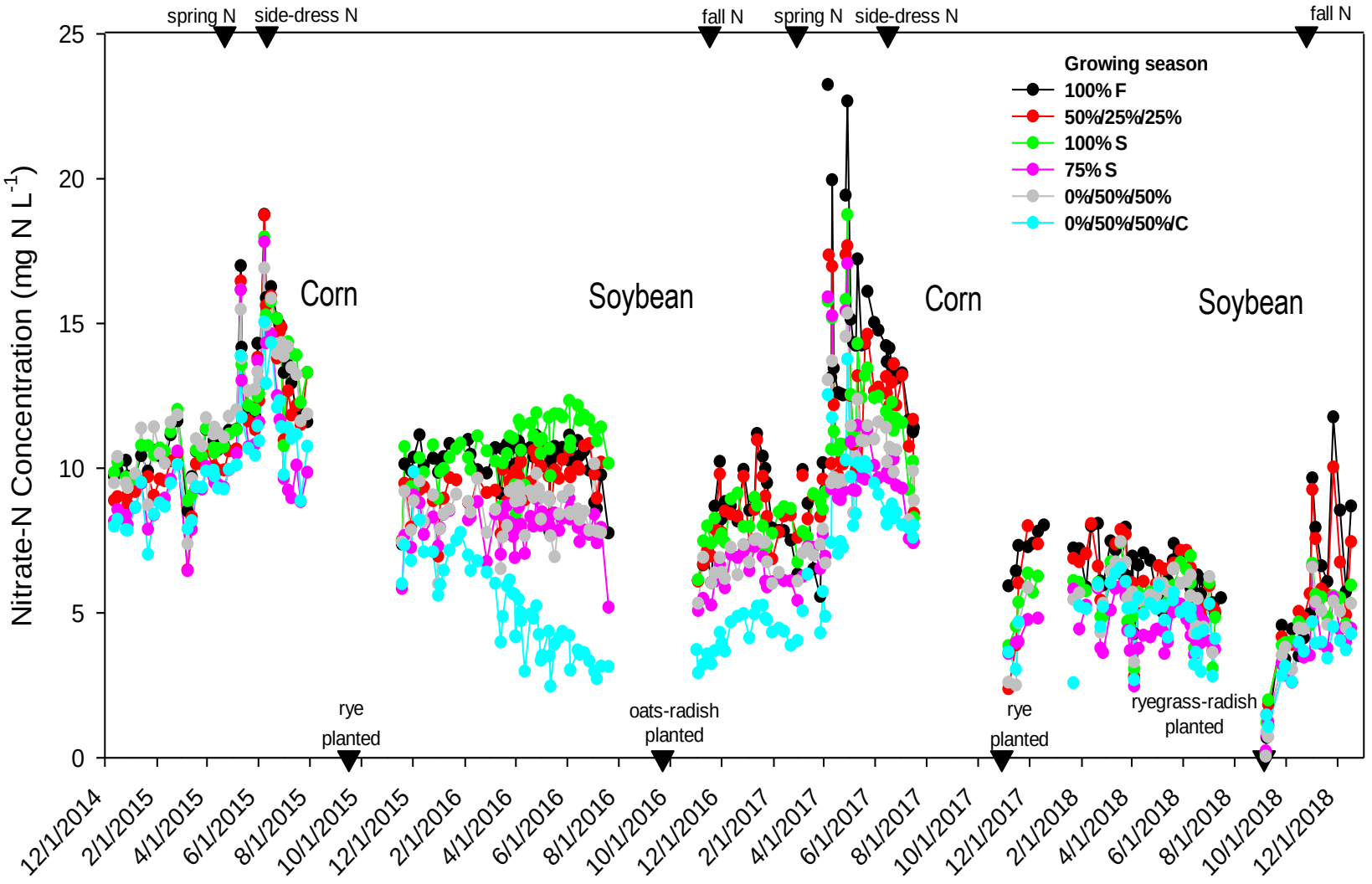
Practical N management: Do's

- Start with the right rate, even if that means that the soil will need to supply some N
- Use common sense with regard to time and form
  - All-early N is safe if it doesn't get wet
  - Safety after application: NH_3>urea>UAN
  - Stabilize when it makes sense (on surface, early)
- Count all of the N that you apply: DAP, starter, herbicide carrier

