Articulating our knowledge

Gary Wagner

January 8-10, 2013

Agvise Seminar

Adoption Advise

Welcome to AgTalk

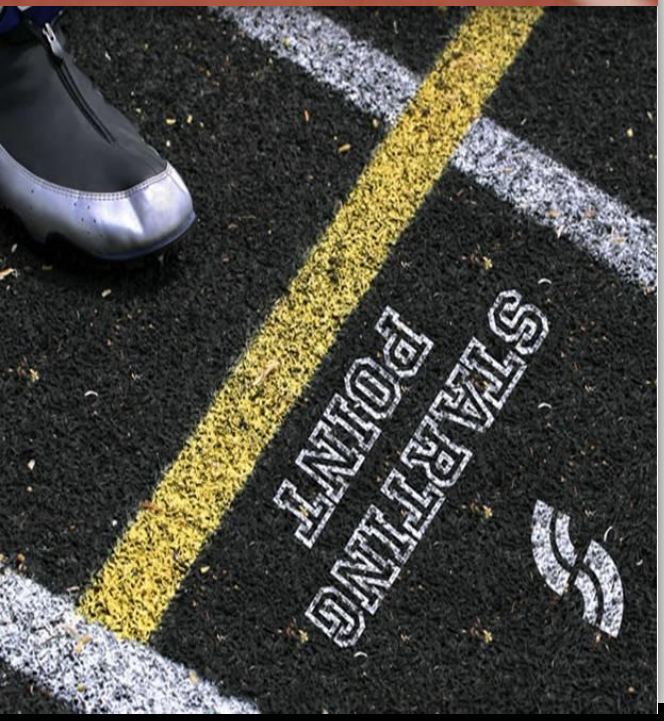
http://talk.newagtalk.com

Forums List

	Forum name	Threads	Messages	Last p
	Machinery Talk Equipment operation, repair, & hints	155037	1209461	Re: 15" S… > 12…
	Crop Talk Crops & cropping practices	44005	405036	Re: Acquiri… > 12/27/…
	Stock Talk Livestock Related Discussions	11808	104921	RE: B… > 12/27/2…
	AgTalk Cafe A Polite Place to Meet and Talk	27146	296196	Re: Wish… > 12/27/20…
	Kitchen Table Discussions of family, hearth and home	3381	33565	Re: putt… > 12/27/201…
	Computer Talk Computer and software questions, answers, & hints	7526	41284	Re… > 12/2…
	Precision Talk Precision-Ag equipment and operation	24576	133576	Re: … > 12/2…
	Market Talk Marketing thoughts and discussions	17063	160909	Yes, good… > 12/27…
	Test Forum Use this board for testing and Learning	9178	11554	Safe… > 12/26/20…
FAQ	**FAQ & Support** Forum Questions and Help	653	2222	Re… > 12…

- *"If the system doesn't work it isn't worth anything"*
  - No matter how much you paid for it
- *"Find a good dealer that will provide service on the equipment after the sale"*
  - It's only as good as the dealer that sell it
- *"EDUCATION is very important"*
- *"Keep updated on the industry and be aware of what is available"*
- *"Keep equipment purchases separate from software needs for ultimate flexibility"*
  - The real value is in YOUR brain

awg Precison Ag



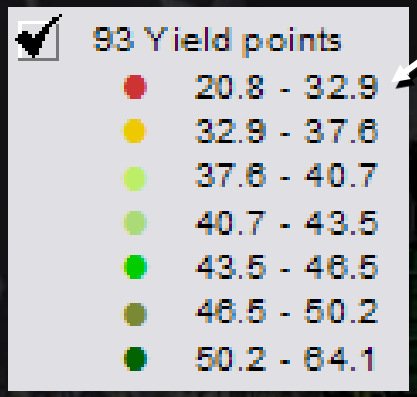
My Experience

approaching 20 years

- Which Precision Farming practices have benefited my farm the most…
- How I make this stuff *(precision ag tools)* pay / work…

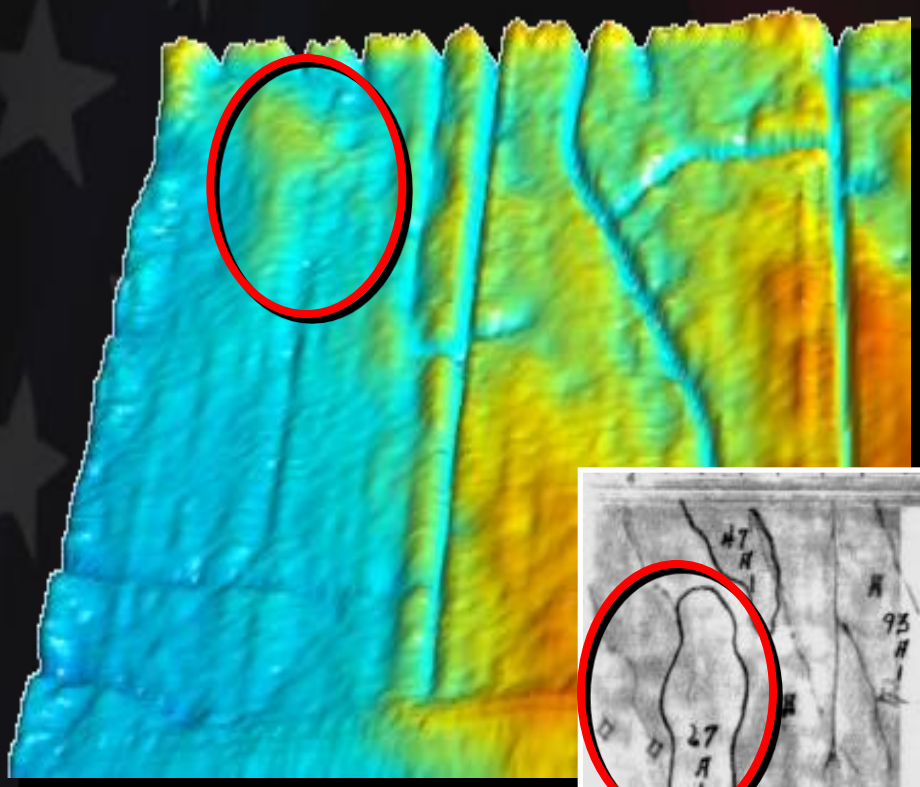
First Experience at Interpretation

1993

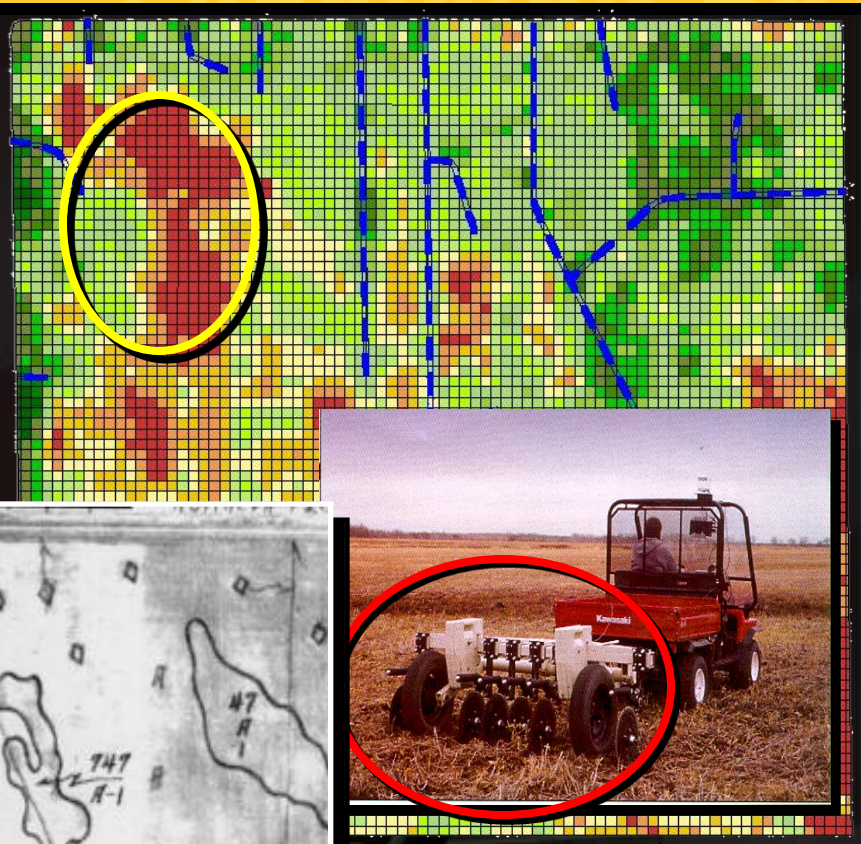


160 acres

June 1997 Color Aerial Image



Topography

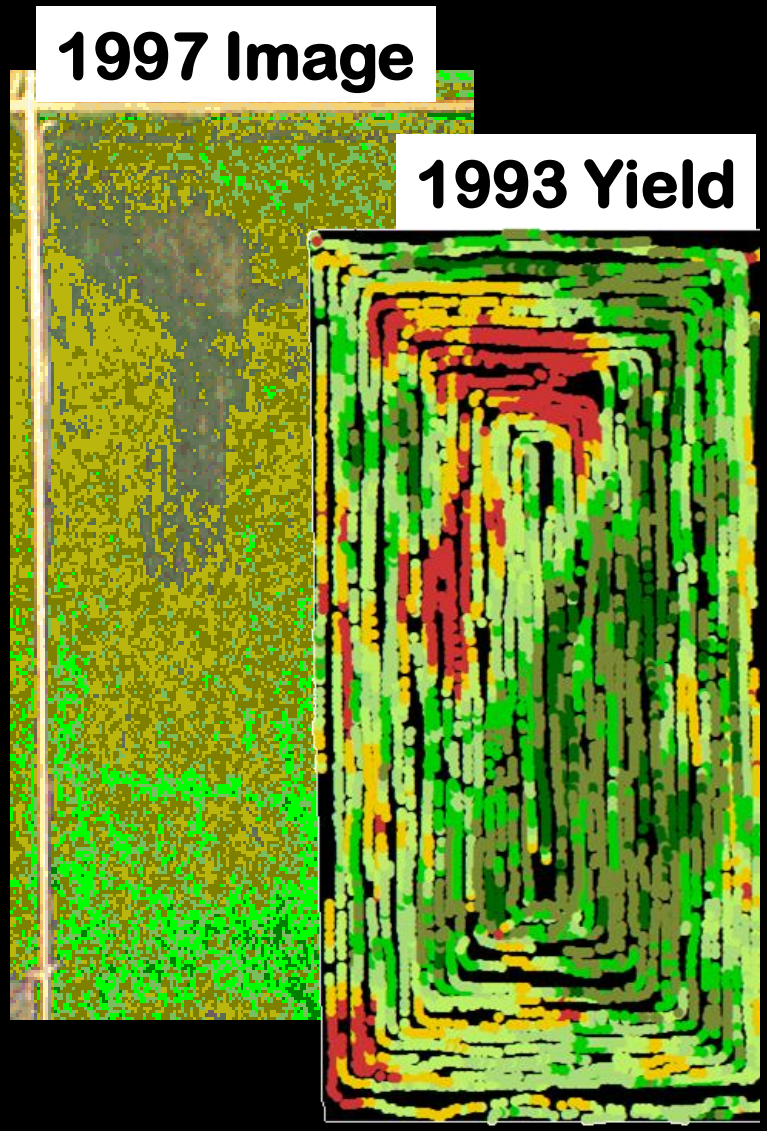


Soil Texture

Soil Survey

Other Technologies

Other technologies to confirm analysis



- Soil Survey
- Soil Texture
  - Electrical conductivity
- Topography
- Image from 1981
- Ground Truthing

Moisture Stress

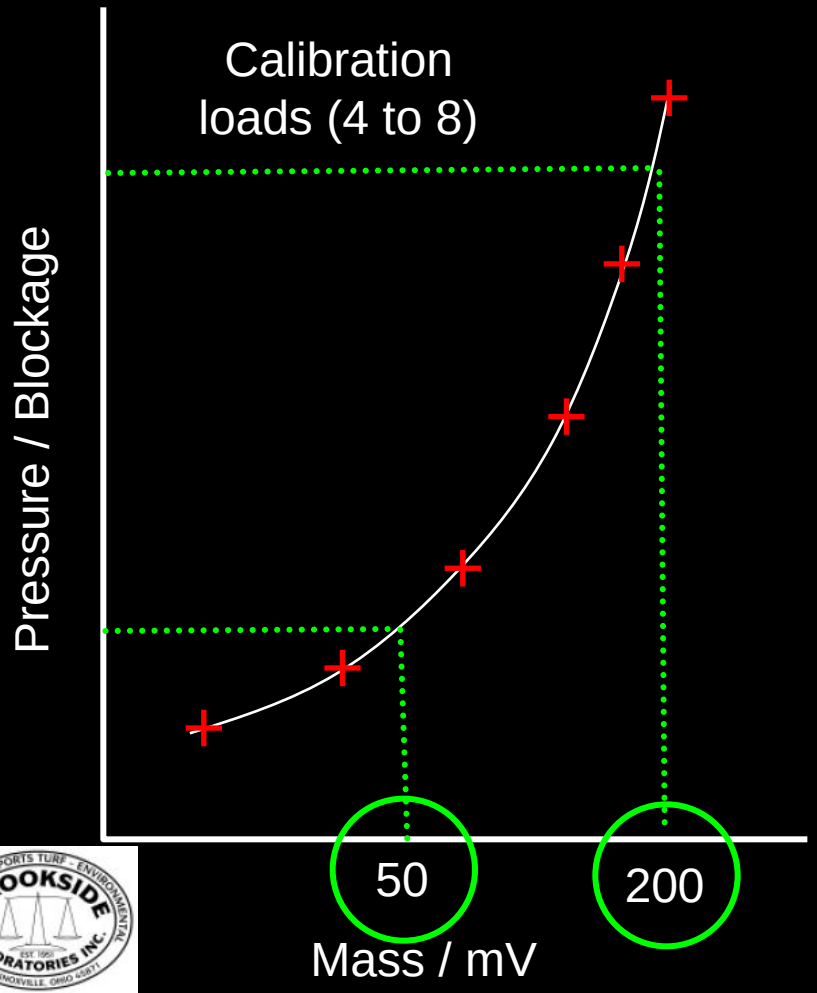
8 Most Important Yield Factors on Our Farms

1. Drainage
2. Crop Variety
3. Insect / Weeds problems
4. Crop Rotation
   - Tillage
   - Compaction
   - pH
5. Herbicides
   - Subsoil condition
7. Fertility placement
8. Fertility
6. Plant population

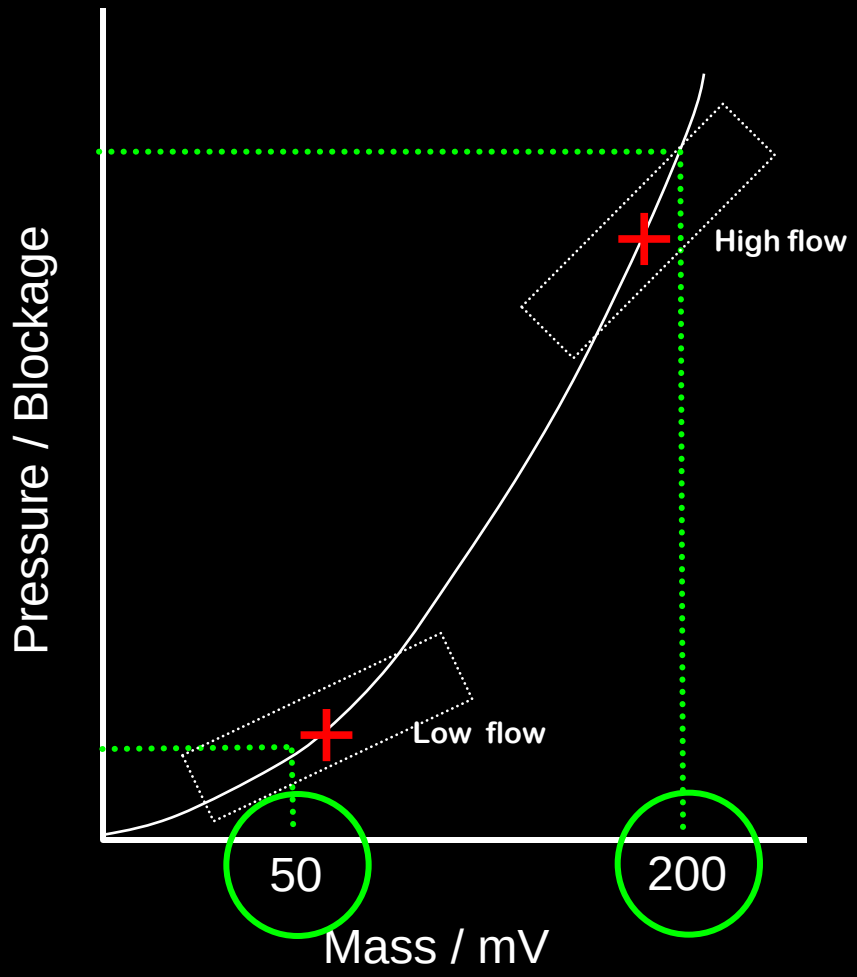
The Starting Point "Yield Mapping"

Proper Yield Monitor Calibration

Ag Leader, Case, AGCO (current)



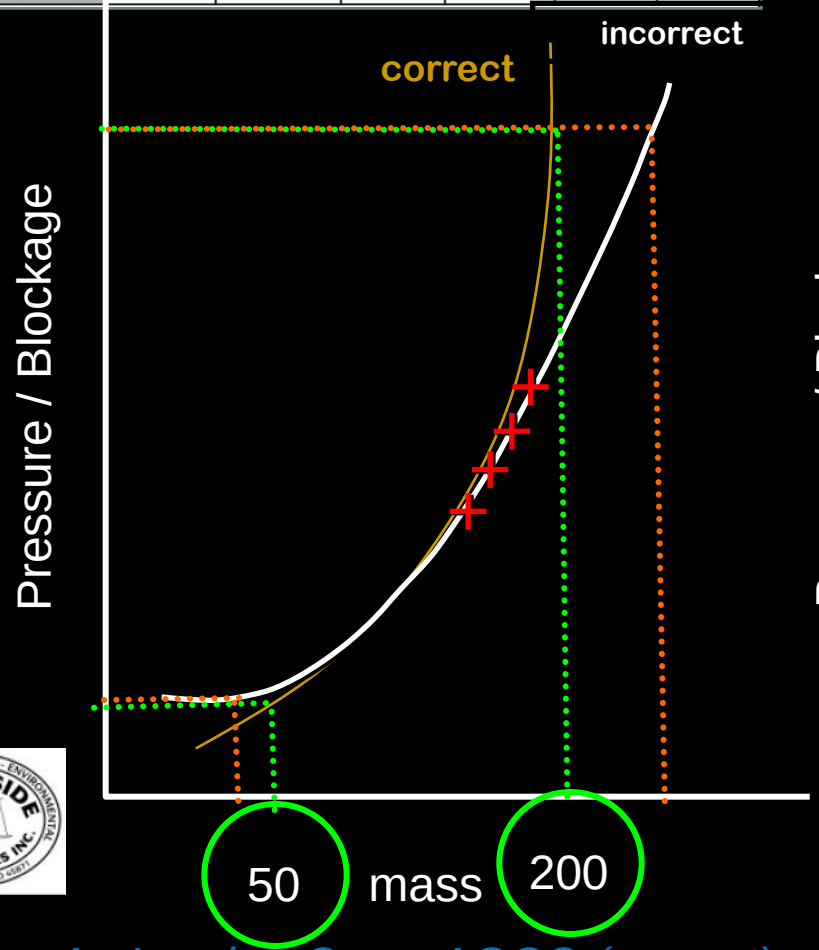
John Deere



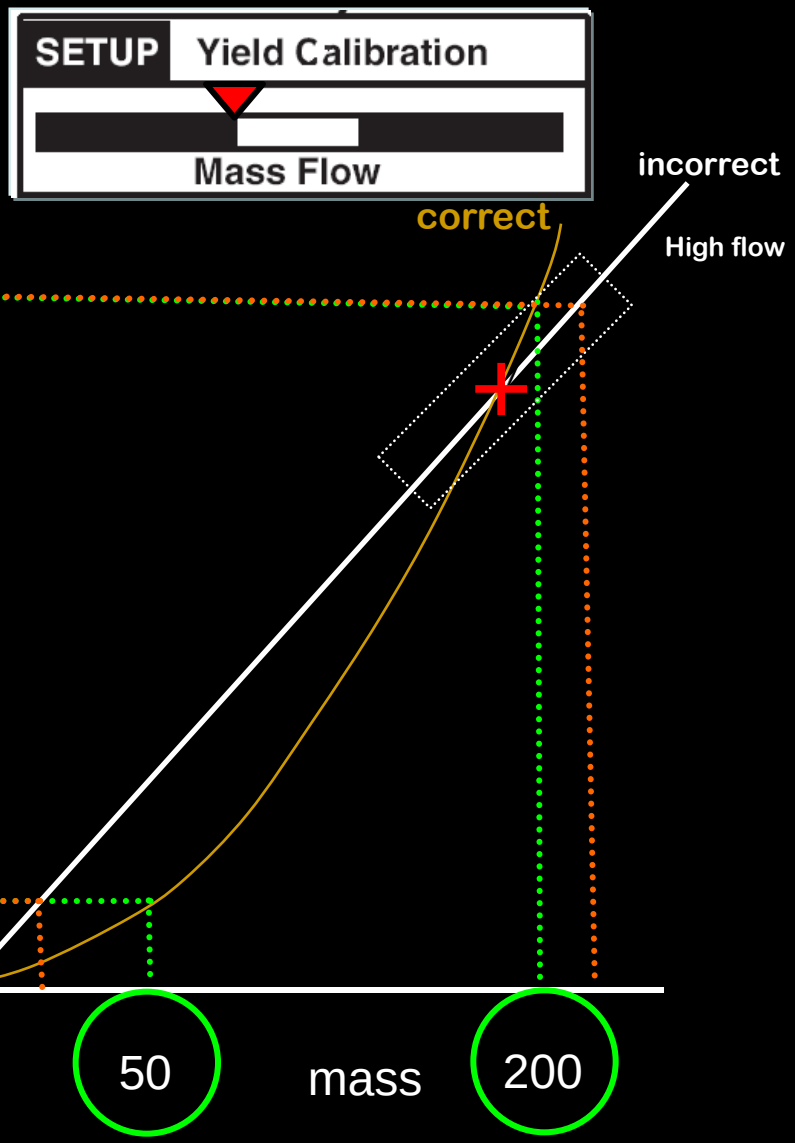
Improper Calibration

Example Calibration loads (Ld) with varying speed (S) or swath width (SW):

