



Site-specific management at Bowles Farming Company

UC Davis Precision Ag Workshop

7/14/2010

Cannon Michael

Bowles Farming Company, Inc.



Bowles Farming Company, Inc.

- Family owned and operated
- 150+ years farming in California
- 10,500 irrigated acres in the Central San Joaquin Valley (Los Banos)
- 4,200 acres Cotton, 2,800 Alfalfa, 2,100 Tomatoes, 1,000 Small grains, 500 melons
- Clay Loam Soils - variable





Bowles Farming Company, Inc.

2010 Crop Map



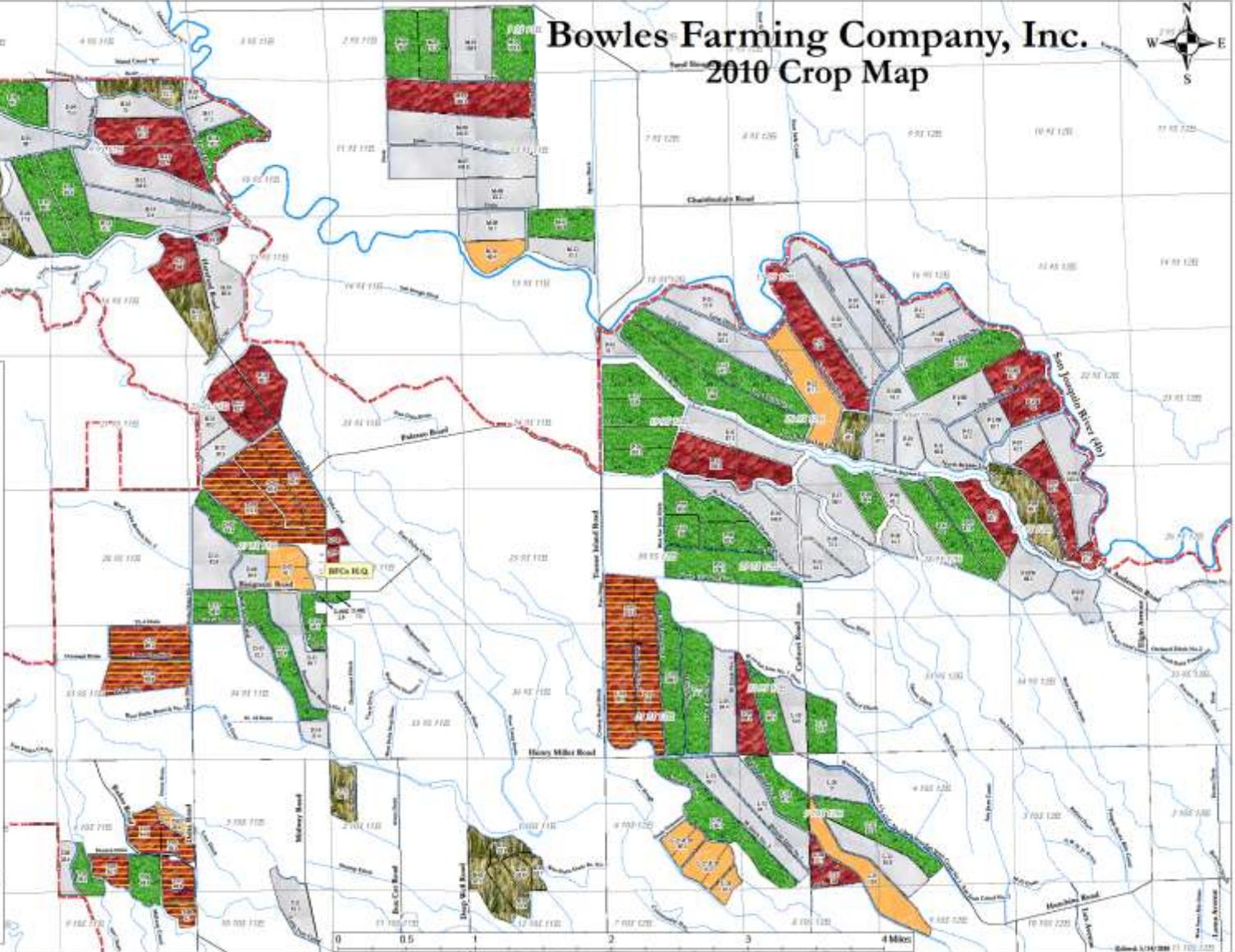
Legend

 SLCC Boundary

2010 Crop Plan

Crop

-  Alfalfa
-  Barley
-  Corn
-  Cotton
-  Melons
-  Melons - Drip
-  Tomatoes
-  Tomatoes - Drip
-  Wheat



Current Precision Ag Program

- GPS Guided Tractors
 - Sub-inch listing (RTK) (2002)
 - DGPS Tillage (2001)
- Geographic Information System software (2001)
 - Basic mapping
 - Advanced data analysis
 - Data Management
- GPS “directed” Soil Sampling (2002)
- Variable Rate Prescriptions and Applications (2002)
- Collection of Yield Data (2002)
 - Grain & Cotton
- Satellite Imagery (2002)
 - Field Analysis & Remediation
 - Crop Scouting (basis of VR applications)
- High Resolution imagery (2004)
 - Drip irrigation fields

Primary Goals

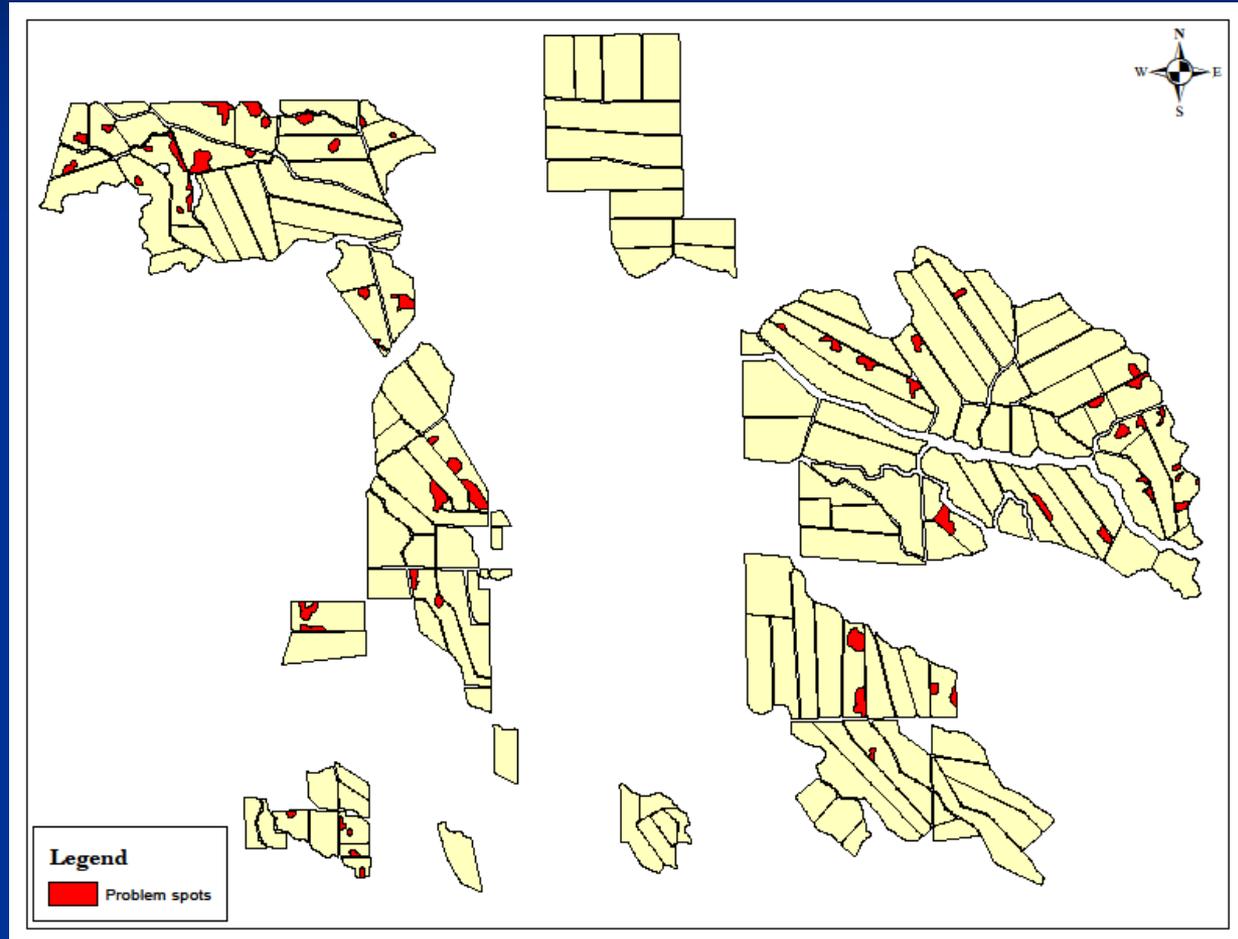
- Use Advanced Data to Identify Areas of Field Variability and Correct if Possible
 - Determine Causes
 - Soil Type
 - Leveling
 - Irrigation
 - Mechanical or Chemical Damage
 - Bug Pressure
 - Nutrient Deficiency
- Use Advanced Data to Target Crop Inputs to Areas of Need
 - Growth Regulator
 - Defoliant
 - Fertilizer, Amendments, Organic Matter (compost)

Other benefits

- Cost savings
 - 15-20% reduction in amendment costs
 - 20% reduction in chemical costs
- Good to be “progressive”
 - Compliance with future regulations
 - Nitrogen & other inputs
 - Restricted materials
 - Tells a good story for agriculture

Problem spots

- Over 300 acres
- Identified from historical observations, imagery database and yield monitor data
- Can spend \$\$\$ to remediate
- High salt
- Low organic matter
- Can target spots with VR applications over time
- Use of imagery, field observation and yield data confirms results



