# From Cover to Cover

## A Systems Approach to Cover Cropping

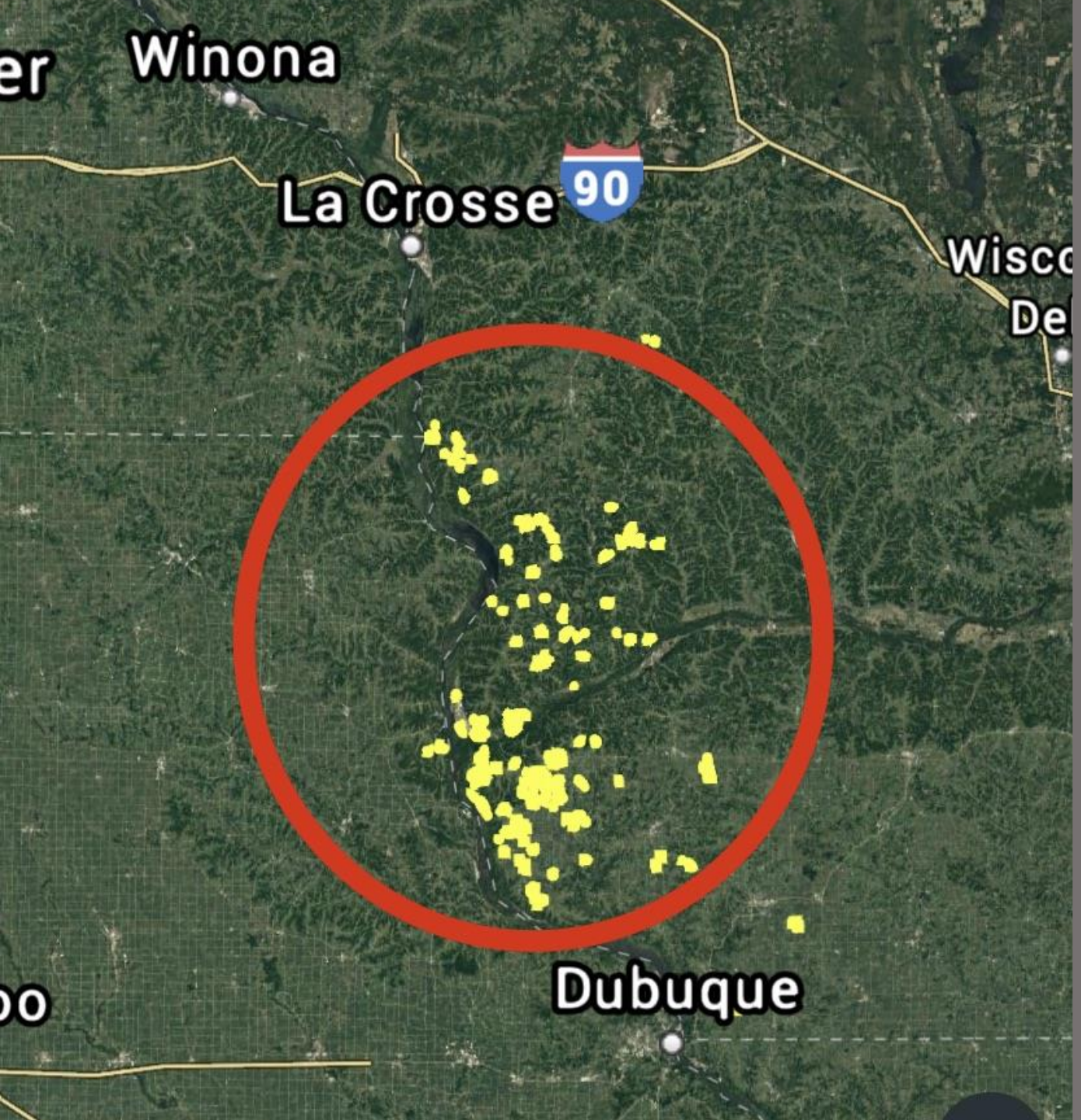
**Adam Kramer, CCA**

2019 IOWA CCA of the Year

2020 INTERNATIONAL CCA of the Year

# INTRODUCTION

- Black Sand Granary: Agronomy-Centered Focus
- Growers United: Demonstration Farms, Network
- Collaboration, Demonstration



Winona
La Crosse
90
Dubuque


Driftless Area Landscape Conservation Initiative
USDA NRCS
Ramsey
St. Croix
Chippewa
Dunn
Marathon
Dakota
Pierce
Pepin
Eau Claire
Clark
Rice
Goodhue
Wabasha
Buffalo
Trempealeau
Jackson
Wood
Portage
Waushara
Dodge
Olmsted
Winona
La Crosse
Monroe
Juneau
Adams
Marquette
Steele
Freeborn
Mower
Fillmore
Houston
MINNESOTA
WISCONSIN
Green Lake
Vernon
Mitchell
Howard
Winneshiek
Allamakee
Richland
Sauk
Columbia
Crawford
IOWA
Floyd
Chickasaw
Iowa
Dane
Fayette
Clayton
Grant
Butler
Bremer
Lafayette
Green
Rock
Initiative Area
Buchanan
Delaware
Dubuque
Jo Daviess
Stephenson
Winnebago
ILLINOIS
Jones
Jackson
Linn
Carroll
Ogle
Clinton
Cedar
Whiteside
Lee
Dataset Sources:

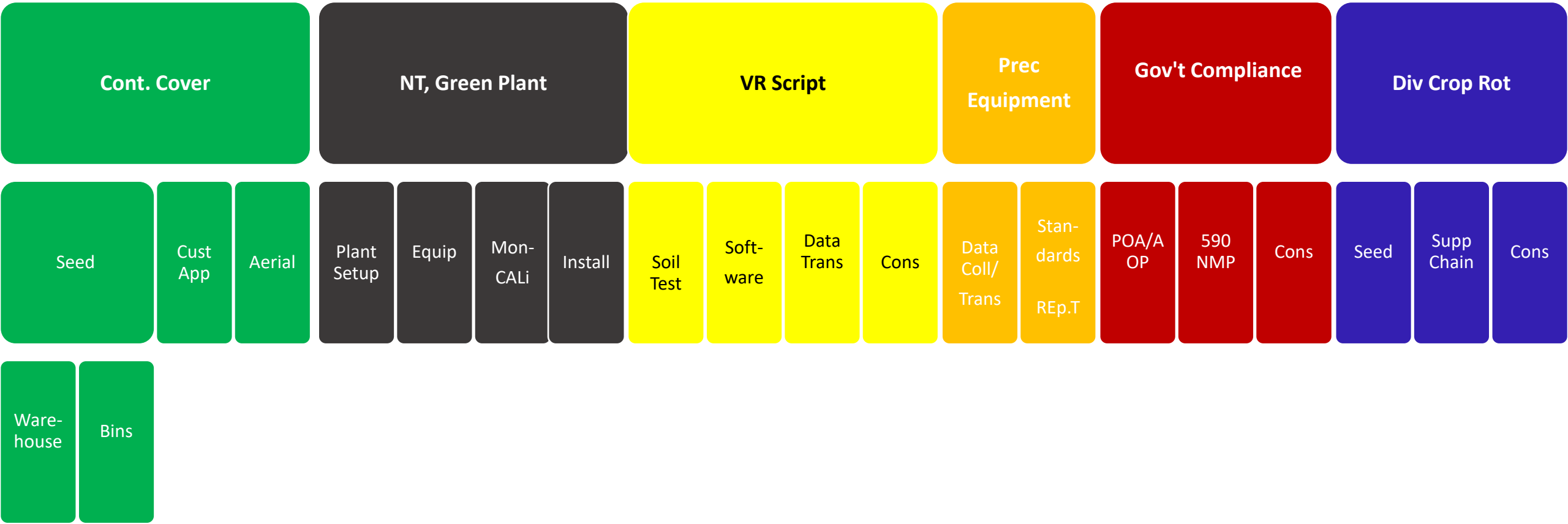
Black Sand Granary
Growers United

Physical Address:
12265 Highway 35/133
Prairie du Chien, WI 53821

Mailing Address:
PO Box 15
Patch Grove, WI 53817

# Soil Health

# Water Quality



# Driftless Area

- Largest Resource Concern = Water Erosion
  - Hypoxia Zone
- Caused By:
  - Freshwater discharge and nutrient loading
  - Mississippi River drains approx. 41% of the US land
  - Marked increase in Nitrogen/Phosphorus
    - Non-Point source pollution
    - Phosphorus…HOW?

# Upland Water Erosion

- Decrease Tillage
- More perennial vegetation on the landscape
- Cover Cropping annually following row crops
- Adding small grains into rotation

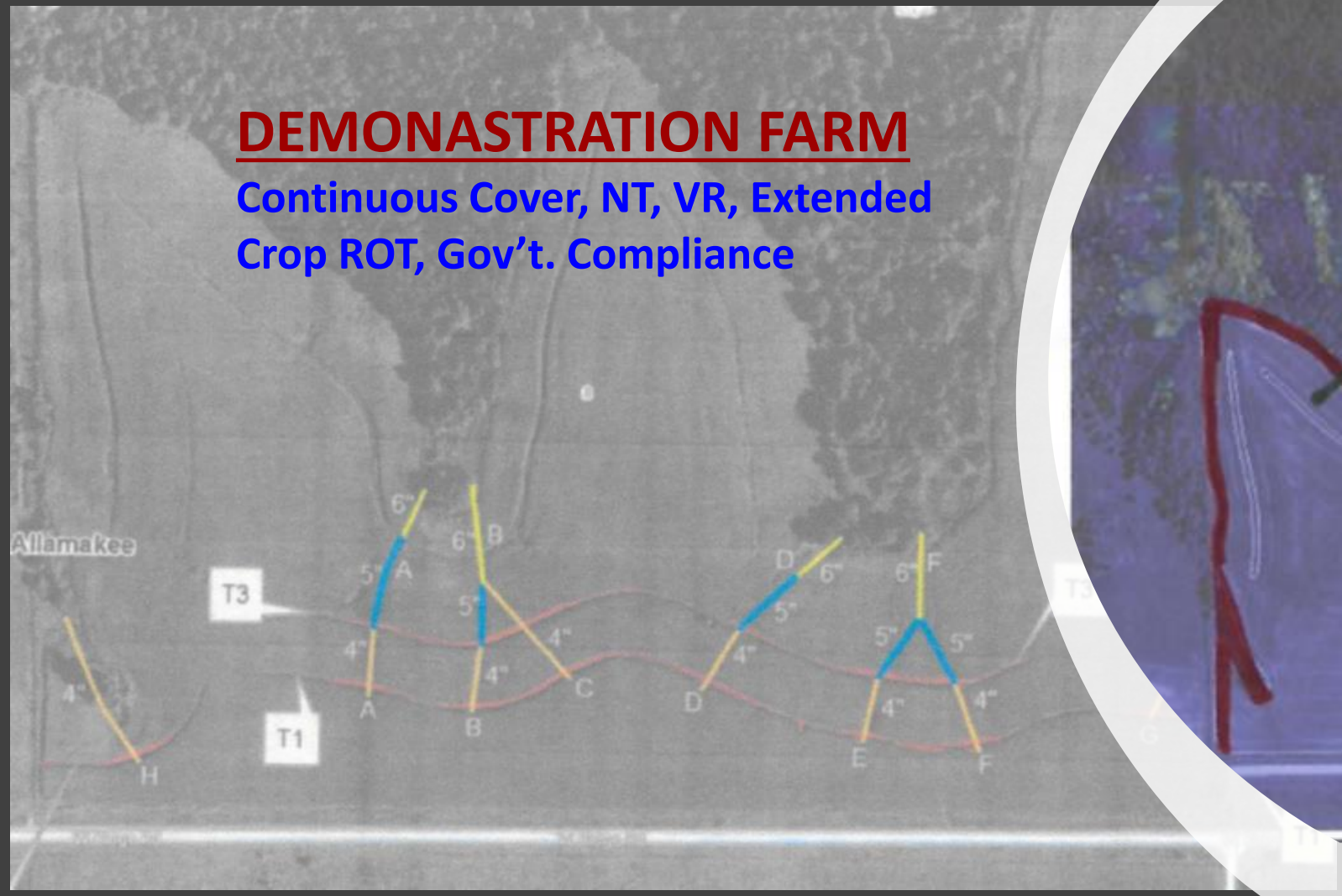
# Challenges in the Driftless Area

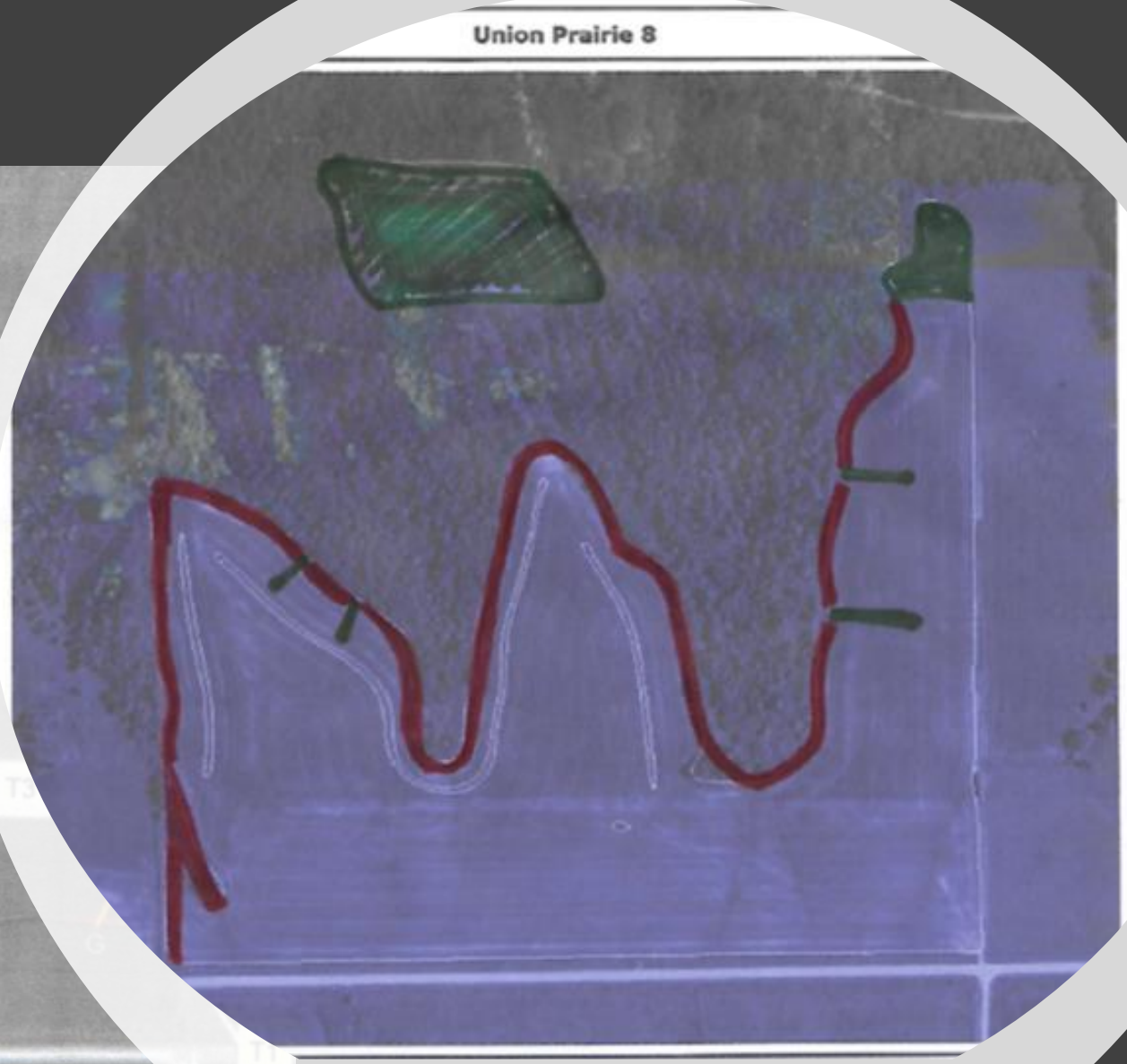
- No-TILL: mind over matter
- Perennial Vegetation: where/how
- Cover Cropping: expensive, extra management, GDUs
- Small Grains: access to markets, basis/quality, straw

# Union Prairie 8

**DEMONASTRATION FARM**

**Continuous Cover, NT, VR, Extended Crop ROT, Gov't. Compliance**



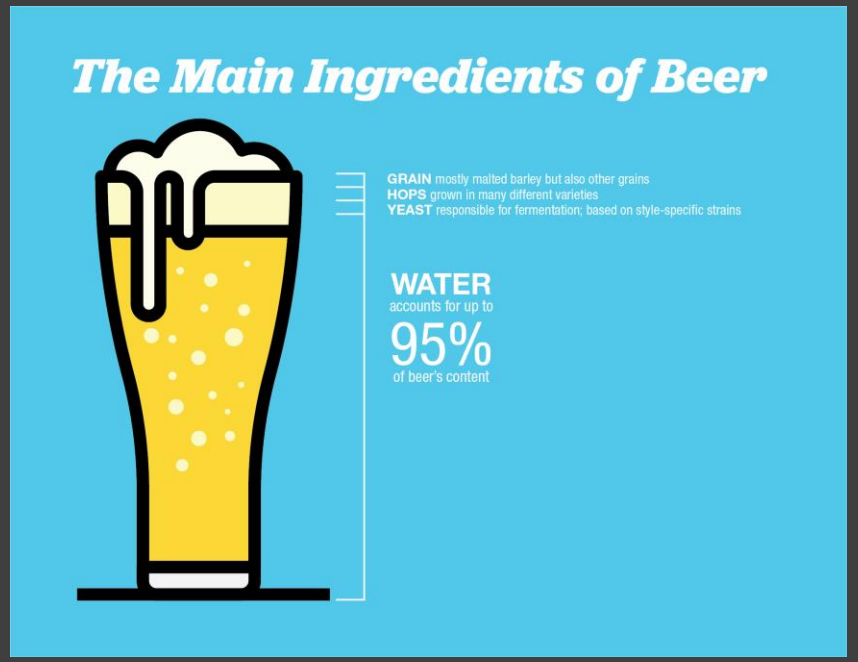
# Why small grains up NORTH?

