

Nitrogen Loss: Again??!!

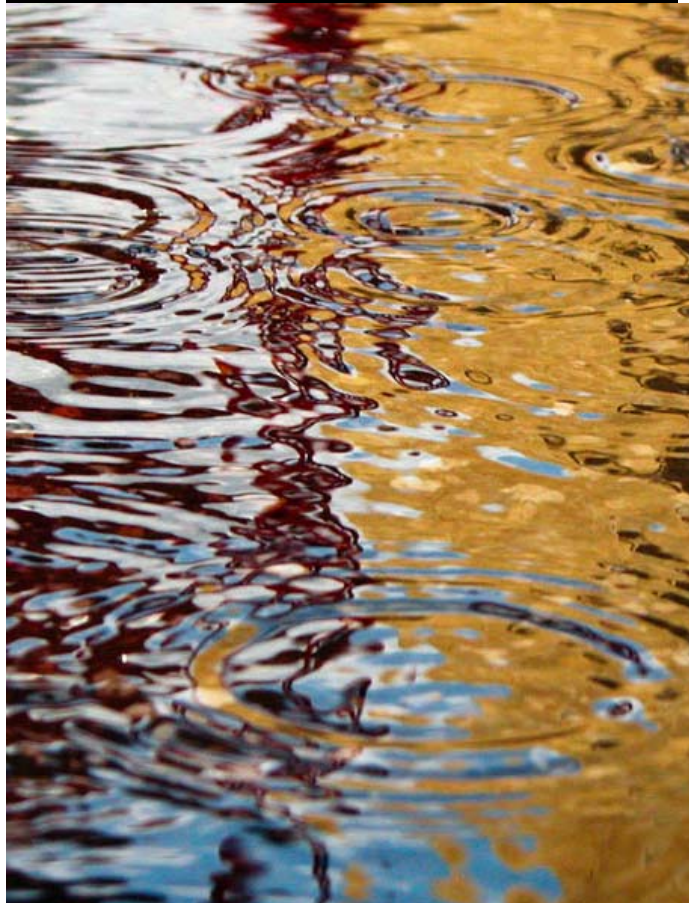
Peter Scharf
University of Missouri
Plant Sciences Division



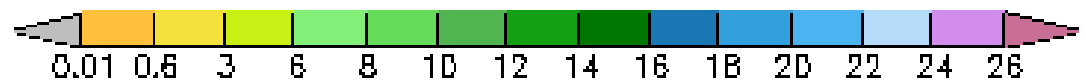
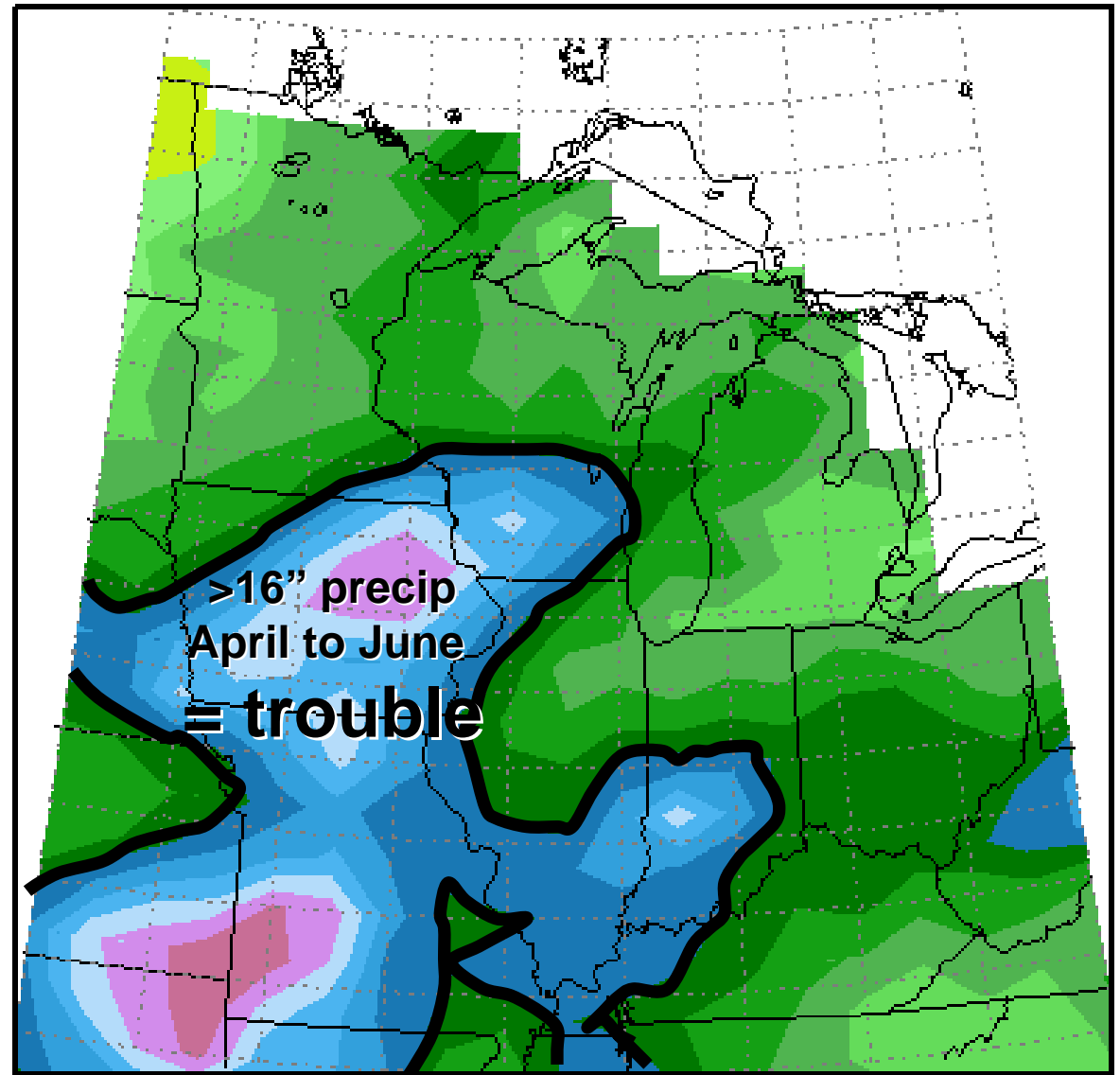
The Missouri N deficiency story

- Terrible in 2008 (recap)
- Even worse in 2009
- How big is this problem?
- Can we solve it with rescue N?
 - Effectiveness, timing
 - Logistics, cost
- Need to have a plan before planting
- Diagnosis & decision

The Cause



Total Precipitation in Inches
April 1, 2008 to June 30, 2008



Wet & wetter

- Pat Guinan, December 2008:
 - 1999 to 2008: wettest 10-year period in Missouri history
- 2009: even wetter

An aerial photograph of a rural farm. The landscape is dominated by large, green agricultural fields. In the center, there is a farmstead with several buildings, including a large white barn and a smaller structure. A dirt road winds through the fields. The sky is clear and blue. The text 'The Symptoms' is overlaid in large, bold, black letters with a white outline at the top of the image.

