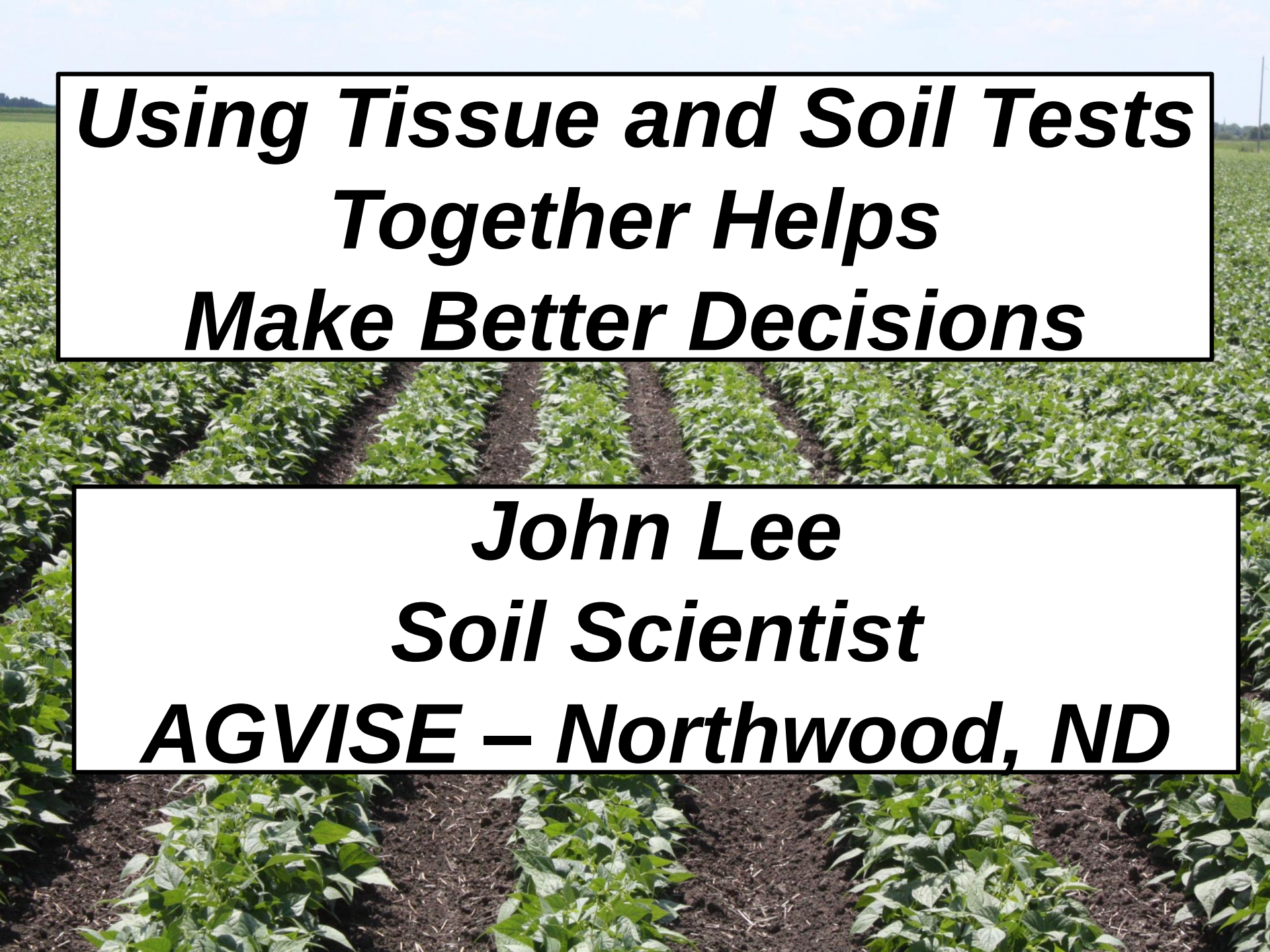


Using Tissue and Soil Tests Together Helps Make Better Decisions

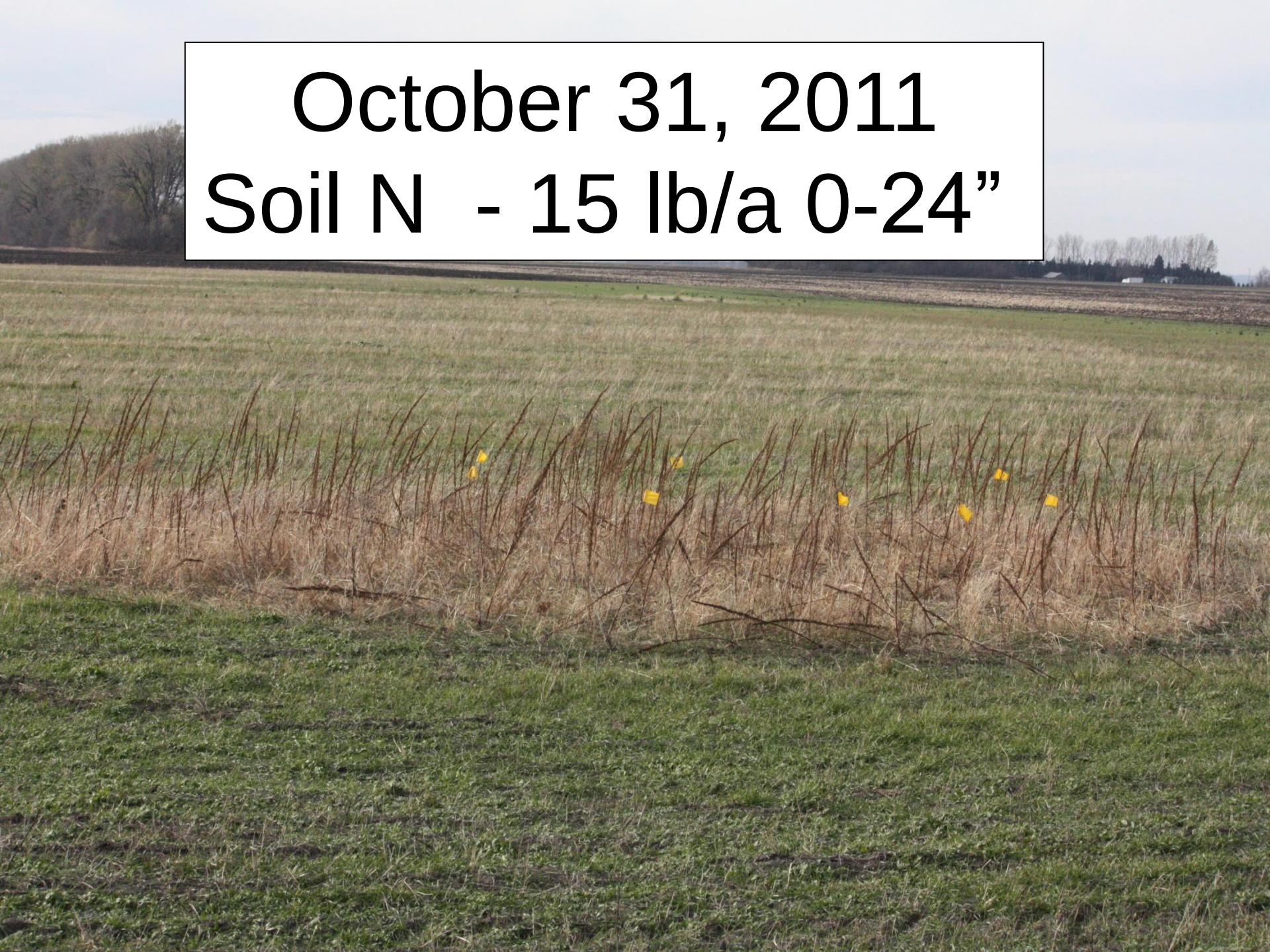
John Lee

Soil Scientist

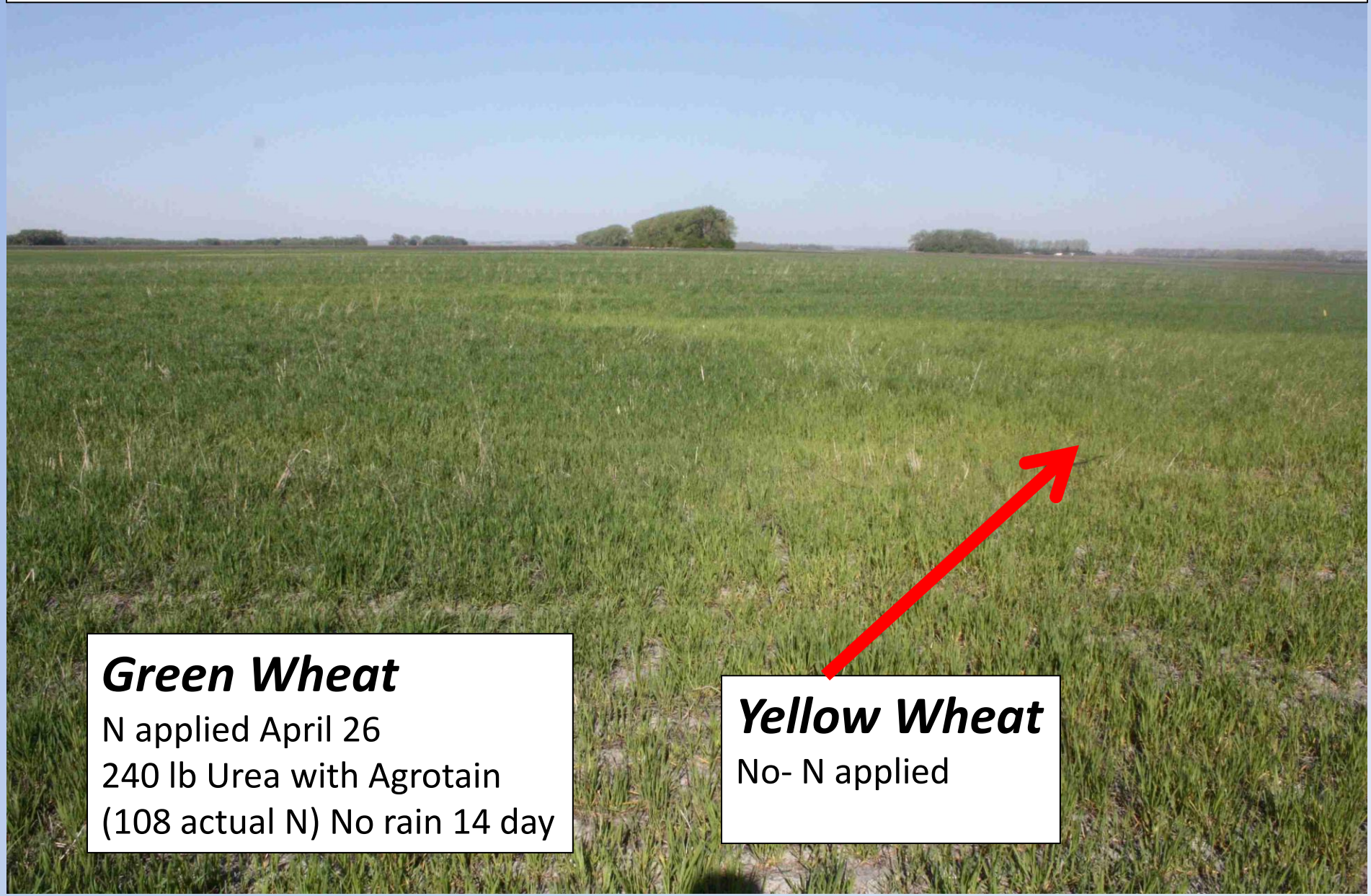
AGVISE – Northwood, ND

Winter Wheat – Tissue Demo Northwood, ND

- Prevent Plant field from 2011
- Winter wheat seeded late
- Start fertilizer only at seeding

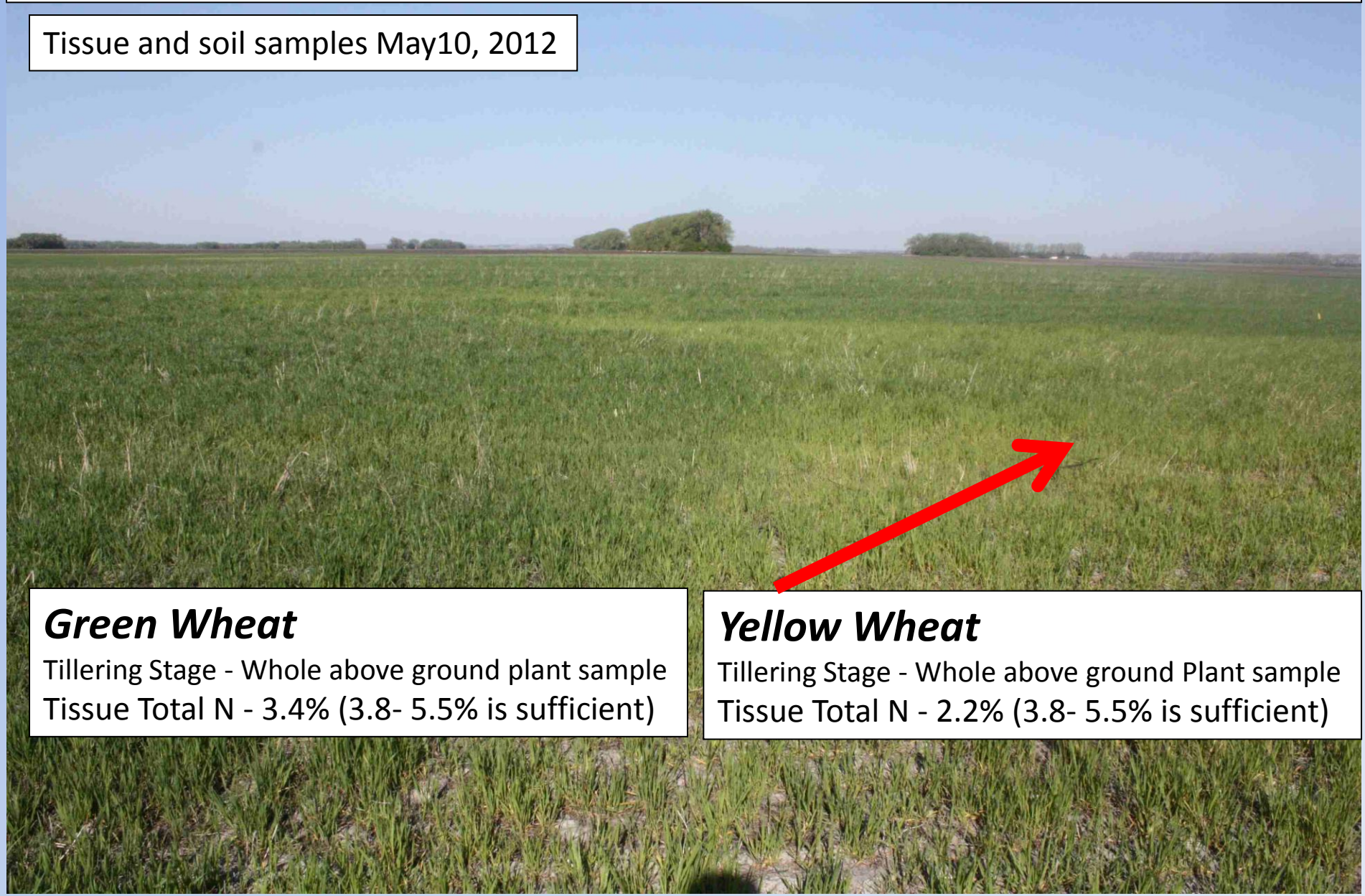

October 31, 2011
Soil N - 15 lb/a 0-24”

