

Utilizing Precision AG Practices to Reduce Fertilizer Costs and/or Maximize Returns

The AR Corn and Grain Sorghum Producer
Conference

Dec 10, 2008

Topics

- What is the right strategy?
- Which technologies are right for me?
- Does all of this technology really work?
- What is the ultimate goal?

Introduction

- Extremely high input costs
 - *\$400/ton urea*
 - *\$900/ton phosphate*
 - *\$700/ton potash*
- Reduction in commodity prices
 - *\$5.50 spring corn price to \$3.12 now*
 - *\$13.00 spring soybeans to \$8.50 now*

Introduction

- Producers must make a profit
 - *Cannot afford to have a reduction in yield because of reduced fertilizer use*
 - *Cannot afford to over apply fertilizer*
- Realistic look at precision ag
 - *Gained popularity in mid 1990's and lost popularity in mid to late 1990's*
 - *Equipment, computers, knowledge, and conditions have changed drastically*

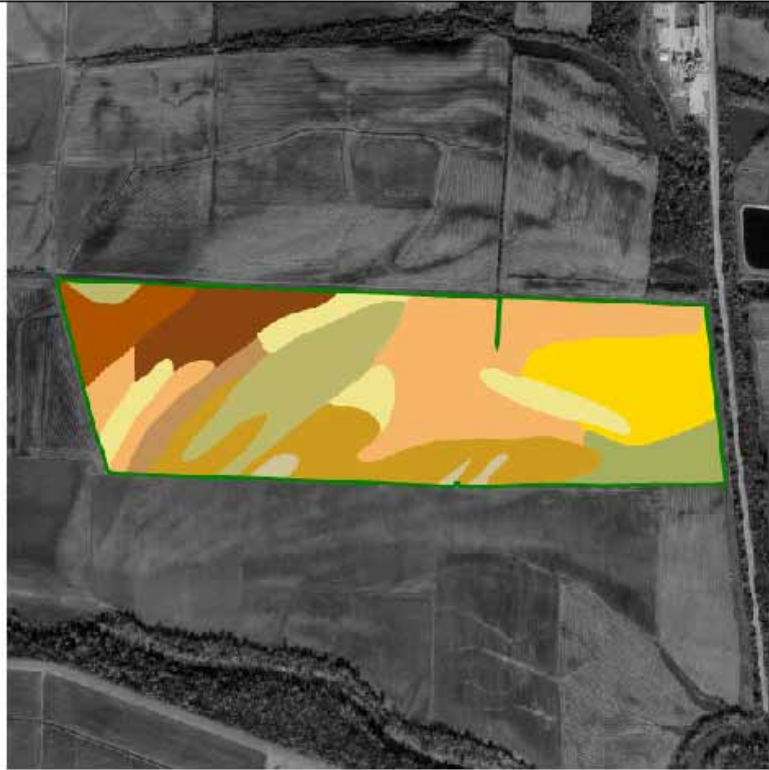
Strategy

- Try to make the complex understandable
- Use common sense and agronomic sense
- Divide fertility management into two stages
 - *Soil fertility management*
 - *In-season fertility management*

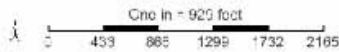
Soil Fertility Management

- Grid sampling
 - 10, 5, 2.5, 1 acre grid?
 - *Interpolates/estimates values between sample points*
- Zone sampling
 - *Field is divided into zones (EC or bare soil imagery)*
 - *Each zone is treated as an individual field*

Soil Type



Client: SEILER FARMS ILL
 Farm: Mason
 Field: Northeast Block
 Date: 11/23/2008
 Area: 224.9 ac
 Lat: 37.09711°N
 Lon: 089.21186°W



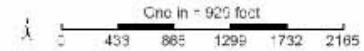
	Cape silty clay loam, 0 to 2 percent slopes, frequently flooded (61 ac) (27%)
	Hunt silt loam, 0 to 2 percent slopes, rarely flooded (37 ac) (16%)
	Karnak and Cape silty clays, undrained, 0 to 2 percent slopes, frequently flooded (27 ac) (12%)
	Karnak silty clay, 0 to 2 percent slopes, frequently flooded (13 ac) (6%)
	Karnak silty clay, 0 to 2 percent slopes, frequently flooded, long duration (13 ac) (6%)
	Okaw silty clay loam, 0 to 2 percent slopes, rarely flooded (17 ac) (7%)
	Piscola silty clay loam, 0 to 2 percent slopes, frequently flooded (27 ac) (12%)
	Pebbly fine sandy loam, 0 to 2 percent slopes, occasionally flooded (7 ac) (3%)
	Scotsville silt loam, 0 to 2 percent slopes, rarely flooded (4 ac) (2%)
	Scotsville silt loam, 2 to 5 percent slopes, rarely flooded (19 ac) (8%)



