Nvision:

Remote sensing to visualize AND CORRECT nitrogen (N) deficiency in corn

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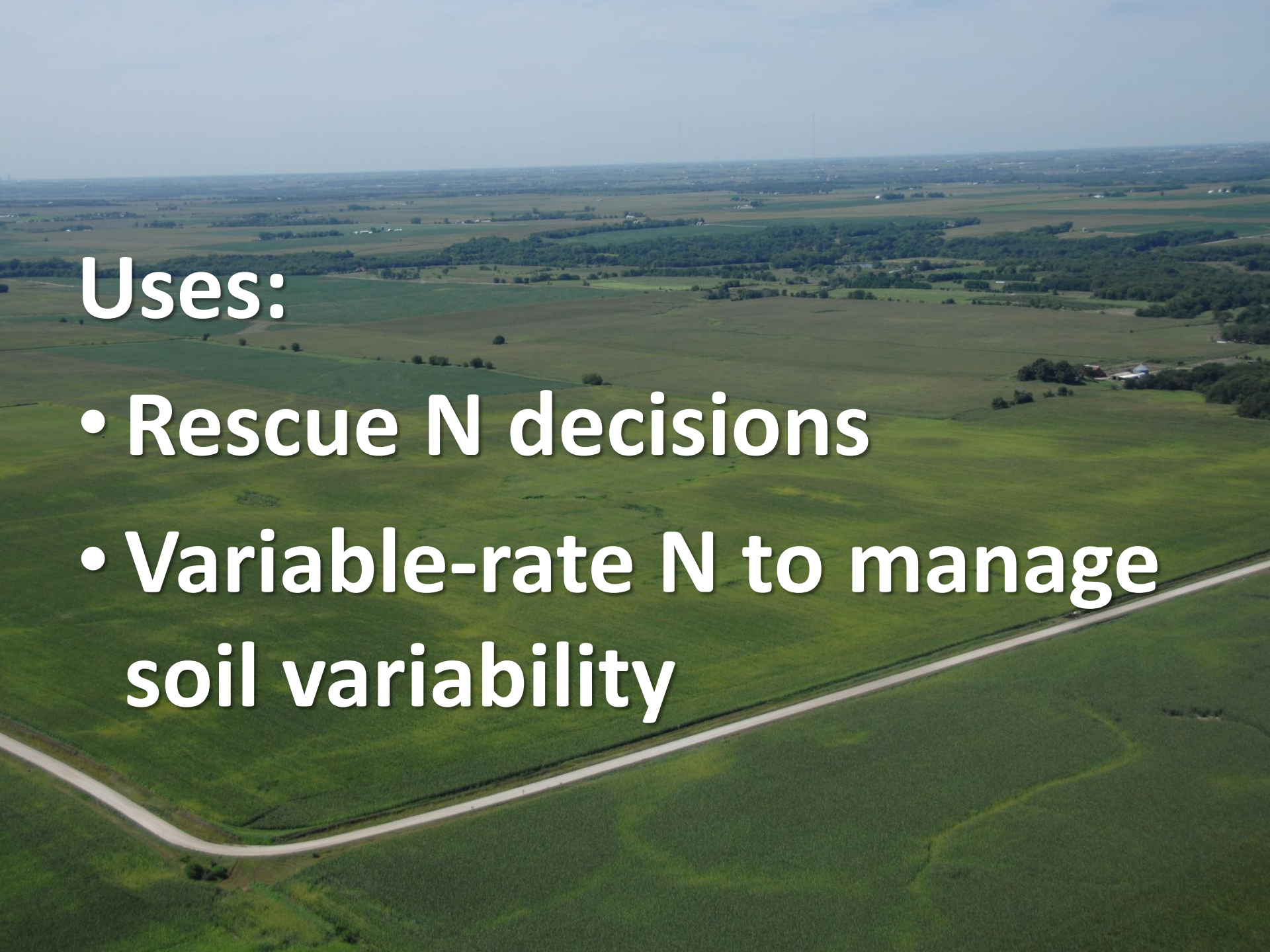
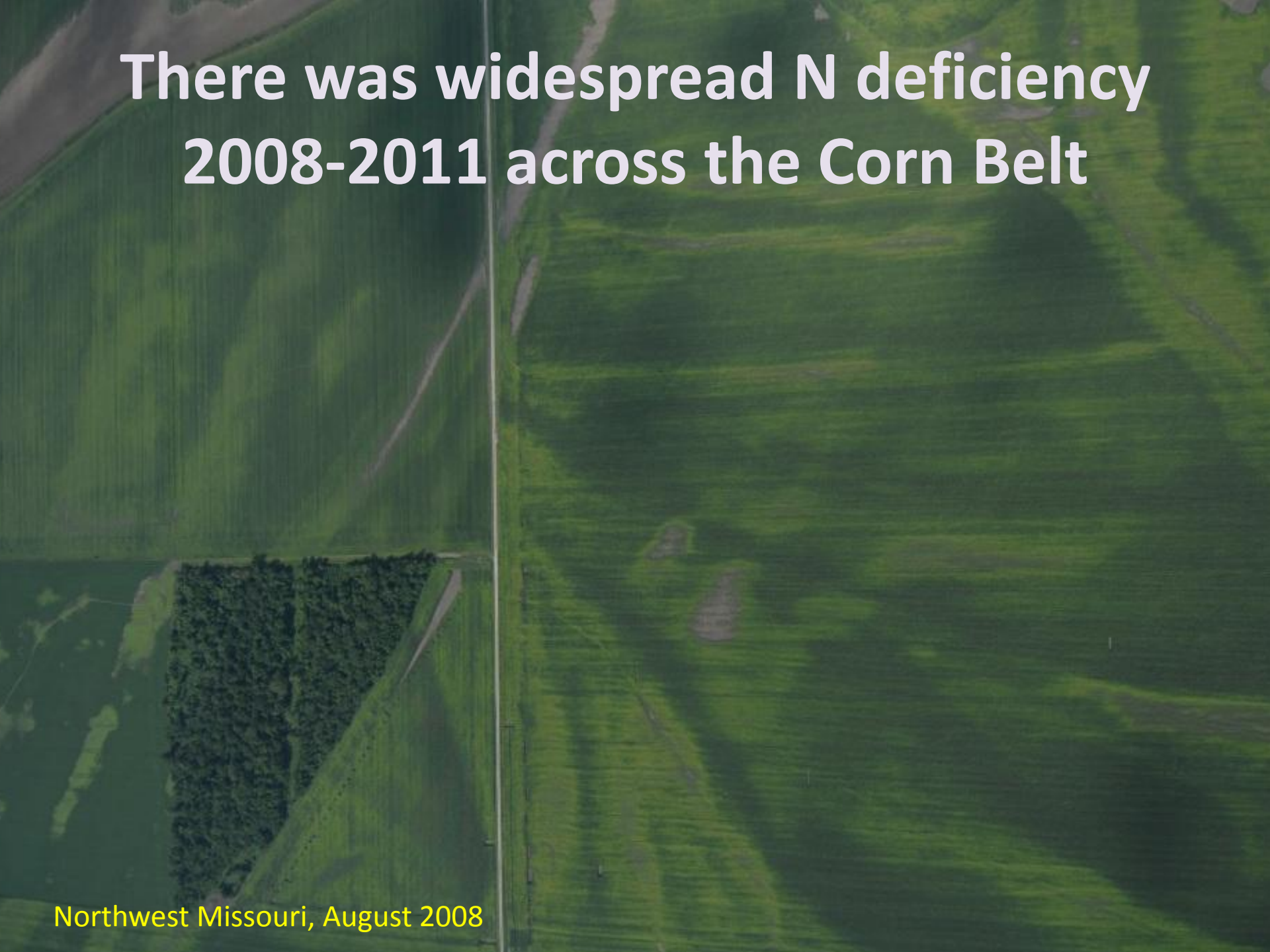