The Symptoms

1. Yellow corn!!

2. STREAKS

Northwest Missouri

early August 2008



Western Illinois

mid August 2008



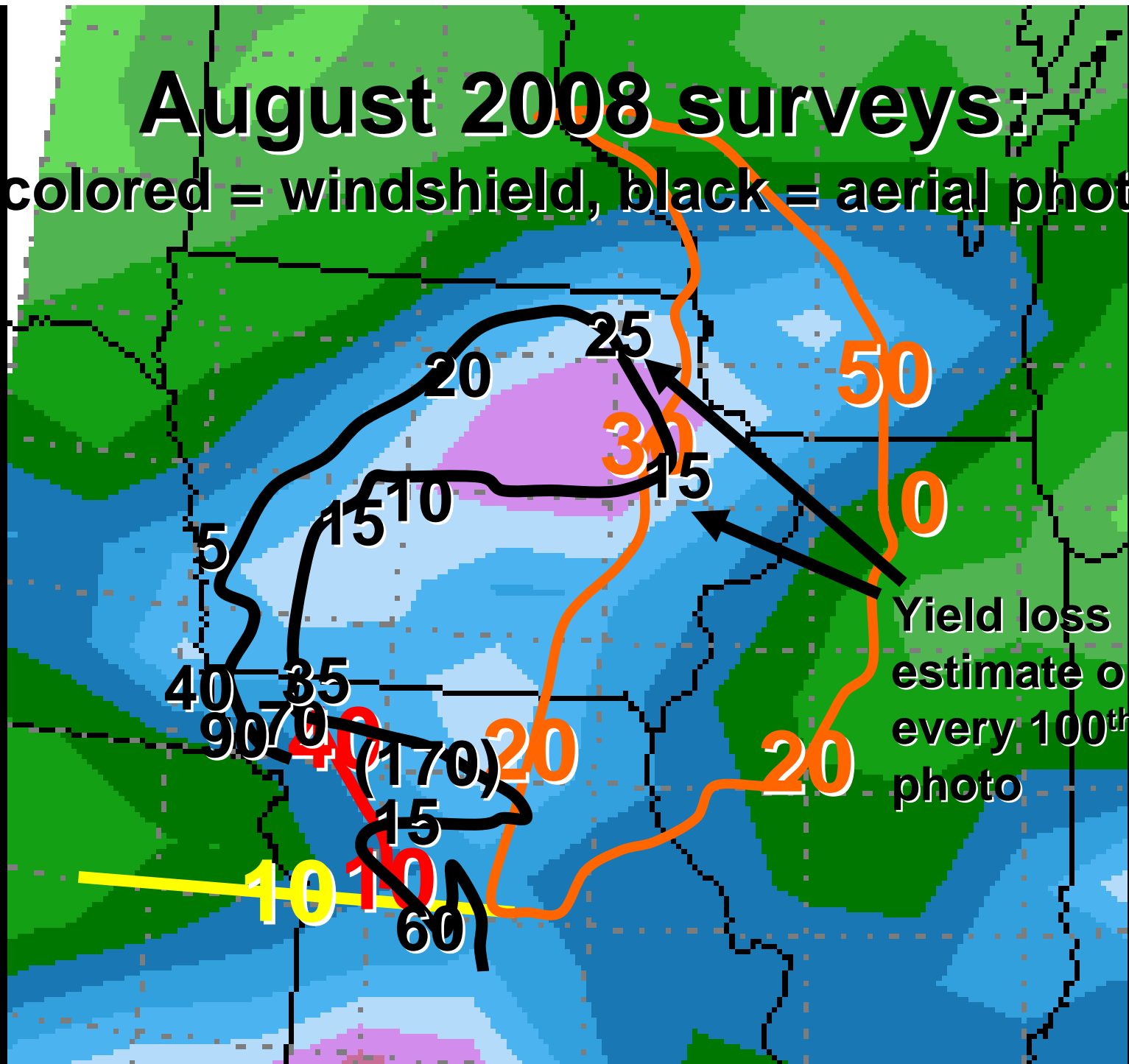
An aerial photograph of a vast agricultural landscape in Central Iowa. The fields are a vibrant green, showing distinct rows of crops. A road or canal runs diagonally across the upper right portion of the image. The overall scene is a dense, organized pattern of green fields.

Central Iowa

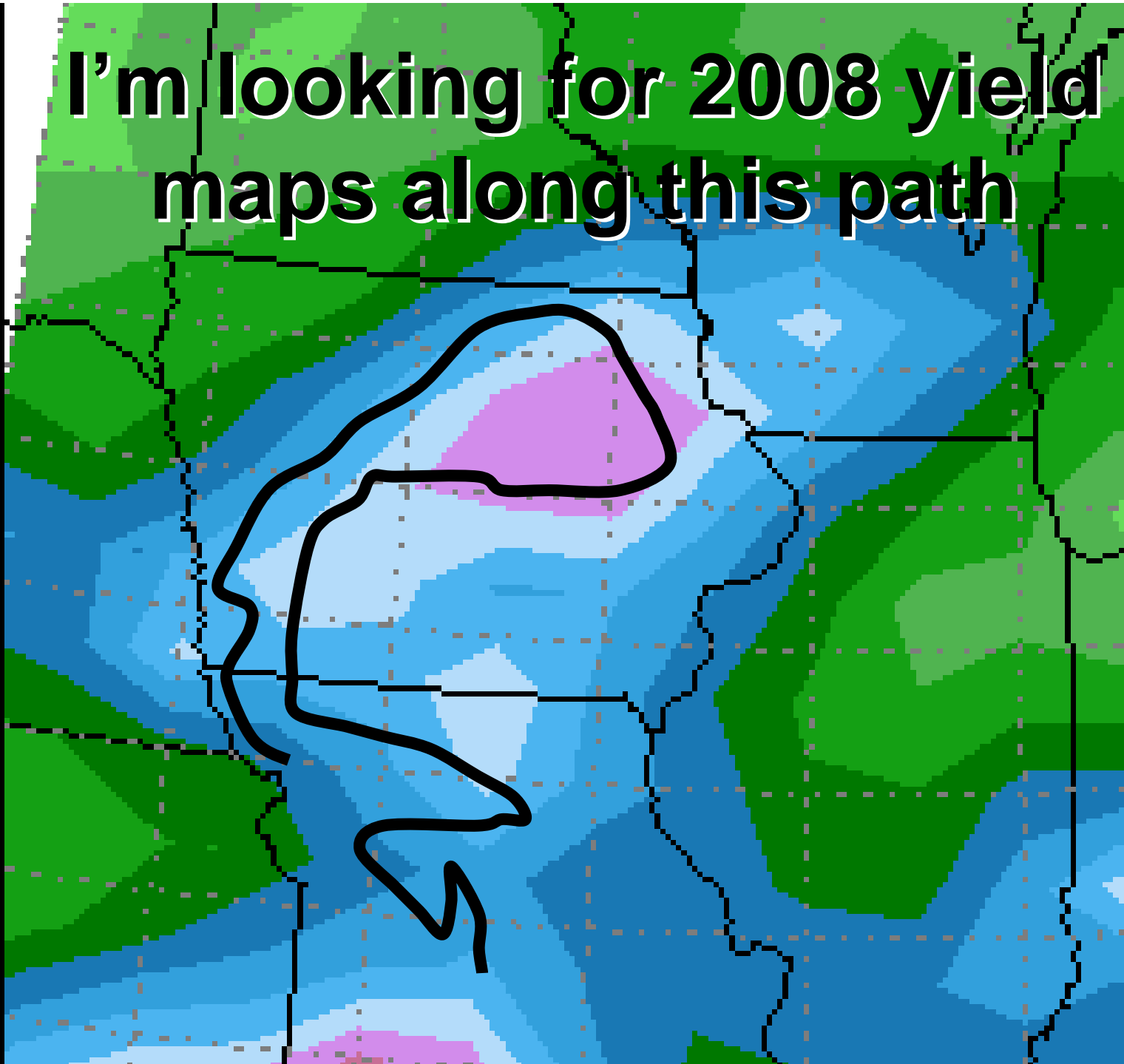
late August 2008

August 2008 surveys:

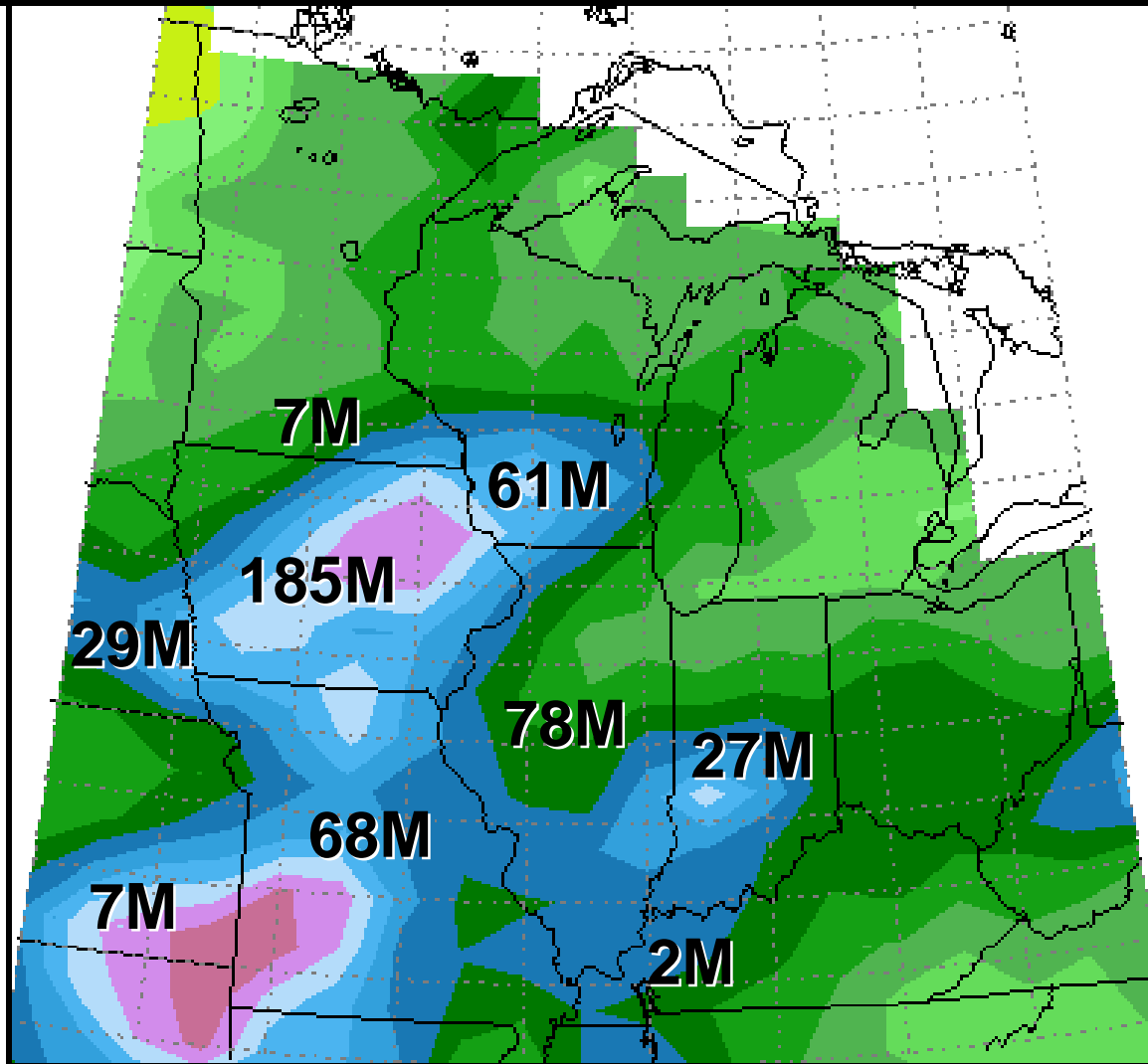
colored = windshield, black = aerial photo



