

Grid or Zone sampling “Unfertilized” Soybean Fields in the Spring/Summer is Increasing (topsoil only)



Advantages of Spring/Summer Sampling P, K, pH, %OM, Zn

- Sample quality is better (firm soil = consistent depth)
- K test data is equal or better than fall data (moist soil K data may be little better)
- Labor is available for getting soil samples collected
- Soil Test data available before soybean harvest
- VR maps for P & K can be discussed by grower and agronomist with plenty of time to make best decisions for application right after harvest

Questions: Can you Soil Test
“Fertilized” Soybean Fields?

***How long do you have to wait after
fertilizer has been applied?***



“Researchers Said”

- Moderate rates (50 lb/a P_2O_5 , 50 lb/a K_2O)
 - You can soil test right away with low rates
 - Must wait 3-4 weeks before soil testing
 - Must wait until after harvest to soil test
 - Don't really know how long to wait
 - Depends

Sampling “Fertilized” Soybean Fields? Demonstration Project

- Objective: Determine if a moderate amount of P & K fertilizer will affect soil test levels if you sample a short time later?
- Moderate rate = 50 lb P_2O_5 and 50 lb/a K_2O
- P & K Applications made in fall and in spring on adjacent locations
- P and K fertilizer incorporated (tiller or farmer practice)
- Higher rates of 100 and 200 lb/a of P_2O_5 and K_2O too
- Location in ND, MN and MB

P & K applied and tilled into topsoil
Fall and Spring application
(Other locations left to grower practices)



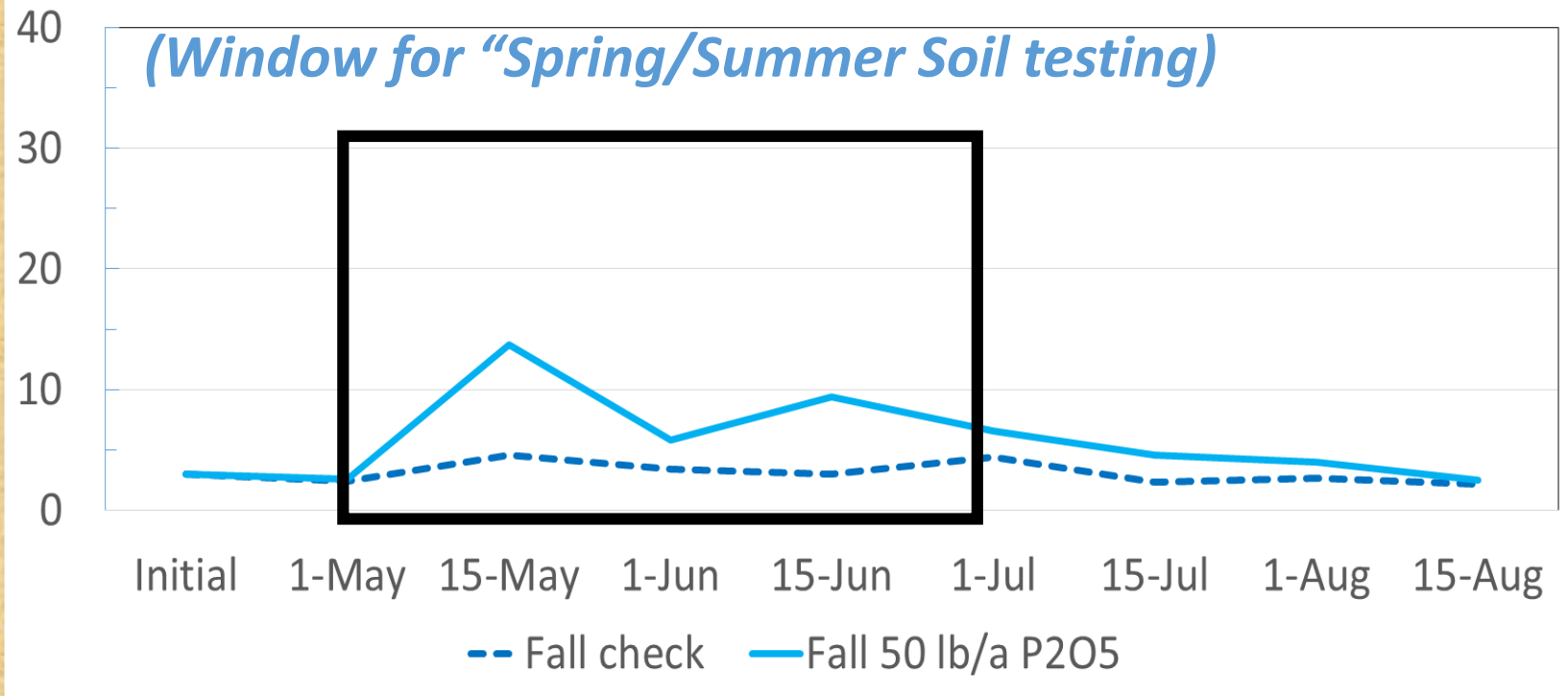
Application areas 20' by 20'

Phosphorus



Sampling Fertilized Soybean Fields (Northwood ND) Fall Application 50 lb/a P₂O₅

Olsen P Soil Test - ppm

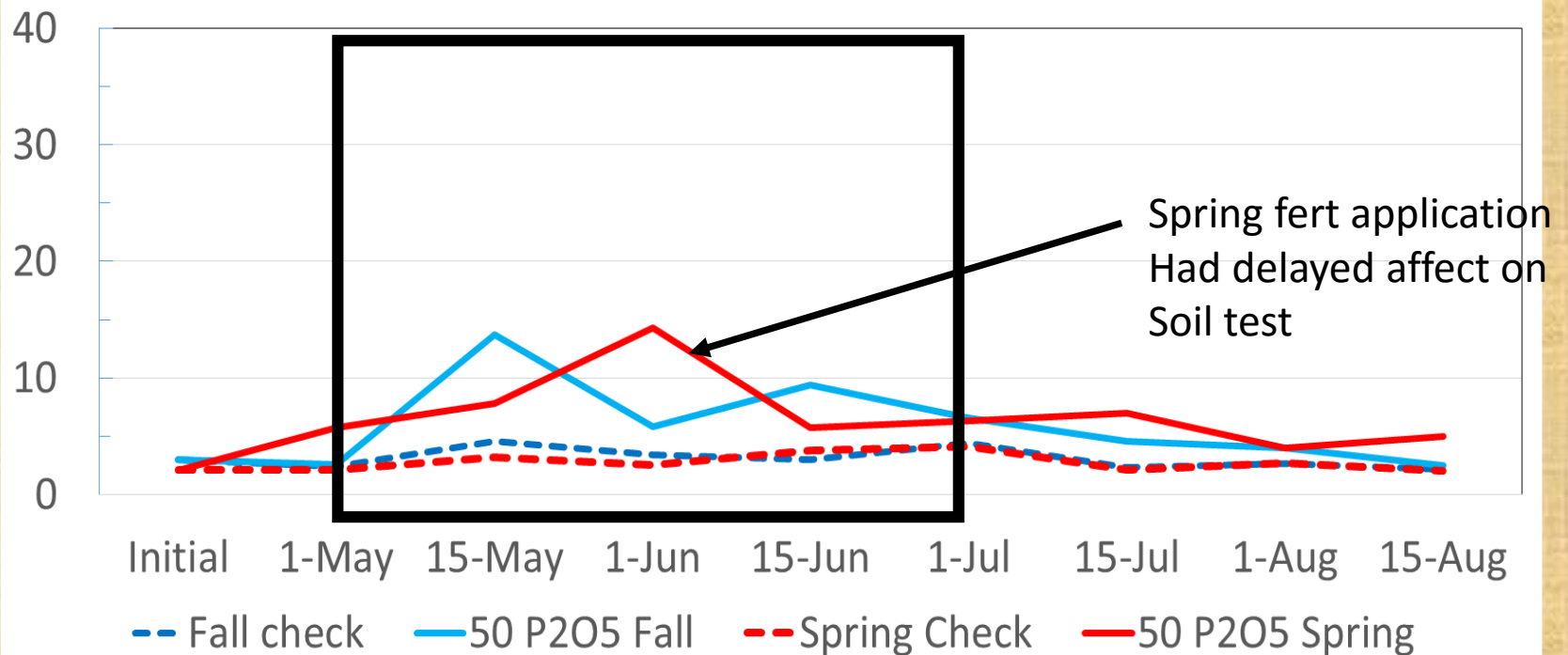


Sandy Clay Loam, salts 2.0, carbonates 6.0%, pH 8.0

Sampling Fertilized Soybean Fields (Northwood ND)

Fall and Spring Application 50 lb/a P_2O_5

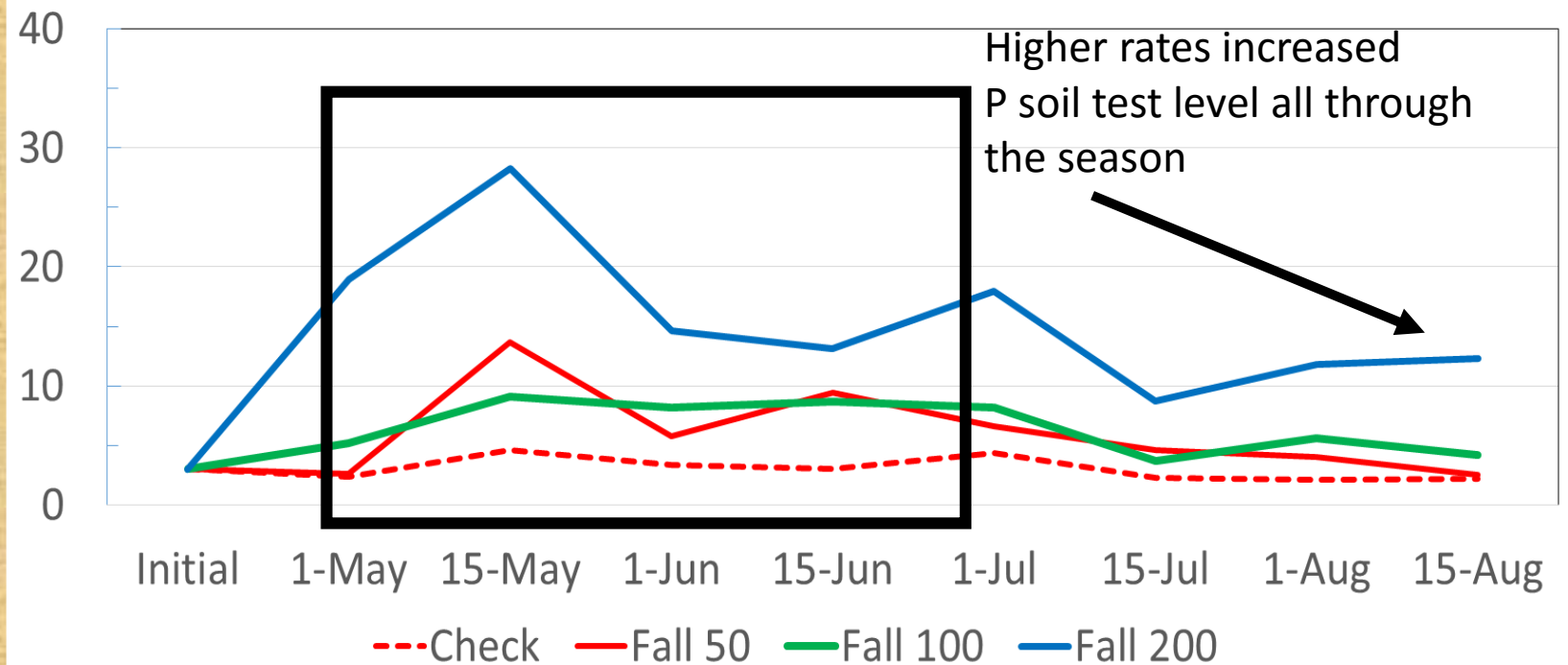
Olsen P Soil Test - ppm



Sandy Clay Loam, salts 2.0, carbonates 6.0%, pH 8.0

Sampling Fertilized Soybean Fields (Northwood ND) Fall – 50, 100, 200 lb/a P_2O_5

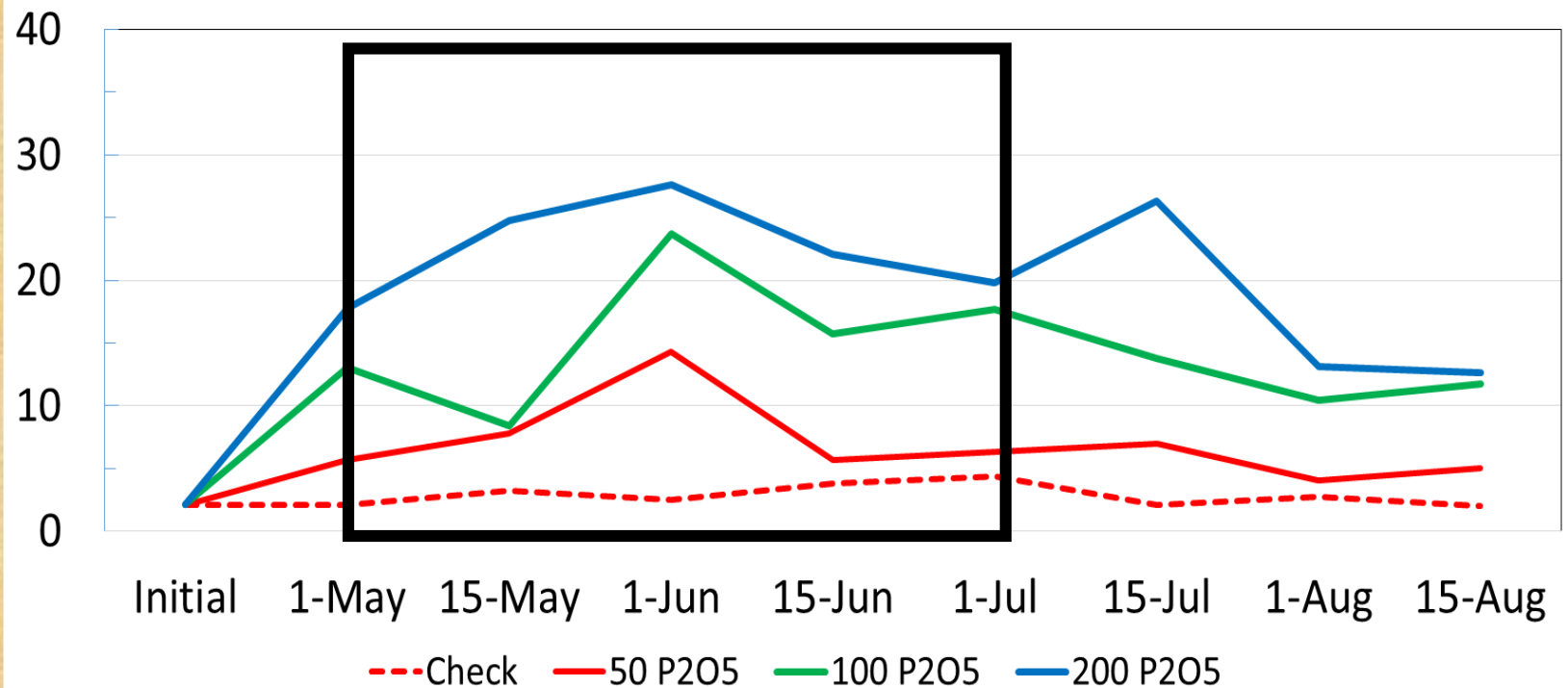
Olsen P Soil Test - ppm



Sandy Clay Loam, salts 2.0, carbonates 6.0%, pH 8.0

Sampling Fertilized Soybean Fields (Northwood ND) Spring - 50, 100, 200 lb/a P₂O₅