Winter Wheat Tissue Example 2012
Good and Bad Tissue Samples, Good and Bad Soil Samples



Winter Wheat Tissue and Soil Example 2012
Good and Bad Tissue Samples

Tissue and soil samples May10, 2012



Green Wheat

Tillering Stage - Whole above ground plant sample

Tissue Total N - 3.4% (3.8- 5.5% is sufficient)

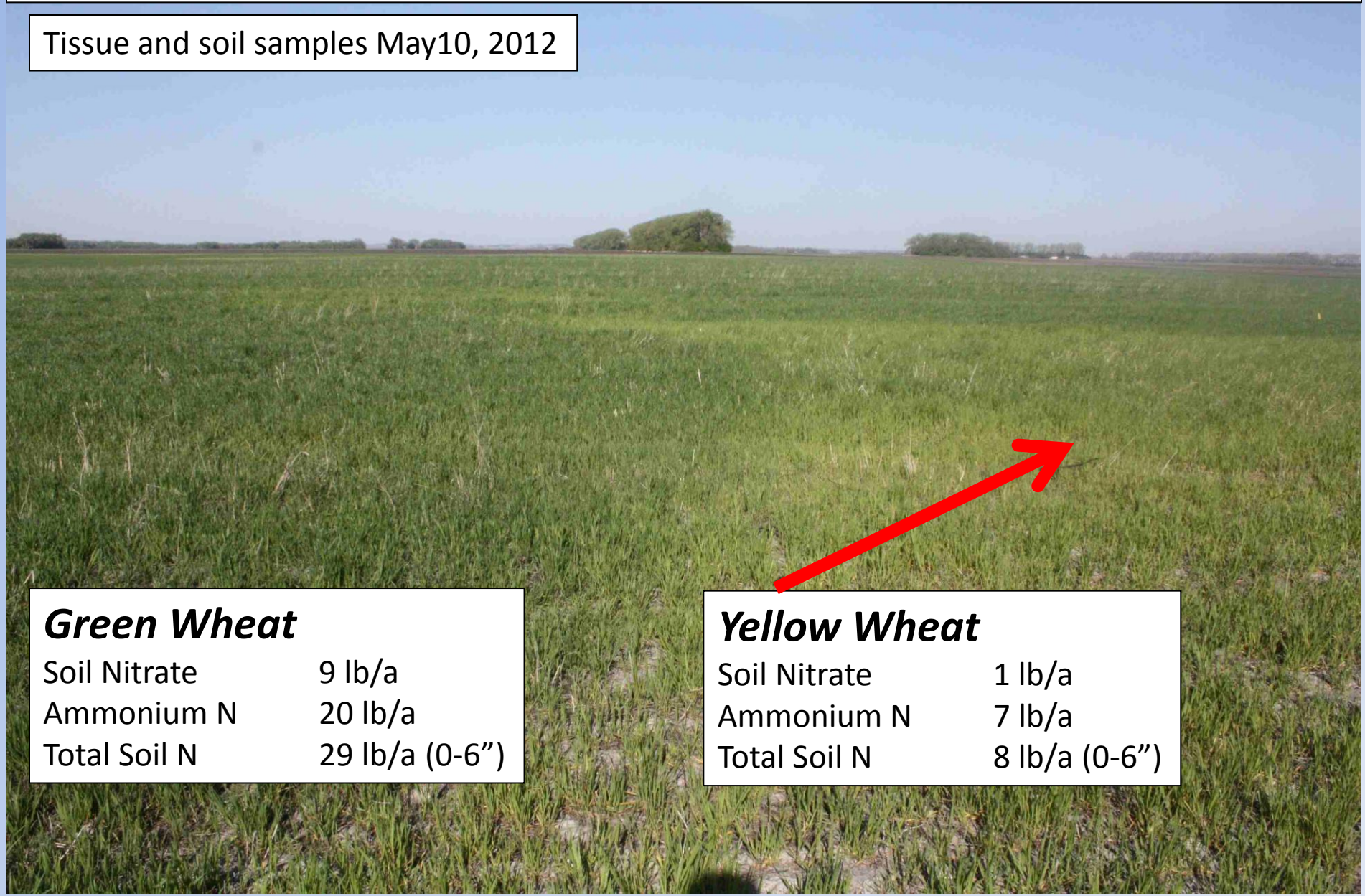
Yellow Wheat

Tillering Stage - Whole above ground Plant sample

Tissue Total N - 2.2% (3.8- 5.5% is sufficient)