I'm looking for 2008 yield maps along this path



Bushels lost in 2008 due to N deficiency: My estimates by state



Total 9 states:
463 million bushels

- Some yields were very good anyway
- Many could have been better



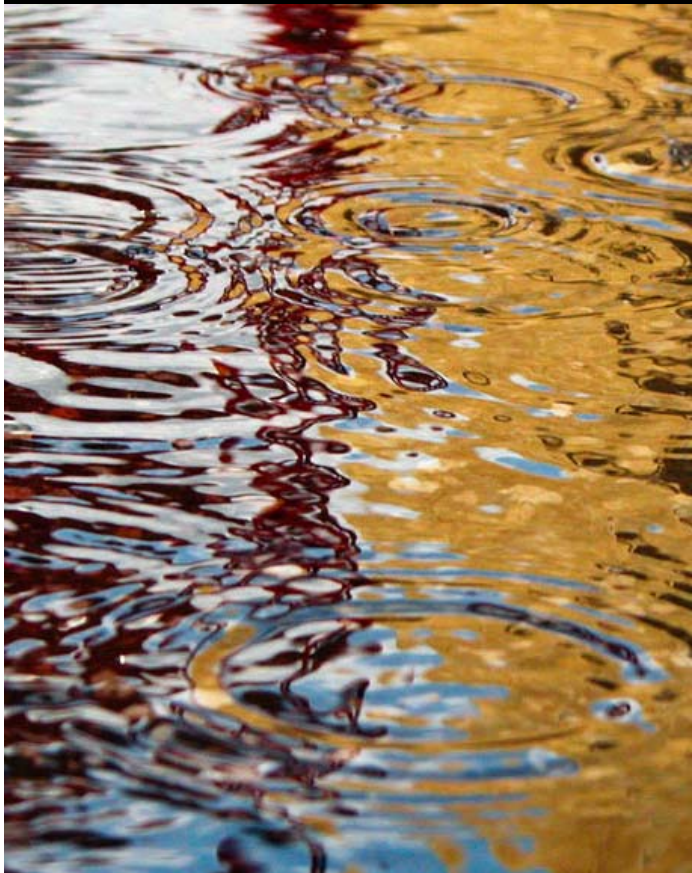
Prevention/Cure: in-season N

180 N
at planting

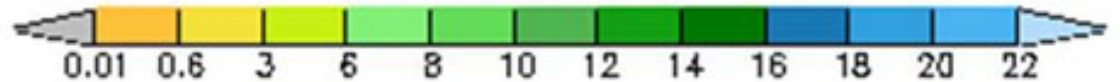
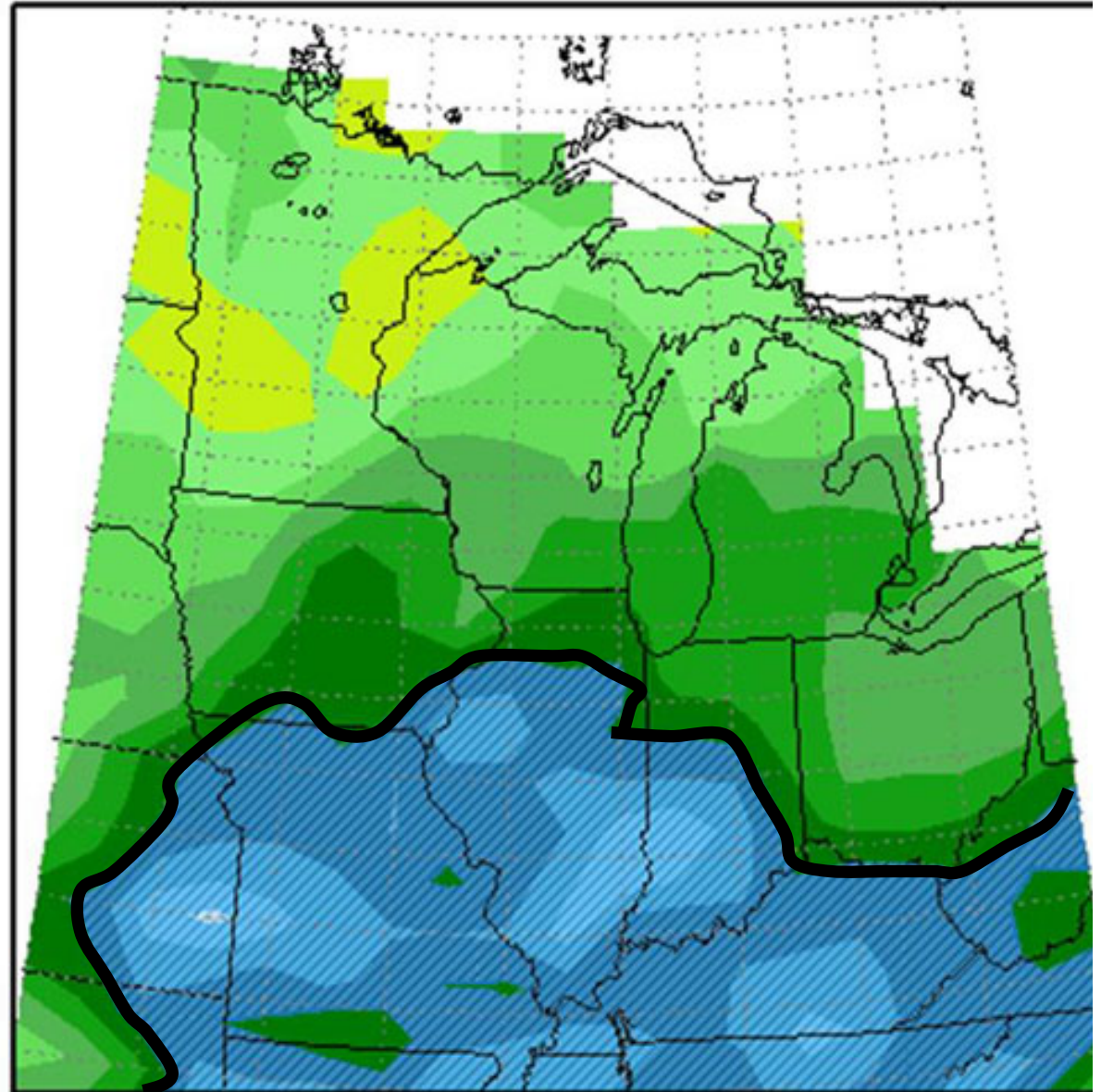
+ 44 bu/ac