- PABST founded in 1844 for by Jacob Best [aka Empire]
  - Named after Frederick Pabst in 1889
  - In 1895 Pabst produced 100,000 barrels of beer [#1]
  - In 1895 Schlitz produced 75,000 barrels of beer [#3]


Is this Heaven? No, it's Wisconsin.

# Filtered WATER

Galena+Ohio Limestone Formations
= Natural Filtration

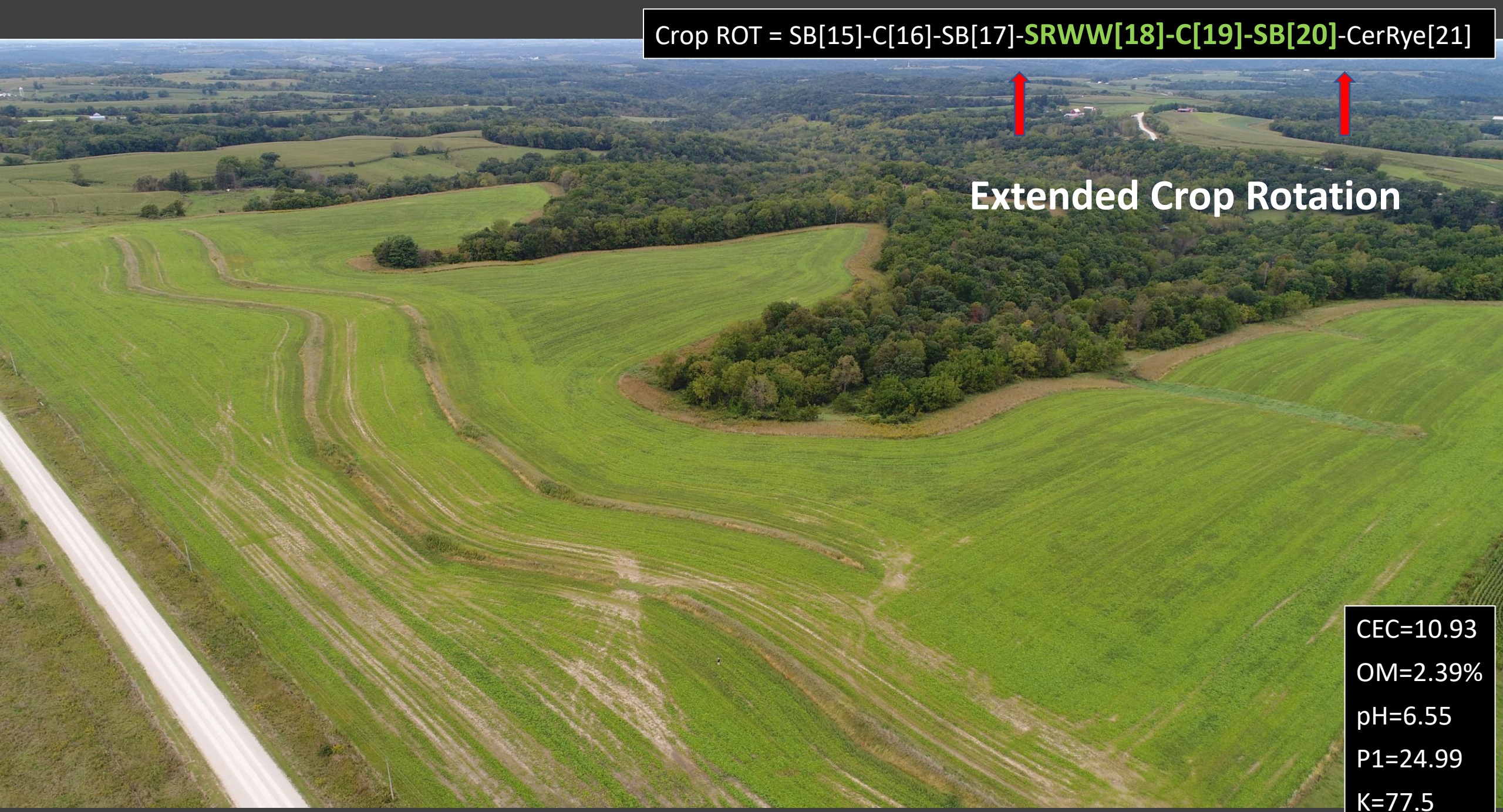



# Access to Raw Materials

- 1 bushel of barley = 1 barrel of beer
- 1895 – average yield was 22 bushels/acre [2017 = 61.7 bushels/acre]
- 77,000 acres of barley to meet production
- FACT = in 2015 only 15,000 acres were planted to barley in Wisconsin
- What about WHEAT in Southwest WI?
  - 1858: Victory, WI traded 100,000 bushels of wheat
  - 2017: ALL of Vernon County grew 43,000 bushels of wheat

# Why NOT Small Grains?

- Old way vs New Tech
- GENETICS
- Access to Markets
- Quality vs Quantity
- MINDSET


Crop ROT = SB[15]-C[16]-SB[17]-SRWW[18]-C[19]-SB[20]-CerRye[21]
Extended Crop Rotation
CEC=10.93
OM=2.39%
pH=6.55
P1=24.99
K=77.5

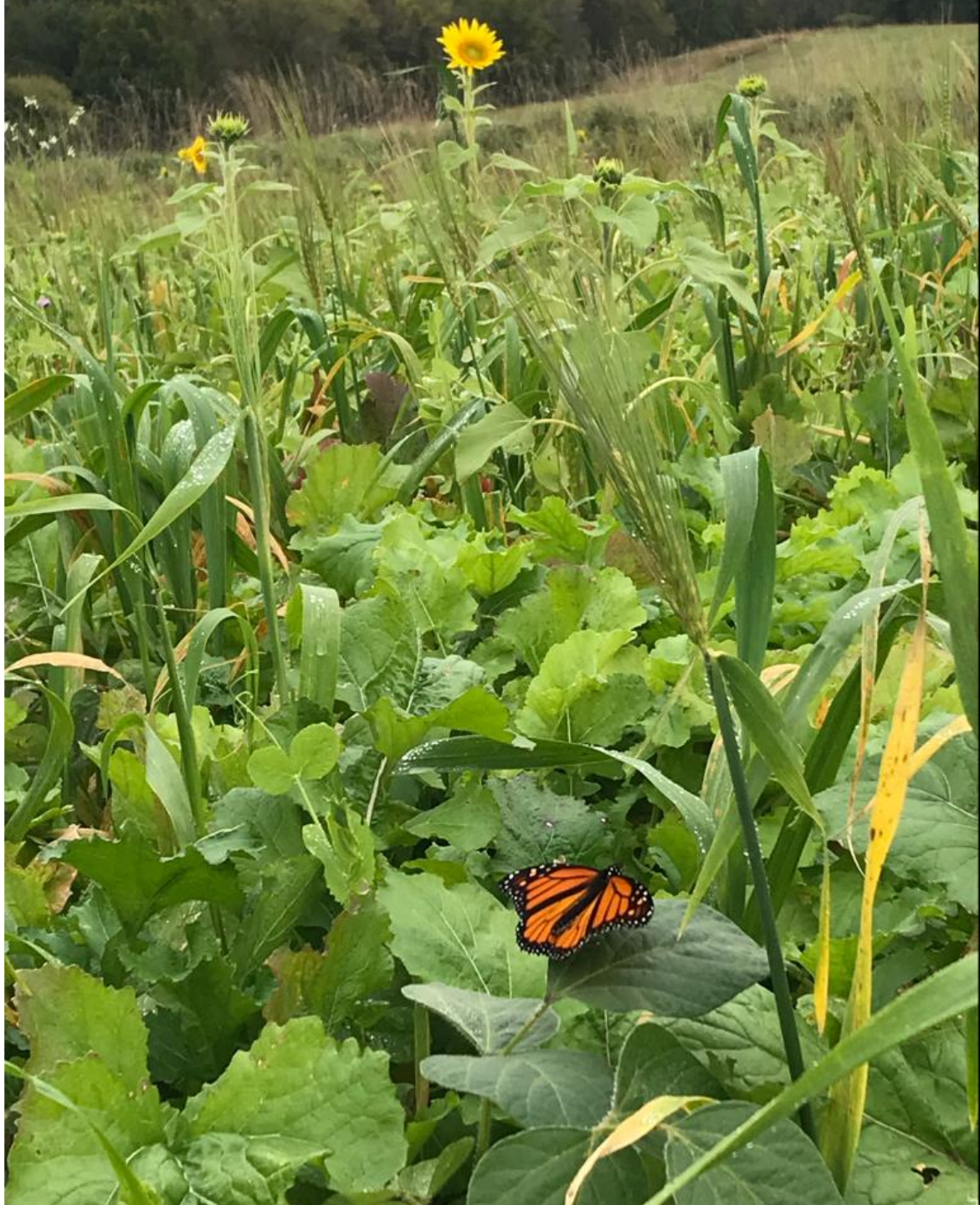
# SRWW Cropping Plan

1. **Fert [FALL]:  VRT MAP, VRT Pell Lime**
2. **Planting: 1.9m seeds/acre OCT1**
3. **Fert [SPRING]: 80lb N2 w/ ESN + 20lb w/ Urea + 150lb Pell Gypsum BLENDED, VRT Potash**
4. **Chem Pass 1 [Apr 25]: Huskie @ 15 fl oz/a + Palisade @ 12 fl oz/a**
5. Chem Pass 2 [May 15]: Trivapro @ 13.7 fl oz/a + *Takeoff Phite @ 32 fl oz/a
6. **Chem Pass 3 [June 10]: Prosaro @ 6.5 fl oz/a + *TakeOff Phite @ 32 fl oz/a**

*TakeOff Phite MZ (3-20-7+Mn+Zn)

**BIG GROWING WINDOW = BIG COVER CROP**


SOIL
USDA
NRCS



# Biomass

| Seeded 7/27/18 | | | | |
|---|---|---|---|---|
| sampled 10/2/18 | 1 | 2 | 3 | **Plot Avg** |
| dry biomass (g)/.96 ft^2 | 15.1 | 16.3 | 46.1 | 5.8 |
| dry biomass (g)/1 ft2 | 15.7 | 17.0 | 48.0 | 26.9 |
| dry biomass (lbs/ac) | 1510.37 | 1629.1 | 4603.56 | **2580.9** |