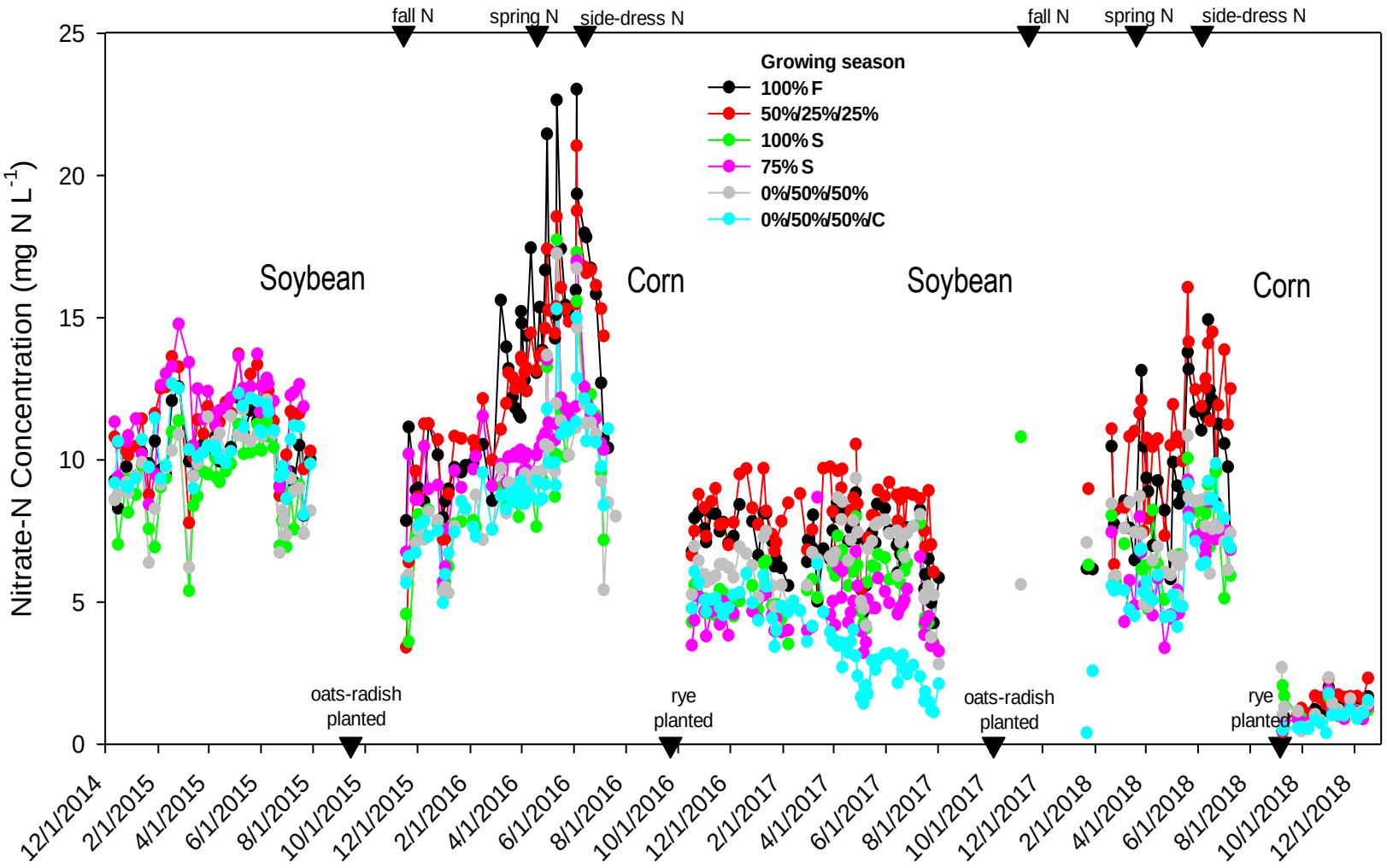
Practical N management: Don’ts

- Apply “more” N “just in case”
  - When yield potential looks high and you’ve applied enough, don’t apply more, esp. in higher-OM soils
  - Yield potential is set by pollination, and the crop won’t run out of N the week after that
- Apply N forms in ways and at times that bring unnecessary risk of N unavailability to the crop when it needs it
- Split N application (more than once) without justification
- Use unnecessary additives
- Second-guess, if you’ve already done it right