Olsen P Soil Test - ppm

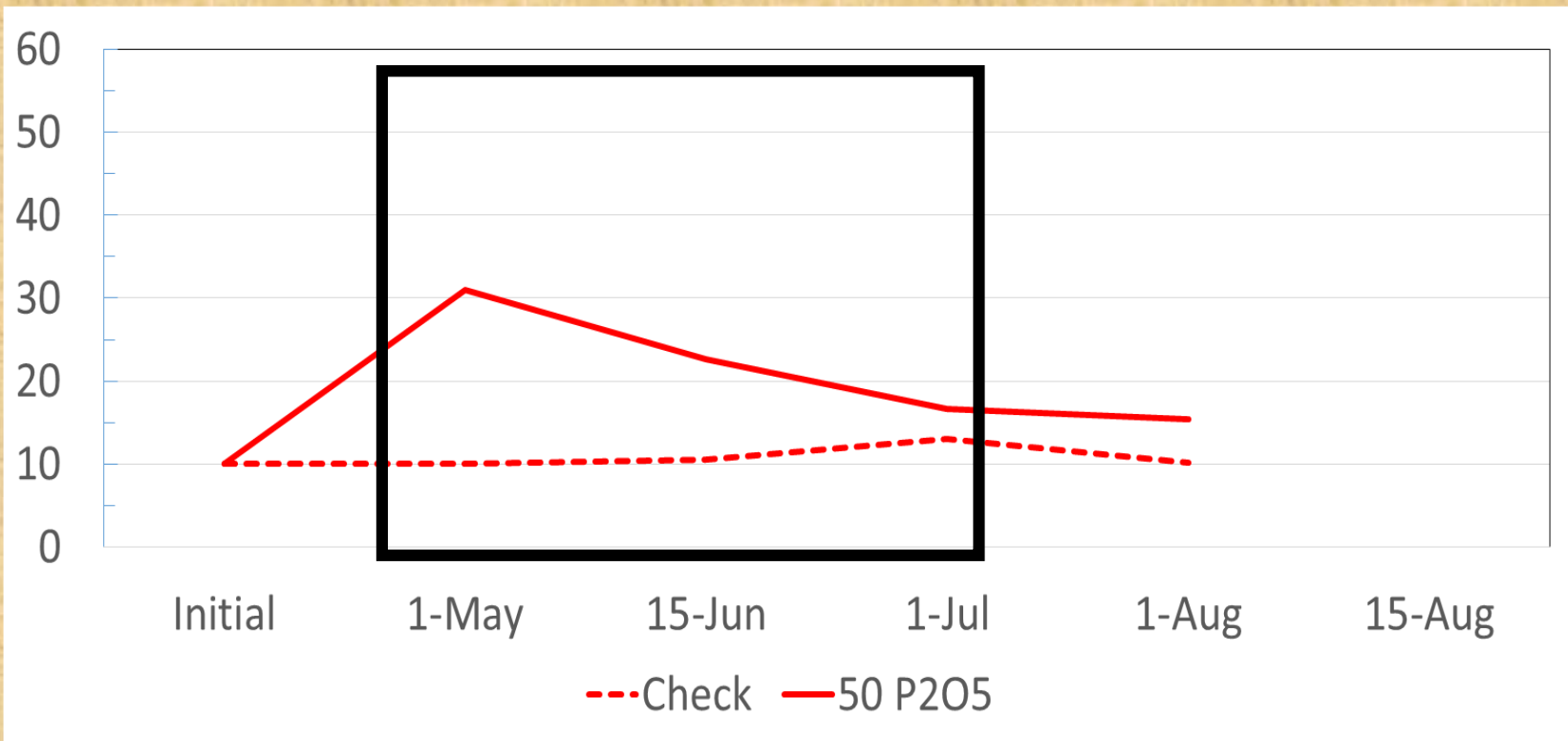


Sandy Clay Loam, salts 2.0, carbonates 6.0%, pH 8.0

Sampling Fertilized Soybean Fields

Hillsboro ND - Fall 50 lb/a
Broadcast and incorporated Application

Olsen P Soil Test - ppm



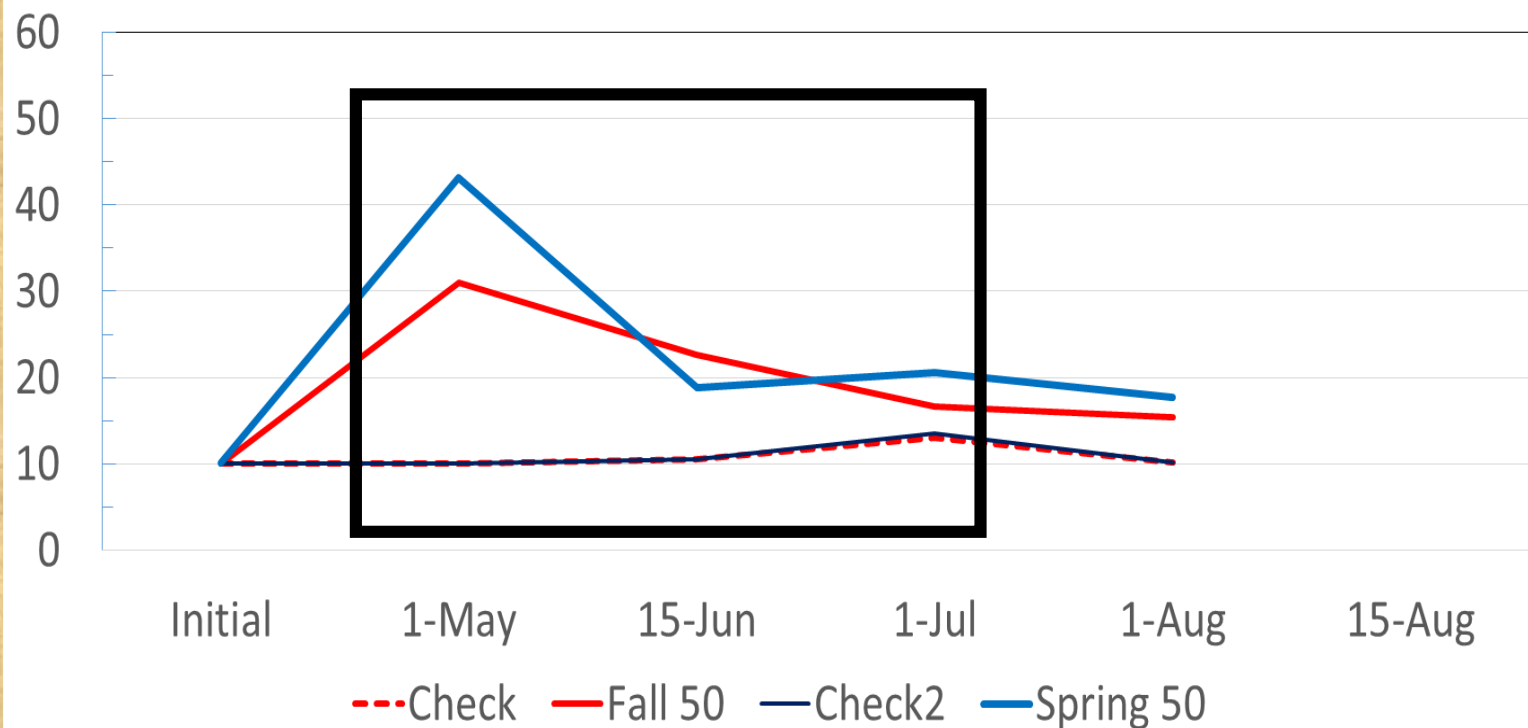
Hillsboro ND, pH -7.7 Clay texture (59%)

Sampling Fertilized Soybean Fields

Hillsboro, ND

Fall or Spring 50 lb/a P_2O_5

Olsen P Soil Test - ppm



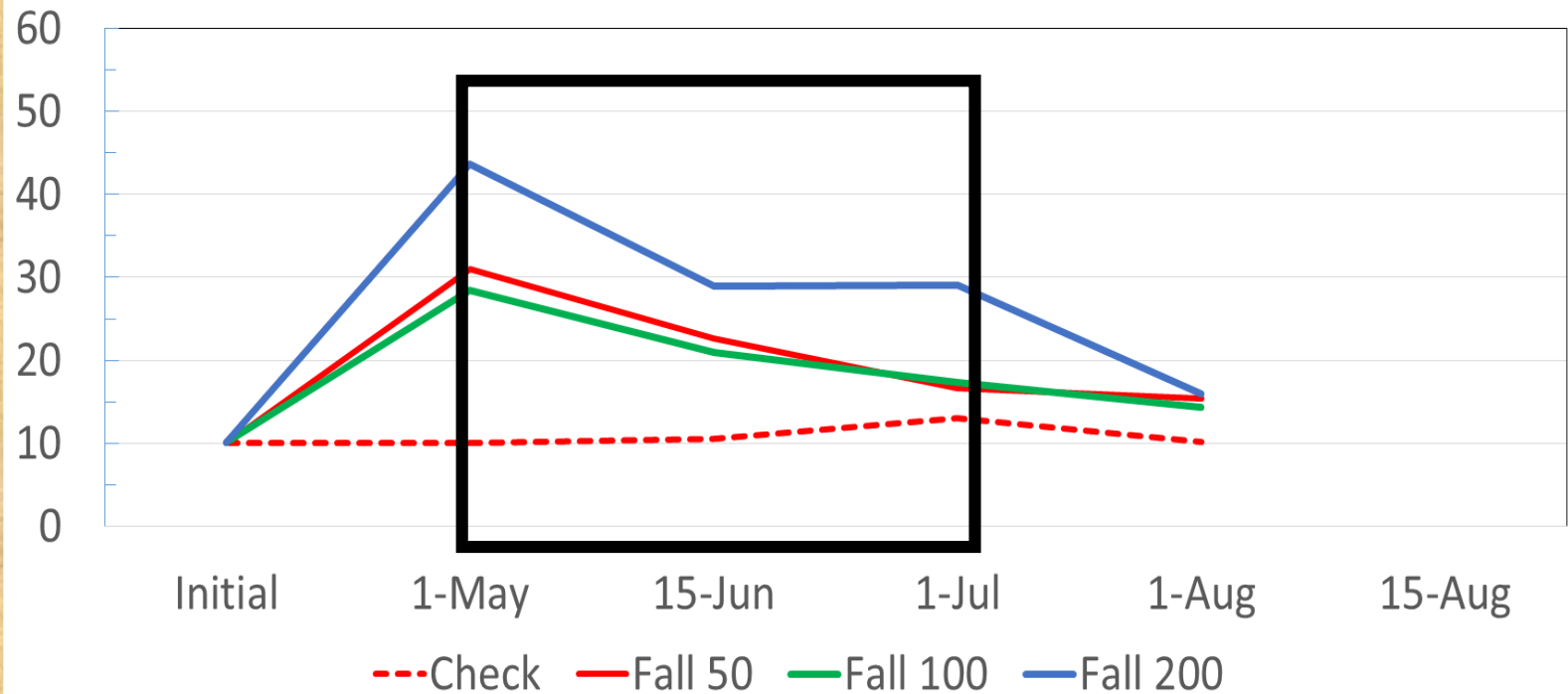
Hillsboro ND, pH = 7.7 Clay texture (59%)

Sampling Fertilized Soybean Fields

Hillsboro, ND

Fall – 50, 100, 200 lb/a P_2O_5

Olsen P Soil Test - ppm



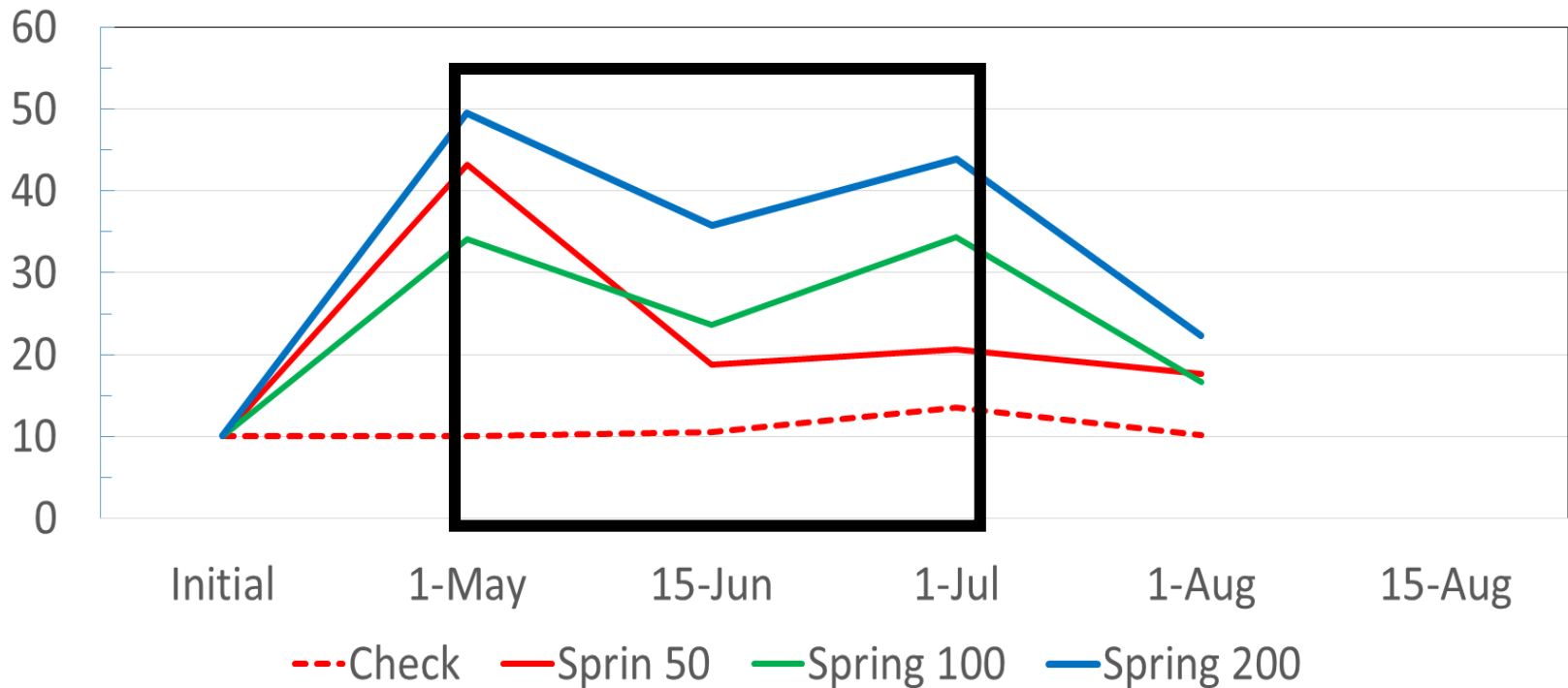
Hillsboro ND, pH – 7.7 Clay texture (59%)