110 N
sidedress V7.5

2009: Deja vú all over again



Total Precipitation in Inches
April 1, 2009 to June 29, 2009



central Illinois

early August 2009

Same yellow corn



Western Missouri **early August 2009, Harrisonville**



Western Missouri **early August 2009, Missouri City**



Western Missouri **early August 2009, Kearney**



Western Missouri **early August 2009, NE of Kansas City**



Western Missouri

early Aug. 2009, N of Richmond



Western Missouri

early August 2009, NE of Lexington



West central Missouri **early August 2009, south of Marshall**



West central Missouri **early August 2009, south of Marshall**



Eastern Missouri

early August 2009, NE of Mexico



Eastern Missouri

early August 2009, NE of Montgomery City



Eastern Missouri

early August 2009, SE of Louisiana



Southern Iowa



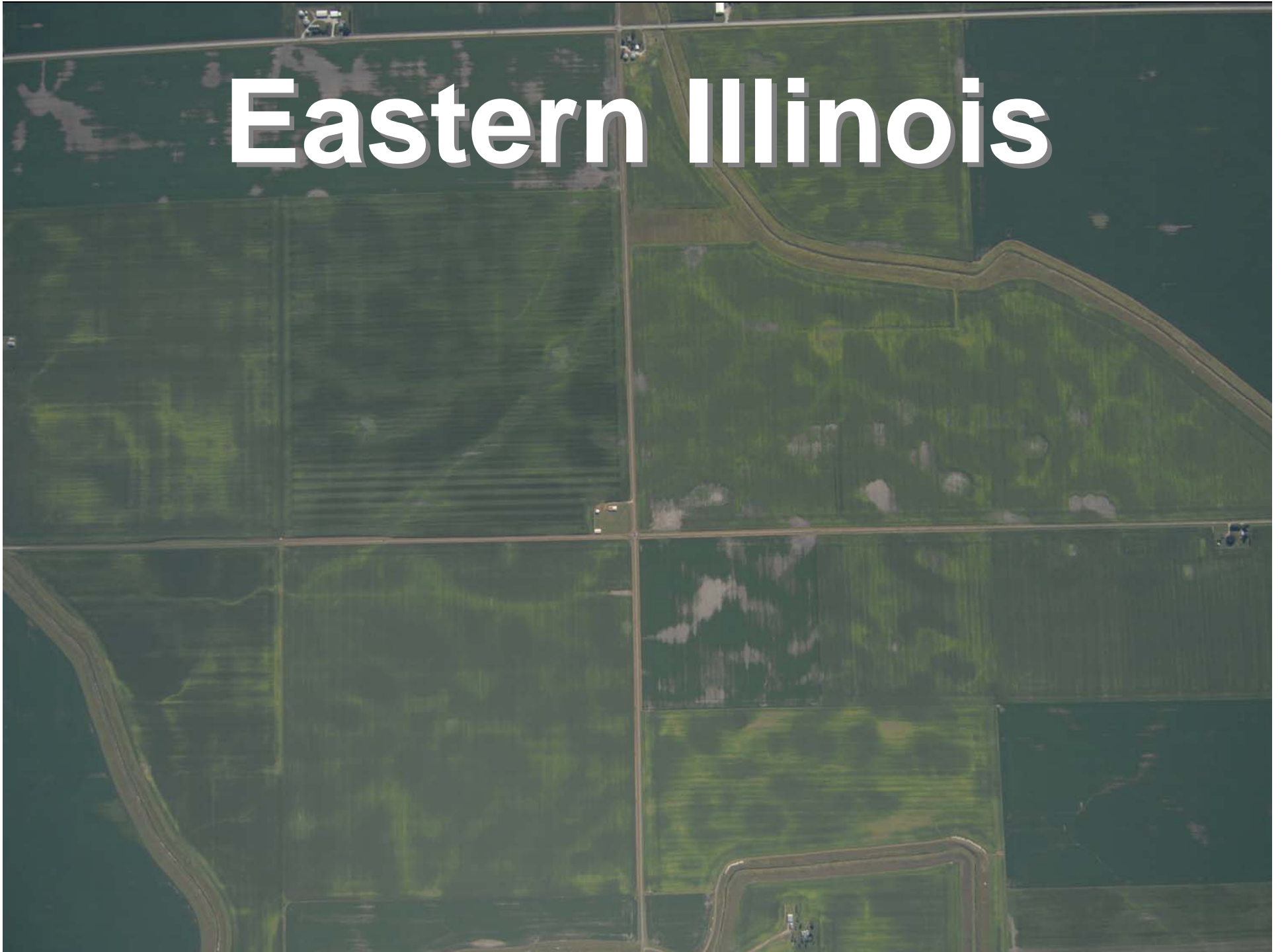
Southern Indiana



Eastern Illinois



Eastern Illinois



Nitrogen timing in 2009

Just sidedressed

Preplant N



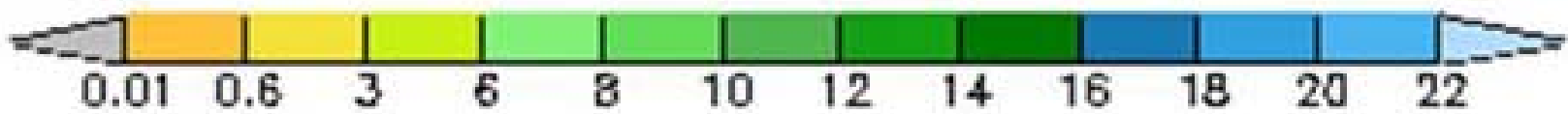
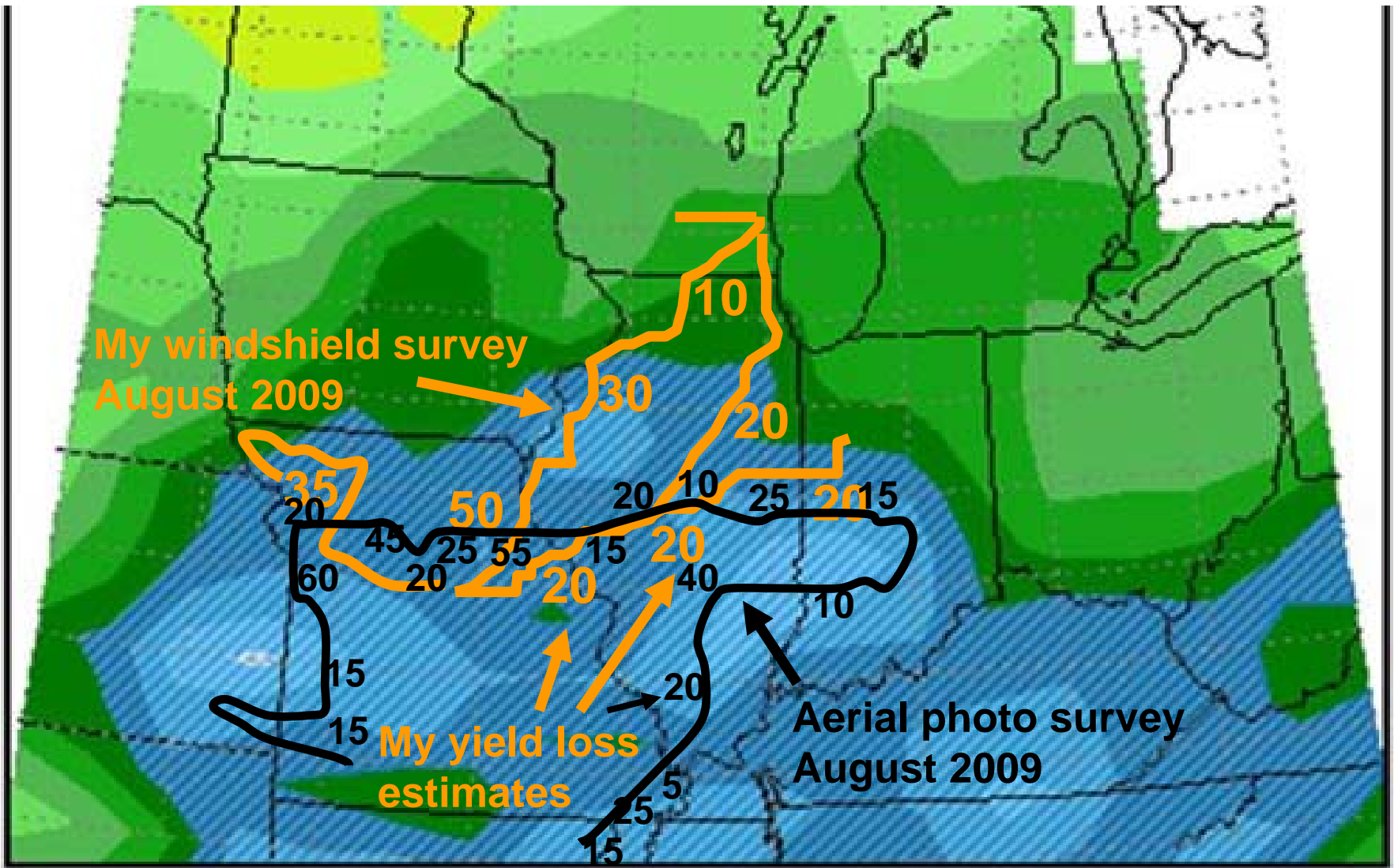