Winter Wheat Tissue and Soil Example 2012
Good and Bad Soil Samples

Tissue and soil samples May10, 2012



Green Wheat

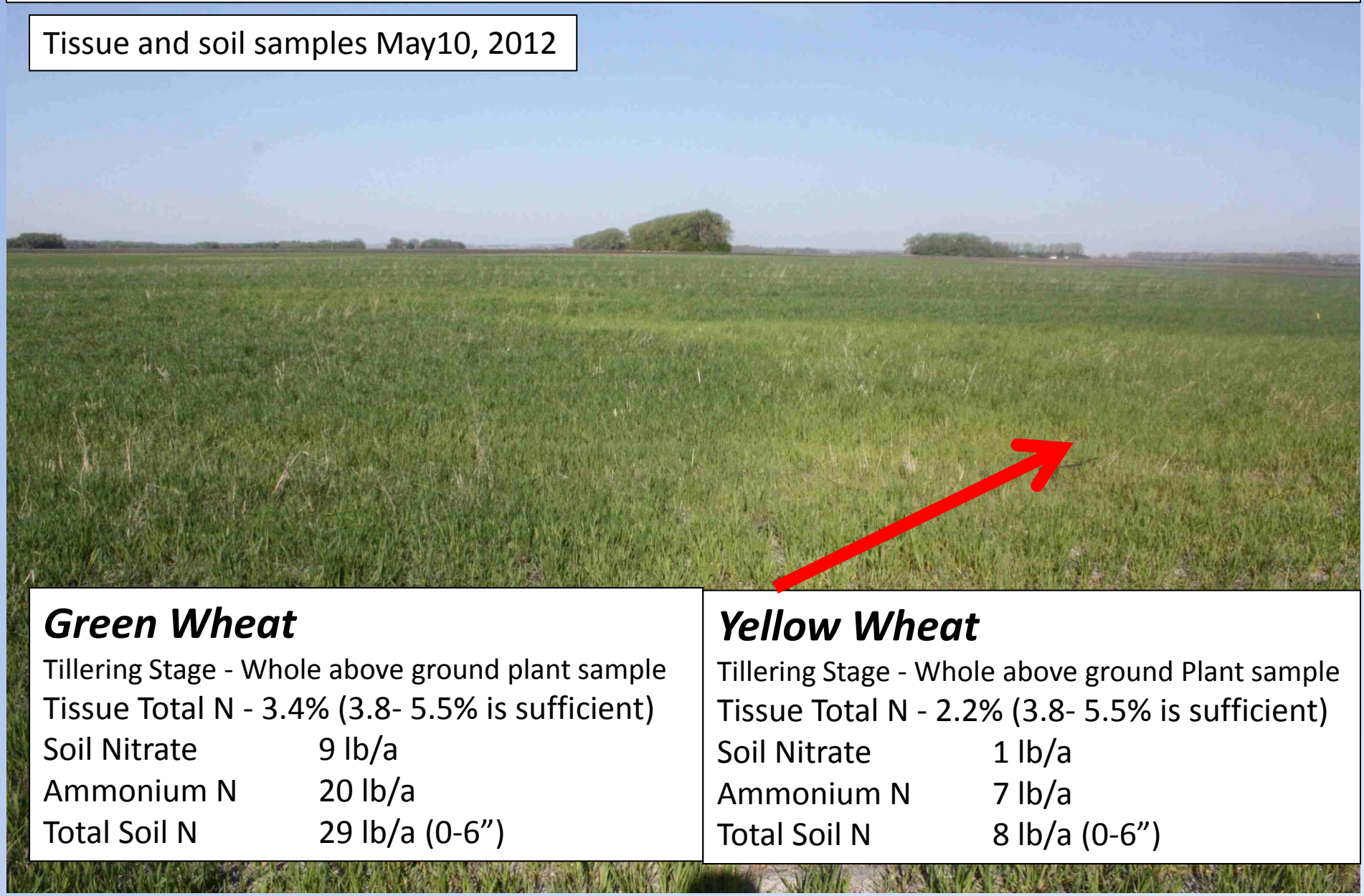
Soil Nitrate	9 lb/a
Ammonium N	20 lb/a
Total Soil N	29 lb/a (0-6”)

Yellow Wheat

Soil Nitrate	1 lb/a
Ammonium N	7 lb/a
Total Soil N	8 lb/a (0-6”)

Winter Wheat Tissue and Soil Example 2012
Good and Bad Tissue Samples, Good and Bad Soil Samples

Tissue and soil samples May10, 2012



Green Wheat

Tillering Stage - Whole above ground plant sample
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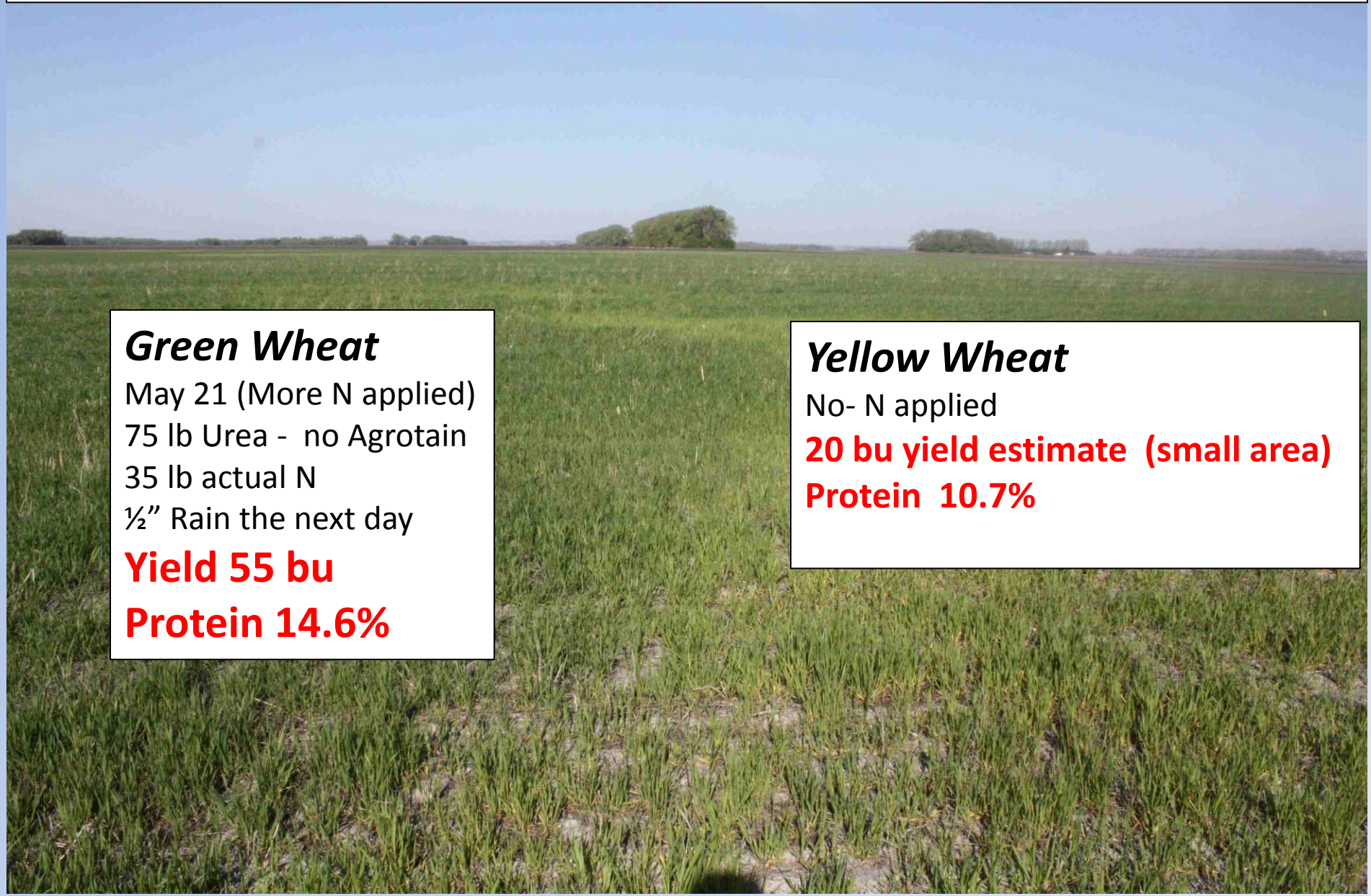
Winter Wheat Tissue Example 2012
Good and Bad Tissue Samples, Good and Bad Soil Samples



Green Wheat

May 21 (More N applied)
75 lb Urea - no Agrotain
35 lb actual N
½" Rain the next day

