The Power of Precision Agriculture in Vermont No-Till

February 26, 2020

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Professional Crop Services & Precision Ag. Management

Vermont

There are 236 different soil components mapped in Vermont, each acre of Vermont soils has variability unique to the next, precision agriculture provides tools to identify, manage and lessen the variability found within this challenge.

Laws, regulations, funding opportunities require records

Vermonter Farmers are investing in precision agriculture, all coverage maps in the presentation are from technology we are currently utilizing or trialing locally

Progression timeline

Initial investment prioritizing one practice

Nutrient application

Steering

Planting

Data investment for analysis and reporting

Secondary investments in the field

Integration/Evaluation/Utilization

Apply well informed rate information to your field based on the data layers you have recorded.

PRECISION AGRICUTLURE DISPLAYS

THE HEART OF A PRECISION AG OPERATION

Monitor, control, and record practices

Educate yourself and set goals early

The goal of the presentation is to help you identify short term and long-term goals

GPS RECEIVER

GPS SIGNALS

<u>WASS</u>: Free, 6”12” accuracy, poor repeatability

<u>OMNI STAR, TERRA STAR:</u> Paid services 4”-8” accuracy, good repeatability

<u>RTK</u>: Sub 1” accuracy, good repeatability, requires base station or access to an RTK network

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Acting with precision

What needs to be addressed?

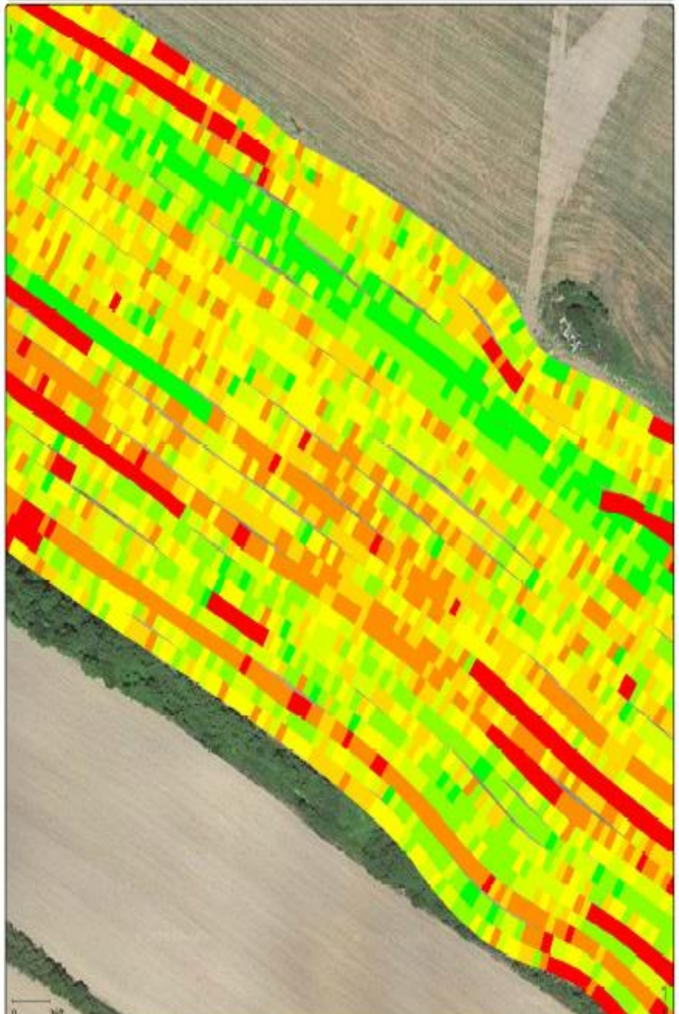
What tool do we need for the job?

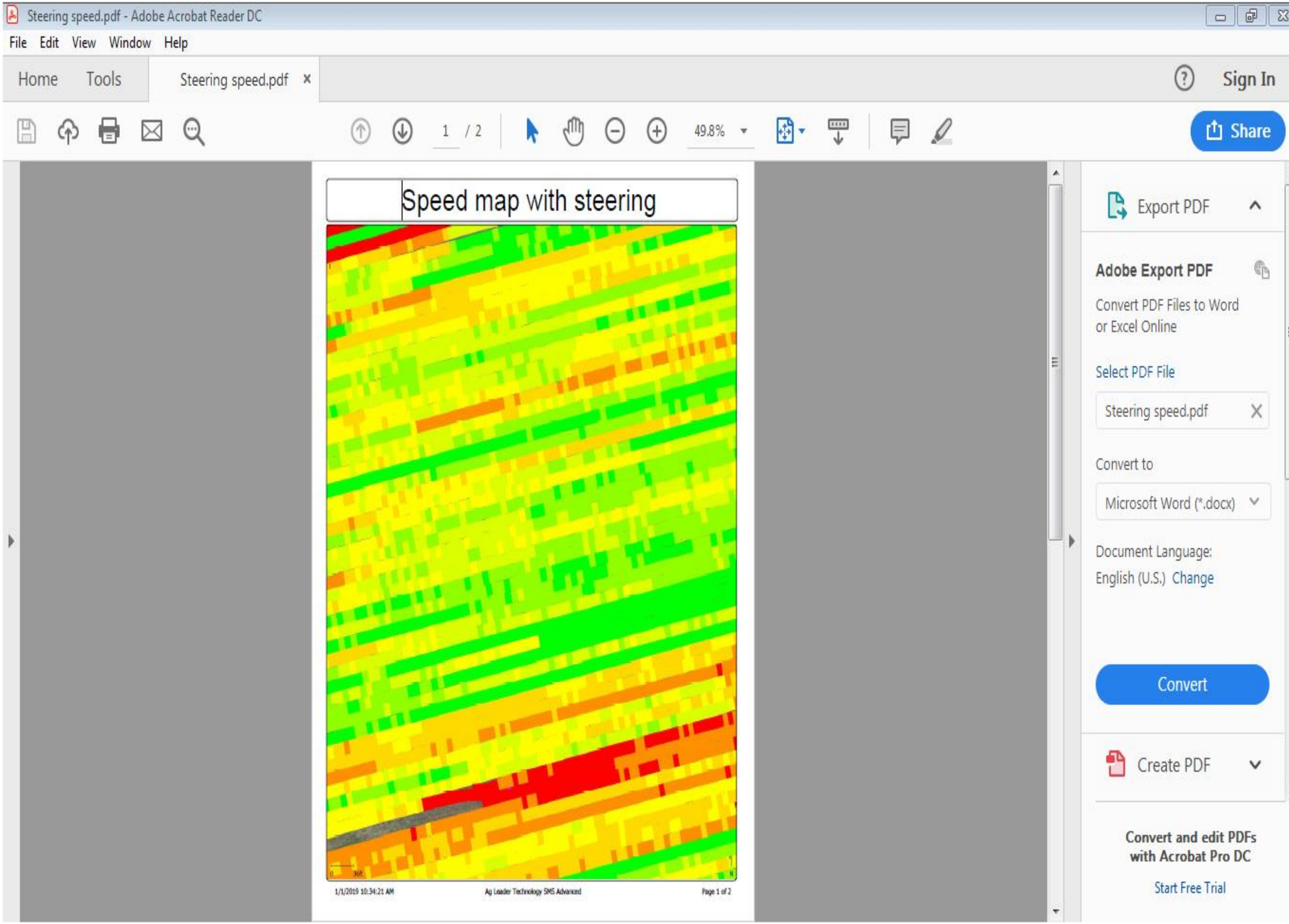
Often difficult to pick up row marker lines in no-till

Steering Systems

1 / 2 49.8%

Speed map without steering

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Page 1 of 2
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Benefits of steering

-Less fatigue

-Reduced Underlap or overlap

-More consistent ground speed

-More time to focus on the implement

-Repeatability to perform other field operations with minimal crop losses

Steering systems do not typically

-Turn on headlands

-Know where rocks are

-Slow down or speed up the tractor

The operator still maintains full function of these aspects of the operation

Subsurface Fertility in No-till With Precision


Ag Leader
SCOTT MAGNAN'S
Custom Service
KROHNE
GEA
SCOTT MAGNAN'S
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Control allows for slow speed at desired rate

STRIP TILL, Cultivating

-By adding fertilizer application tools during these practices, we address subsurface fertility, weed control and compaction in one operation.

-We need good pass to pass accuracy. A subscription service will be needed, RTK is recommended.

-Recorded and labeled guidance lines will help track nutrient placement for future reference and planning.

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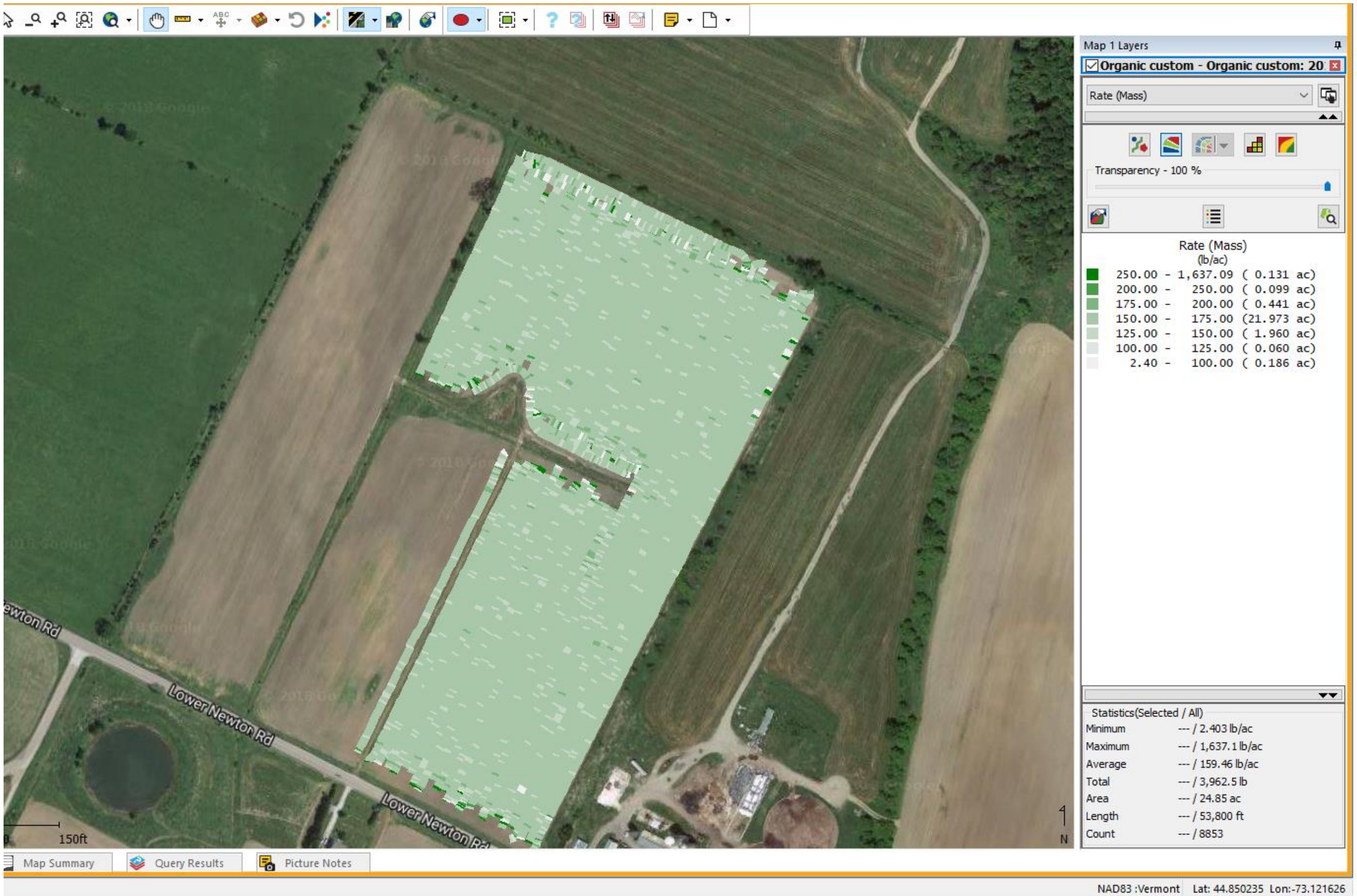
Strip till fertilizer application