Sampling Fertilized Soybean Fields

Hillsboro, ND

Spring 50, 100, 200 lb/a P₂O₅

Olsen P Soil Test - ppm



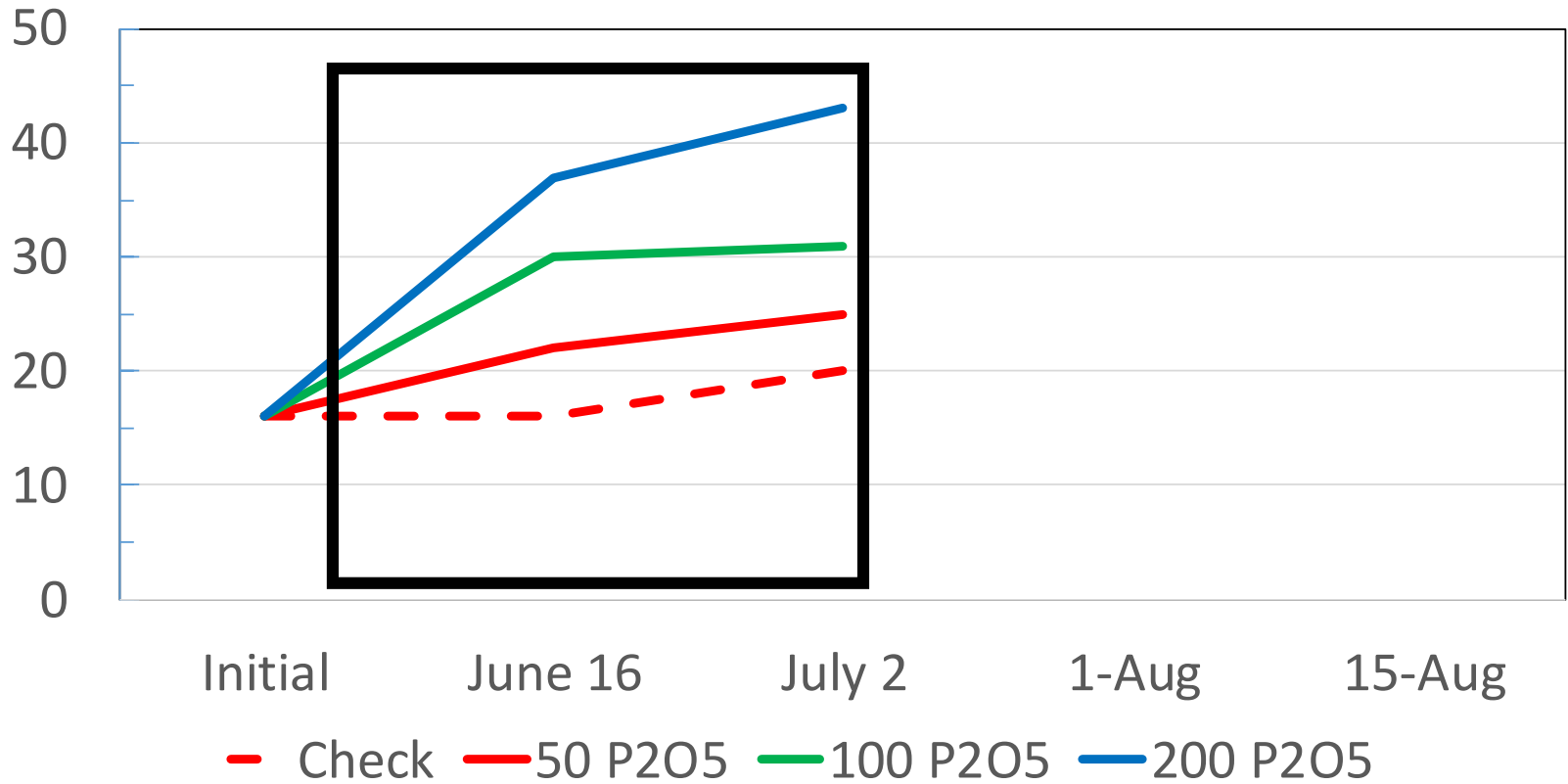
Hillsboro ND, pH 7.7 Clay texture (59%)

Sampling Fertilized Soybean Fields

Benson, MN Site 1 - Spring

Broadcast and incorporated Application

Olsen P Soil Test - ppm



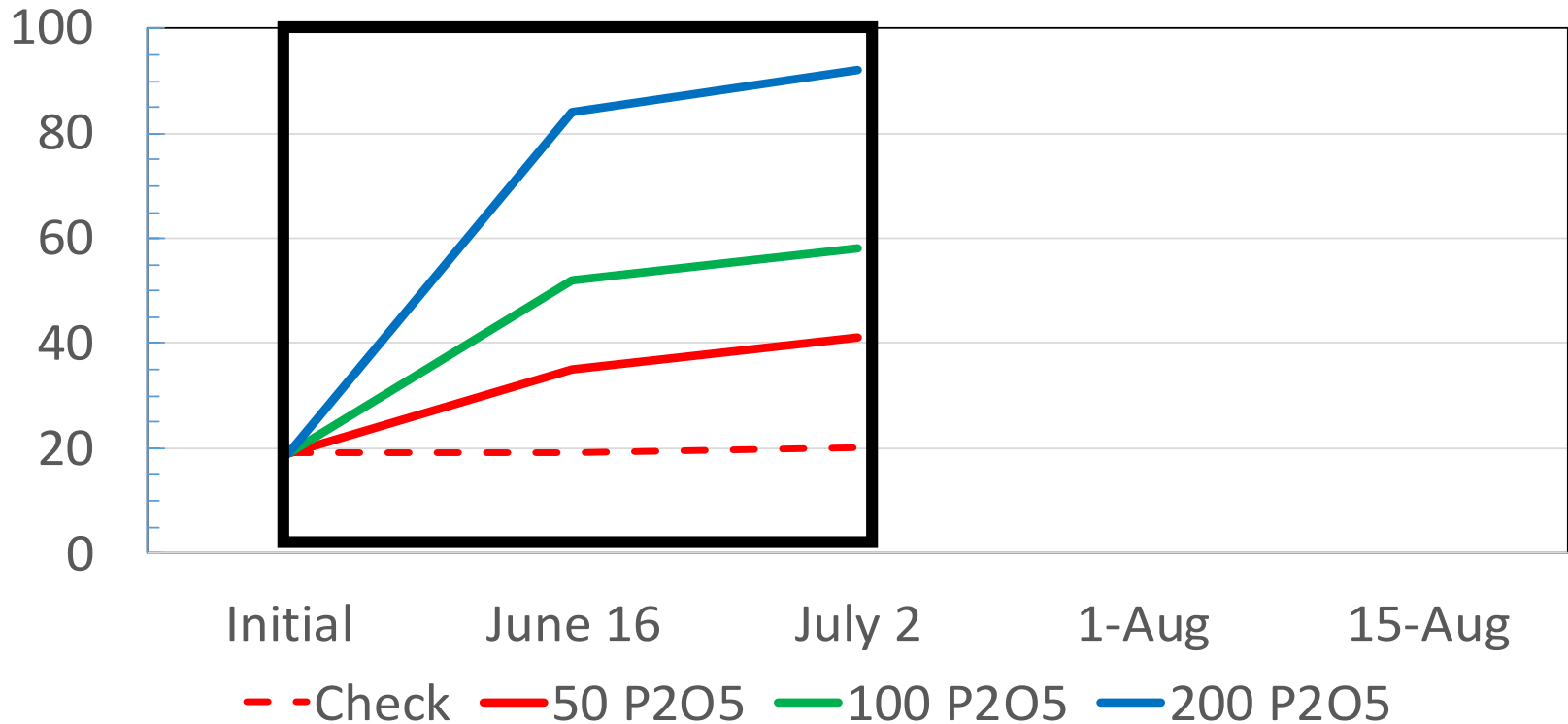
Site 1, Benson, MN, pH = 6.1, silty clay loam

Sampling Fertilized Soybean Fields

Benson, MN Site 2 - Spring

Broadcast and incorporated Application

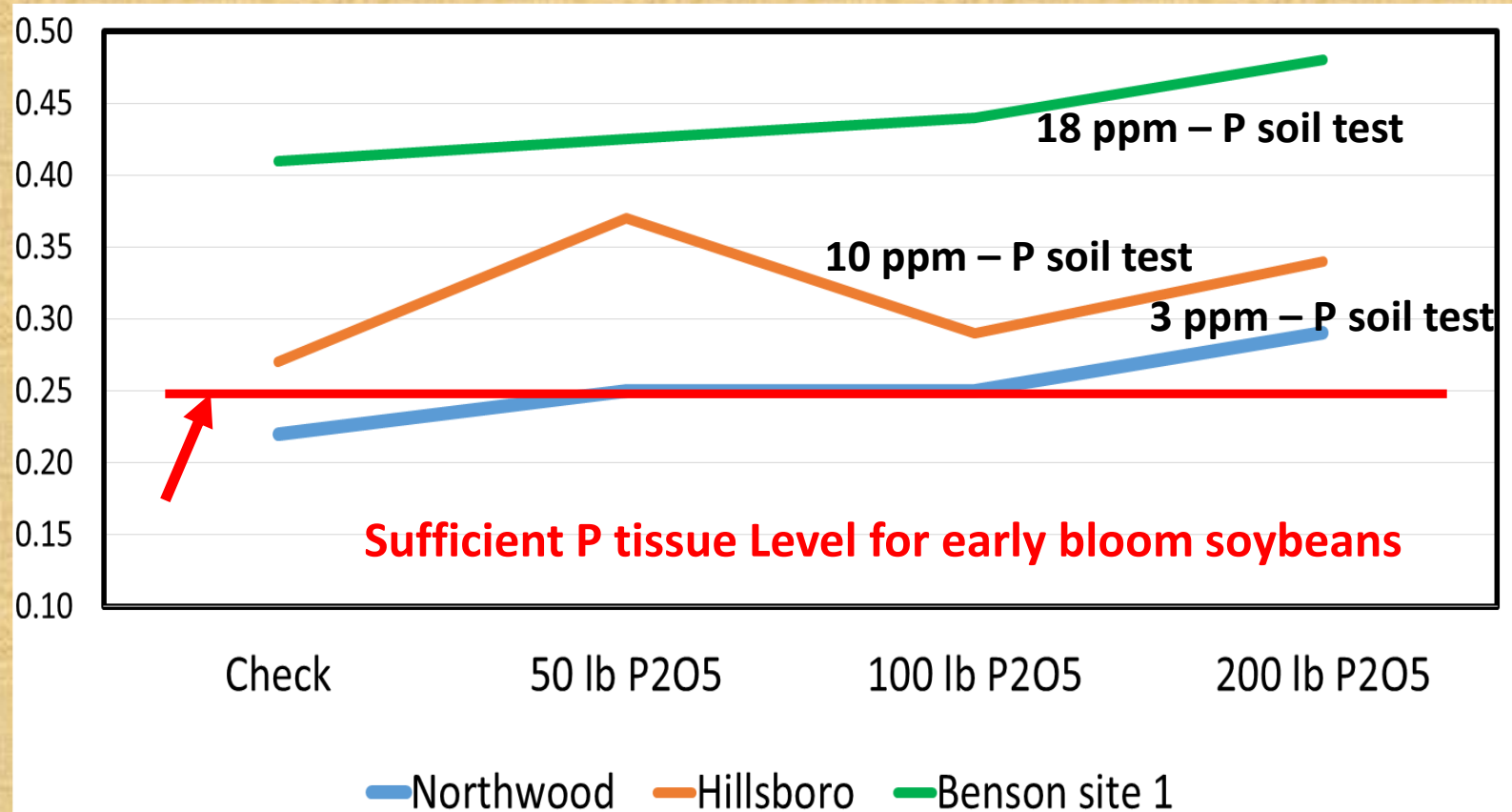
Olsen P Soil Test - ppm



Site 2, Benson, MN, pH = 7.6, silty clay loam

Soybean "P" tissue levels? Early Bloom

Tissue - % total P



Conclusions

- 50 lb/a P₂O₅ did effect soil test levels whether the fertilizer was applied fall or the spring
- Spring applied Fertilizer had more affect on soil test level.
- 50 lb/a P205 rate did increase P soil test slightly at end of the season in Northwood
- Higher rates of P fertilizer increased soil test levels all season long

Conclusions

- Soil testing should wait until after harvest when P fertilizer is applied the fall before or in the spring before planting.
- To do spring/summer sampling you will need to plan to sample fields which were not fertilized with P the fall before or in the spring
- You could sample fields where P was banded if you avoid the P fertilizer bands

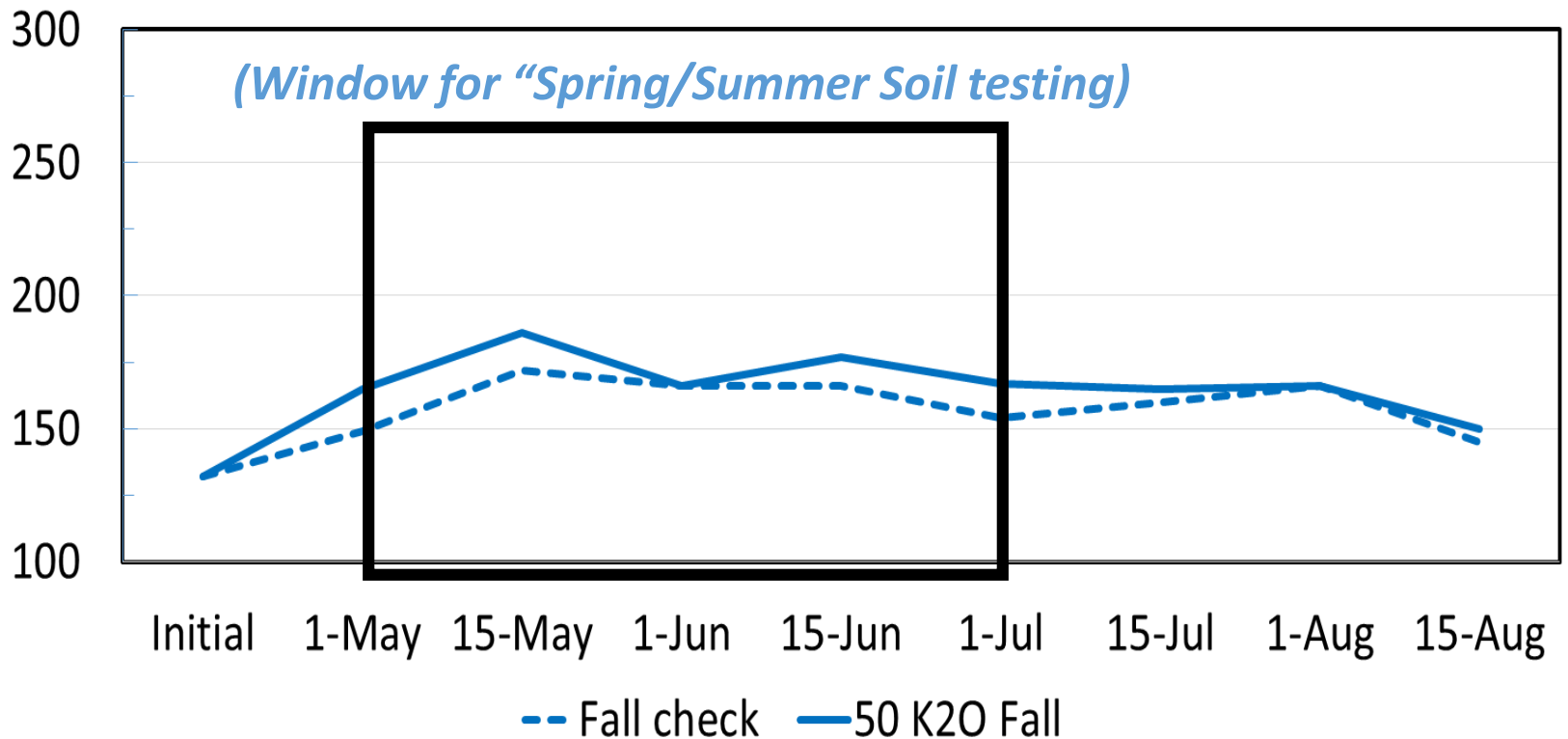
Potassium



Sampling Fertilized Soybean Fields

Northwood, ND Fall and Spring Application
K fertilizer (50 lb/a K_2O)