Yield 55 bu

Protein 14.6%

Yellow Wheat

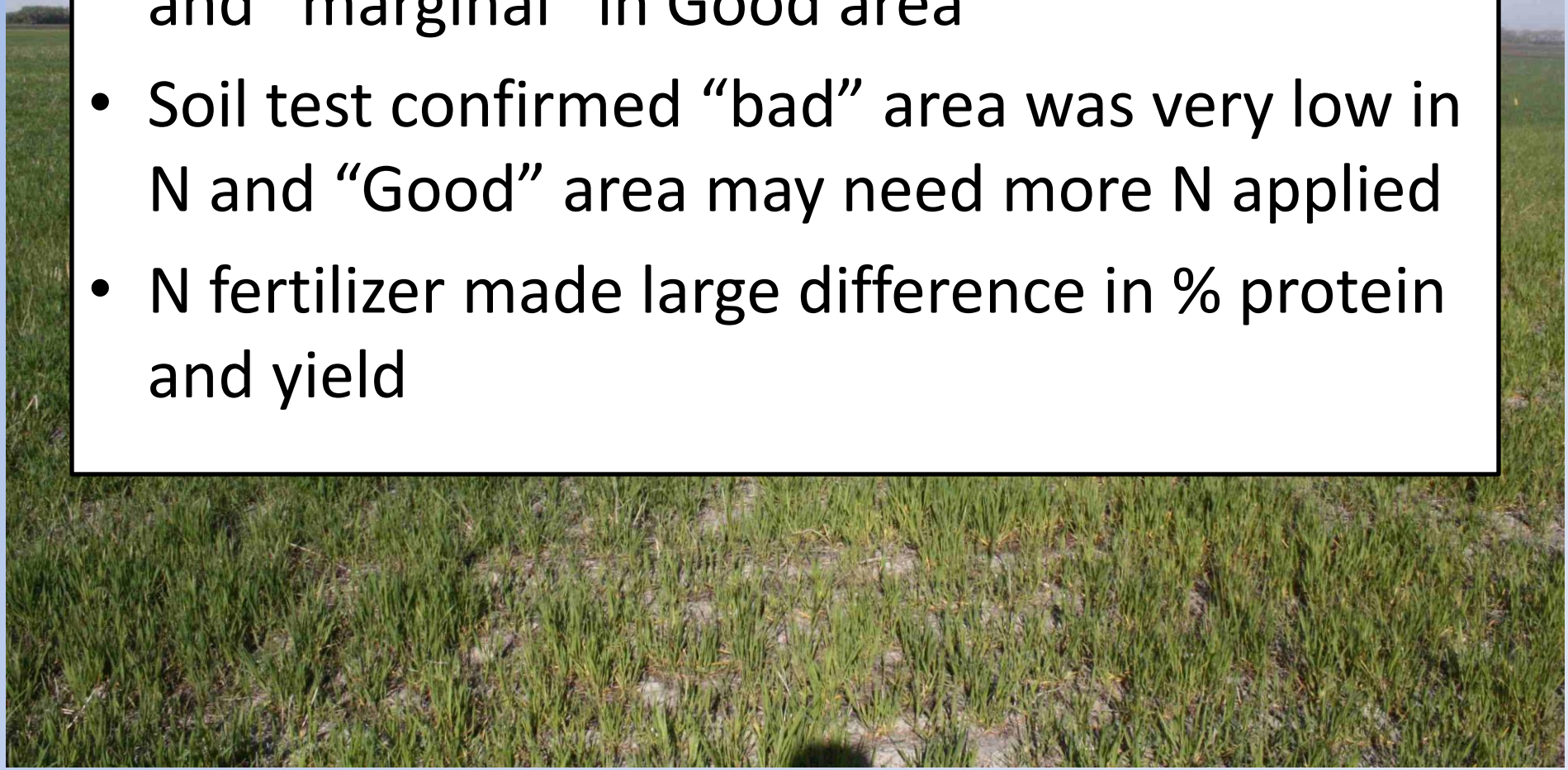
No- N applied

20 bu yield estimate (small area)

Protein 10.7%

Winter Wheat
Tissue and Soil Test Demo

- Tissue test confirmed N was low in “bad” area and “marginal” in Good area
- Soil test confirmed “bad” area was very low in N and “Good” area may need more N applied
- N fertilizer made large difference in % protein and yield



Corn Tissue and Soil Test Demonstration - Starter

Plant size without and with starter

Starter – 5 gallons 10-34-0 with 2 pints of zinc chelate

No Starter

With Starter

No Starter

Tissue Total N – 4.1% (3.5-5.0 is sufficient)
Tissue Total P - .48% (.35-.80 is sufficient)
Tissue Total Zn – 25 ppm (20-75 is sufficient)

With Starter (5 gallon 10-34-0 - 2pt Zn)

Tissue Total N – 5.6% (3.5-5.0 is sufficient)
Tissue Total P - .83% (.35-.80 is sufficient)
Tissue Total Zn – 56 ppm (20-75 is sufficient)

Tissue Test Results

Picture 5-23-2012

No Starter
Soil nitrate in row – 16 lb/a (0-6” sample)
P Soil test in row – 15 ppm
Zn Soil test in row – 1.6 ppm

With Starter (5 gallon 10-34-0 - 2pt Zn)
Soil nitrate in row – 102 lb/a (0-6” sample)
P Soil test in row – 68 ppm
Zn Soil test in row – 5.9 ppm

Soil Test Results

Picture 5-23-2012

No Starter

Tissue Total N – 4.1% (3.5-5.0 is sufficient)

Soil nitrate in row – 16 lb/a (0-6” sample)

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P Soil test in row – 68 ppm

Tissue Total Zn – 56 ppm (20-75 is sufficient)

Zn Soil test in row – 5.9 ppm

Picture 5-23-2012

Tissue Plus Soil Test Helps Make better Decisions

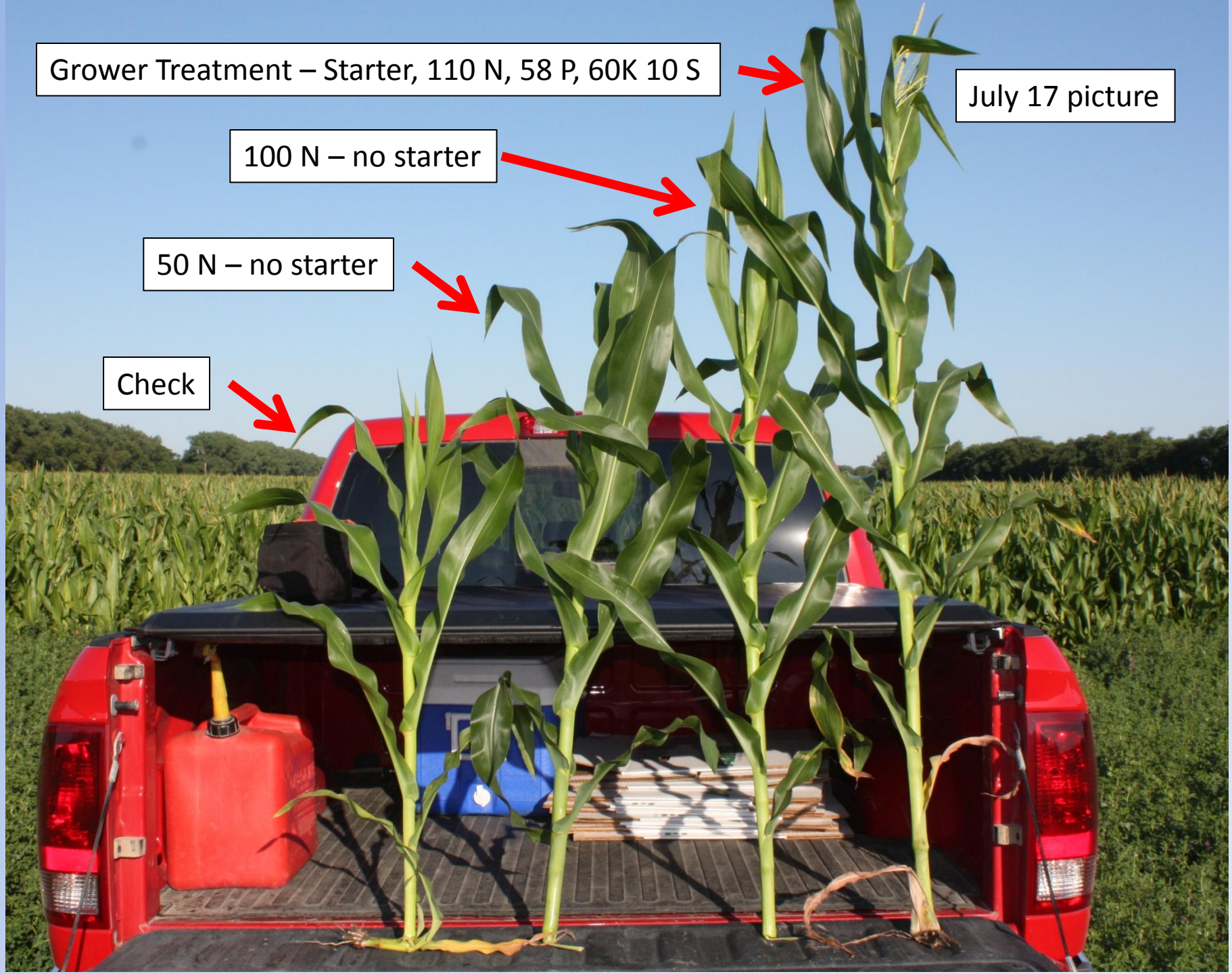
- Tissue test showed differences between “short” and “tall” corn was starter
  - Even though “short” and “tall” both showed sufficient Nutrient levels for N, P and Zn
- Soil test confirmed lack of starter was the difference
  - Soil test N,P, Zn in the row for “tall” was much higher than soil test in row where no starter had been applied

Corn – Tissue and Soil Test Nitrogen Demonstration

- Soil Test Levels
- Previous crop – soybeans
- N - 25 lb/a
- P - 12 ppm (Olsen P)
- K – 100 ppm
- S – 30 lb/a
- Zn - .9 ppm
- OM 1.5%
- pH 6.2