Cover Cropping

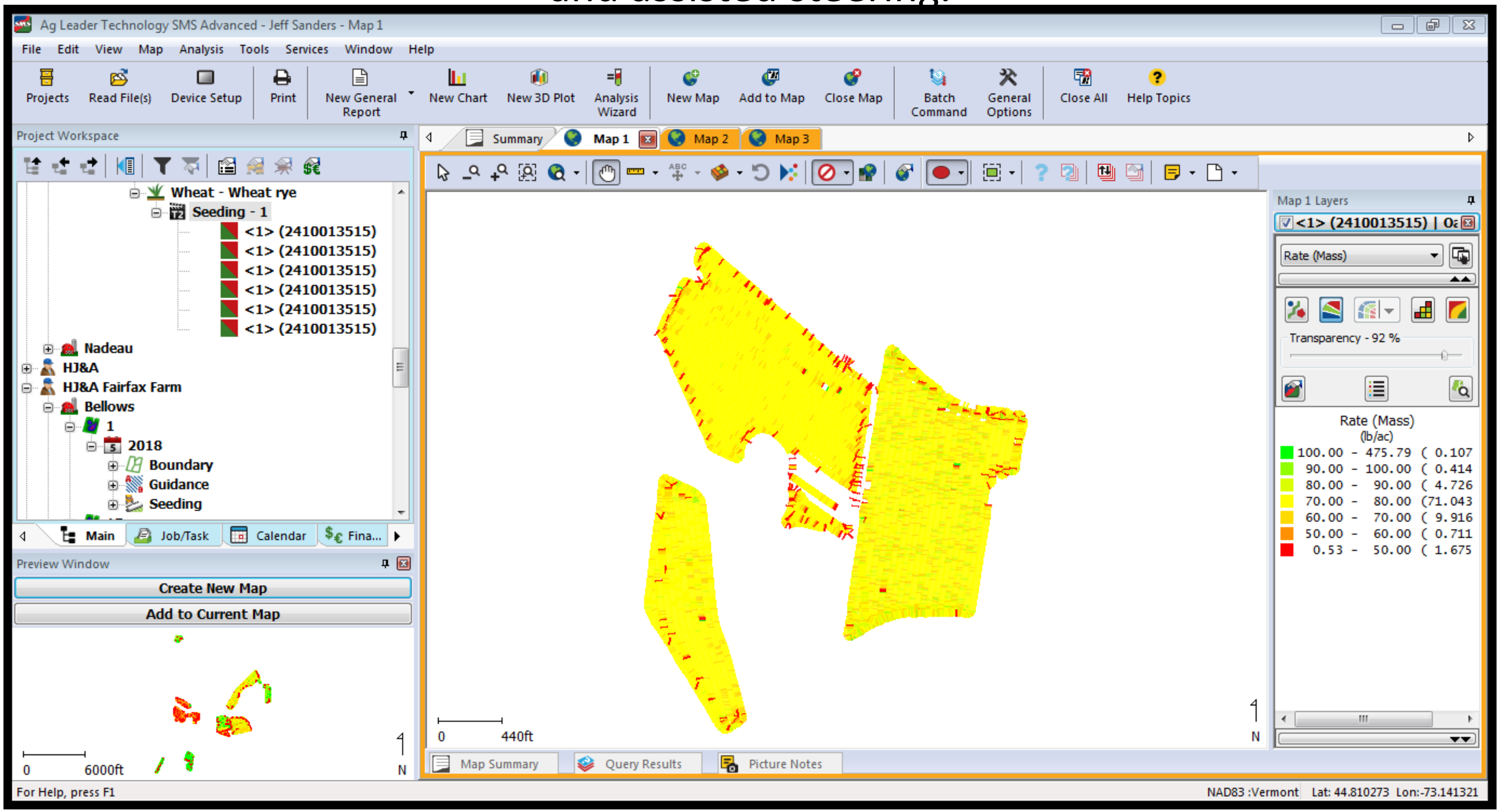
Pictured is an inner seeder that could be enhanced with a steering system and seed tube monitoring, same principles would apply to a grain drill or even broadcasting

Air Seeder


SALFORD
40
VALMAR
6056

Air Seeder Map

Even coverage with ability to set a rate, used with automatic swath control and assisted steering.

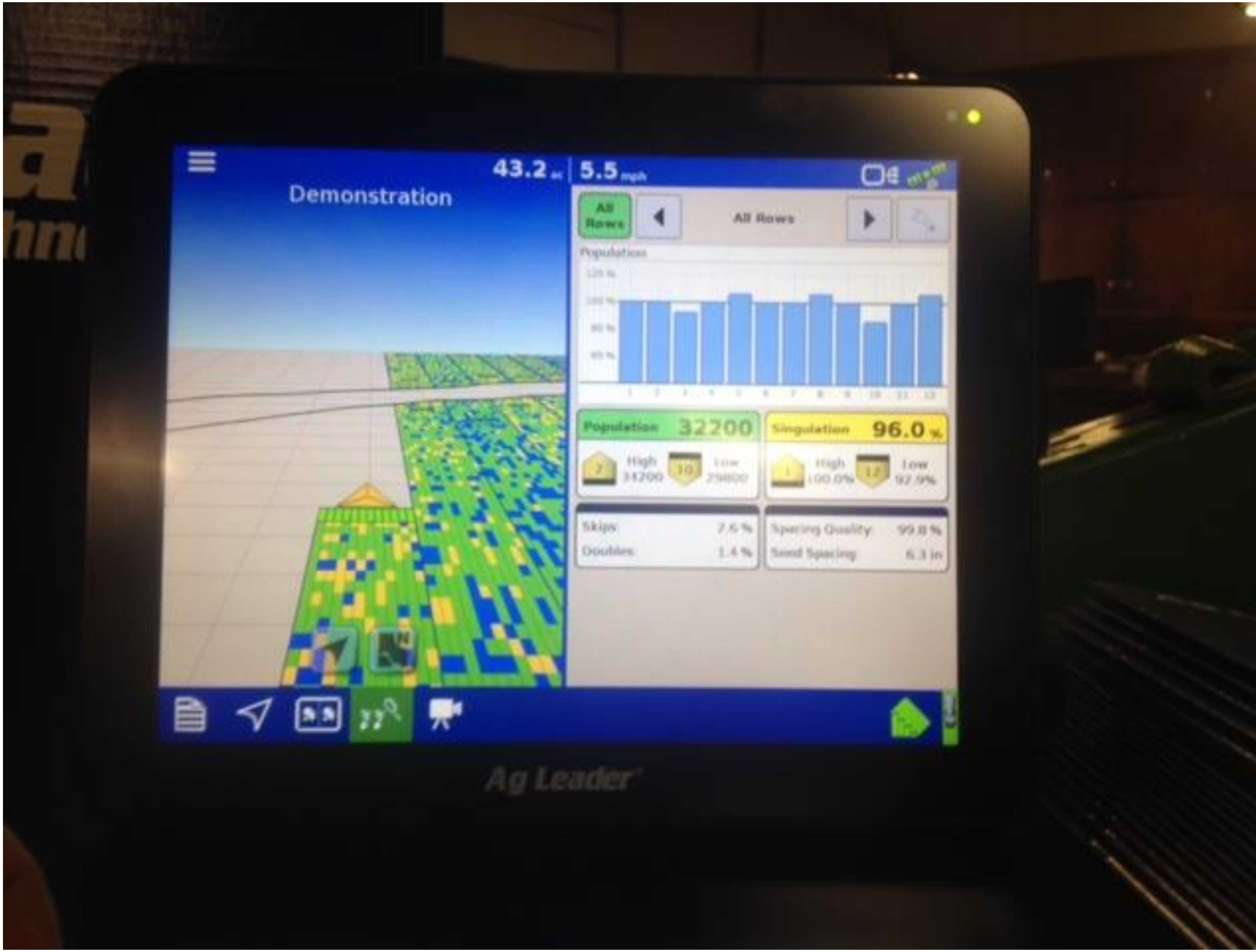


Poor Soil Health + Poor Planter Setup=Lost Revenue

Down pressure sensor data would have identified increased up pressure on the row unit from floating row cleaner

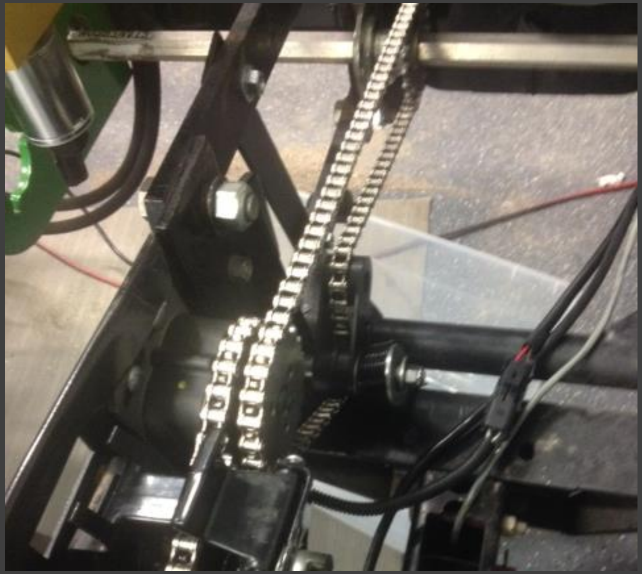
Rented land without sample data

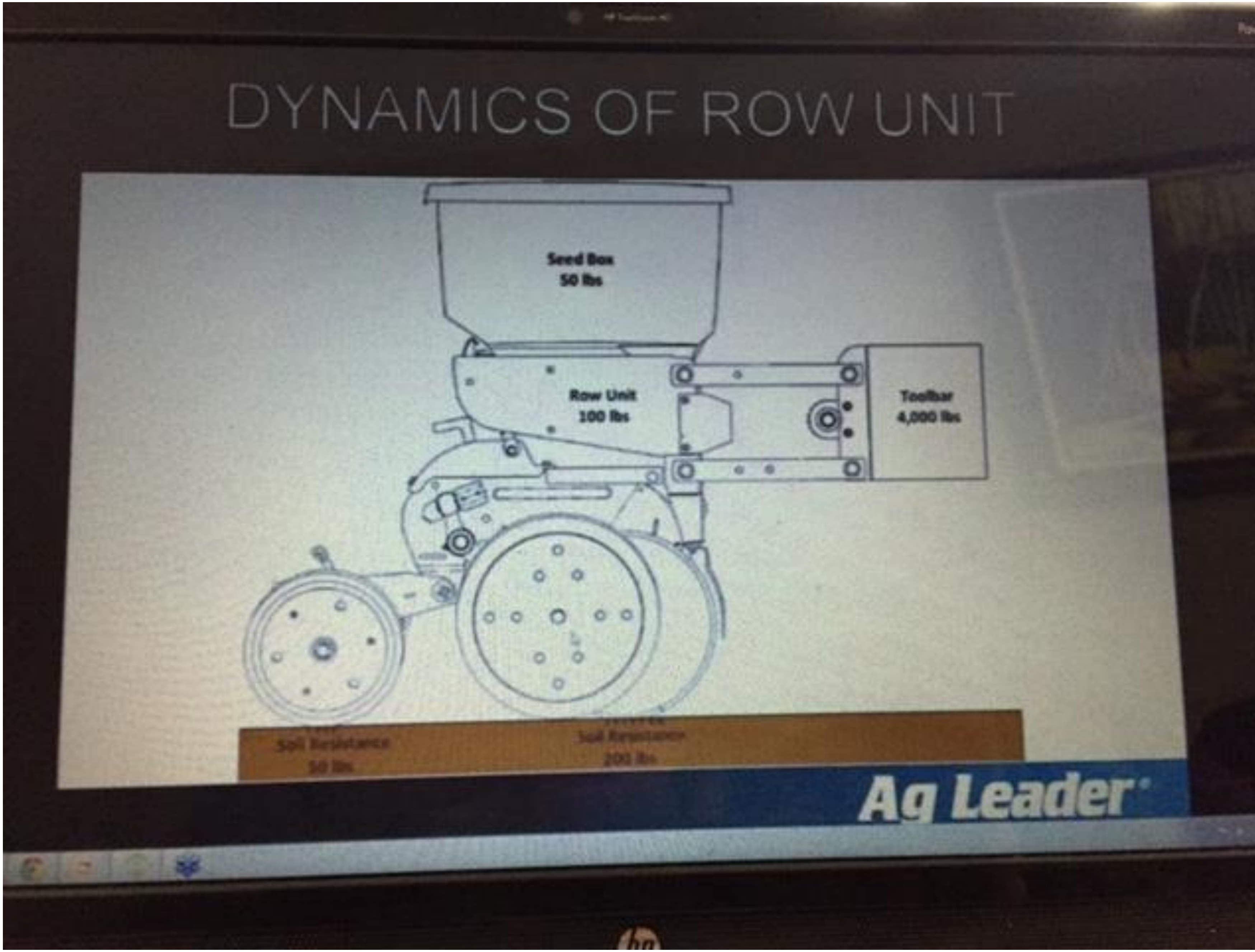
Planting With Precision



Demonstration
43.2
5.5 mph
All Rows
All Rows
Population
Population 32200
High
Low
Singulation 96.0 %
High
100.0%
Low
Skips:
Doubles
Spacing Quality
Seed Spacing
6.3 in
Ag Leader


Ag Leader



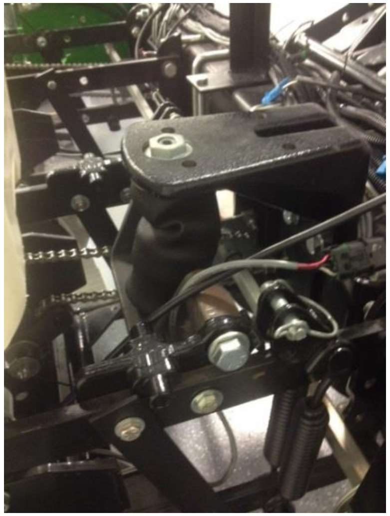

DYNAMICS OF ROW UNIT
Seed Box
50 lbs
Row Unit
100 lbs
Toolbar
4,000 lbs
Soil Resistance
50 lbs
Soil Resistance
200 lbs
Ag Leader