**Nitrogen timing in 2009:
in-season N kicks butt again**

+ 68 bu/acre

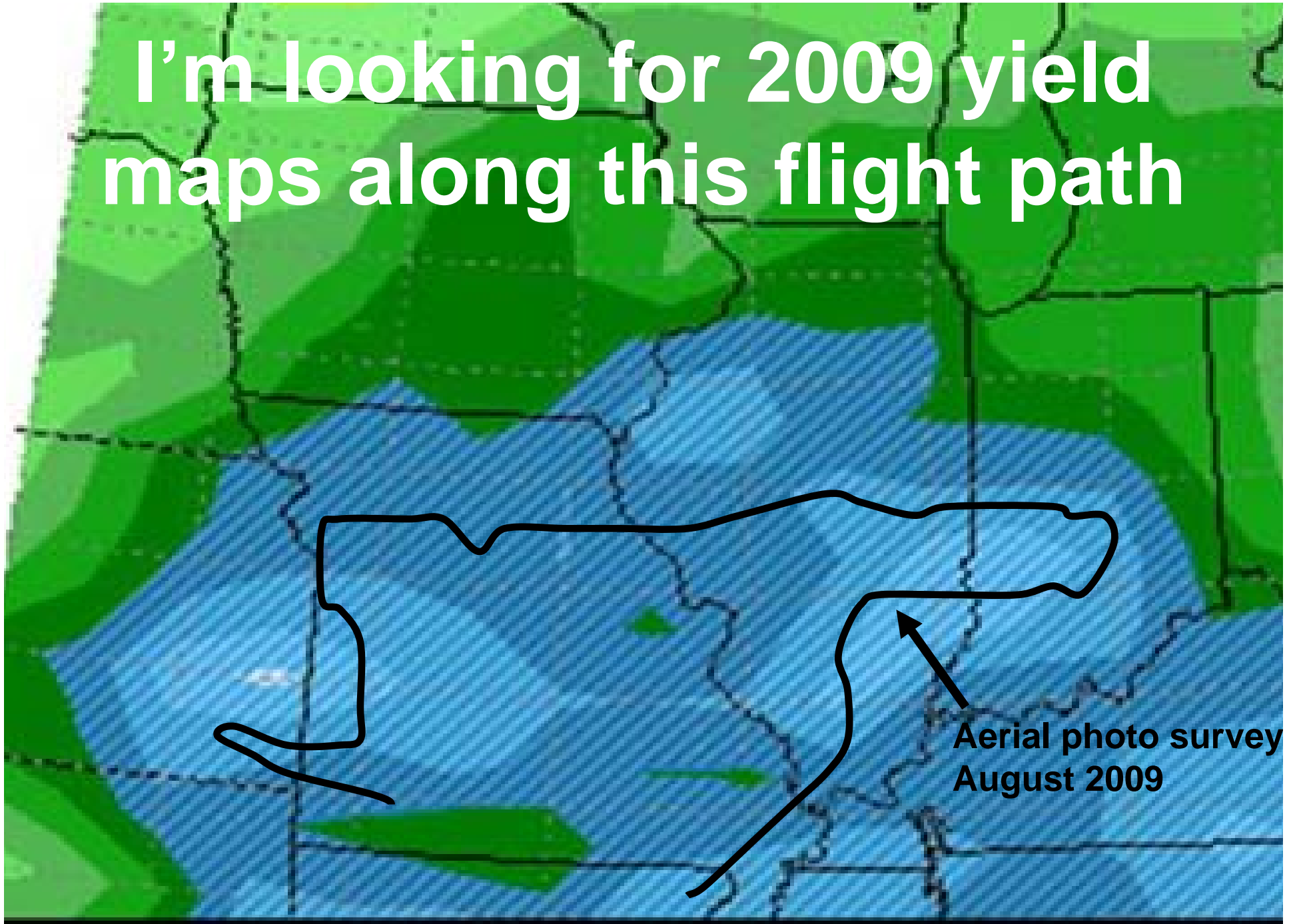
153 N
153
sidedress V7.5

180 N
180
at planting

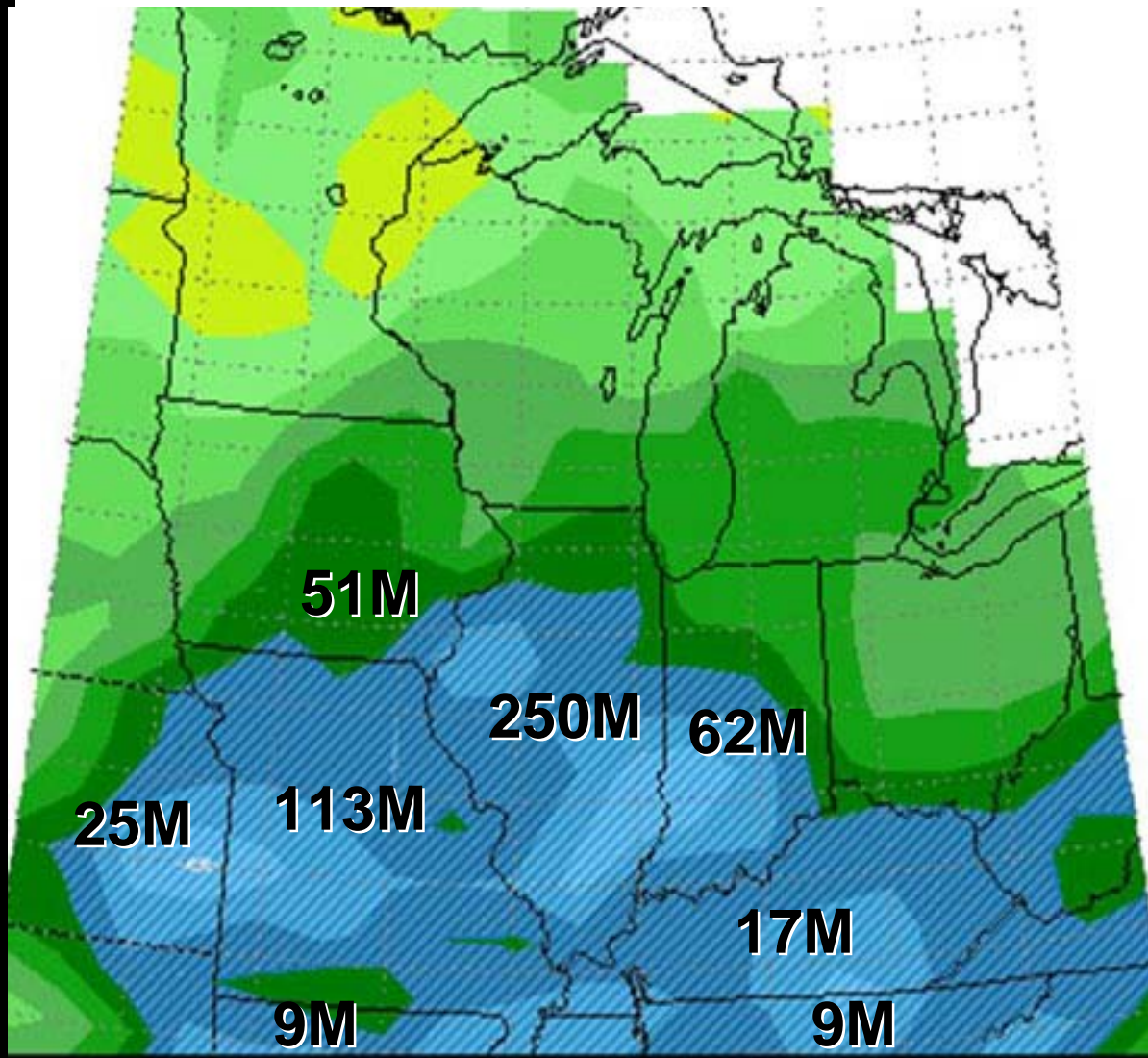


Total Precipitation in Inches
April 1, 2009 to June 29, 2009

I'm looking for 2009 yield maps along this flight path



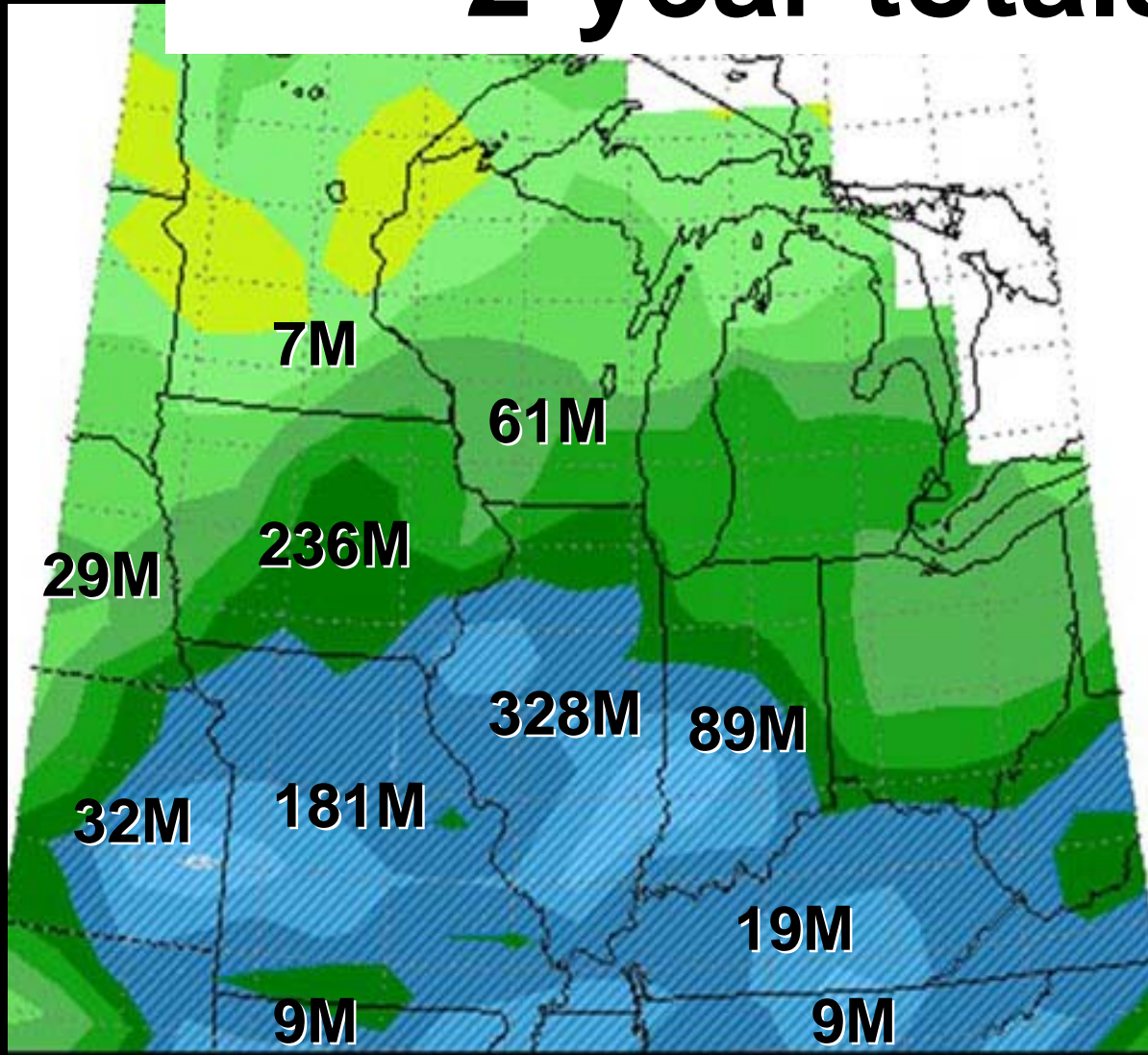
Bushels lost in 2009 due to N deficiency: My estimates by state



Total 8 states:
518 million bushels