Uses:

- Rescue N decisions
- Variable-rate N to manage soil variability

There was widespread N deficiency 2008-2011 across the Corn Belt



Northwest Missouri, August 2008


I estimate that we lost 2 billion bushels of potential yield 2008-2011

In a wet year,

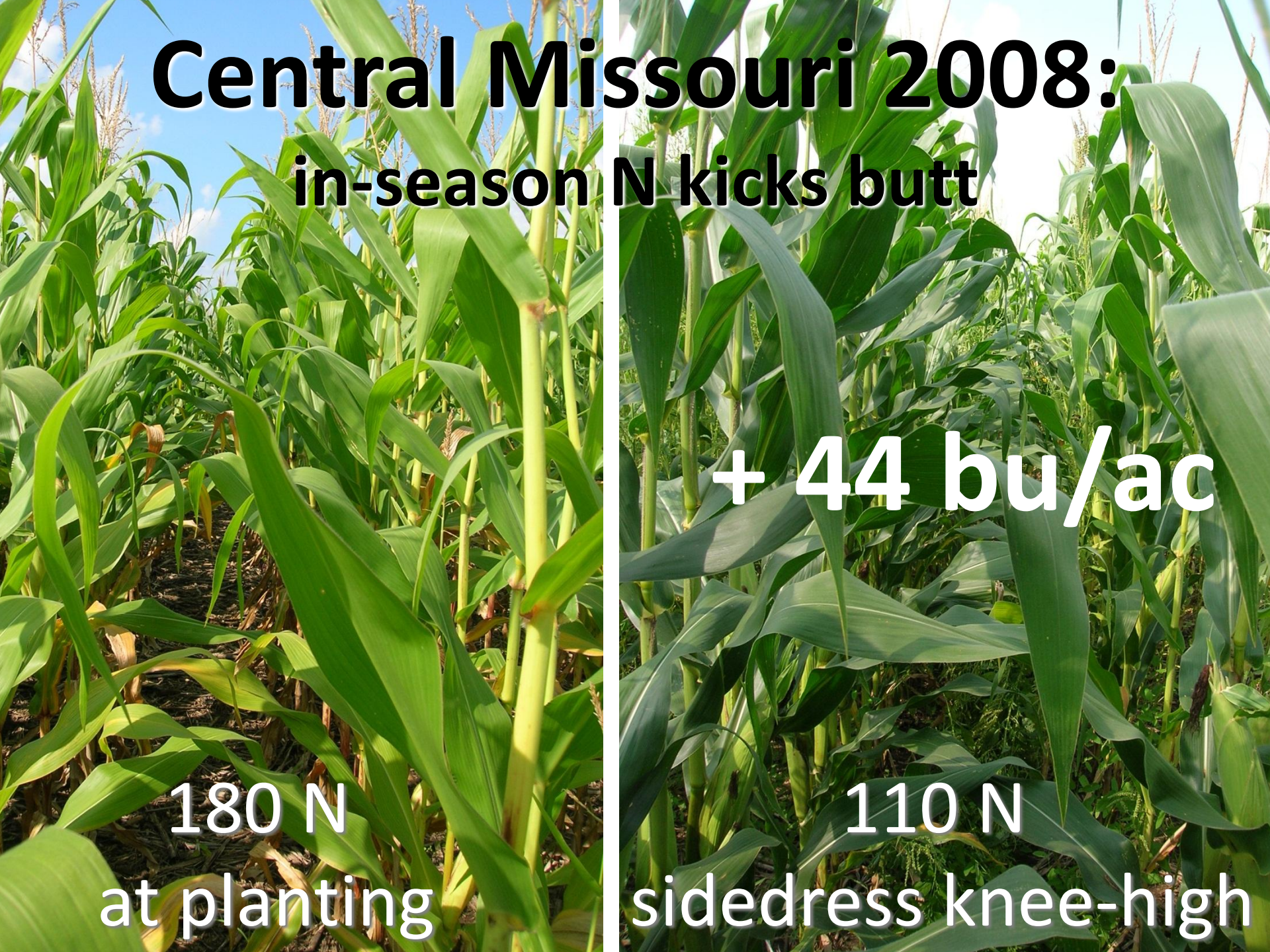
N must be applied in-season

Planned in-season N 

Rescue N in-season 

No in-season N 

Central Iowa, August 2008


Central Missouri 2008:
in-season N kicks butt
+ 44 bu/ac
180 N
at planting
110 N
sidedress knee-high


Central Missouri 2009:
in-season N kicks butt again
+ 68 bu/acre
153 N sidedress
knee-high
180 N
at planting
153
Post
180
Pre

Central Missouri 2010:
Can you believe a 3-peat?

Central Missouri 2013: In-season N wins big

N timing	N rate	Yield
Knee-high	160 (chlorophyll meter)	213
Knee-high	144 (crop sensor, VR 67 to 191)	207
Knee-high	116 (soil nitrate test)	196
Preplant	180	126
Preplant	140	101
Preplant	140 (soil nitrate test)	94
Preplant	100	72
----------	0	51