Soil Test Points



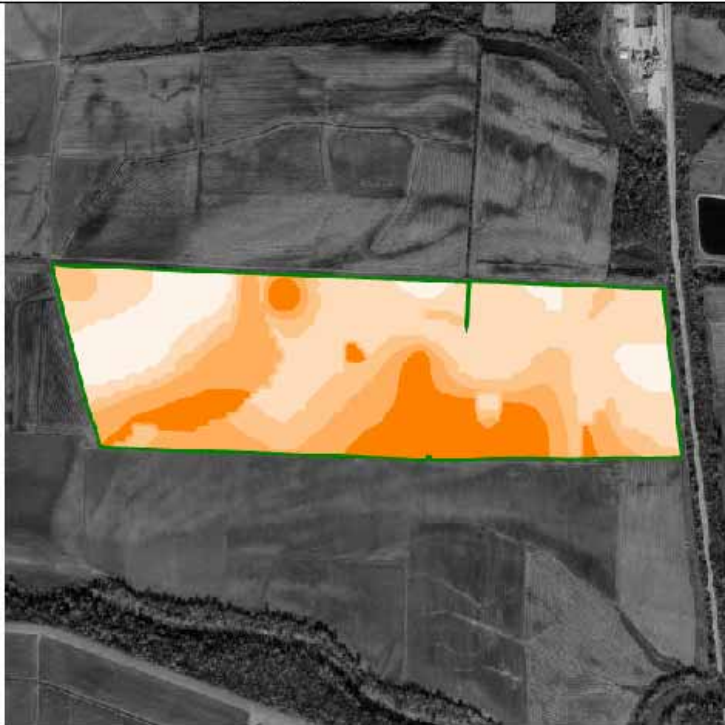
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 Farm: Mason
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 Area: 224.9 ac
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- Field Boundary
- Soil Test Points



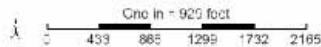
Soybean 0-0-60



Client: SEILER FARMS ILL
 Farm: Mason
 Field: Northeast Block
 Date: 11/23/2008
 Area: 224.9 ac
 Lat: 37.09711°N
 Lon: 089.21186°W

Min Rate: 66.67 lb/ac
 Avg Rate: 100.66 lb/ac
 Max Rate: 188.80 lb/ac
 Total Product: 22,859.34 lb
 Product: 0-0-60
 Applied Area: 195.40 ac
 Task: SBU AM, Rec - K Rec
 Order Id - 39410
 Order Task Id - 650916
 Crop - Year 1 - Soybean
 Purpose - Year 1 - Dry Grain
 Yield Goal - Year 1 - 70
 Build Years - 0
 K Rec Option - No Build

- Field Boundary
- K Recommendation lb/ac
- 0 - 0 (29.5 ac) (13%)
- 56.7 - 66.7 (85.7 ac) (38%)
- 118.5 - 146.1 (34.8 ac) (15%)
- 146.2 - 164.5 (42.1 ac) (19%)
- 164.6 - 188.8 (32.8 ac) (15%)



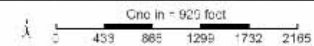
2009 Lime Rec



Client: SEILER FARMS ILL
 Farm: Mason
 Field: Northeast Block
 Date: 11/23/2008
 Area: 224.9 ac
 Lat: 37.09711°N
 Lon: 089.21186°W

Min Rate: 0.98 U.S. ton/ac
 Avg Rate: 0.40 U.S. ton/ac
 Max Rate: 4.61 U.S. ton/ac
 Total Product: 92.38 U.S. ton
 Product: Lime
 Applied Area: 45.20 ac
 Task: SBU Lime - Lime Rec
 Order Id - 39284
 Order Task Id - 648067
 Lime Rec Option - SMP Buffer pH
 pH Target - 6.5

- Field Boundary
- Lime Recommendation U.S. ton/ac
- 0 - 0 (179.7 ac) (80%)
- 1 - 1.6 (13.6 ac) (6%)
- 1.6 - 2.2 (15.5 ac) (7%)
- 2.2 - 3 (11.2 ac) (5%)
- 3 - 4.6 (4.9 ac) (2%)



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New Look
At An
Old Farm...

“Management
Zones”



Veris How it works...