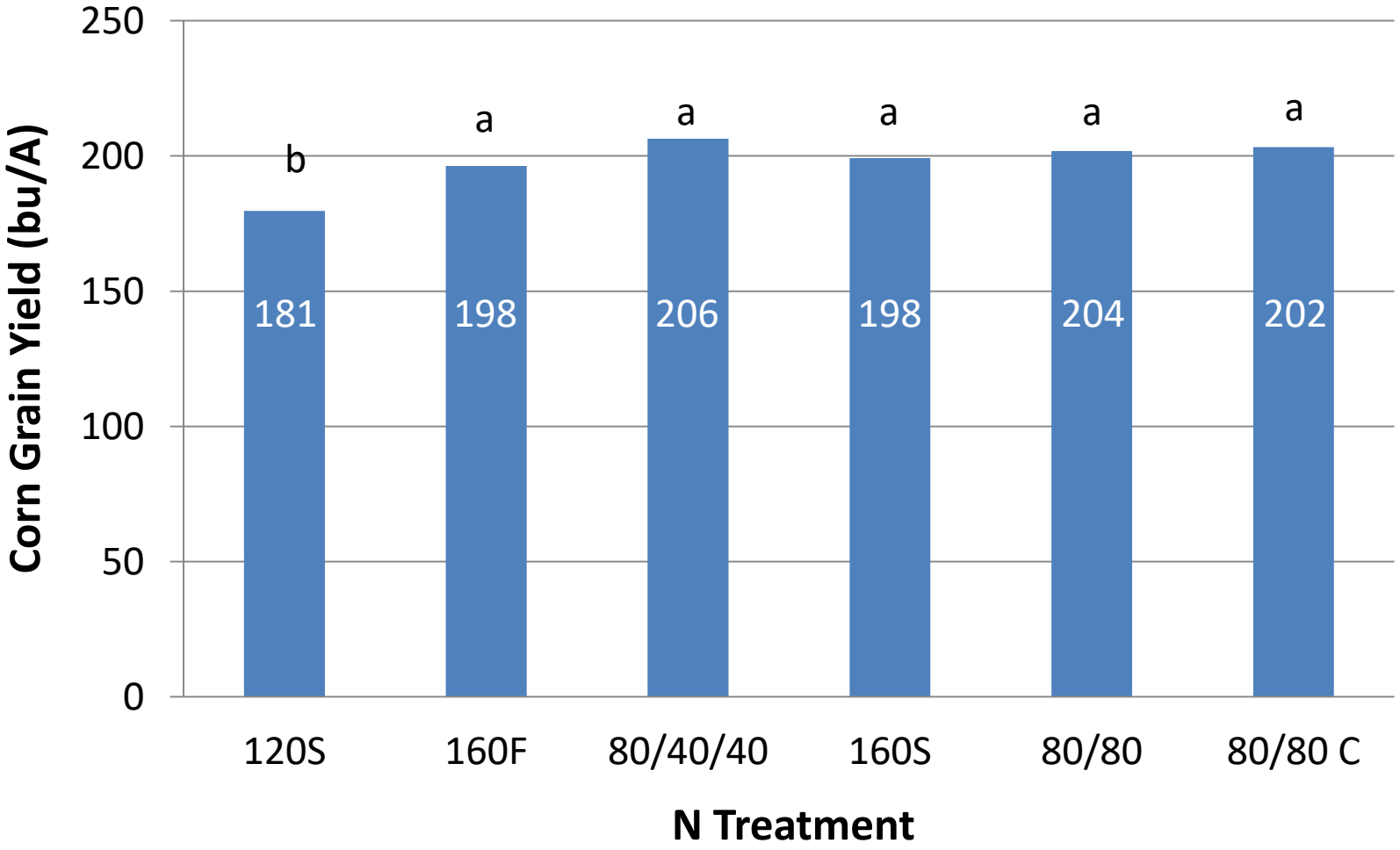
Tile Nitrate Concentration



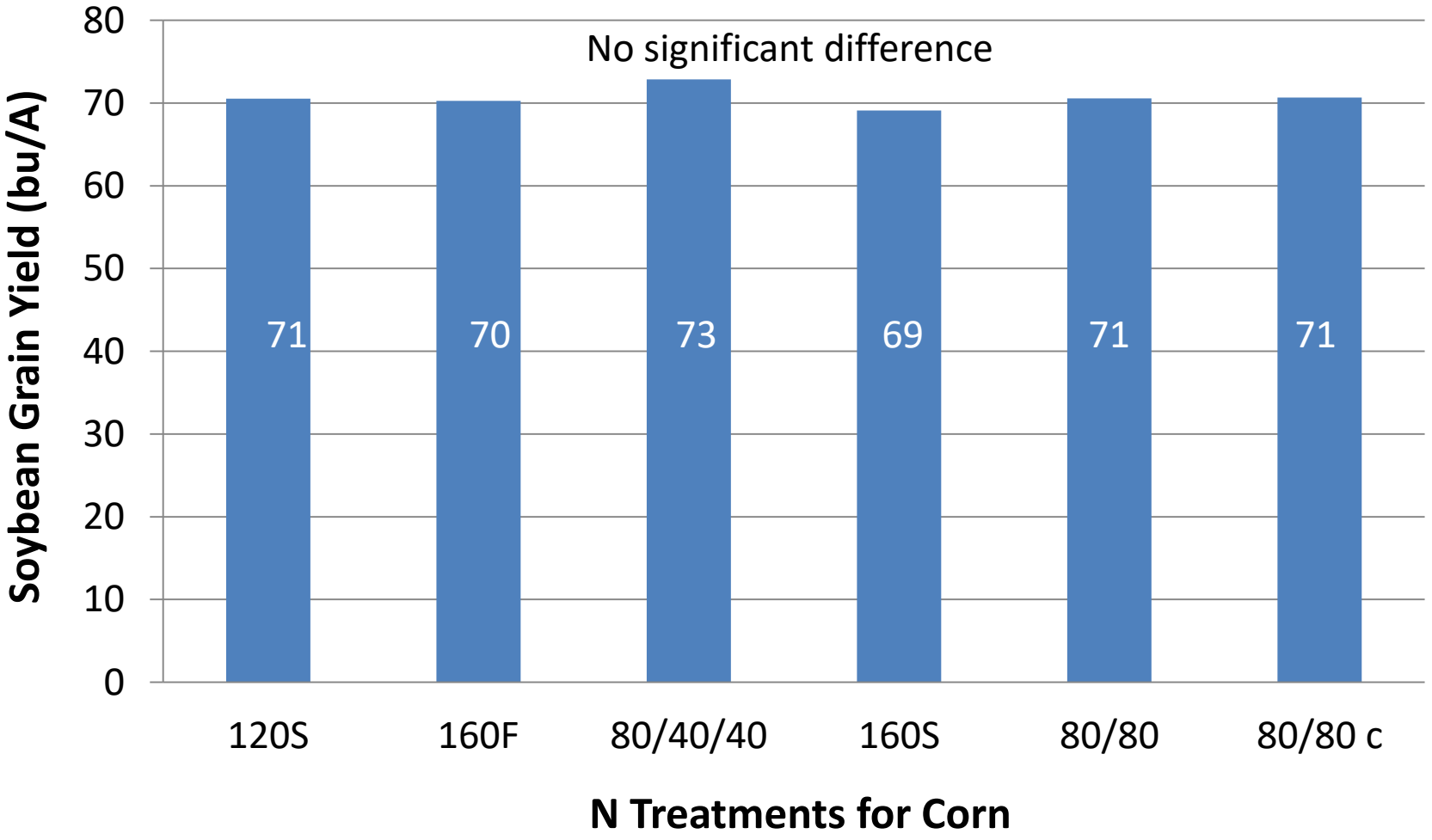
Tile Nitrate Concentration



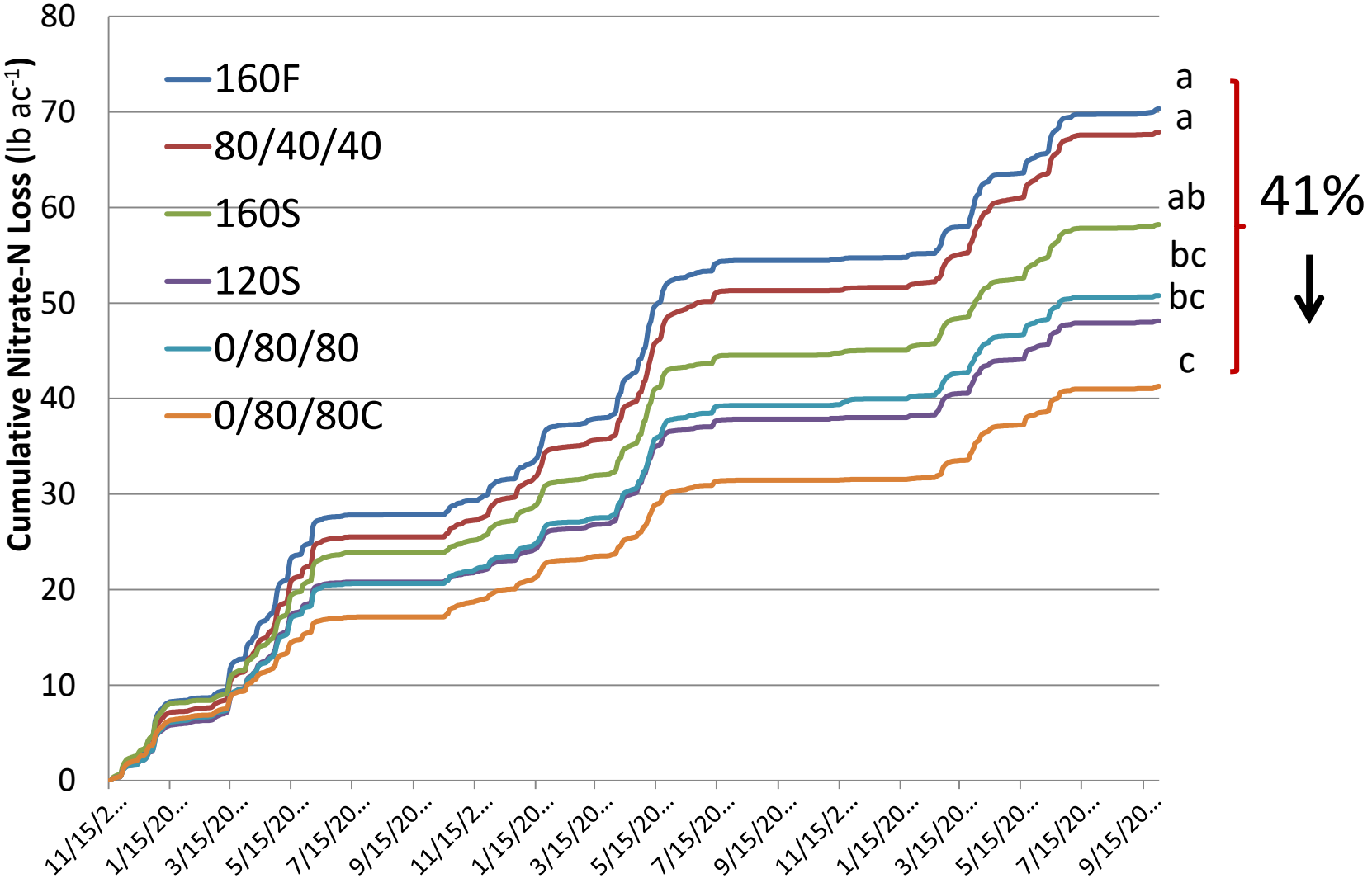
Average Corn Yields 2016-2018



Average Soybean Yields 2016-2018