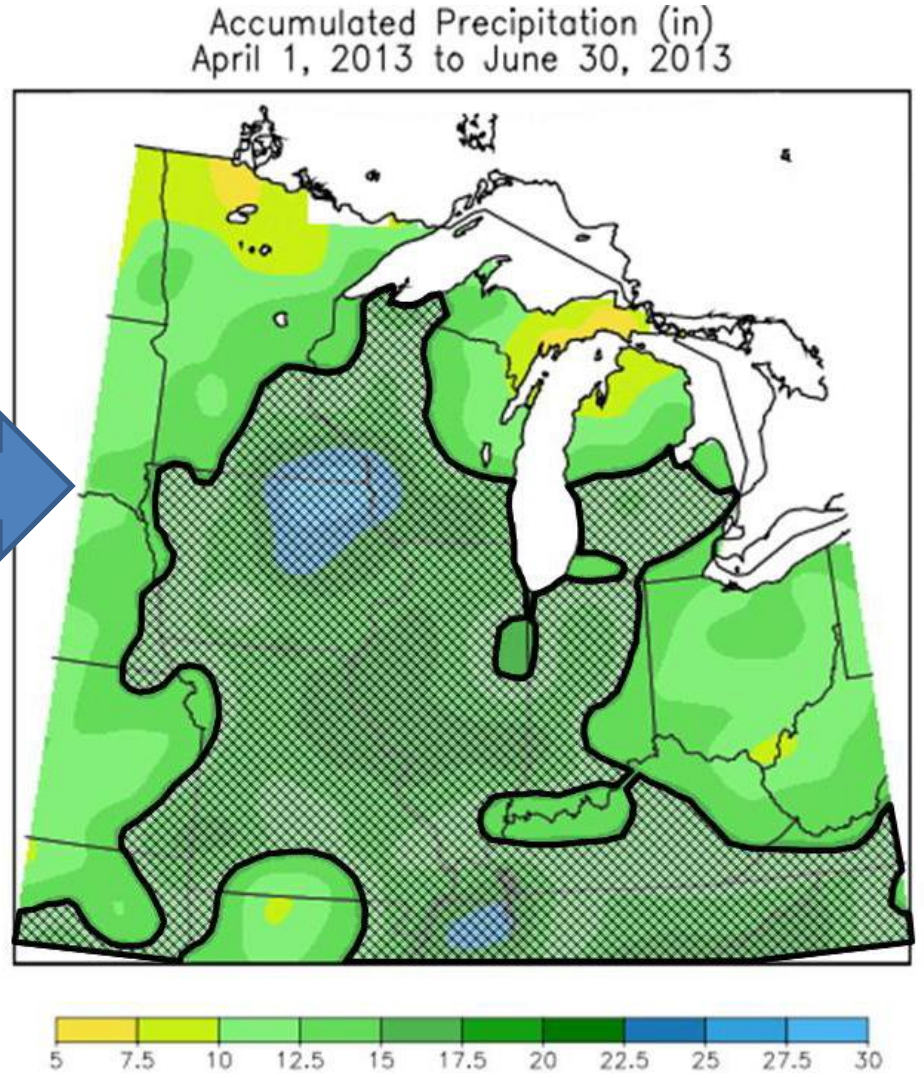
In-season N benefit in this experiment 2007-2013 totals about 265 bushels/acre

With 120 lb less N/acre

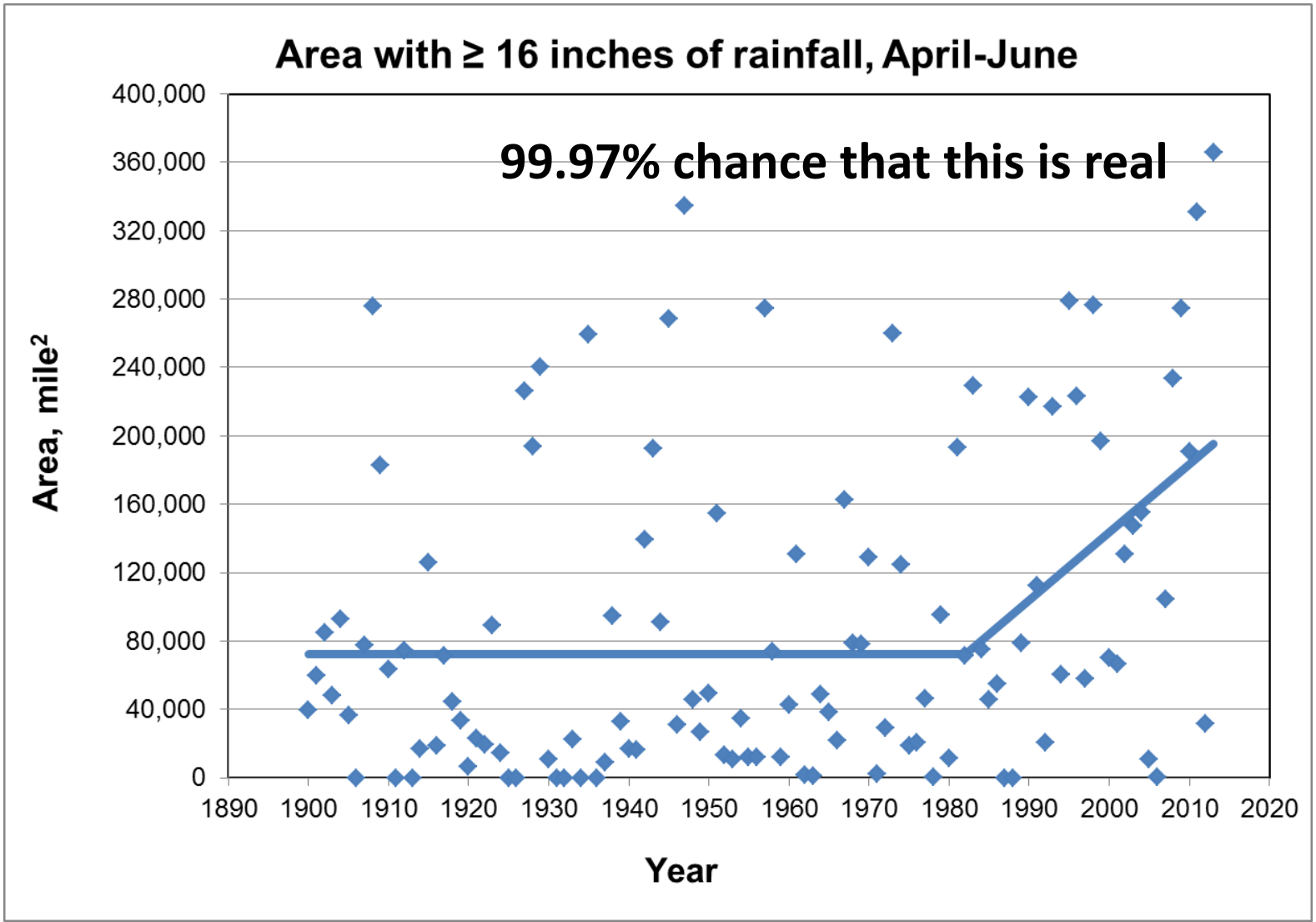
All in the wet years: 2008, 2009, 2010, 2013

2013: Largest wet spring in history

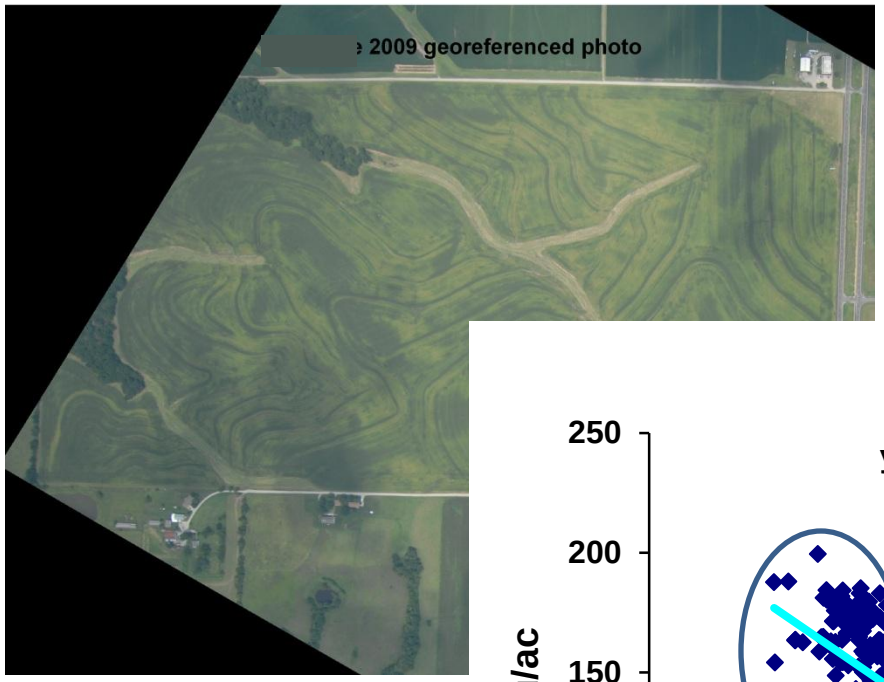
- My rule of thumb: more than 16” of rain April-June = high risk of N deficiency
- Areas that wet in 2013 are shown in crosshatch
- We made maps like this one going back to 1900