Wisconsin Pest Bulletin 17, August 17, 2019

# Ryleage, Feeding, Grazing

- What is a CASH crop?
- Make it WHEN?
- Making both…
- Overgrazing



# Planting Green


5/15/19

5/28/19

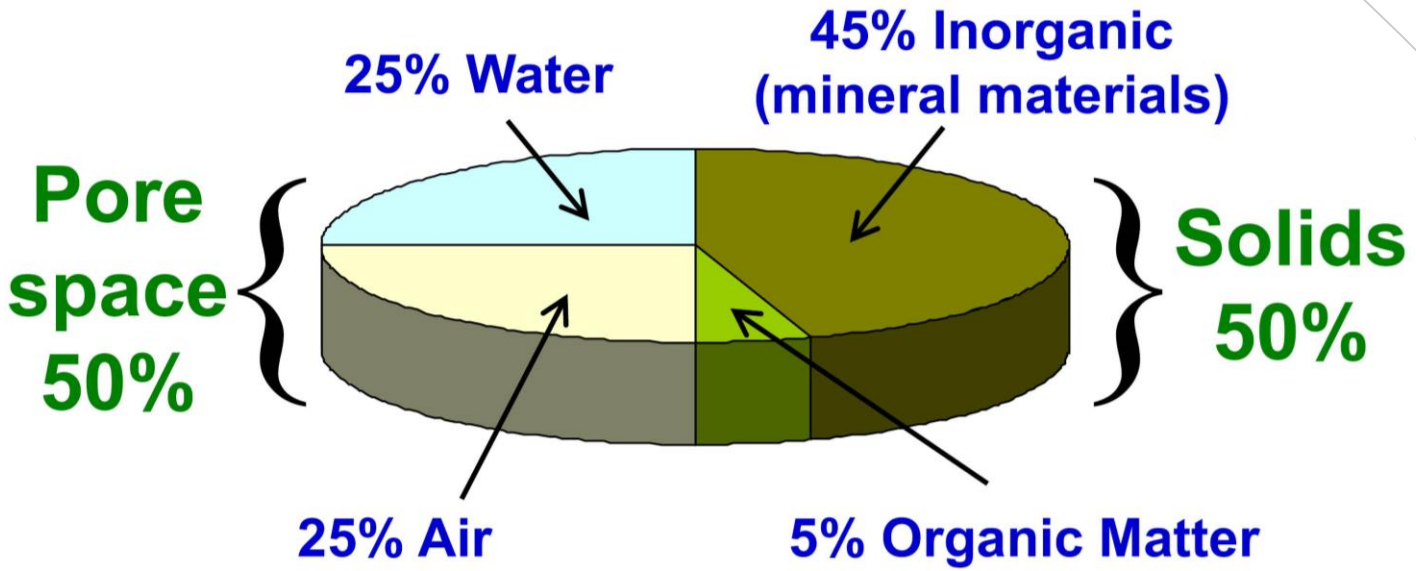

6/20/19


9/20/19


10/13/19

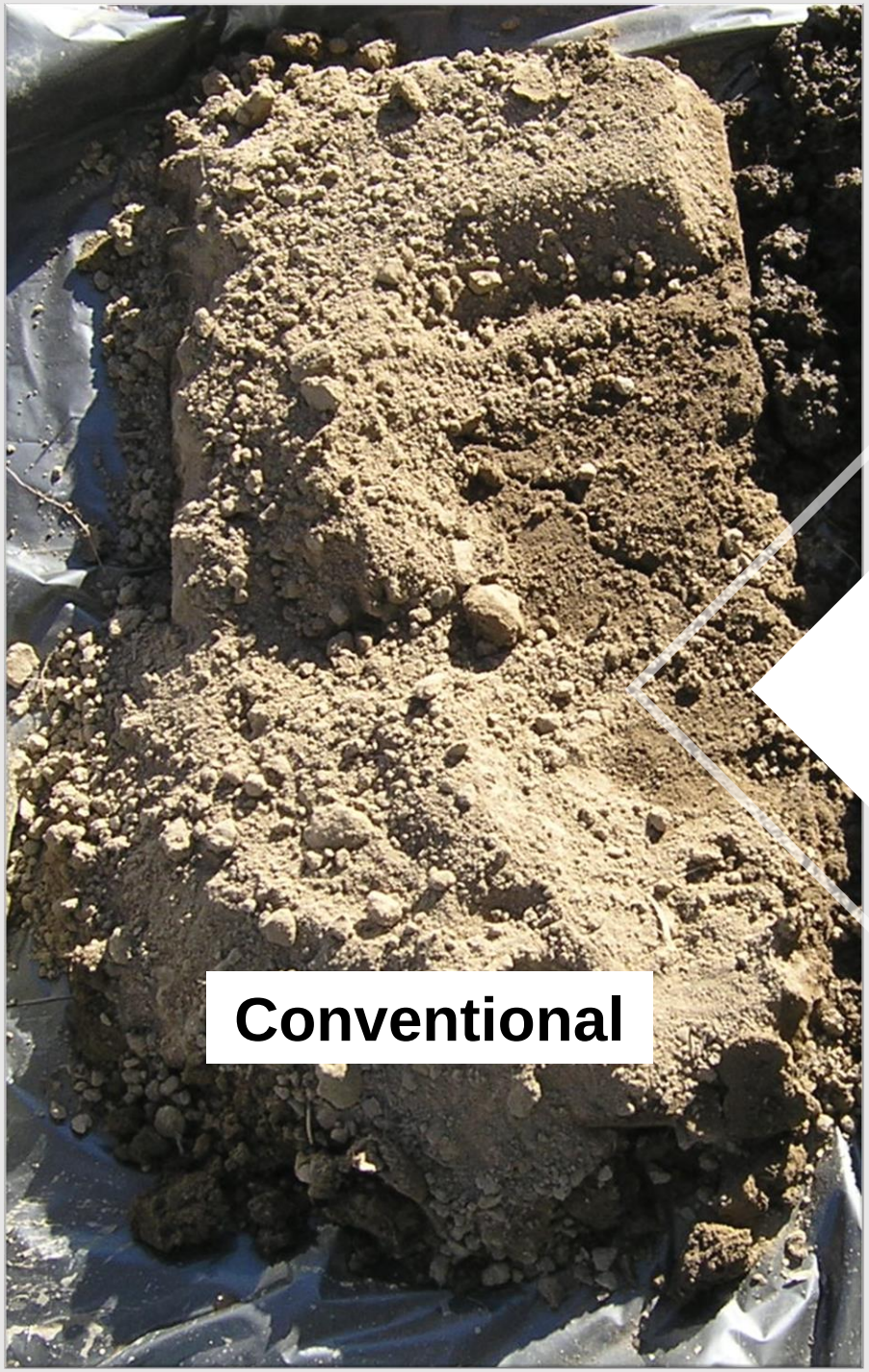

4/28/2020

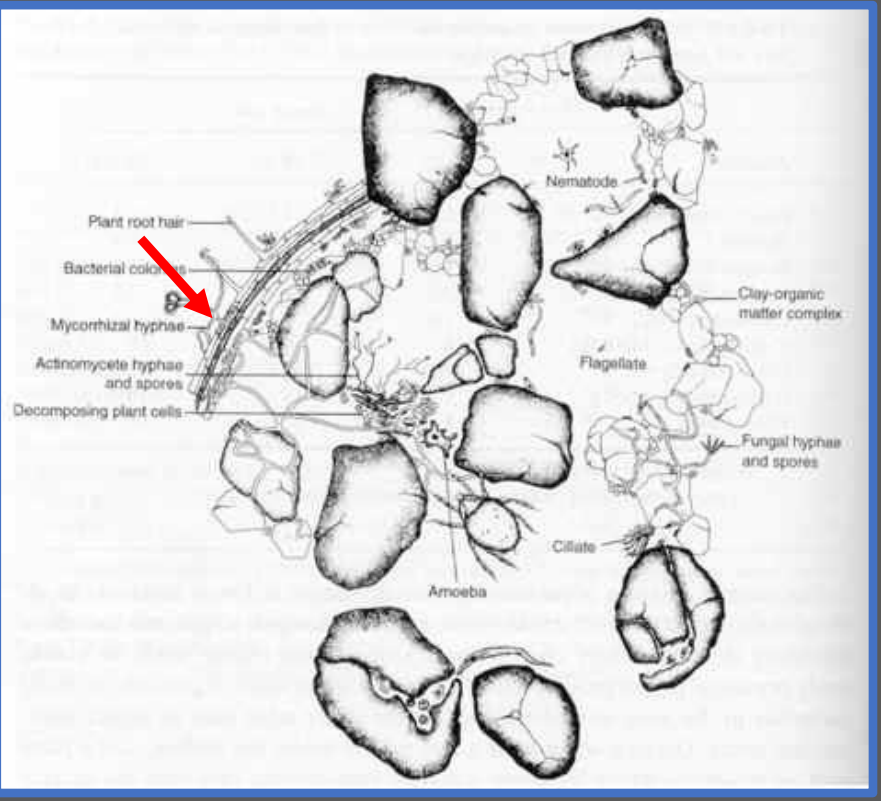

6/11/2020

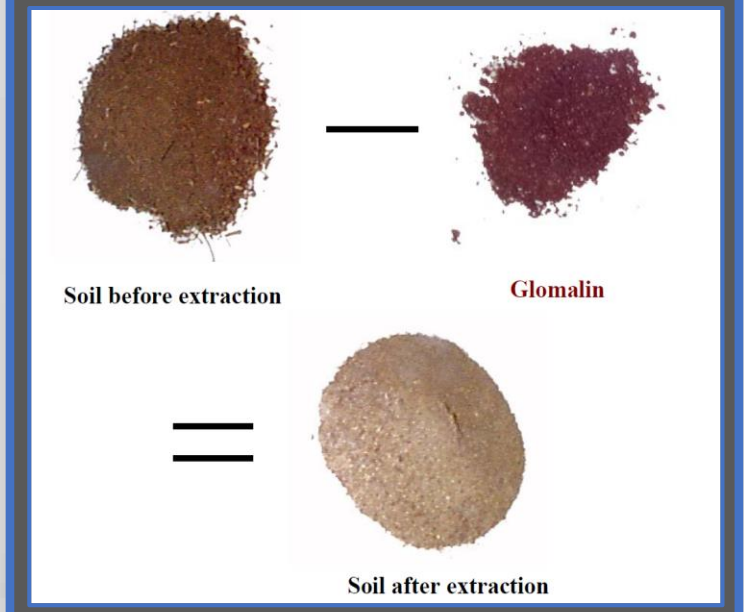


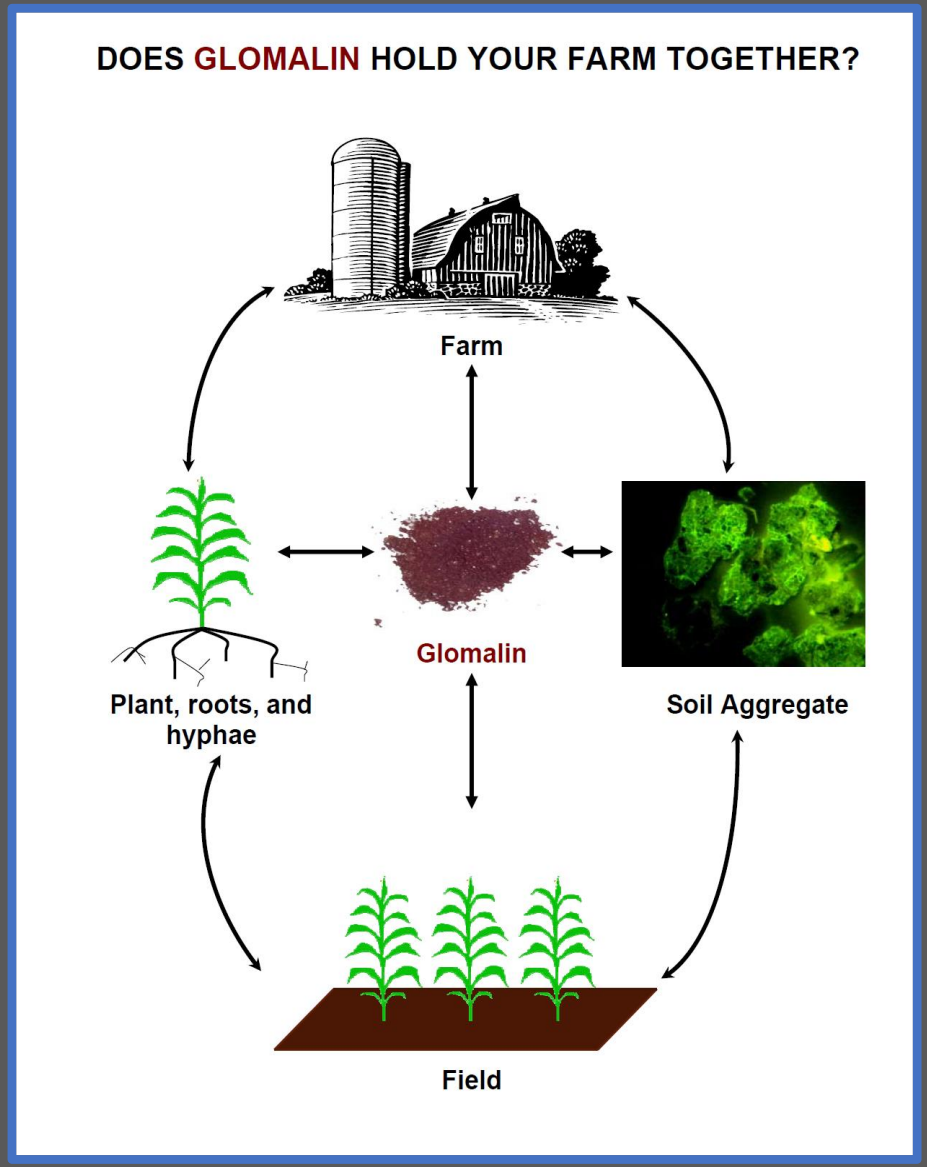

# Ideal Soil Composition

# Water Infiltration



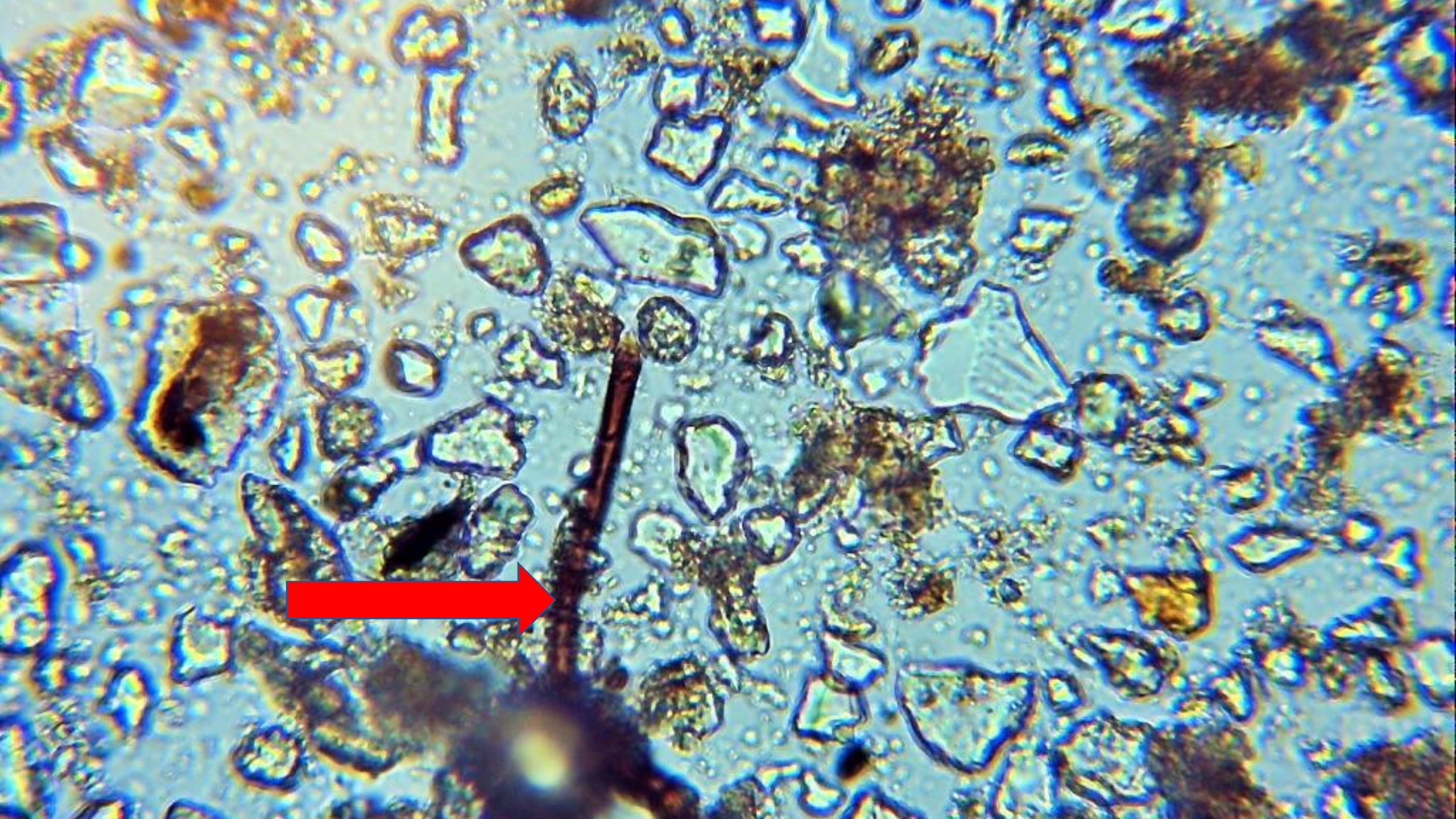




**Glomalin** (Fig. 2) was identified at USDA in the early 1990's on hyphae (hair-like projections) of **arbuscular mycorrhizal fungi (AMF)**. These fungi are ancient microorganisms that evolved with plants to aid in acquiring nutrients, especially immobile nutrients like phosphorus (P). Most plants (about 70 to 80% of the vascular plants) are mycorrhizal. Some nonmycorrhizal plants are canola, cabbage, broccoli and cauliflower.

Source: USDA

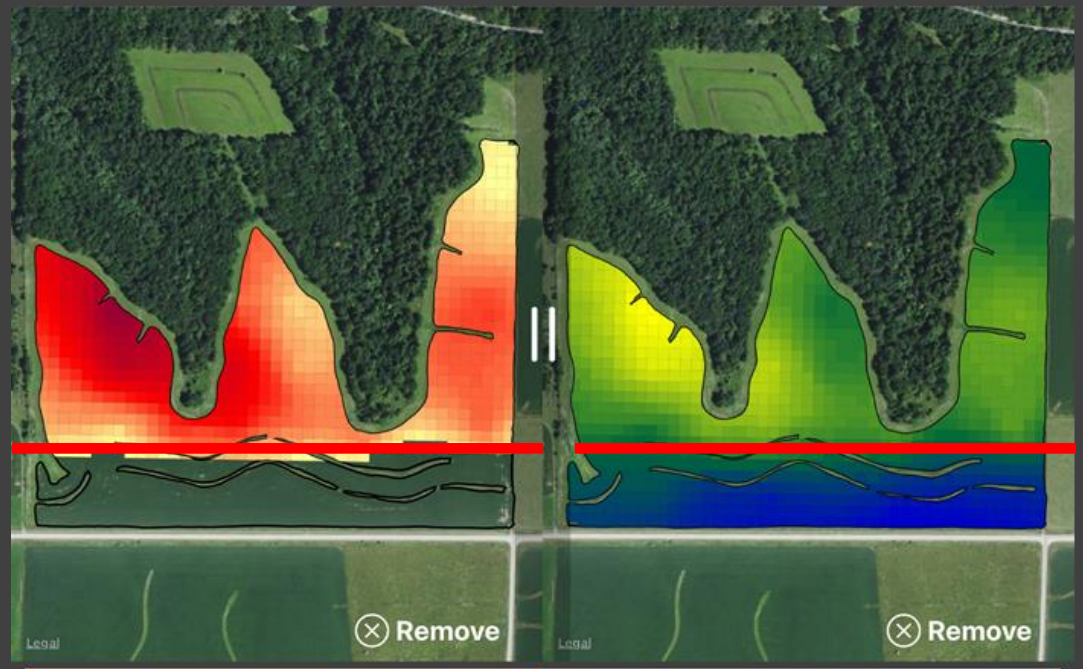



UP 8
52
53
54
55
56
39
40
46
47
38
41
45
48
37
42
43
44
49
50
51
36
35
34
33
32
31
30
29
Compare


GPS Soil Testing – Replicated Data

U.S. Cellular 12:40 PM 67%

Back Options

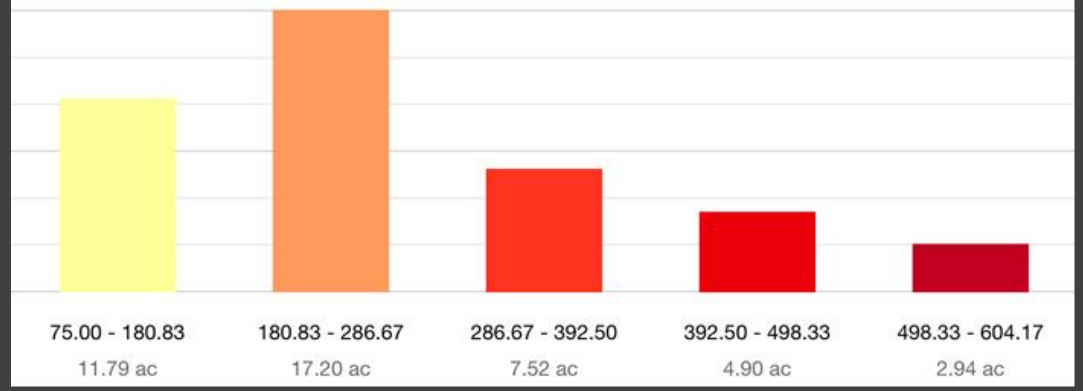



2016: Pell Lime [2xS] nCAP | 2016 Soil Fertility - pH Surface

More **SuperCal 98G** Edit Legend

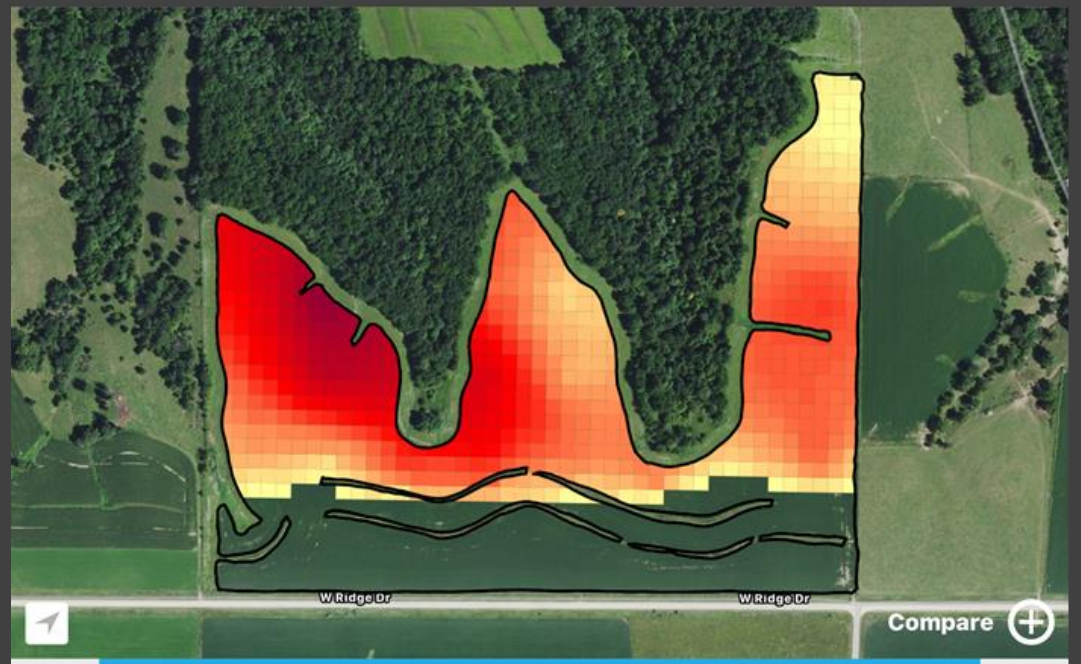
Pell Lime [2xS] nCAP
Min: 75 Max: 710 Avg: 286.89 lb/ac
Total: 13010.6 lb