- Some yields are very good anyway
- Many could have been better

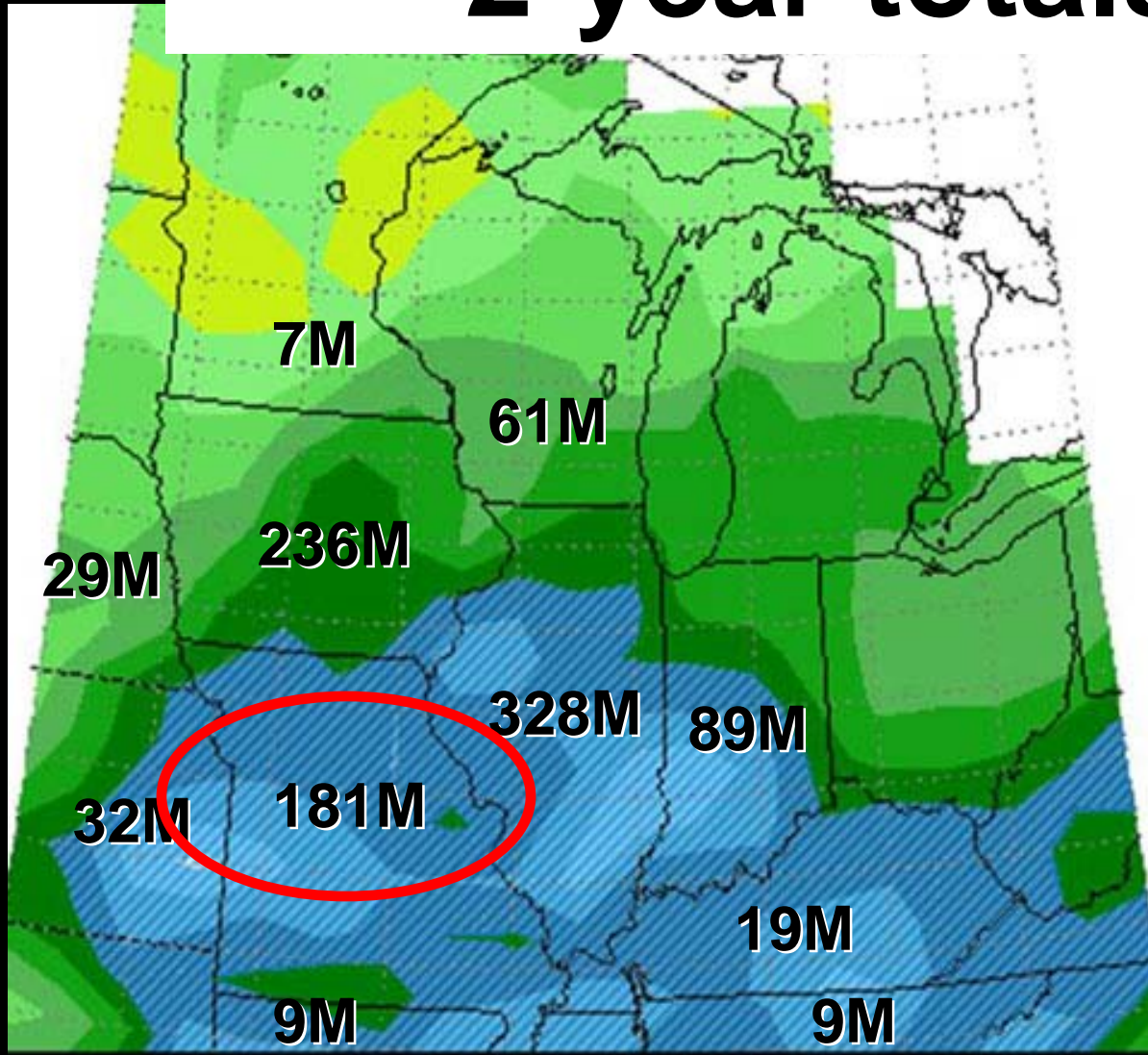
Bushels lost due to N deficiency: 2-year totals



Total 11 states:
1 billion bushels



Bushels lost due to N deficiency: 2-year totals

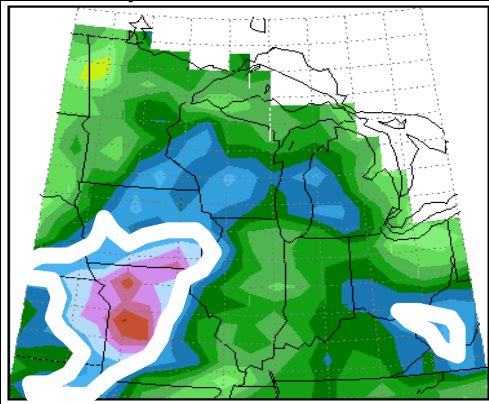


Total Missouri:
181 million bushels

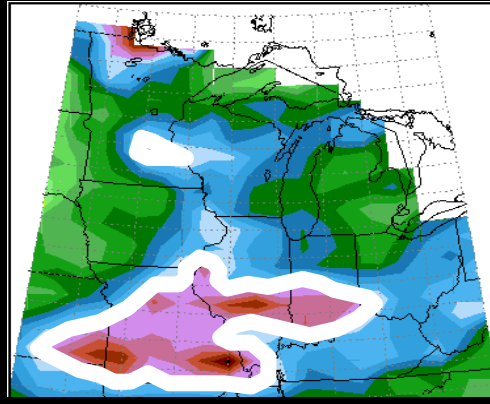
In perspective:
2009 Missouri corn crop is
438 million bushels

2 wet years in a row—
What about the last 9?