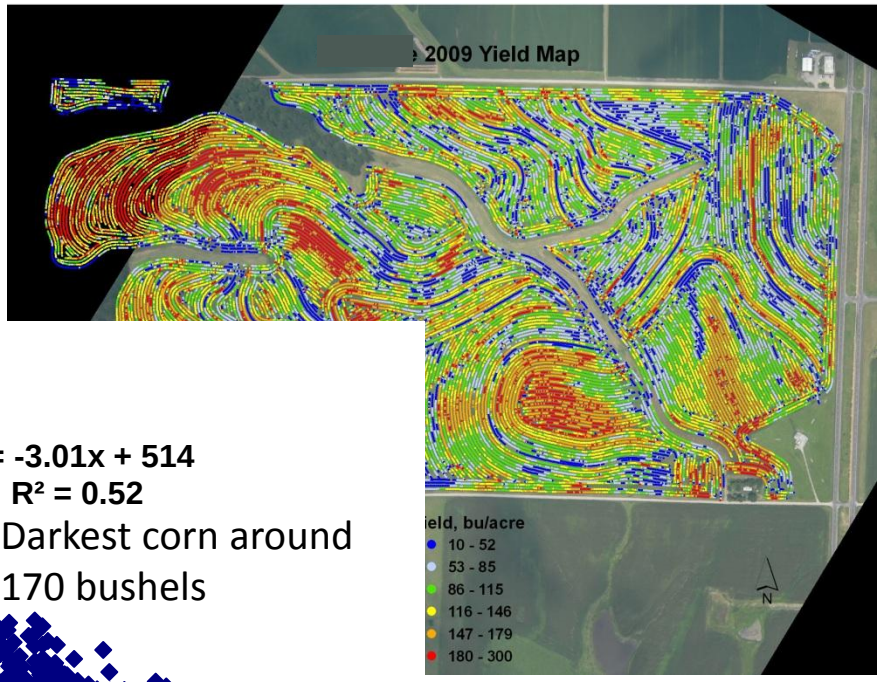


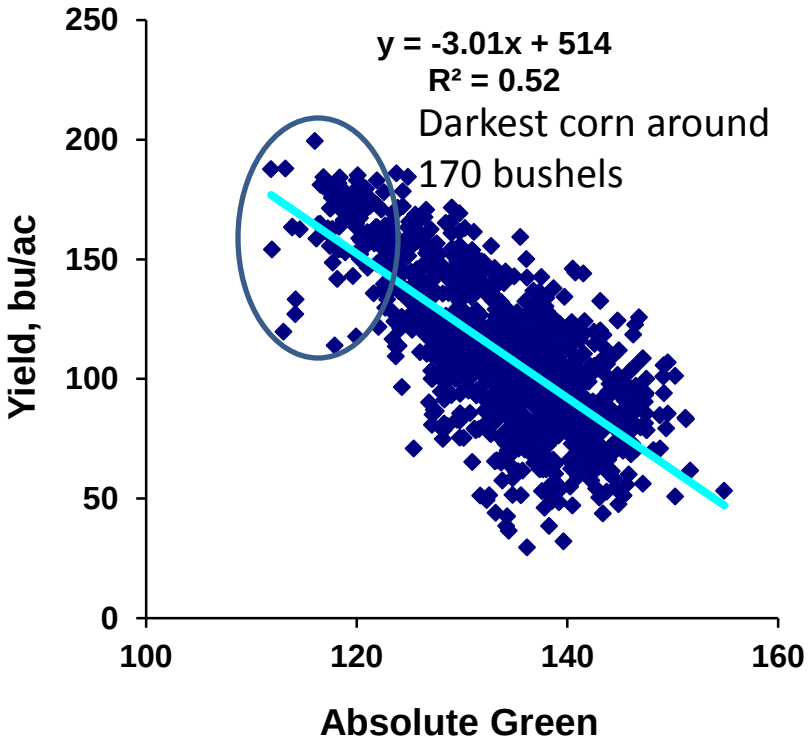
More wet area in the central U.S.