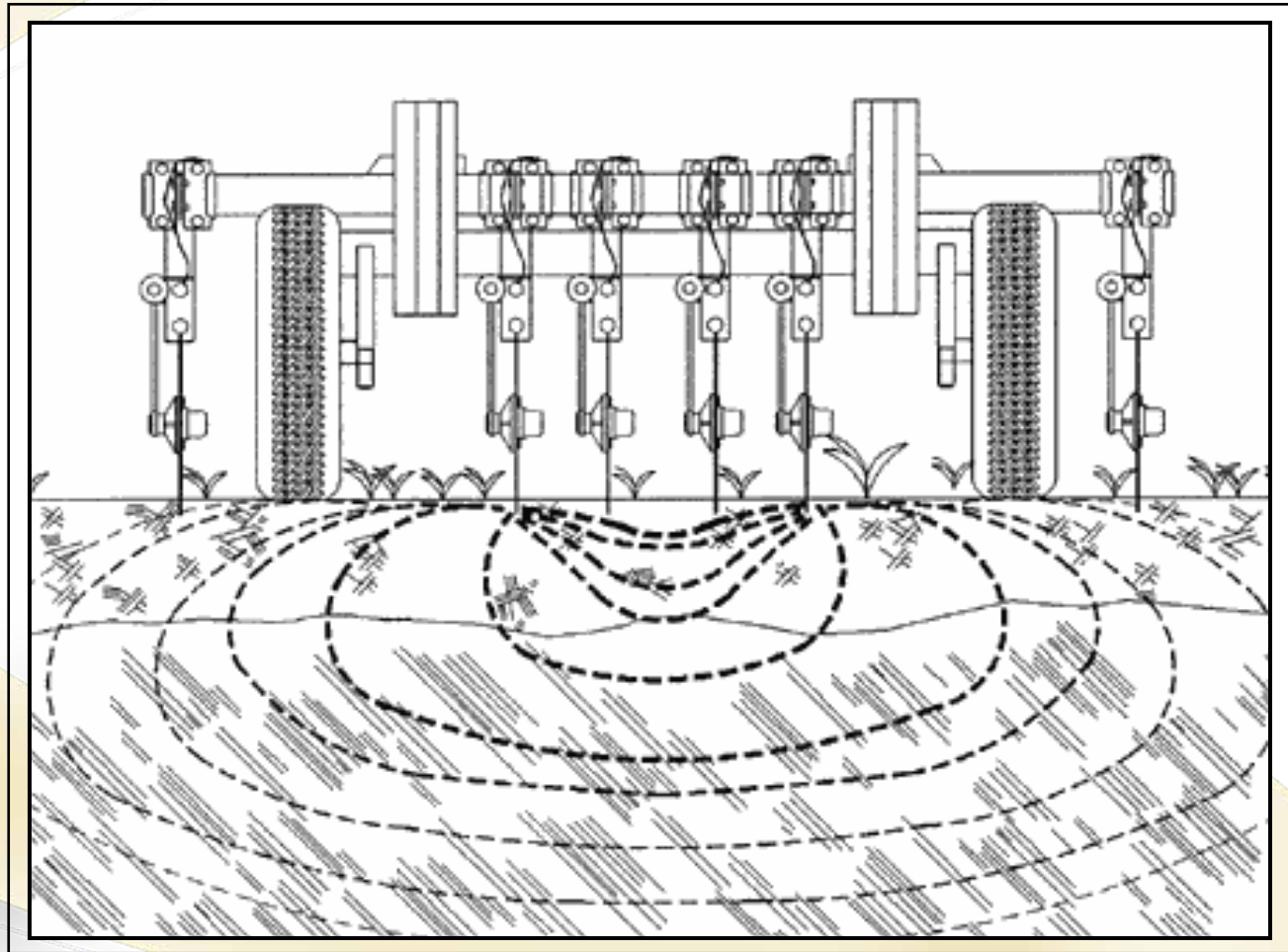
- Veris travels at regular intervals throughout a field.
- Data is then used to create a Management Zone map.
- Soil Sampling Sites can be placed according to variability.

Electrical Conductivity

Two Depth Readings

Shallow
0-12"