Covered Area: 45.84 ac
Effective Date: 11/21/16




U.S. Cellular 12:26 PM 70%

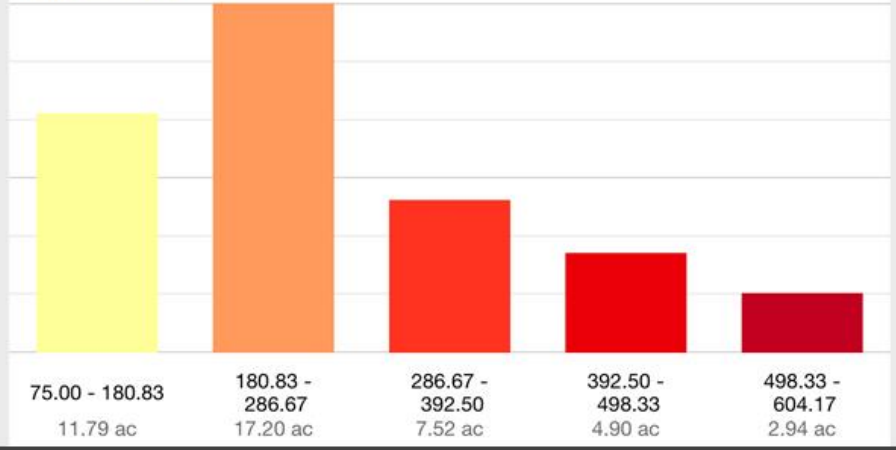
UP 8 - 66.75 Acres Options




More **SuperCal 98G** Edit Legend

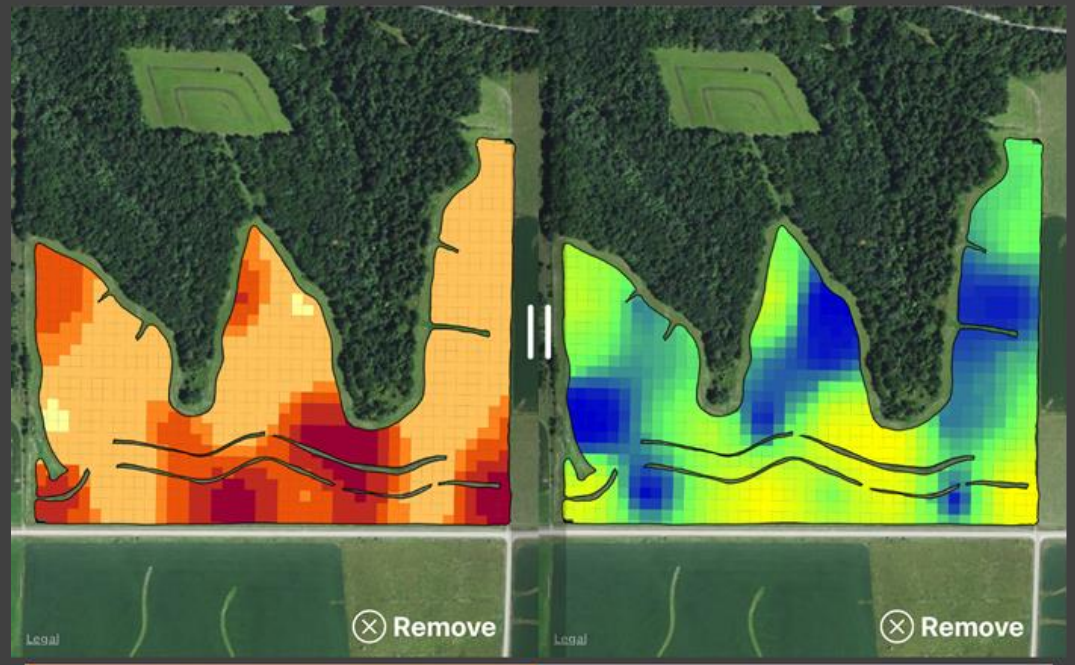
Pell Lime [2xS] nCAP
Min: 75 Max: 710 Avg: 286.89 lb/ac
Total: 13010.6 lb

Covered Area: 45.84 ac
Effective Date: 11/21/16



U.S. Cellular 12:43 PM 66%

Back Options

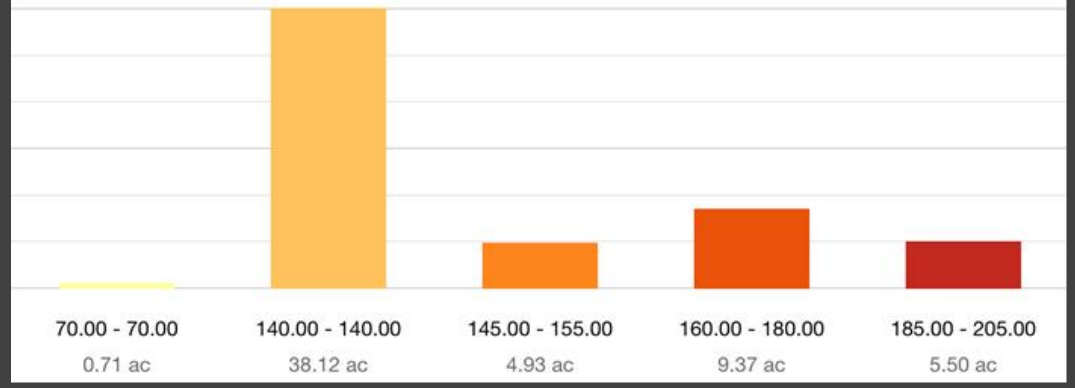



2016: MAP_1.25 Build_25ppm nCAP | 2016 Soil Fertility - P Surface

More **11-52-0 MAP** Edit Legend

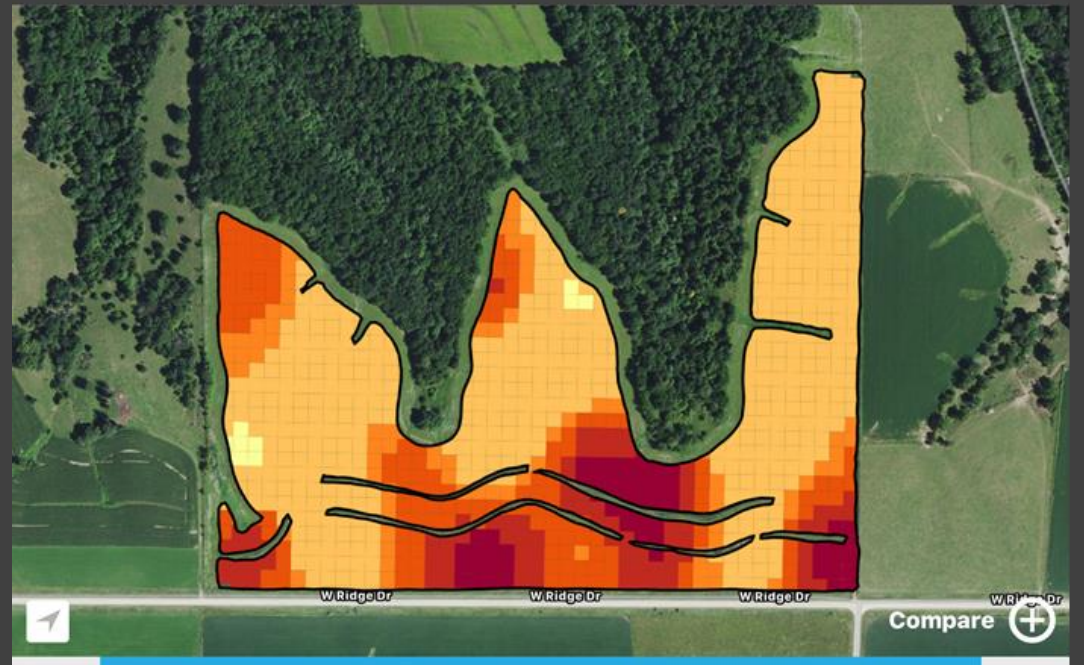
MAP_1.25 Build_25ppm nCAP
Min: 70 Max: 250 Avg: 155.79 lb/ac
Total: 10353.26 lb

Covered Area: 66.71 ac
Effective Date: 11/21/16




U.S. Cellular 12:43 PM 66%

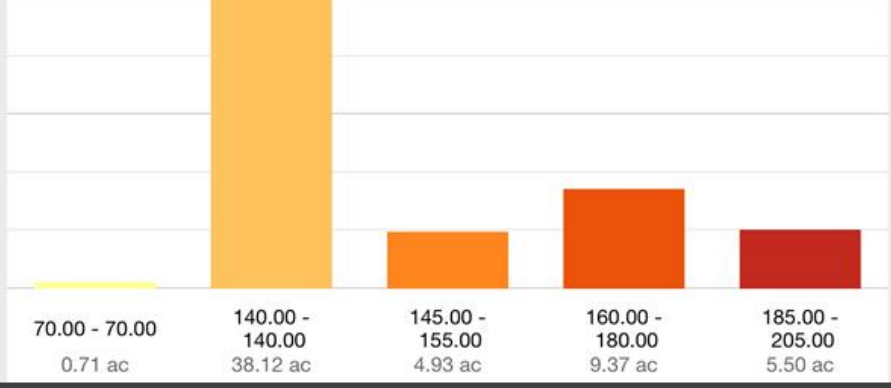
UP 8 - 66.75 Acres Options




More **11-52-0 MAP** Edit Legend

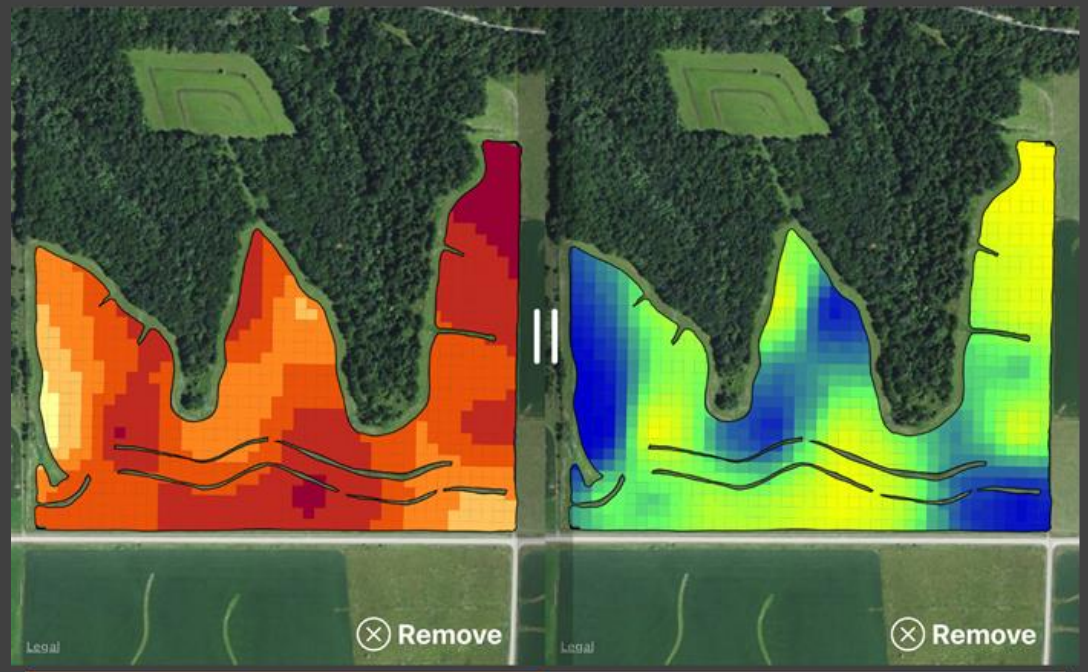
MAP_1.25 Build_25ppm nCAP
Min: 70 Max: 250 Avg: 155.79 lb/ac
Total: 10353.26 lb

Covered Area: 66.71 ac
Effective Date: 11/21/16



U.S. Cellular 1:10 PM 62%

Back Options

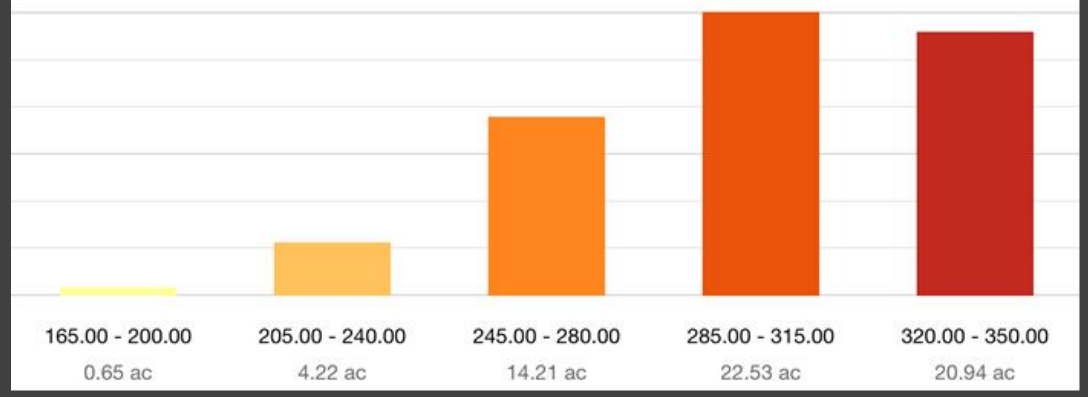



2016: POT_1.25 Build_150ppm nCAP | 2016 Soil Fertility - K Surface

More **0-0-60** Edit Legend

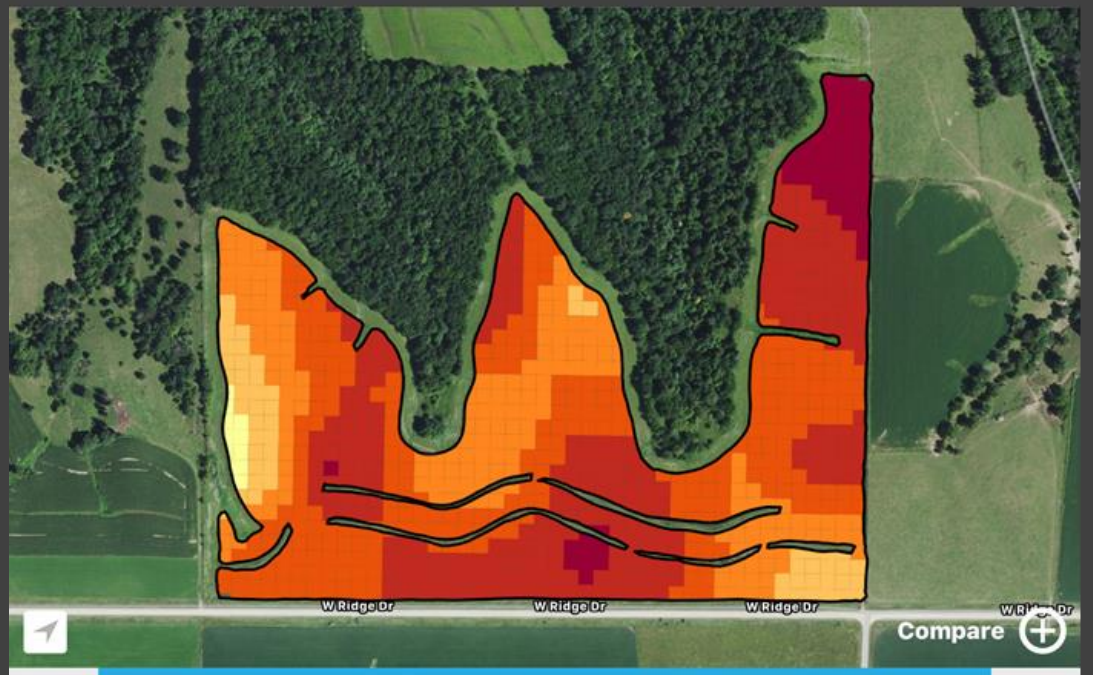
POT_1.25 Build_150ppm nCAP
Min: 165 Max: 385 Avg: 301.51 lb/ac
Total: 20155.1 lb