Yield map: yellow corn yields poorly







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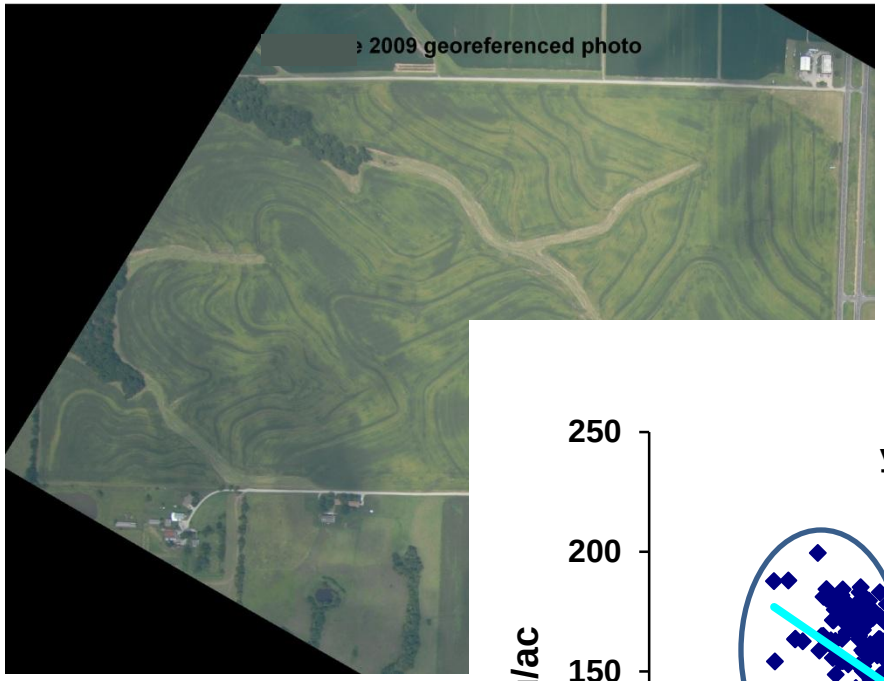
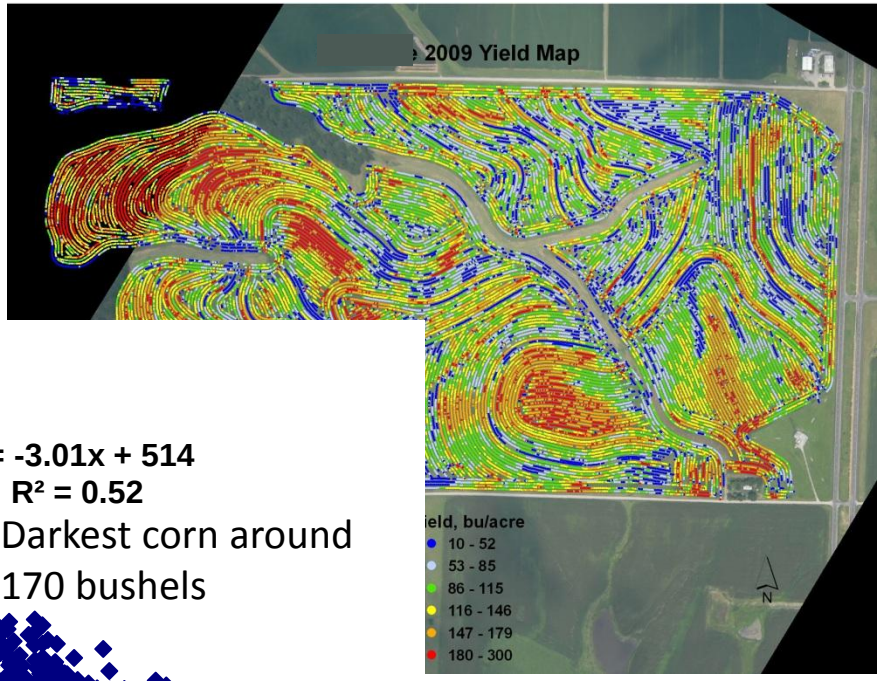
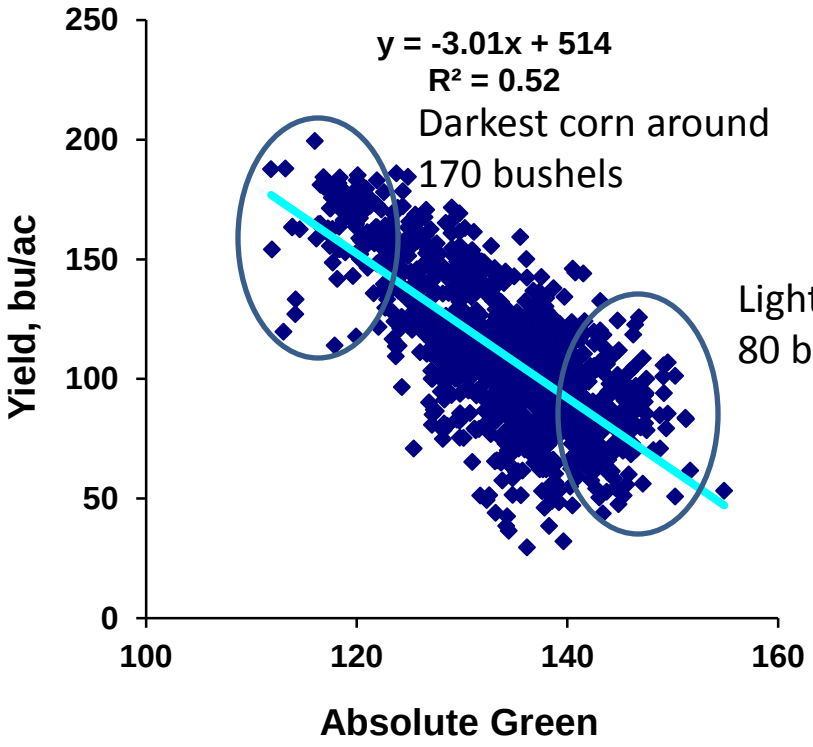






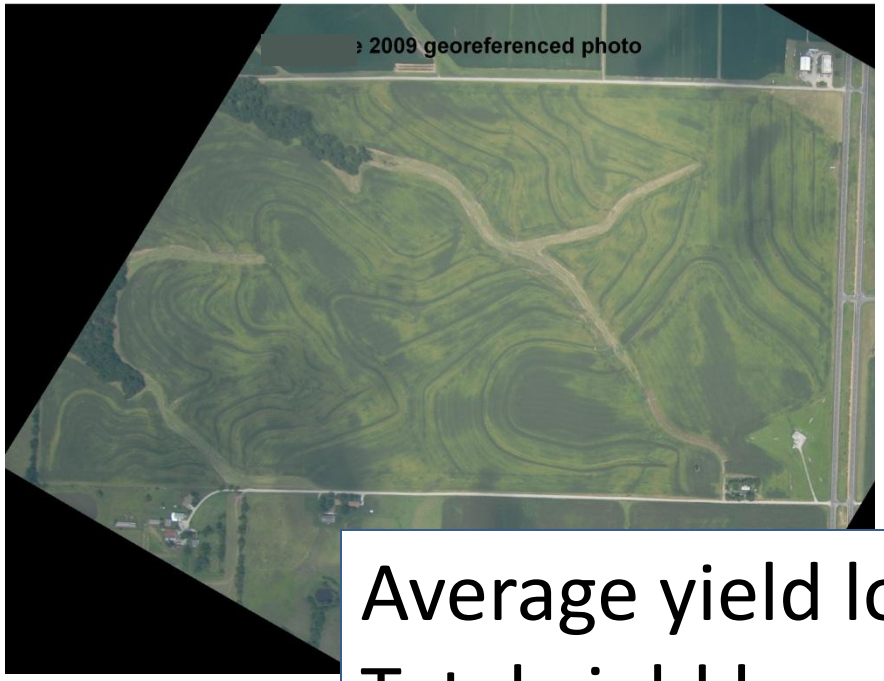
Darkest corn around 170 bushels

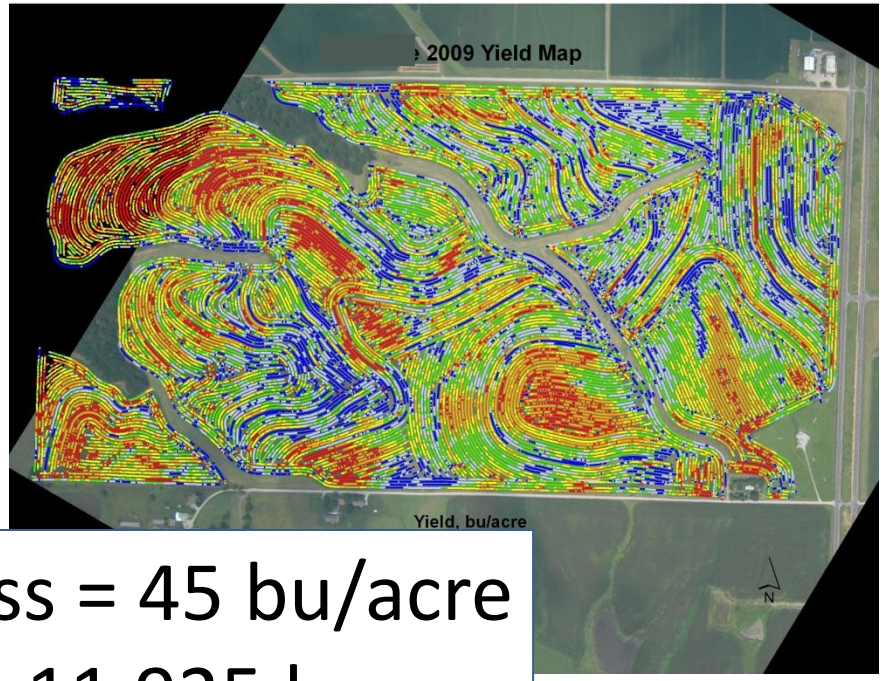
Lightest corn around 80 bushels

Average yield 125 bushels

45 bushels less than dark green corn

N Deficiency costs a lot!