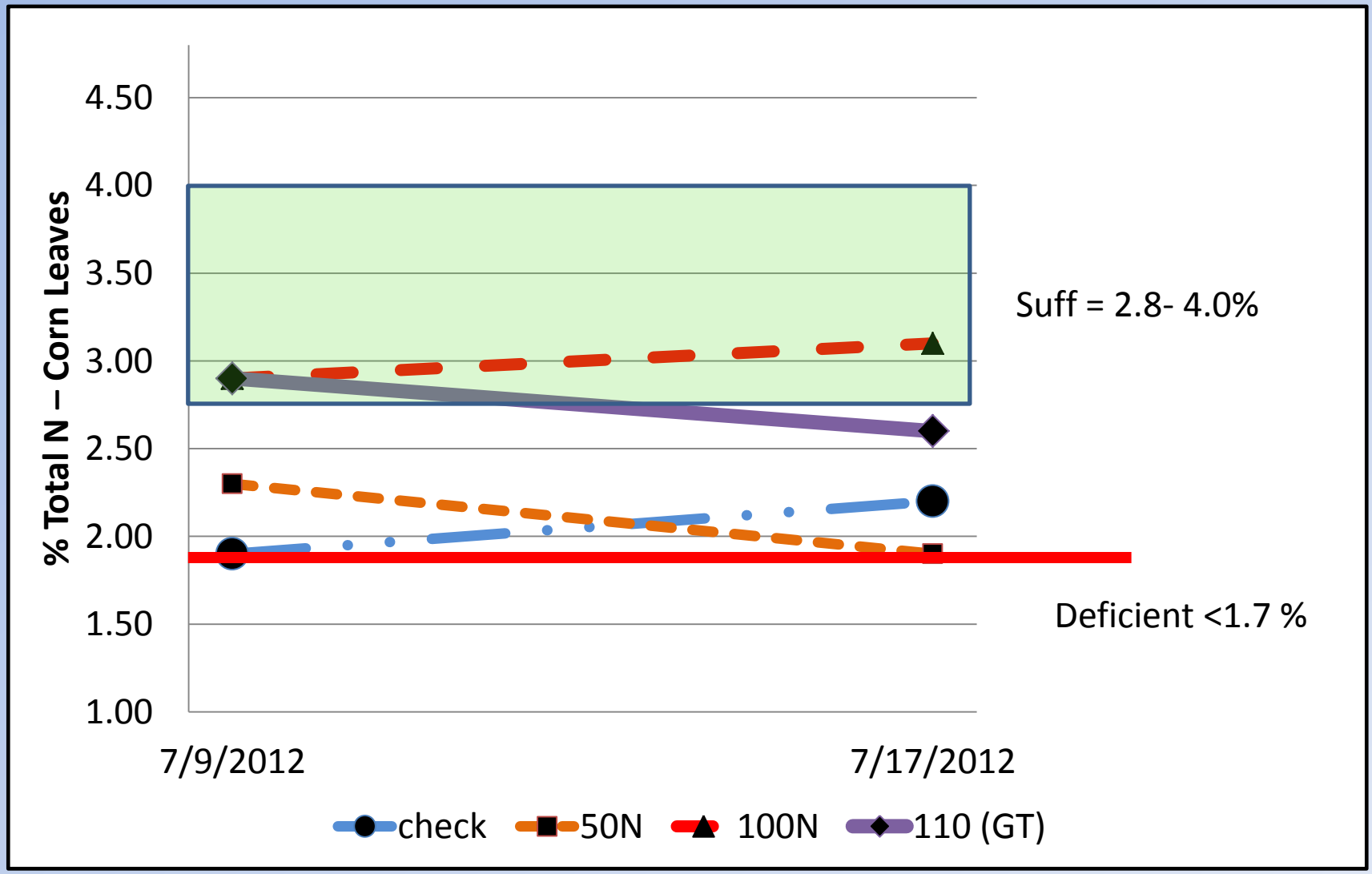
Corn – Nitrogen Demo

- Check area (no starter - no broadcast N,P,K,)
- N Top-dressed at 6” corn (ammonium sulfate)
  - 50 and 100 lb/a actual N (about May 25)
- Grower Treatment (5 gallon 10-34-0 starter plus Zn)
  - 110 N
  - 59 P_2O_5
  - 60 K_20
  - 10 S
  - .5 Zn


Grower Treatment – Starter, 110 N, 58 P, 60K 10 S
July 17 picture
100 N – no starter
50 N – no starter
Check

Corn N – Tissue Tests

Check, 50, 100, 110 (Grower Rate)




N Deficiency showing on lower leaves, even on high N treatment
07/17/2012 06:52

Corn Stalk Nitrate and Soil N Test at the end of the season (September 26)

Treatment	Corn Stalk Nitrate ppm	Fall Soil Nitrate 0-24" lb/a
Check	35 ppm	5 lb/a
50 lb/a N topdressed	185 ppm	8 lb/a
100 lb/a N topdressed	162 ppm	8 lb/a
Grower trt – 110 lb/a N pre-plant incorporated	188 ppm	24 lb/a

Corn Stalk Nitrate Interpretation

Low: (Less than 250 ppm) Likely that N deficiency limited yield

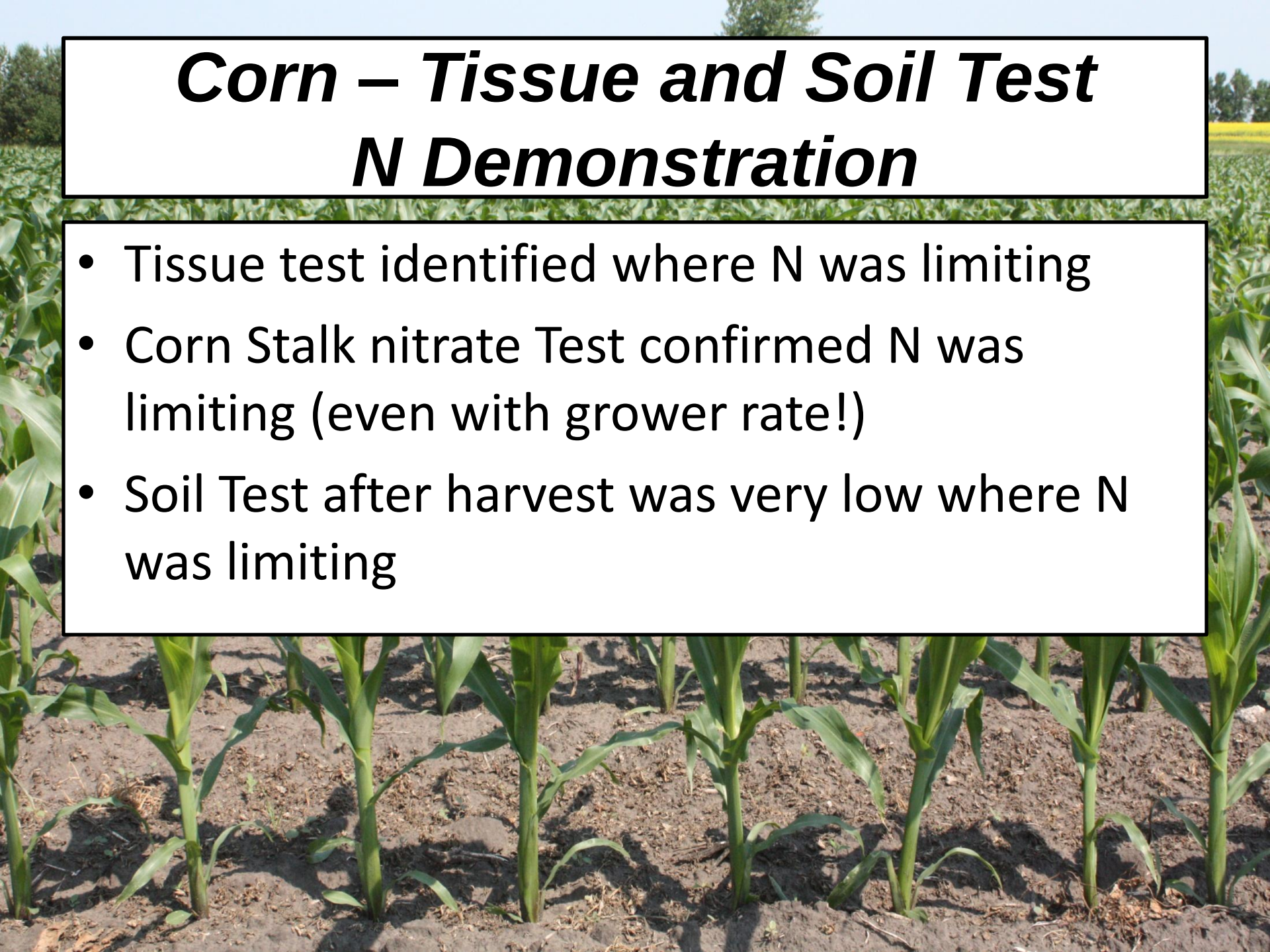
Marginal: (250-700) Possible that N deficiency limited yield

Optimal: (700-2000) Yield was not limited by N

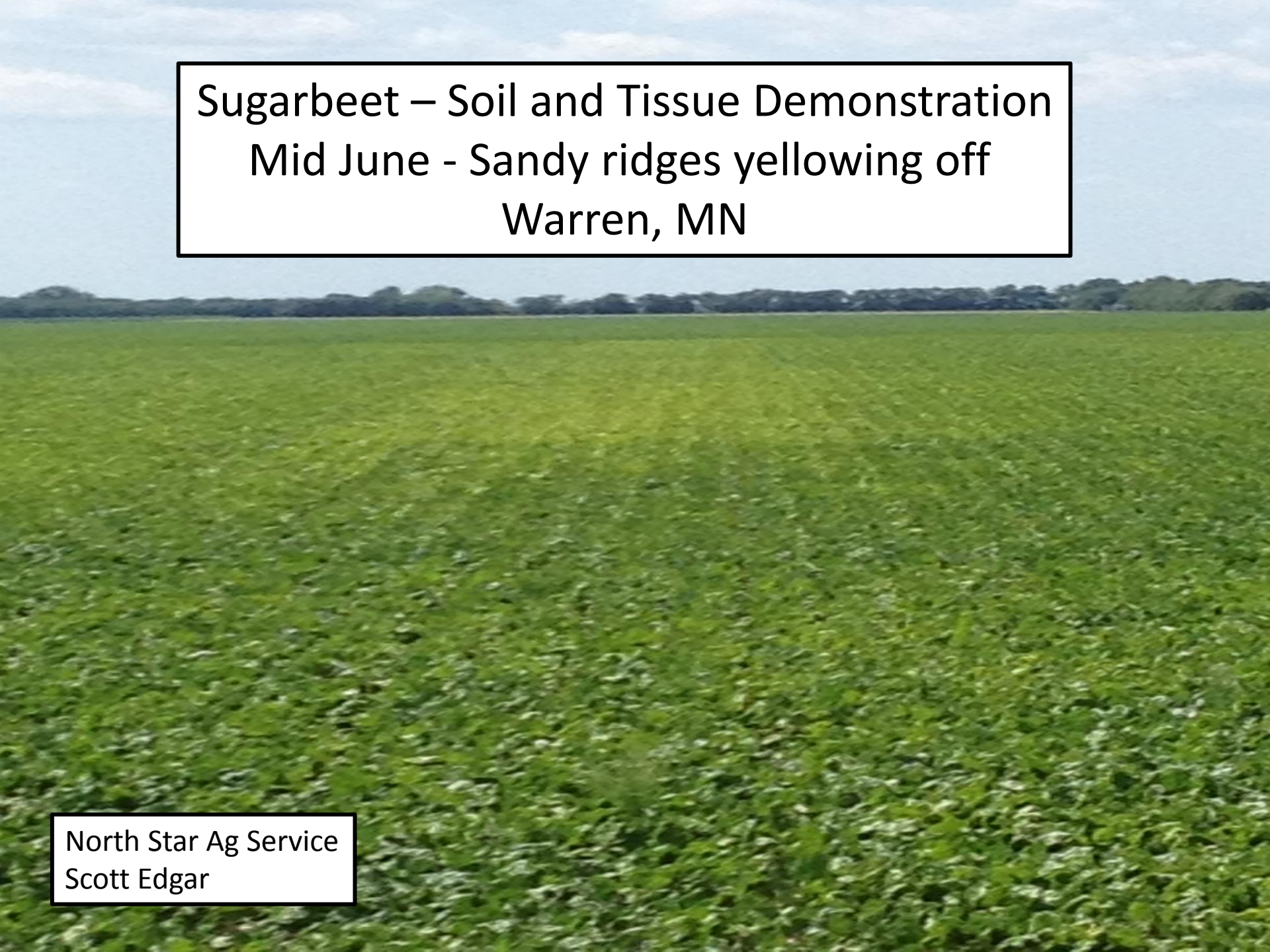
Excessive: (>2000 ppm) Nitrogen supply was excessive