Problems

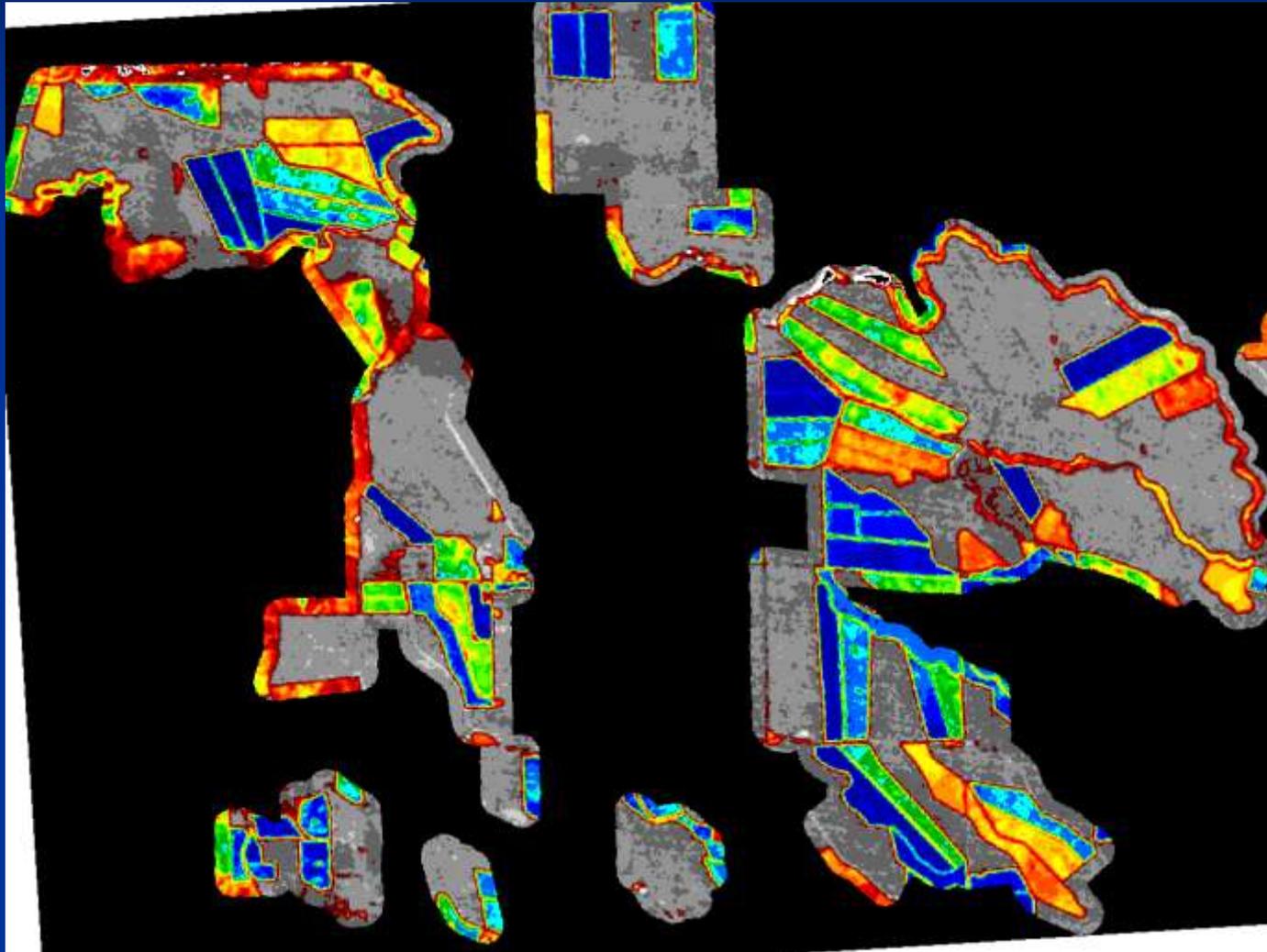


- Data overload
- Time (review, interpret and manage data)
- Interoperability
 - Many different formats from many different companies
- Software
 - Each program does one or two things well
 - Need to learn several systems to achieve desired results

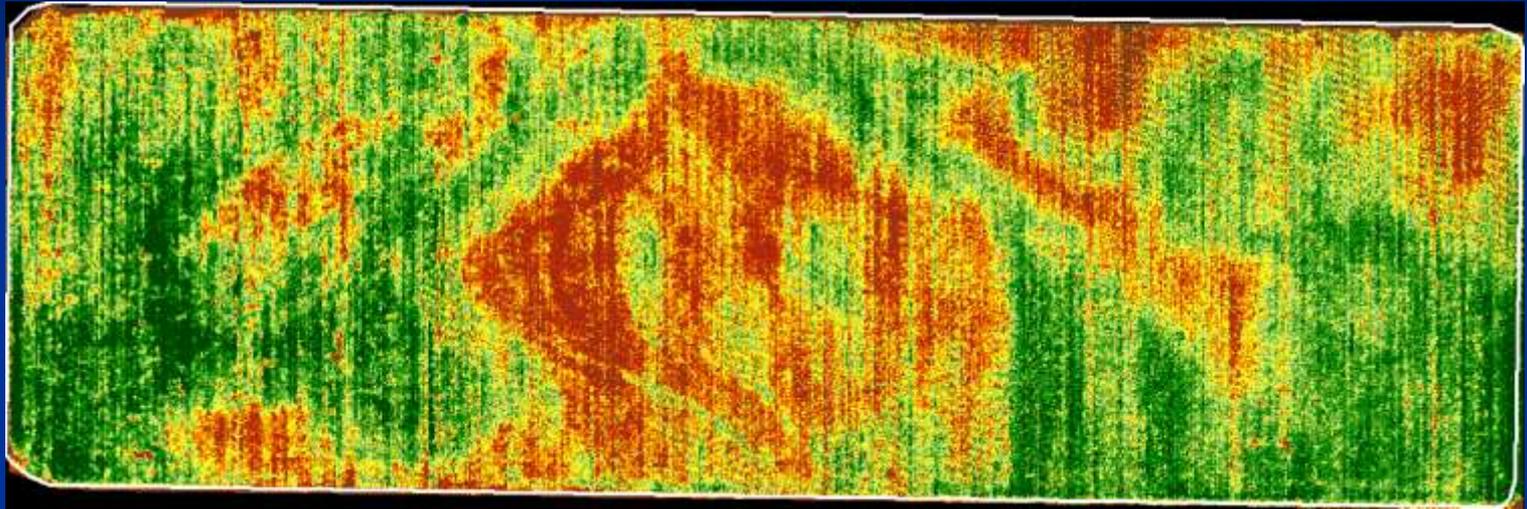
Software

- ArcView (www.esri.com): GIS program for spatial data management and mapping
- HGIS (www.starpal.com): Easily creates zones from imagery
- SMS Advanced (www.agleader.com): Interprets yield data from monitors
- MapStar (www.hemispheregps.com): Creates variable rate maps for Satloc controllers
- Apex (stellarsupport.deere.com): Manage data from John Deere controllers

Imagery – the cornerstone of SSM



All images are not created equal



LandSat vs Aerial Imagery

Quick Cost Breakdown

■ **Aerial:**

- \$1.00 - 2.00 / acre (per image) – depends on acreage discounts
- Some acre minimums – can be flexible
- Selected fields only

■ **LandSat:**

- \$.19 / acre (per image using a 3 image program cost)
- 100% acres imaged per image

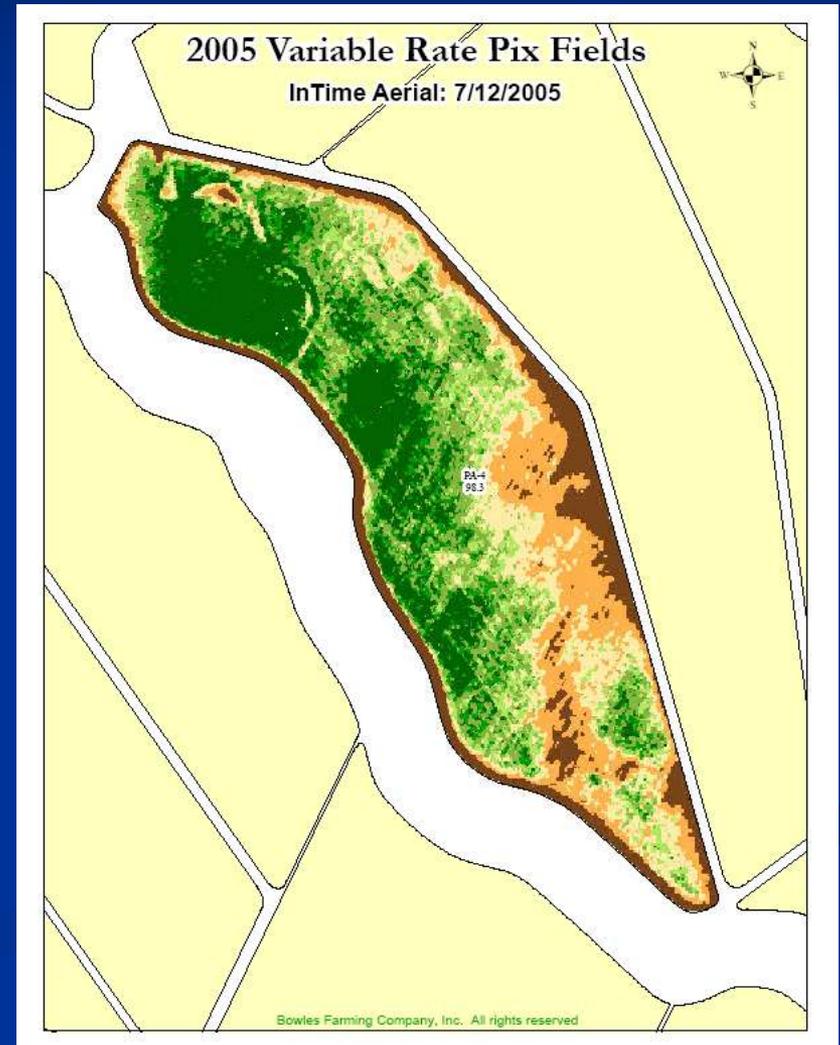
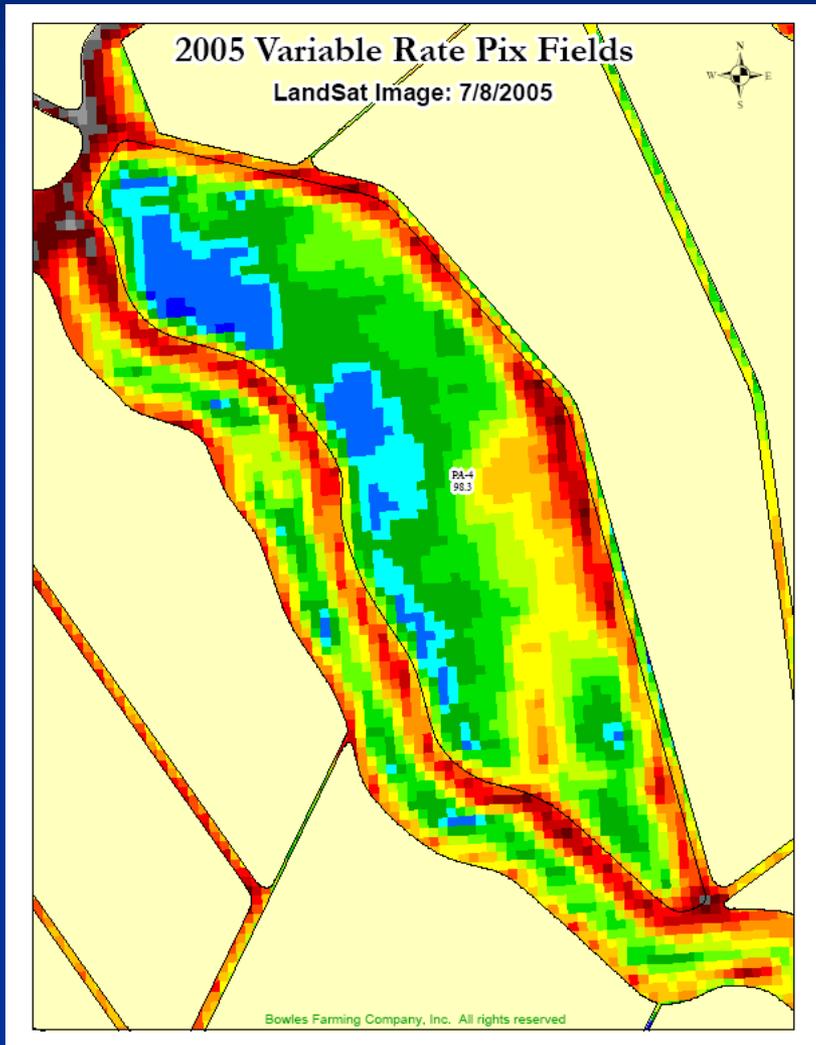
■ **To image our cotton acreage (1 image):**