Average yield loss = 45 bu/acre

Total yield loss = 11,925 bu

(45 bu/ac x 265 acres)

Total economic loss = **$44,720**

(11,925 bu x $3.75/bu)

Yellow corn can be rescued

- Fully fertilized fields but producers concerned
- N applied anywhere from thigh-high to tassel

Rescue N outcomes

- **Average yield response 34 bu/acre** (11 fields)
- **Yield response depended on visible stress**
  - High stress: 57 bushels (2 tests)
  - Medium stress: 41 bushels (5 tests)
  - Low stress: 14 bushels (4 tests)

Rescue N timing

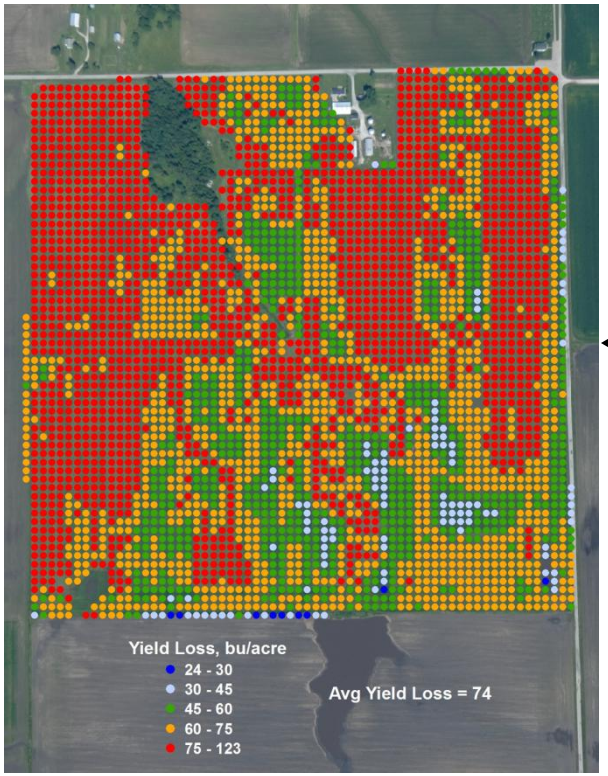
- **How late is too late?**
  - Six tests in 2010, all applied at tasseling, ave 34 bu response
    - **<u>Tasseling is NOT too late</u>**
  - Give up by 2 weeks after tassel?

How do I know whether I need to apply rescue N?

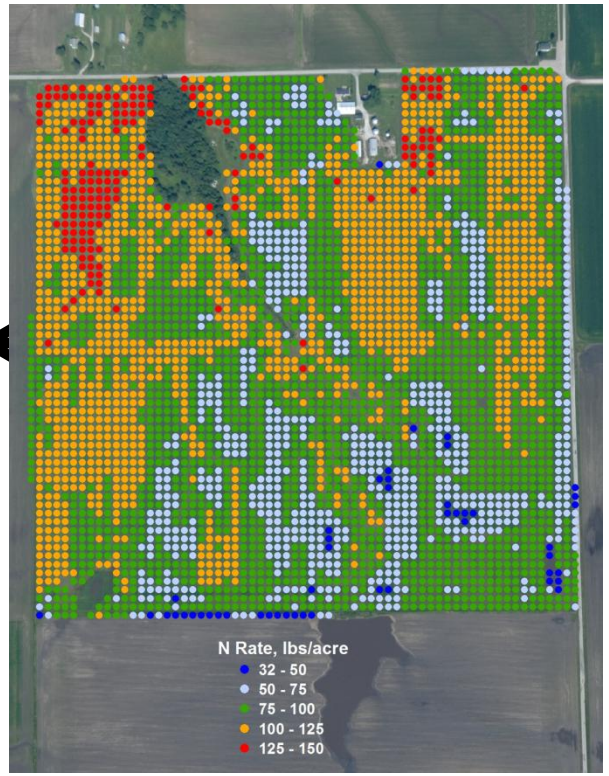
NVision:

quantitative decision support

aerial photo



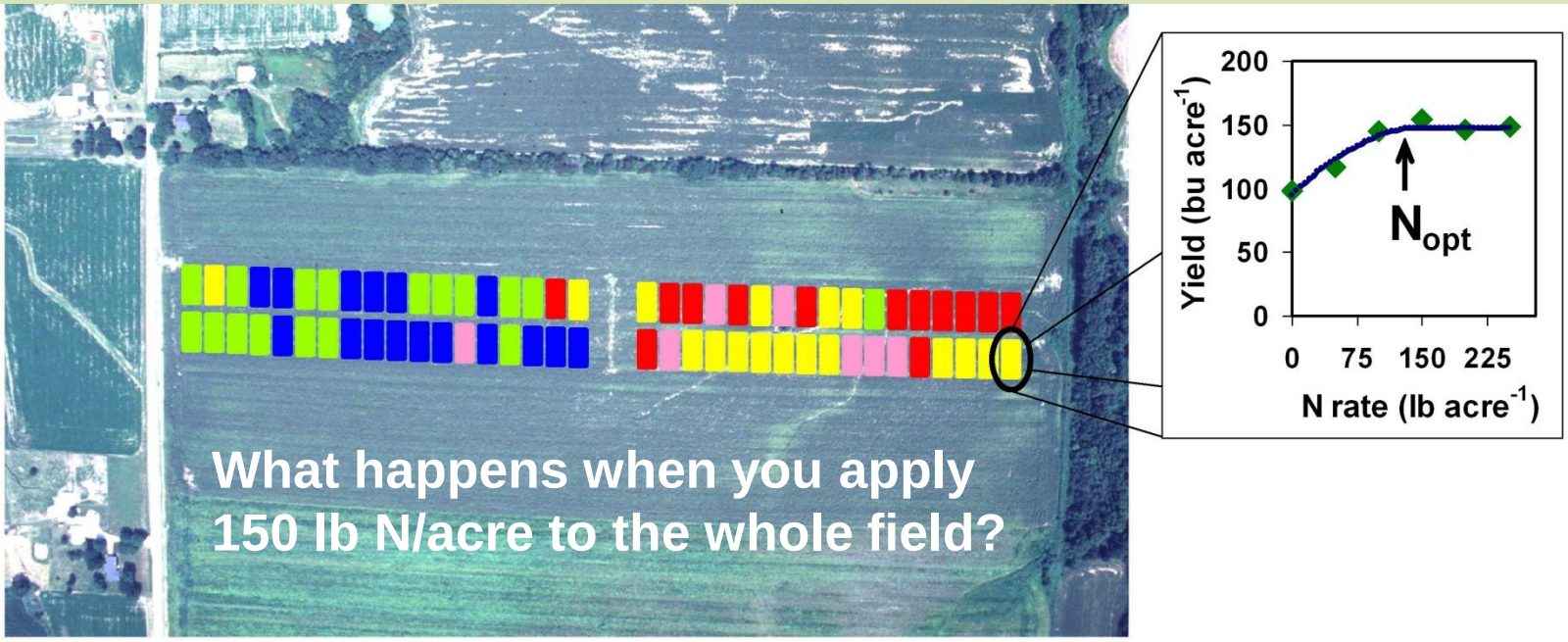
yield loss map (ave 74)



N rate map: fix the problem

Is there any reason I'd use NVision in a normal year?