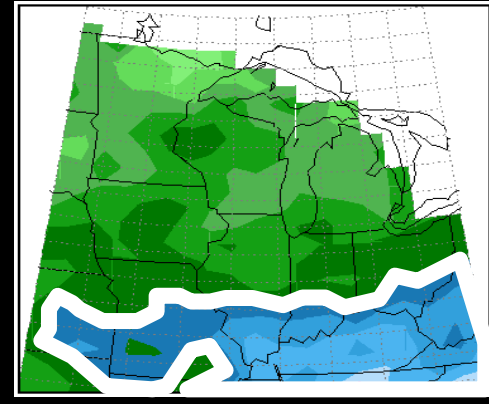
2001



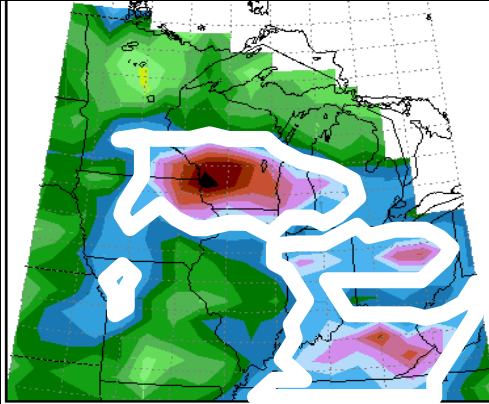
2002



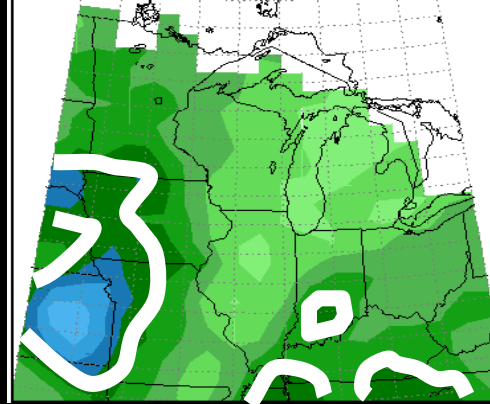
2003



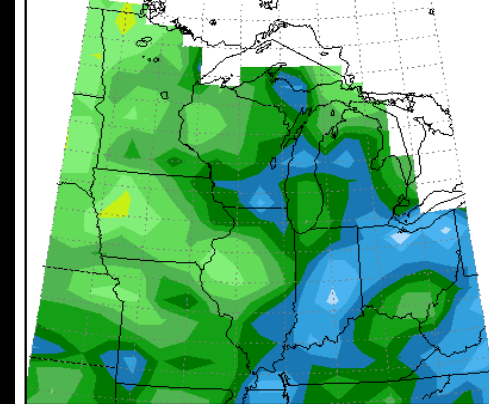
2004



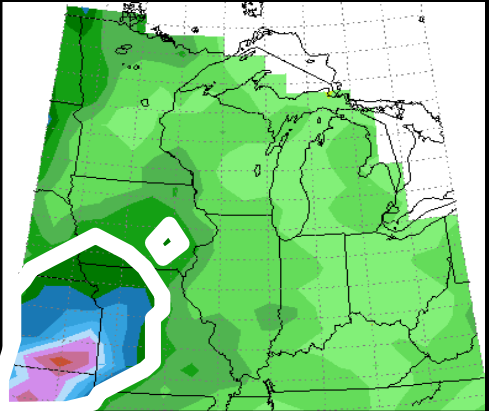
2005



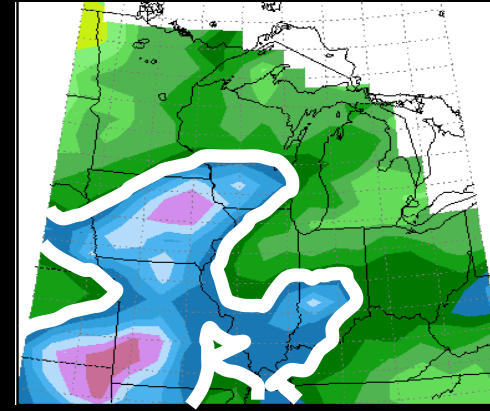
2006



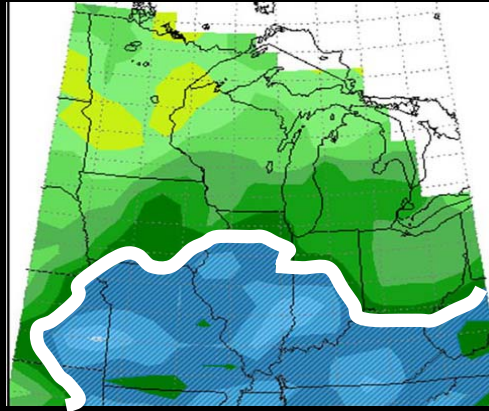
2007



2008



2009



More perspective: how big is this?

- Ray Massey (ag economist): 2009 production costs for corn about \$490/acre
- Break-even yield = 130 bu at \$3.80
- Estimated state-average yield = 151 bu/ac
- $151 - 130 = 21$ bu/ac is profit
- 21 bu/ac x 3 million acres = 63 million bu are profit, the rest pays production costs

More perspective: how big is this?

- 438 million bu state total 2009
- 375 million bu to pay production costs
- 63 million bu are profit
- My estimate: 113 million bu lost to N deficiency
- I believe that at least 80 million bu could have been economically recovered with rescue N applications
- **Rescue N doubles profit?**

Rescue N—worth it?

- Ground preparation
- Fertilizer application(s)
- Spray herbicide
- Plant
- Spray again?
(herbicide or fungicide)
- Harvest



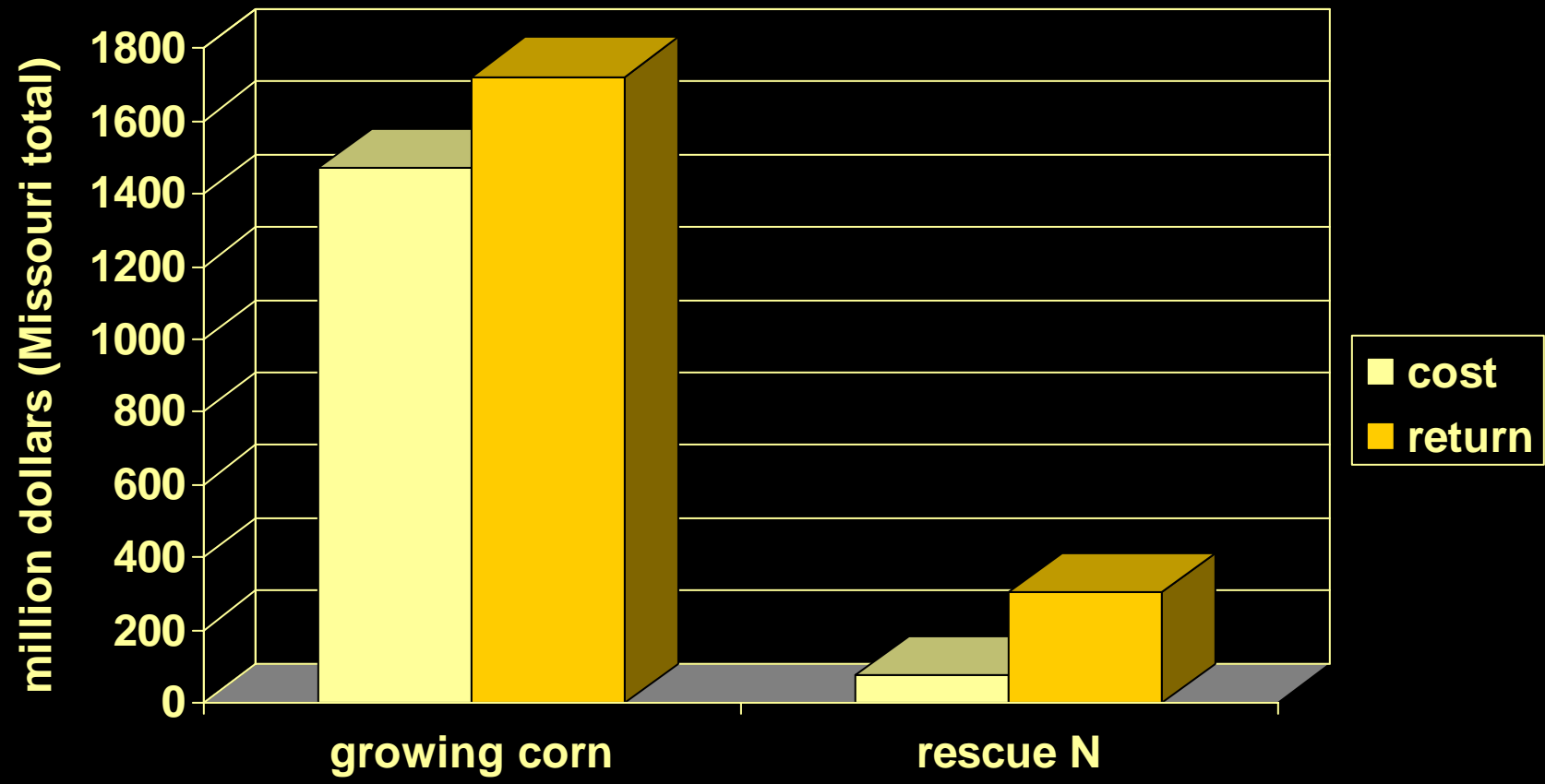
63 million bushels net

- Apply rescue N



60 million bushels net

(20 million bushels to pay for
rescue N and application)