DOWNPRESSURE

Spring

Applies constant pressure with only manual adjustment

Pneumatic

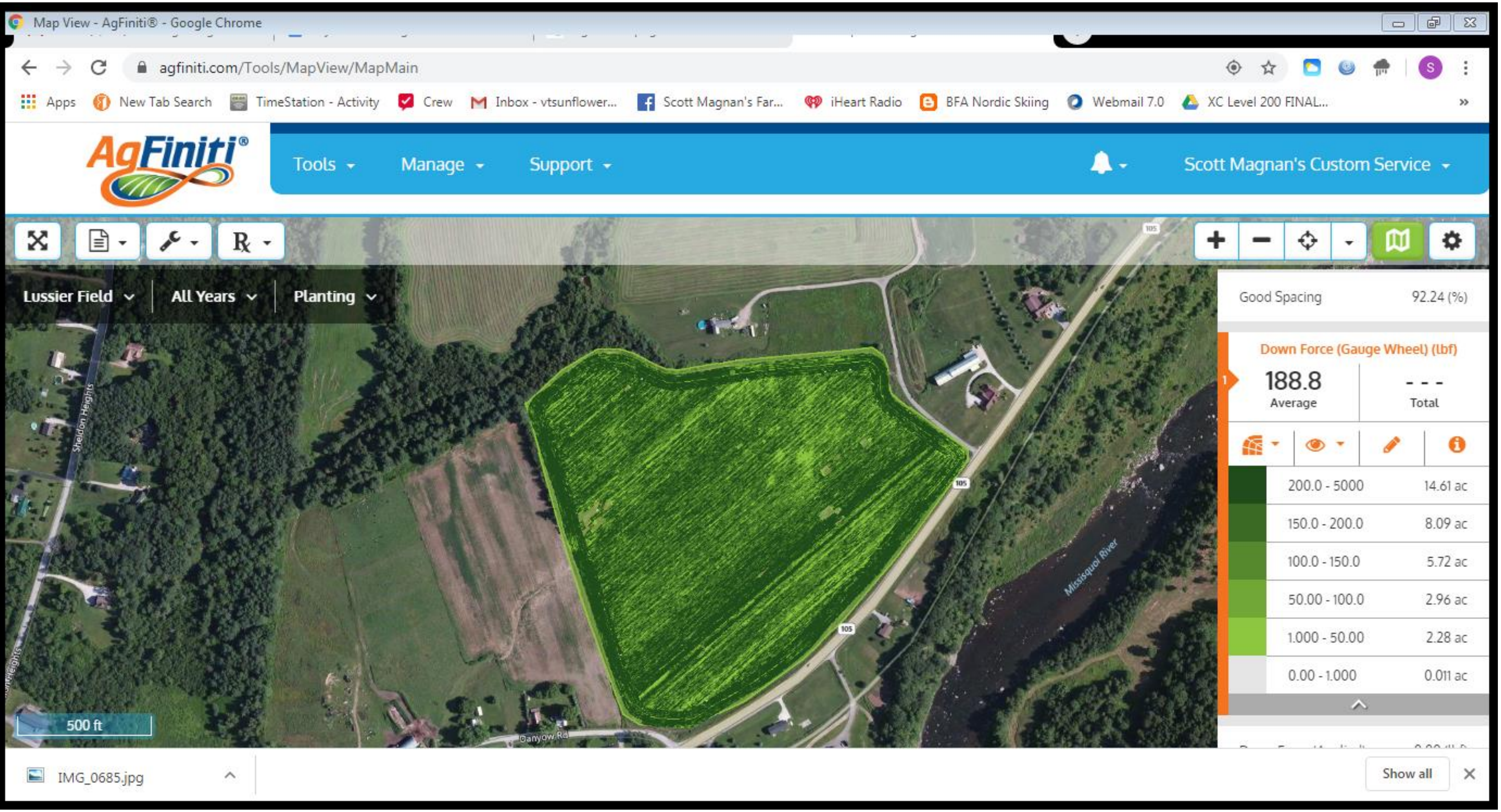


Applies down force to the row unit but takes several feet to adjust.

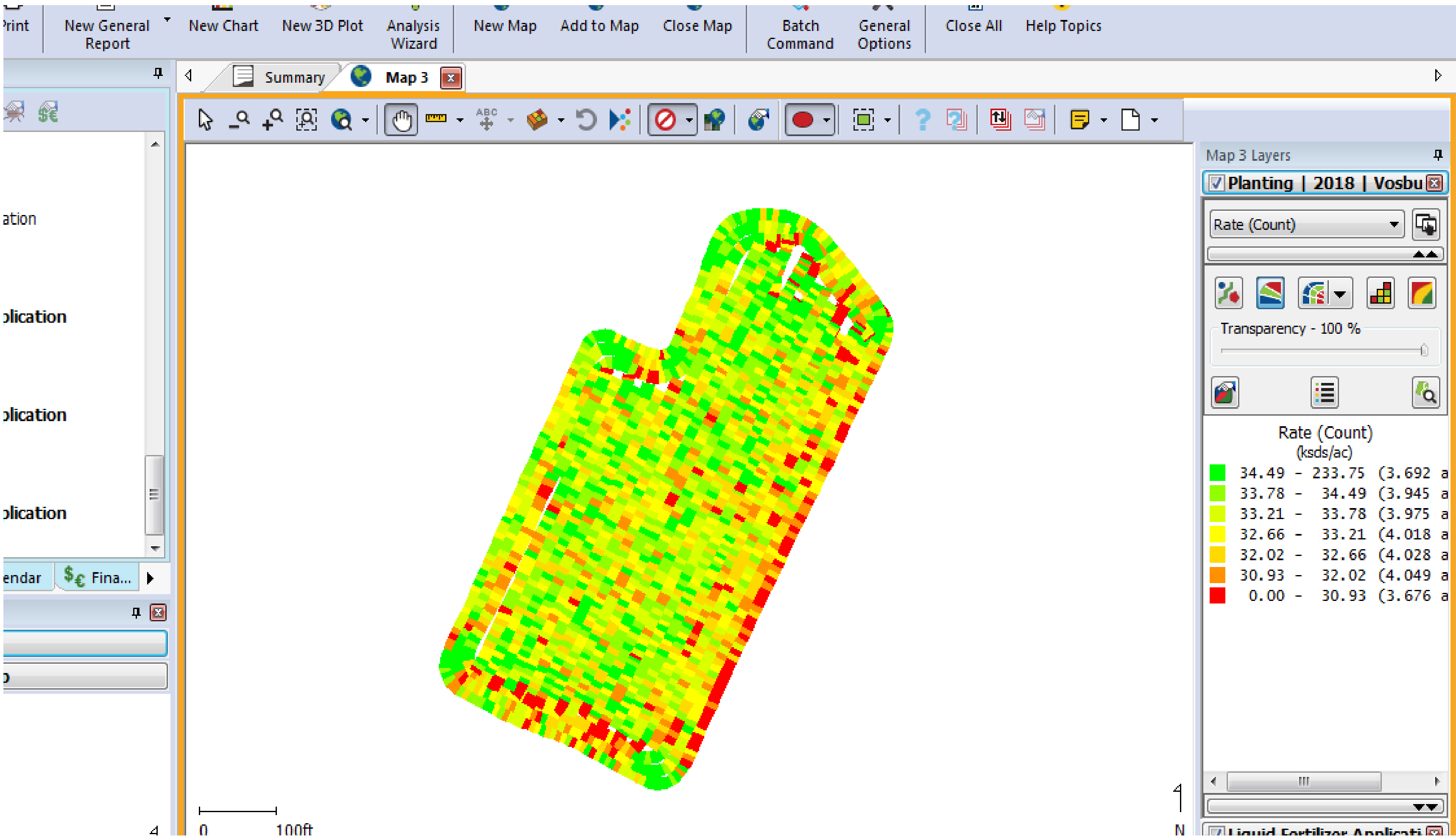
Hydraulic

Applies down force to row
unit within a second.

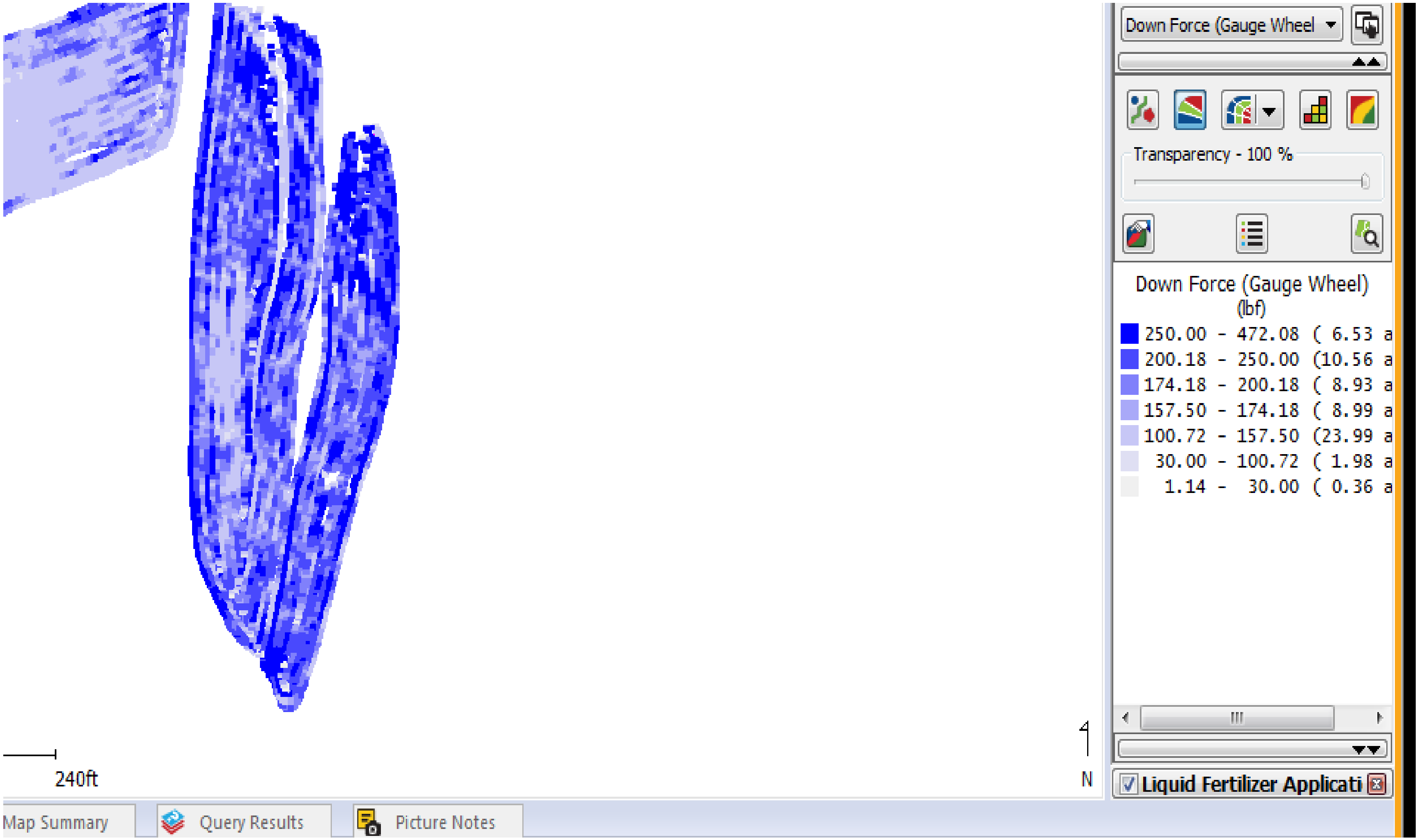
Spring monitored and spring adjusted downforce



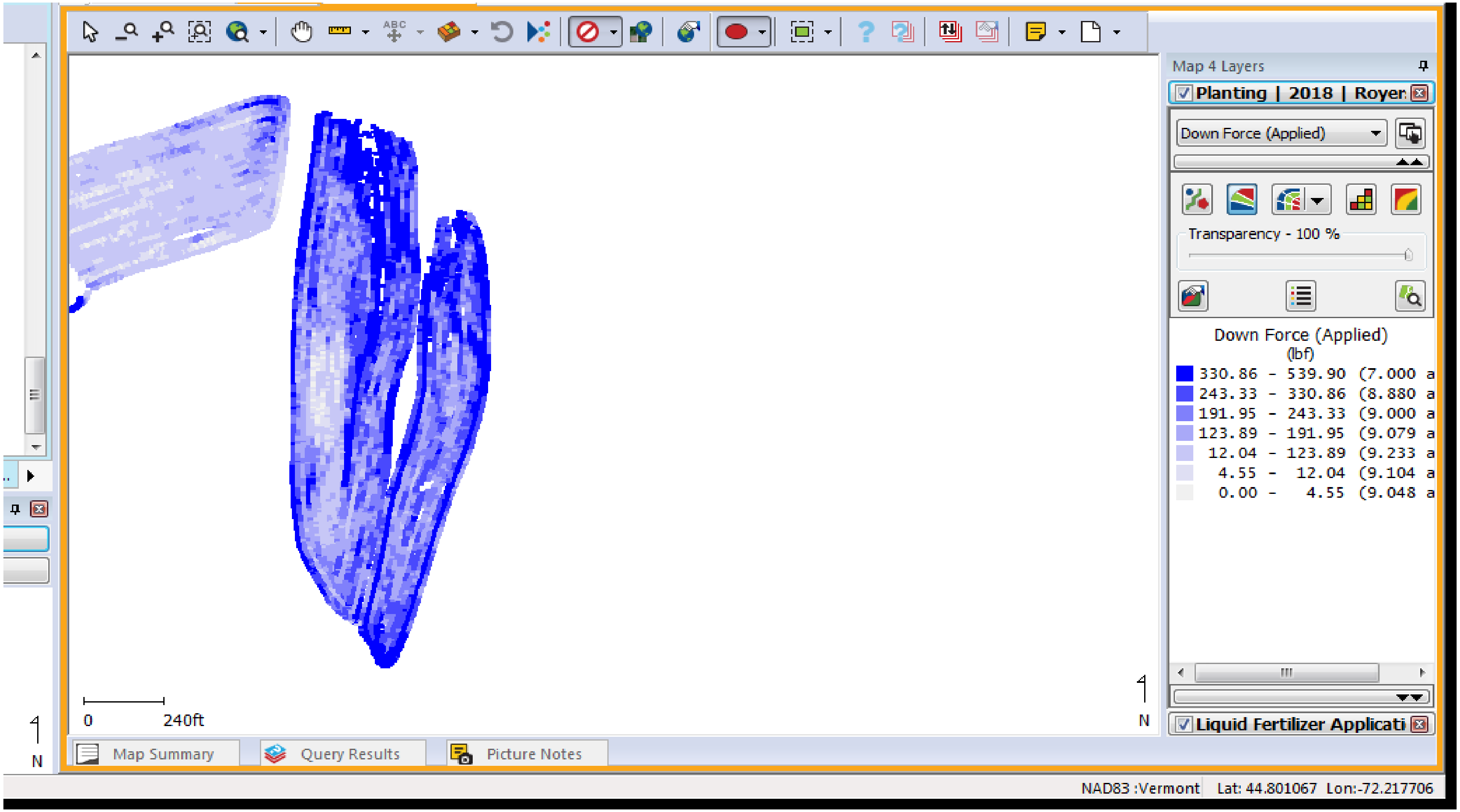
Tilled field, Gauge wheel pressure Consistency