Potassium Soil Test - ppm

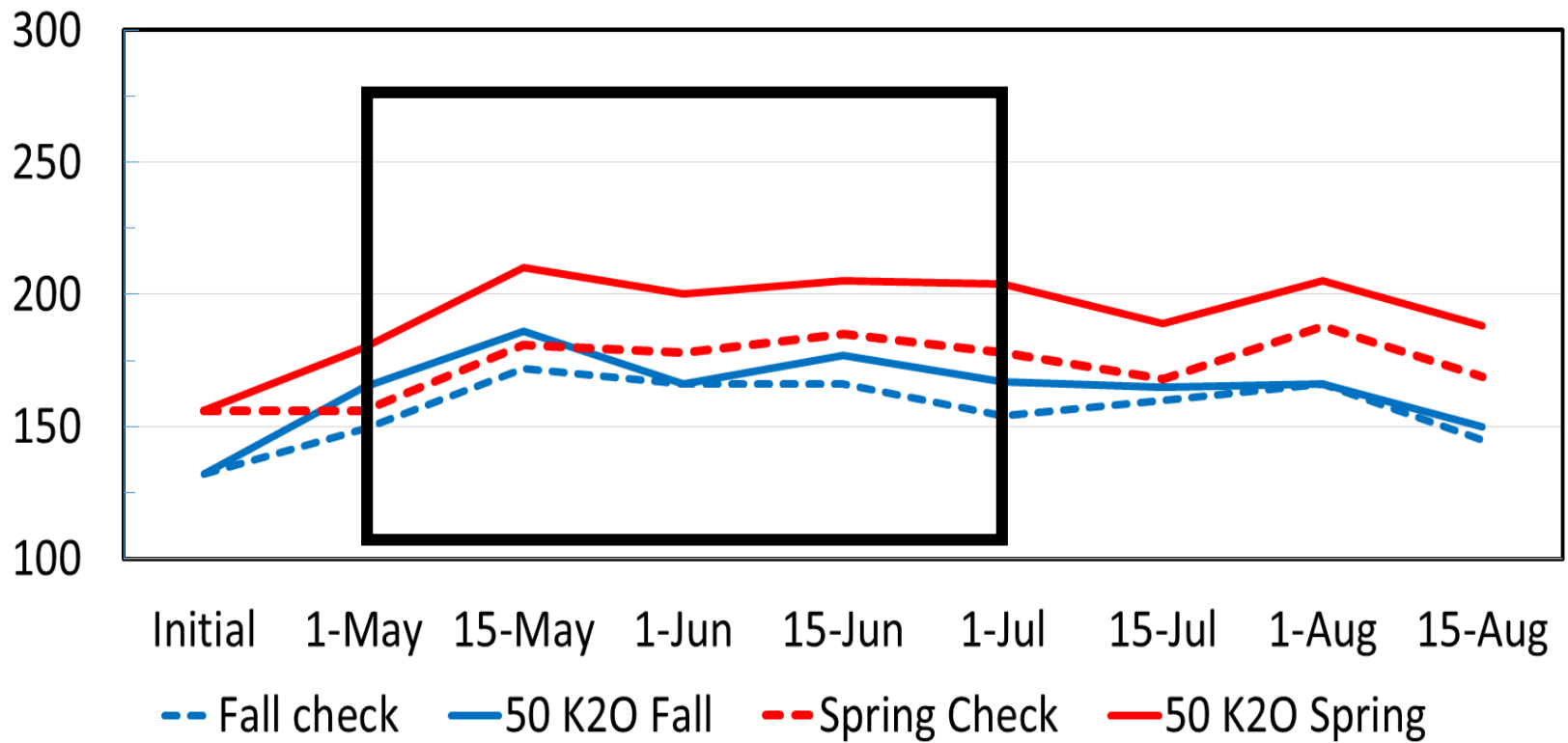


Sandy Clay Loam, salts 2.0, carbonates 6.0%, pH 8.0

Sampling Fertilized Soybean Fields

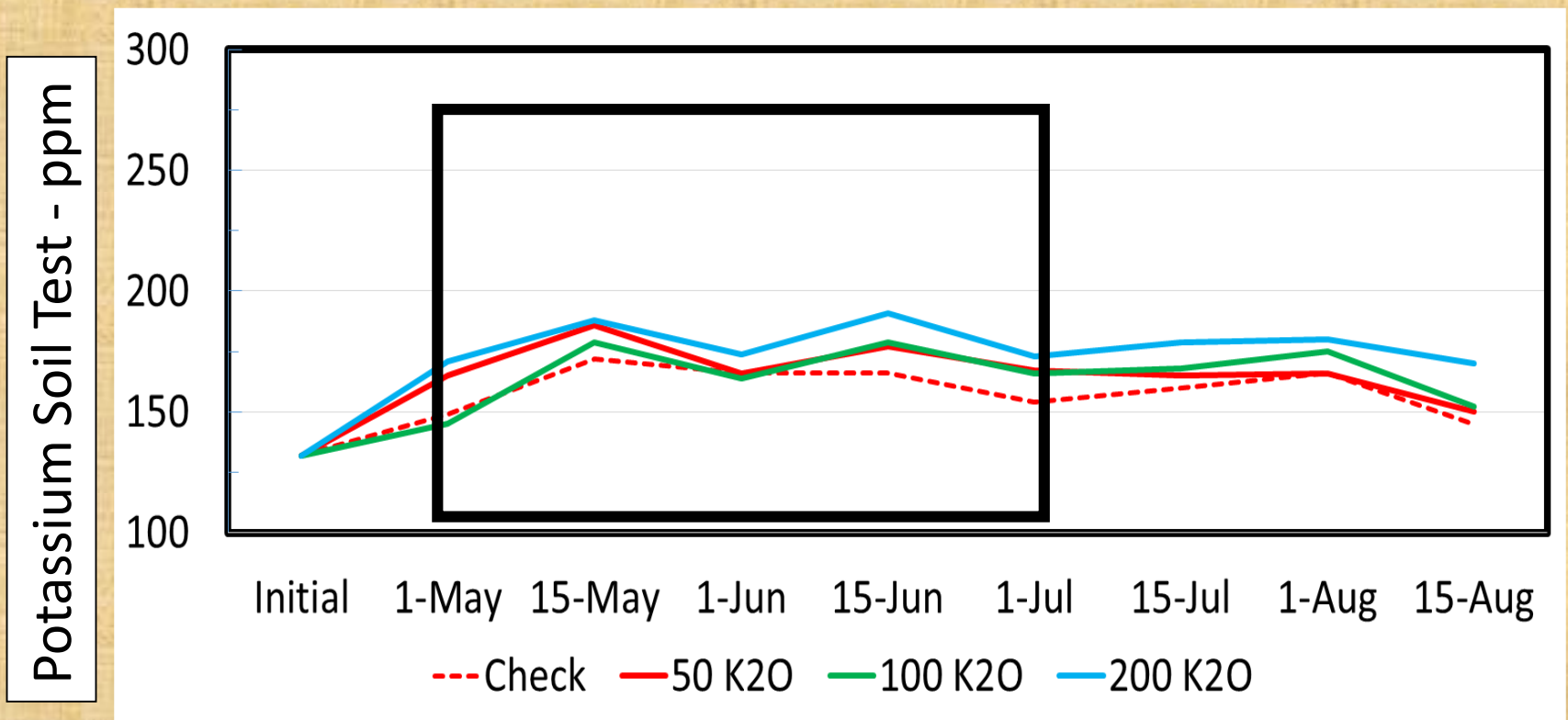
Northwood, ND Fall and Spring Application
K fertilizer (50 lb/a K_2O)

Potassium Soil Test - ppm



Sandy Clay Loam, salts 2.0, carbonates 6.0%, pH 8.0

Sampling Fertilized Soybean Fields Northwood ND Fall Broadcast Application

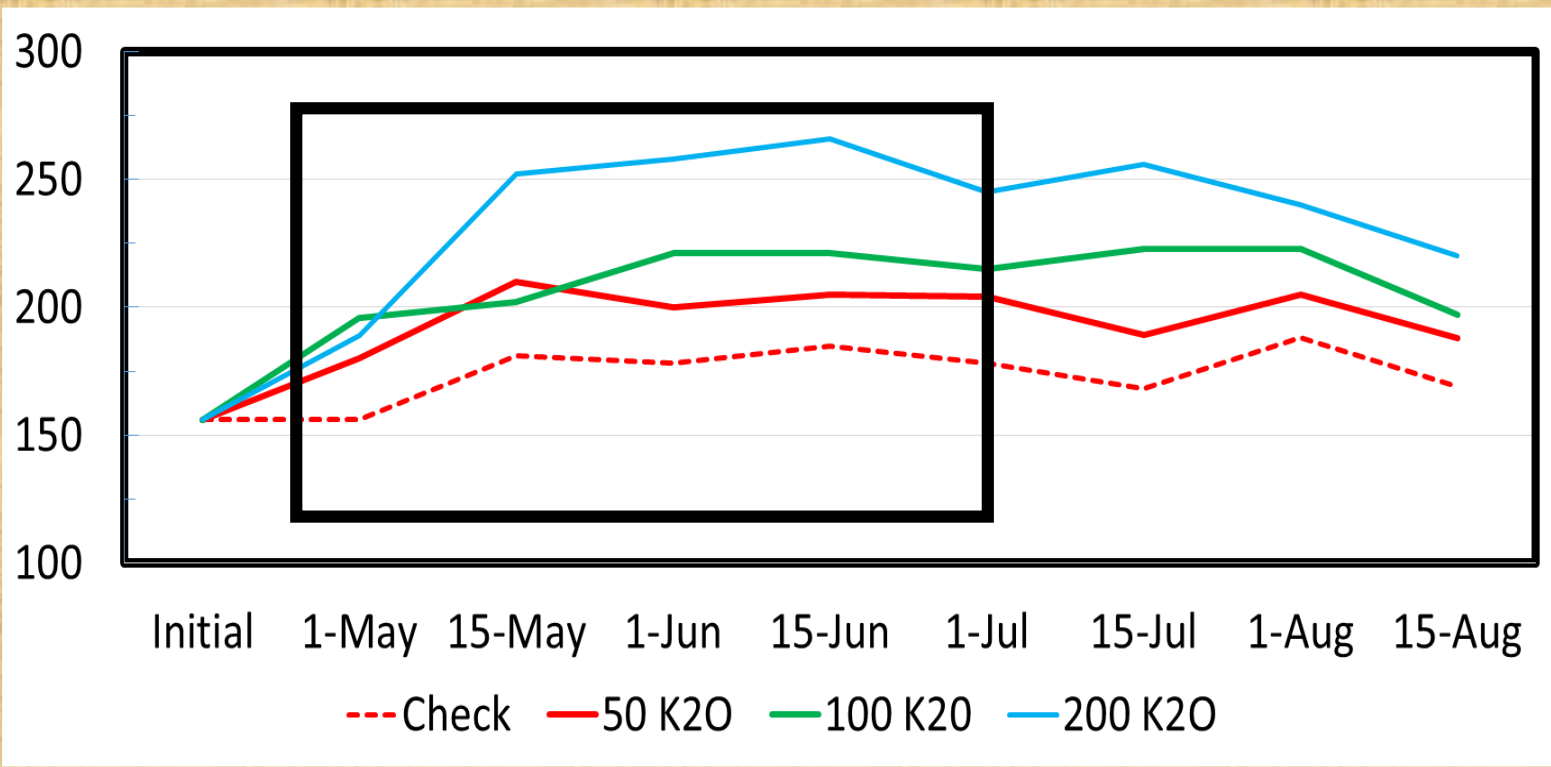


Sandy Clay Loam, salts 2.0, carbonates 6.0%, pH 8.0

Sampling Fertilized Soybean Fields (Northwood, ND)