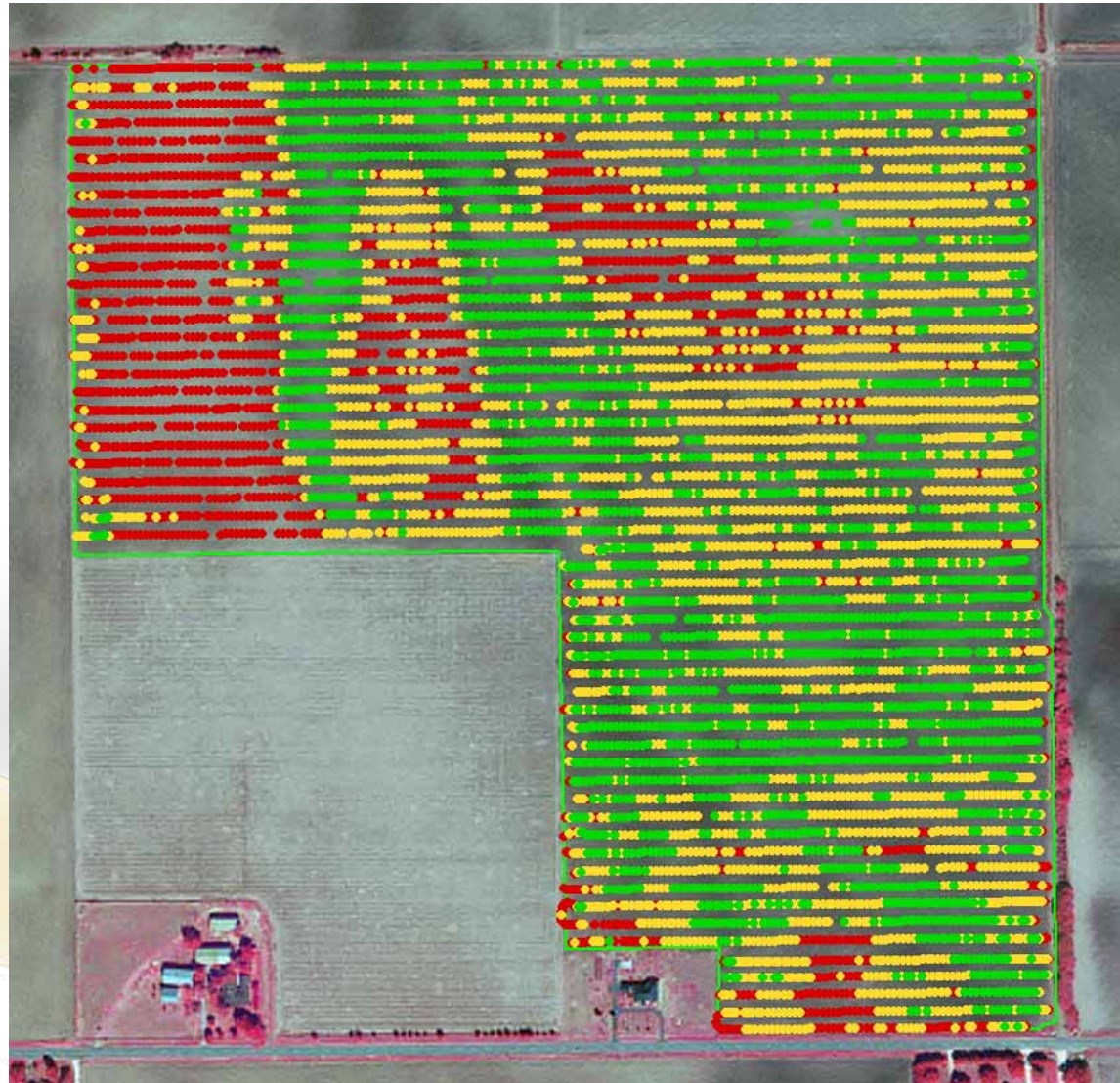
Deep
0-36"



One pair of coulter-electrodes injects electrical current into the soil, while two other pairs of coulter-electrodes measure the voltage drop.