	Ld 1	Ld 2	Ld 3	Ld 4	Ld 5	Ld 6
S (mph)	5.0	4.5	4.0	3.5	3.0	2.5
SW (rows)	6	5	4	3	2	1



Ag Leader, Case, AGCO (current)



John Deere

Grain Cart with Scale

- Allow to calibrate quickly and <u>often</u>
  - Allows to collect at different flow rates
    - Loads between 3,000 and 6,000 lbs
- Calibrate for each crop; <u>*each year*</u>
  - Also for different moisture ranges
    - *Dry crop vs. Wet crop*
      - *8 to 11% beans vs. 13 to 18% beans*
      - *Dry corn vs. wet corn*
- For John Deere combines
  - 3 <u>*normal*</u> / <u>*low flow*</u> calibrations and average the values

Yield Monitor Accuracy

AWG Farms

Spring Wheat

Year	Harvested bushels	Gross Error *	Net Error *	Acre Error	Acre %
2006	93,573.0	97.86%	100.23%	43.2	2.519%
2007	109,237.4	97.15%	99.14%	38.3	2.364%
2008	137,306.6	97.83%	98.97%	58.6	3.248%
2009	142,617.7	98.20%	101.36%	4.7	0.270%
2010	127,982.6	98.57%	100.17%	8.3	0.502%
2011	106,718.0	98.75%	99.94%	66.9	3.719%
	719,435.3	1.93%	-0.019%		

Swath control

2 Combines

* *Base on crop delivered to elevator*

Yield Monitor Accuracy

AWG Farms

Soybeans

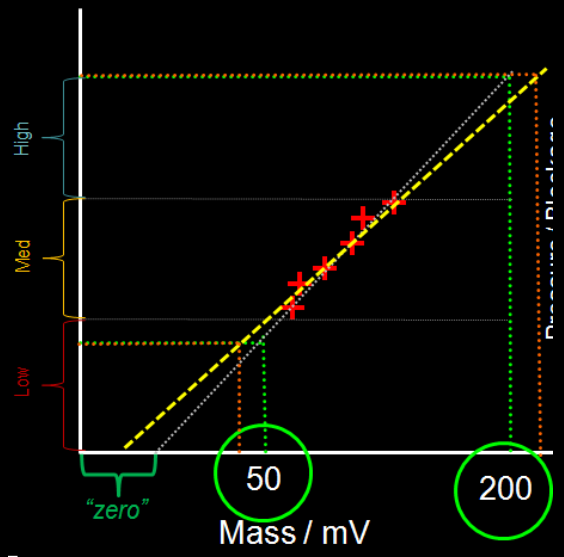
Year	Harvested bushels	Gross Error *	Net Error *	Acre Error	Acre %
2006	38,859.9	98.35%	99.33%	21.6	1.79%
2007	58,641.9	97.71%	98.69%	18.7	1.43%
2008	48,871.4	97.02%	97.99%	19.1	1.23%
2009	42,246.3	96.11%	97.01%	5.9	0.40%
2010	68,187.3	98.72%	99.98%	5.1	0.29%
2011	76,506.6	99.35%	100.14%	16.4	16.43%
	333,313.4	-1.90%	-0.97%		

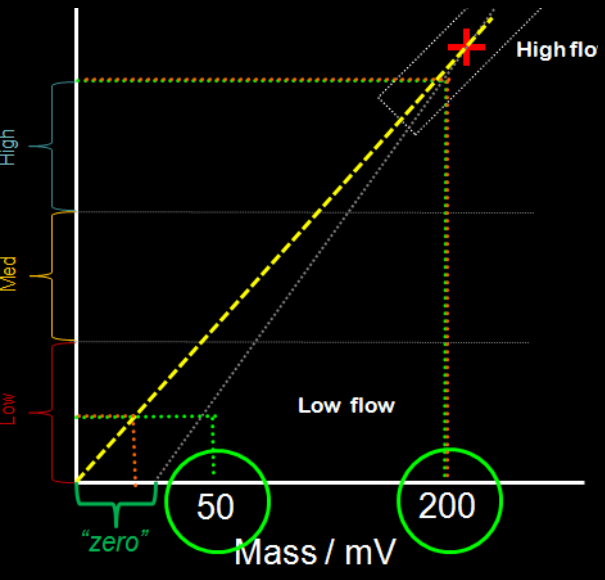
Swath control

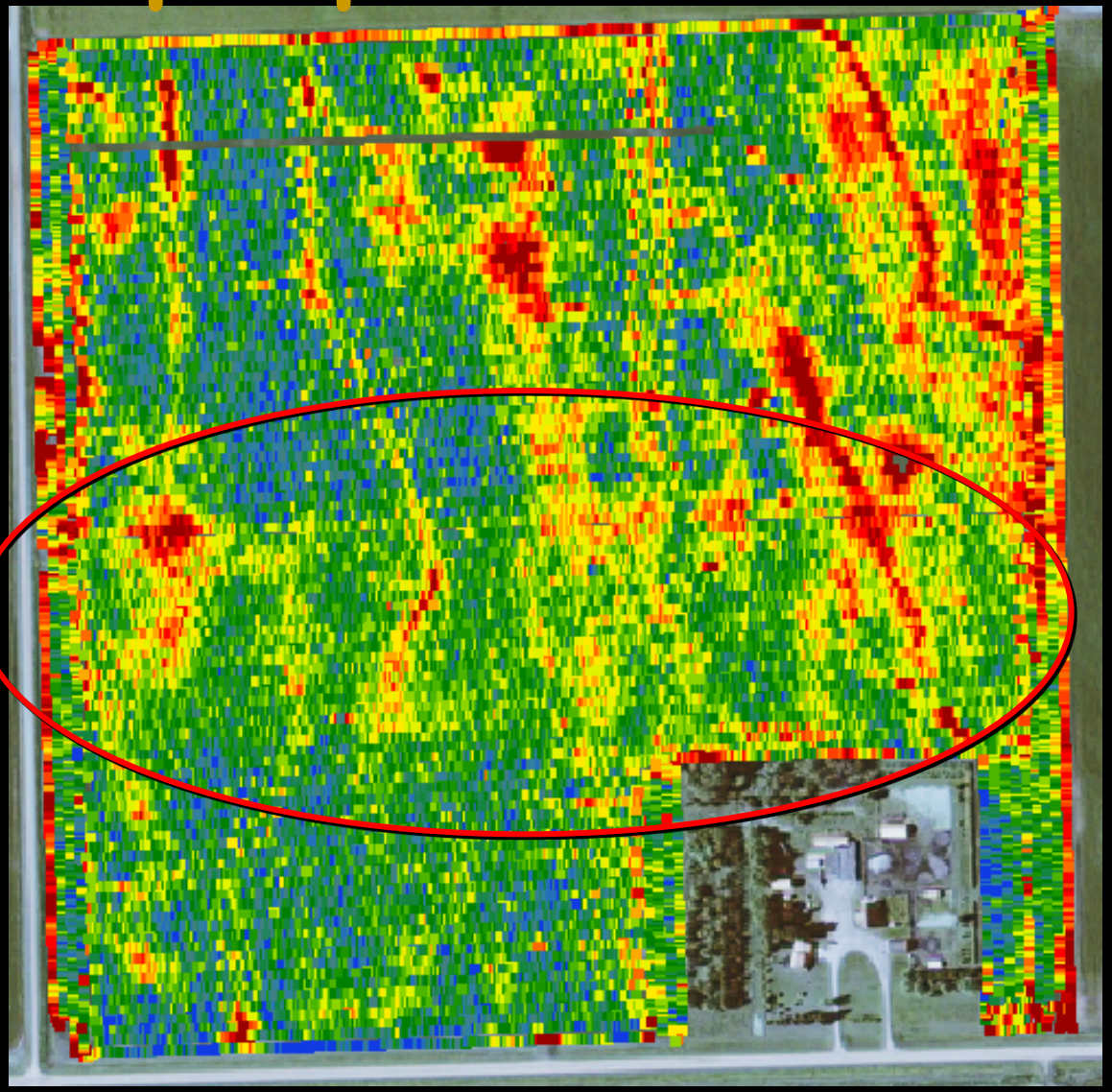
2 Combines

* *Base on crop delivered to elevator*

Improper Calibration

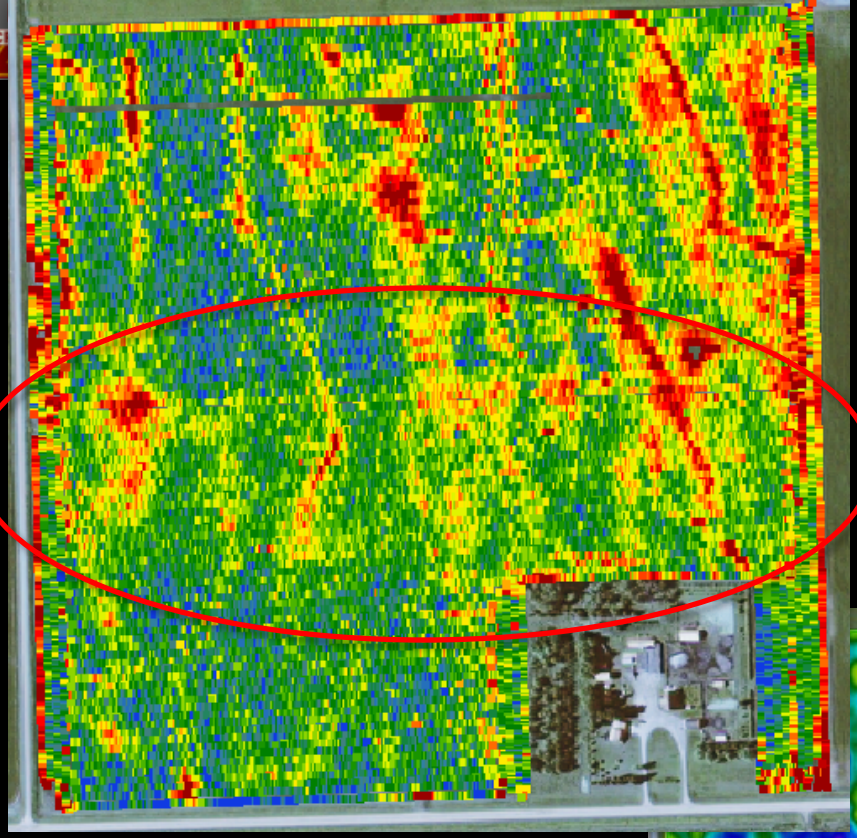




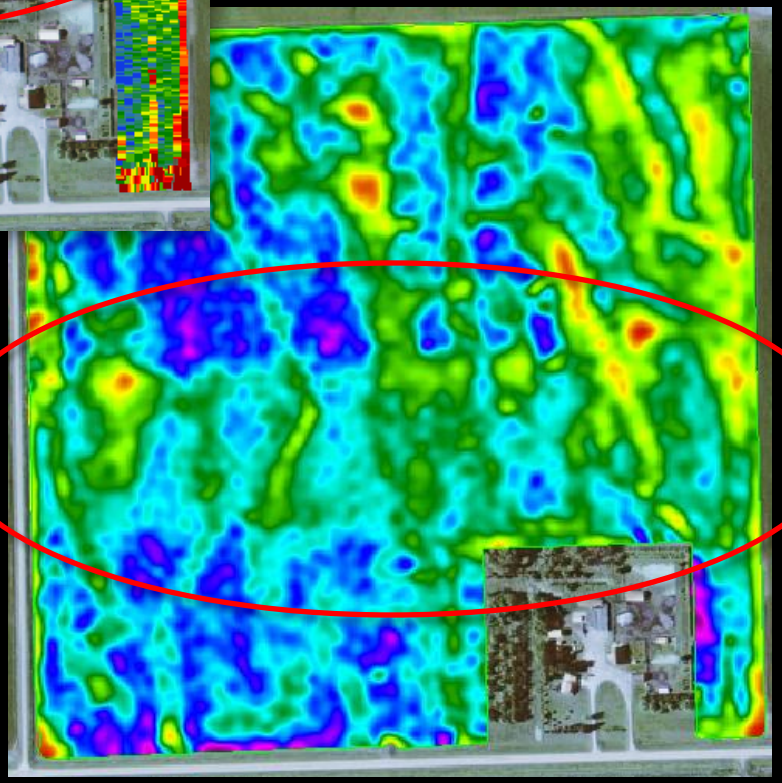


University of Minnesota Crookston

Sunflowers



Raw Yield Pts



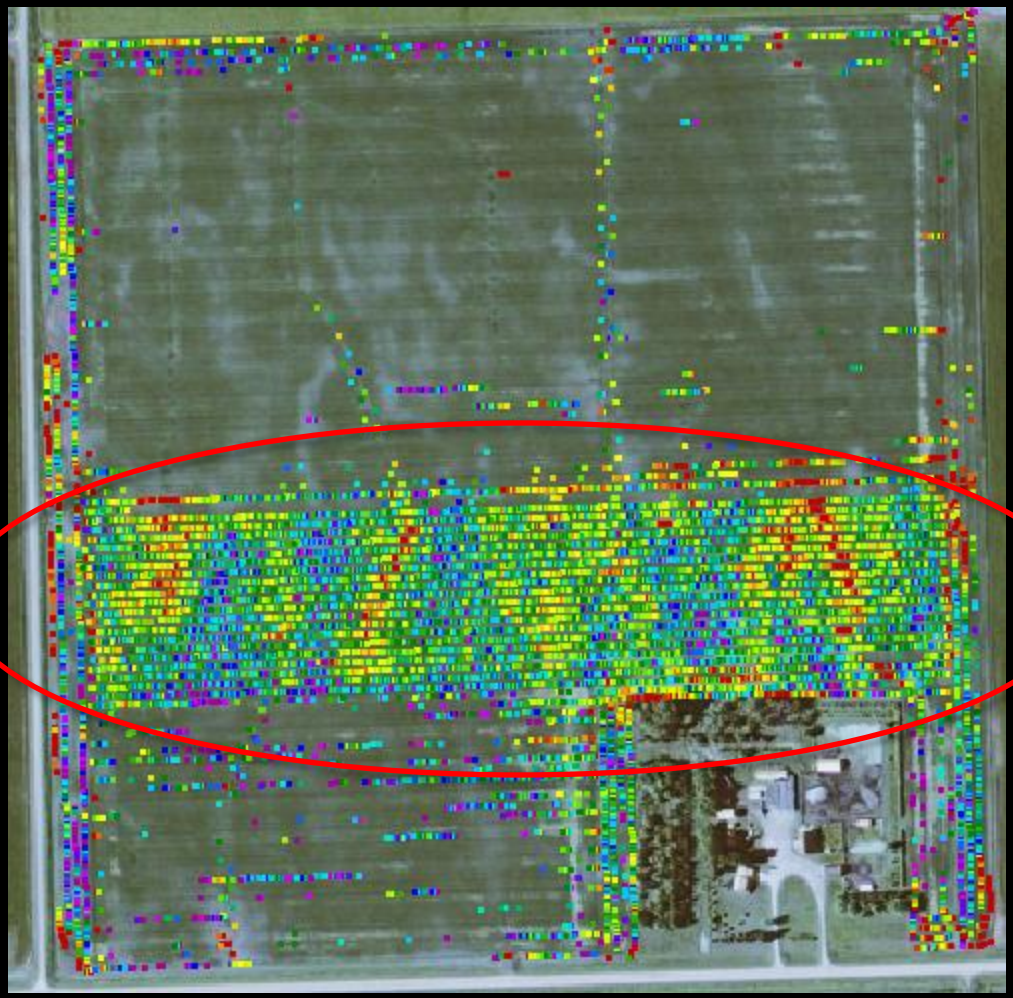
Interpolated map

C..	Min	Max
	502.56	647.93
	647.93	793.31
	793.31	938.68
	938.68	1084.05
	1084.05	1229.43
	1229.43	1374.8
	1374.8	1520.17
	1520.17	1665.55
	1665.55	1810.92
	1810.92	1956.29
	1956.29	2101.66
	2101.66	2247.04
	2247.04	2392.41
	2392.41	2537.78
	2537.78	2683.16
	2683.16	2828.53
	2828.53	2973.9
	2973.9	3119.28
	3119.28	3264.65

Average Value:	2009.88
Standard Dev:	399.029
Minimum Value:	502.562
Maximum Value:	3264.654

awg Precison Ag

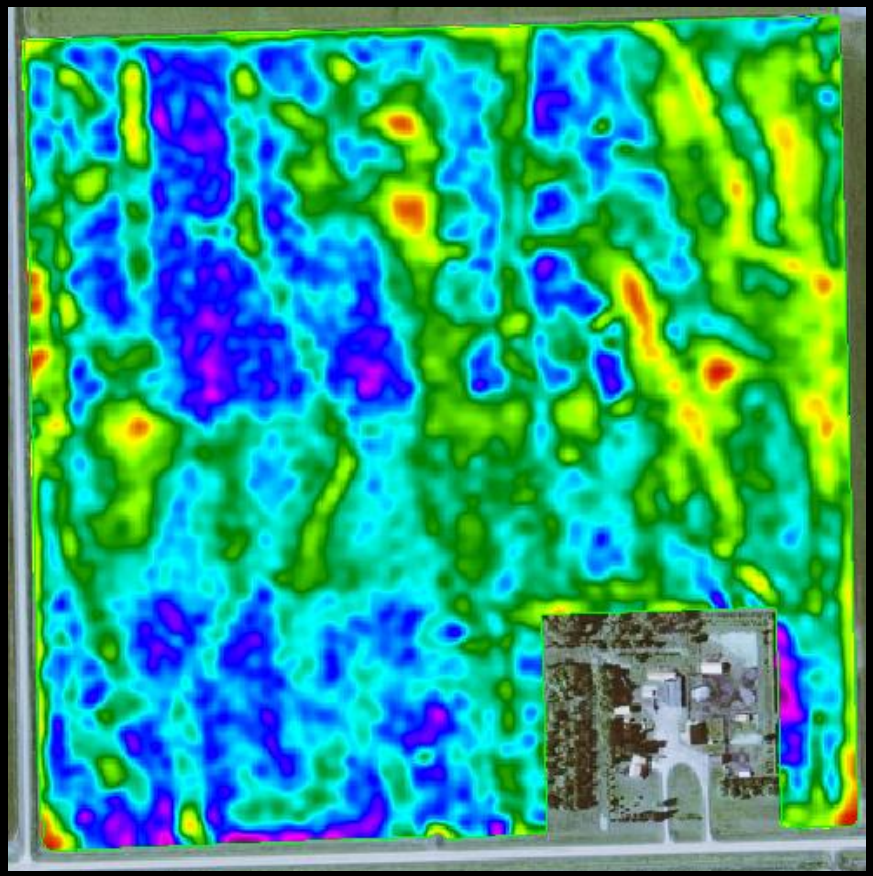
Improper Calibration



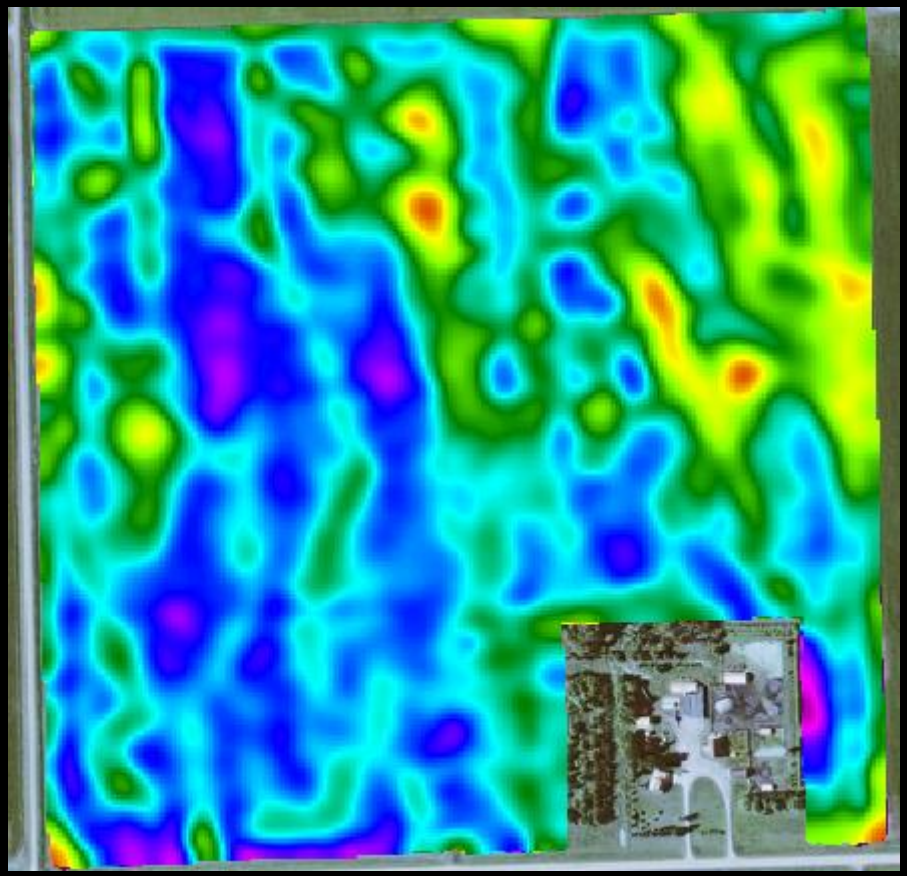
Yield pts with speed between 1.5 and 4.2 mph