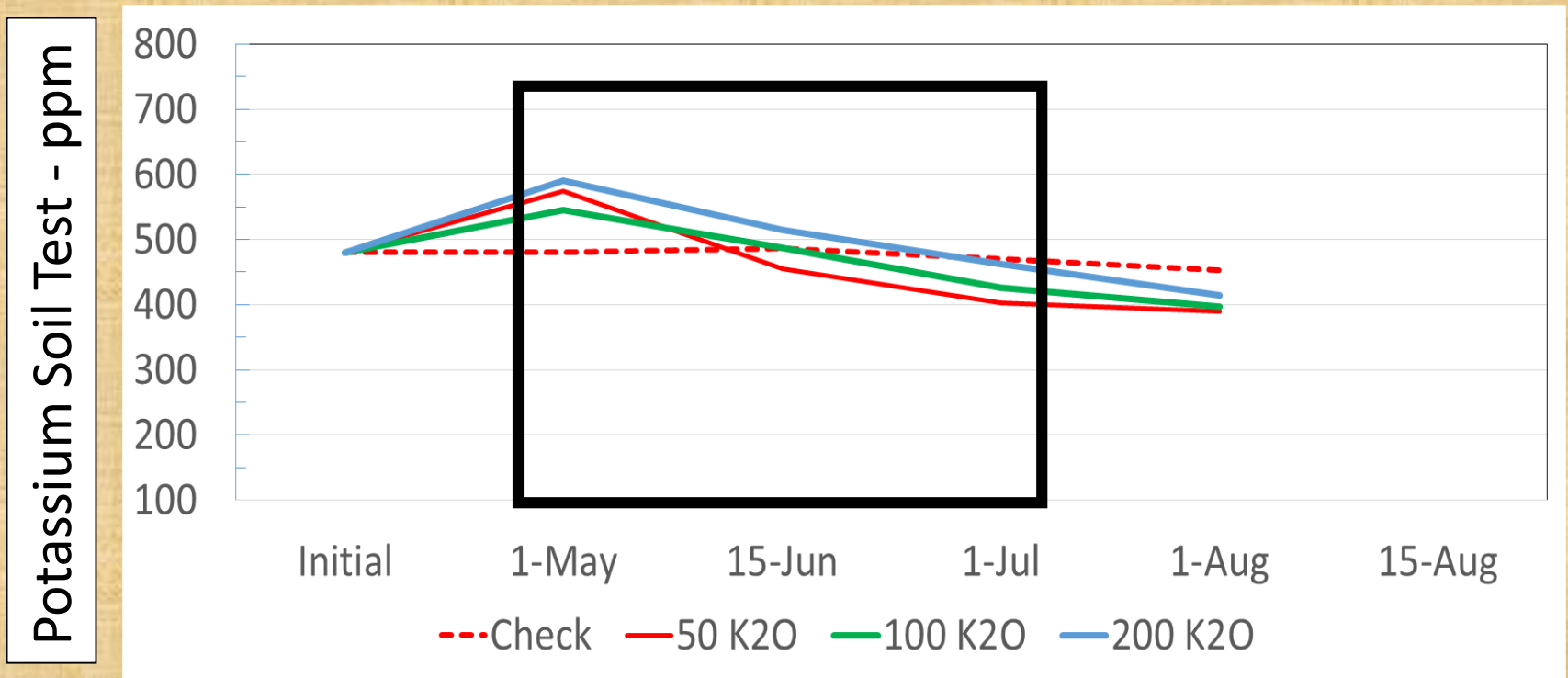
Spring Broadcast Application

Potassium Soil Test - ppm



Sandy Clay Loam, salts 2.0, carbonates 6.0%, pH 8.0

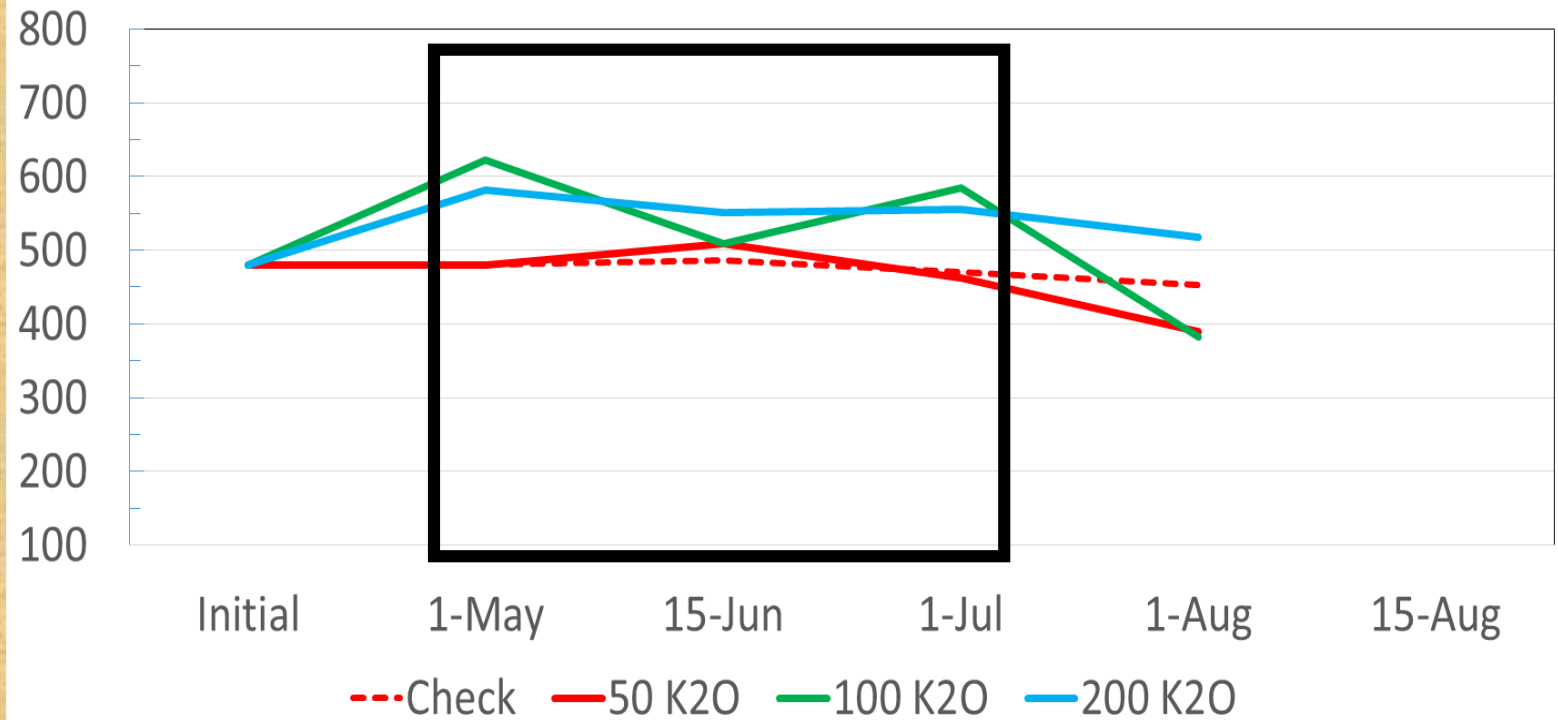
Sampling Fertilized Soybean Fields Hillsboro, ND Fall Broadcast Application



Hillsboro ND, pH = 7.7 Clay texture (59%)

Sampling Fertilized Soybean Fields Hillsboro, ND Spring Broadcast Application

Potassium Soil Test - ppm



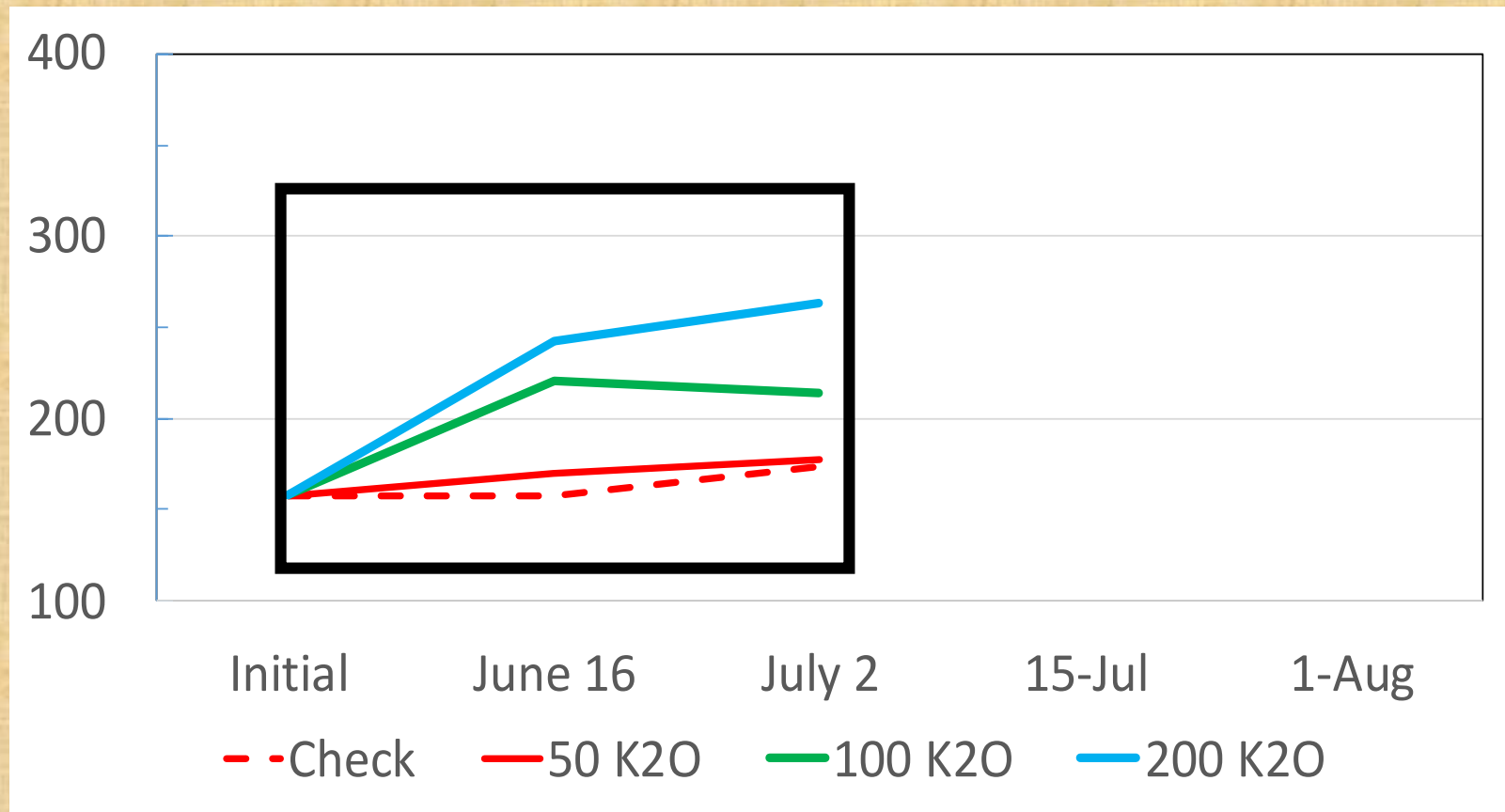
Hillsboro ND, pH 7.7 Clay texture (59%)

Sampling Fertilized Soybean Fields

Benson, MN

Site 1 - Spring Broadcast Application

Potassium Soil Test - ppm



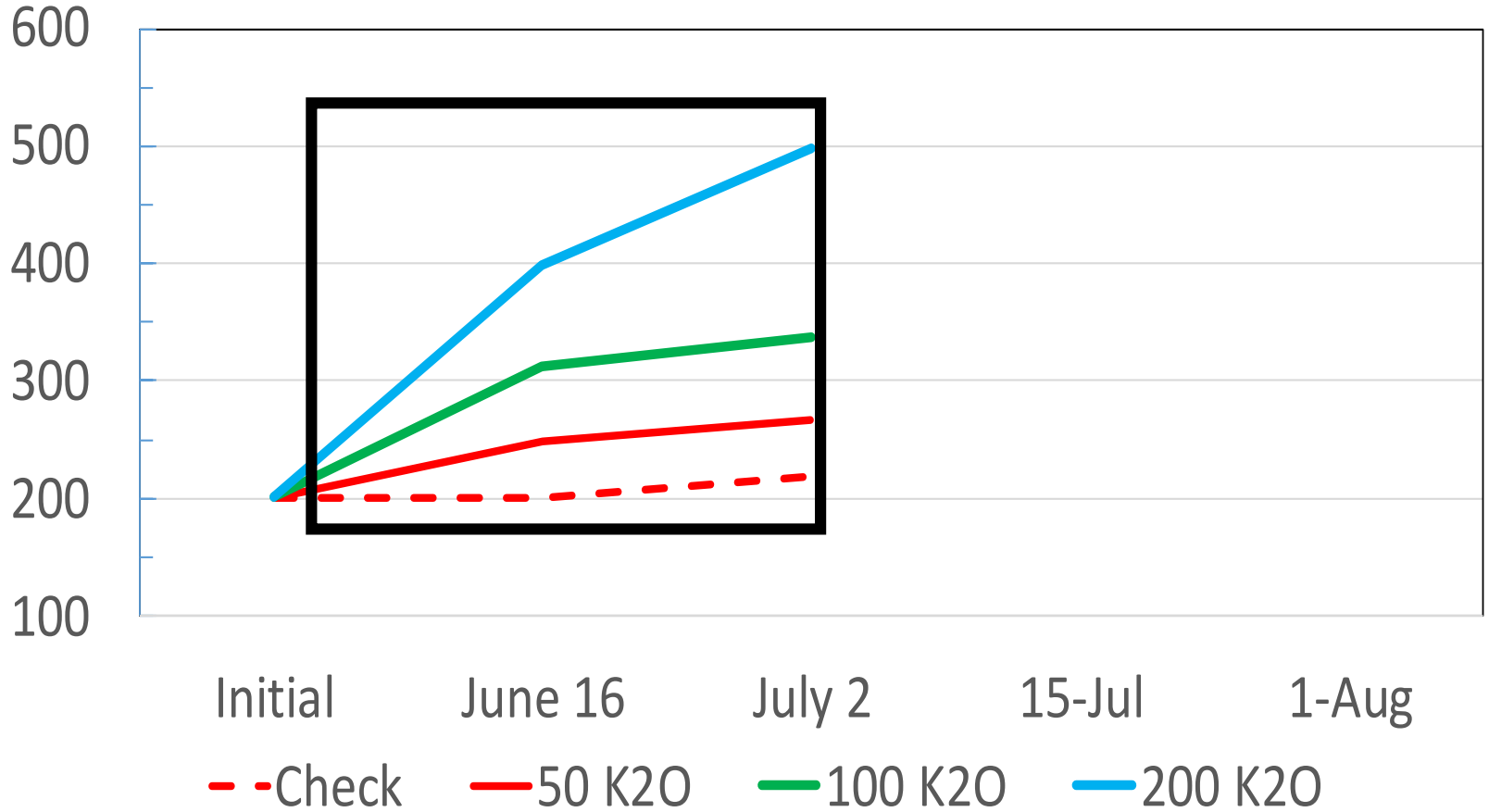
Site 1, Benson, MN, pH = 6.1, silty clay loam

Sampling Fertilized Soybean Fields

Benson Site 2

Spring Broadcast Application

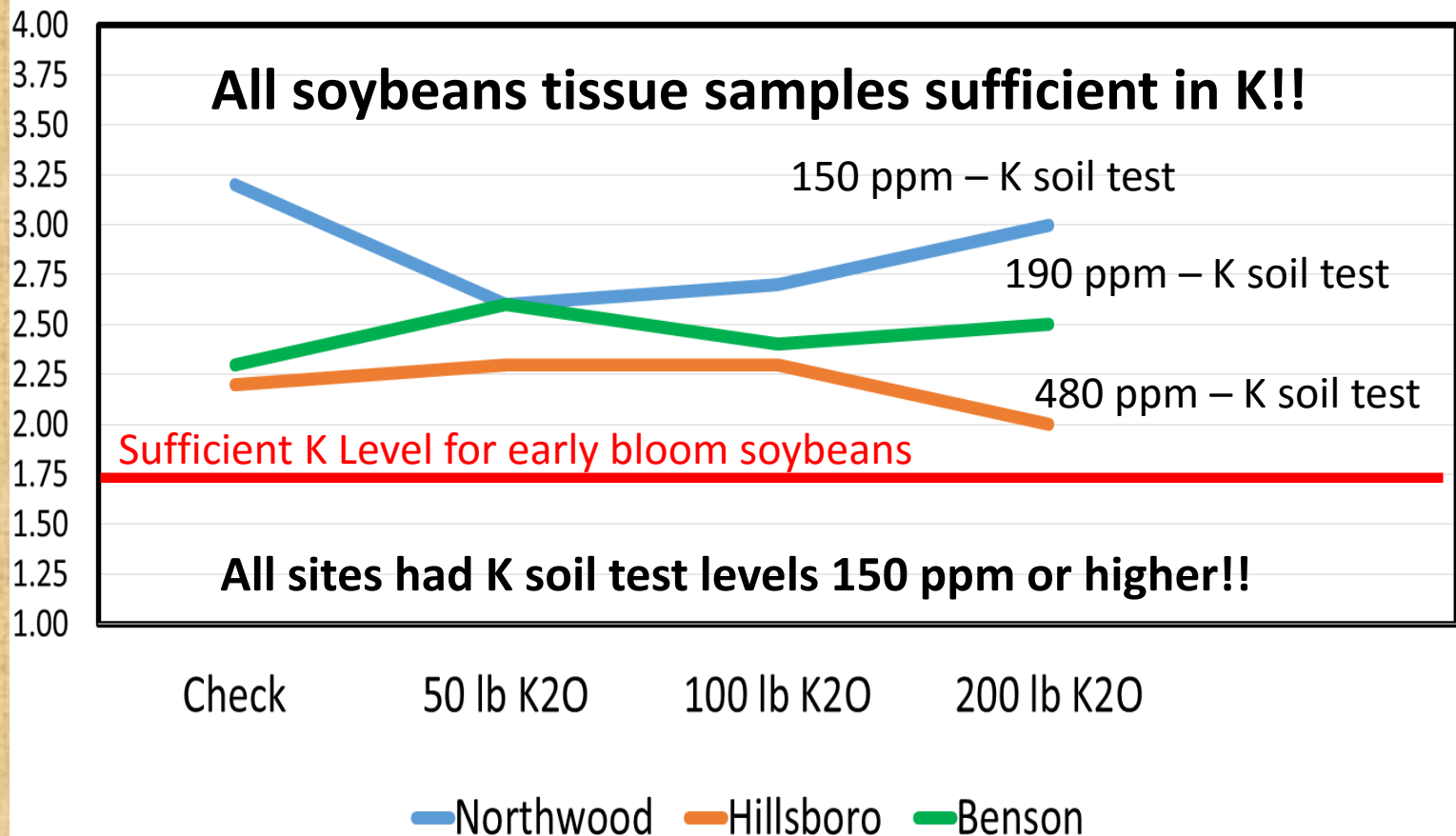
Potassium Soil Test - ppm



Site 2, Benson, MN, pH = 7.6, silty clay loam

Soybean K tissue levels? Early Bloom

Tissue - %Total K



Conclusion

- 50 lb/a K_2O did effect soil test levels whether the fertilizer was applied in the fall or the spring
- Spring applied Fertilizer effected soil test level a little more
- Higher rates of K fertilizer increased soil test levels all season long

Conclusions

- Soil testing should wait until after harvest when K fertilizer is applied the fall before or in the spring before planting.
- To do spring/summer sampling you will need to plan to soil test fields which were not fertilized with P & K the fall before or in the spring.