- With aerial: $4,200 \times \$1 = \$4,200$
- With LandSat: $4,200 \times \$.19 = \798.00
- **Note:** We subscribe to a LandSat imagery program that guarantee's a minimum of six images during the growing season. For this comparison and to be fairer to aerial, I cut the number down to 3 images (there is really a small window of time when we need images for variable rate applications in cotton).

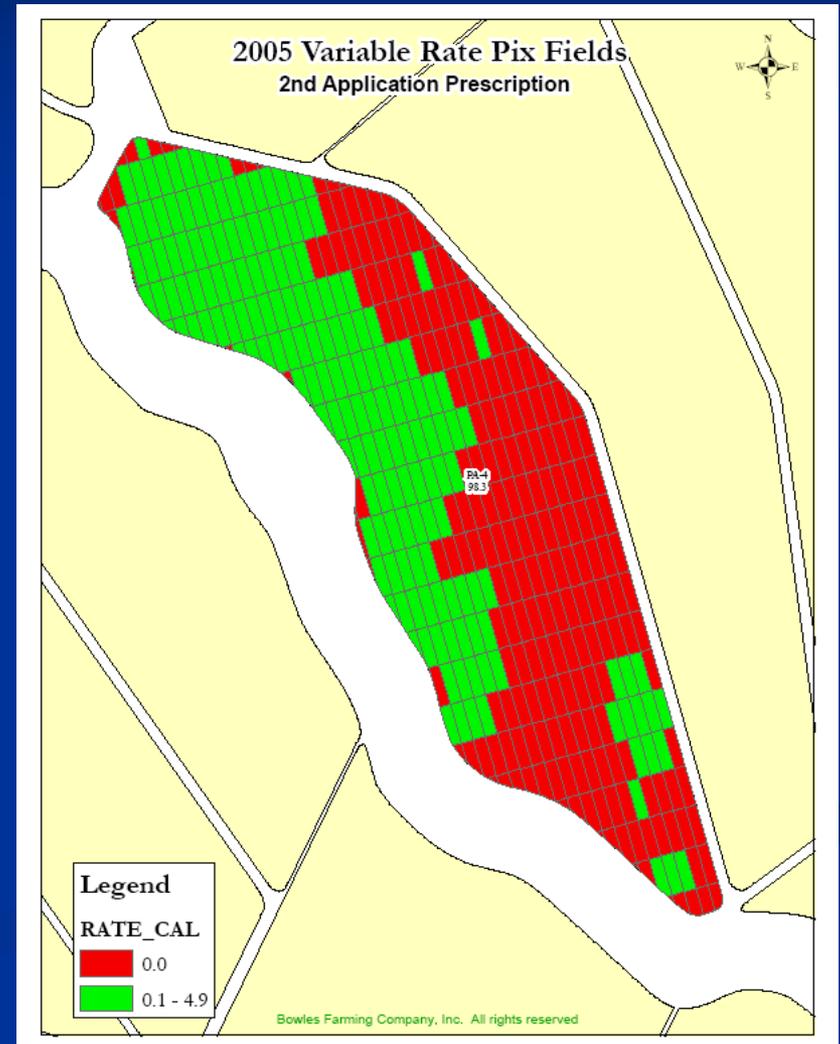
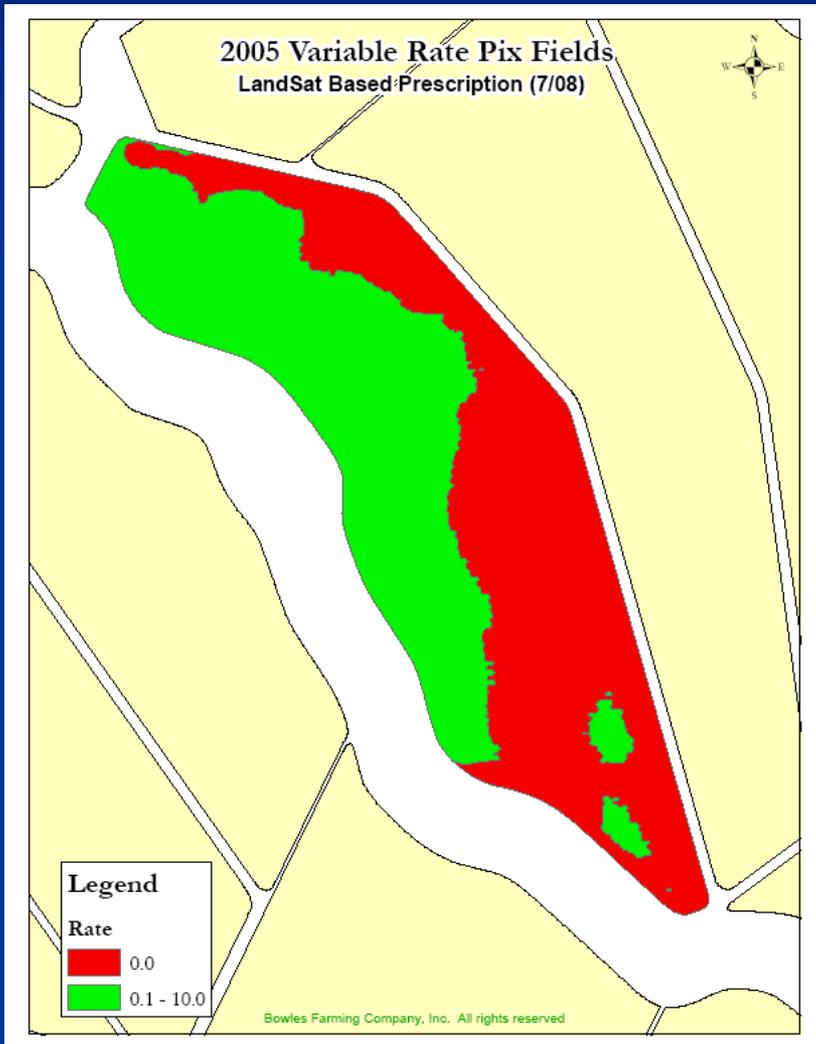
Common Arguments against LandSat

- **The resolution is too low**
 - **True.** LandSat's 14 meter pixel can't compare to the 2 meter resolution provided by an aerial image, but what is the unit size that we can apply to?
- **You can't get an image on demand or you could miss an image if the sky is cloudy.**
 - **True.** LandSat takes an image every two weeks and there have been times when we have missed an image due to clouds. This has been the rarity and not the norm, but it has happened.
- **LandSat 7 has had recent problems and LandSat 5 is very old. LandSat is just not reliable.**
 - **True.** There have been some recent issues with #7 and #5 is operating way past the lifespan that NASA had planned for it, but **both are still providing usable data.** This is a big concern for LandSat users. Current plan is to launch LDCM in December 2012.