- The combine was traveling between 1.5 and 4.2 mph
- The low end of the calibration curve had not been done

~ 31 # difference



Yield error 2010 #/a



Calibration corrected 2041#/a

Other Benefits

- Document each load
  - Grain bin document
  - Inventory Report
  - Field Report / Federal Crop documentation
- Legal Truck Weight

BRo3503	Spring Wheat	Ro3534	TLE 5107	7/24/2012 17:45	40,650	677.5	11.20%
BRo3503	Spring Wheat	Ro3534	TLE 5106	7/24/2012 18:10	44,240	737.3	12.00%

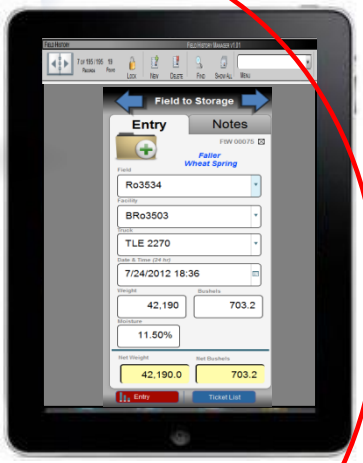
BLo1502 1,490 2012

Vi144	OwnerName	Year	Crop	Variety	Date Harvested	Licence	Load Weight	Load Bushels	Moisture	Warehouse
	Wagner Acres	2012	SWht	Faller	7/28/12 9:05 AM	TLE 5107	19,100	318.33	14.00%	CHS-Wheat
	Wagner Acres	2012	SWht	Faller	7/28/12 2:30 PM	TUO 0776	52,410	873.50	13.80%	CHS-Wheat
	Wagner Acres	2012	SWht	Faller	7/29/12 3:00 PM	TUO 1820	52,030	867.17	13.80%	CHS-Wheat
	Wagner Acres	2012	SWht	Faller	7/28/12 3:15 PM	TLE 5106	35,540	592.33	14.10%	CHS-Wheat
	Wagner Acres	2012	SWht	Faller	7/28/12 4:00 PM	TUO 1820	52,660	877.67	13.80%	CHS-Wheat
	Wagner Acres	2012	SWht	Vantage	7/28/12 4:12 PM	TLE 5107	41,180	686.33	13.70%	BLo1507
	Wagner Acres	2012	SWht	Vantage	7/28/12 4:27 PM	TLE 2270	39,090	651.50	13.70%	BLo1507
	Wagner Acres	2012	SWht	Vantage	7/28/12 4:50 PM	TLE 5106	40,140	669.00	13.70%	BLo1507
	Wagner Acres	2012	SWht	Vantage	7/28/12 5:14 PM	TLD 7516	38,810	646.83	13.70%	BLo1507
	Wagner Acres	2012	SWht	Vantage	7/28/12 5:41 PM	TUO 1820	53,280	888.00	13.70%	BLo1507
	Wagner Acres	2012	SWht	Vantage	7/28/12 6:12 PM	TUO 0776	52,140	869.00	13.70%	CHS-Wheat
	Wagner Acres	2012	SWht	Vantage	7/29/12 6:30 PM	TLE 5107	37,430	623.83	13.70%	BRo3502
	Wagner Acres	2012	SWht	Vantage	7/28/12 7:00 PM	TLE 5106	41,290	688.17	13.00%	BRo3502
				Vi144			555,100	9,251.66	13.71%	

In-House Development

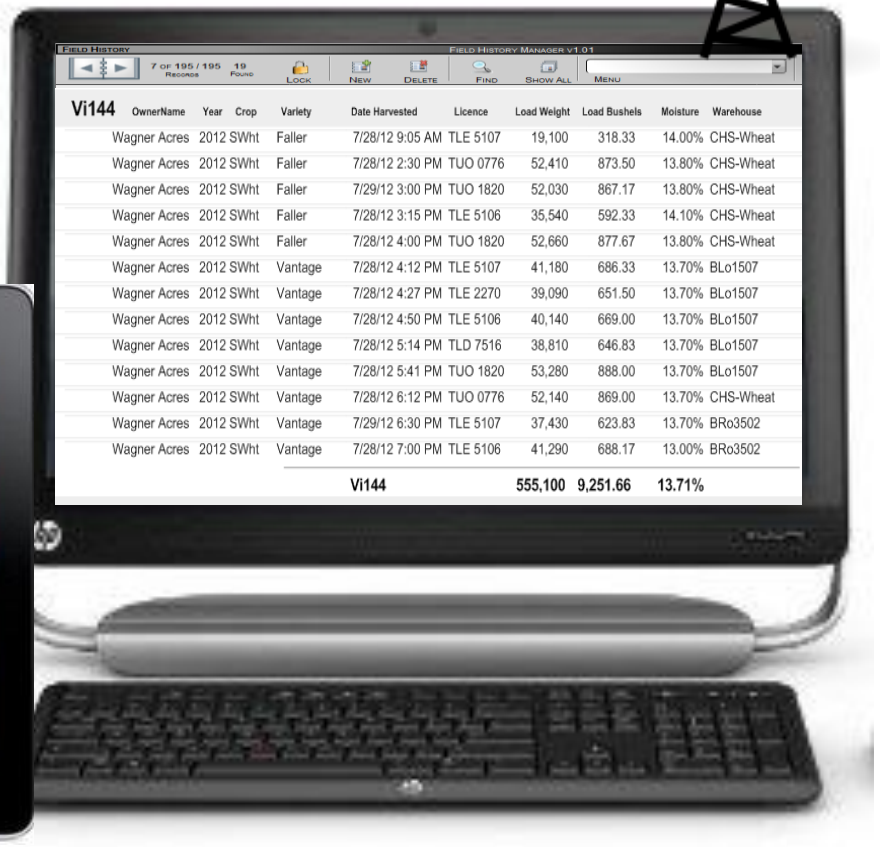
real time data entry

iPhone



iPad mini

iPad



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	Wagner Acres	2012	SWht	Vantage	7/28/12 4:27 PM	TLE 2270	39,090	651.50	13.70%	BLo1507
	Wagner Acres	2012	SWht	Vantage	7/28/12 4:50 PM	TLE 5106	40,140	669.00	13.70%	BLo1507
	Wagner Acres	2012	SWht	Vantage	7/28/12 5:14 PM	TLD 7516	38,810	646.83	13.70%	BLo1507
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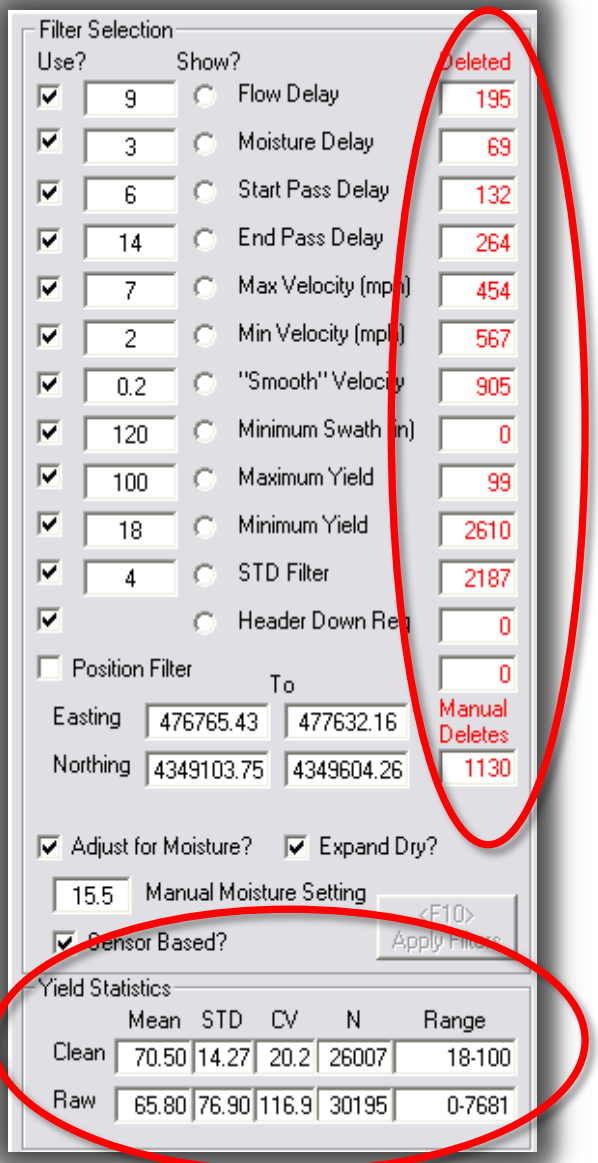
	Wagner Acres	2012	SWht	Vantage	7/29/12 6:30 PM	TLE 5107	37,430	623.83	13.70%	BRo3502
	Wagner Acres	2012	SWht	Vantage	7/28/12 7:00 PM	TLE 5106	41,290	688.17	13.00%	BRo3502
					Vi144		555,100	9,251.66	13.71%	

Windows

Yield Editor



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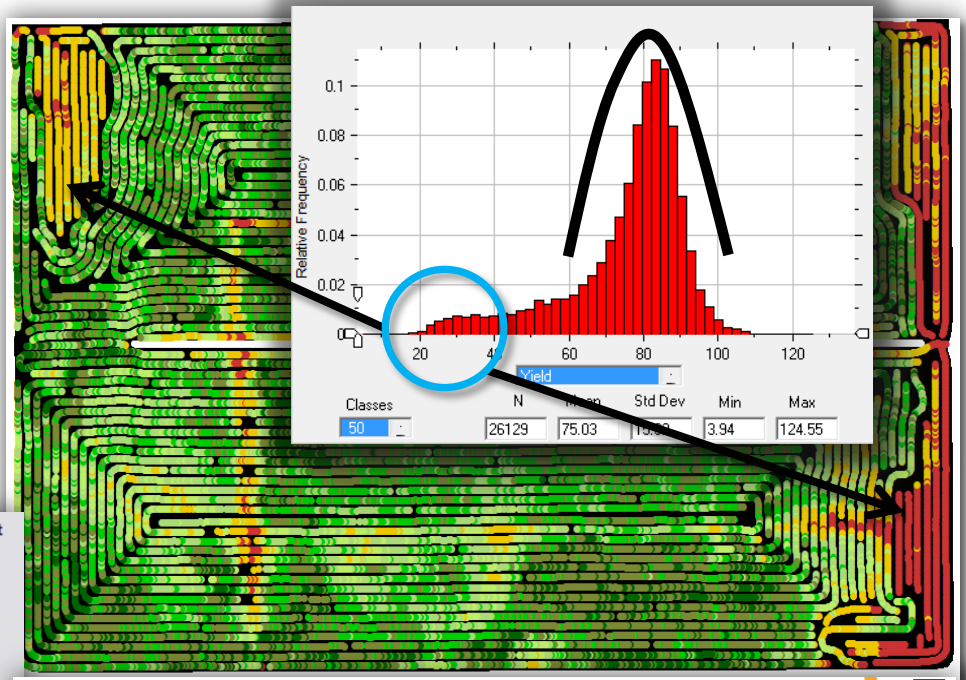
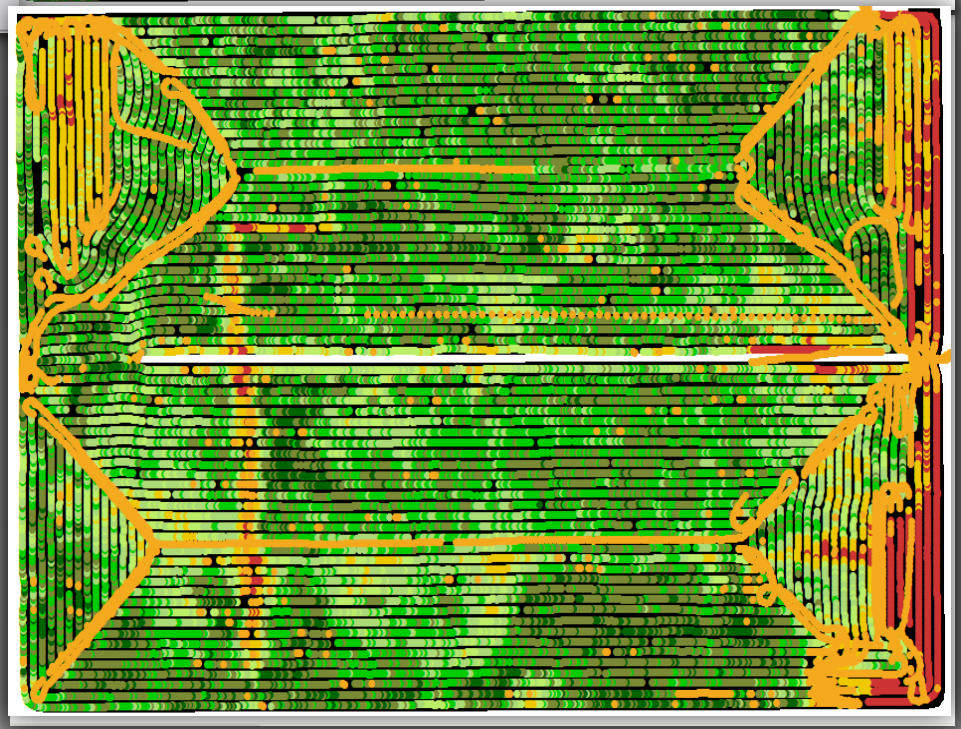
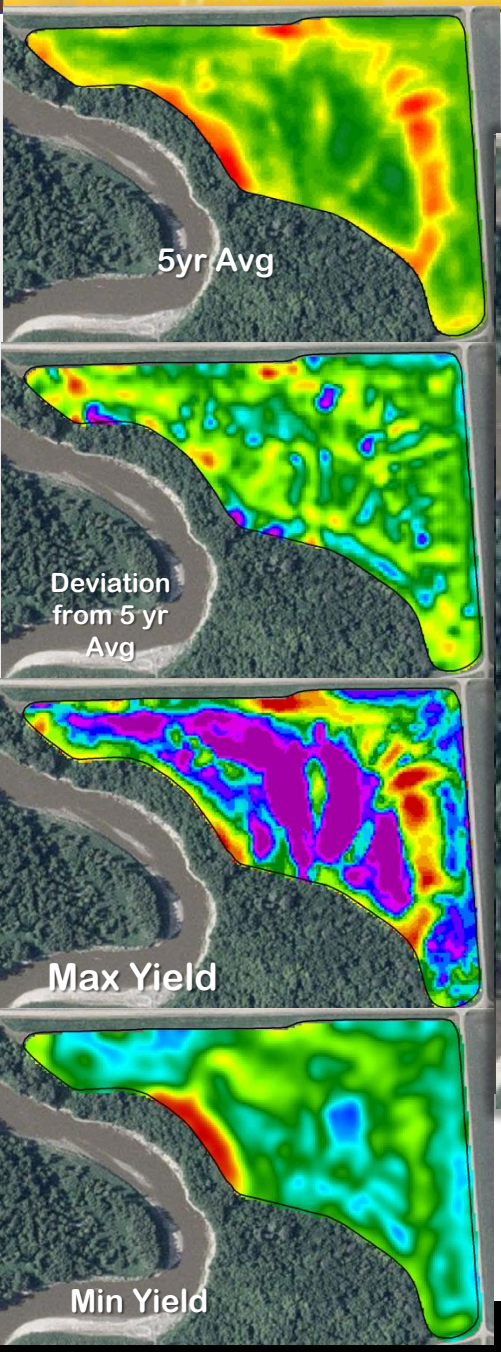