No-Till into Sod- Gauge wheel pressure Variability



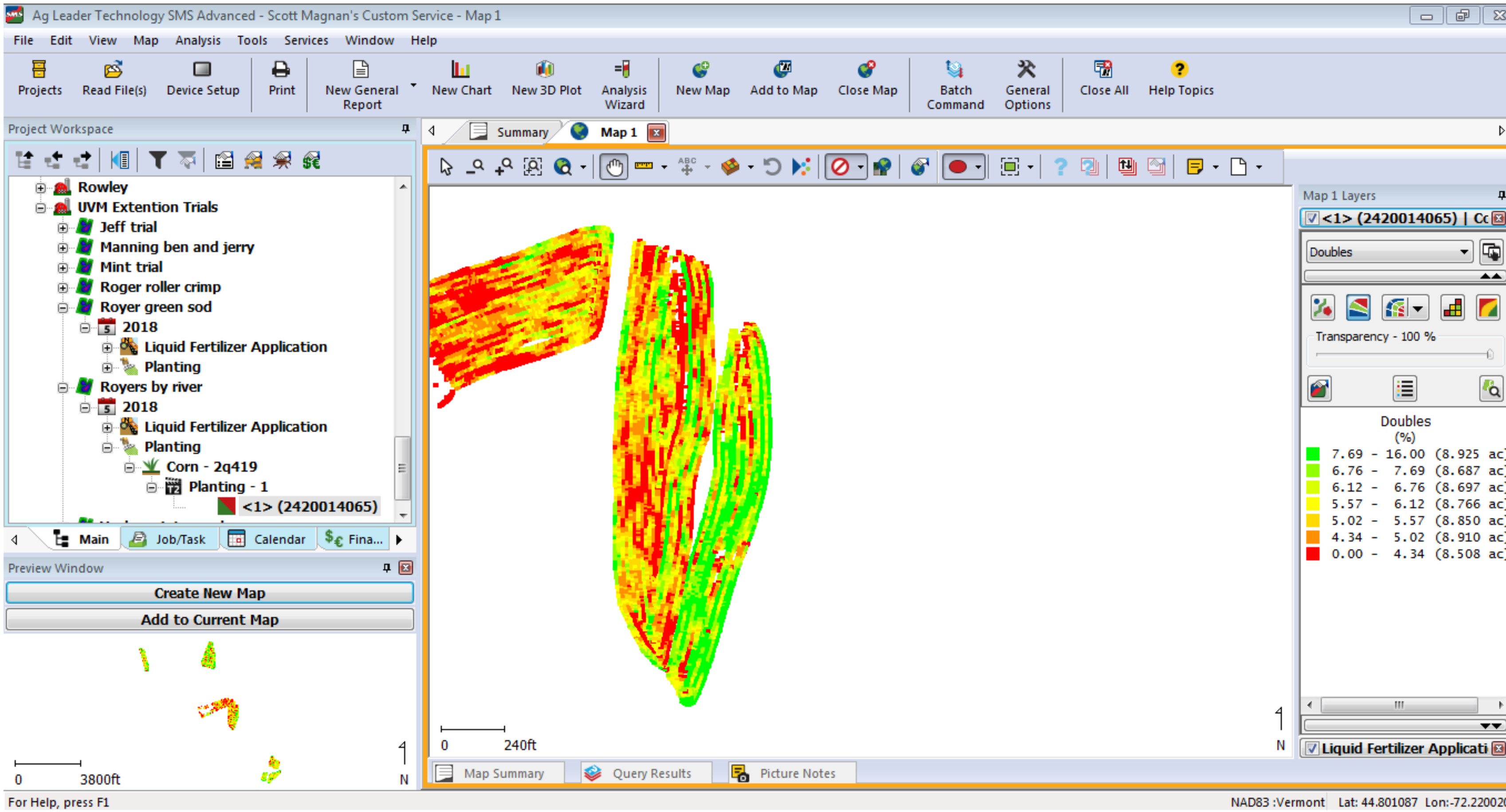
Down pressure applied



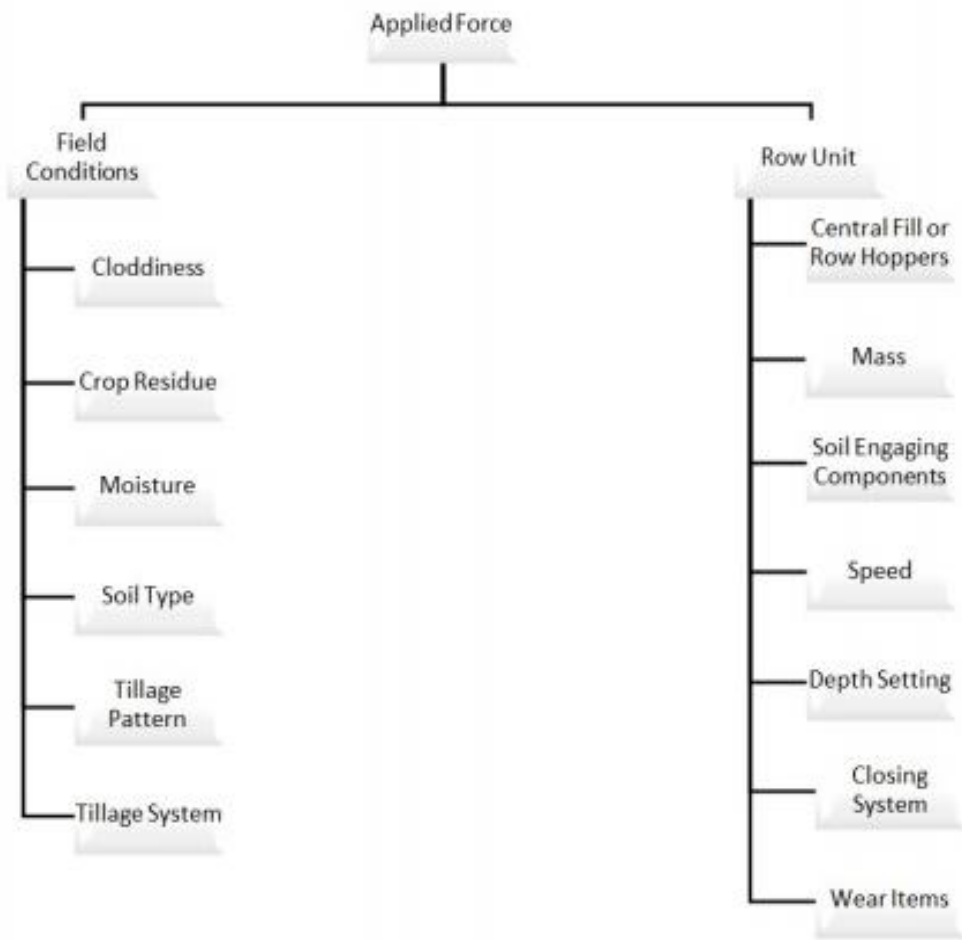
-Planted field road
-Potential soft spot
-Variability in seed bed

-Compaction Map
-Ledge

Doubles map further identifies variability



Consider the two categorical influencers for applied force, the row unit and field conditions. Typically the row unit will be unchanging throughout a planting season, whereas field conditions change seasonally and spatially.



Call comes in "doubles are high and gauge wheel pressure is low across all rows, row six not closing"

Best Management Practices

- Consult with a trusted agronomic advisor to gain an understanding of the impact of seed depth and side wall compaction to the crop being planted.
- Set target depth and begin planting on an intermediate setting. The objective is to achieve and maintain target seed depth at all times without inhibiting root development from over compaction of the seed trench. IMPORTANT: Proper Force is between the extremes of inadequate force resulting in depth loss or excess force resulting in compaction.
- Check for depth loss in areas of the field with the lowest and highest values of applied force.
- If depth is being routinely lost, consider moving to a higher setting.
- If compaction is being routinely observed, consider moving to a lower setting.


When soil health and planter setup are addressed you get positive results

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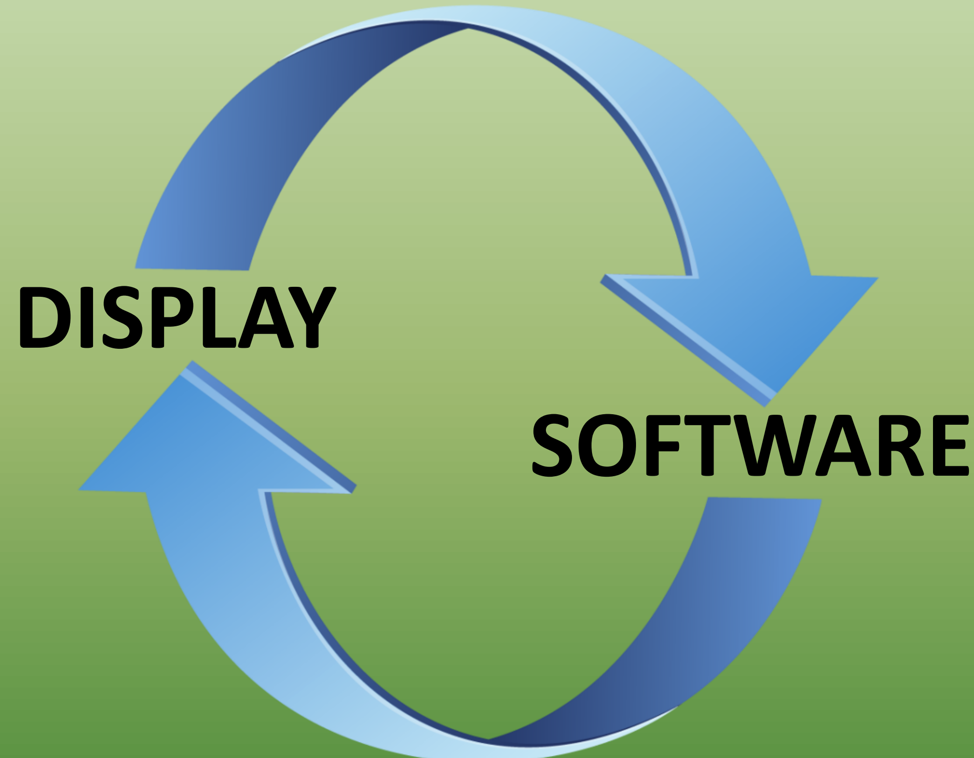
Harvest

Soil profile

Integration/Evaluation/Utilization

Apply well informed rate information to your field based on the data layers you have recorded.

Moving and Managing Data



CAN BE MOVED WITH A USB OR WIRELESSLY

***ASK FOR HELP**

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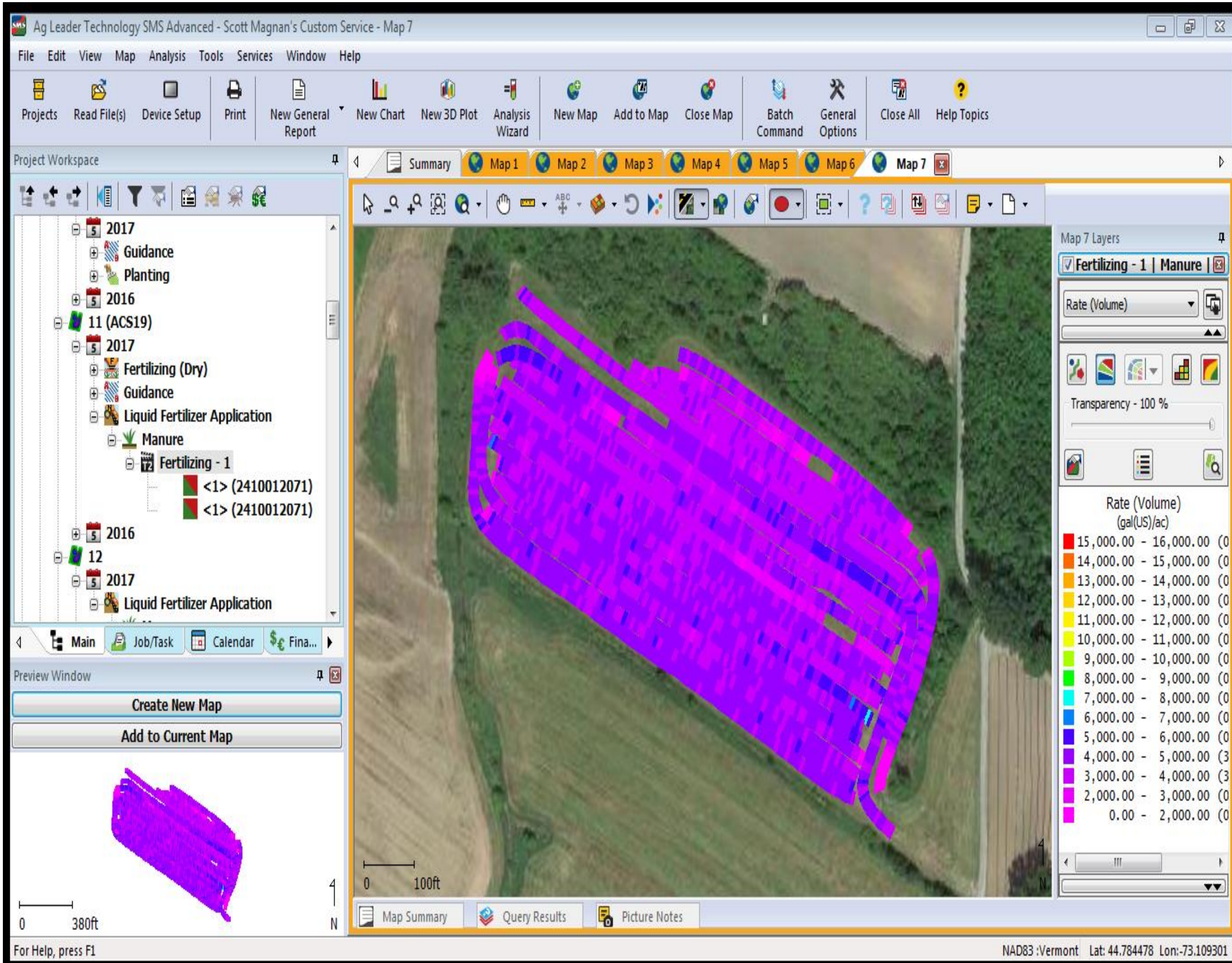