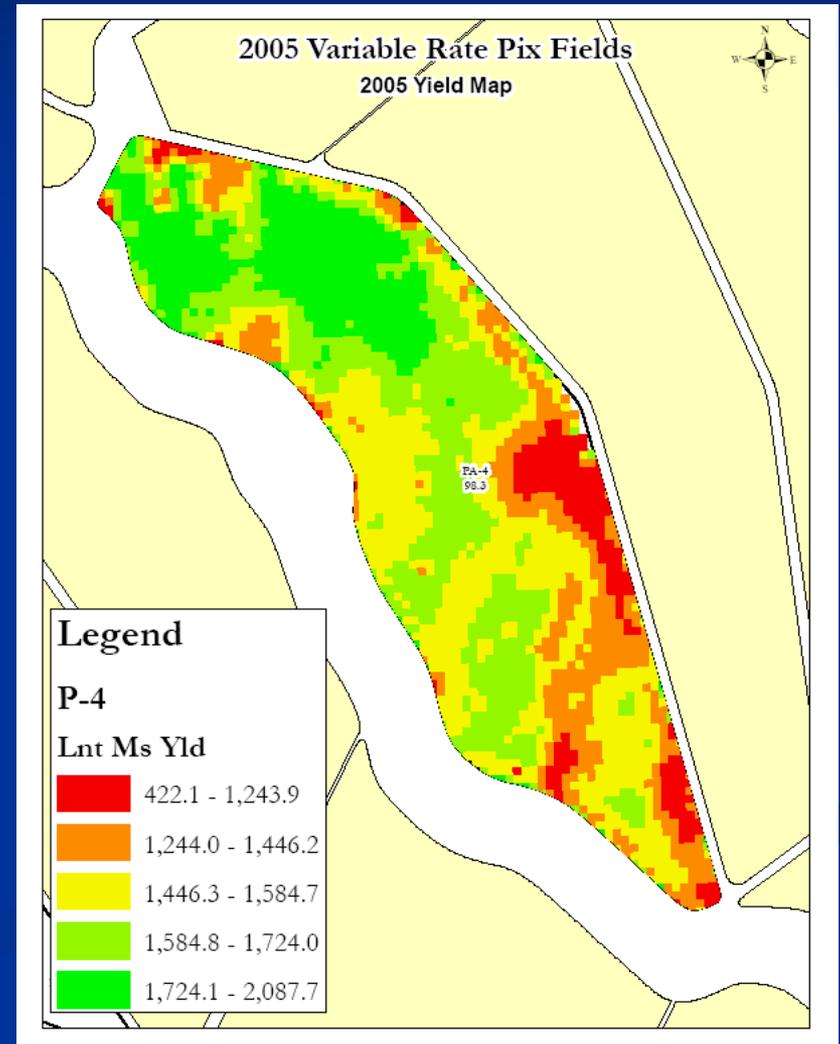
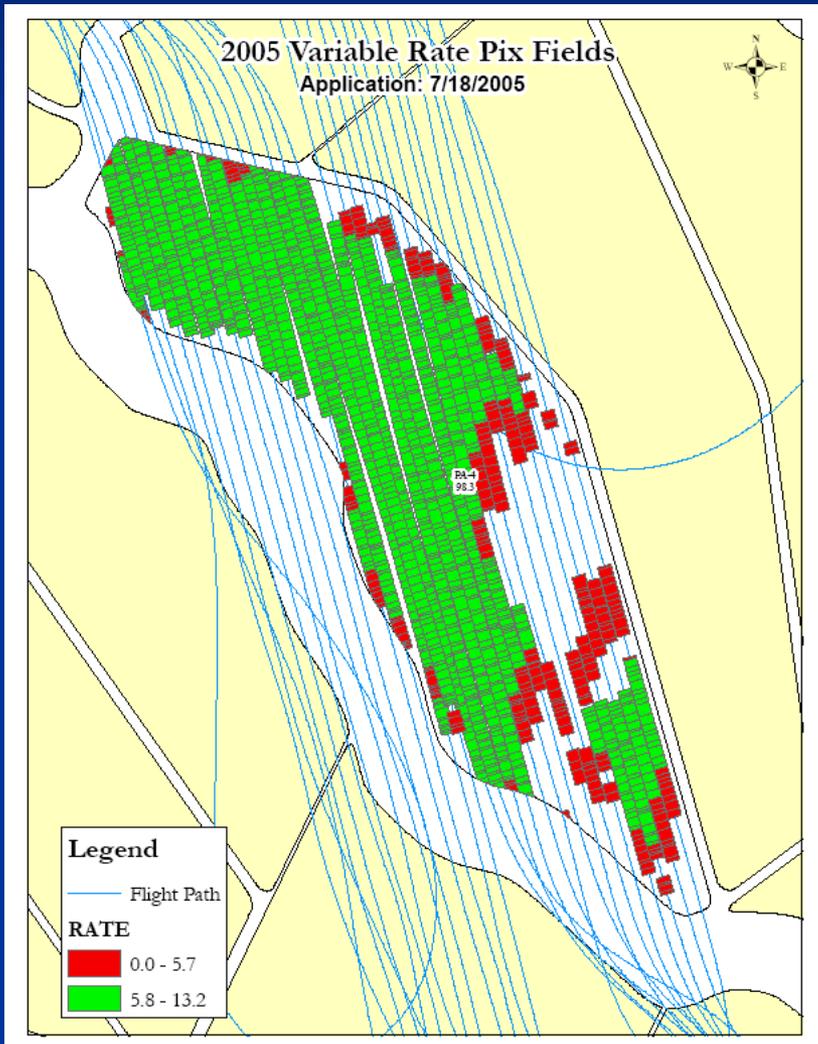
LandSat vs. Aerial Imagery