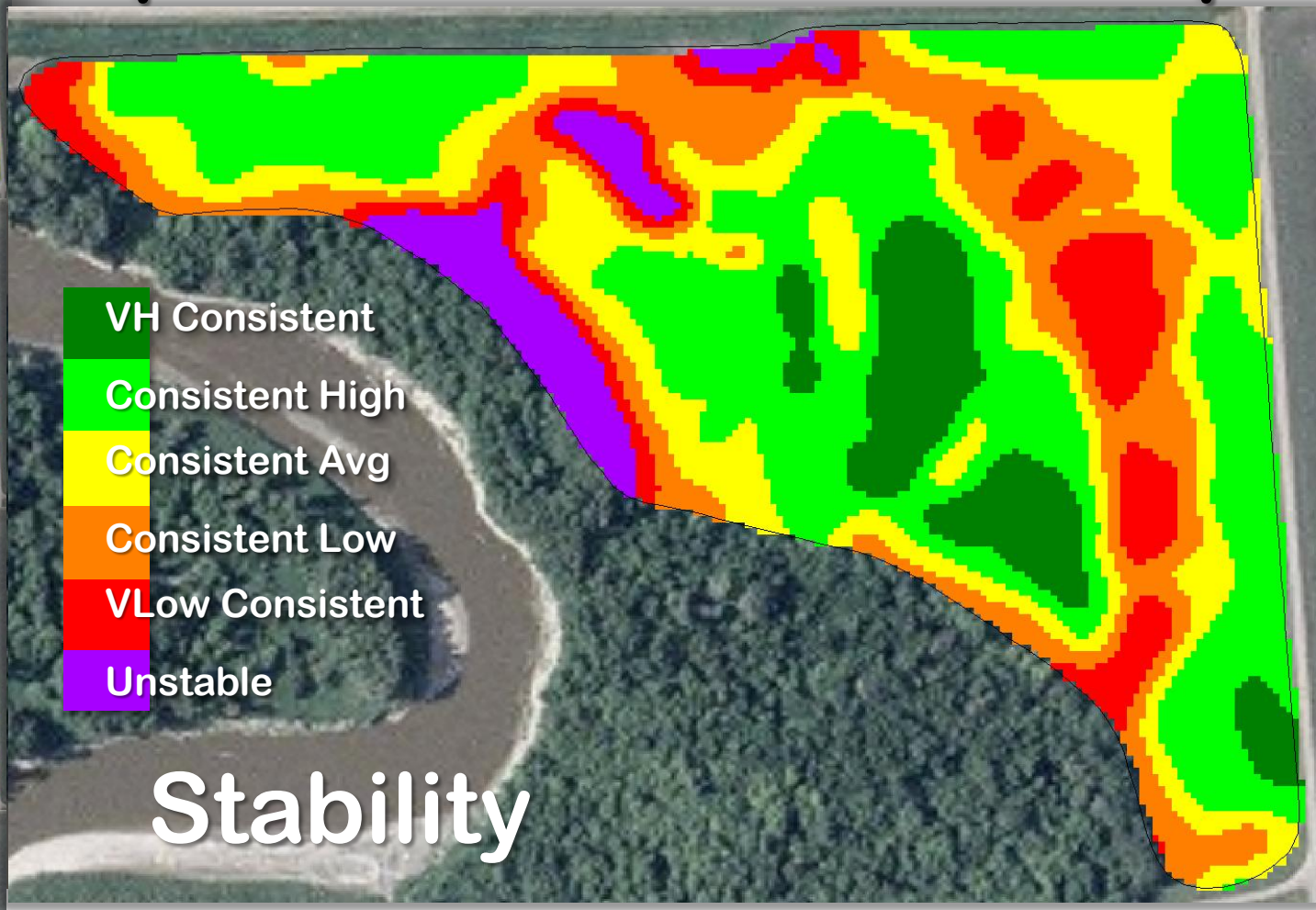
Before



https://www.ars.usda.gov/services/software/download.htm?softwareid=370

Importance of Multi-Year Maps

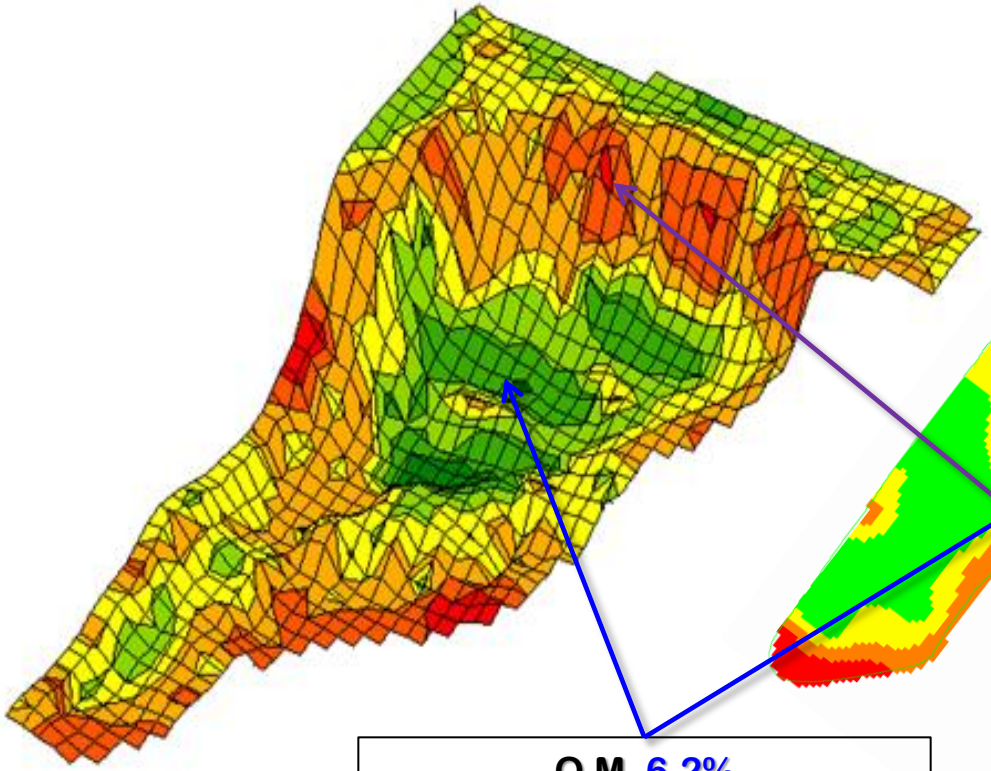




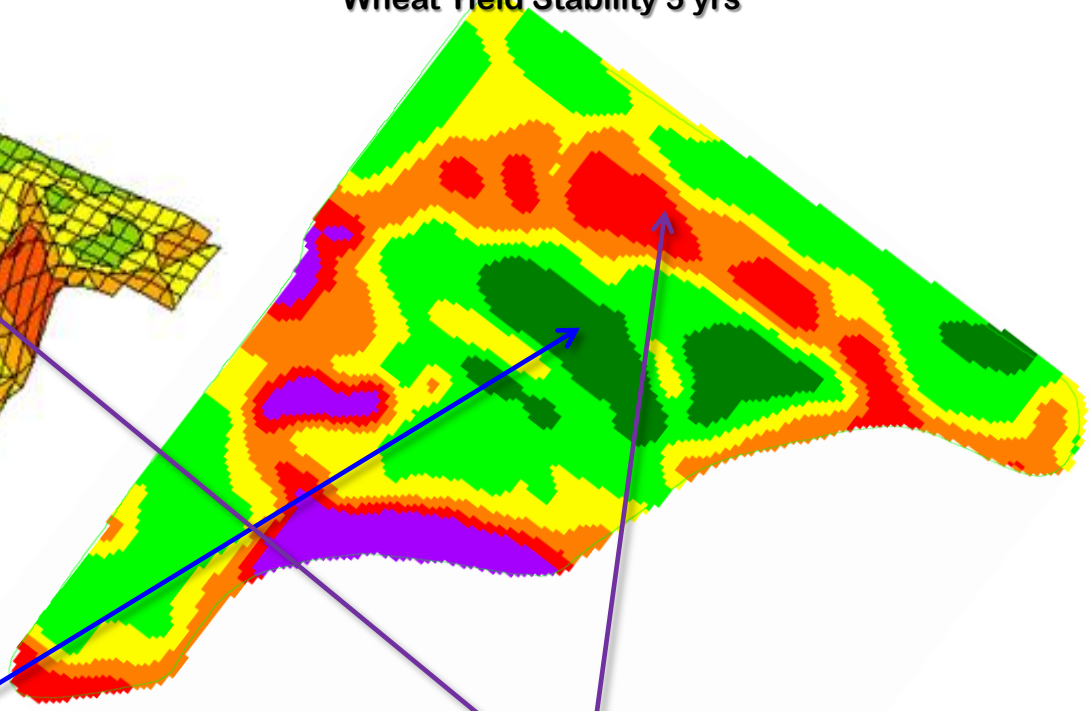
GK Technology For Agriculture

Response Zones

Max Wheat Yld over Topography



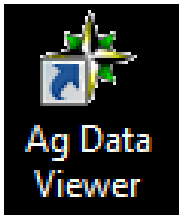
Wheat Yield Stability 5 yrs



O.M. 6.2%
Max Yld 95 bus
High res N,P,K
Constant High Yield
Limiting Factor- Lodging

O.M. 2.1%
Max Yld 27 bus
Low res N,P,K
Constant Low Yield
Limiting Factor- Water / Fertility

Steps for Yield Stability



Using Ag Data Viewer

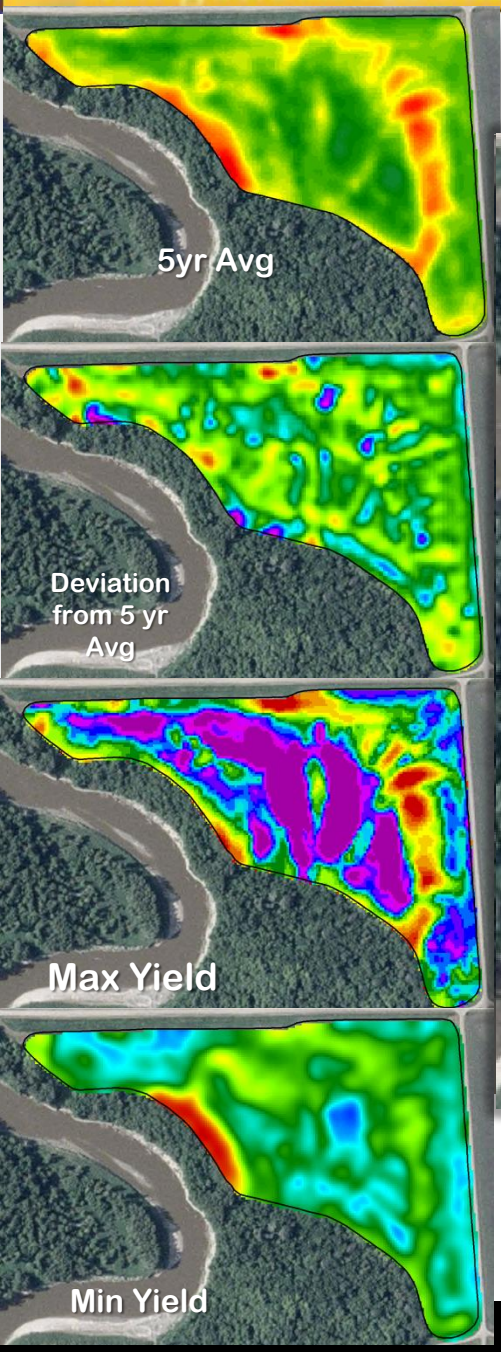
1. **Process and Clean yield maps**
2. **Normalize each yield map**
   (create map Norm??wht)
   1. **Determine Field Average**
      1. FieldAvg = Rasters("Dry95wht").Mean
      2. Map1 = Rasters("Dry95Wht").Value
   2. **Normalize each yield value**
      1. Map1 = (Map1 / FieldAvg) * 100
3. **Average all Normalized maps**
   (Average Normalized Yield AvgNormYld)
   1. 'define next value within map
      Map1 = Rasters("Norm95wht").Value
      Map2 = Rasters("Norm98wht").Value
      Map3 = Rasters("Norm00wht").Value
      Map4 = Rasters("Norm03wht").Value
   2. 'Average the values
      Return (Map1 + Map2 + Map3 + Map4) / 4
4. **Calculate Standard Deviation**
   (create map YieldStdDev)
   1. 'define next value within map
      Map1Norm = Rasters("Norm95Wht").Value
      Map2Norm = Rasters("Norm98Wht").Value
      Map3Norm = Rasters("Norm00Wht").Value
      Map4Norm = Rasters("Norm03Wht").Value
      AvgNormYld = Rasters("AvgNormYld").Value

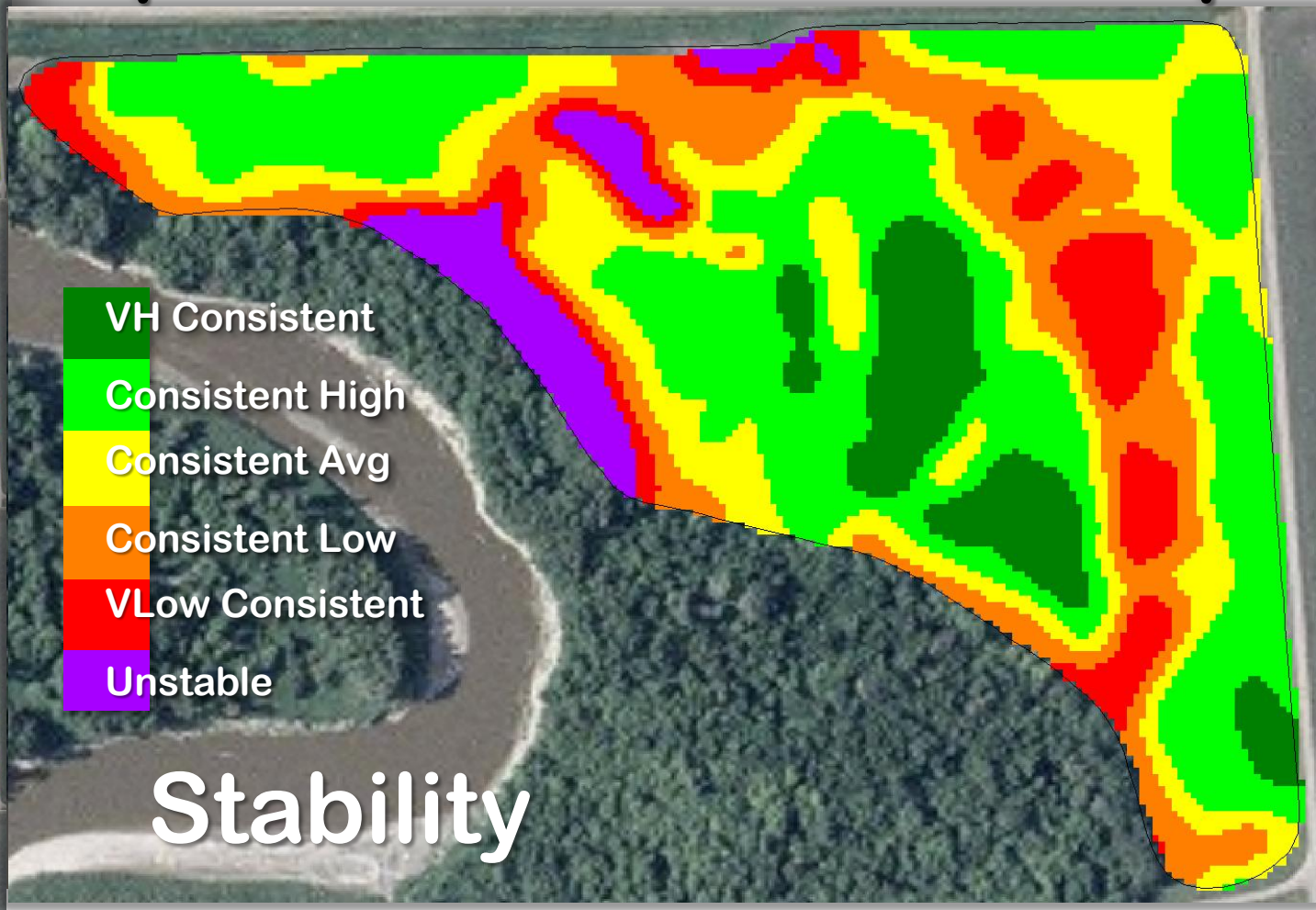
- 'calculate Standard Deviation YieldStdDev = (((([Norm95yld] - [AvgNormYld])^2) + (([Norm98Yld] - [AvgNormYld])^2) + (([Norm00Yld] - [AvgNormYld])^2) + (([Norm03Yld] - [AvgNormYld])^2)) / (4-1)) .Sqrt

5. **Calculate CV Value**
   (create map CV)
   1. CV = (StdDev / AvgNormYld) * 100
6. **Rank Values**
   1. Set CVBreak = 30
   2. If AvgNormYld >= 120 And CVMap <= CVBreak Then
      'Very High Consistent Yields' Rank = 1
      ElseIf AvgNormYld >= 105 And AvgNormYld < 120 And
      CVMap <= CVBreak *'Consistent High Yields'* Rank = 2
      ElseIf AvgNormYld >= 96 And AvgNormYld < 105 And
      CVMap <= CVBreak *'Consistent Average Yields'* Rank = 3
      ElseIf AvgNormYld >= 80 And AvgNormYld < 96 And
      CVMap <= CVBreak *'Consistent Low Yields'* Rank = 4
      ElseIf AvgNormYld < 80 And CVMap <= CVBreak
      'Very Low Consistent Yields' Rank = 5
      ElseIf CVMap > 30 *'Inconsistent'* Rank = 6

Questions, Comments or get scripts; glw@rrv.net

Importance of Multi-Year Maps





GK Technology For Agriculture

In-House Development

Making data useful for all farm partners

- Not all partners have the same computer skills
- The need for quick access to information
  - Landlords
  - Bank or Loan Companies
  - Crop Rotations
  - Etc.
- Desktop and mobile applications
- Perceived notion canned software does not “fit”

In-House Development

Tools Implemented

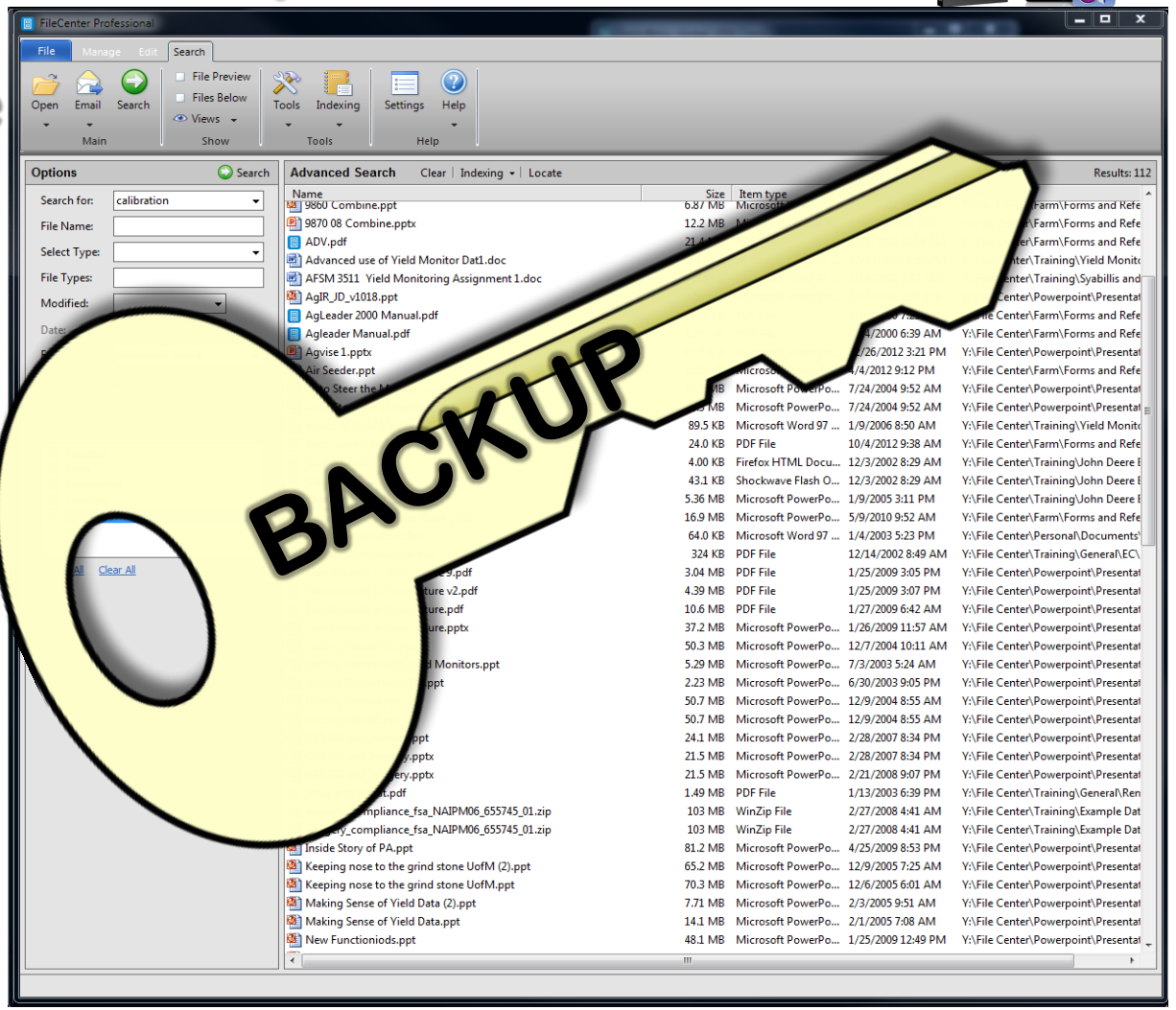
- **Computer Server**
  - HP server (office) WD4000 sentinel (home)
  - Allows for centralized data
  - Remote access from home / mobile devices
  - Routine data backups
- **Data Backups !!!**
  - Sever is a RAID 5 configuration
  - Placed backup drive in Shop (via cat 6e cables)
  - 2nd backup drive in office
  - And weekly backups to 4 external drives routinely rotated

- **Implemented desktop scanners for data input** (4)
  - ScanSnap 1500
  - File Center Pro Software *www.lucion.com*

In-House Development

Tools Implemented

- **Paperless office**
  (Searchable PDF)
  - Federal Crop Yield Audits
    - All grain tickets and assembly lists > pdf files
  - Equipment / Vehicles
    - All purchase orders, warranty, titles, etc.
    - Maintenance records
    - Pictures
  - Input purchases



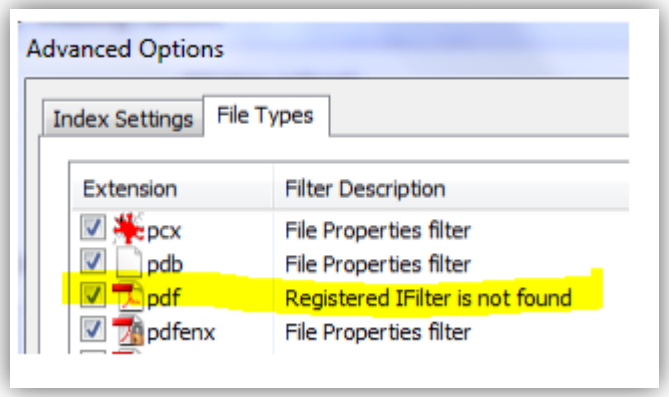
Windows 7* 64-bit and searchable PDF

How To Fix PDF Search In Windows 7 64-Bit

by Brooks on December 7, 2010 in Software

http://www.documentsnap.com/how-to-fix-pdf-search-in-windows-7-64-bit/

** Applies to 64 bit Vista and 64 bit XP*



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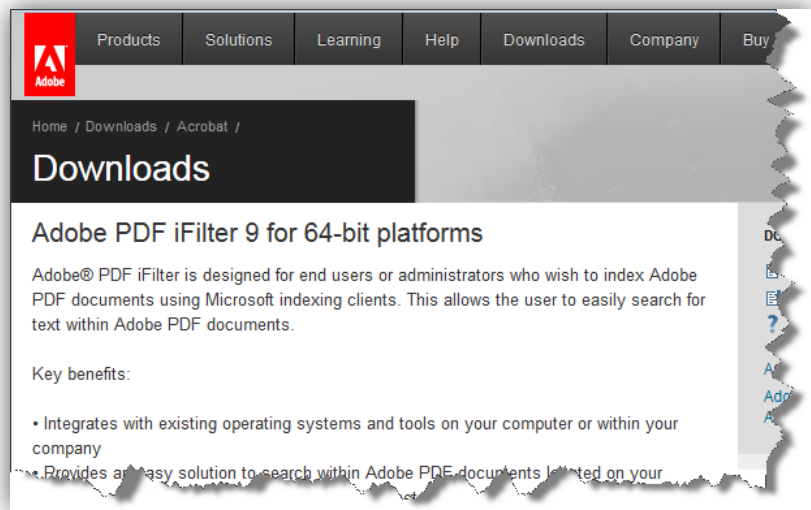
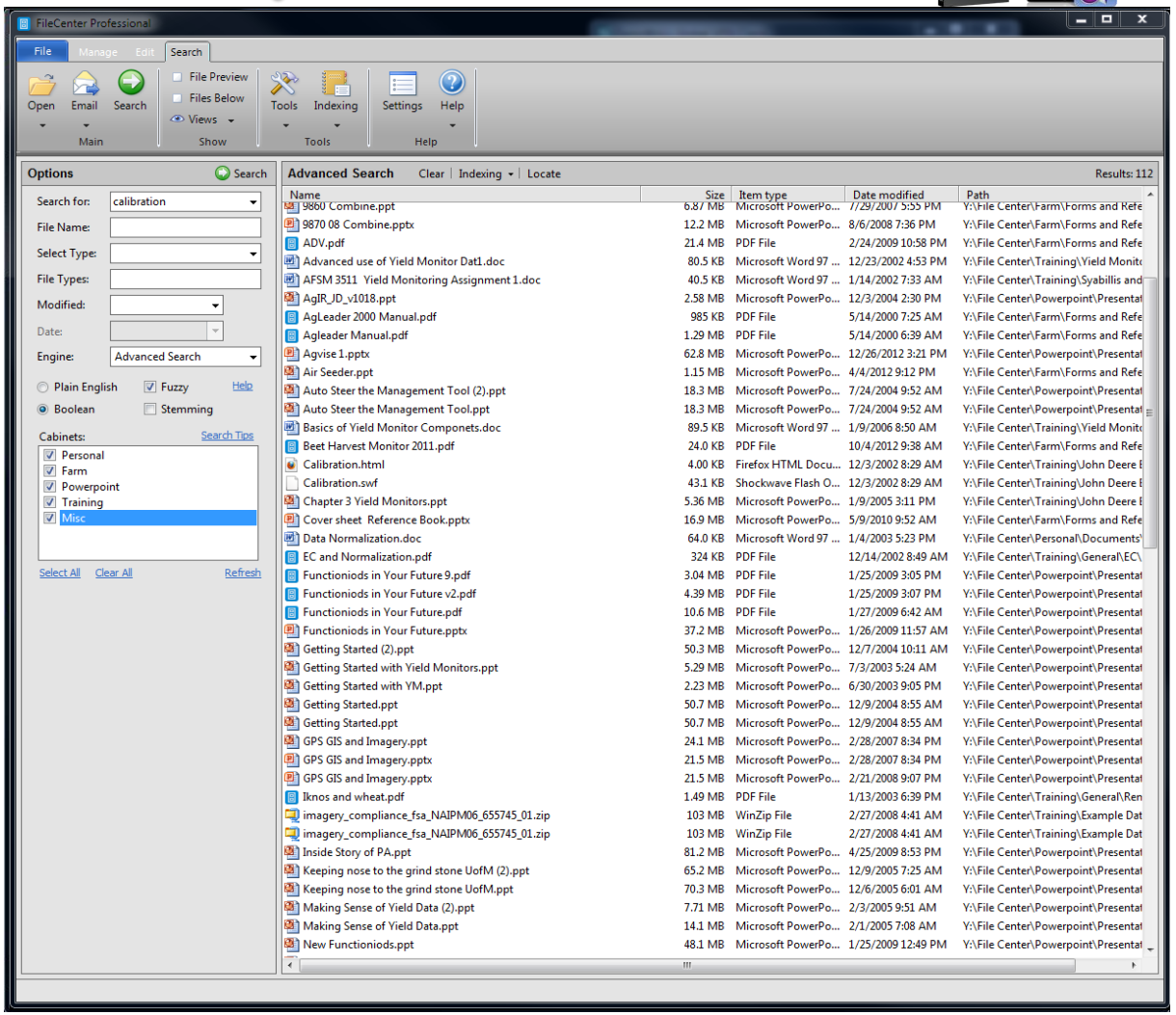