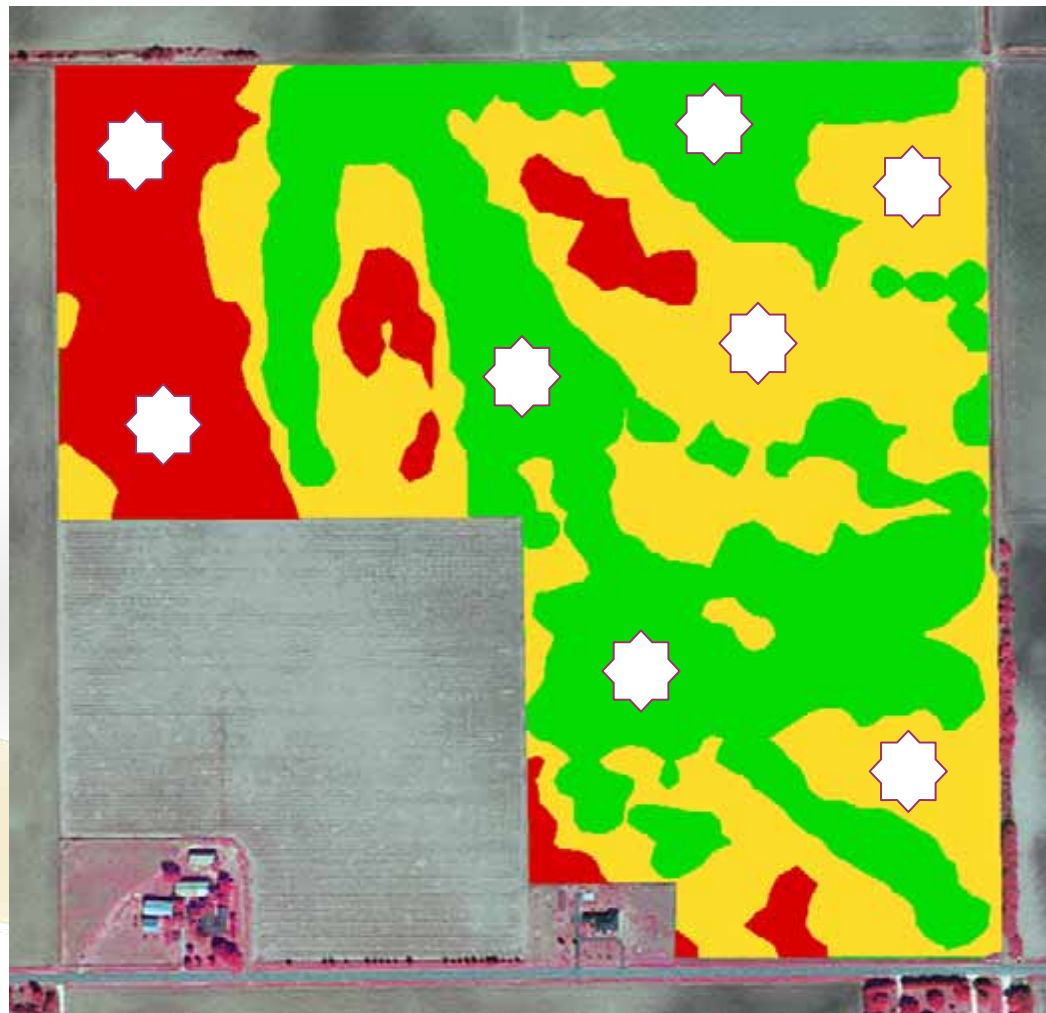
Veris Output

- Returns 1 data point per second
- Sandier Soils have lower conductivity values
- Clays have higher values



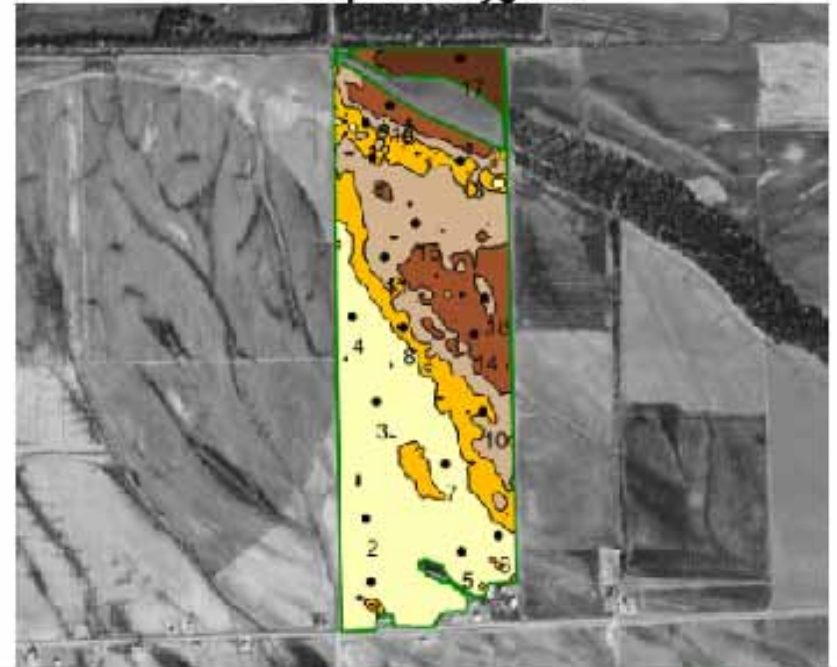
Management Zones

- Provide Guides for soil sampling
- Identify “Fields within Fields”
- Track productivity or profitability of any subset of the field



Shallow EC Polygons

Deep EC Polygons



Client: _____
 Farm: _____
 Field: _____
 Date: _____
 Area: _____
 Latitude: _____
 Longitude: _____

Field Boundary	
Shallow EC Polygons mS/meter	
Light Yellow	5.1 - 14.8 (50 ac) (27%)
Yellow	14.9 - 24.9 (40 ac) (22%)
Light Brown	25 - 37.4 (37.4 ac) (20%)
Dark Brown	37.4 - 53 (41.1 ac) (22%)
Very Dark Brown	53.2 - 71.7 (15.5 ac) (8%)