Ag Leader Technology SMS Advanced - Scott Magnan's Custom Service - Map 7
File Edit View Map Analysis Tools Services Window Help
Projects
Read File(s)
Device Setup
Print
New General Report
New Chart
New 3D Plot
Analysis Wizard
New Map
Add to Map
Close Map
Batch Command
General Options
Close All
Help Topics
Project Workspace
2017
Guidance
Planting
2016
11 (ACS19)
2017
Fertilizing (Dry)
Guidance
Liquid Fertilizer Application
Manure
Fertilizing - 1
<1> (2410012071)
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2016
12
2017
Liquid Fertilizer Application
Main
Job/Task
Calendar
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Preview Window
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Add to Current Map
0 380ft
N
Summary
Map 1
Map 2
Map 3
Map 4
Map 5
Map 6
Map 7
0 100ft
N
Map 7 Layers
Fertilizing - 1 | Manure |
Rate (Volume)
Transparency - 100 %
Rate (Volume)
(gal(US)/ac)
15,000.00 - 16,000.00 (0
14,000.00 - 15,000.00 (0
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12,000.00 - 13,000.00 (0
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Map Summary
Query Results
Picture Notes
For Help, press F1
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Quick accurate record keeping

-Increased efficiency when filing reports

-Enhances funding opportunities for your no-till operation

-Provides a tool for sound decision making

Condensed Farm Product Report

Grower : Magnan, Scott

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Field	Area ac	Estimated Amount gal(US)	Average Rate gal(US)/ac	Minimum Date	Maximum Date
11 (ACS19)	8.208	32,789	3,994.9	10/4/2017	10/4/2017
12	0.308	1,356.8	4,411.5	10/4/2017	10/4/2017
15 (ACS18)	8.394	35,904	4,277.1	10/4/2017	10/5/2017
15 (ACS18) Beans	0.048	207.69	4,294.0	10/5/2017	10/5/2017
Mimmo's	5.764	25,866	4,487.6	10/4/2017	10/4/2017
Totals	**22.72**	**96,123**	**4,230.4**	**10/4/2017**	**10/5/2017**
			Average	Minimum	Maximum

Farm: Home
Year: 2017
Operation: Liquid Fertilizer Application
Product: Manure

Field	Area ac	Estimated Amount gal(US)	Average Rate gal(US)/ac	Minimum Date	Maximum Date
2 (ACS35)	6.167	27,572	4,471.2	10/5/2017	10/5/2017
5	1.492	6,903.2	4,626.7	10/5/2017	10/5/2017
6	3.011	10,720	3,560.6	10/5/2017	10/5/2017
7	7.853	34,196	4,354.3	10/5/2017	10/5/2017
Totals	**18.52**	**79,391**	**4,286.2**	**10/5/2017**	**10/5/2017**
			Average	Minimum	Maximum

Farm: Scott's Land
Year: 2017
Operation: Liquid Fertilizer Application
Product: Manure

Field	Area ac	Estimated Amount gal(US)	Average Rate gal(US)/ac	Minimum Date	Maximum Date
17 (ACS14)	0.380	2,999.7	7,896.3	10/5/2017	10/5/2017
19	7.330	32,265	4,402.0	10/4/2017	10/5/2017
20 (ACS15)	4.357	19,246	4,417.1	10/4/2017	10/4/2017
21	5.534	24,764	4,475.0	10/4/2017	10/4/2017
Totals	**17.60**	**79,274**	**4,504.1**	**10/4/2017**	**10/5/2017**
			Average	Minimum	Maximum

Weed Control

Liquid application tools provide exact rate control and automatic shutoff of product.

Steering control for application of products as well as improved efficiency and accuracy when using cultivation tools

Herbicide Application

Liquid application receives flow rates from a flow meter signal and then applies a target rate that is generally controlled by pump speed. Shutoffs are in place, so the sprayer shuts off automatically anytime the boom overlaps, minimizing overuse of chemicals. * Rates match the label on the herbicide product.

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In this photo a steering system was used while planting and again when cultivating using a flat cultivation point for minimal soil disturbance and weed control

Drainage-TILE PLOW

A tile plow uses an RTK signal to control the tile plow vertically, and a signal to run a straight line horizontally, providing a service for modern-day system tiling.

Crop Sensors

- Not often found in Vermont but perhaps part of our future, crop sensors collect NDVI data at the field level, drone or plane level and from space.

- NDVI crop sensors, bounce light off a crop and measure the reflective properties of the crop, algorithms are developed using the data to reference crop health, and to determine the nutrient needs of the crop on the go.

- Nitrogen is currently the only nutrient we have algorithms for to my knowledge, however ongoing research and development in this area is underway.

HARVEST

Yield Data

Common on combines and found locally on some choppers, Yield monitoring is a very important to piece in fully utilizing all the precision tools on your farm. With that data we gain the ability to identify gains and drops in yield. From there field improvements can be made, equipment issues identified, and plans can be made to utilize inputs as efficiently as possible.

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Field Trials

Soil sample data layer

Query tools

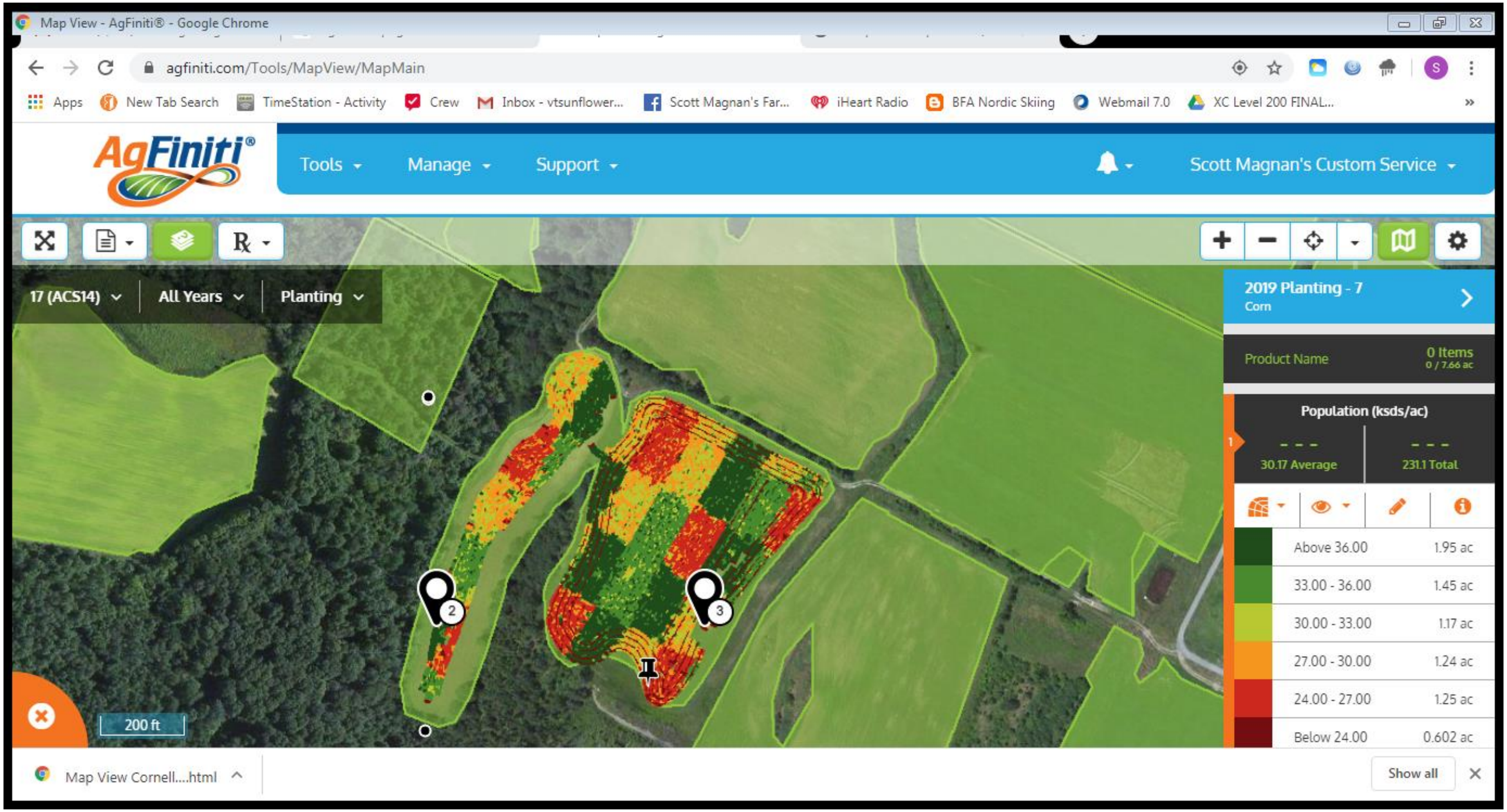
Advisor meetings

Farm based decision

leveraged negotiating

Apply well informed rate information to your field based on the data layers you have recorded.