Optimal N rate varies widely



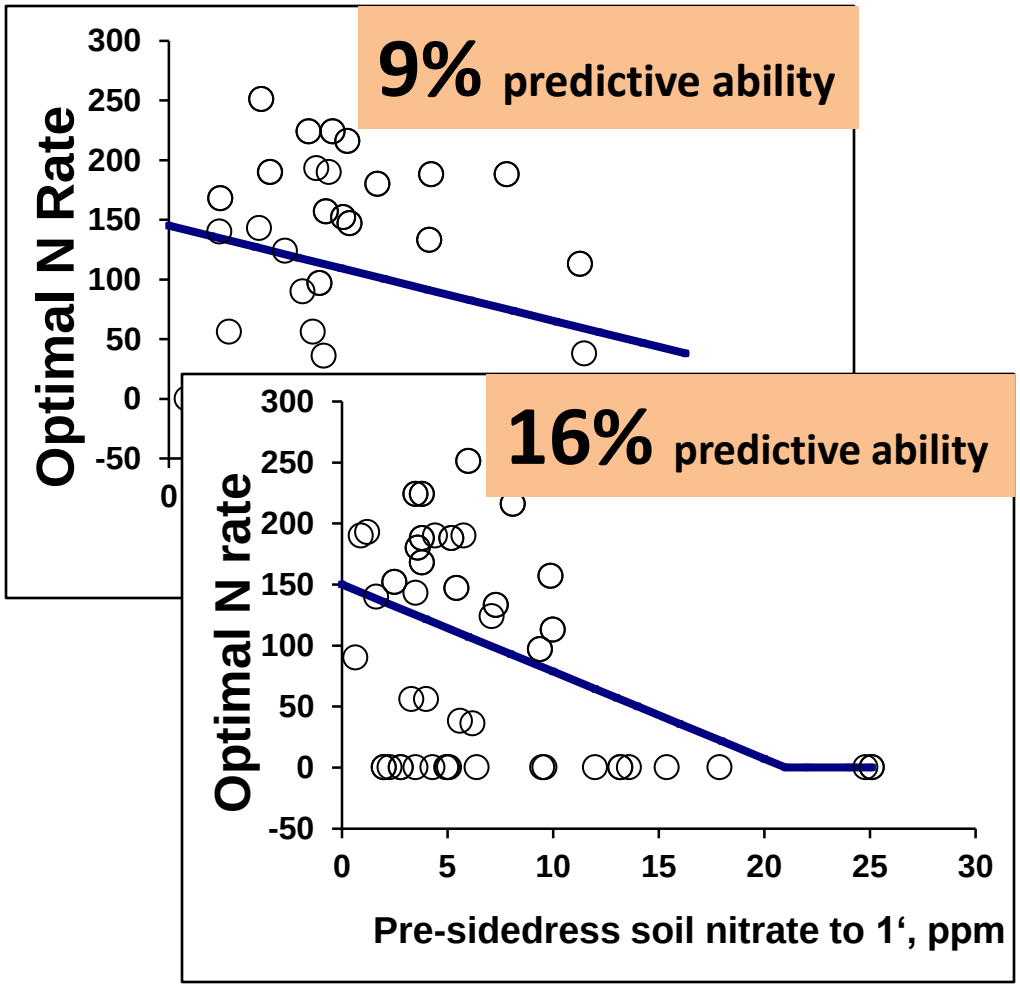
We studied eight fields this way—seven were as variable as this one

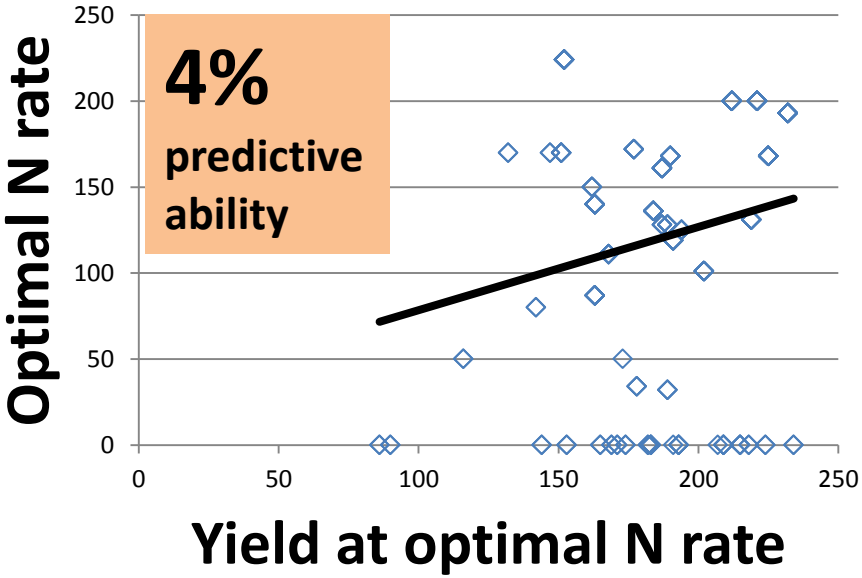
In one field, average best rate was 65;
In another field it was 200