3 year Cumulative Tile Nitrate Load




Right Source & Rate:
Fall and Spring
Anhydrous Ammonia
IFCA's Keep it 4R Crop Program – Implementing the 4Rs

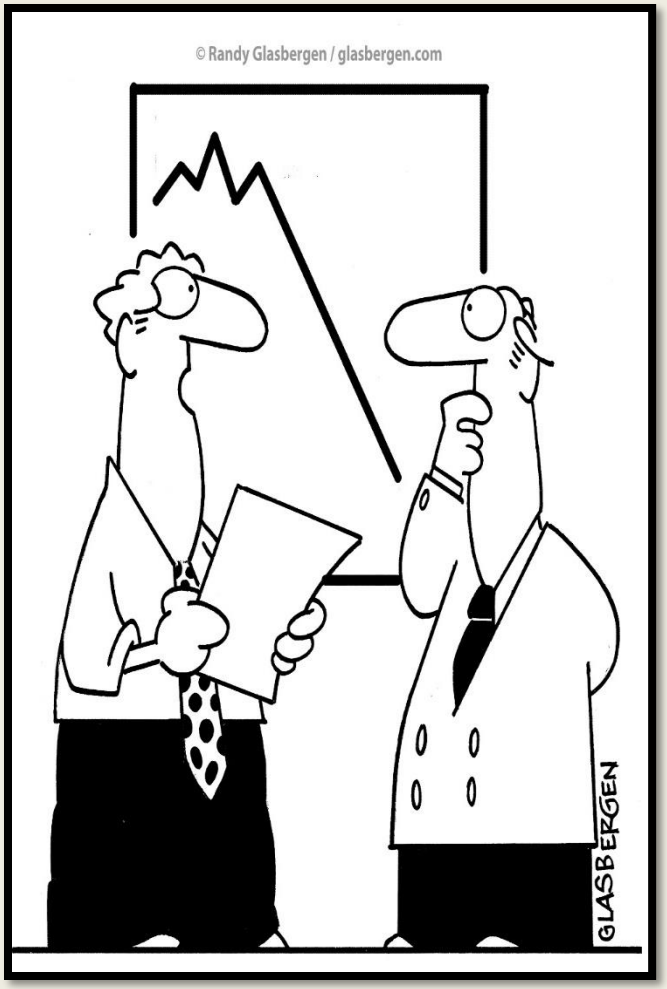

Right Rate, Right Time, Right Place: Side-Dressing Ammonia After Crop Emergence


Right Source, Rate, Time and Place:
Top-Dressing Urea After Crop Emergence
JOHN DEERE
FRONTIER
SS1116P

Right Source, Rate, Time & Place:

Side-Dressing UAN After Crop Emergence


JOHN DEERE
GATOR
825i
AHW
Enduraplas



"We're seeing a significant drop in customer complaints since we stopped answering our phones."

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IFCA

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