Covered Area: 66.71 ac
Effective Date: 11/21/16




U.S. Cellular 1:11 PM 62%

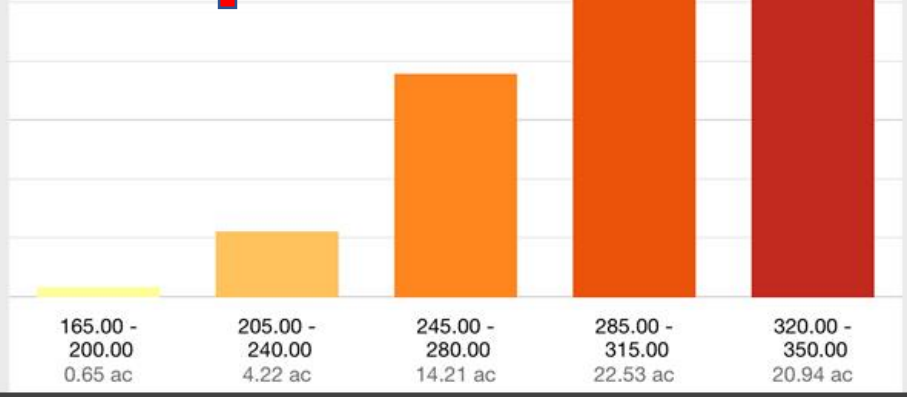
UP 8 - 66.75 Acres Options



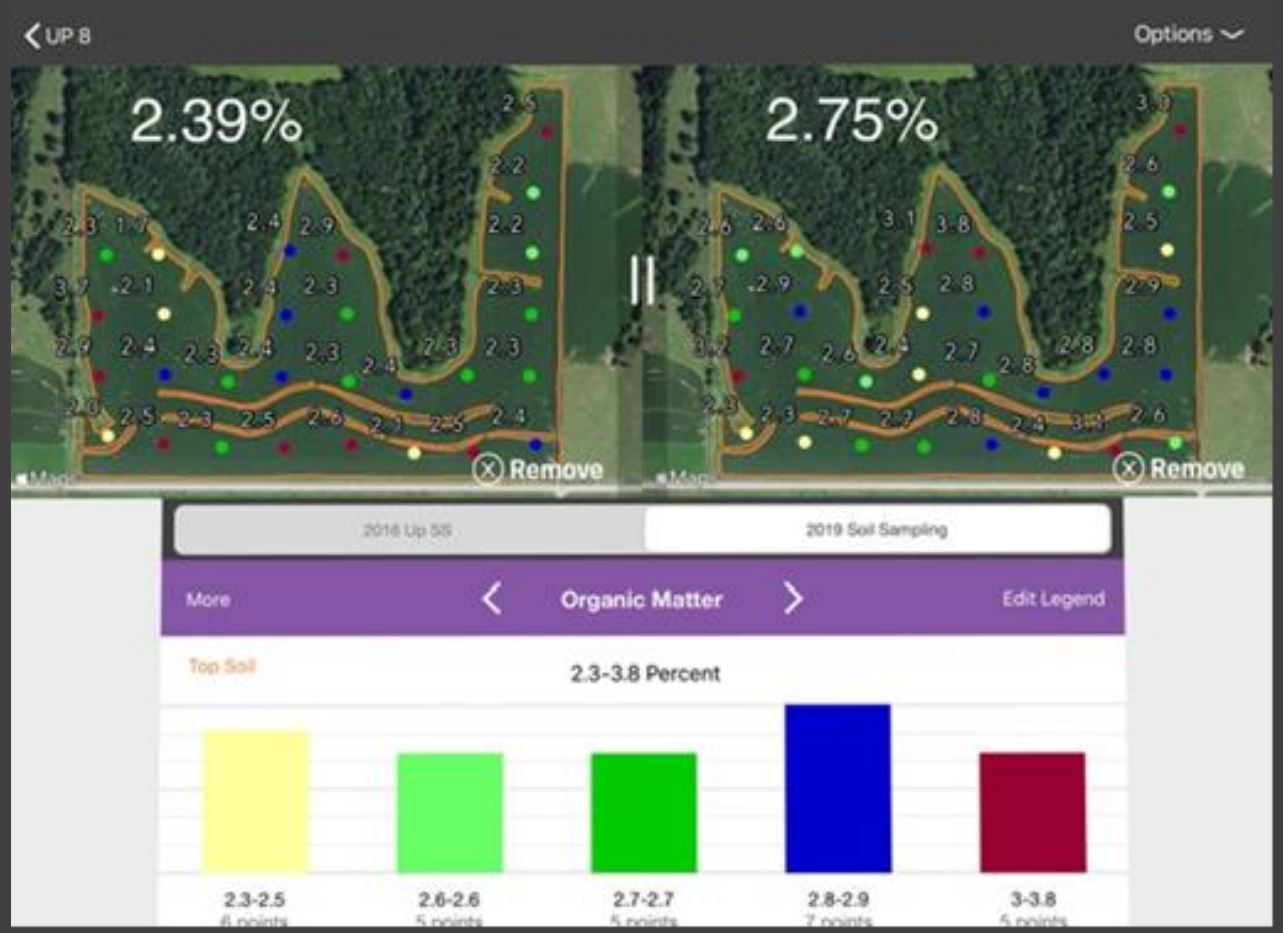

More **0-0-60** Edit Legend

POT_1.25 Build_150ppm nCAP
Min: 165 Max: 385 Avg: 301.51 lb/ac
Total: 20155.1 lb

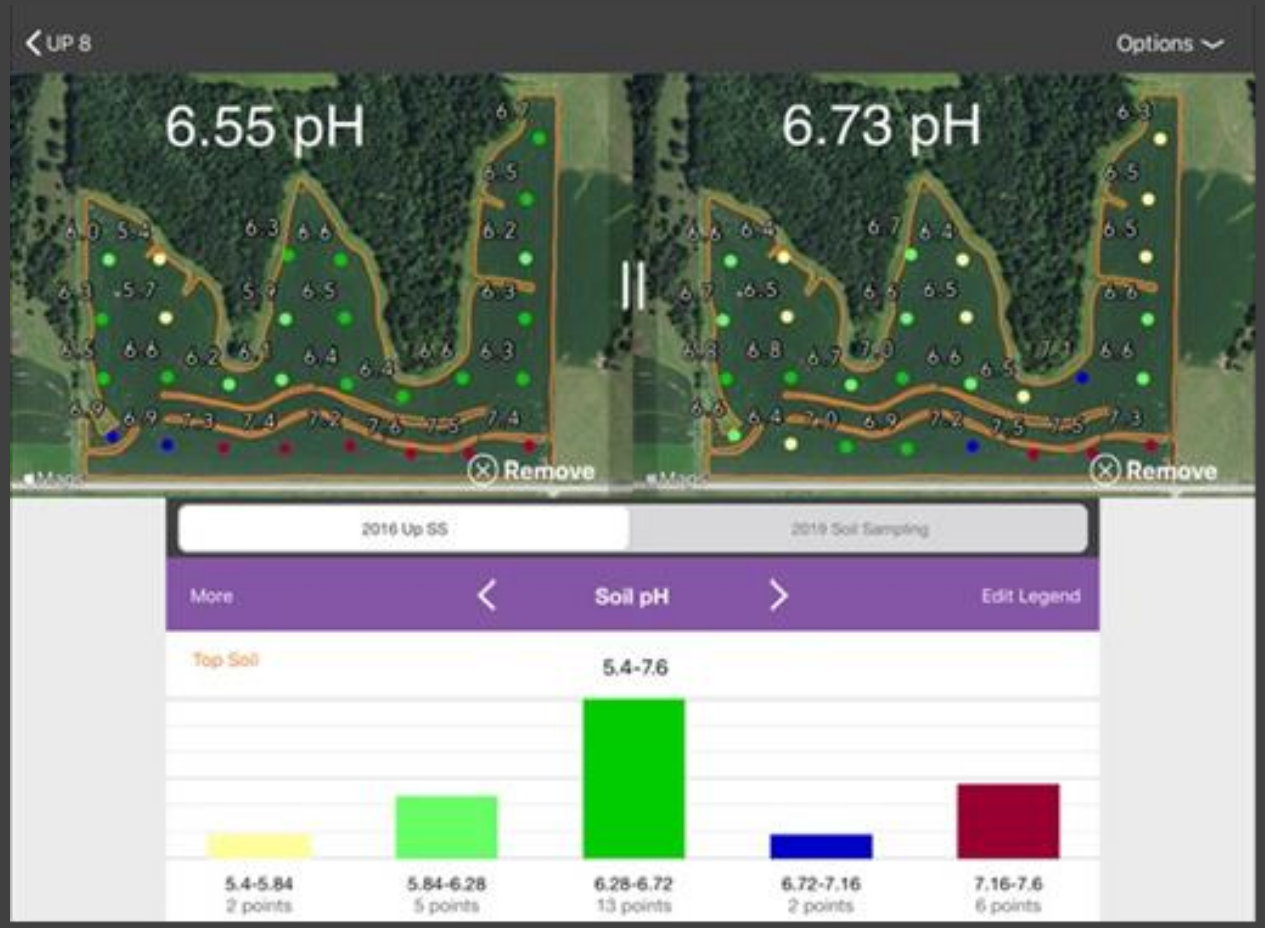
Covered Area: 66.71 ac
Effective Date: 11/21/16