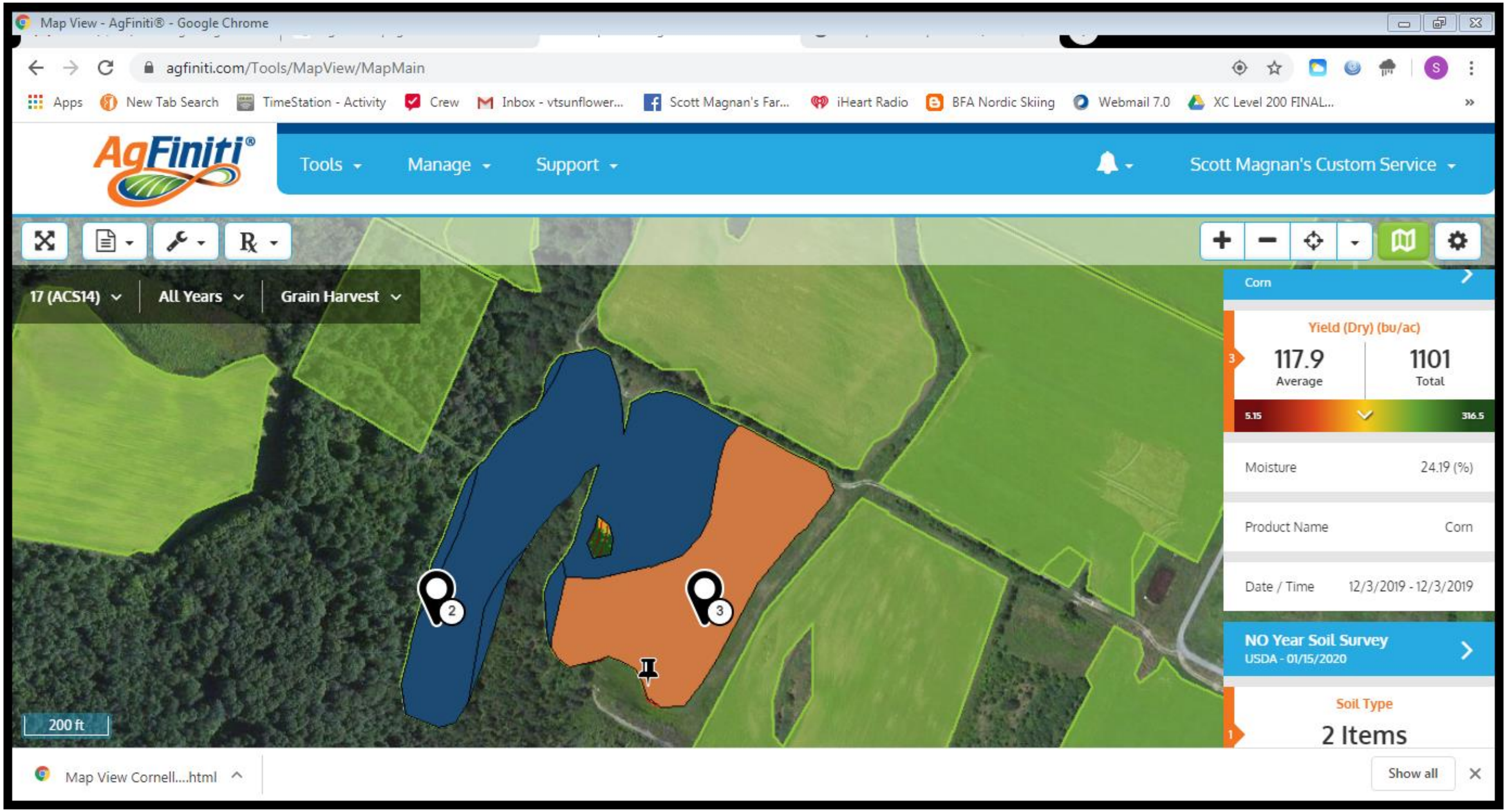
2019 Variable rate planting trial



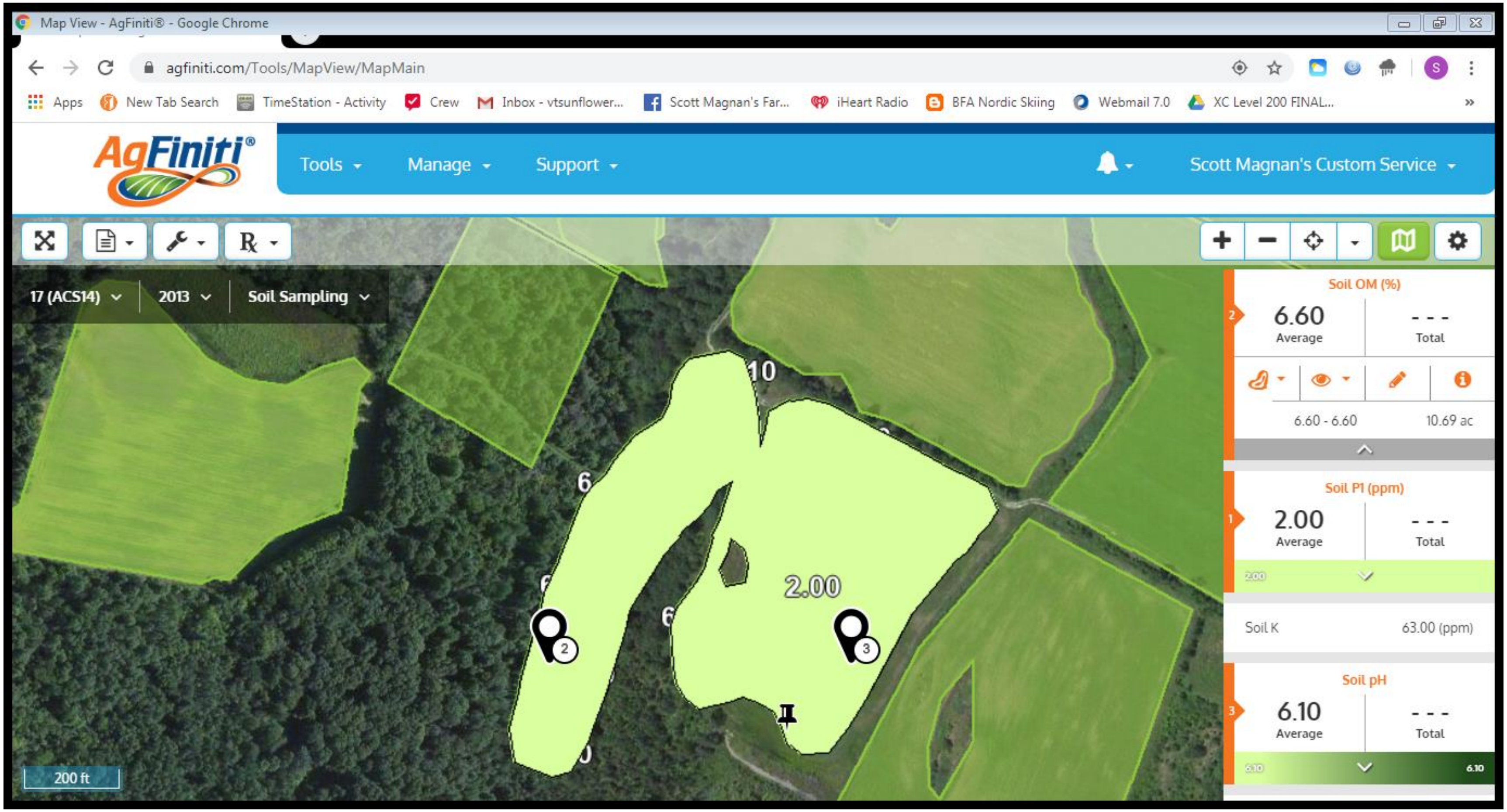
2 soil types within the field

Lordstown- well drain loam

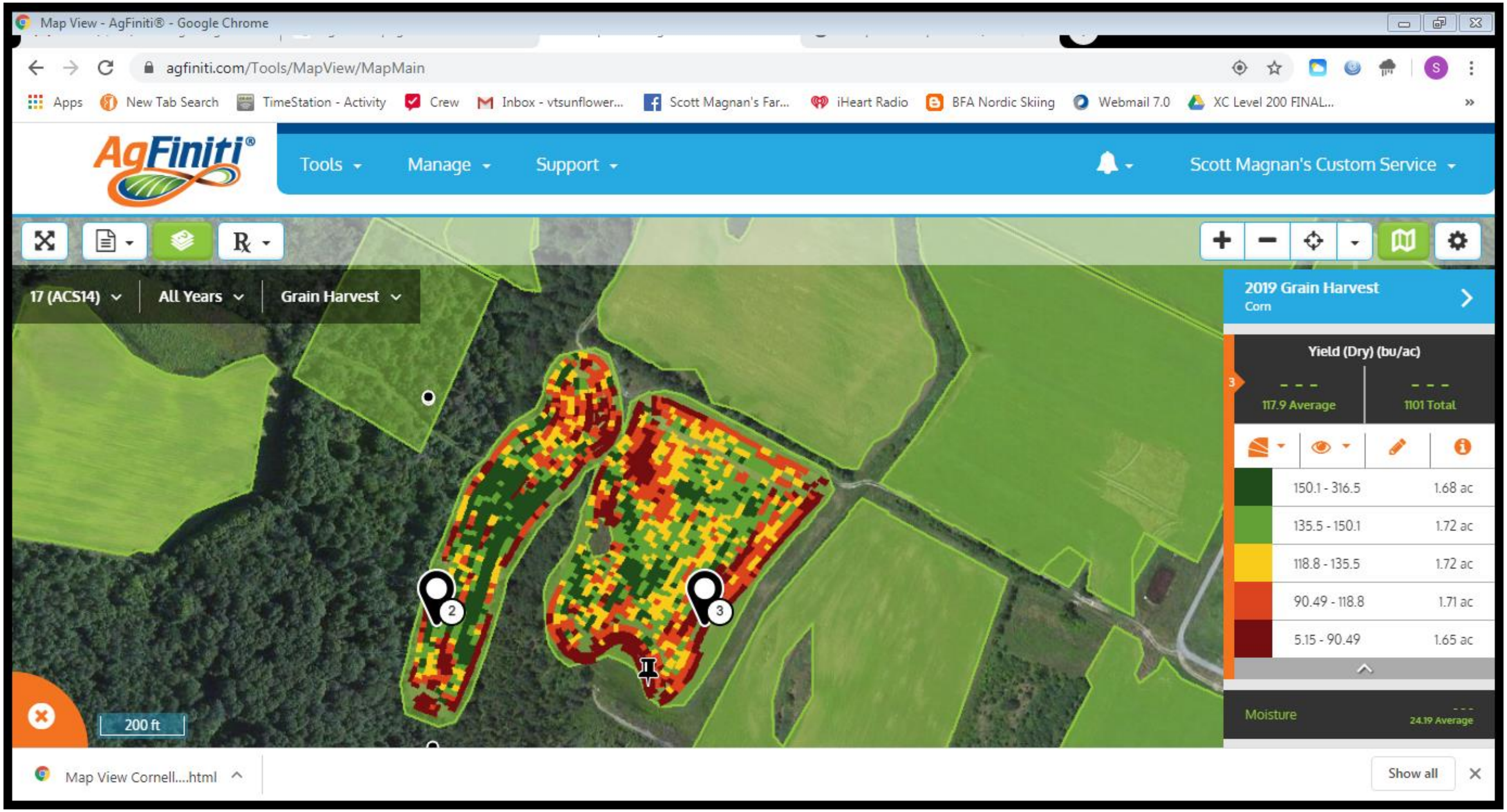
Massena-Poorly drained heavier soil



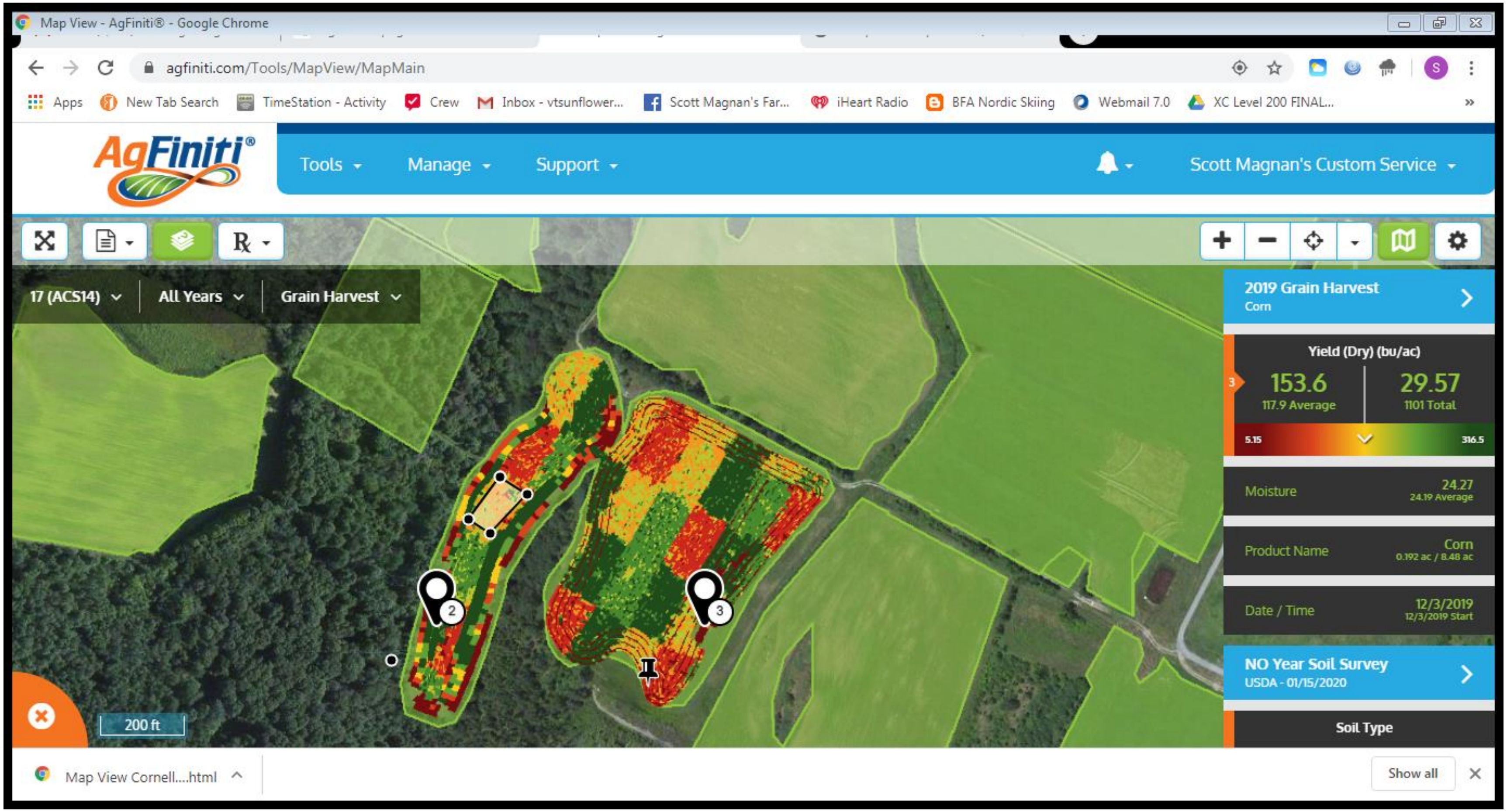
Soil sample layer-Low fertility-2020 goal create 3-4 sample points