Questions?



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05 AUG 2015 06:

Grower Meetings Promoting “Base Saturation” and “Cation Ratios” (lots of questions)

- Base saturation is a calculation showing % of each cation

<u>Cation</u>	<u>Typical range (not optimum!)</u>
• Calcium (Ca ⁺⁺)	5000 ppm (60-80%)
• Magnesium (Mg ⁺⁺)	1000 ppm (15-35%)
• Potassium (K ⁺)	150 ppm (1-7%)
• Sodium (Na ⁺)	50 ppm (0-4%)

- Research from 40's & 50's implied “Optimum” % range existed for each cation to achieve high yields!
- Research from 60's, 70's, 80's, 90's 2000's proved % of each cation is not important and does not limit crop yield
- What is important is “ppm” of each cation is sufficient!

***Simple Demonstration
Project To Show
“One Flaw”
in “Base Saturation/Cation Ratio”
Concept?***

***“Project Dreamed Up!
Apply 1000 lb/a K_2O
(1666 lb/a KCl 0-0-60)
Uff-Da Project!***

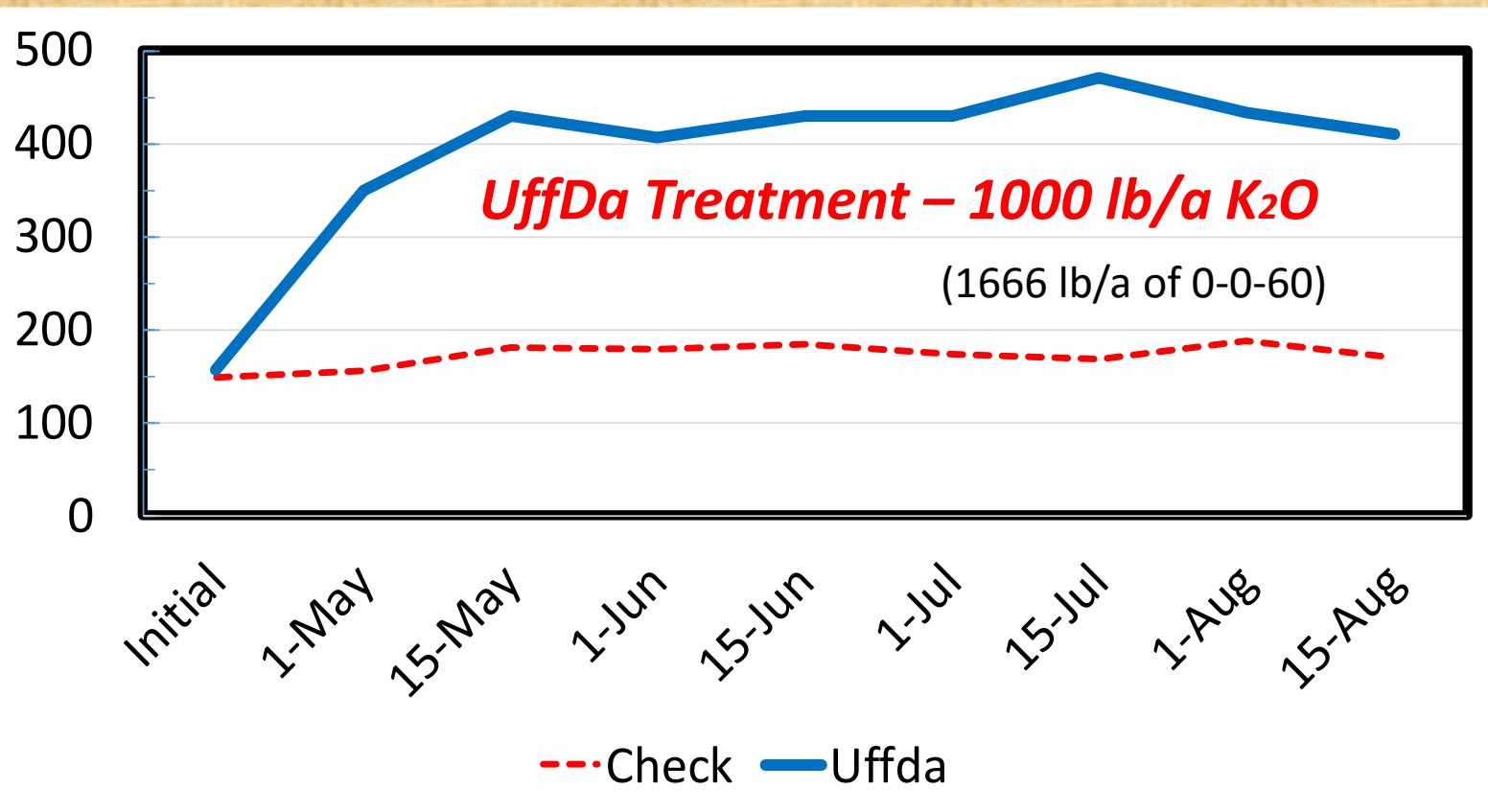
Reason: See if we could increase the %K to the magical 4-8% range

“Uff Da” Project

- My Grandpa was a farmer who came over on the boat from Norway
- “Uff Da” Comes from Scandinavian immigrants during the early part of the 20th century. If you are over worked you say "Uff Da", if you are surprised you say "Uff Da", If you are Upset you say "Uff Da“
- He would have said “Uff Da” that’s a lot of Potash

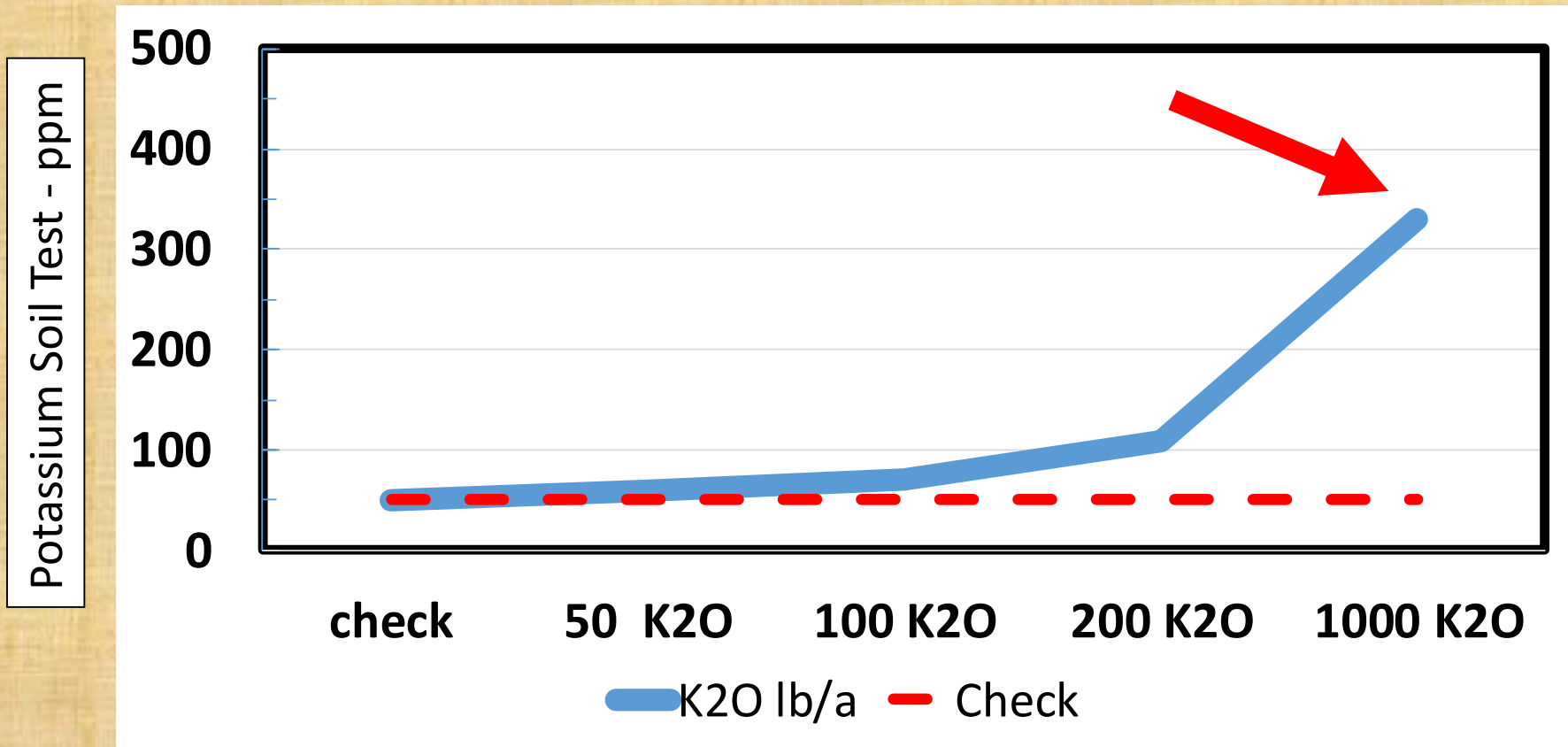
“Uff Da” Project – Northwood, ND Site Effect of 1000 lb/a K₂O on K Soil Test ppm

Potassium Soil Test - ppm



Sandy Clay Loam, salts 2.0, carbonates 6.0%, pH 8.0

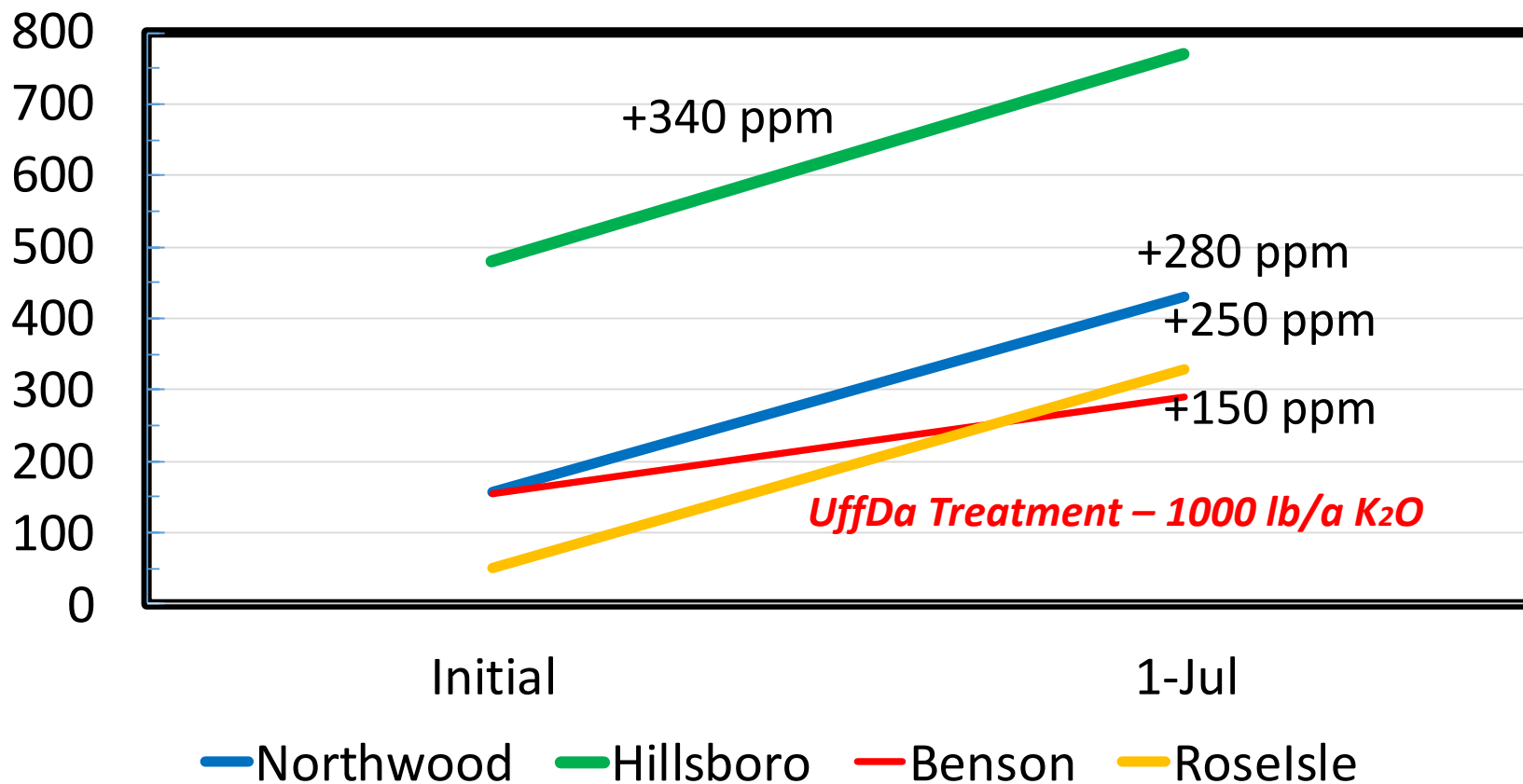
Effect of 1000 lb/a K_2O on K Soil Test ppm UffDa Treatment – Rode Isle MB



salts 0.45, carbonates 13-14%, pH 8.7

Effect of 1000 lb/a K_2O on K Soil Test ppm Northwood, Hillsboro, Benson, Rose Isle MB