Corn – Tissue and Soil Test N Demonstration

- Tissue test identified where N was limiting
- Corn Stalk nitrate Test confirmed N was limiting (even with grower rate!)
- Soil Test after harvest was very low where N was limiting



Sugarbeet – Soil and Tissue Demonstration
Mid June - Sandy ridges yellowing off
Warren, MN



North Star Ag Service
Scott Edgar

Sugarbeet Soil Analysis – June 20

Site Appearance	Sulfur 0-6”	Sulfur 6-24”	Chloride 0-6”	Chloride 6-24”
	lb/a	lb/a	lb/a	lb/a
Yellow	8	24	4	8
Green	108	240+	22	104

Sulfur Sufficiency Range: 15 lb/a topsoil?

Chloride Sufficiency Range: 40 lb for wheat?

Soil nitrate for good and bad >80 lb/a 0-24”

Tissue Analysis - June 27

Site	Sulfur	Chloride
Yellow	.14%	.22%
Green	.23%	.87%

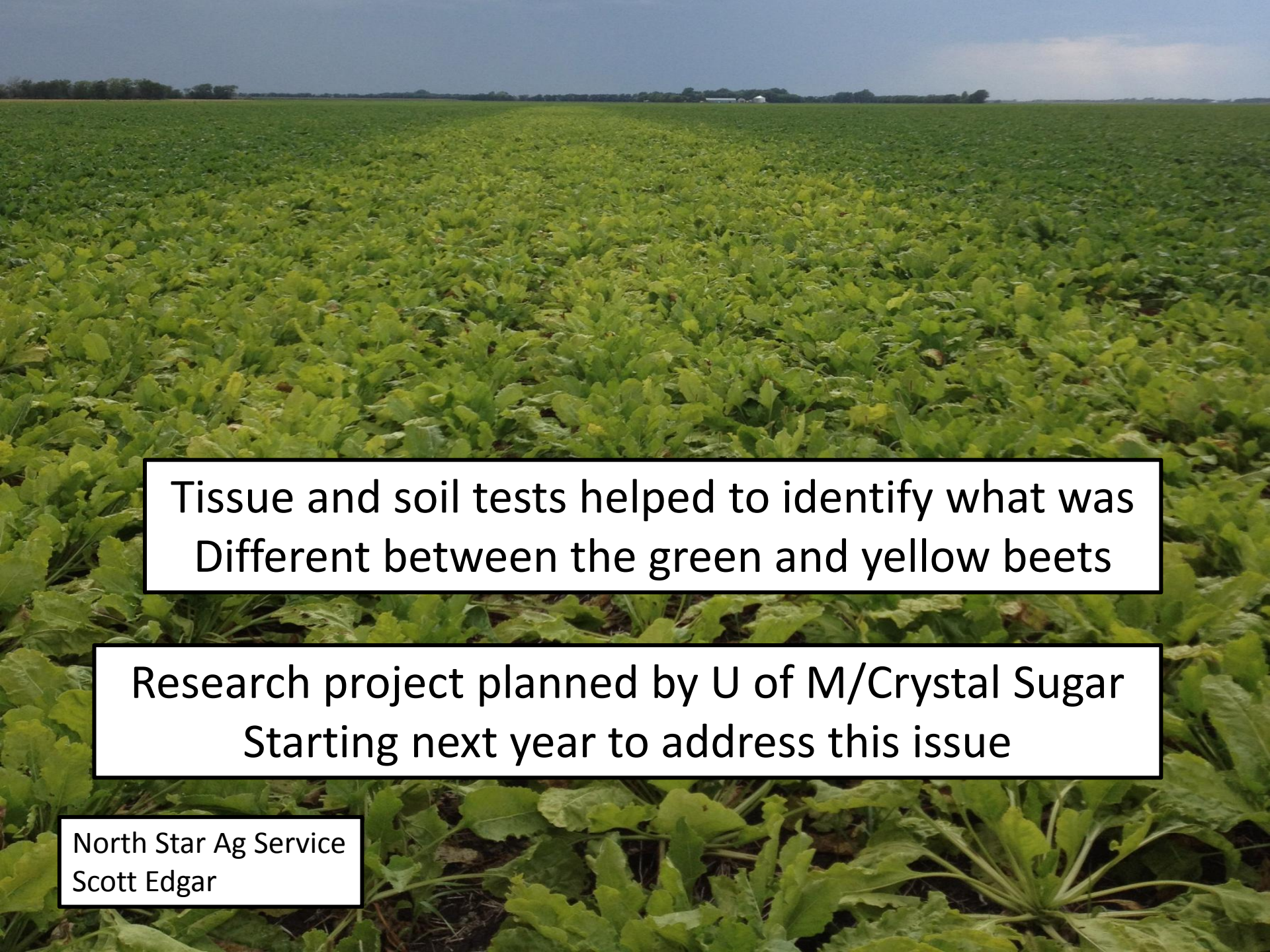
Sulfur Sufficiency Range: .25% to .50%

Chloride Sufficiency Range: Sugarbeets?

All other nutrients in sufficiency range

Sugarbeet <u>Tissue</u> Analysis After Fertilizer Trial Strips (July 11)

Treatment	Sulfur	Chloride
Yellow (check)	.13%	.13%
Green (adjacent good)	.28%	.41%
Potassium Chloride – 50 lb/a	.17%	.42%
AMS - 50 lb/a Potassium Chloride – 50 lb	.50%	.47%



Tissue and soil tests helped to identify what was Different between the green and yellow beets

Research project planned by U of M/Crystal Sugar Starting next year to address this issue

North Star Ag Service
Scott Edgar

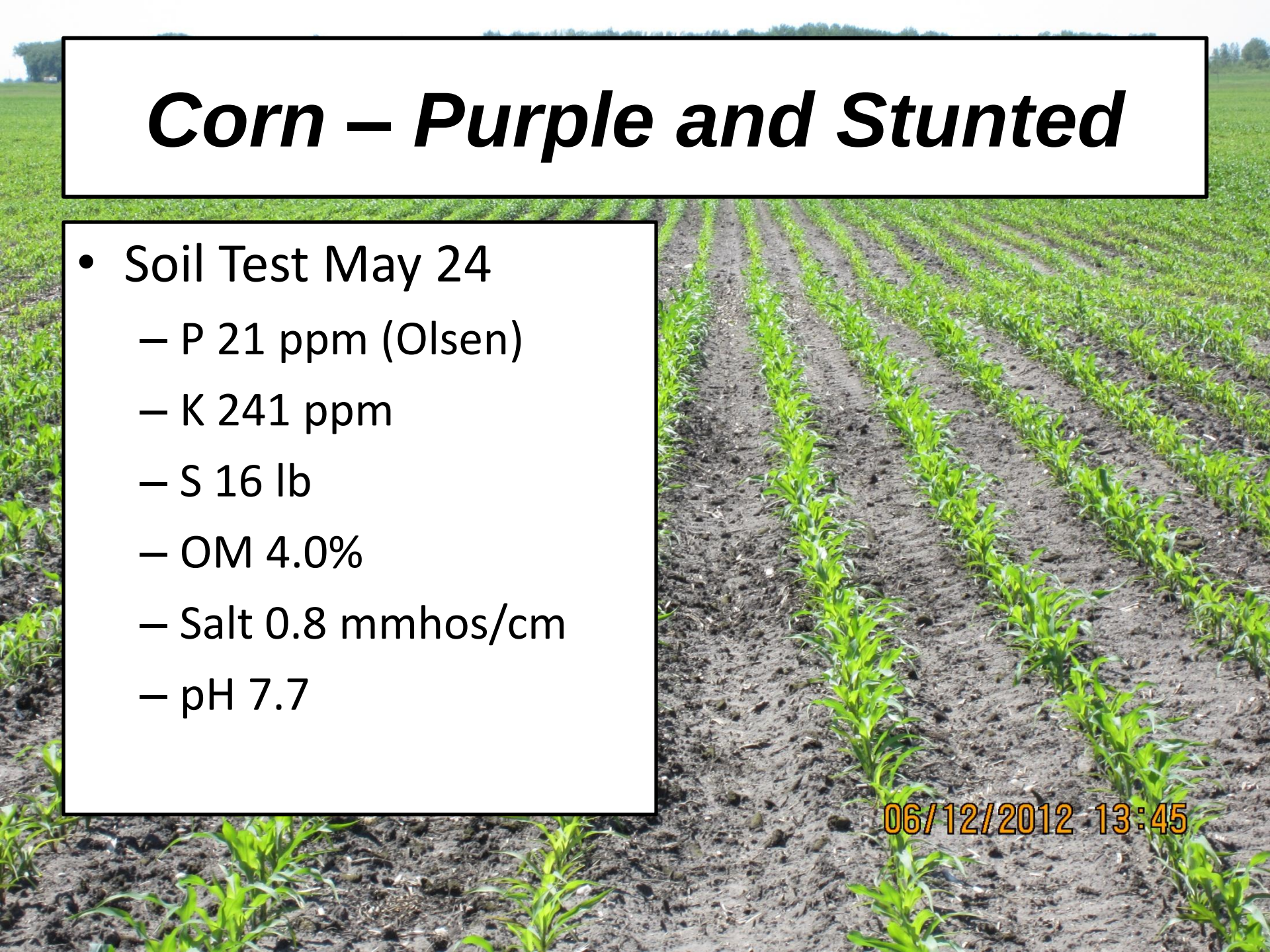
Corn – Soil and Tissue Demonstration Purple and Stunted plants