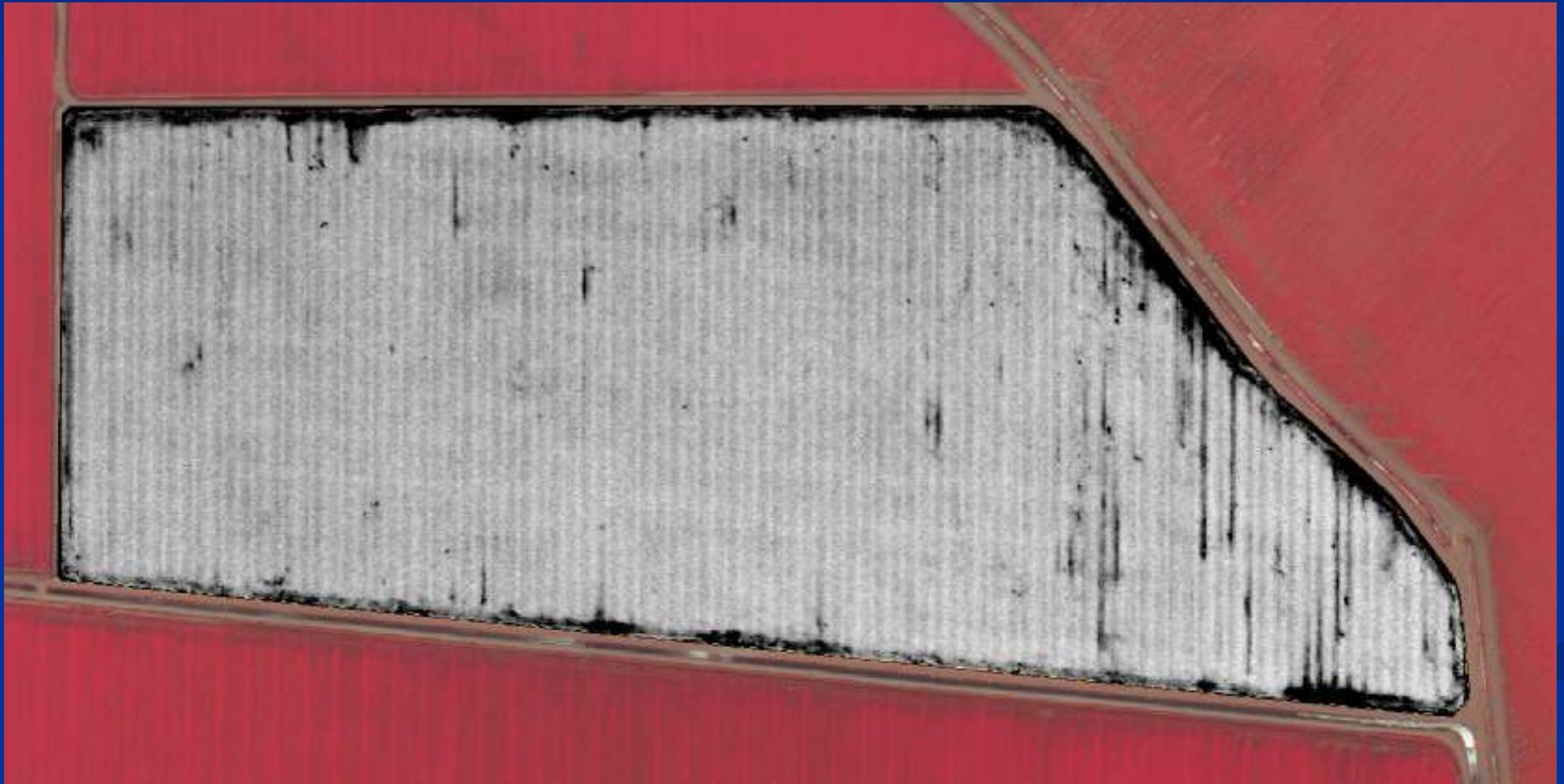
LandSat vs. Aerial Imagery



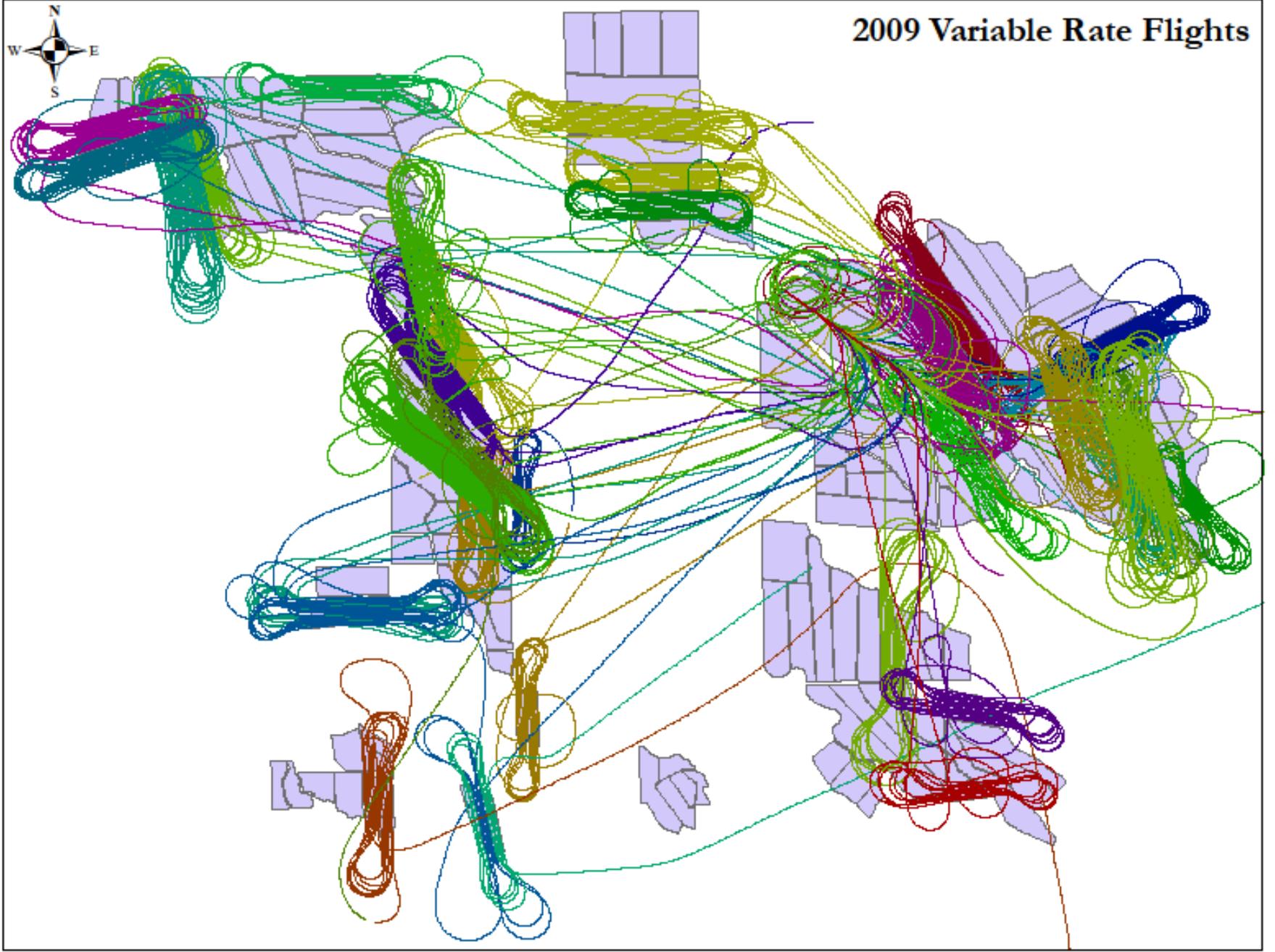
LandSat vs. Aerial Imagery



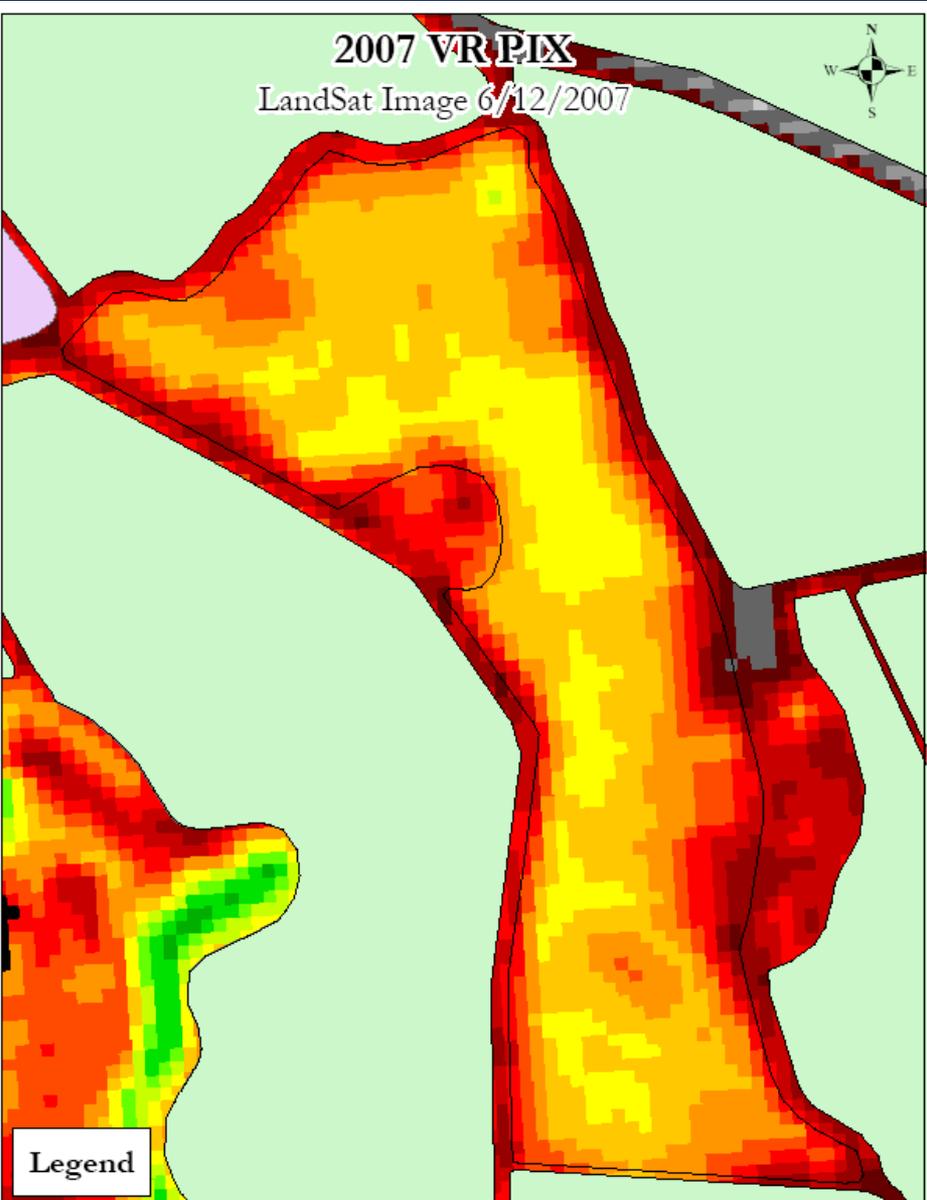
Using Imagery for SSM



2009 Variable Rate Flights

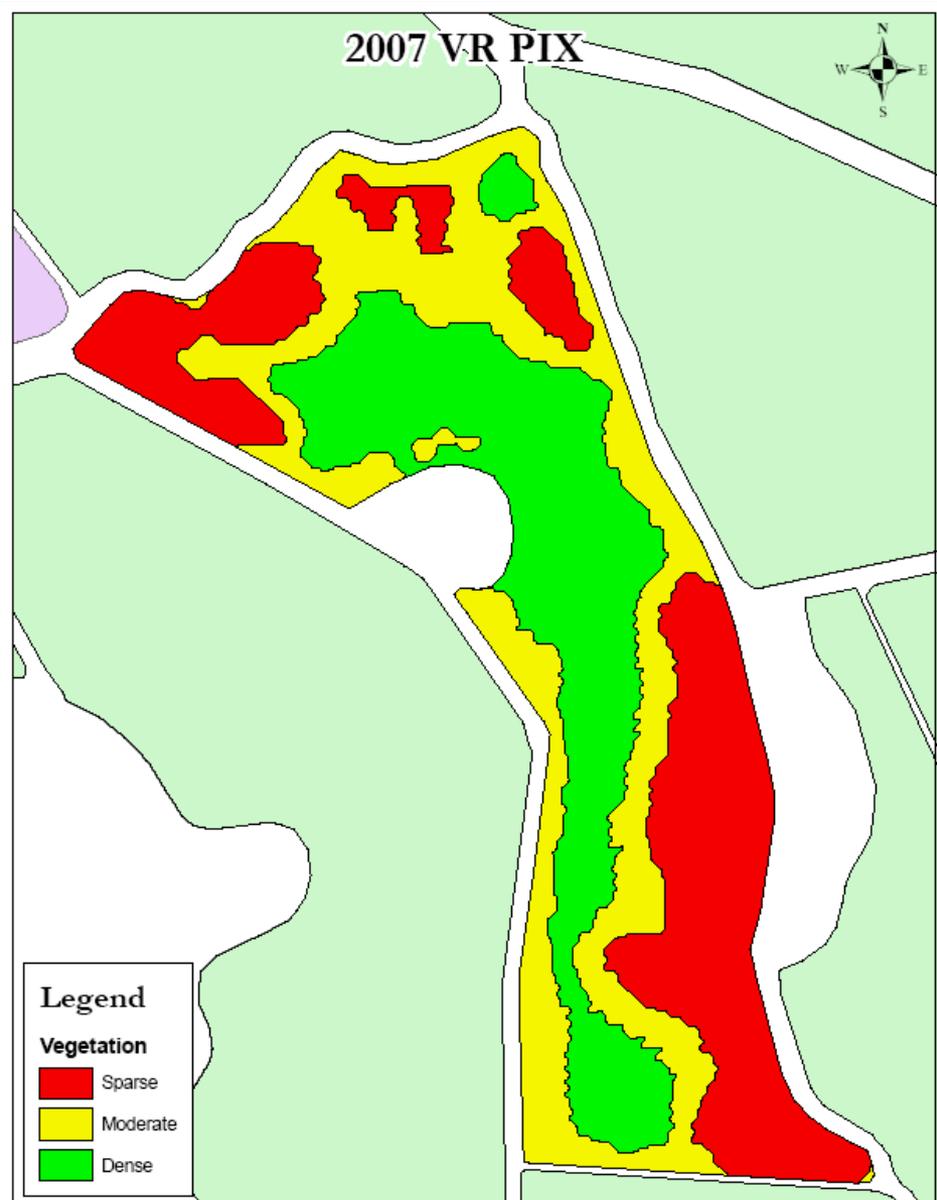


2007 VR PIX
LandSat Image 6/12/2007



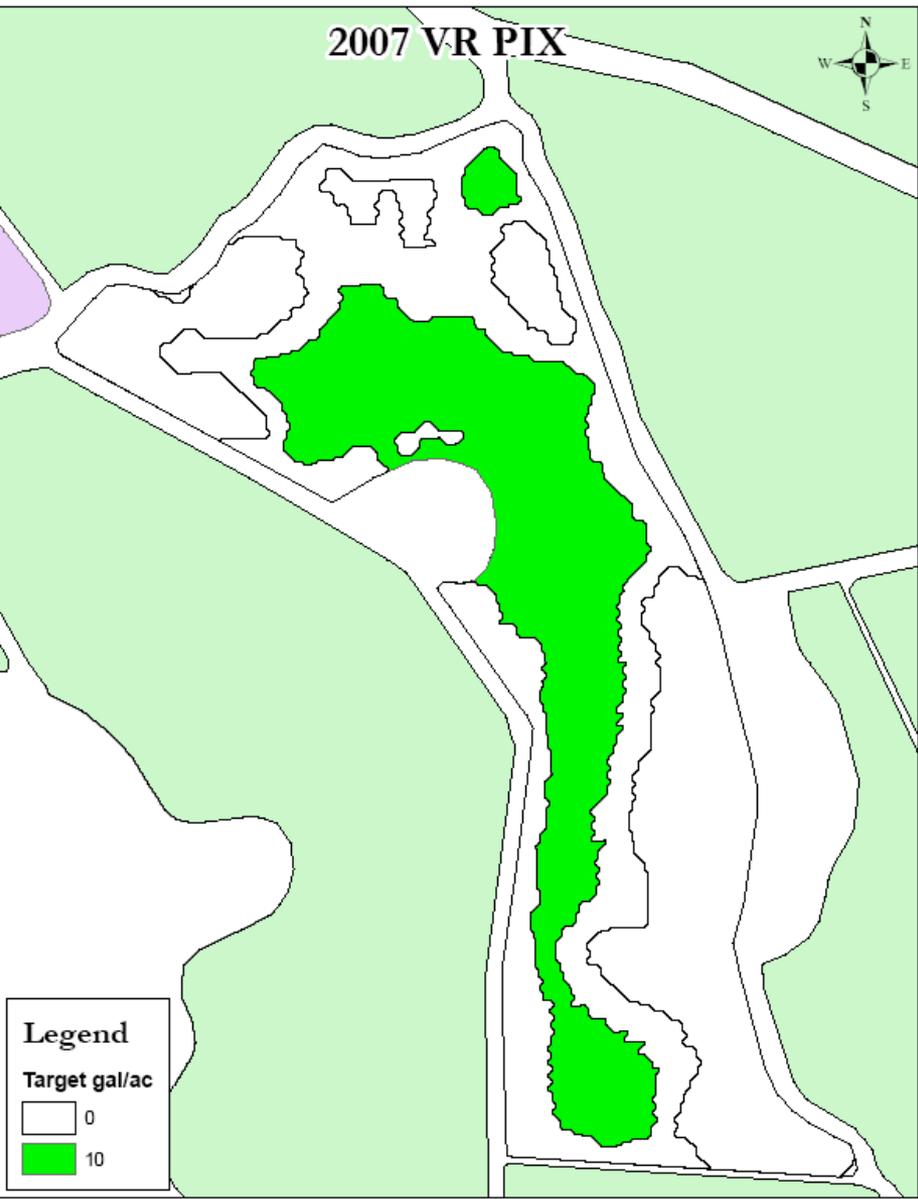
Legend