Potassium Soil Test - ppm

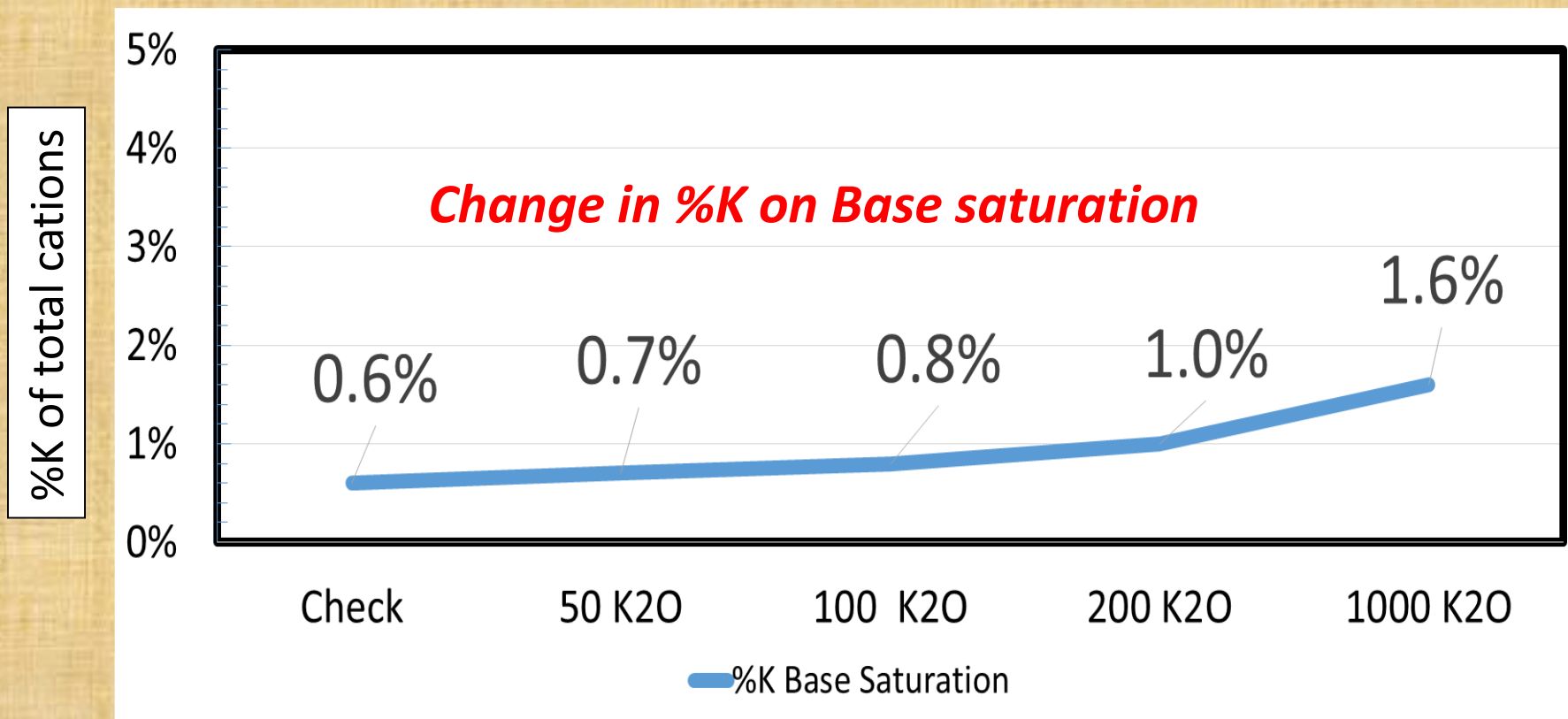


“Uff Da” Project - Conclusion 1

- Did the K soil test pick up the large amount of K fertilizer applied? **(YES!)**
- The K soil test increased 150-350 ppm on 4 sites
- Would K fertilizer still be recommended based on the soil test K ppm test after this large application of potassium?
- **NO! - critical soil test level for K is 150-160 ppm**

Did 1000 lb/a K₂O Change %K on Soil test?

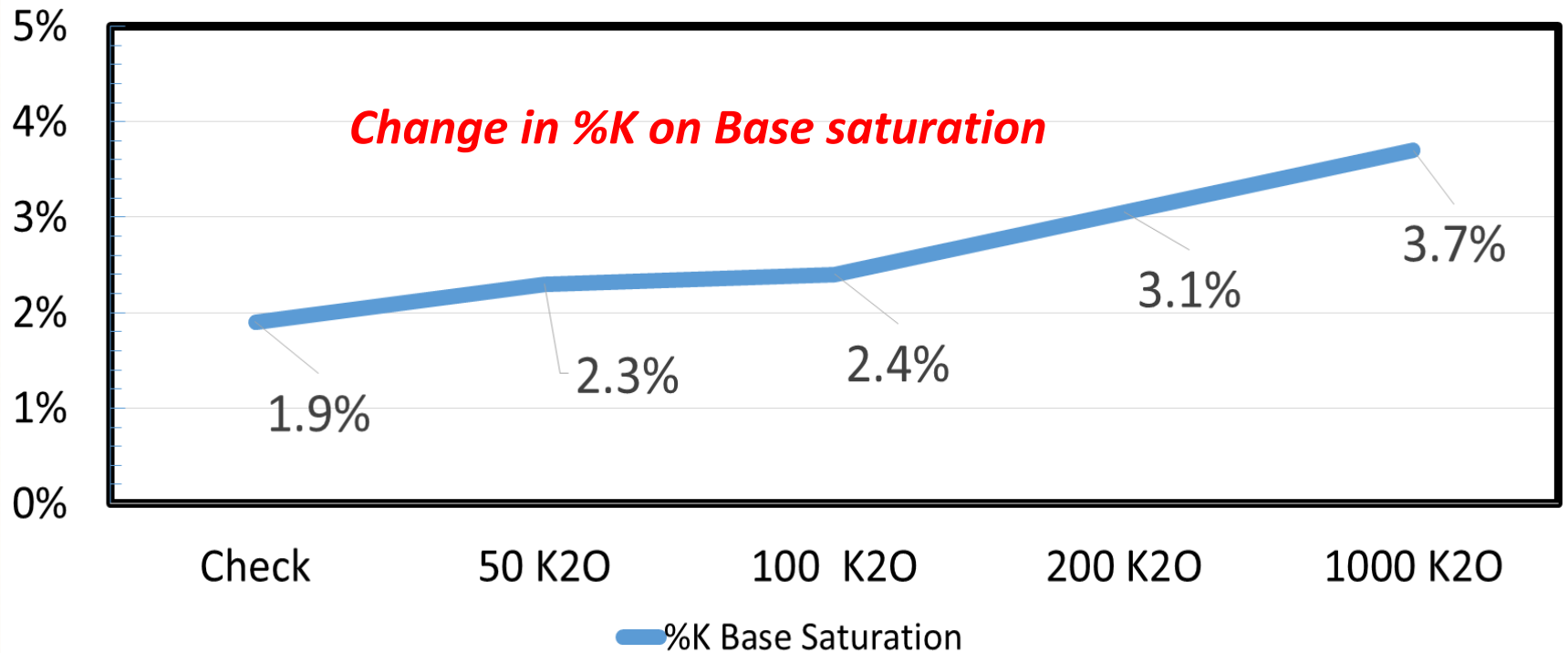
Northwood, ND Site



Sandy Clay Loam, salts 2.0, carbonates 6.0%, pH 8.0

Did 1000 lb/a K₂O Change %K on Soil Test? Benson, MN Site

%K of total cations

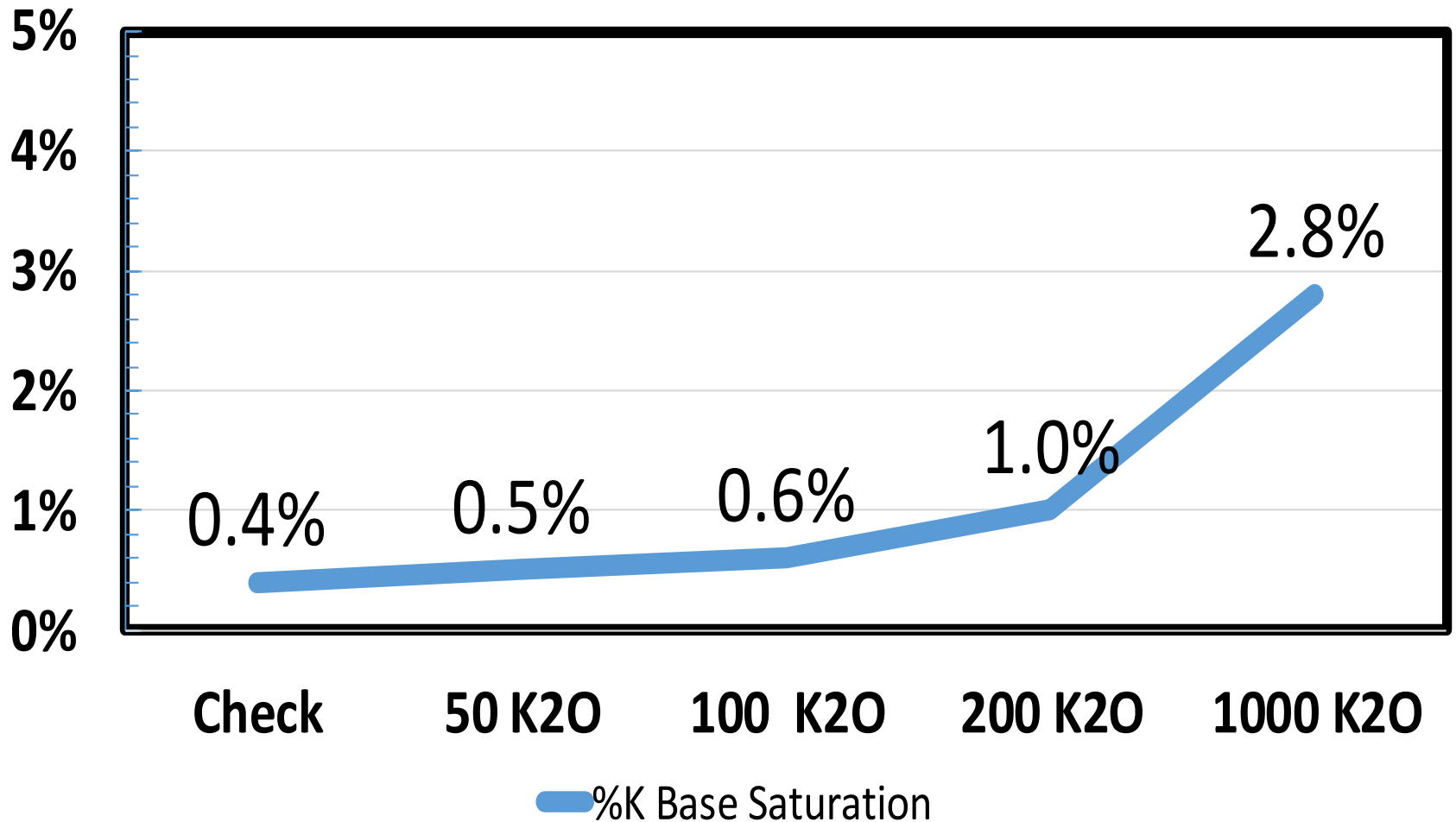


pH 6.6 salt .17, carbonates 0%

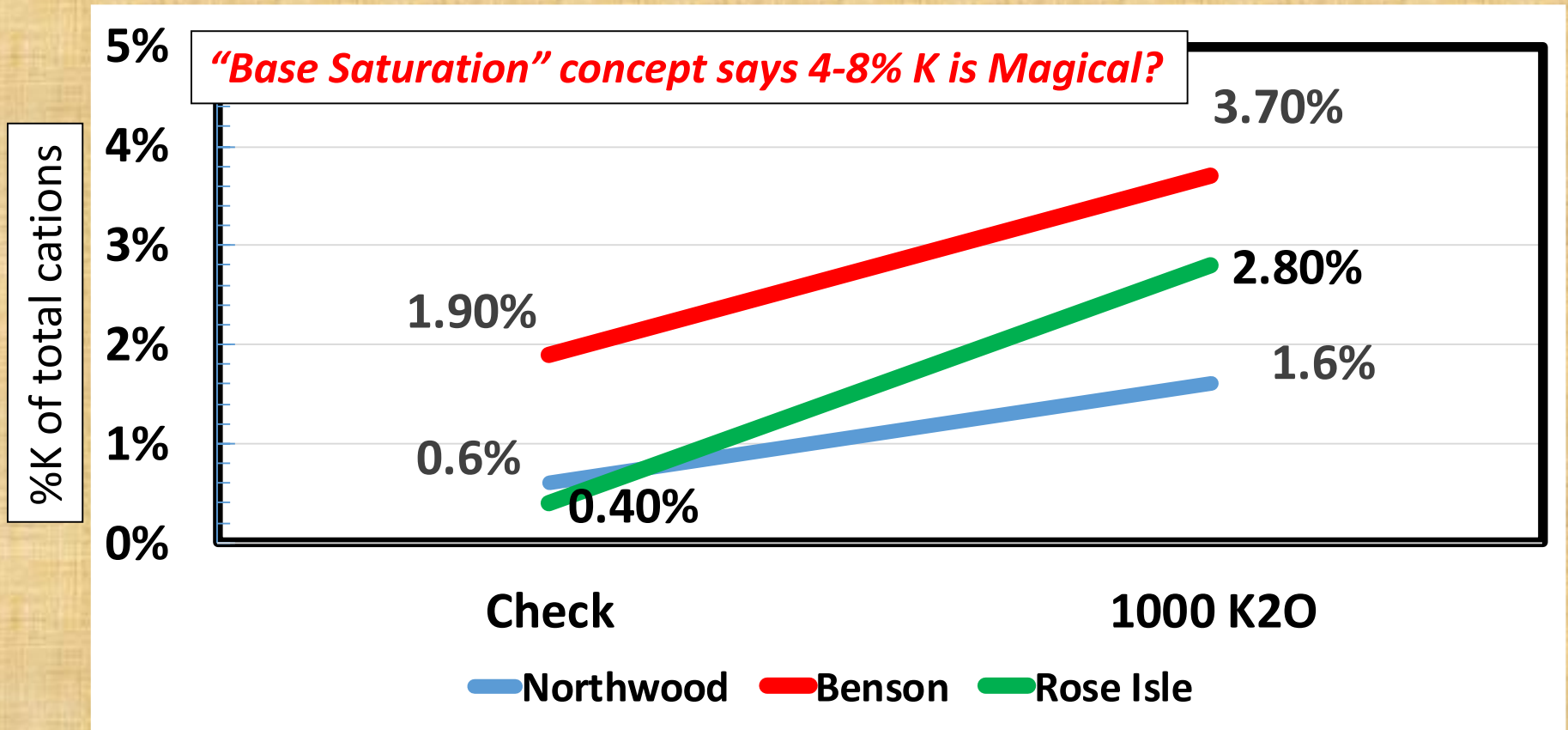
Does K fertilizer rate change %K on soil test?