Yes: Minnesota, Kansas, Missouri, Pennsylvania
No: Wisconsin

Color predicts N rate better than soil tests or yield

data from 64 fields, 7 states





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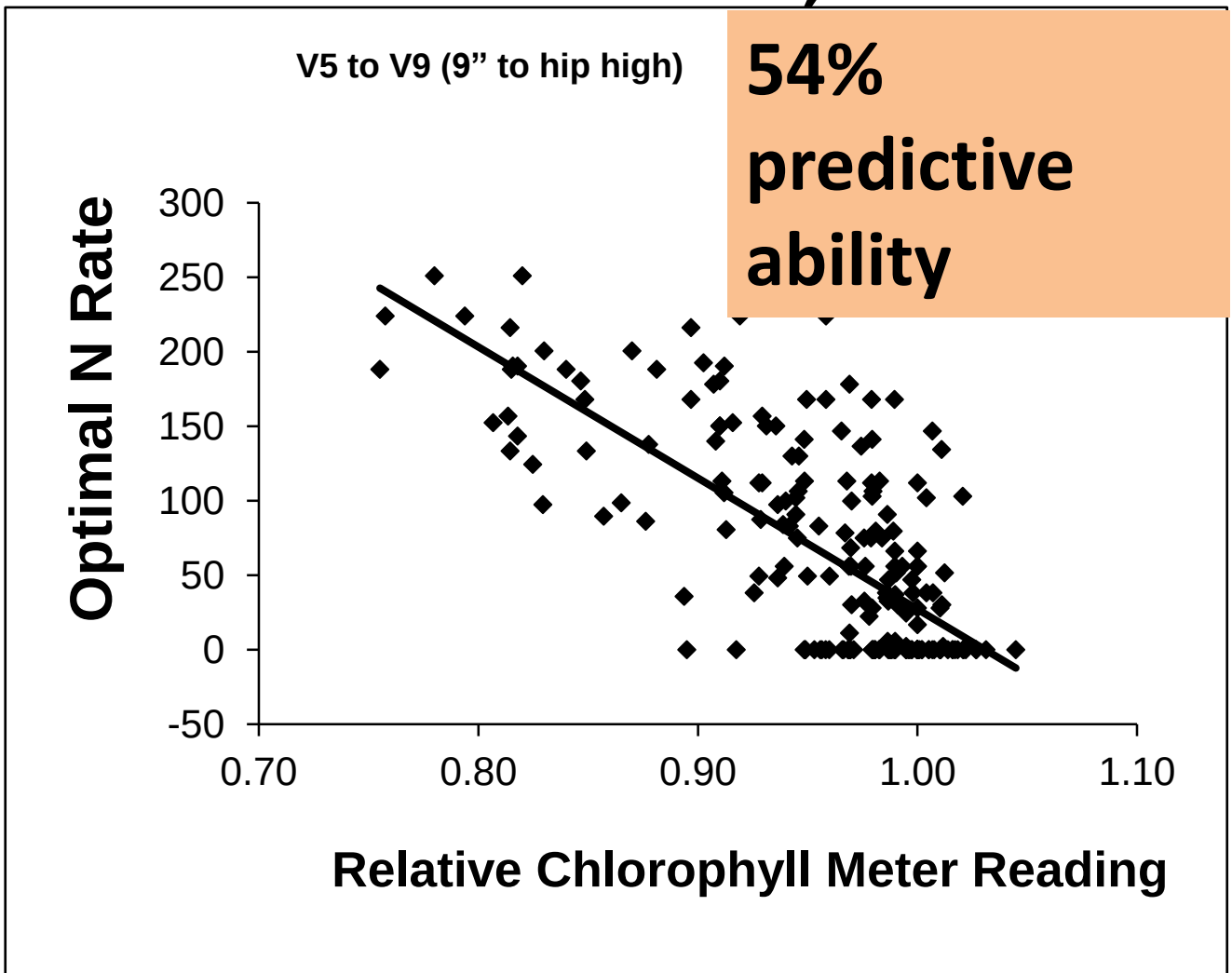


2013: Far more in-season N than ever before

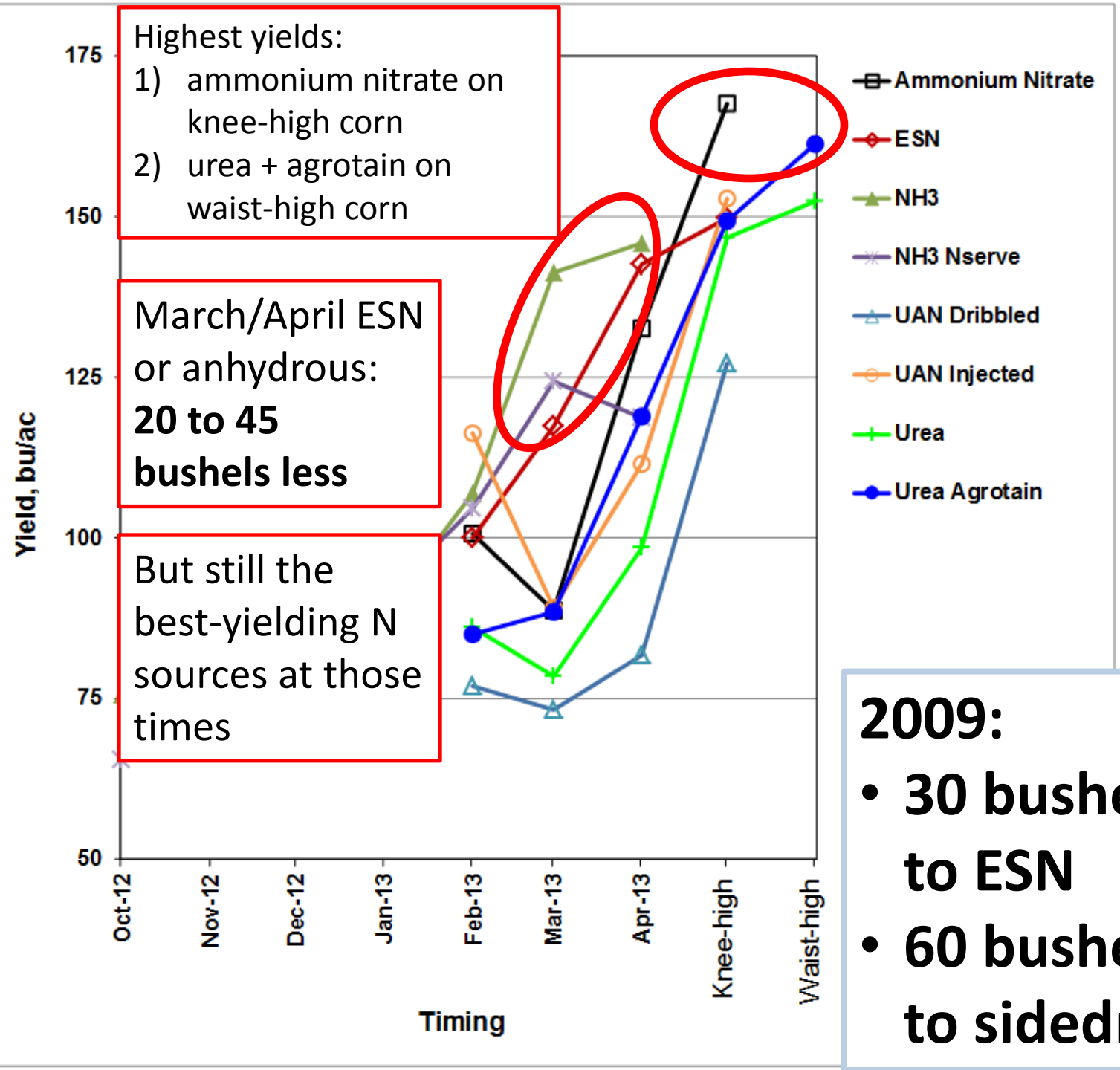
- Pioneer agronomist webinar June (mainly IA/MO)
  - **On average expected 50% of acres to get in-season N**
- Phone calls July: a dozen consultants, extension agronomists, and retailers in MO/IA/IL
  - **On average thought 45% of acres had received in-season N**
- Field day wagons northwest MO in August
  - 22/63 = **35% of corn producers had applied in-season N**
- **I don't think it had ever been above 5% before**

Questions?
Comments?

Near Craig, Missouri
August 2, 2008

Can we get by with applying all N pre-plant?

- I’ve had this question several times from producers & advisors in the delta region
- If we use N sources resistant to loss?
  - Anhydrous ammonia
  - ESN



central Missouri 2013

2009:

- **30 bushel response to ESN**
- **60 bushel response to sidedress**

ESN and anhydrous ammonia are the best preplant N sources in a wet year…

…but not as good as sidedress