2019 yield data



Winner!
Why?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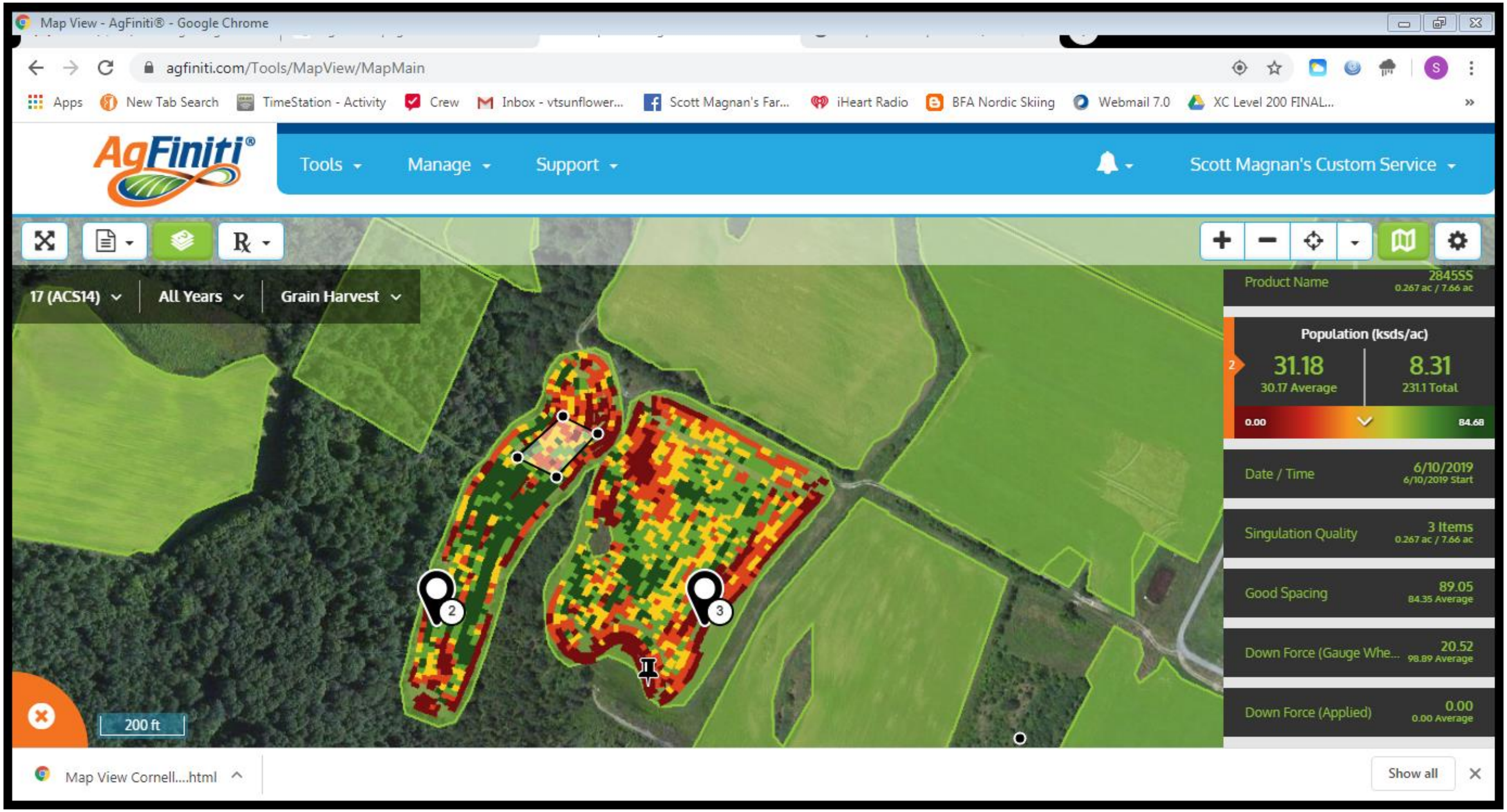
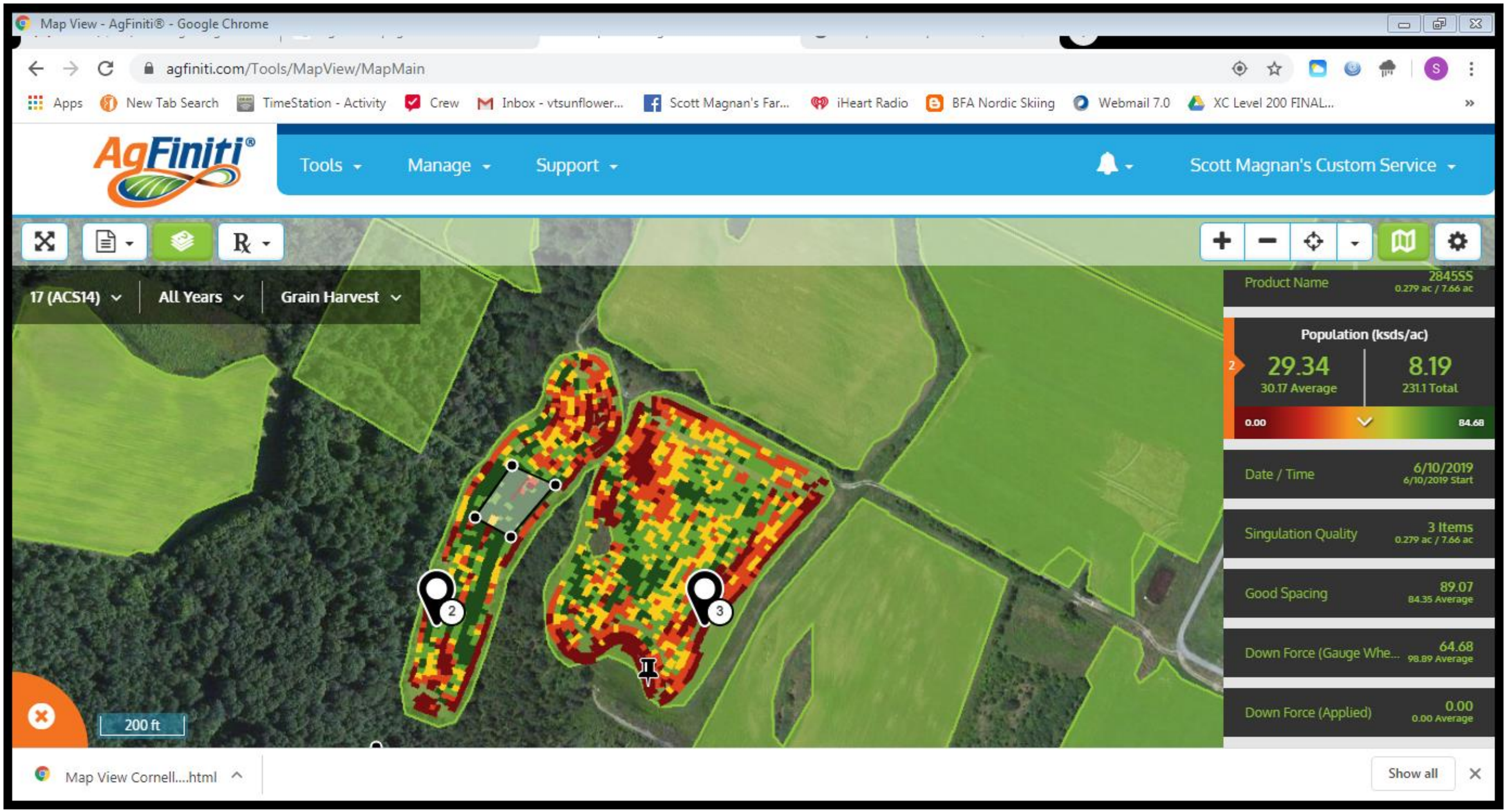
New Tab Search
TimeStation - Activity
Crew
Inbox - vtsunflower...
Scott Magnan's Far...
iHeart Radio
BFA Nordic Skiing
Webmail 7.0
XC Level 200 FINAL...
AgFiniti®
Tools
Manage
Support
Scott Magnan's Custom Service
17 (ACS14)
All Years
Grain Harvest
2019 Grain Harvest
Corn
Yield (Dry) (bu/ac)
153.6
117.9 Average
29.57
1101 Total
5.15
316.5
Moisture
24.27
24.19 Average
Product Name
Corn
0.192 ac / 8.48 ac
Date / Time
12/3/2019
12/3/2019 Start
NO Year Soil Survey
USDA - 01/15/2020
Soil Type
200 ft
Map View Cornell....html
Show all

Was population the key factor?

Down pressure 20.52lbs Yield 117b/u



Down pressure 64.68lbs Yield 153BU



Corn

Soil Type	Yield (Dry) (bu/ac)	Moisture (%)	Area (ac)
Lordstown	123.9	24.26	5.25
Massena	116.7	23.77	3.22
Total	**121.2**	**24.07**	**8.47**

Corn			
Population (ksds/ac)	Yield (Dry) (bu/ac)	Moisture (%)	Area (ac)
Below 24.00	100.1	23.83	0.861
24.00 - 27.00	117.6	23.78	1.59
27.00 - 30.00	125.6	23.94	1.13
30.00 - 33.00	127.1	24.04	1.45
33.00 - 36.00	134.3	24.25	1.32
Above 36.00	124.8	24.24	1.29
Total	**122.7**	**24.02**	**7.63**

Progression timeline

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Manure application monitoring for example

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Management changes
Prioritization
Prescriptions

WE NEED TO UNDERSTAND VARABILTITY

Precision ag gives us the tools to identify it, from the tractor seat, from the office, truck, or at home, and the ability to share that information with a TSP

Form a plan to manage those zones, prioritize

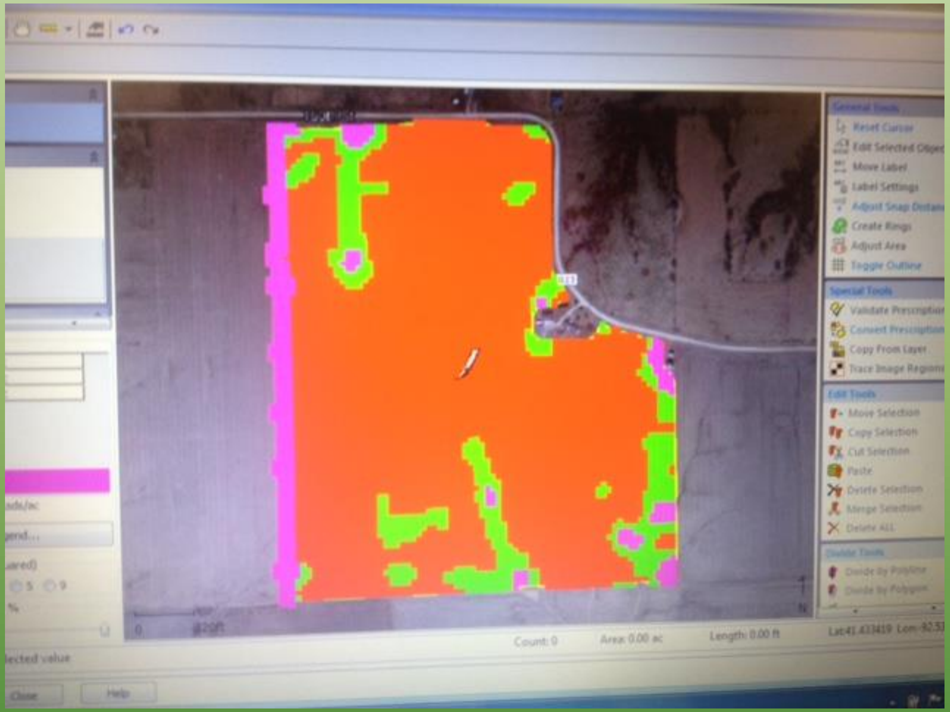
Examples:

Problem	**Potential solution**
Compaction	Planter setup, tillage, Cover crop Variety
Soil Moisture	Drainage
Hybrid performance	Seed variety/rate, Field operation timing
Soil type	Crop selection, seed rate
Shade	Trim field edges for firewood
Fertility	Rate selection, product type

PRESCRIPTION WRITING

Map predetermined rates for seeding, fertilizing and manure application using a software program.

Base the prescription on a variety of map layers and previously recorded data.