Rose Isle, Manitoba site

%K of total cations



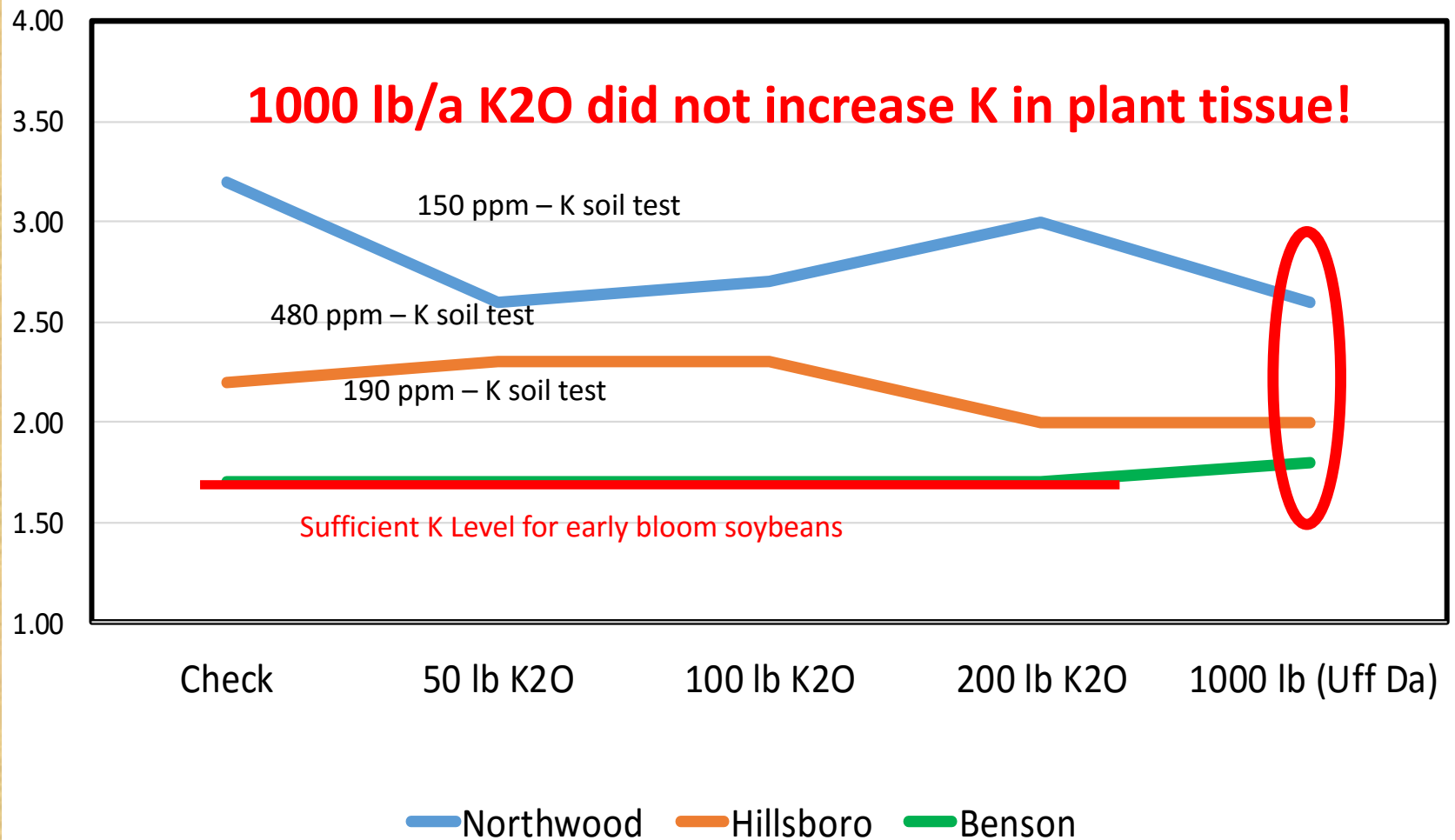
*1000 lb/a K₂O
changes %K by only 1.0-2.5%*



“Uff Da” Project – Conclusion 2

- Did 1000 lb/a K_2O increase the %K on base saturation?
- Yes, but only increased 1 to 2.5% (with 1000 lb/a K_2O !)
- “Base Saturation” concept would still recommend more K fertilizer because %K is still below 4-8% magical range
- Apparently 1000 lb/a K_2O (1666 lb KCL) is not enough!!!!!!

Soybean K tissue levels? Early Bloom



Lots of “Good” Reasons to Apply K Fertilizer

- K soil test is below 160 ppm (zone or grid test)
- K soil test is below 200 ppm (composite sample-variable field)
- K tissue levels have history of being below sufficiency range when no K is applied
- Replicated strip trials show profitable yield increases when K is applied!!!
- Soil chloride is low so KCL is applied for the Cl for cereals
- %Base Saturation/Cation Balancing is “NOT” a reason to apply more K fertilizer! (Time to get out of the 50’s)

Additional information on Base saturation and Cation Balancing

www.agvise.com – Agronomic information – CEC and Cation Ratios



Current Soil Temps
ND MN SD

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▶ CEC and Holding N in the Soil

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CEC and Holding N in the Soil

Estimated Texture Based on CEC

CEC Range	Approximate Texture
1 to 10	Sands
10 to 20	Coarse Loams
20 to 30	Fine Loams
30+	Clays/Clay Loams

Approximate Wetting Depth

Texture	2" Rain	4" Rain
Sand	34	69
Sandy Loam	18	37
Loam	13	27
Clay Loam	11	23

An idea being promoted at some farmer meetings is that a soil can hold 10 lbs of nitrogen for each millequivalent (meq) of CEC. Lets put this idea in the category of urban legend. This legend would have you believe that a sandy soil with a CEC of 11 would safely hold 110 lb/a nitrogen on the cation exchange sites. The truth is that all the ammonium from many common fertilizers will be held on the soil cation exchange site

Questions?

Neighbors wife shot this deer last fall!!

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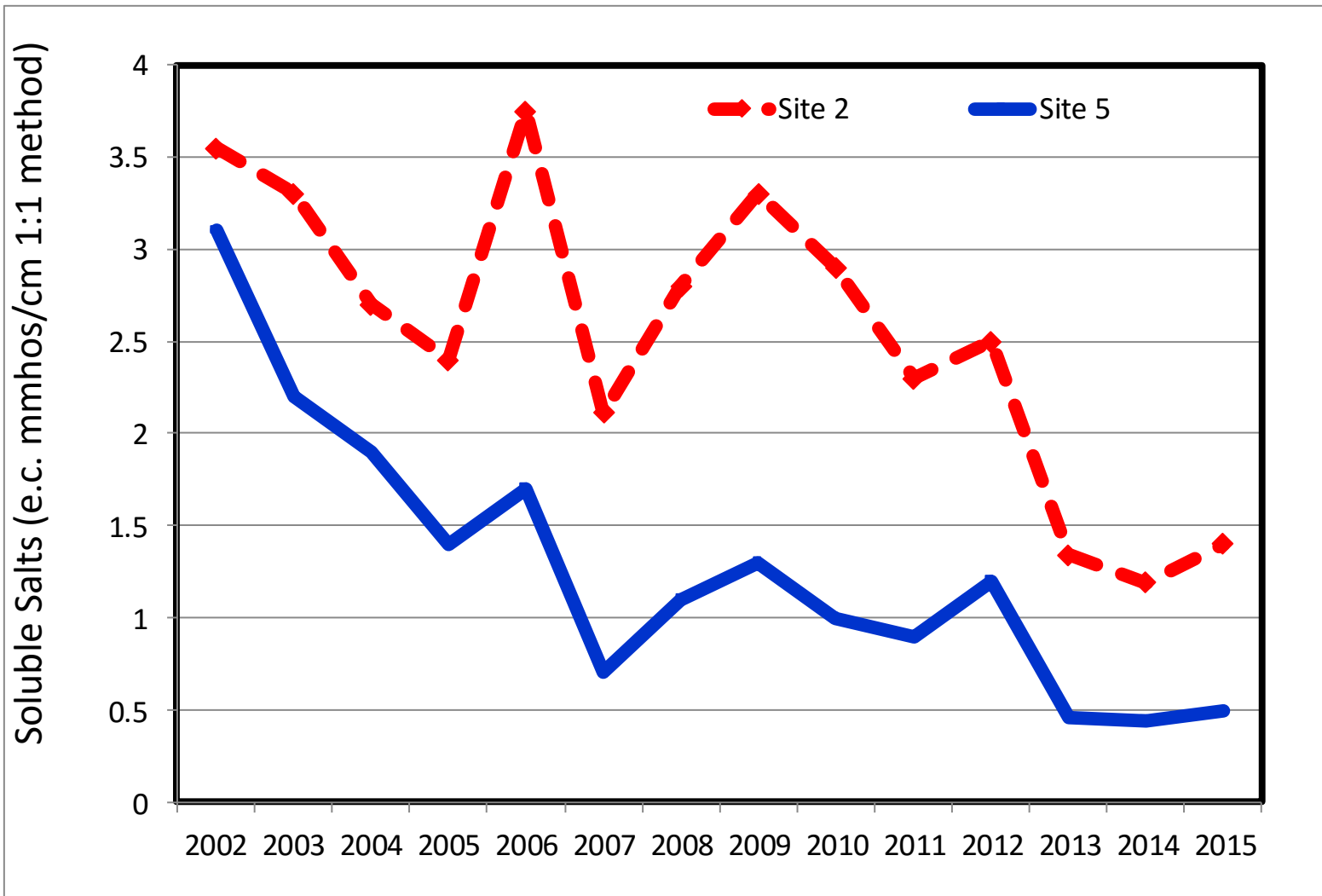
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Salinity Trend of Two Sites

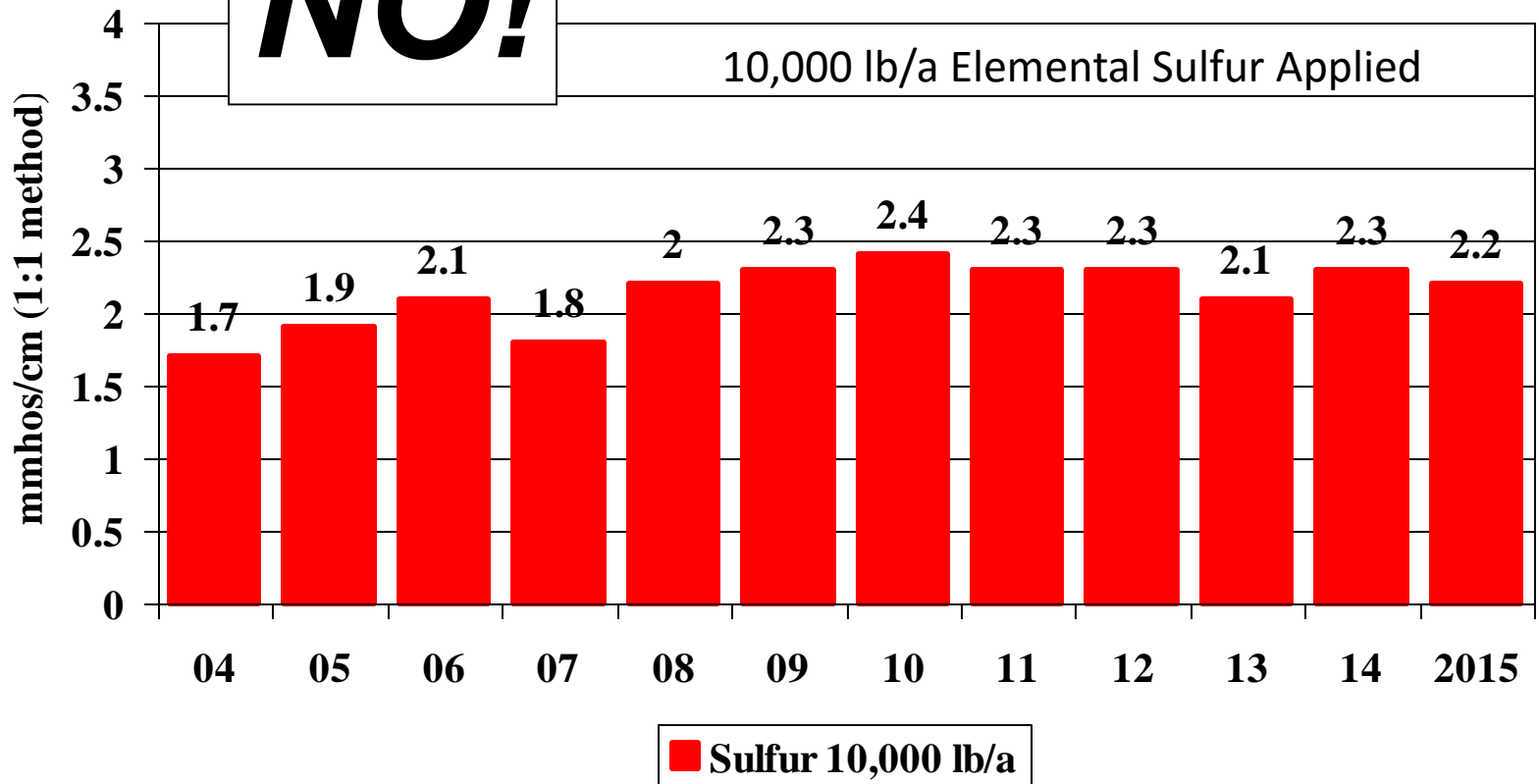
Tile Drained Field (2002 – 2015)



Does Elemental Sulfur Reduce Soluble Salts?

NO!

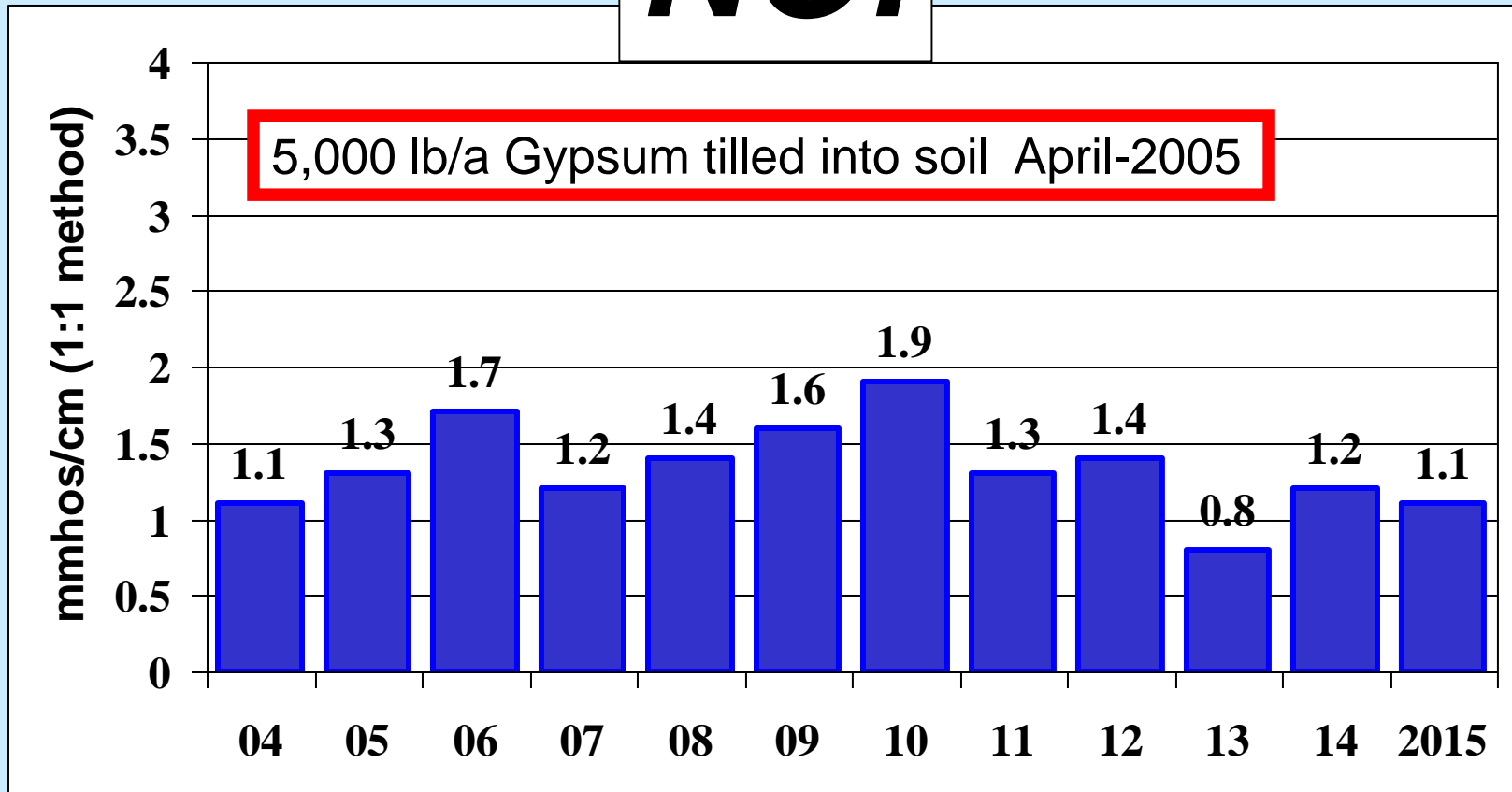
10,000 lb/a Elemental Sulfur Applied



Topsoil (0-6") sample tested each fall

Does Gypsum Reduce Soluble Salts?

NO!



Topsoil (0-6") sample tested each fall