- Previous Crop was ***Sugarbeets***
- Low rate of low P Content starter fertilizer with seed

Greg Reidman
Riverbend Agronomy

Corn – Purple and Stunted

- Soil Test May 24
  - P 21 ppm (Olsen)
  - K 241 ppm
  - S 16 lb
  - OM 4.0%
  - Salt 0.8 mmhos/cm
  - pH 7.7

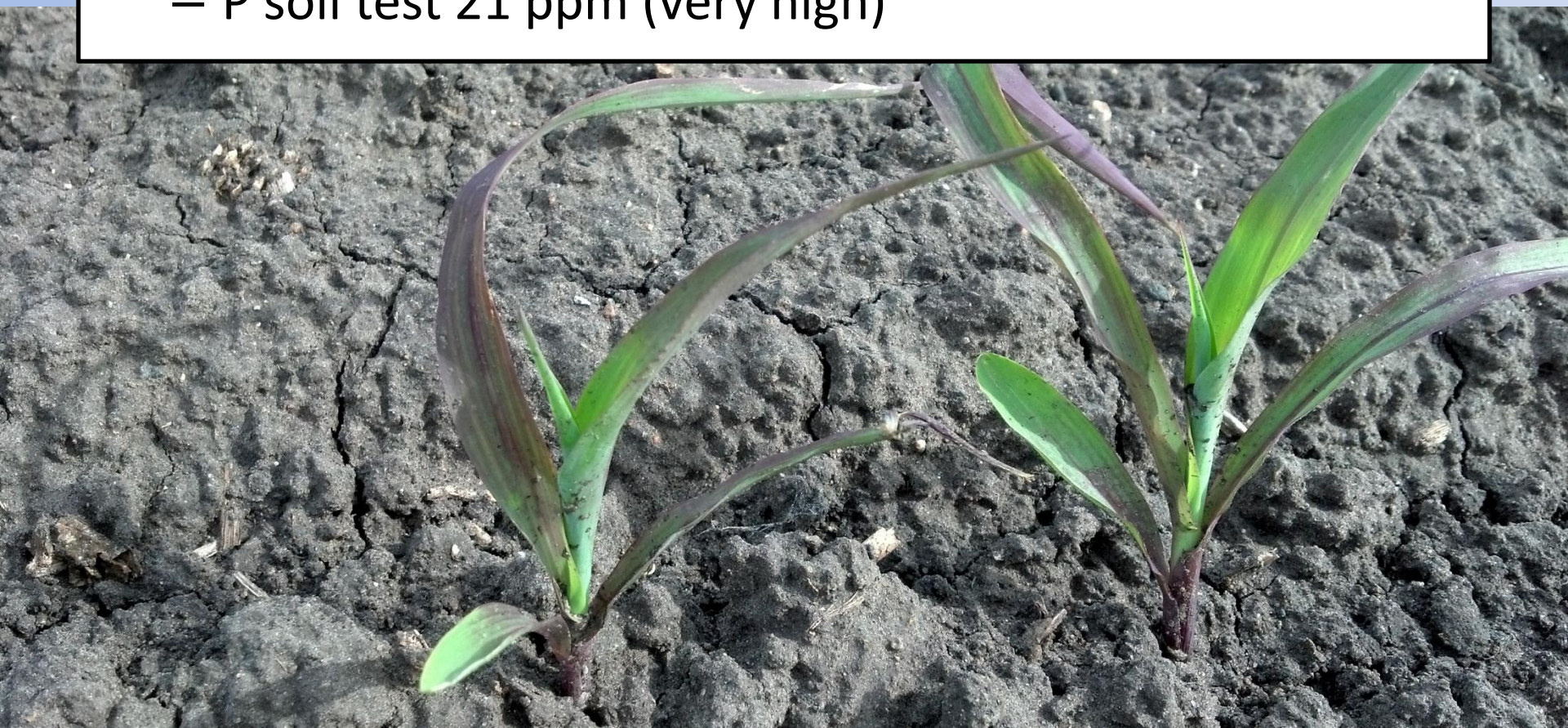


Sugarbeets don't support Mycorrhizae (Fallow syndrome)

- Fungus helps plant take up nutrients like P and Zn
- Previous crop of sugarbeets, canola, fallow
  - Don't support mycorrhizae and fungus pop decreases
- Following crop needs extra P fertilizer
- Corn needs high starter rate and extra P broadcast

Tissue Analysis - May 24

- Phosphorus very low in tissue
  - .17% Sufficiency range is .35% to .8%
  - P soil test 21 ppm (very high)



P Def. - Rescue in season?

- 6 gallon 9-24-3 applied
  - placed near row with single disc
- 4 gallon 10-34-0 + Zn
  - Foliar application

P Def. - Rescue in season?

Tissue Test 2 weeks trt

Check - .24% P

Treated - .22% P

(Sufficiency Range is .35% - .80%)

- No difference in growth
- No difference in tissue P
- Yield loss estimated at 40 bu/a

Corn – Tissue and Soil Test Demo – Purple Corn

- Tissue Test indicated low P was issue
- Soil Test was high in P (Low rate P starter)
- Previous Crop of Sugarbeets pointed towards “Fallow Syndrome”
- Rescue Treatment did not work
- Strong Starter P program for corn following sugarbeets or do not plant corn after beets

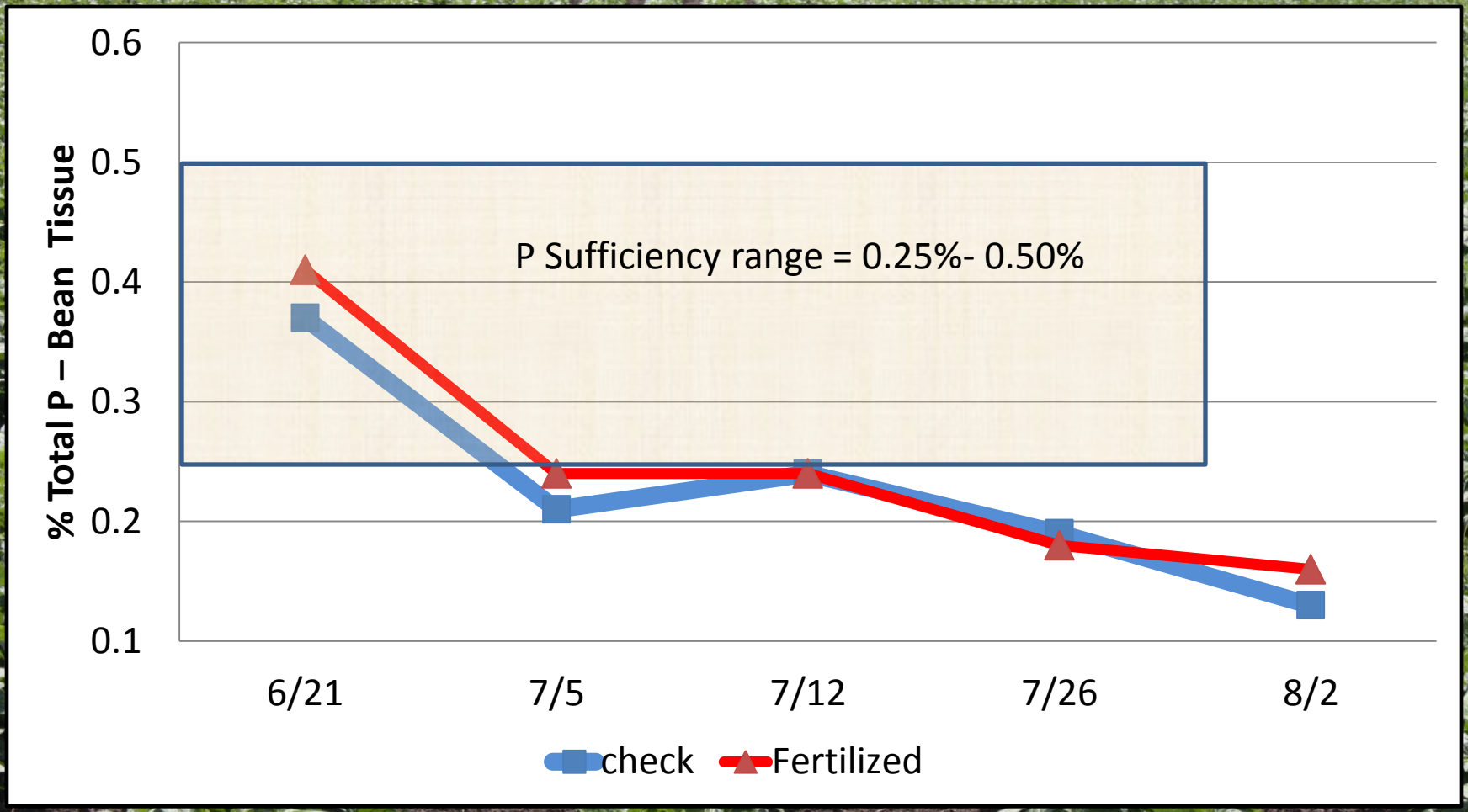
Navy Bean – Tissue and Soil Test Demonstration Fertilized and unfertilized