2007 VR PIX



Legend
Vegetation
■ Sparse
■ Moderate
■ Dense

2007 VR PIX



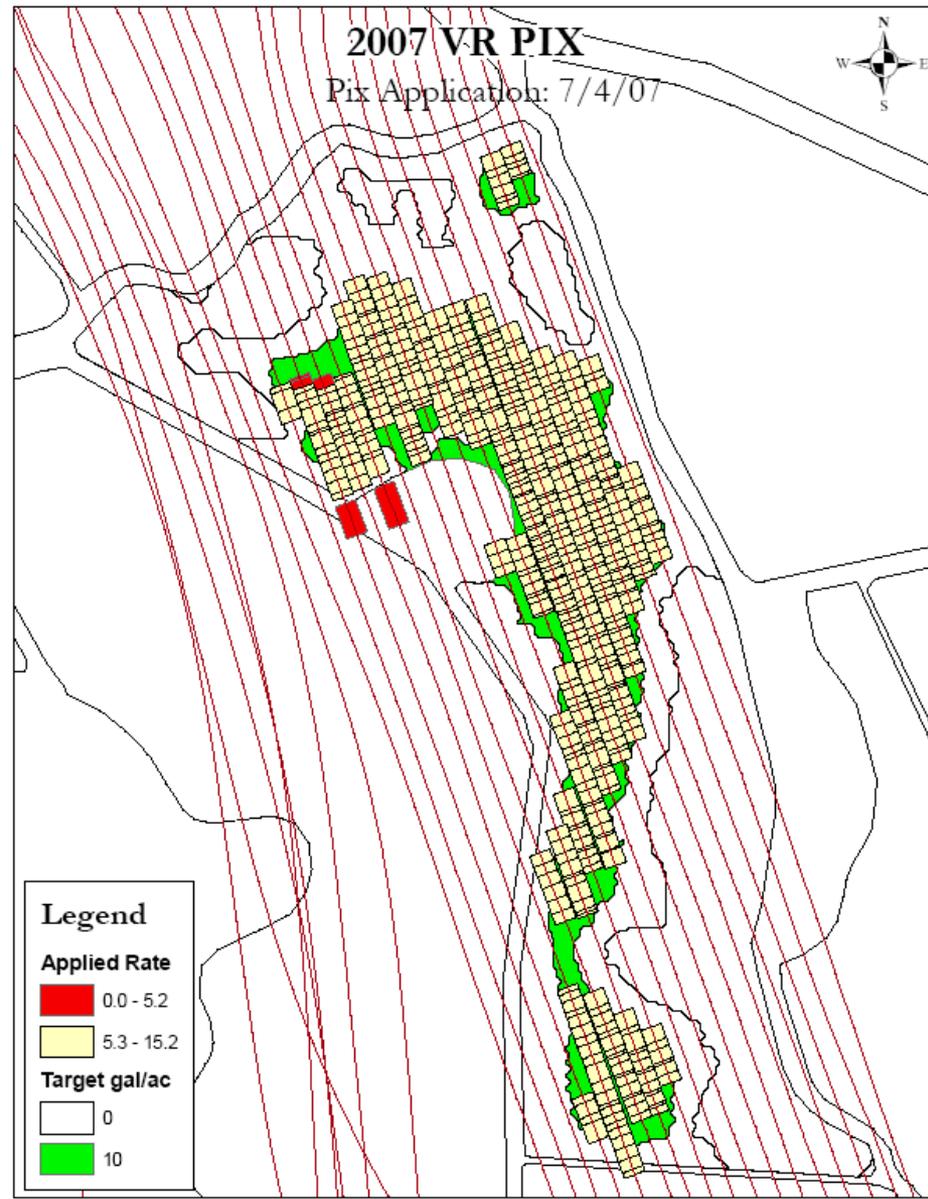
Legend

Target gal/ac

White	0
Green	10

2007 VR PIX

Pix Application: 7/4/07



Legend

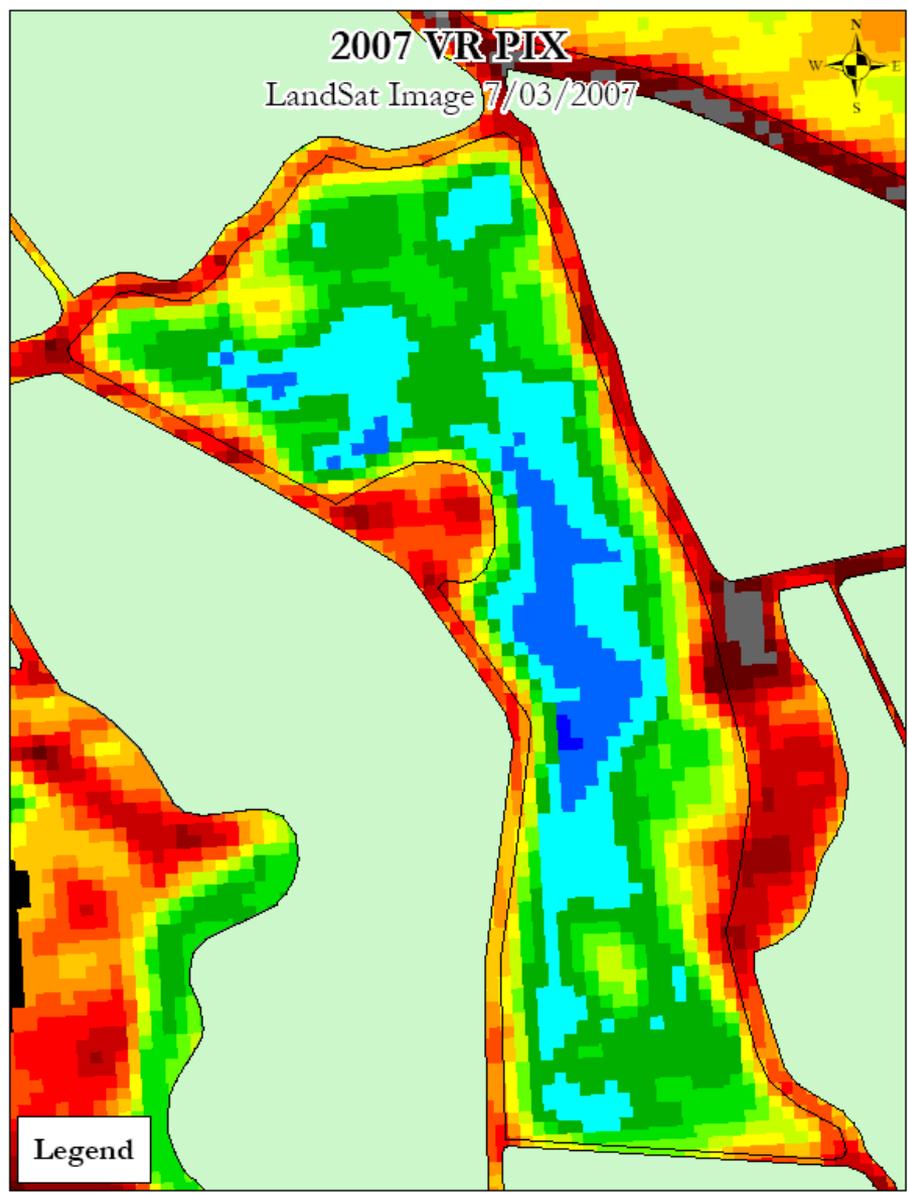
Applied Rate

Red	0.0 - 5.2
Yellow	5.3 - 15.2

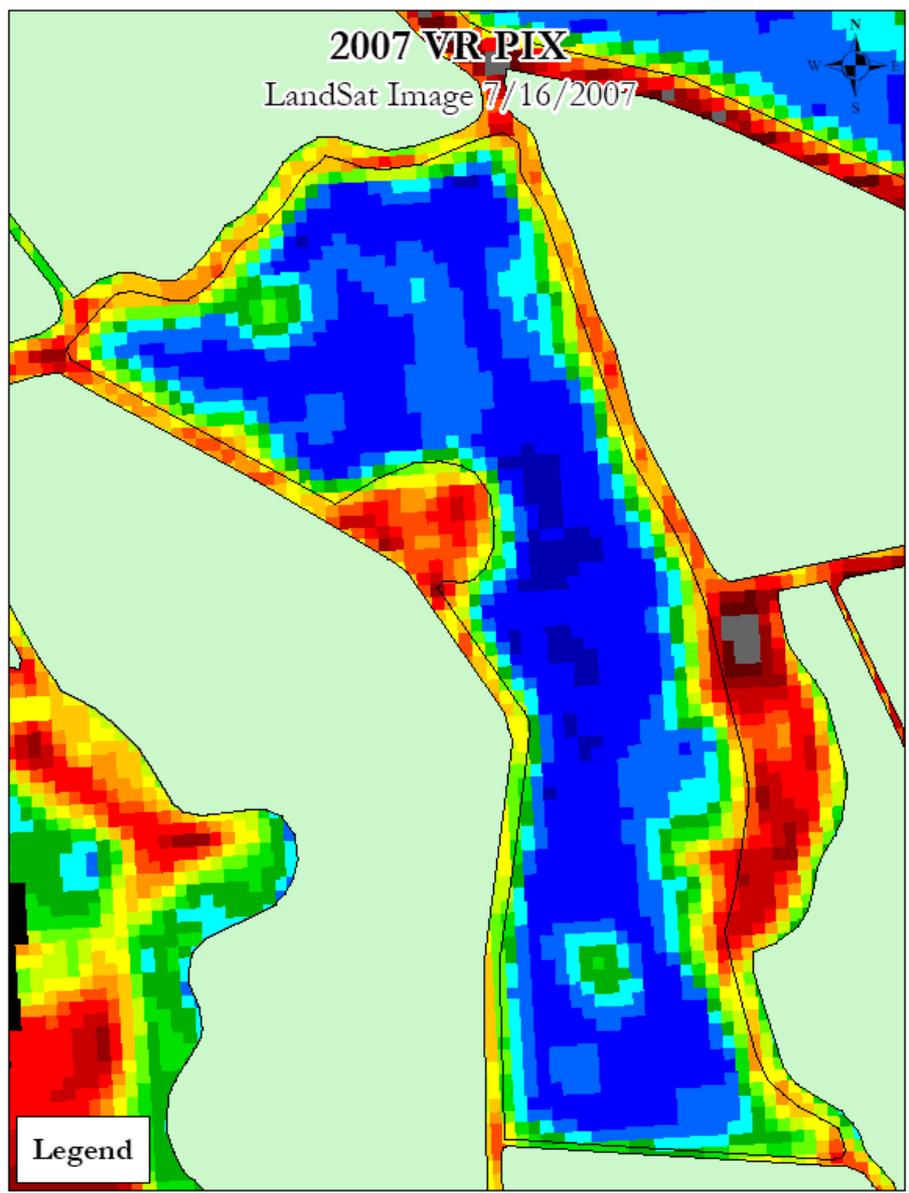
Target gal/ac

White	0
Green	10