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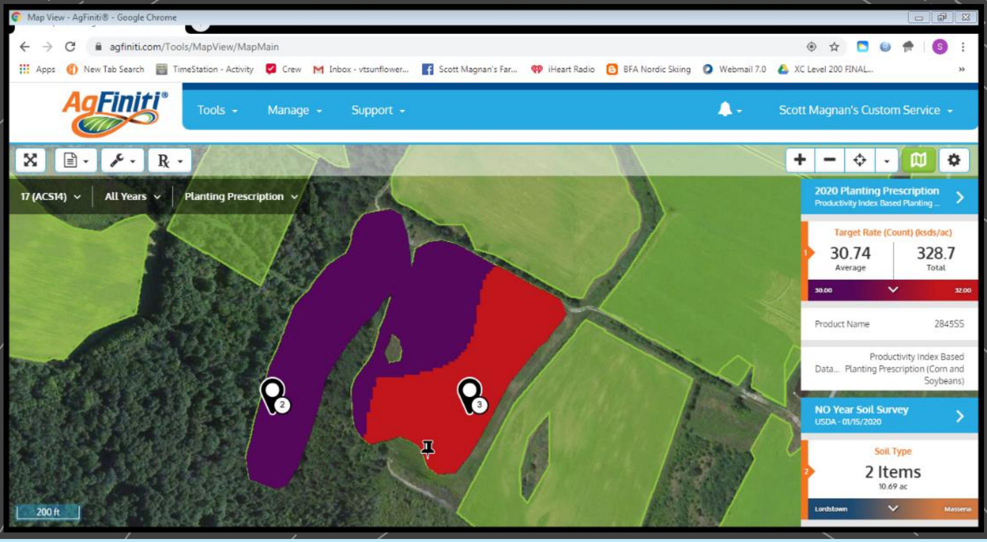
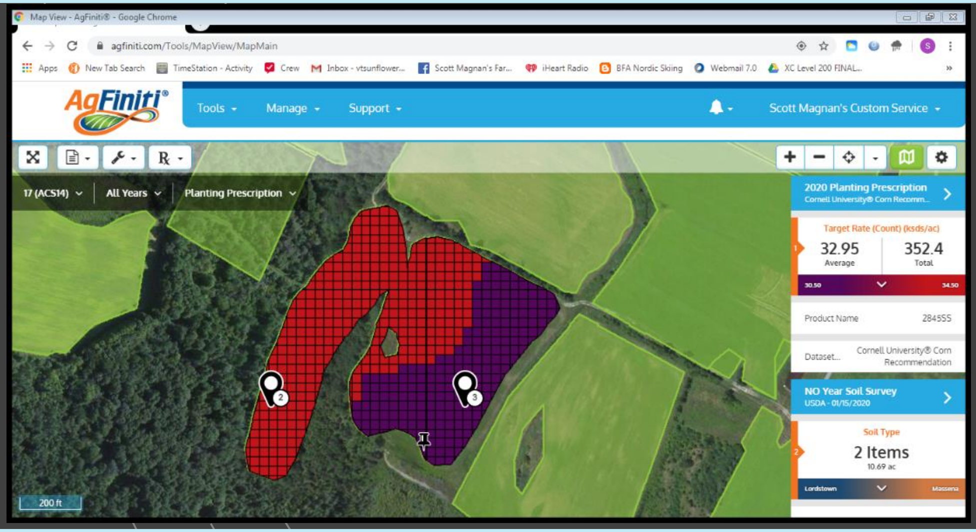
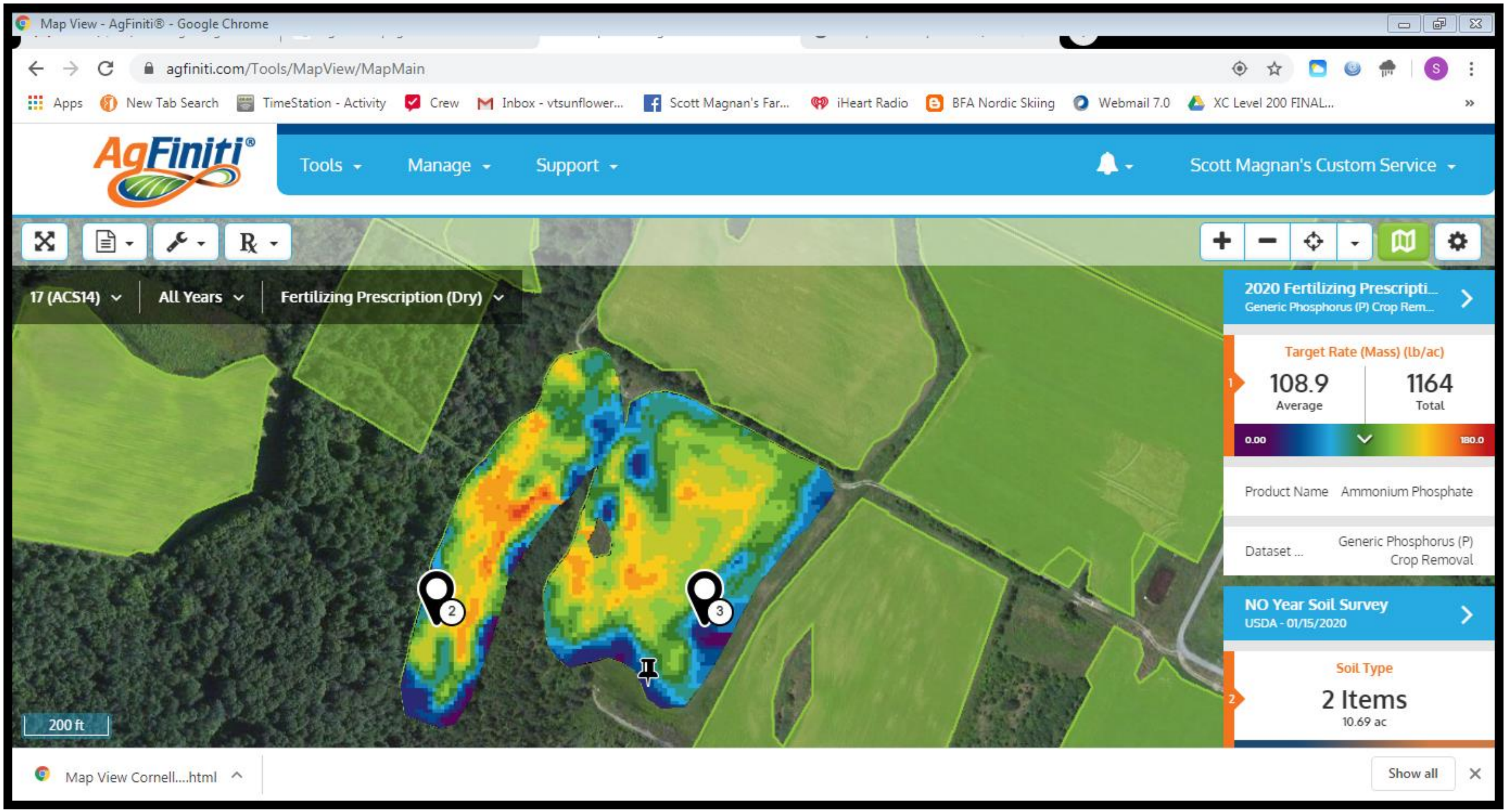


Productivity Index Based Planting Prescription (Corn and Soybeans)
This equation calculates a ratio between Grain Harvest data for corn and soybeans and the National Commodity Crop Productivity Index (NCCPI) from United States Soil Survey data, and helps you create three management zones to apply different planting rates for corn or soybeans.



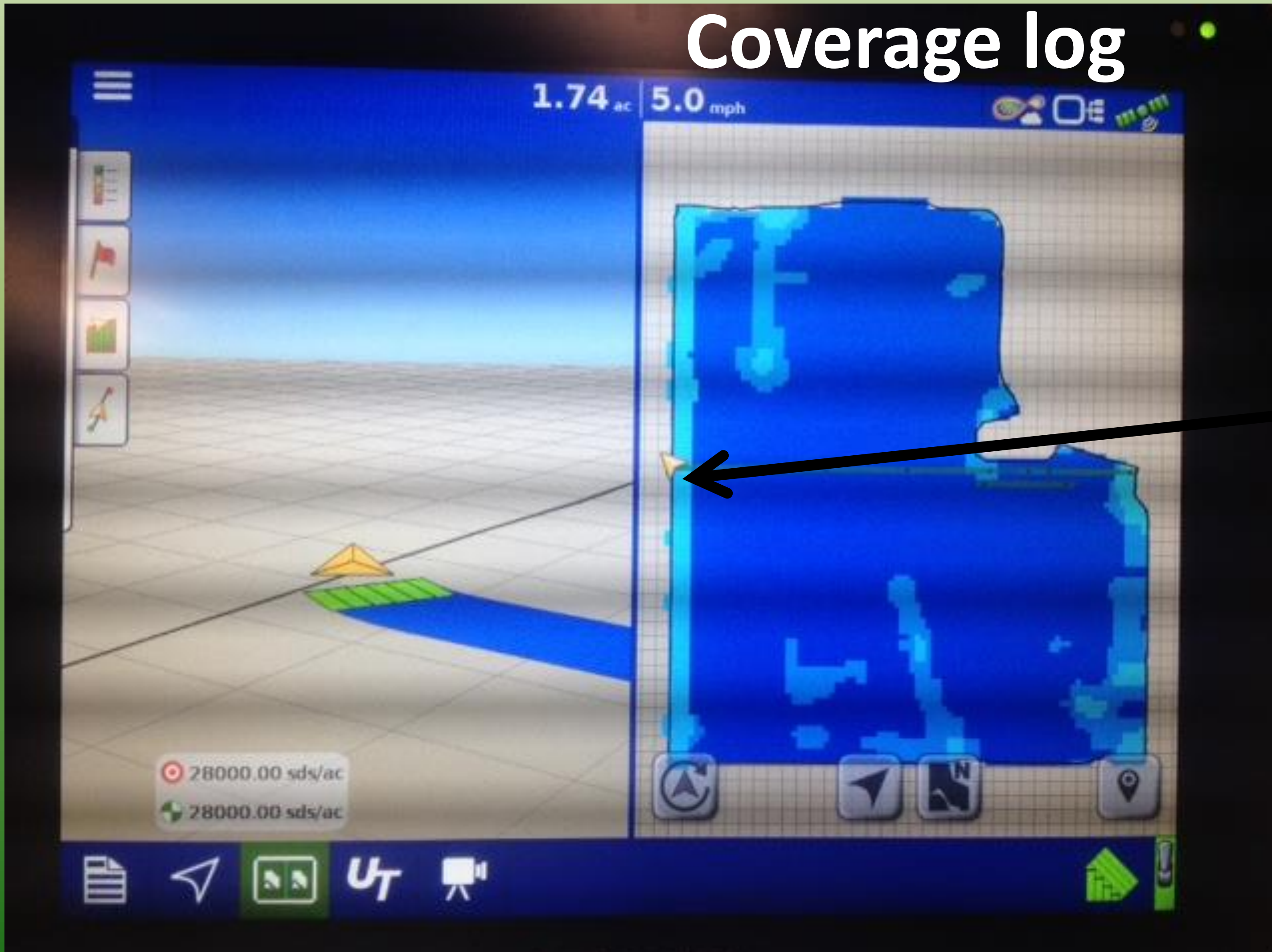
Cornell University® Corn Recommendation
This equation calculates how much corn to plant based on desired harvest population, soil survey information, and location of installed tile.

2020 Fertilizer P Prescription based off 2019 crop removal



Variable rate fertilizer application

APPLY THE PRESCRIPTION TO THE FIELD



Arrow shows direction traveled

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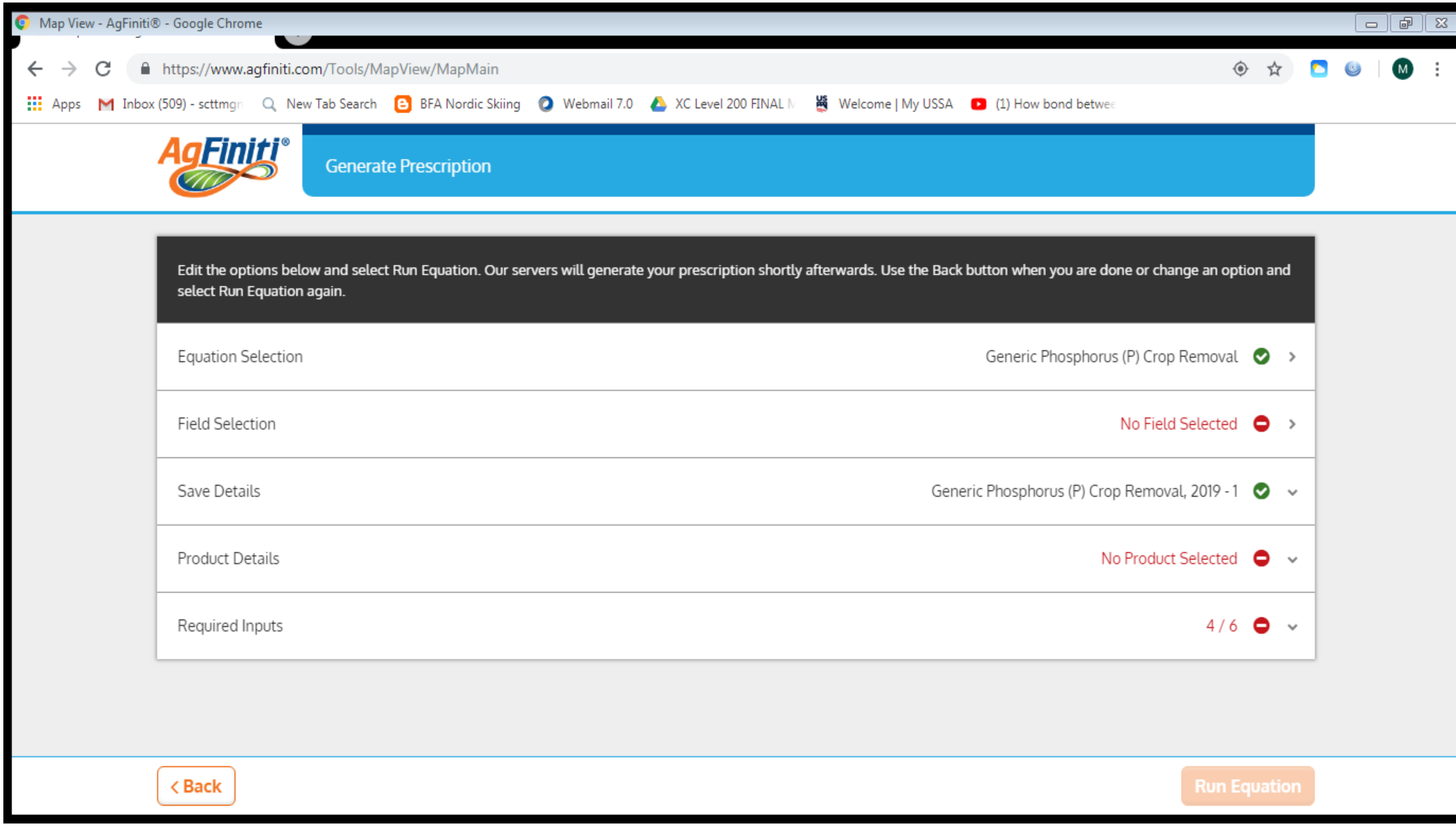
Increasingly easier access



Questions?

Visit us this afternoon for a more in depth look and discussion on Precision Agriculture

-Farmer Stories and conversation

How farmers have prioritized there first purchase and why

How do we put the data into action in the field to improve our no till operation, what tools do we need for the job

-Planter row unit discussion

-Display Demo

-Software and Cloud programs

-Interactive use of the Agfiniti program

-Data Sharing

-Planter row unit discussion

-Display Demo

-Fact checking WIFI limitations

- Scott Magnan
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- Phone (802) 363-7707