In-House Development

Tools Implemented

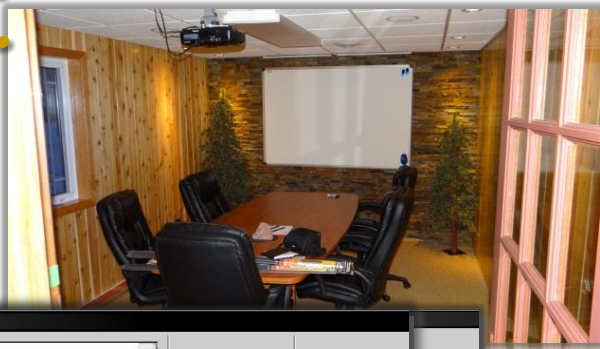
- **Paperless office**
  (Searchable PDF)
  - Federal Crop Yield Audits
    - All grain tickets and assembly lists > pdf files
  - Equipment / Vehicles
    - All purchase orders, warranty, titles, etc.
    - Maintenance records
    - Pictures
  - Input purchases

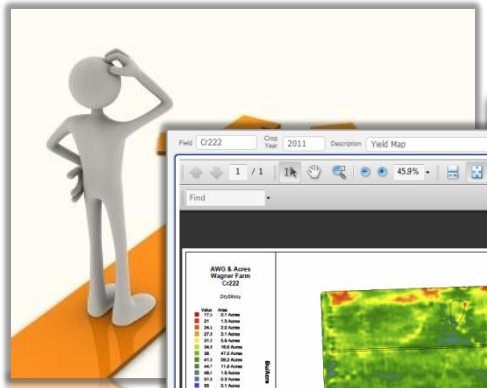


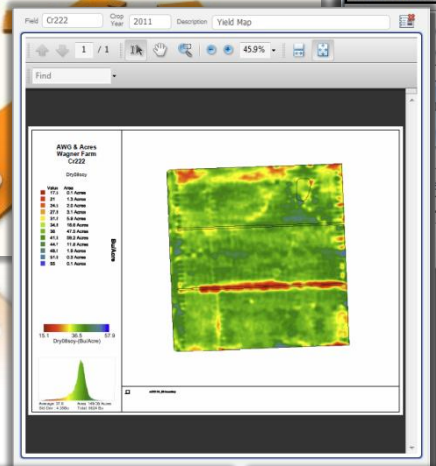
In-House Development

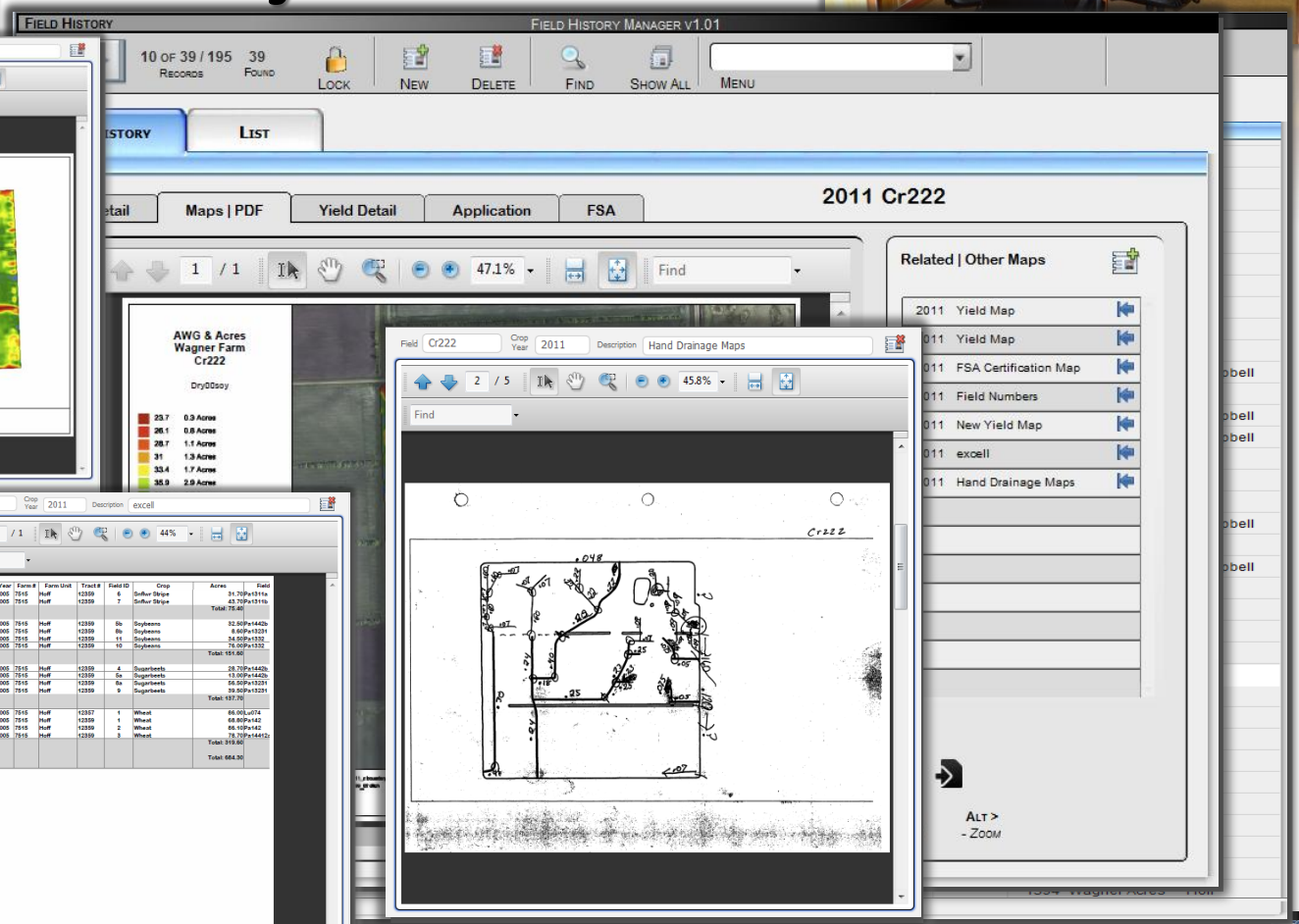
Tools Implemented

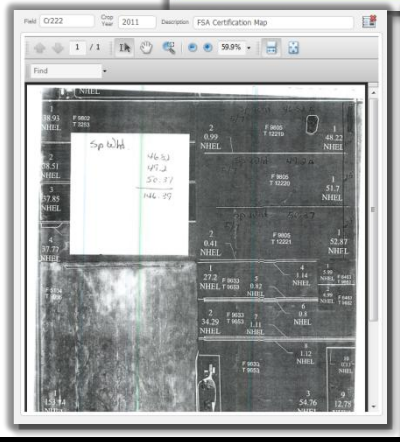
- Training
- History Records

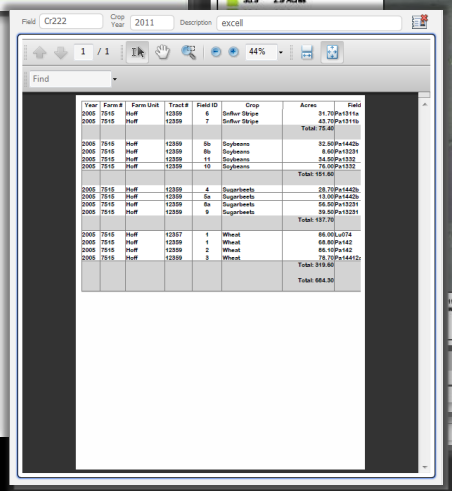












THE Most Important Yield Factor on Our Farm

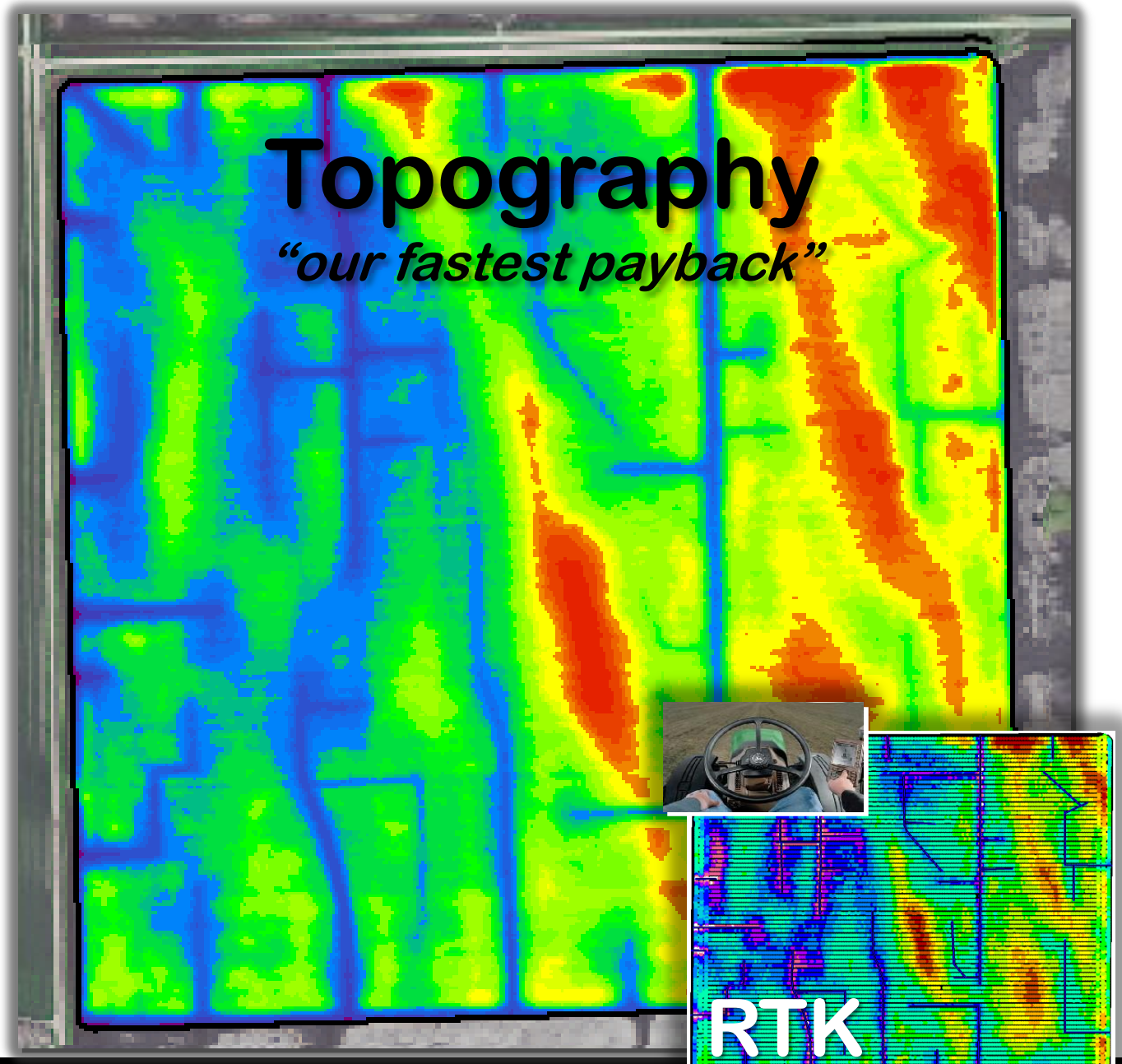
1 Drainage

- Crop Variety
- Insect / Weeds problems
- Crop Rotation
- Tillage
- Compaction
- pH
- Herbicides
- Subsoil condition

2 Fertility placement

- Fertility
- Plant population

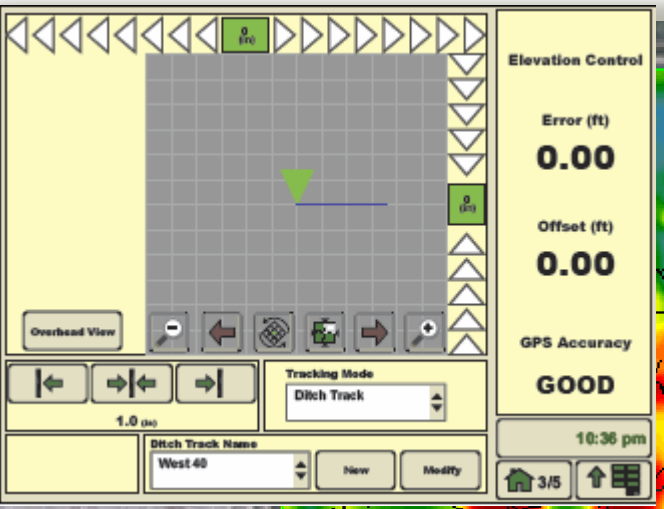
LiDAR Topography



2010 NAIP

after a 6" rain Event

Derived Elevation



- Depression
- Flow path (FP)
- FP over Yield Map

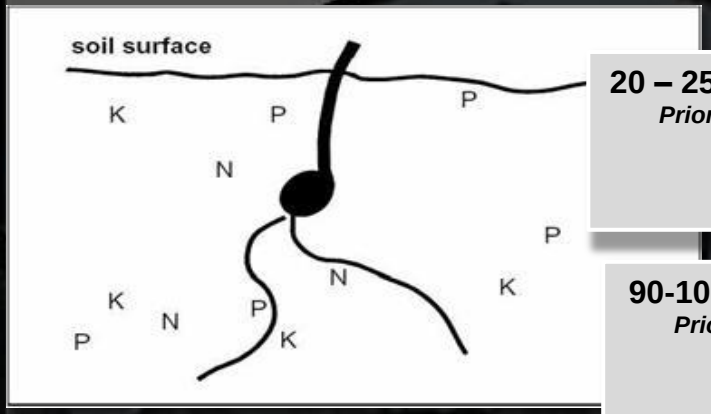
GK Technology For Agriculture

What are the Benefits due to a Well Drained Field?

- No Planting delay
- Little Nutrient loss
- Better Root growth
- In-season field access
- Possible less Diseases
- Better Weed control
- Better Crop Quality
- No Delay in Harvest
- others……

Fertilizer Placement

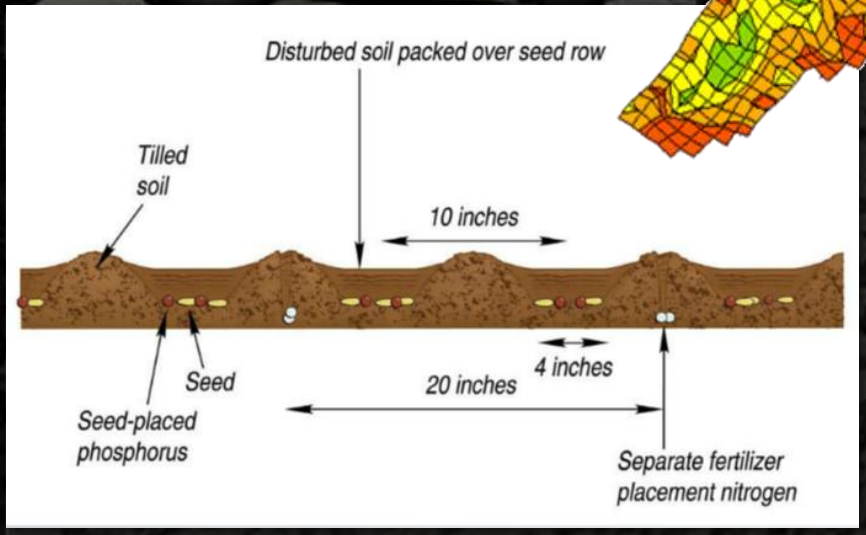
Broadcast Application

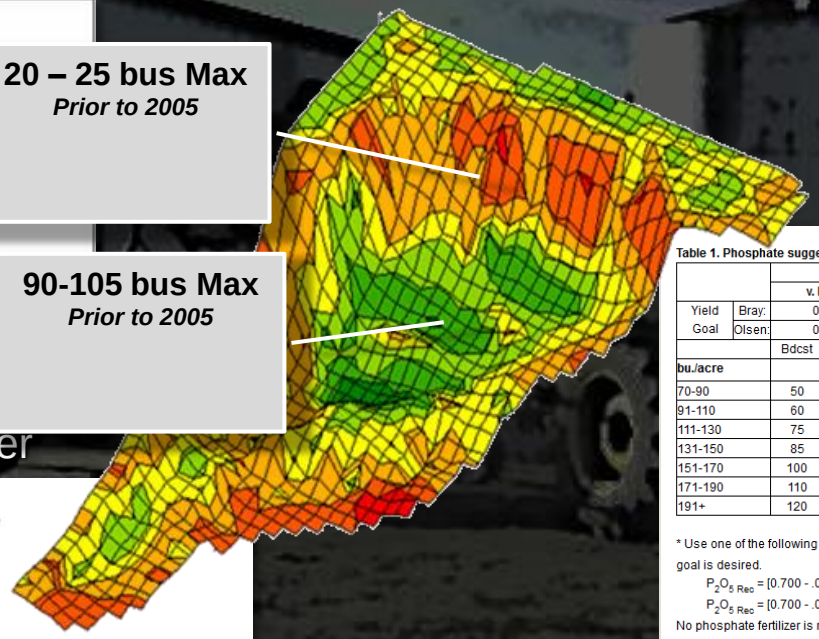


20 – 25 bus Max
Prior to 2005

90-105 bus Max
Prior to 2005

Planting with Air Seeder





Use of Banded Fertilizer for Corn Production

George Rehm

Table 1. Phosphate suggestions for corn production in Minnesota.*

		Soil Test P (ppm)									
		v. low		low		med		high		v. high	
Yield Goal	Bray:	0-5		6-10		11-15		16-20		21+	
	Olsen:	0-3		4-7		8-11		12-15		16+	
		Bdcst	Band	Bdcst	Band	Bdcst	Band	Bdcst	Band	Bdcst	Band
bu./acre		lb. P_2O_5/acre to apply									
70-90		50	25	35	20	20	15	10	10-15	0	10-15
91-110		60	30	40	20	25	20	10	10-15	0	10-15
111-130		75	40	50	25	30	20	10	10-15	0	10-15
131-150		85	45	60	30	35	25	10	10-15	0	10-15
151-170		100	50	70	35	40	30	15	10-15	0	10-15
171-190		110	55	75	40	45	30	15	10-15	0	10-15
191+		120	60	85	45	50	35	15	10-15	0	10-15

* Use one of the following equations if a P_2O_5 recommendation for a specific soil test value and a specific yield goal is desired.

$P_2O_{5\ Rec}$ = [0.700 - .035 (Bray P ppm)] (yield goal)

$P_2O_{5\ Rec}$ = [0.700 - .044 (Olsen P ppm)] (yield goal)

No phosphate fertilizer is recommended if the soil test for P is higher than 25 ppm (Bray) or 20 ppm (Olsen).