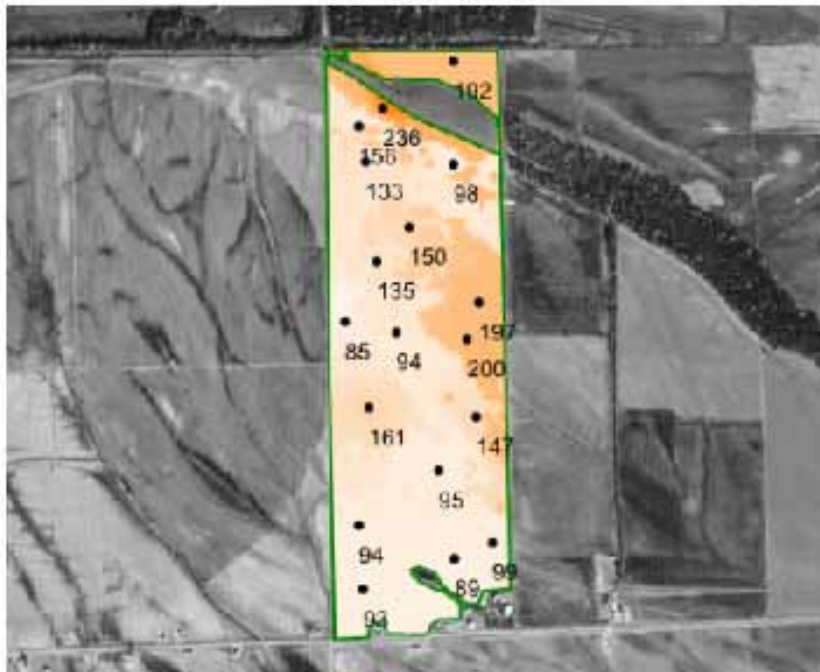
Field Boundary	
Deep EC Polygons mS/meter	
Light Yellow	4.7 - 26.4 (76.9 ac) (42%)
Yellow	26.5 - 42.5 (27.9 ac) (15%)
Light Brown	42.6 - 57 (44.4 ac) (24%)
Dark Brown	57 - 75.5 (25.4 ac) (14%)
Very Dark Brown	76.9 - 94.3 (9.4 ac) (5%)

Season: 2009
 Min: 5.13 mS/meter
 Avg: 28.80 mS/meter
 Max: 71.75 mS/meter

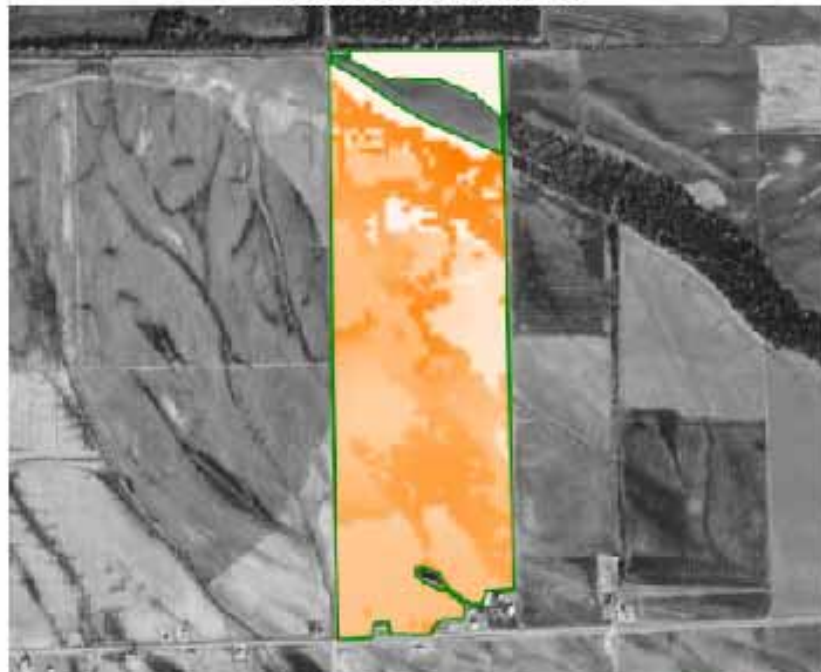
Season: 2009
 Min: 4.67 mS/meter
 Avg: 38.50 mS/meter
 Max: 94.32 mS/meter