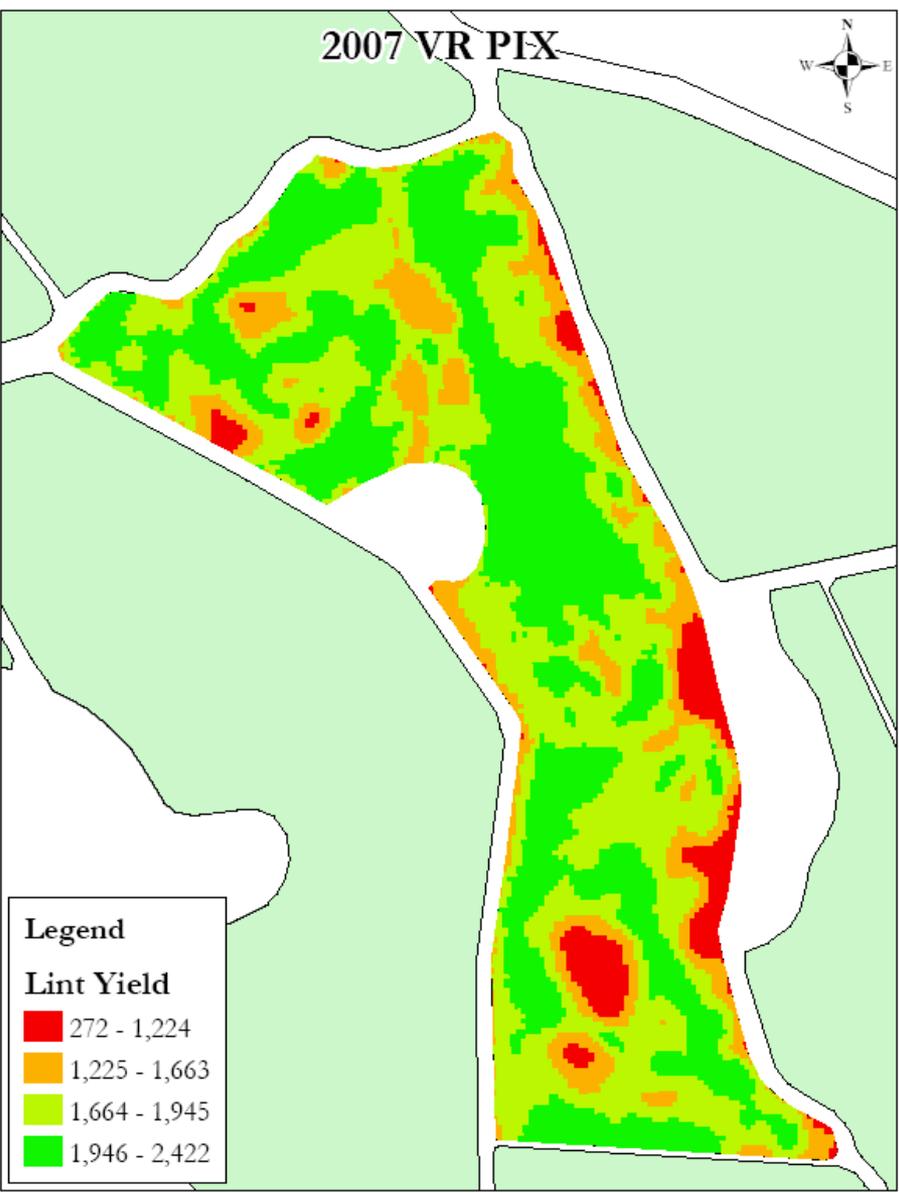
2007 VR PIX
LandSat Image 7/03/2007



2007 VR PIX
LandSat Image 7/16/2007



2007 VR PIX



Analysis Description

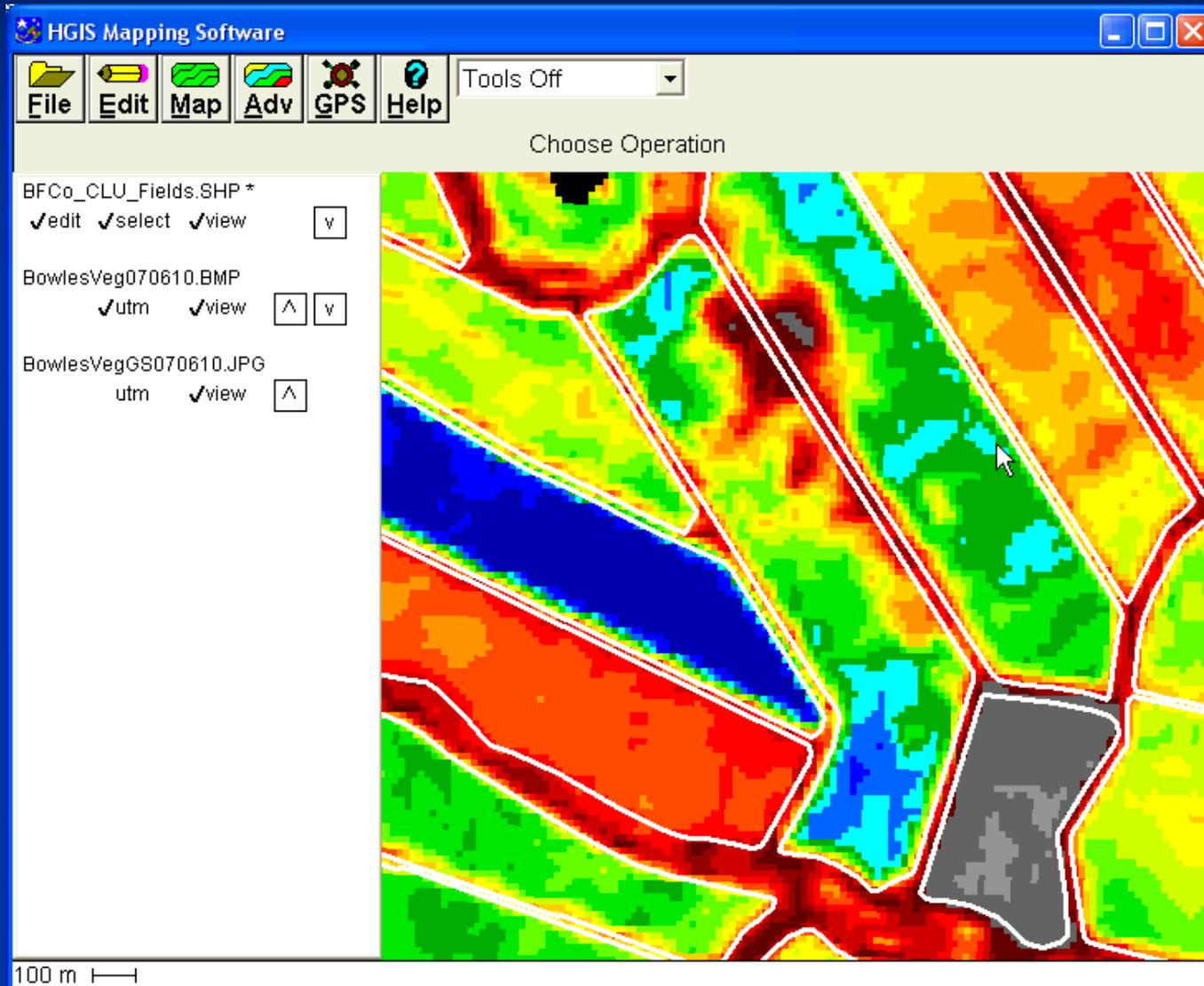
Allows the comparison of an attribute(s) or property(s) against other attributes/properties

BFCo | Hereford | H-06 | 2007 | Cotton Harvest | (All) | (All) | (All)