Table 2. Potash suggestions for corn production in Minnesota.*

	Soil Test K (ppm)									
	v. low		low		med		high		v. high	
Yield Goal	0-40		41-80		81-120		121-160		161+	
	Bdcst	Band	Bdcst	Band	Bdcst	Band	Bdcst	Band	Bdcst	Band
bu./acre	lb. K_2O/acre to apply									
70-90	80	40	60	30	35	20	15	10-15	0	10-15
91-110	100	50	75	40	45	30	15	10-15	0	10-15
111-130	120	60	90	45	50	30	20	10-15	0	10-15
131-150	145	75	105	55	60	40	20	10-15	0	10-15
151-170	165	85	120	60	70	40	25	10-15	0	10-15
171-190	185	90	135	70	80	50	25	10-15	0	10-15
191+	205	105	160	80	90	55	30	10-15	0	10-15

* Use the following equation if a K2O recommendation for a specific soil test value and a specific yield goal is desired.

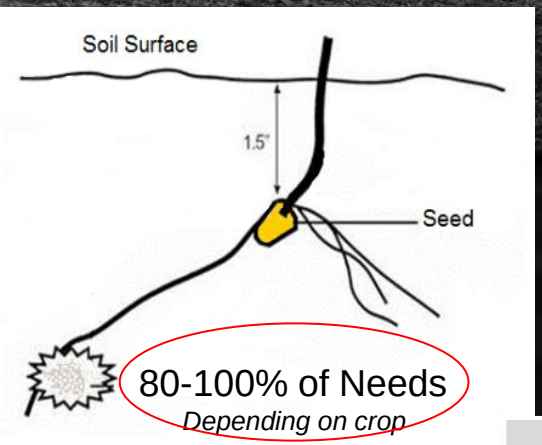
K_2O_{Rec} = [1.166 - .0073 (Soil Test K, ppm)] (yield goal)

No potash fertilizer is recommended if the soil test for K is 175 ppm or higher.

Fertilizer Placement

"Layering"

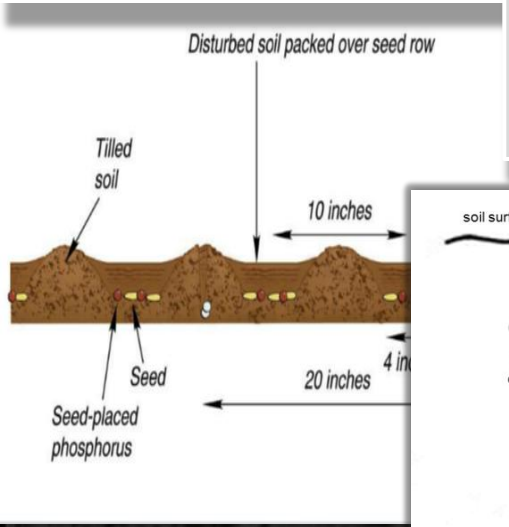
+ VRT



80-100% of Needs
Depending on crop

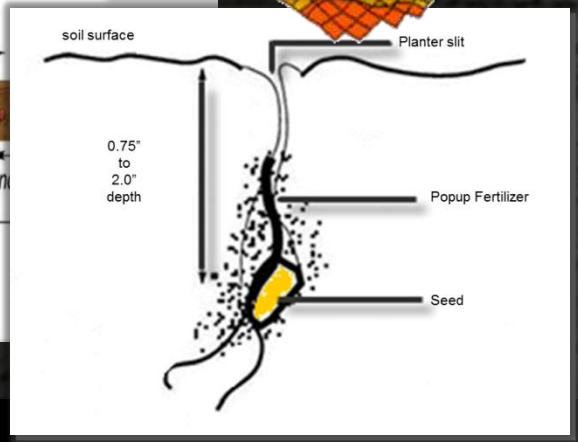
20 – 25 bus Max
Prior to 2006

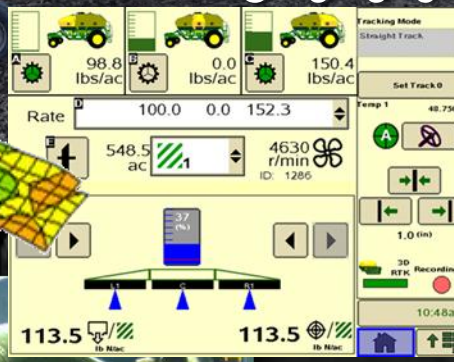
50- 60 bus Max
In 2006 - 2011



90-105 bus Max
Prior to 2006

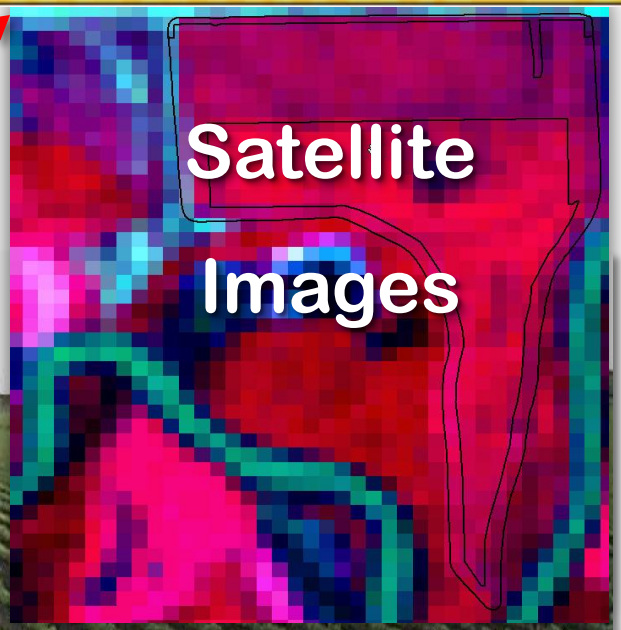
Because of VRT
Yield same / Less Fert

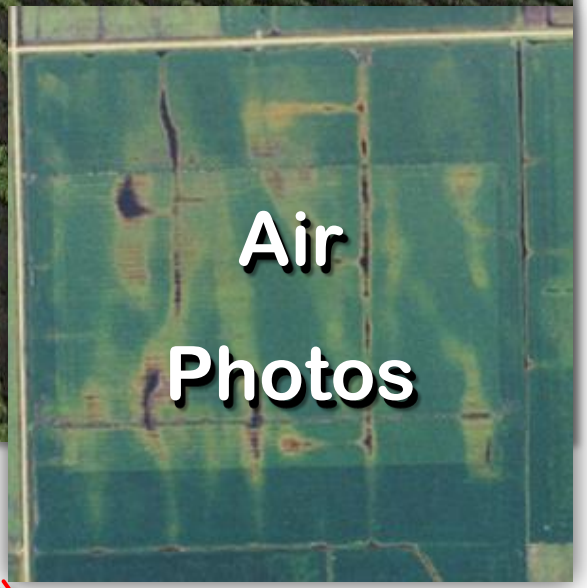




In the absence

of Yield Data





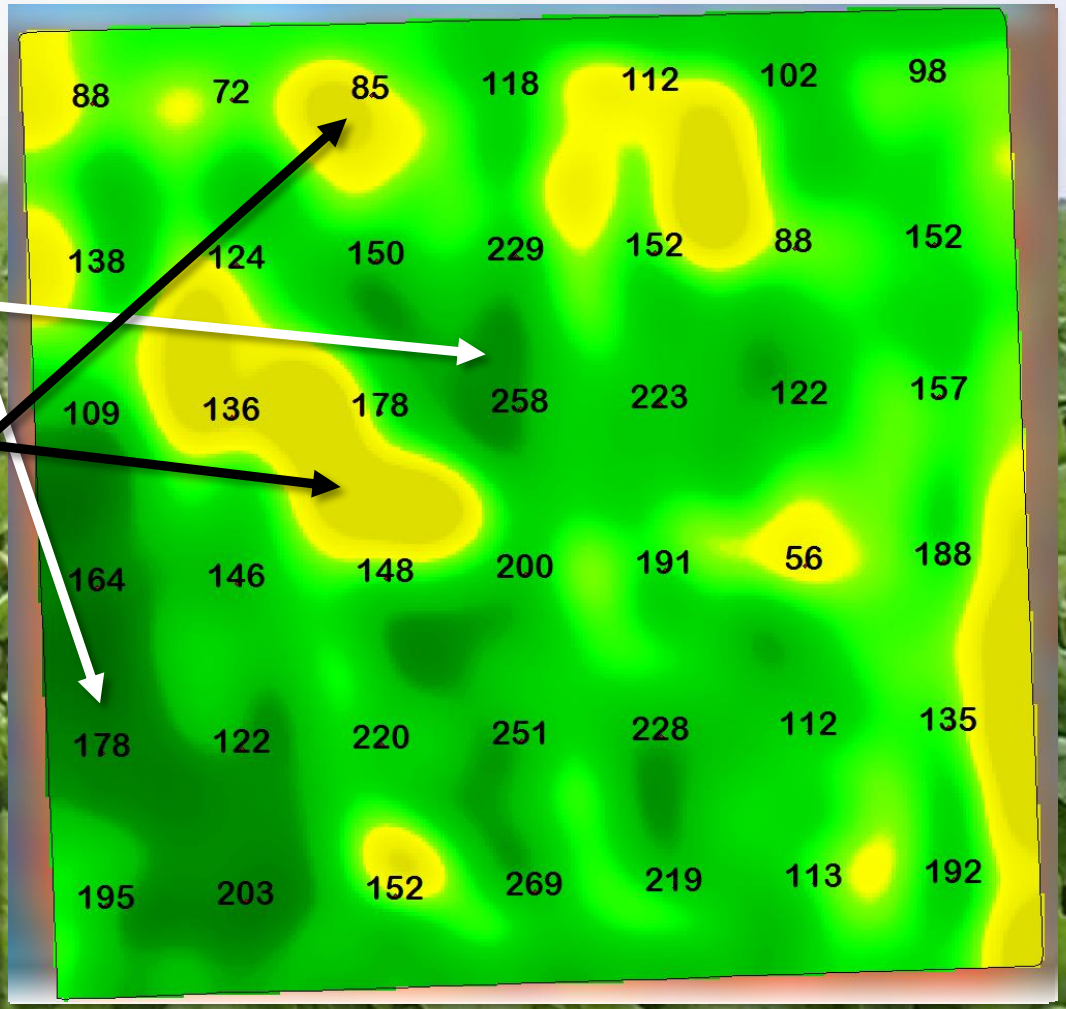
with ground truthing

Reducing Inputs with Remote Sensing

Research Results 1997

Dark Green

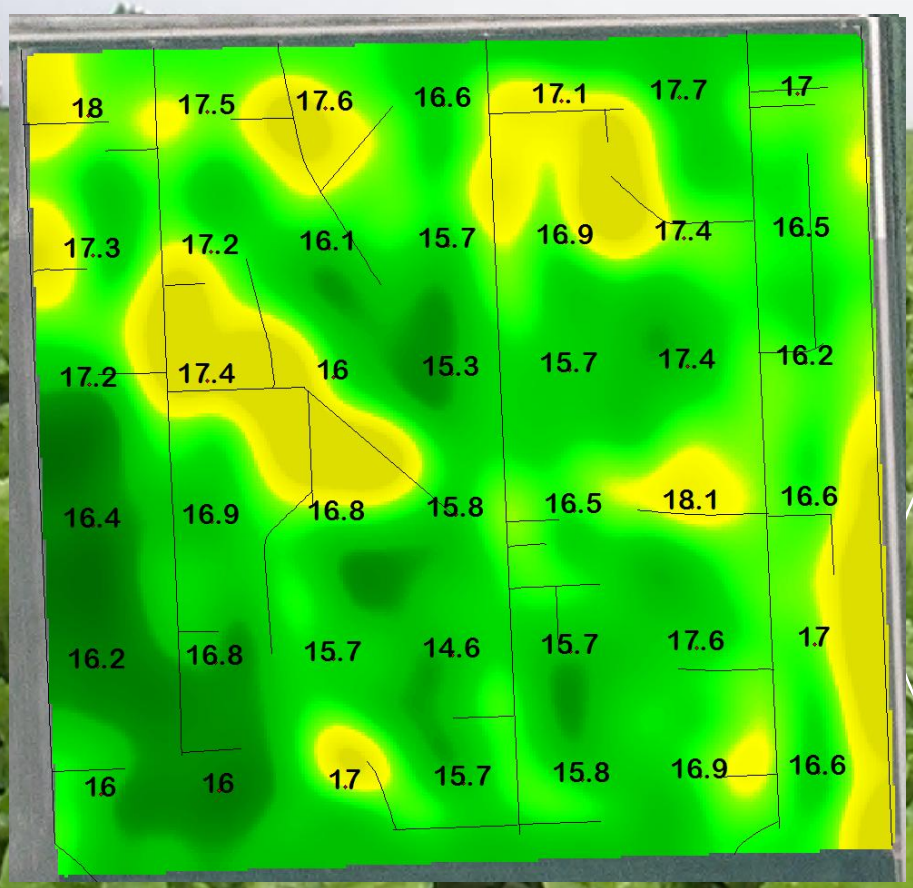
Yellow Beet



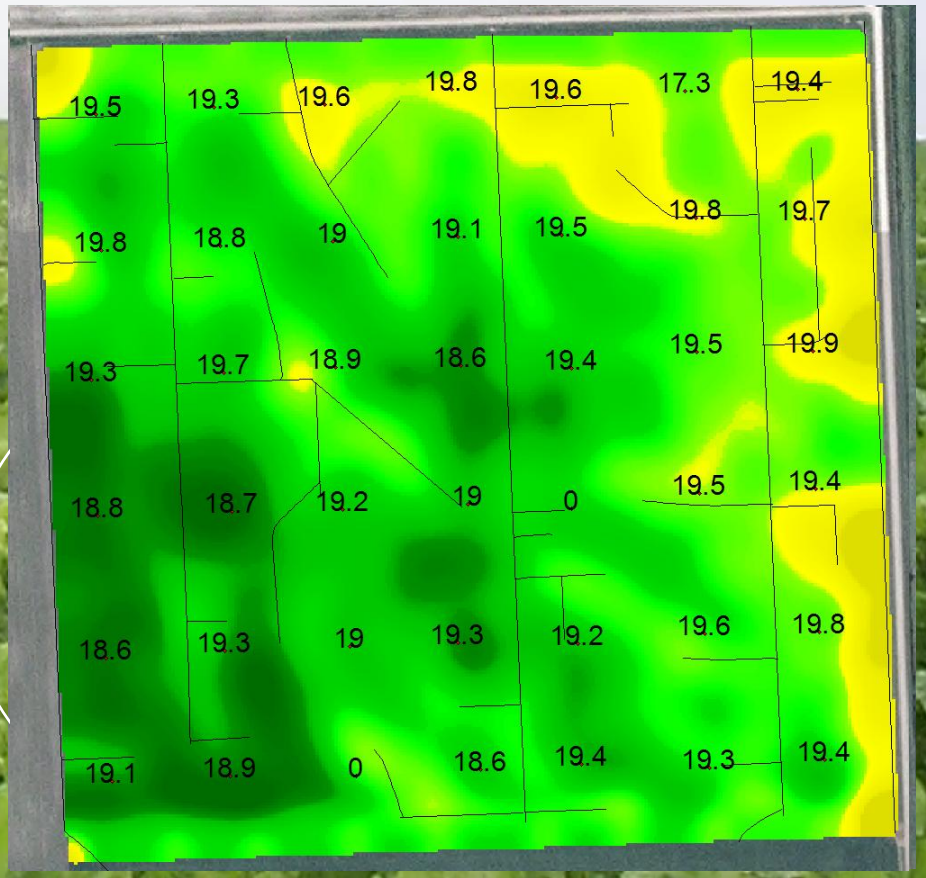
Data Gathered by:
David Garret
American Crystal Sugar Company
&
Dr. John Moraghan
NDSU

#'s of Organic Nitrogen which 70% available following year

Did we make a difference?

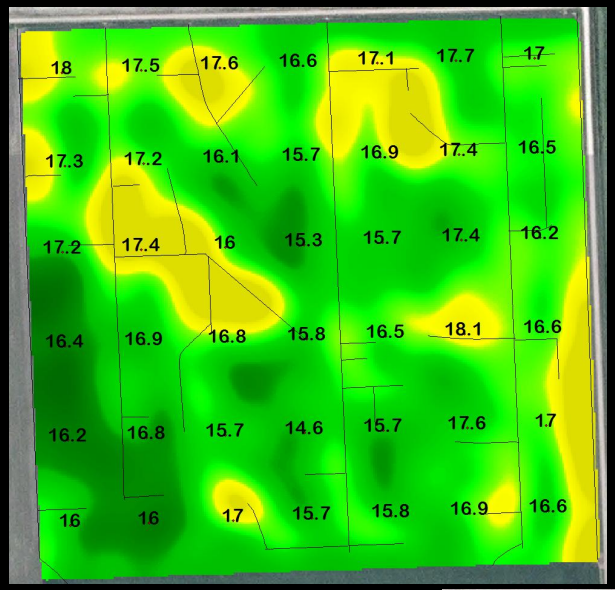


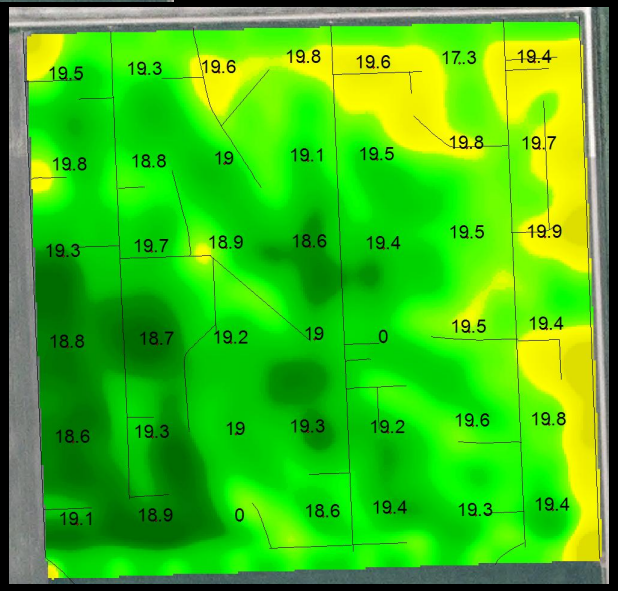
1997 NIR Beet Top Image
% Sugar



2001 NIR Beet Top Image
% Sugar

Did we make a difference?





Over This 4 year Period

- Improved Drainage
- Saved over $89/ ac in fertilizer cost *(2009 $)*
- Maintained Yield
  - 98- Wheat 74 bus
  - 99- Soybeans 42 bus
  - 00- Wheat 68 bus
  - 01- Beets 24.6 ton
- Reduced Variability

GK Technology For Agriculture

Agri ImaGIS www.SKYSHOT.com

awg farms inc.