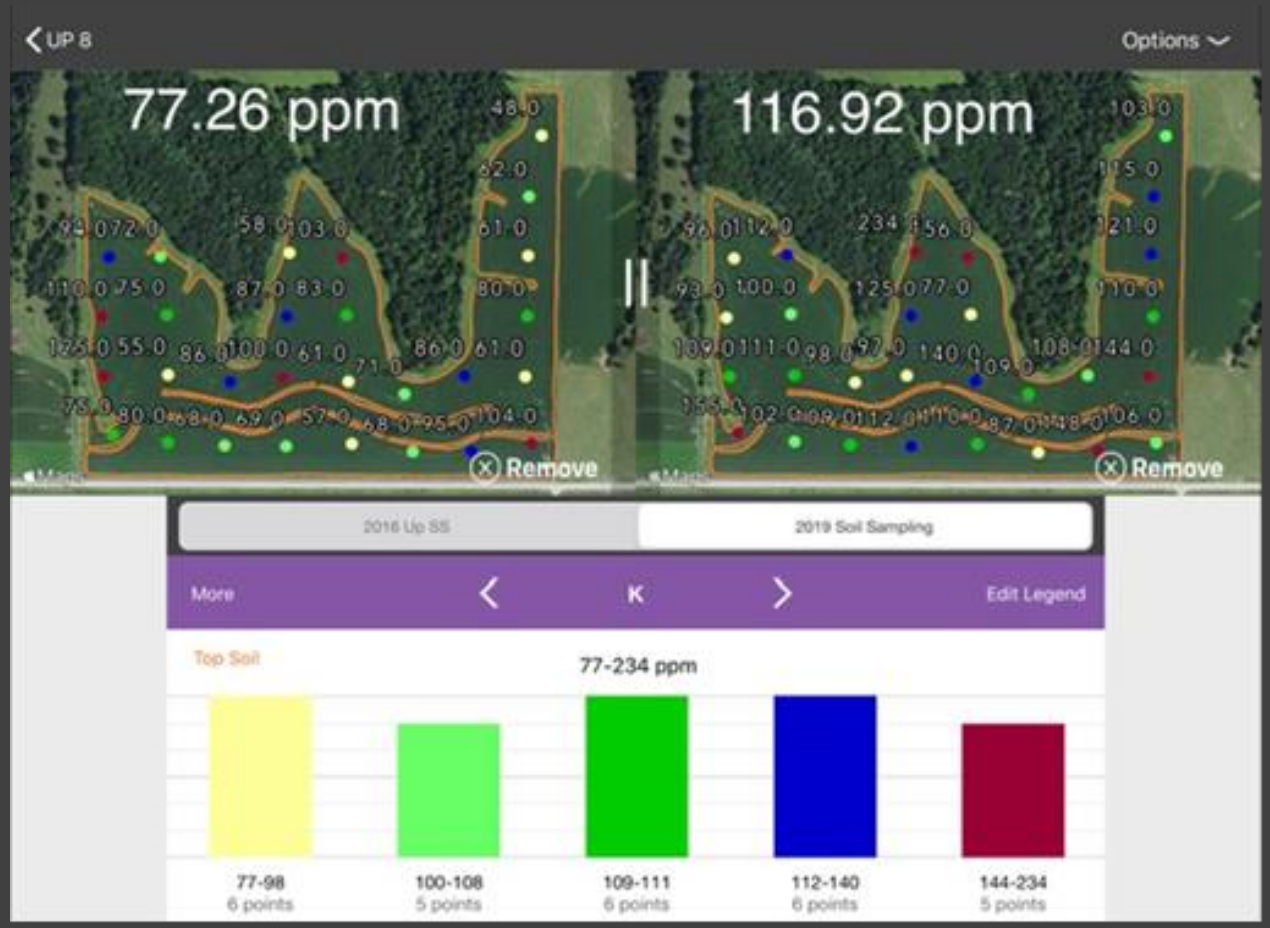


# Soil Test Results 2016 - 2019

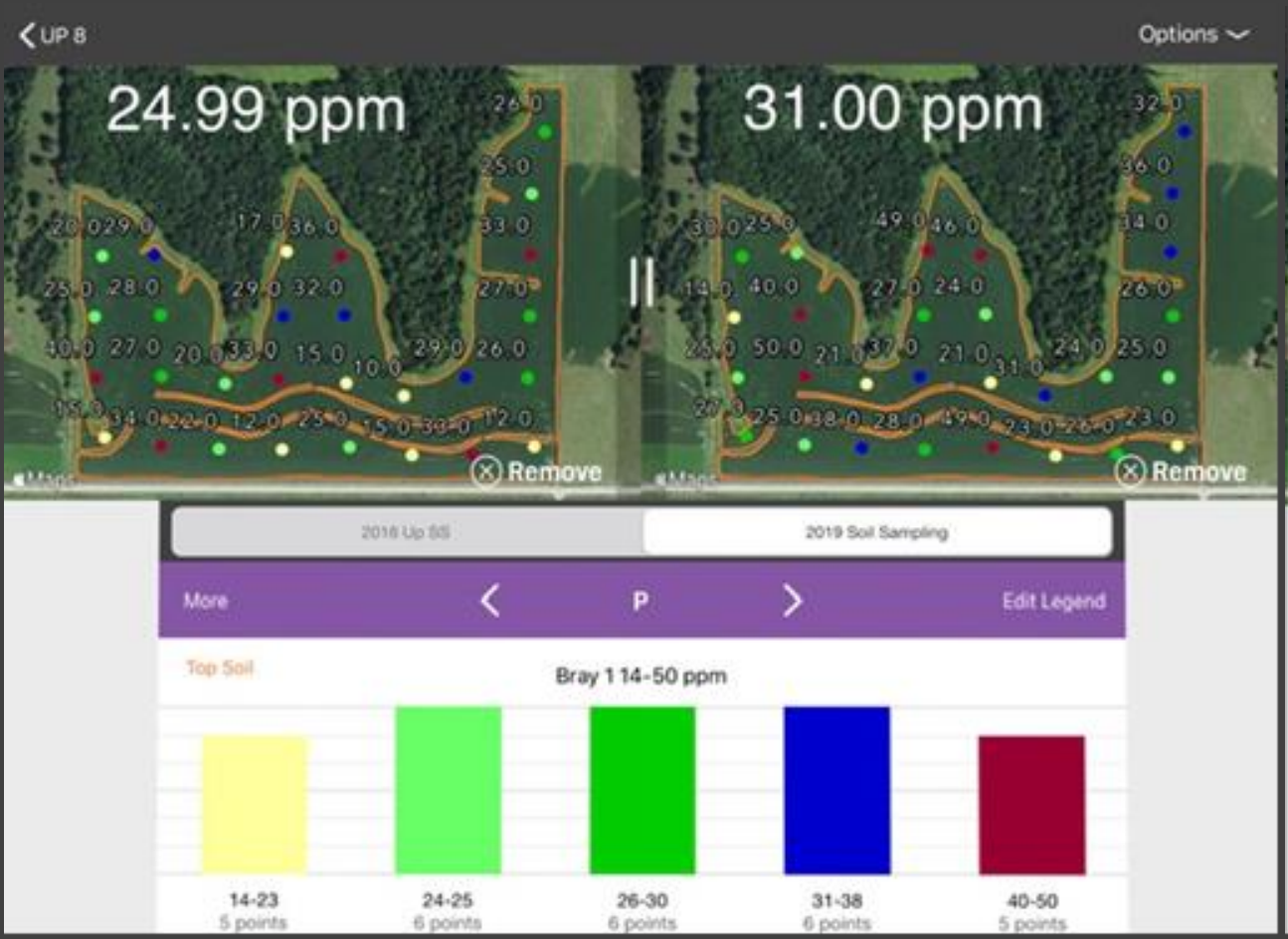



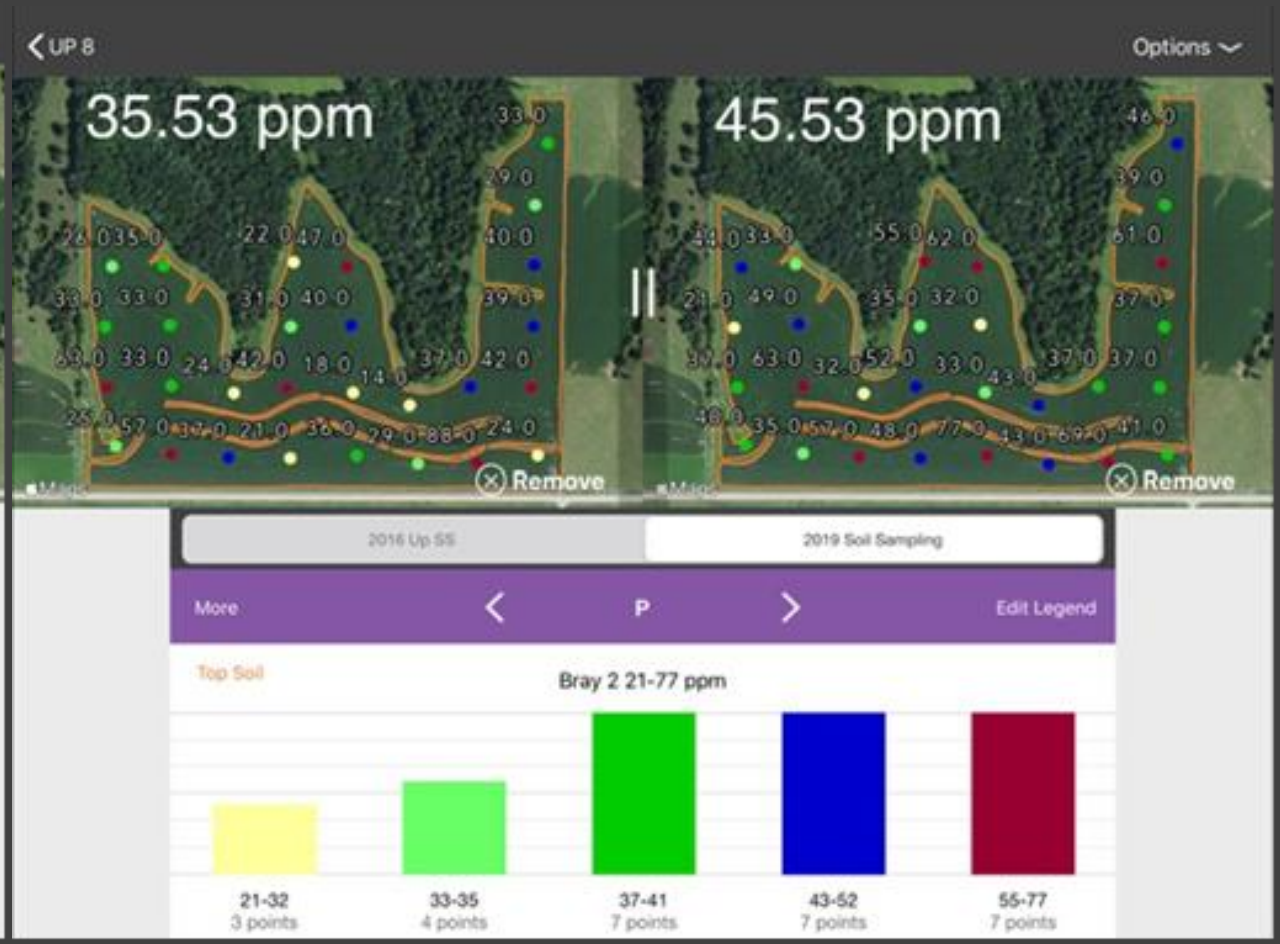
# Soil Test Results 2016 - 2019



# Soil Test Results 2016 - 2019




# YIELD RESULTS

2015: 48 bu/acre SB

| YIELD | PRICE | BREAK-EVEN |
|---|---|---|
| 48 | $11.60 | $557 |

2016: 178 bu/acre CORN

2017: 54 bu/acre SB

| YIELD | PRICE | BREAK-EVEN |
|---|---|---|
| 54 | $10.47 | $565 |

2018: 99 bu/acre SRWW

2019: 204 bu/acre CORN

2020: 65 bu/acre SB

| YIELD | PRICE | BREAK-EVEN |
|---|---|---|
| 65.6 | $7.68 | $504 |

# Yes, AND?

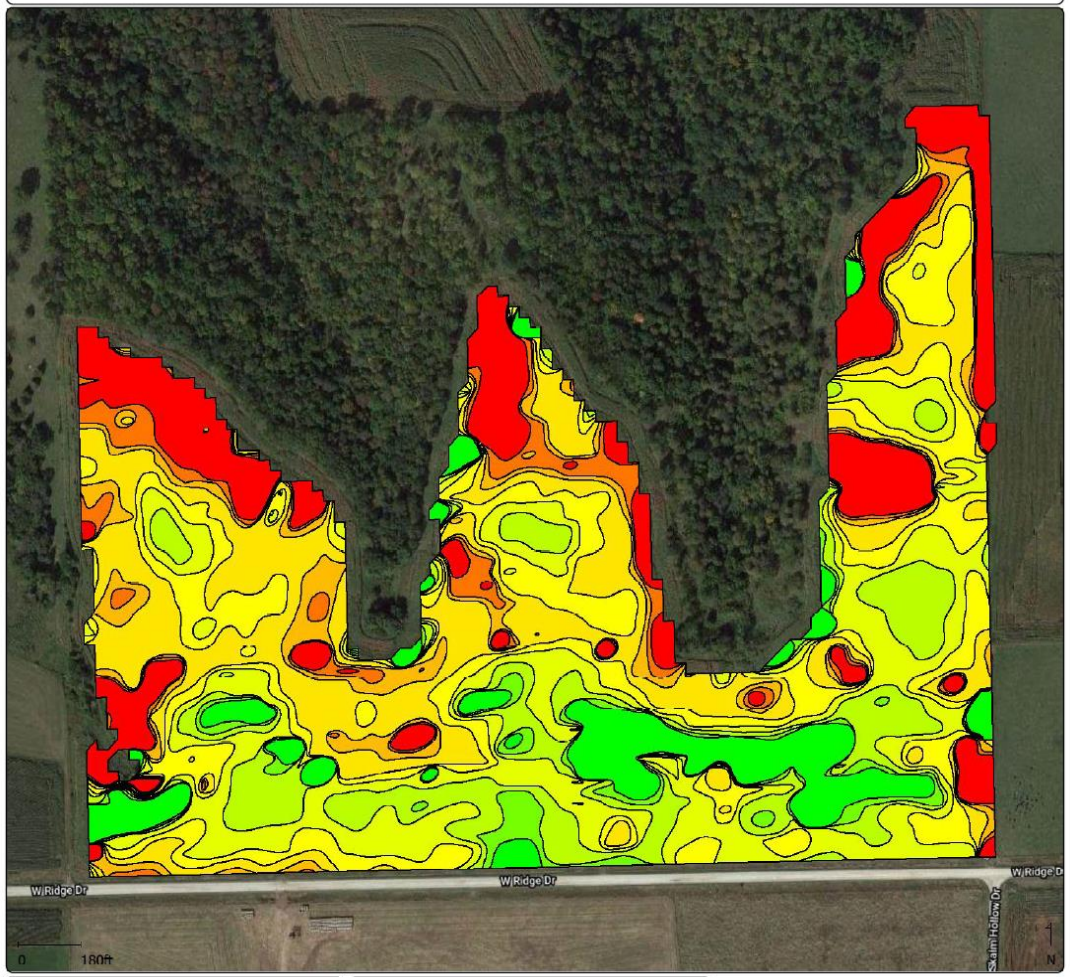
## Profitability Measure for Soybean

| | SEED | CHEMICAL | FERTILIZER | NITROGEN | EQUIPMENT | REP/UTI/MISC | TAXES/INS. | LAND |
|---|---|---|---|---|---|---|---|---|
| | $50 | $45 | $119 | $0 | $85 | $5 | $20 | $180 |
| | TOTAL | | | | | | | |
| | $504 | | | | | | | |

| | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 |
|---|---|---|---|---|---|---|---|---|
| $6.75 | ($267.75) | ($234.00) | ($200.25) | ($166.50) | ($132.75) | ($99.00) | ($65.25) | ($31.50) |
| $7.00 | ($259.00) | ($224.00) | ($189.00) | ($154.00) | ($119.00) | ($84.00) | ($49.00) | ($14.00) |
| $7.25 | ($250.25) | ($214.00) | ($177.75) | ($141.50) | ($105.25) | ($69.00) | ($32.75) | $3.50 |
| $7.50 | ($241.50) | ($204.00) | ($166.50) | ($129.00) | ($91.50) | ($54.00) | ($16.50) | $21.00 |
| $7.75 | ($232.75) | ($194.00) | ($155.25) | ($116.50) | ($77.75) | ($39.00) | ($0.25) | $38.50 |
| $8.00 | ($224.00) | ($184.00) | ($144.00) | ($104.00) | ($64.00) | ($24.00) | $16.00 | $56.00 |
| $8.25 | ($215.25) | ($174.00) | ($132.75) | ($91.50) | ($50.25) | ($9.00) | $32.25 | $73.50 |
| $8.50 | ($206.50) | ($164.00) | ($121.50) | ($79.00) | ($36.50) | $6.00 | $48.50 | $91.00 |
| $8.75 | ($197.75) | ($154.00) | ($110.25) | ($66.50) | ($22.75) | $21.00 | $64.75 | $108.50 |
| $9.00 | ($189.00) | ($144.00) | ($99.00) | ($54.00) | ($9.00) | $36.00 | $81.00 | $126.00 |
| $9.25 | ($180.25) | ($134.00) | ($87.75) | ($41.50) | $4.75 | $51.00 | $97.25 | $143.50 |
| $9.50 | ($171.50) | ($124.00) | ($76.50) | ($29.00) | $18.50 | $66.00 | $113.50 | $161.00 |
| $9.75 | ($162.75) | ($114.00) | ($65.25) | ($16.50) | $32.25 | $81.00 | $129.75 | $178.50 |
| $10.00 | ($154.00) | ($104.00) | ($54.00) | ($4.00) | $46.00 | $96.00 | $146.00 | $196.00 |
| $10.25 | ($145.25) | ($94.00) | ($42.75) | $8.50 | $59.75 | $111.00 | $162.25 | $213.50 |
| $10.50 | ($136.50) | ($84.00) | ($31.50) | $21.00 | $73.50 | $126.00 | $178.50 | $231.00 |
| $10.75 | ($127.75) | ($74.00) | ($20.25) | $33.50 | $87.25 | $141.00 | $194.75 | $248.50 |
| $11.00 | ($119.00) | ($64.00) | ($9.00) | $46.00 | $101.00 | $156.00 | $211.00 | $266.00 |
| $11.25 | ($110.25) | ($54.00) | $2.25 | $58.50 | $114.75 | $171.00 | $227.25 | $283.50 |
| $11.50 | ($101.50) | ($44.00) | $13.50 | $71.00 | $128.50 | $186.00 | $243.50 | $301.00 |
| $11.75 | ($92.75) | ($34.00) | $24.75 | $83.50 | $142.25 | $201.00 | $259.75 | $318.50 |

| YIELD | PRICE | BREAK-EVEN |
|---|---|---|
| 65.6 | $7.68 | $504 |

## Financial Analysis 2020 - Union Prairie(Soybeans)




Count : 13744

Area : 66.57 ac

Length : 795,896 ft

Profit/Loss ($/ac)

| | | | |
|---|---|---|---|
| Above | 300.00 | 6.11 ac | 6.9% |
| 250.00 - | 300.00 | 9.18 ac | 10.4% |
| 200.00 - | 250.00 | 16.49 ac | 18.6% |
| 150.00 - | 200.00 | 11.95 ac | 13.5% |
| 100.00 - | 150.00 | 11.68 ac | 13.2% |
| 50.00 - | 100.00 | 14.53 ac | 16.4% |
| 25.00 - | 50.00 | 4.33 ac | 4.9% |
| 0.00 - | 25.00 | 3.23 ac | 3.6% |
| Below | 0.00 | 11.11 ac | 12.5% |

5/17/2021 4:40:12 PM
Data Altered/Created through Analysis

Ag Leader Technology SMS Advanced

Page 1 of 1

# Cover Crops, Diversity Fit OUR System…

- Increase in SOM
- Increase in Water RETENTION
- Decrease in soil erosion
- Resilient Soils [can handle traffic]
- Planting Date, Yield Expectations
- Less Herbicides
- Increased Fertilizer Efficiency
- Increased Plant Available Nutrition
- INCREASED YIELD [eventually]

# Proper Management = Successful Outcomes

- Soil Testing, Benchmark Data
- Herbicide Selection
- Timing of Termination
- Crop Rotation, Maturity, Timing
- Field Conditions at Planting
- Crop Inputs, Timing
- **Don’t expect different results with the same behavior(s). SHIFT the PARADIGM.**

# Interseeding CONSIDERATIONS

- Timing
- Moisture
- Crop Stage
- Species Mix
- Rate
- Method of Application

## Year-to-Year Comparisons

From 4/18 to 9/23

| Season | Total GDUs | GDUs from Normal |
|---|---|---|
| 2020 | 2723 | -121 |
| 2019 | 2750 | -94 |
| 2018 | 3034 | +190 |
| Normal | 2844 | - |

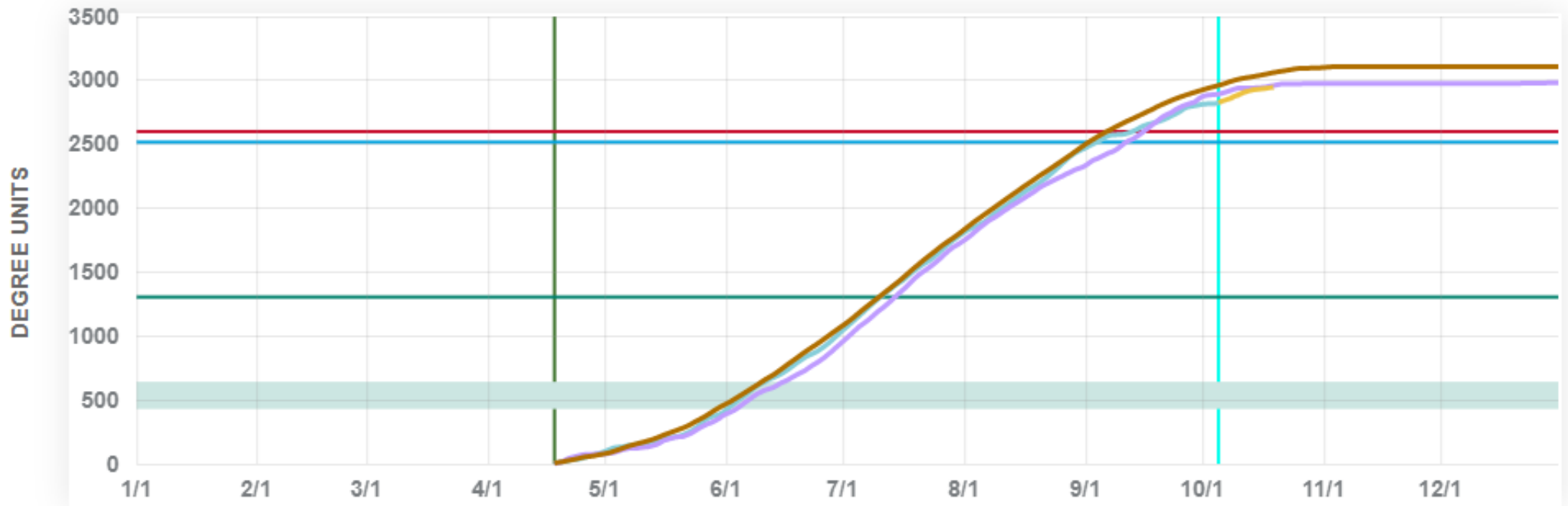
# Weather Data

# **Total GDUs** Since 4/18

| To Date | Normal | Versus Normal | Forecast (+14 Days) |
|---|---|---|---|
| **2818** | **2953** | **-135** | **2947** |

**Legend** 2020 2019 Forecast Normal Start Date Current Date Silking Black Layer V4-V7 Custom Stage

**Accumulated GDUs**




**Year-to-Year Comparisons** From 8/24 to 9/29

| Season | Total GDUs | GDUs from Normal |
|---|---|---|
| 2020 | 535 | -63 |
| 2019 | 626 | +28 |
| 2018 | 638 | +40 |
| Normal | 598 | - |