K - Soil Test



K Recommendation



Min: 84.76 ppm
 Avg: 131.09 ppm
 Max: 235.55 ppm

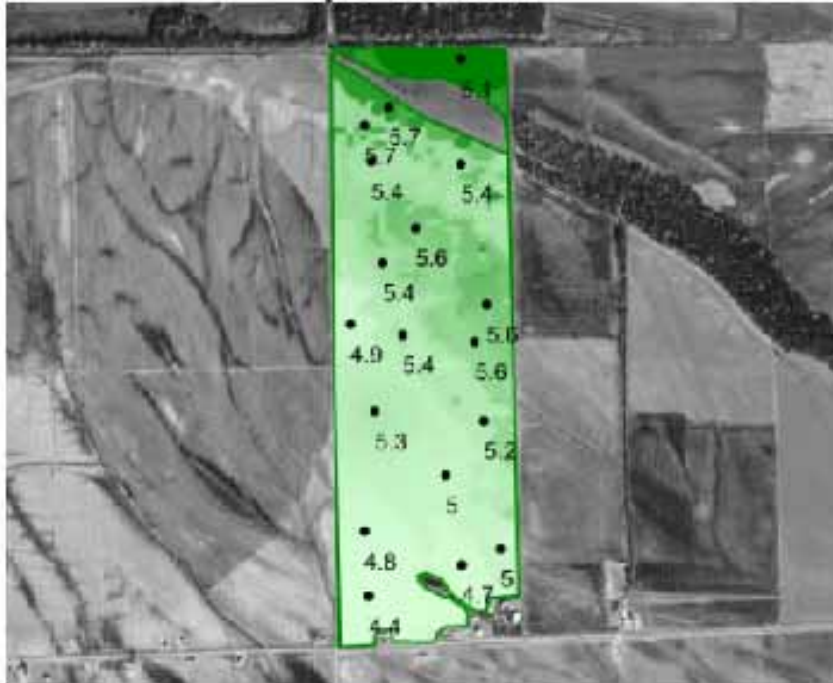
Min Rate: 26.71 lb/ac
 Avg Rate: 43.45 lb/ac
 Max Rate: 79.07 lb/ac
 Total Nutrient: 8,172.90 lb
 Applied Area: 160.78 ac
 Purpose 1 -- Dry Grain
 Build Years -- 0
 Yield Goal 1 -- 80
 Crop 1 -- Wheat
 K Rec Option -- No Build

Field Boundary	K - Soil Test ppm
Lightest Orange	84.8 - 117.5 (93 ac) (51%)
Light Orange	117.6 - 163.9 (52.6 ac) (29%)
Orange	164.1 - 203.5 (33.5 ac) (18%)
Dark Orange	204.4 - 223.9 (4.2 ac) (2%)
Darkest Orange	224.6 - 235.6 (0.7 ac) (0%)

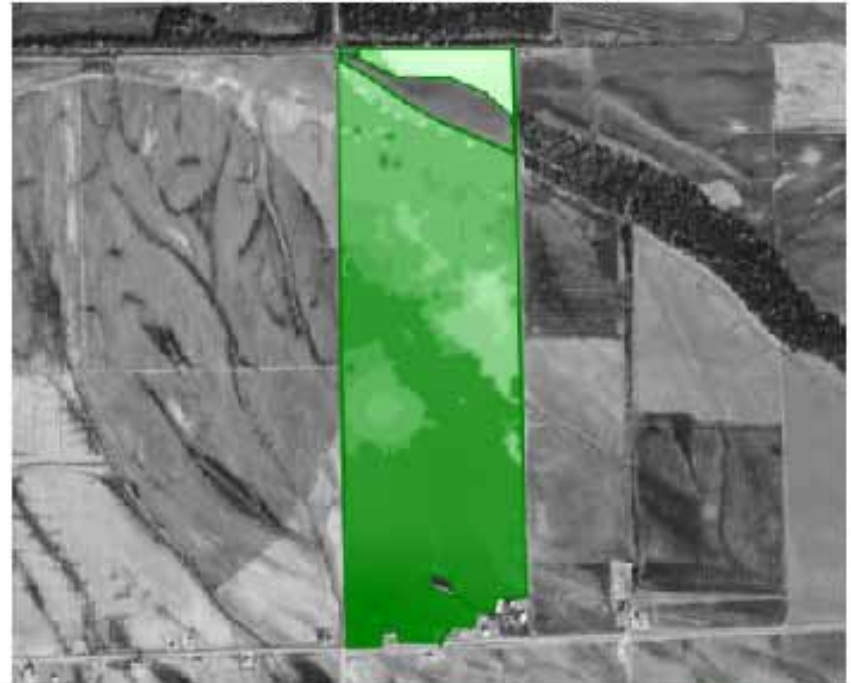
Field Boundary	K Recommendation lb/ac
Lightest Orange	0 - 0 (23.3 ac) (13%)
Light Orange	26.7 - 35.9 (18.9 ac) (10%)
Orange	36.1 - 54.3 (79.1 ac) (43%)
Dark Orange	54.4 - 68.2 (44.3 ac) (24%)
Darkest Orange	68.3 - 79.1 (18.4 ac) (10%)



pH - Soil Test



Lime Recommendation



& Sons

- Field Boundary
- pH - Soil Test PH SCALE
- 4.4 - 5 (59.8 ac) (32%)
- 5 - 5.4 (79.7 ac) (43%)
- 5.6 - 5.6 (26.6 ac) (14%)
- 5.6 - 5.8 (8.3 ac) (5%)
- 5.9 - 6.1 (9.7 ac) (5%)