Understand Patterns

Irregular Shapes;

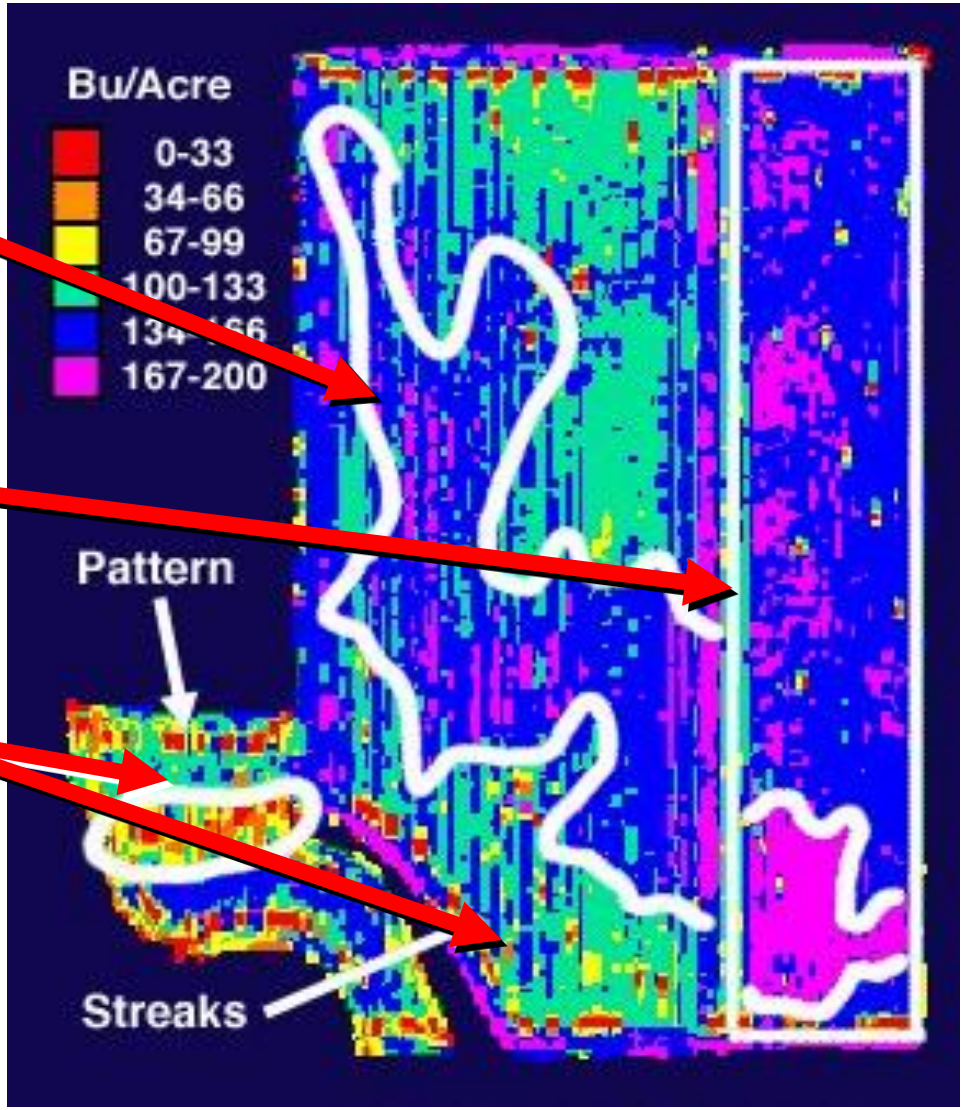
Natural Occurring

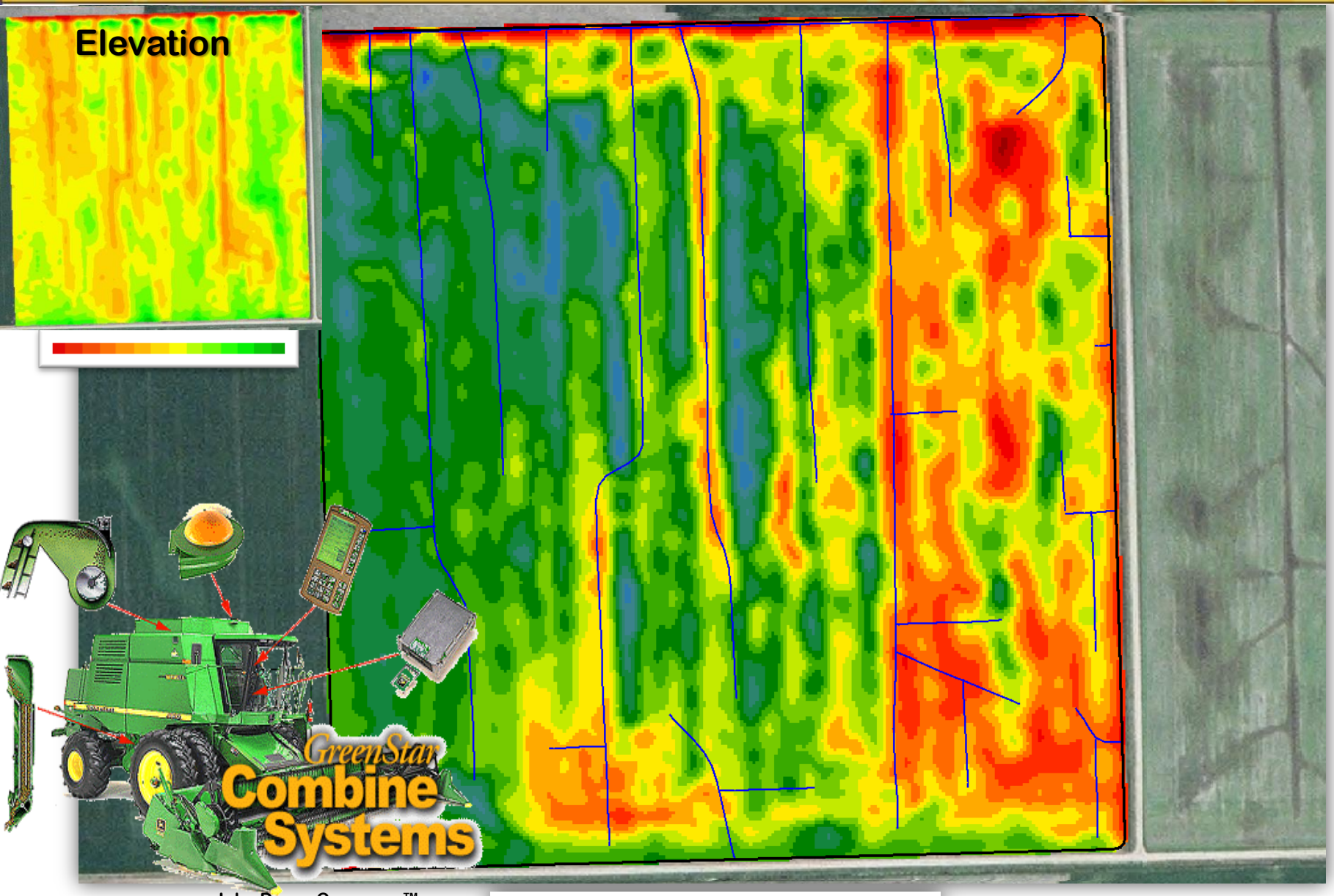
Straight Lines;

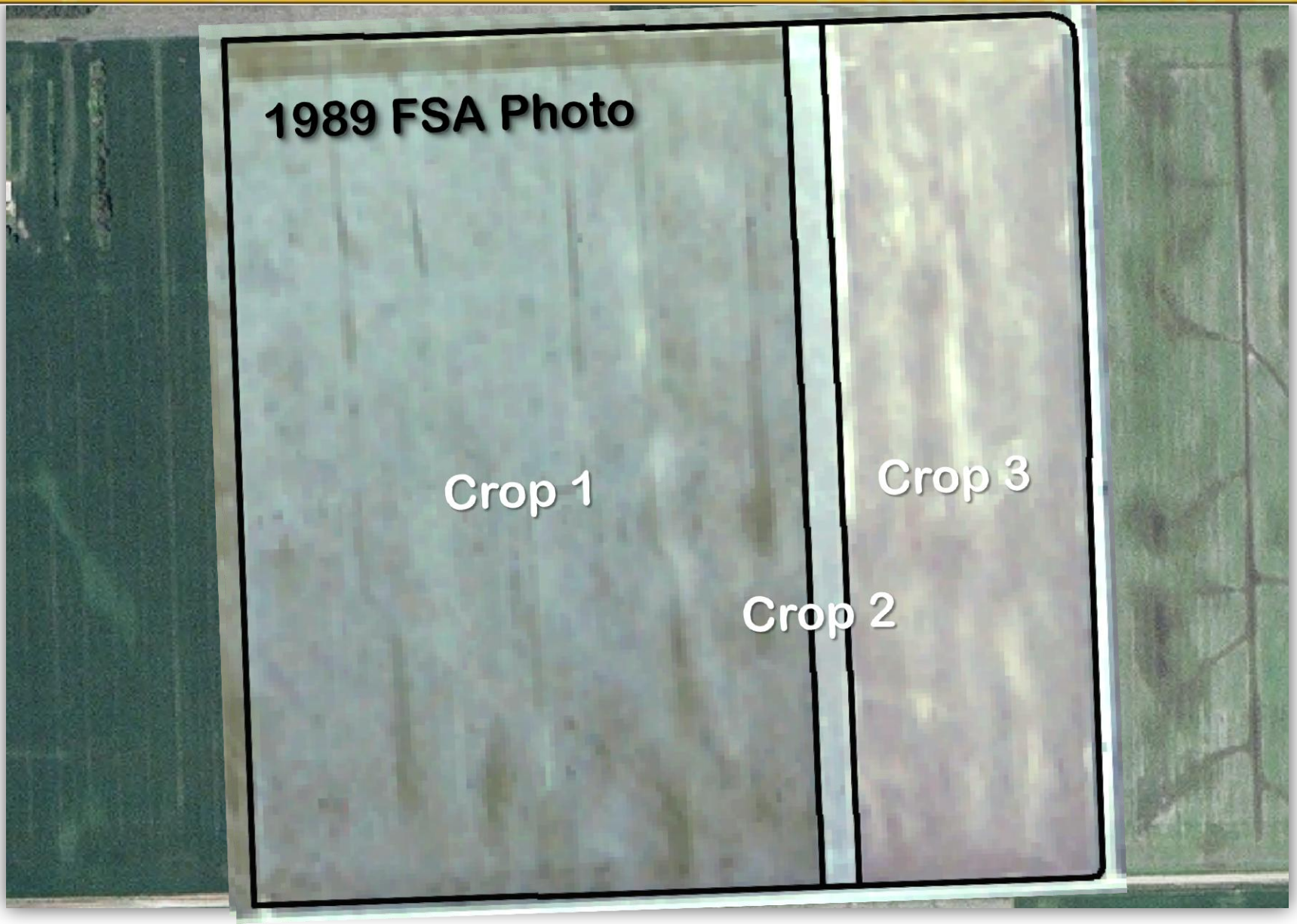
Management

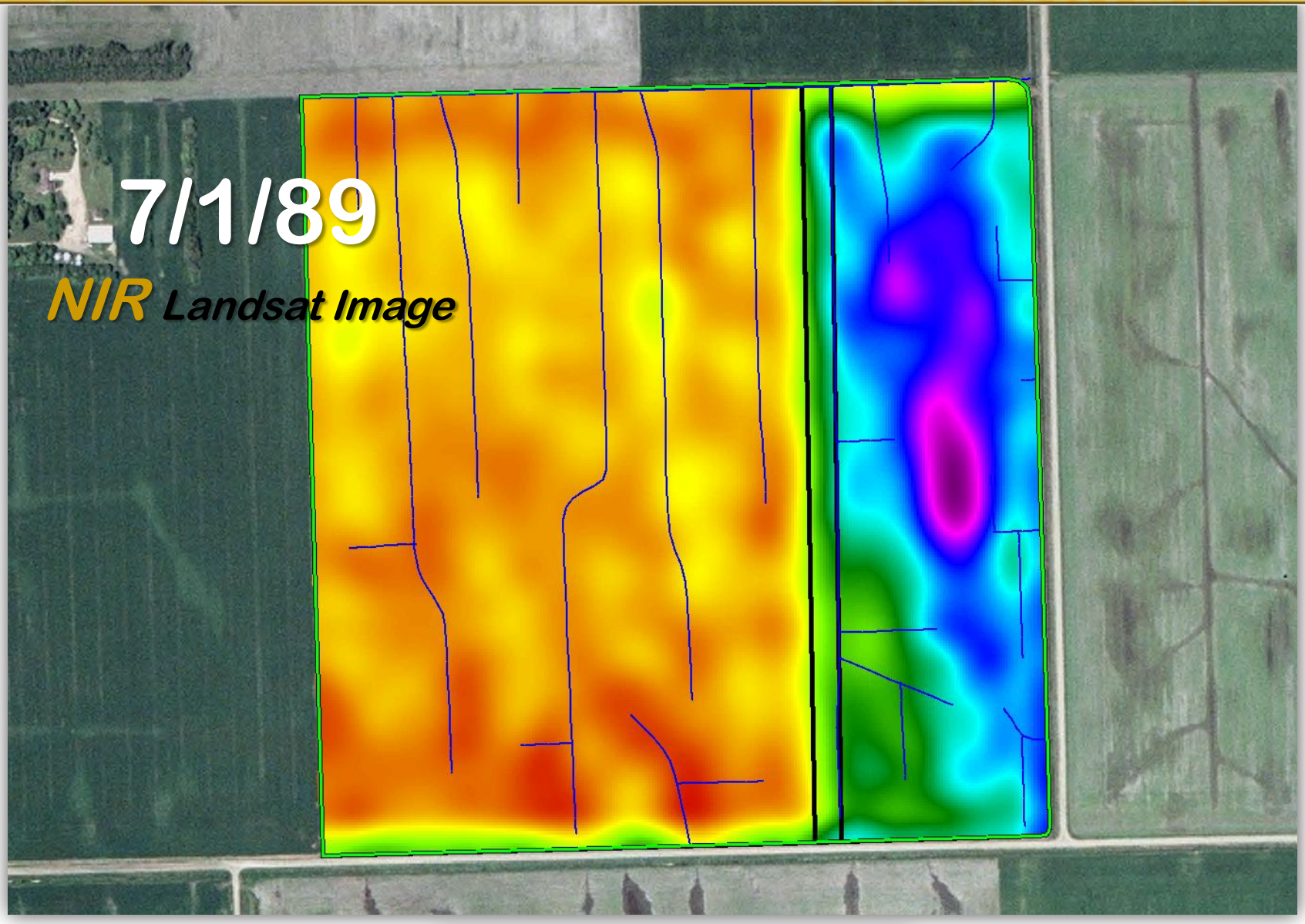
Patterns or Streaks;

Equipment Problems




Elevation
GreenStar
Combine
Systems
John Deere Company ™
45.21
60.83
76.21
91.83
107.2
Dry98wht


1989 FSA Photo
Crop 1
Crop 3
Crop 2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NIR Landsat Image
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85.5
97.8
110
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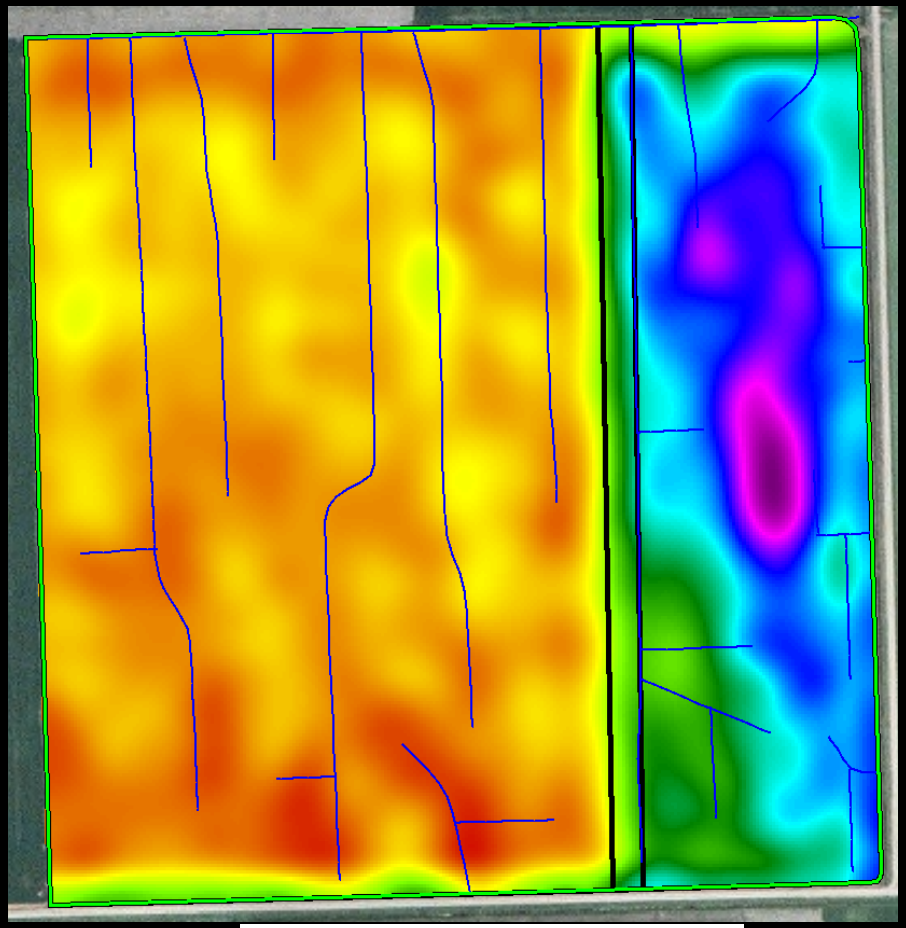
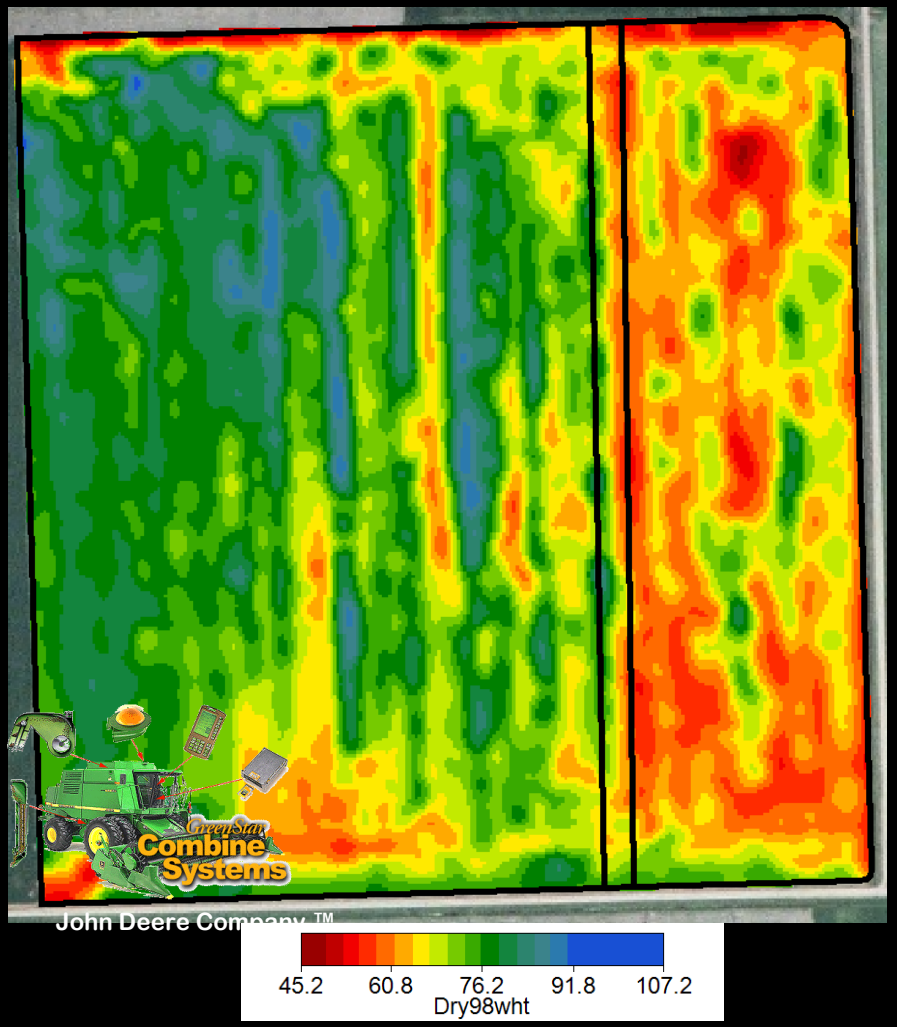
Verification



LandSat 5 Jul1 1989



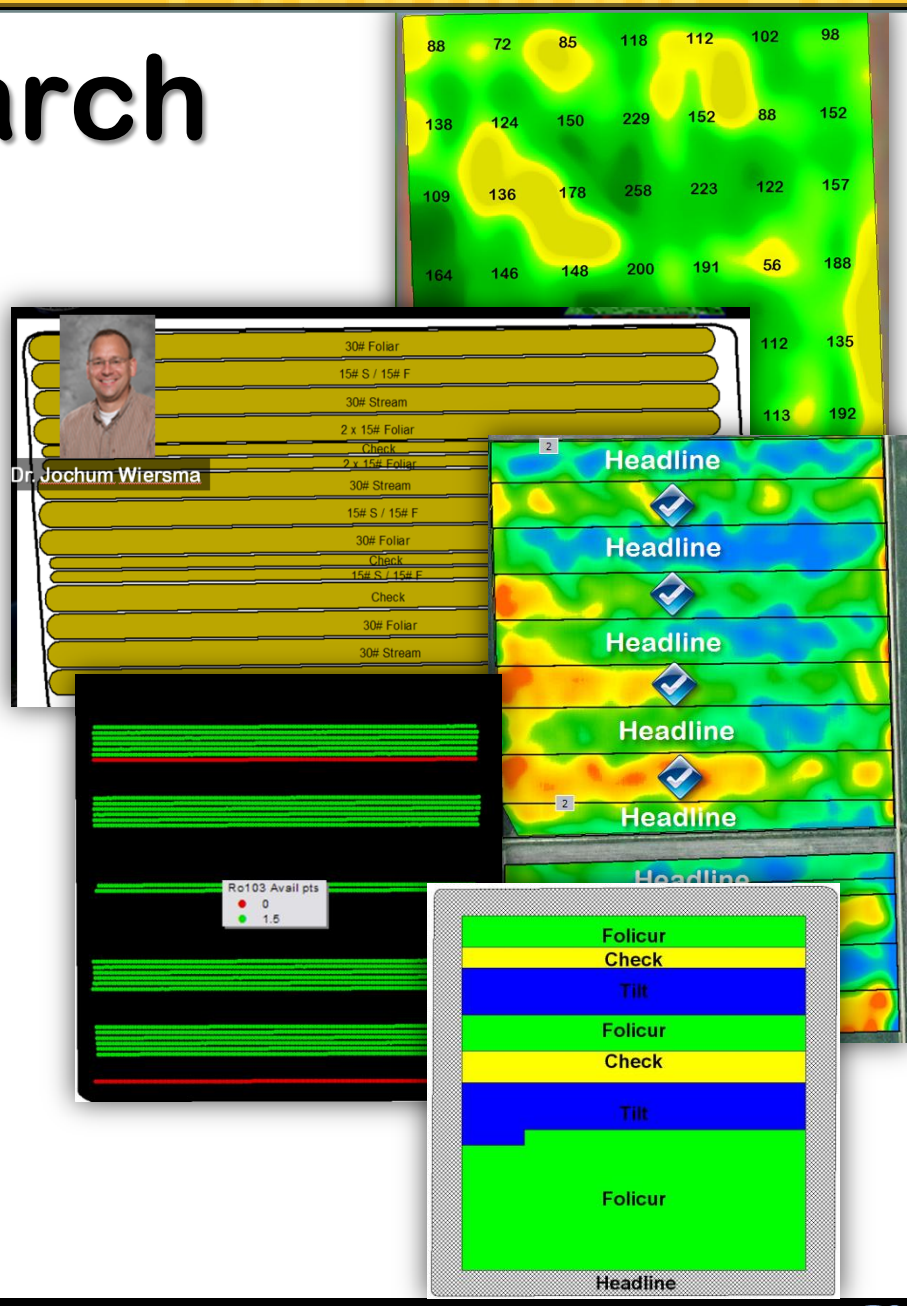
Wheat 1998

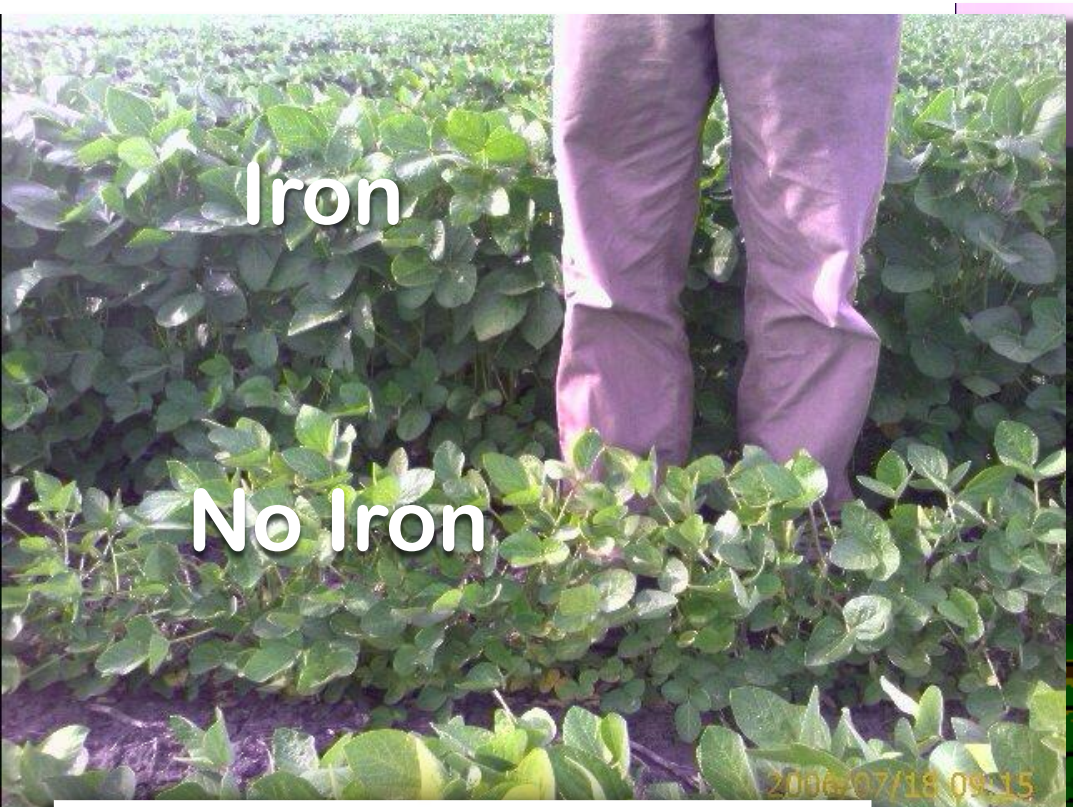
awg farms inc.