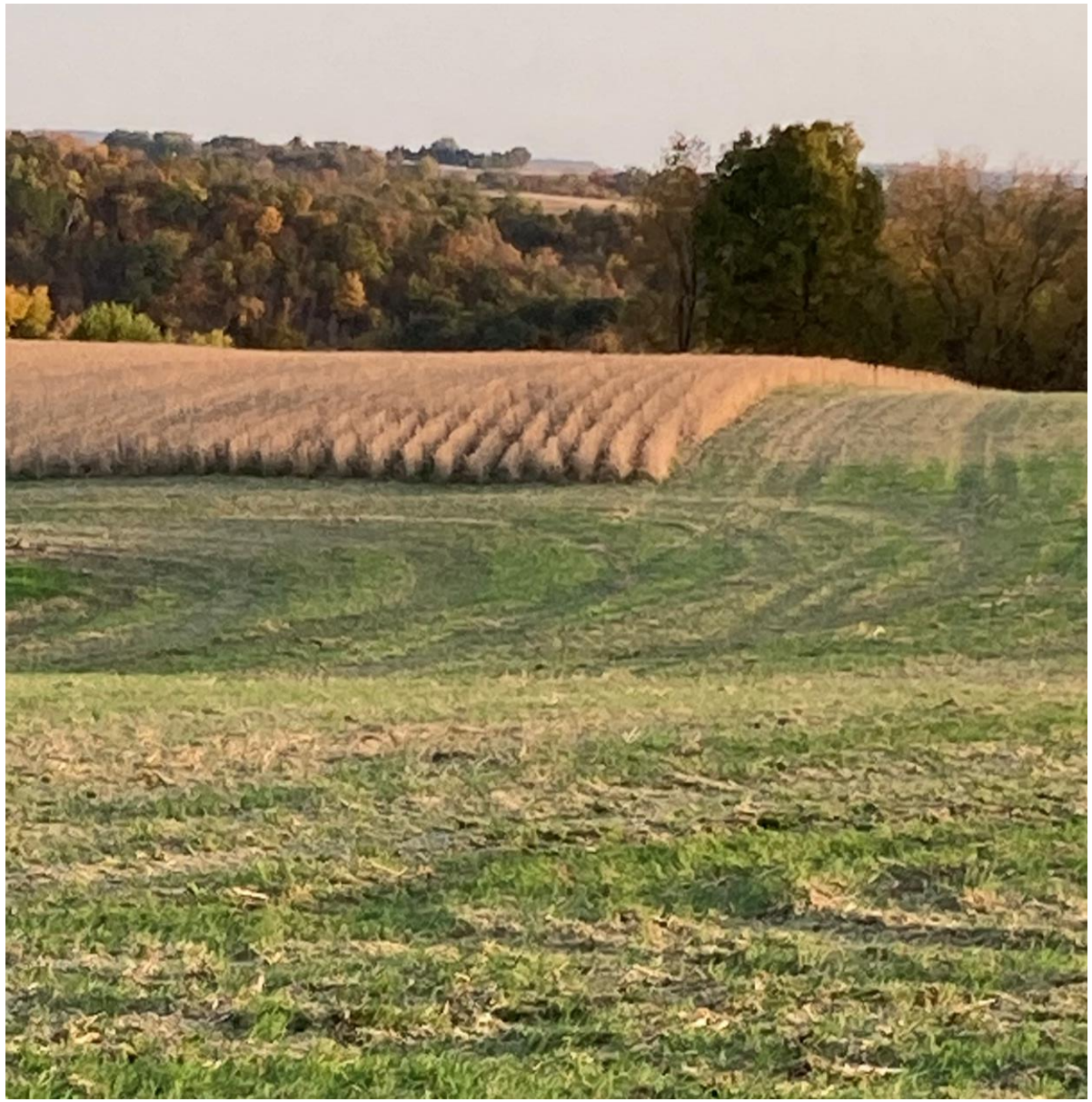
*** AS OF 10/21/2020 = 756 GDU [planted AUG 24] ***

10/03/2013


9/16/2020

9/21/2020

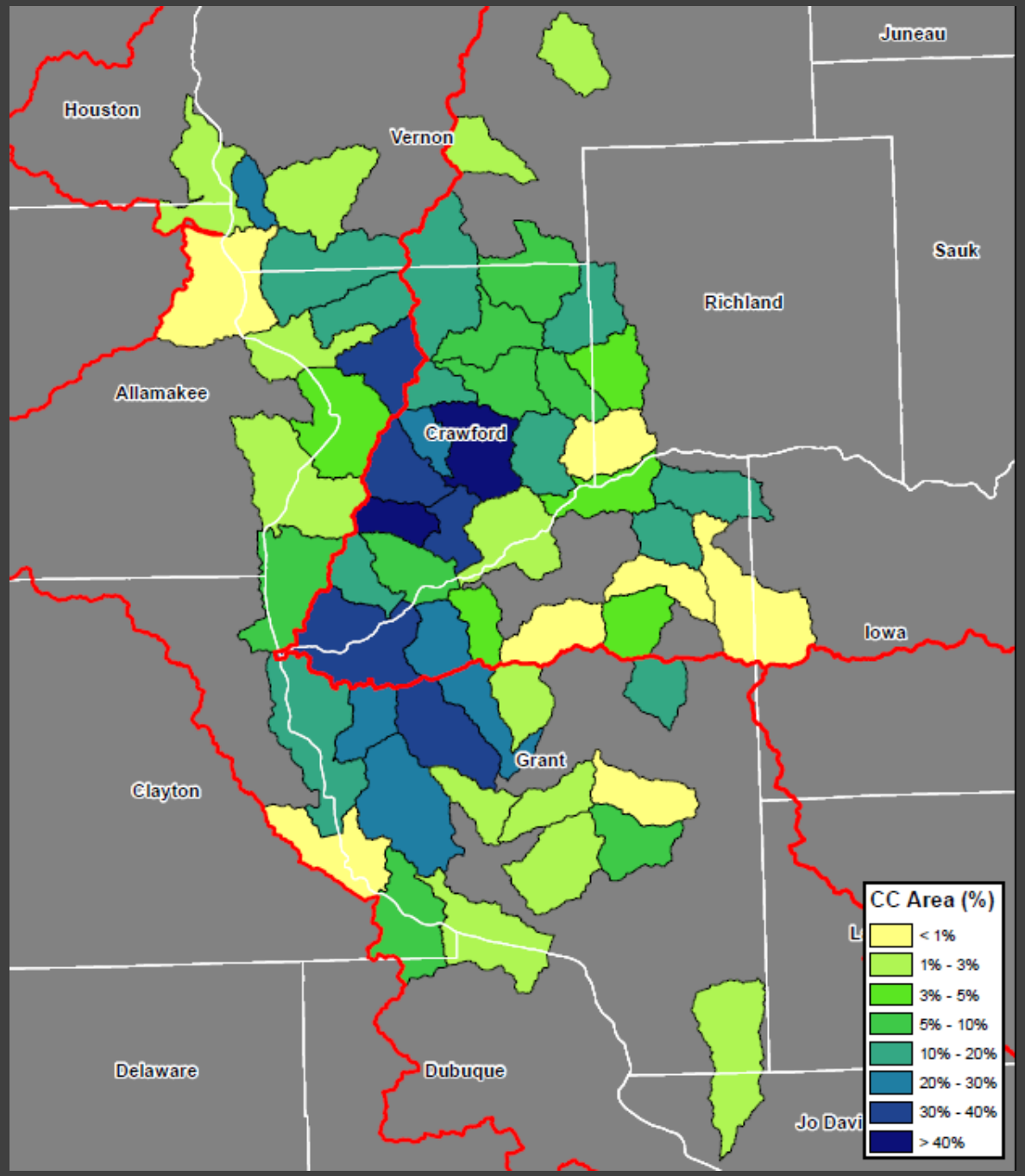
10/9/2020



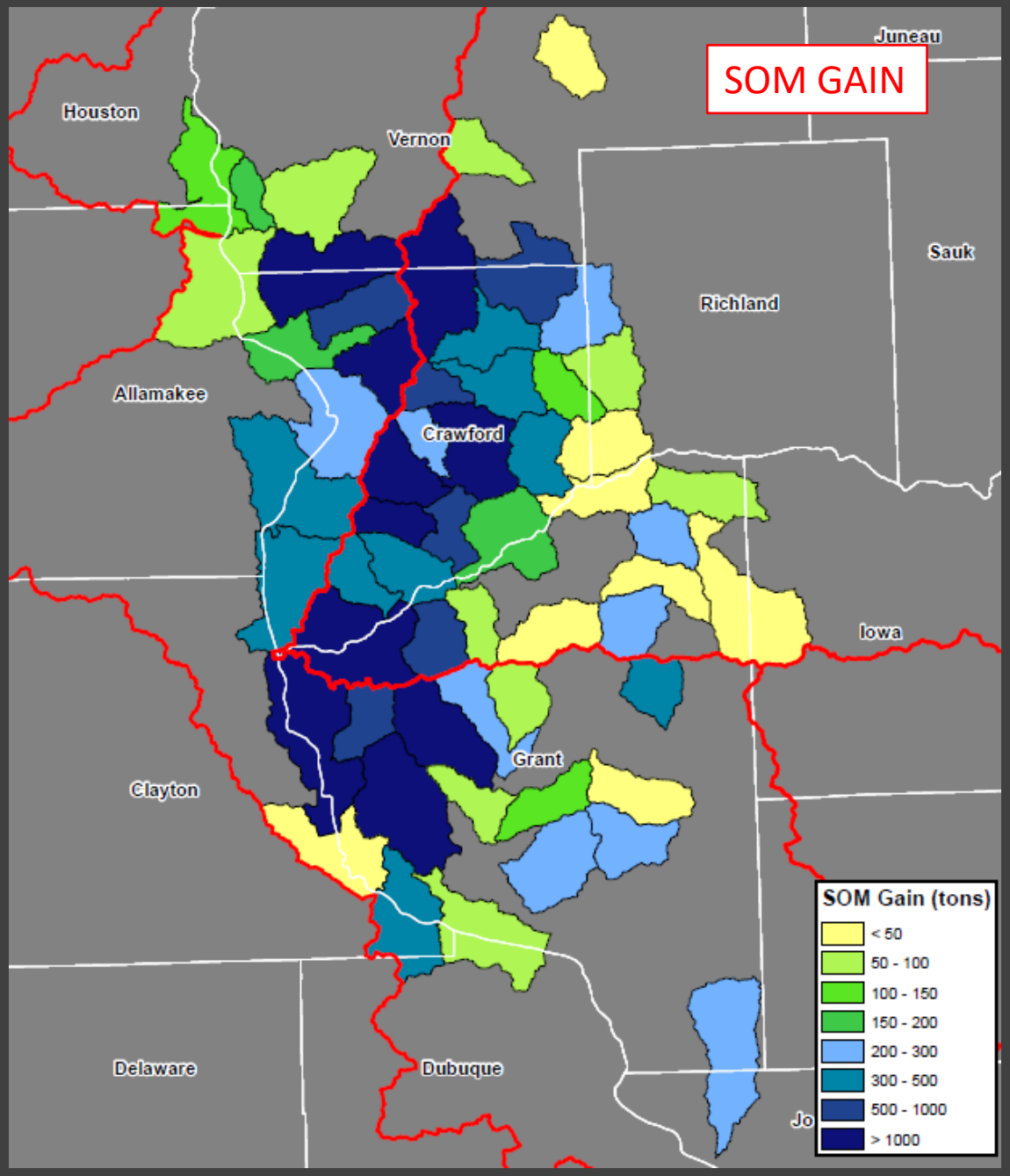
10/10/2020

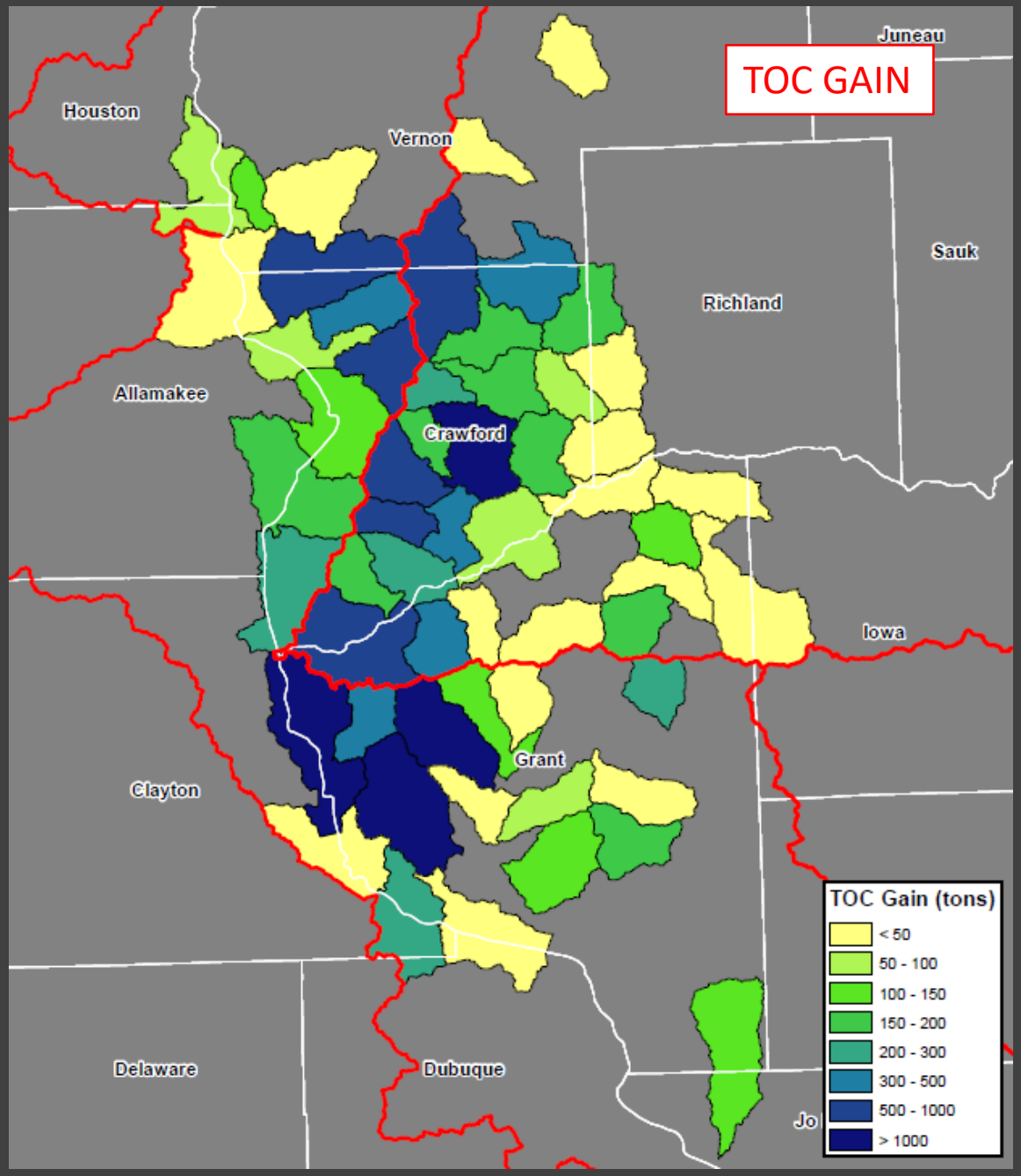
# Harvest Considerations – Observations from the Field