Season: 2009
 Min: 4.40 PH SCALE
 Avg: 5.23 PH SCALE
 Max: 6.10 PH SCALE

Min Rate: 2,747.57 lb/ac
 Avg Rate: 4,353.30 lb/ac
 Max Rate: 6,003.33 lb/ac
 Total Nutrient: 802,507.12 lb
 Applied Area: 184.06 ac
 pH Target -- 6.5
 Lime Rec Option -- SMP Buffer
 pH

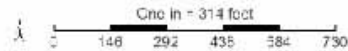
- Field Boundary
- Lime Recommendation lb/ac
- 2747.6 - 2982 (9.7 ac) (5%)
- 3141.5 - 3575.4 (4.3 ac) (2%)
- 3578.1 - 3942 (40.2 ac) (22%)
- 3946.9 - 4585.9 (61.5 ac) (33%)
- 4590.4 - 6003.3 (68.3 ac) (37%)



Soil Type



Client: Jason Bean
Farm: Gideon Farm
Field: Point
Date: 12/09/2008
Area: 79.97 ac
Lat: 36.46207°N
Lon: 089.84216°W



- Gideon loam, 0 to 1 percent slopes, rarely flooded (51 ac) (64%)
- Udorthents-Water complex (3 ac) (3%)
- Wardell loam, 0 to 1 percent slopes, rarely flooded (26 ac) (32%)



EC Soil Test ppm - Veris EC Classes



Date: 12/09/2008
Field: Point
Farm: Gideon Farm
Client: Jason Bean
Area: 79.97 ac
Lat: 36.46207°N
Lon: 089.84216°W

Min: 1.00
Avg: 2.50
Max: 5.00



Classes -		
■	1 - 1	(22.46 ac)
■	2 - 2	(18.47 ac)
■	3 - 3	(20.54 ac)
■	4 - 4	(12.92 ac)
■	5 - 5	(5.57 ac)

Soil Fertility Management

- Grid sampling or zone sampling will work
- Zone sampling has more utility with other precision ag practices (VR planting and herbicides)
- Higher sampling costs and labor costs with grid sampling
- Added initial costs to create zones from EC data or bare soil imagery

In-season fertility management

- Directed tissue and/or soil sampling
 - *Collect samples from “good” and “bad” areas*
 - *Determine if foliar application is needed*
- Aerial imagery
 - *Directs where to collect tissue or soil samples*
 - *Relies heavily on ground truthing*
 - *Limited by clouds*
- On-the-go sensors
 - *Measure reflectance data and simultaneously vary the rates*
 - *Relies heavily on algorithms*
 - *Not limited by clouds*

In-season fertility management

- Interest in VR N management
- BE CAREFUL!!
- Have had success in Corn production
 - *Apply pre-plant N*
 - *Reduce side-dress N*
 - *Apply VR or Blanket application of foliar or dry fertilizer at pre-tassel*
- Can also be useful for P, K, and micronutrient management

Imagery/ On-the-go Sensors



Does this really work?

- Yes and NO
- Lower fertilizer costs inhibit ability to work
- Higher fertilizer cost enhance opportunities

Field A

- **2004 Straight Rate**
- Grower Standard 20 Gal/ Acre of 11-37-0
- Fertilizer Cost - \$1.34/Gal for Total of \$26.72/Acre
- Yield – 1,327# Lint/Acre
- **2006 Variable Rate**
- 11-27-0-7 + 1 Gal/Acre Hydra Hume
- Average Rate per Acre = 14.7 Gal/Ac
- Fertilizer Cost - \$1.35/Gal + Hydra-Hume @ \$5.00/Gal for a **Total of \$24.85/Acre**
- Total Fertilizer Cost in 2004 Dollars was \$22.79
- Yield – 1,387# Lint/Acre

Comparision

- **\$950/ton DAP;**
\$575/Ton 0-0-60
- Rice-
 - *100 lbs DAP*
 - *150 lbs 0-0-60*
- Cost per acre 80 acre field
 - *\$47.50 for DAP*
 - *\$43.00 for 0-0-60*
- **\$90.50/ A**
- Hyground-zone sampling
- Rice-
 - *45 lbs DAP*
 - *180 lbs 0-0-60*
- Cost per acre
 - *\$22.00 for DAP*
 - *\$51.75 for 0-0-60*
- **\$73.75/A**

Ultimate Goal

- Precision fertility management must accomplish at least one of the following
 - *Decrease fertilizer costs*
 - *Improve yields*
 - *Maximize returns on fertilizer dollars spent*

Where are we headed

- Would tying yield maps and record keeping data to fertility management be useful??