On Farm Research

Since 1997

- Sugar beet top variable rate
- Late season N app on Wheat
- Headline use in sunflowers / soybeans
- Avail ™ use in soybeans / beets
- Fungicide use in wheat
- Soybean chlorosis control…





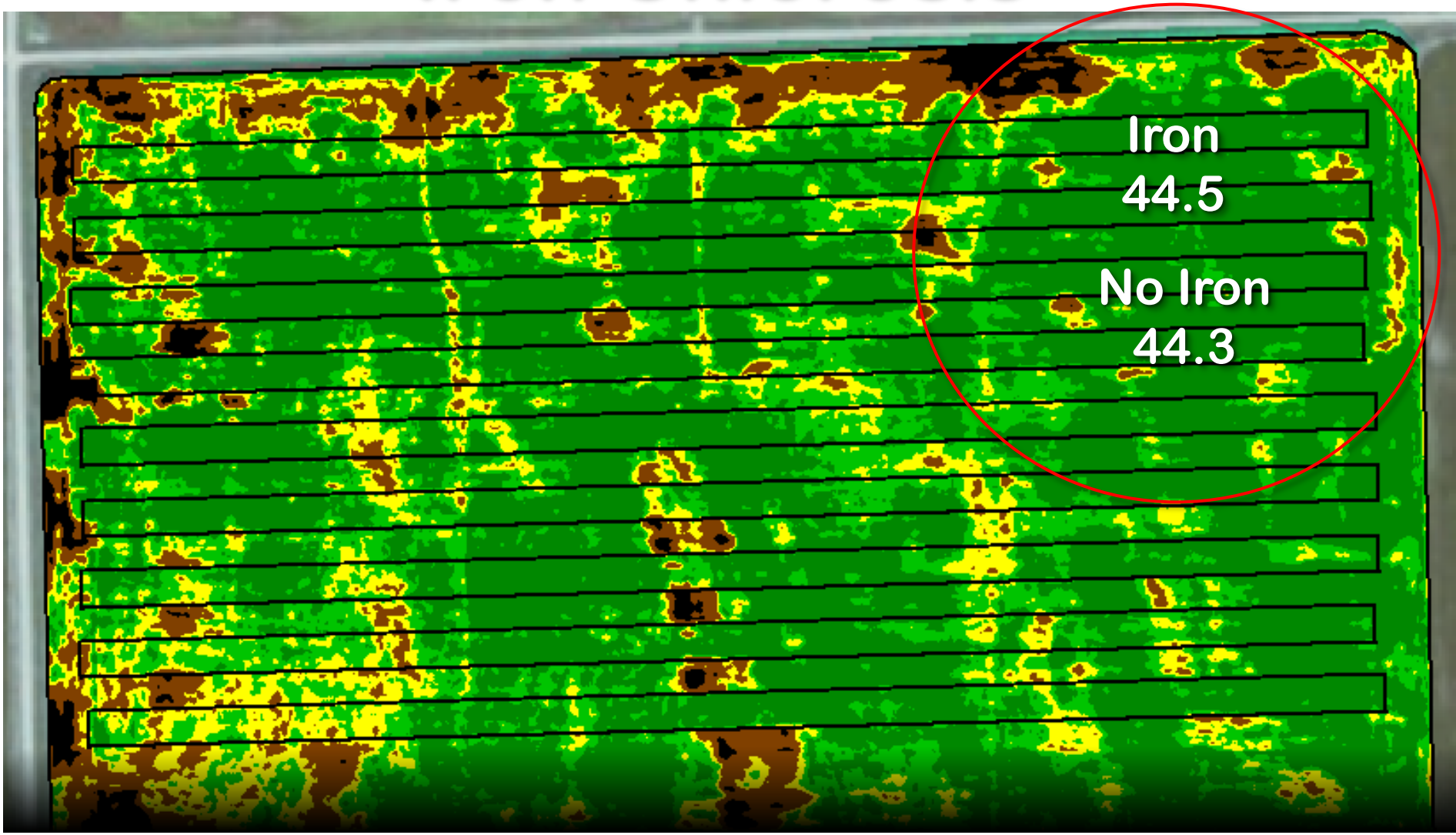
2006 Breakeven
6.8bus ($7.00)
2007 BE 4.5 bus
2010 BE 2 bus ??

June 16th

2006/06/16 09:14

areas to chelated Fe application

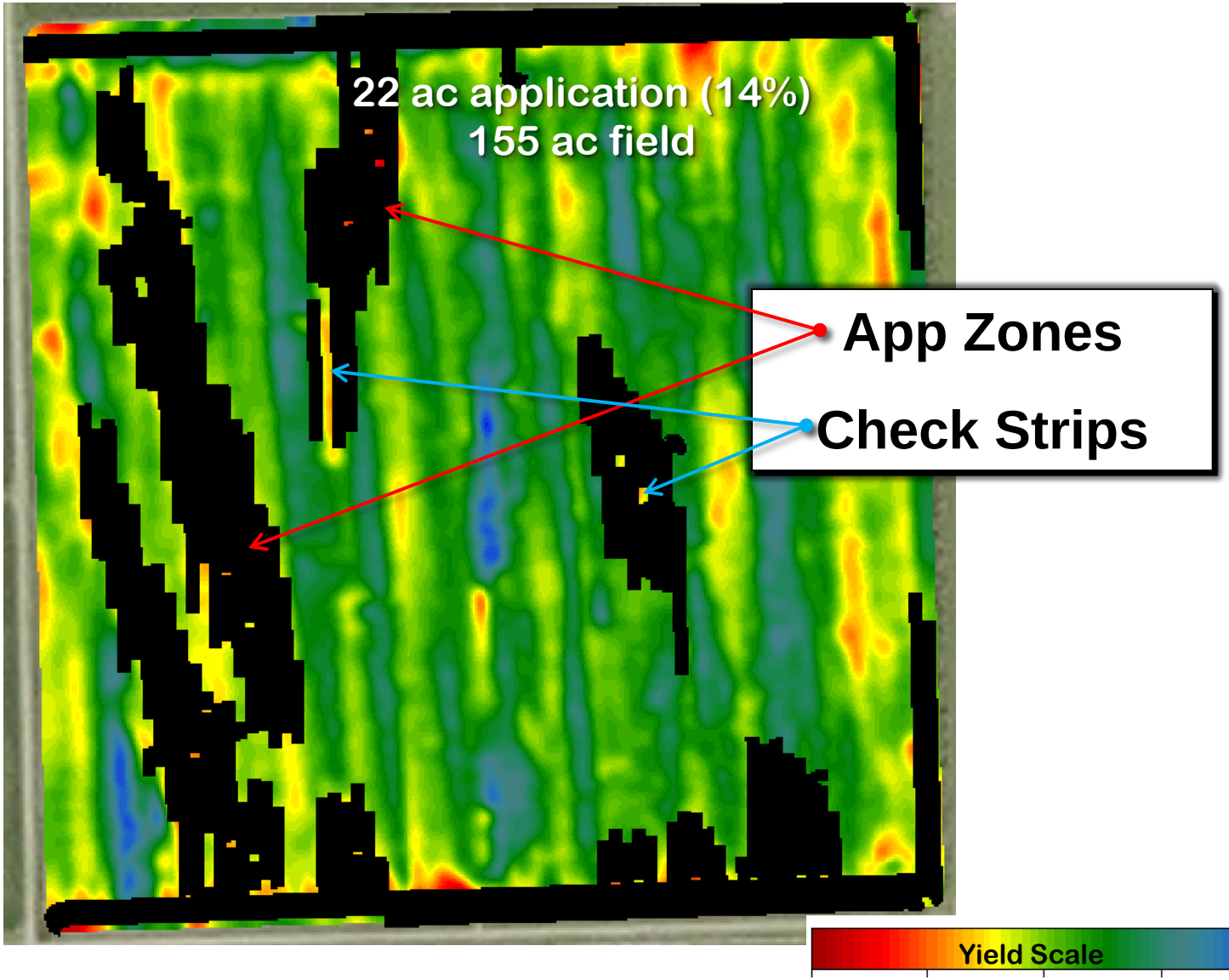
Iron Chlorosis



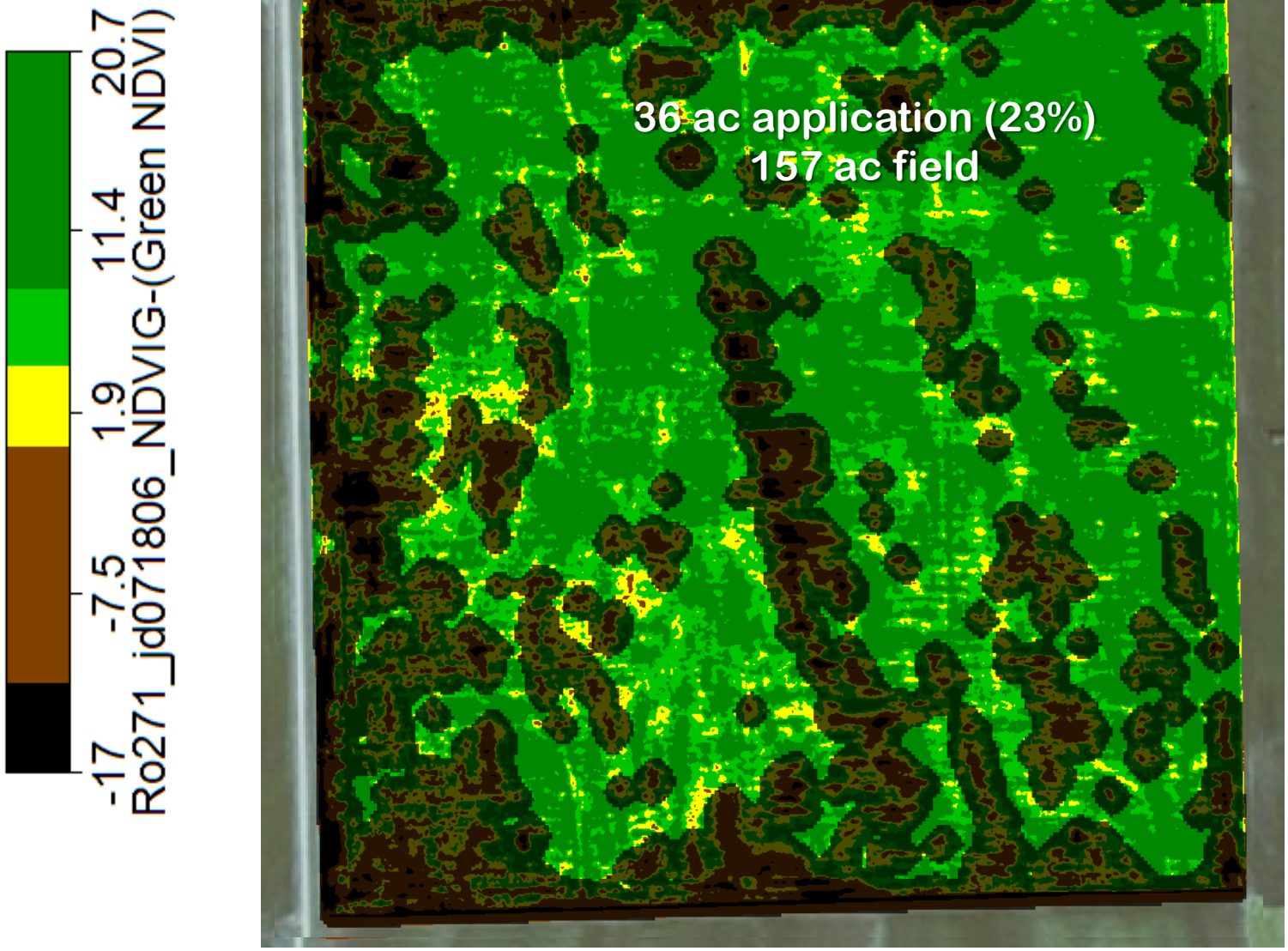
See and Mark

21 ac application (33%)
64 ac field

Yield Map


22 ac application (14%)
155 ac field
App Zones
Check Strips
Yield Scale

High Resolution Image



2010 harvest

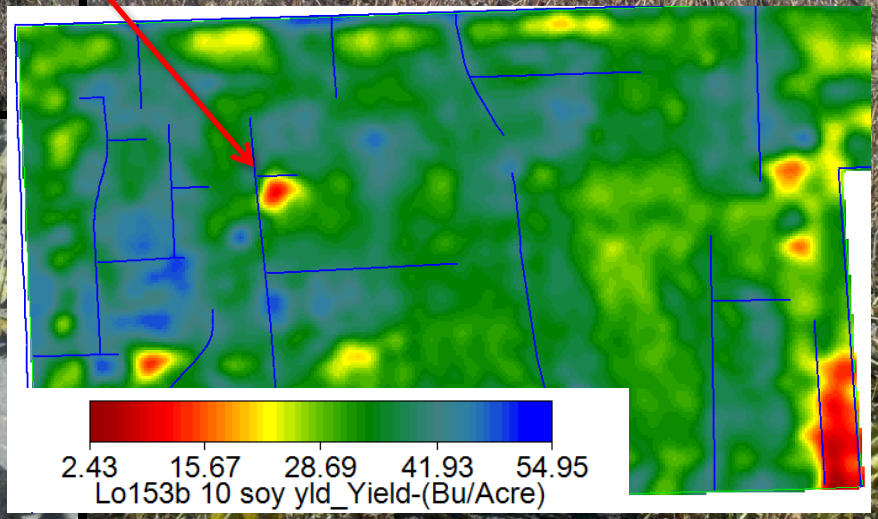
0 bus/ acre

36 bus/ acre

36 bus/ acre

800% ROI

@ $10 beans



0 bus/ acre

0 bus/ acre

VRA Soybeans

1830 Air Hoe Drill

- Multi-Soybean varieties with VRS
  - Defensive / Offensive


Adopting Precision Agriculture is not a Destination…
but an *Educational* Journey

awg Precison Ag™

For More Information;

28572 US Hwy 2 SW

Crookston, Minnesota 56716

218-891-7905

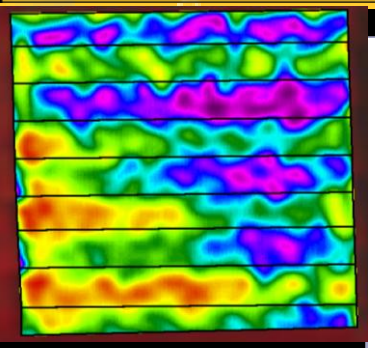
www.awgfarms.com

Owners:

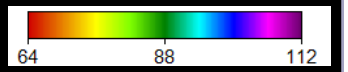
Wayne Wagner
cell 218 280 0901

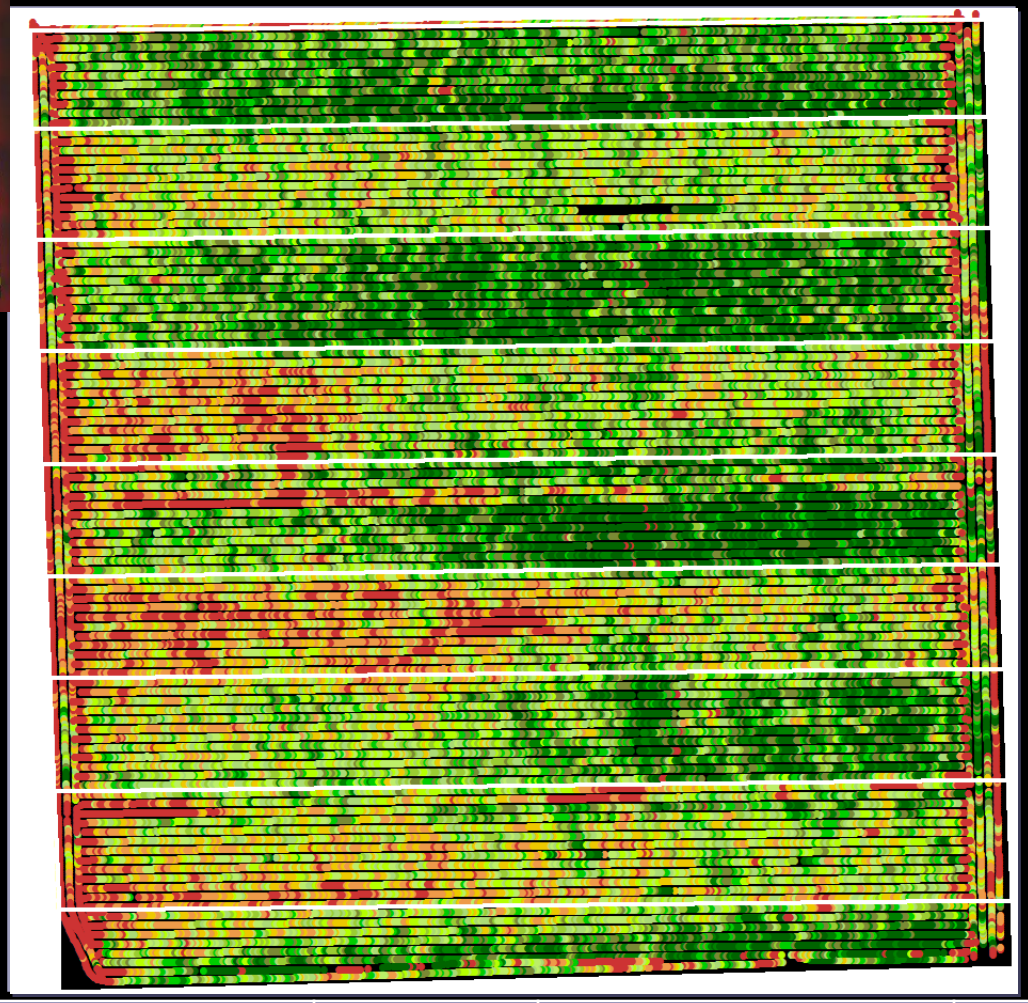
Gary Wagner
cell 218 280 0902

Daryl Wagner
cell 218 280 0903



Landsat NIR 9/05/07





2,255.9 #'s/ac *Headline*

1,983.1 #'s/ac No *Headline*

2,323.3 #'s/ac *Headline*

1,941.5 #'s/ac No *Headline*

2,231.1 #'s/ac *Headline*

1,842.1 #'s/ac No *Headline*

2,148.4 #'s/ac *Headline*

1,880.9 #'s/ac No *Headline*

2,100.7 #'s/ac *Headline*

Headline	84.29 ac	2,218.66 #'s	Increase
No Headline	74.04 ac		305.97 #'s

Vineland 14 SE4 158 ac Crop Year 2007
Harvest date October 23,2007

Headline fungicide

awg farms inc.