The Cure



**Can rescue N
really work?**

July 16, 2005

Alternating 100' strips w/ and w/o 12 gal 32% UAN (6/29)

Rescue N: an example



Miami County, Kansas

Same field



Photo: Andy Holzwarth



Yield response:

- 35 bu where stress is visible
- 2 bu where no stress is visible

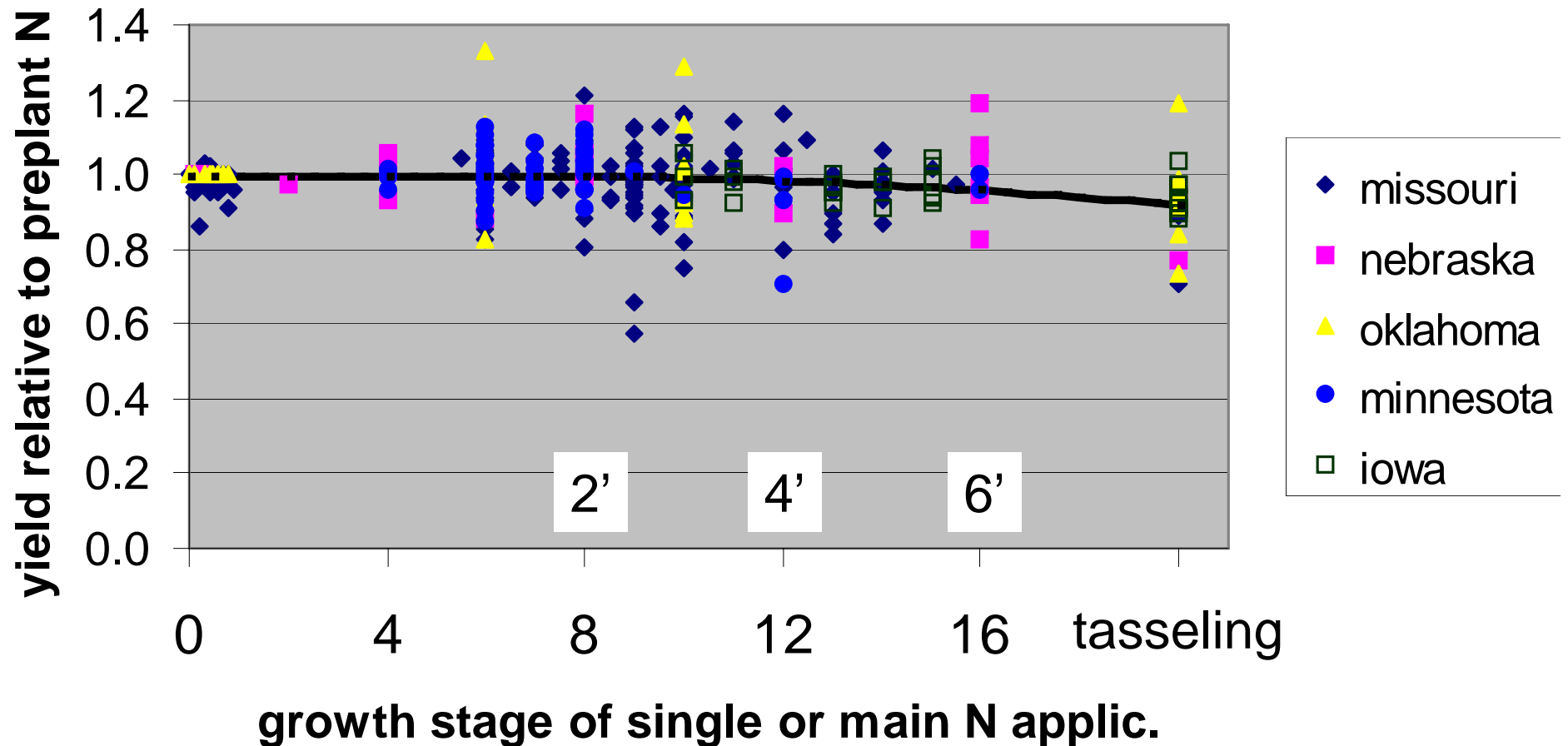
Rescue N: Another example

- Northwest Missouri, 1998
- 200 lb $\text{NH}_3\text{-N}$ applied fall 1997
- Co-op agronomist suspected N loss
- Rescue N applied to thigh high corn, left checks with no additional N
- **Average yield response 40 bu/acre**

N loss scenario

- I've had wet weather
- The corn doesn't look so good, I think I've lost N
- But the corn is chest high, so it's too late— isn't it?
- **NO, it's not too late**

The Cure—how late?



Delivering the Cure

- High-clearance applicators
- Aerial application
- Fertigation

Delivering the Cure

\$5/acre and fast



Delivering the Cure



06/08/2006

Delivering the Cure

\$10/acre



Delivering the Cure



\$7/acre to apply N

‘But we didn’t have enough machines...’

- ...or days when we could drive
- No—we didn’t
- Airplanes!
- I think lack of trying was a bigger obstacle than lack of machines
- We went from <100 thousand to >12 million acres of fungicide in a single year (U.S. total)—machines are out there

Rescue N: Cost & benefit

- \$5 – 10 per acre application cost
- \$23/acre for 50 lb N
- Total \$33/acre
- Average field lost 25 bu/acre = \$95/acre
- Many producers could bid up application cost and still double their money

Yield loss to N burn

(average of 7 locations in Missouri, 2003-04)

150 lb N applied broadcast at corn height:

Treatment	1 foot	2 feet	3 feet	4 feet
Ammonium nitrate	1	8	20	18
28% N solution	9	14	33	61
Urea	0	0	X	4

Broadcasting N over corn

- Fast & effective
- Urea is the best choice
 - N burn on leaves has minimal effect on yield
- Corn 2 feet tall or less: use Agrotain on urea to prevent volatile loss of N

Plan B

- **This is the most important message in this session**
- And the simplest
- **Planning for rescue N ISN'T GOING TO HAPPEN DURING THE SEASON**
- It needs to be done during the winter
- Have rescue N logistics and contacts established

Diagnosis

- N Watch feature on my website
- Aerial photos (NVision product)
 - Quantify potential yield loss
 - Prioritize fields (how severe?)
 - Diagnose a lot of fields quickly
 - Not until corn is waist high
- Computer models (Adapt-N in New York)
 - More regional, less accurate
 - Can diagnose the problem earlier

Nitrogen watch

- On my Nitrogen Loss web page
 - <http://plantsci.missouri.edu/nutrientmanagement/nitrogen/loss.htm>
- Updated weekly from mid-April until the end of June
- Tracks rainfall totals, identifies areas at risk for N loss

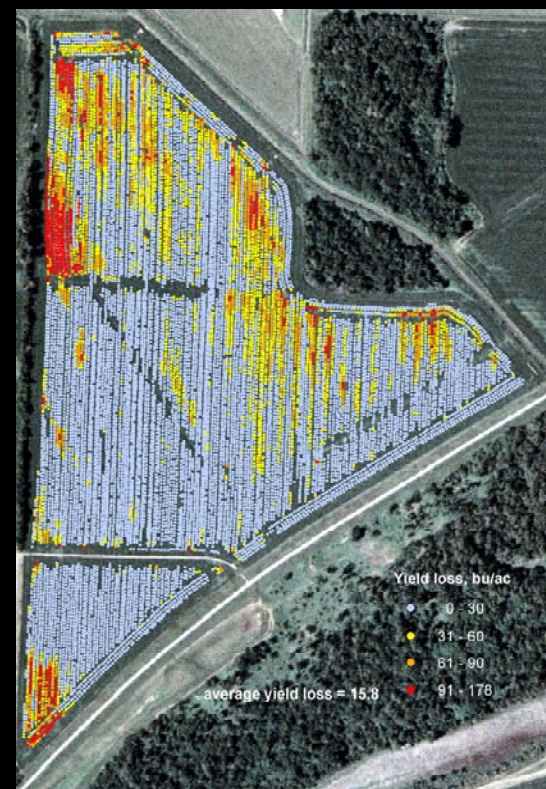
Diagnosis: an example



June 24 aerial photo



Yield loss map predicted from June 24 aerial photo



Yield loss map based on yield monitor data (September 30)

NVision diagnostic service

- Partnership between MU and AgriVision
- Based on aerial photographs
 - Waist high or later
- Products:
 - Field map of predicted yield loss
 - Variable-rate N application map
- Offered this year but not many takers



Questions? Comments?

Photo courtesy of Fred Blackmer