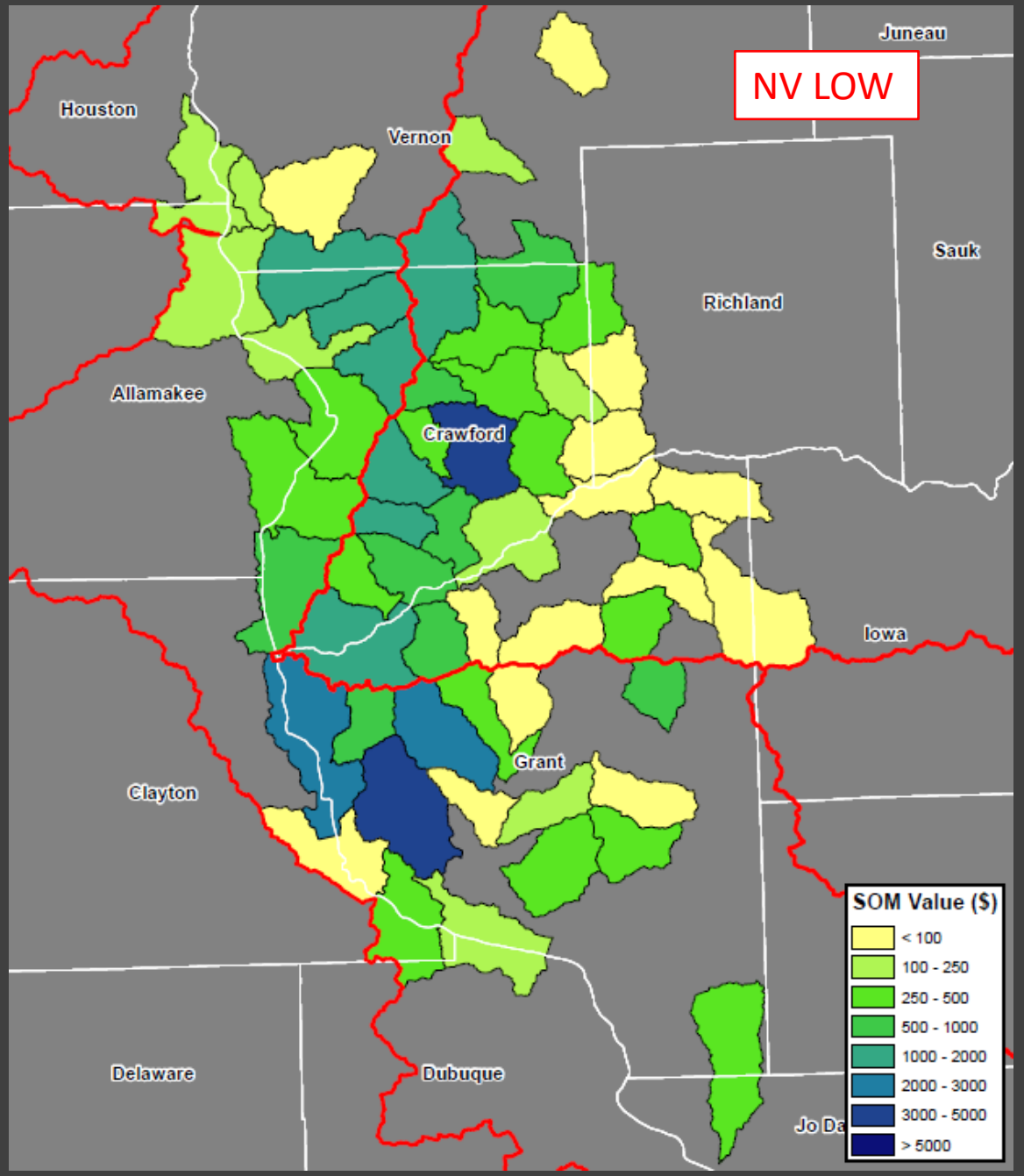
- Dew Point
- Corn vs Beans
- Spring vs Winter Species
- Crop Residue
- Field Traffic

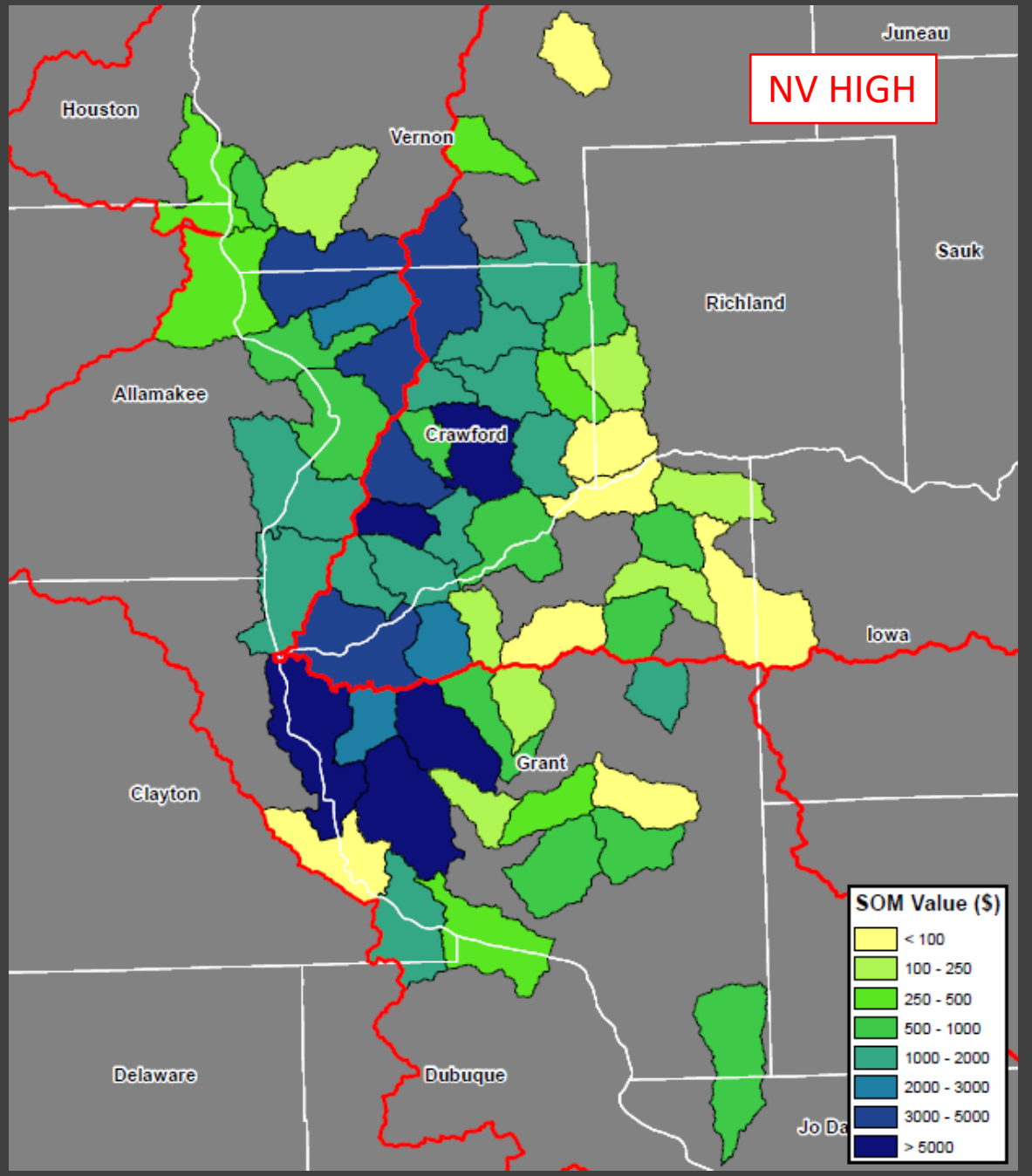


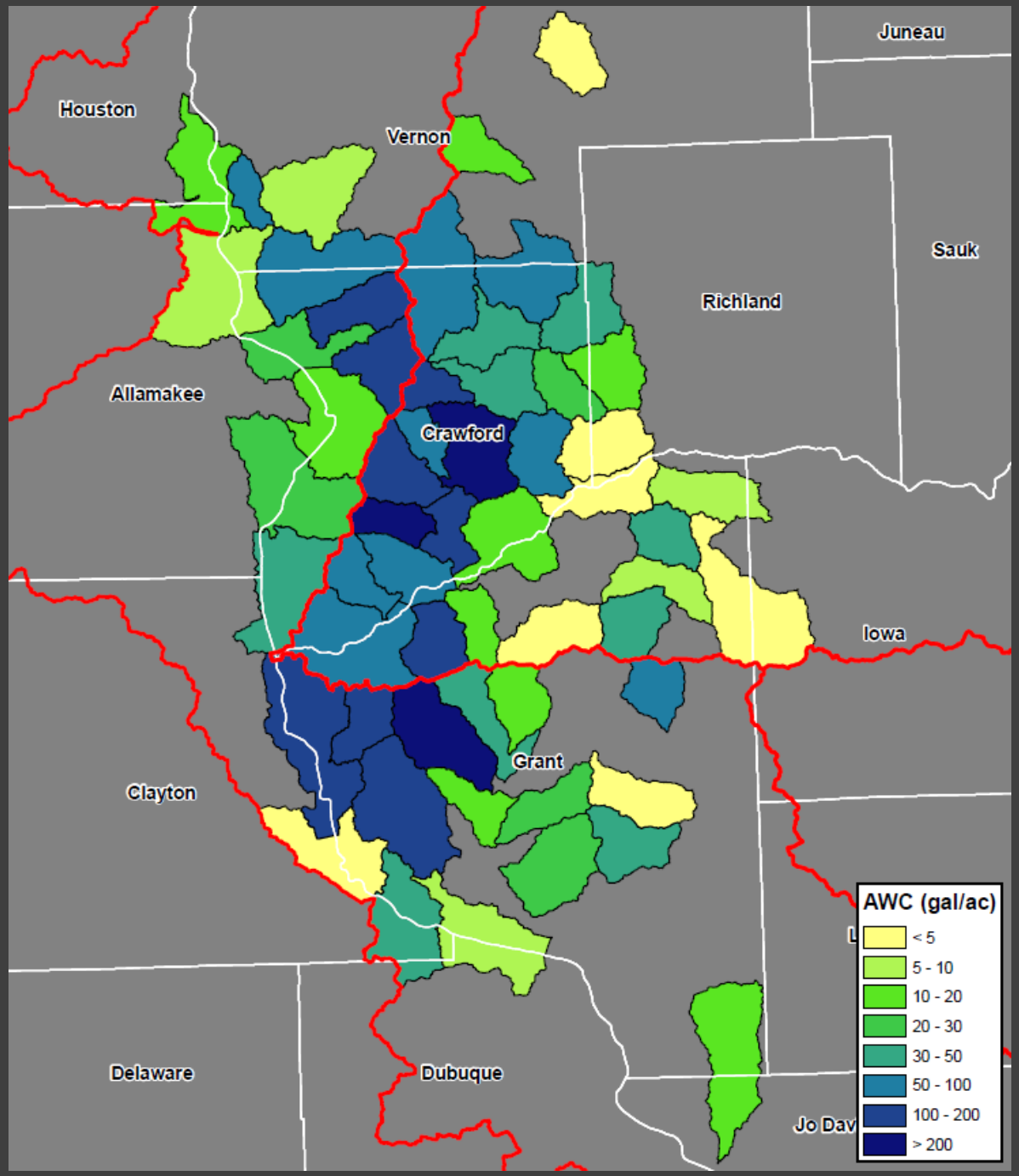

# Total 5 YEAR Coverage


SOM GAIN
Juneau
Houston
Vernon
Sauk
Richland
Allamakee
Crawford
Iowa
Grant
Clayton
Delaware
Dubuque
Jo
SOM Gain (tons)
< 50
50 - 100
100 - 150
150 - 200
200 - 300
300 - 500
500 - 1000
> 1000


TOC GAIN
Juneau
Houston
Vernon
Sauk
Richland
Allamakee
Crawford
Iowa
Grant
Clayton
Delaware
Dubuque
Jo
TOC Gain (tons)
< 50
50 - 100
100 - 150
150 - 200
200 - 300
300 - 500
500 - 1000
> 1000


NV LOW
Juneau
Houston
Vernon
Sauk
Richland
Allamakee
Crawford
Iowa
Grant
Clayton
Delaware
Dubuque
Jo Da
SOM Value ($)
< 100
100 - 250
250 - 500
500 - 1000
1000 - 2000
2000 - 3000
3000 - 5000
> 5000


NV HIGH
Juneau
Houston
Vernon
Sauk
Richland
Allamakee
Crawford
Iowa
Grant
Clayton
Delaware
Dubuque
Jo Da
SOM Value ($)
< 100
100 - 250
250 - 500
500 - 1000
1000 - 2000
2000 - 3000
3000 - 5000
> 5000




# Gain in Water Holding Capacity

| Year | Field Size (ac) | Biomass (t/ac) | N value/ton | Cost/ac | Profit | Cost | ROI | Net Gain |
|---|---|---|---|---|---|---|---|---|
| 1 | 10 | 2 | $3.00 | $45.00 | $60.00 | $450.00 | -$390.00 | -$390.00 |
| 2 | 10 | 2 | $3.00 | $45.00 | $120.00 | $450.00 | -$330.00 | -$720.00 |
| 3 | 10 | 2 | $3.00 | $45.00 | $180.00 | $450.00 | -$270.00 | -$990.00 |
| 4 | 10 | 2 | $3.00 | $45.00 | $240.00 | $450.00 | -$210.00 | -$1,200.00 |
| 5 | 10 | 2 | $3.00 | $45.00 | $300.00 | $450.00 | -$150.00 | -$1,350.00 |
| 6 | 10 | 2 | $3.00 | $45.00 | $360.00 | $450.00 | -$90.00 | -$1,440.00 |
| 7 | 10 | 2 | $3.00 | $45.00 | $420.00 | $450.00 | -$30.00 | -$1,470.00 |
| 8 | 10 | 2 | $3.00 | $45.00 | $480.00 | $450.00 | $30.00 | -$1,440.00 |
| 9 | 10 | 2 | $3.00 | $45.00 | $540.00 | $450.00 | $90.00 | -$1,350.00 |
| 10 | 10 | 2 | $3.00 | $45.00 | $600.00 | $450.00 | $150.00 | -$1,200.00 |
| 11 | 10 | 2 | $3.00 | $45.00 | $660.00 | $450.00 | $210.00 | -$990.00 |
| 12 | 10 | 2 | $3.00 | $45.00 | $720.00 | $450.00 | $270.00 | -$720.00 |
| 13 | 10 | 2 | $3.00 | $45.00 | $780.00 | $450.00 | $330.00 | -$390.00 |
| 14 | 10 | 2 | $3.00 | $45.00 | $840.00 | $450.00 | $390.00 | $0.00 |
| 15 | 10 | 2 | $3.00 | $45.00 | $900.00 | $450.00 | $450.00 | $450.00 |
| 16 | 10 | 2 | $3.00 | $45.00 | $960.00 | $450.00 | $510.00 | $960.00 |
| 17 | 10 | 2 | $3.00 | $45.00 | $1,020.00 | $450.00 | $570.00 | $1,530.00 |
| 18 | 10 | 2 | $3.00 | $45.00 | $1,080.00 | $450.00 | $630.00 | $2,160.00 |
| 19 | 10 | 2 | $3.00 | $45.00 | $1,140.00 | $450.00 | $690.00 | $2,850.00 |
| 20 | 10 | 2 | $3.00 | $45.00 | $1,200.00 | $450.00 | $750.00 | $3,600.00 |
| 21 | 10 | 2 | $3.00 | $45.00 | $1,260.00 | $450.00 | $810.00 | $4,410.00 |
| 22 | 10 | 2 | $3.00 | $45.00 | $1,320.00 | $450.00 | $870.00 | $5,280.00 |
| 23 | 10 | 2 | $3.00 | $45.00 | $1,380.00 | $450.00 | $930.00 | $6,210.00 |
| 24 | 10 | 2 | $3.00 | $45.00 | $1,440.00 | $450.00 | $990.00 | $7,200.00 |
| 25 | 10 | 2 | $3.00 | $45.00 | $1,500.00 | $450.00 | $1,050.00 | $8,250.00 |
| 26 | 10 | 2 | $3.00 | $45.00 | $1,560.00 | $450.00 | $1,110.00 | $9,360.00 |
| 27 | 10 | 2 | $3.00 | $45.00 | $1,620.00 | $450.00 | $1,170.00 | $10,530.00 |
| 28 | 10 | 2 | $3.00 | $45.00 | $1,680.00 | $450.00 | $1,230.00 | $11,760.00 |
| 29 | 10 | 2 | $3.00 | $45.00 | $1,740.00 | $450.00 | $1,290.00 | $13,050.00 |
| 30 | 10 | 2 | $3.00 | $45.00 | $1,800.00 | $450.00 | $1,350.00 | $14,400.00 |

# ROI

## 2 ton/Acre

# USDA STATISTICS

| Fiscal Year | Applied Acres | Tons of Soil Saved | Semi Load Equivalent |
|---|---|---|---|
| 2014 | 1855 | 3895 | 194 |
| 2015 | 2481 | 5209 | 260 |
| 2016 | 3874 | 8136 | 406 |
| 2017 | 2993 | 6284 | 314 |
| 2018 | 4273 | 8975 | 448 |
| 2019 | 9860 | 20706 | 1035 |
| 2020 | 12003 | 25200 | 1260 |
| | **TOTAL** | | |
| | **37338 ACRES** | **78404.5 TONS** | **3917 TRUCKLOADS** |

# Conclusions

- All watersheds in Crawford County impacted by cover crops **[100 – 1,000 tons of SOM & TOC added to the soil]**
- Important in flood-prone regions: **Increased AWC of the soil resulting from the added SOM**
- More BIOMASS, quicker ROI: added nutrient value of **>$1000/watershed** common
- Looking ahead: **PLENTY OF ROOM FOR CONTINUED GROWTH**

# Programs & Procedures

- Talk to your LOCAL NRCS DC or LSP [private]
- Prepare to WAIT, Sign-UP Early
- CURRENT SOIL TEST, Eligible for 590 Nutrient Management Plan [NMP]
- Paperwork Completed, CORRECTLY
- Implement the PRACTICE
- Moving Target(s)

# Summary

- Inter-seeding gives us TIME
- Cropping System, Livestock Utilization
- Follow-Through
- Planting Green/No-Till [?]
- BENEFIT = +SOM

# THANK YOU

- ALL the producers willing to try NEW & challenging practices.
- WALLACE FOUNDATION, Tainter Creek [AGAIN].
- To Dani & Kelsey for inviting me to share my story.
- To YOU for sharing your time.

- CONTACT ME

akramer@blacksandgranary.com

CELL: 608.412.5659