Navy Bean – Soil Test – July 17 Demonstration - Hatton ND

Treatment	N 0-6”	P (Olsen)	K	S 0-6”	Zn	OM
	Lb/a	ppm	ppm	lb/a	ppm	%
check	10	30	235	6	2.6	2.6
Fertilized	24	24	227	14	2.4	2.8

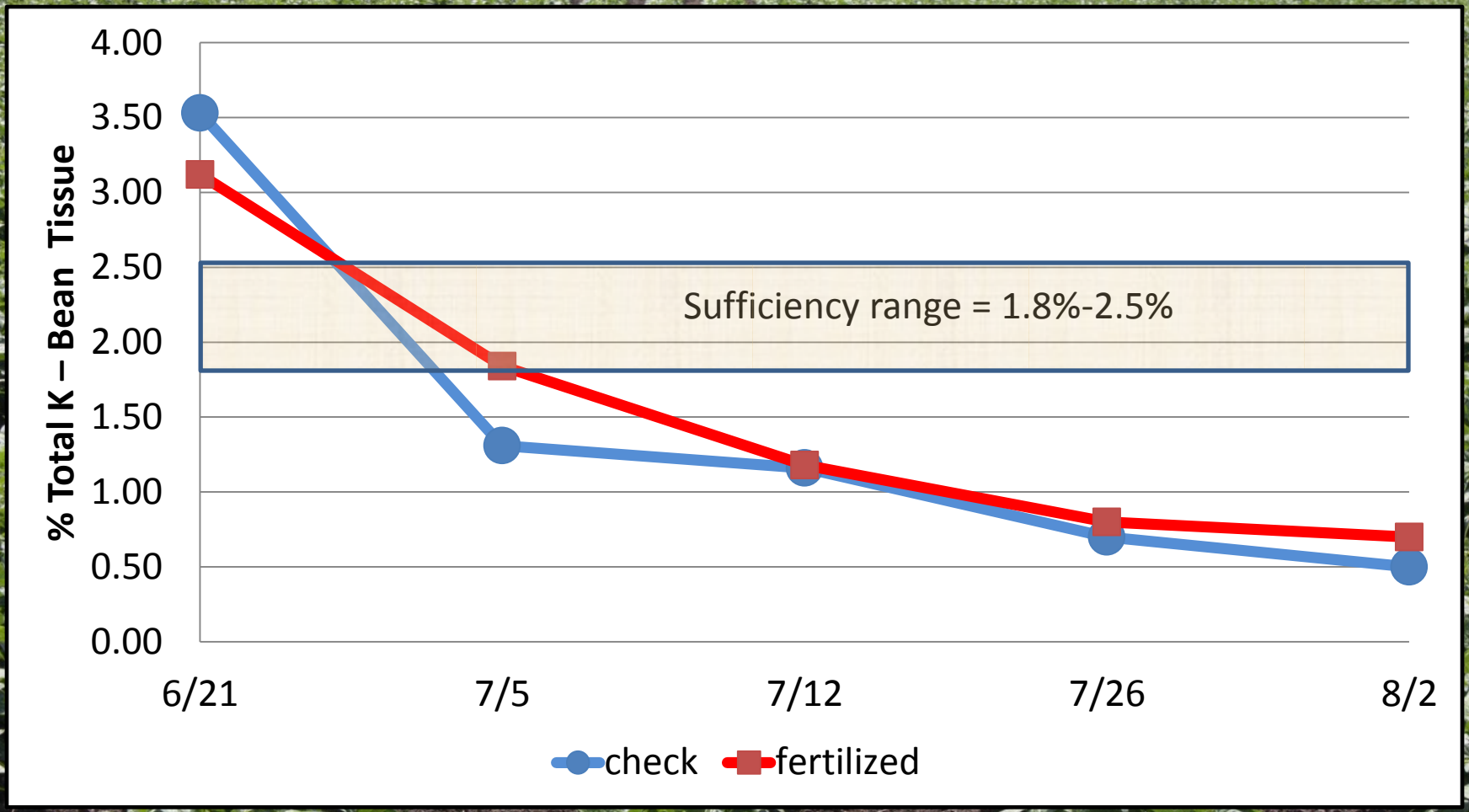
20-31-0-15 broadcast and tilled in before planting

P – Tissue levels –Navy Beans



Olsen P soil test = 20-30 ppm (High)

K – Tissue levels – Navy Beans



K soil test = 235 ppm

Navy Bean Tissue and Soil Test Demonstration

- Tissue levels for P & K dropped off once topsoil got dry
- Soil test showed both P and K levels were high
- Both fertilized and unfertilized area had uptake issues once topsoil got dry
- As crop approached maturity we expect most nutrient levels to decline, but not this early!
- Tissue test does not account for issues like dry soil

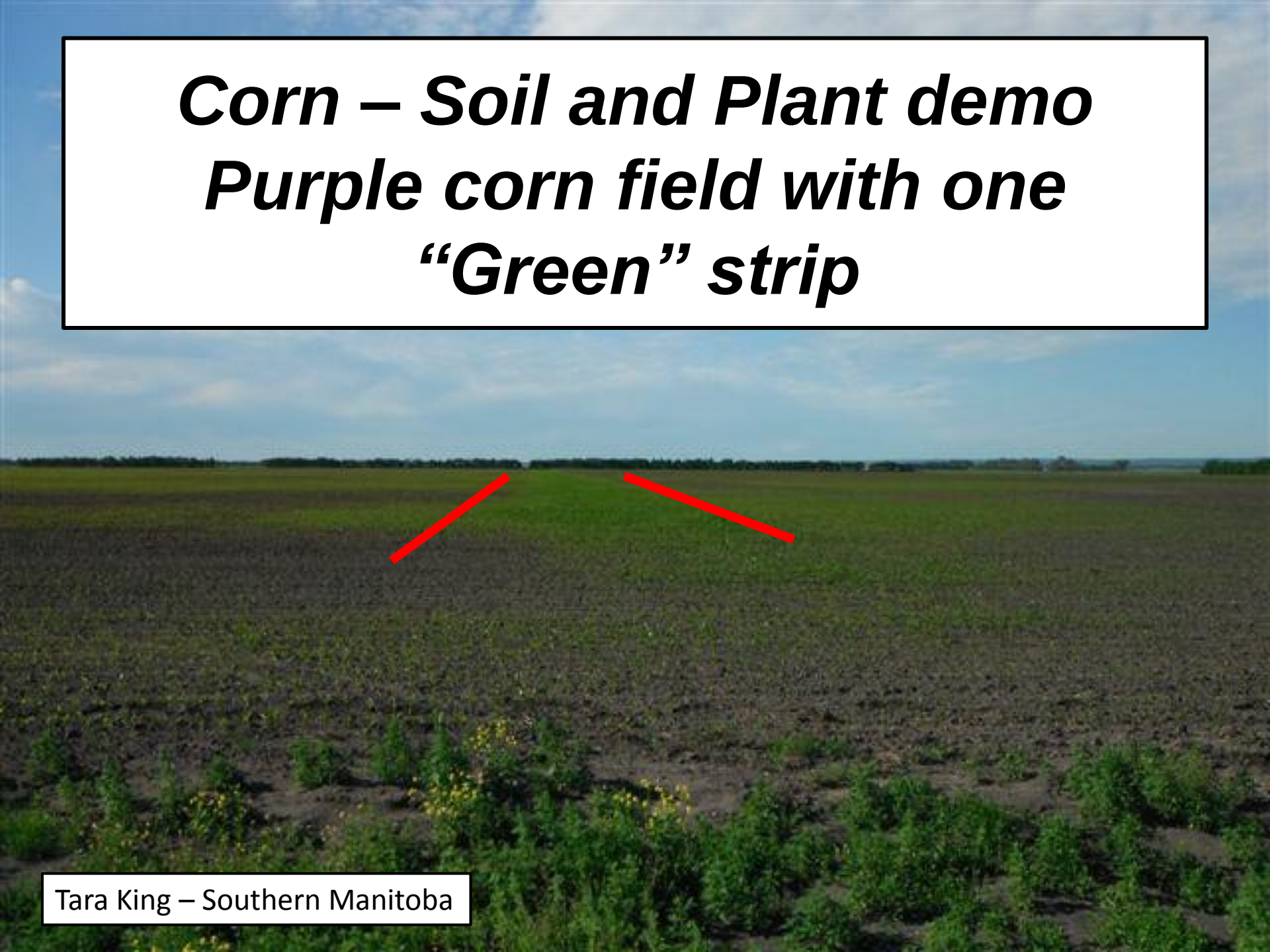
Tissue and Soil Tests (Good and Bad) Provide Better Information

- Very dry areas in 2012: Many tissue samples showed nutrient levels dropping off rapidly as topsoil dried out
- Tissue testing alone may indicate nutrients are low, while a soil test shows the nutrient level to be sufficient or high.
- Reduced nutrient levels in plants also happen with excessive water, compaction etc.
- Having both soil and tissue tests to compare “Good” and “Bad” areas will help make better decisions!

Tissue Test and Soil Test
(Good and Bad)
Provides Better Information

Questions

Corn – Soil and Plant demo Purple corn field with one "Green" strip



Tara King – Southern Manitoba

Corn – Soil and Tissue Demonstration Purple and Stunted plants

- Previous Crop - canola
- No starter fertilizer with seed
- Fallow syndrome suspected

Fallow syndrome is a situation where a beneficial fungus called Mycorrhizia die because there are no host plant roots to grow on. Mycorrhizia is a beneficial fungus which helps plants take up phosphorus, zinc etc. Crops following fallow need extra P fertilizer.

Canola and sugarbeets do not support Mycorrhizia fungus so they die off. The following crop then needs extra P fertilizer to ensure adequate P uptake.

Purple stunted corn
Previous crop: canola
Tissue P = .14% (suff .35 - .80)
P soil test 8 ppm (Olsen)

Green normal height corn
Previous crop: ***Old tree row***
Removed previous year
Tissue P = .28% (suff .35 - .80)
P soil test 8 ppm (Olsen)