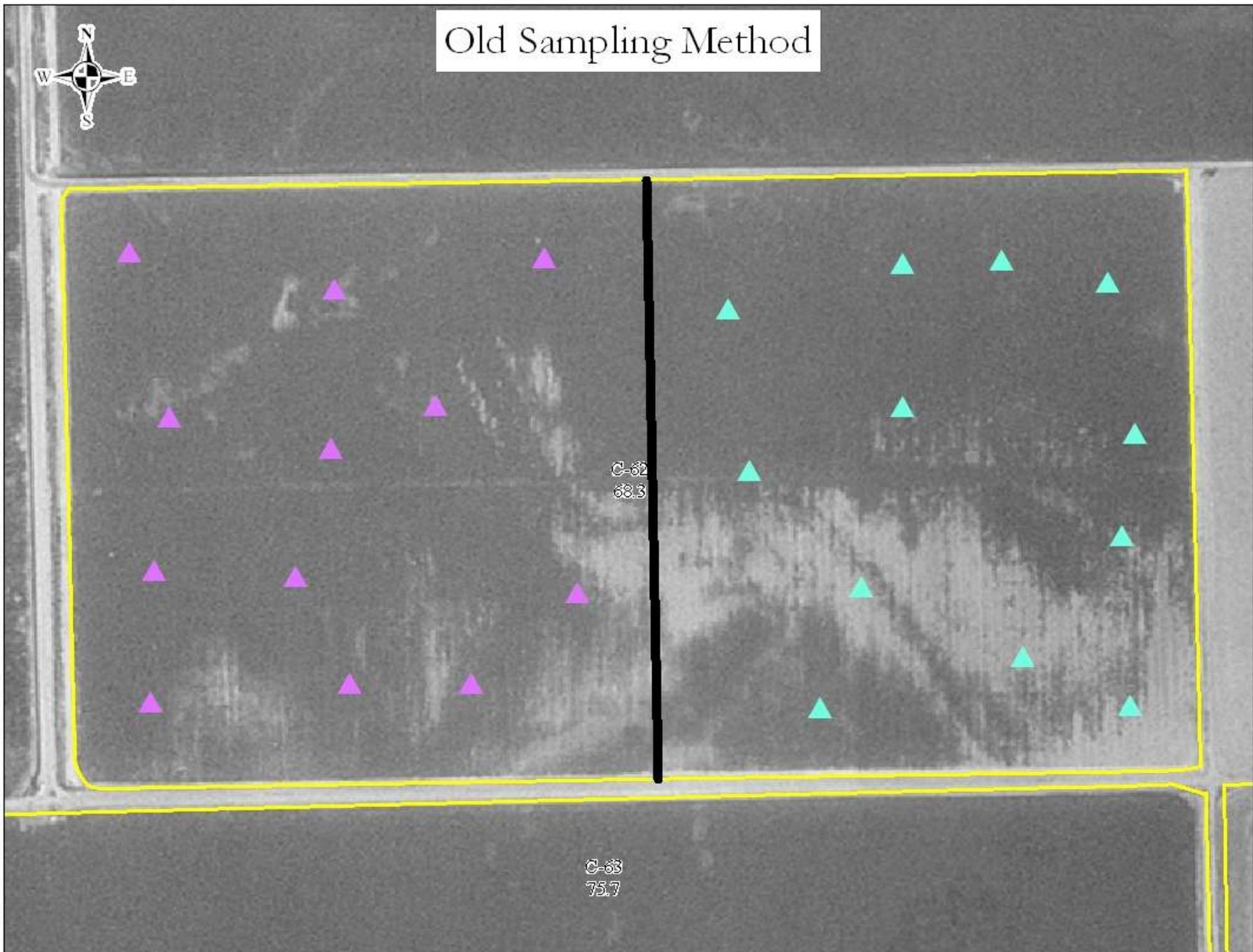
Analysis Results- Lint Mass Yield
Classified By- Generic : Vigor

Vigor	Avg. Lint Mass Yield lb/ac	Total Lint Mass Yield lb	Min. Lint Mass Yield lb/ac	Max. Lint Mass Yield lb/ac	Area ac
High	1,942.3	55,854	1,136.8	2,313.7	28.76
Low	1,732.5	59,337	321.92	2,226.2	34.25
Medium	1,839.9	63,122	818.36	2,358.4	34.31
(All)	1,832.3	178,313	321.92	2,358.4	97.32

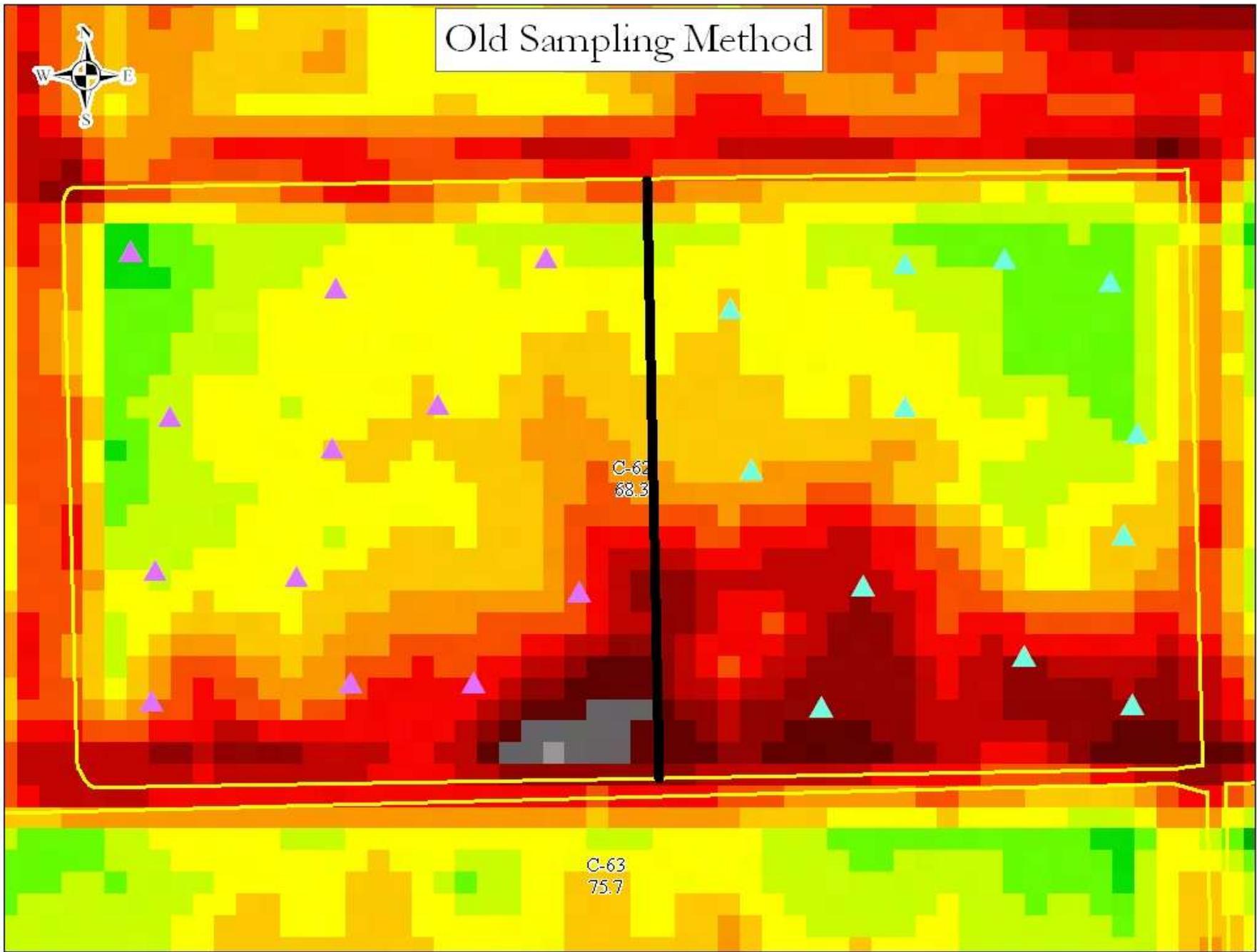
Making an image based Zone Map



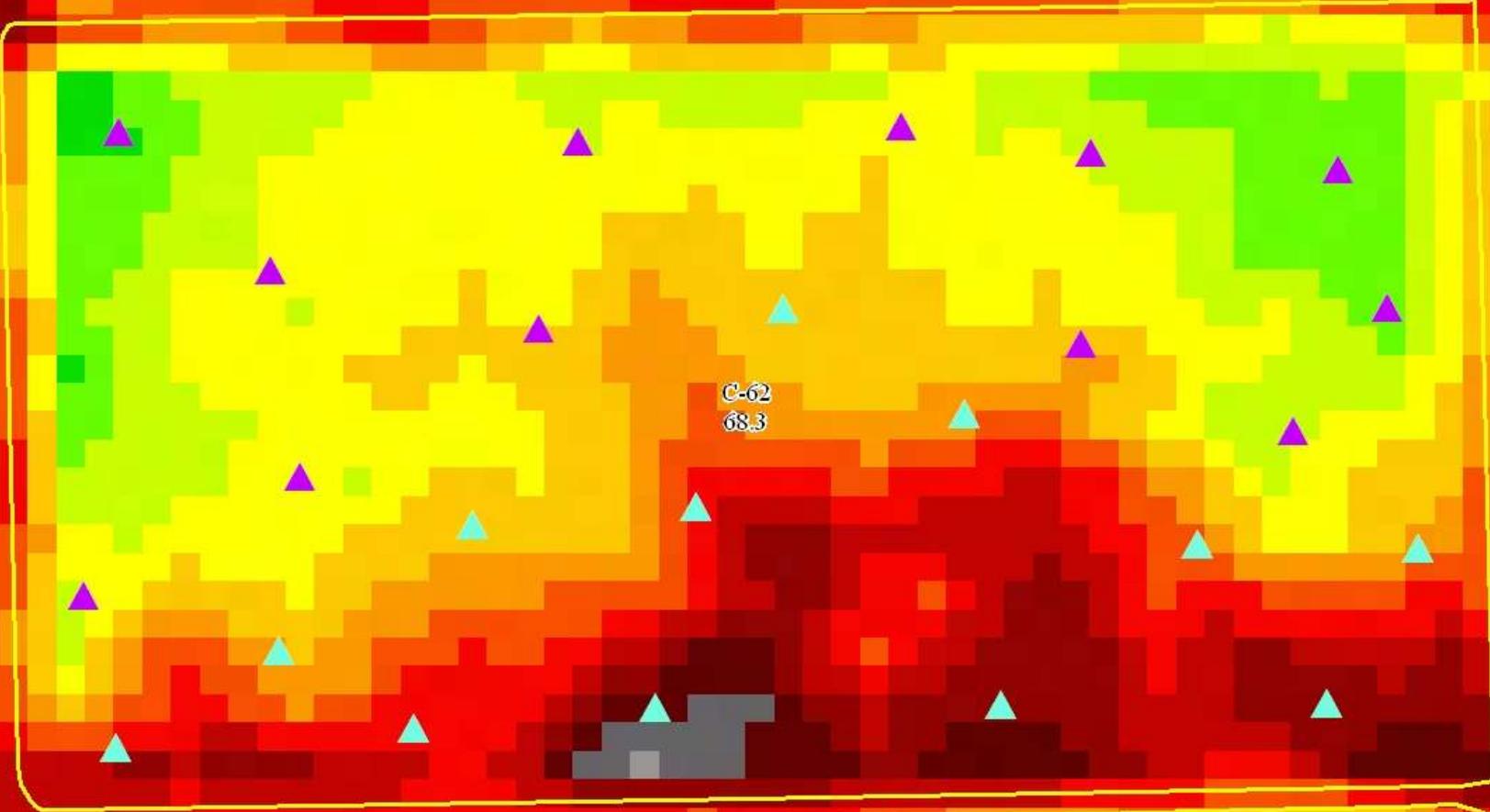
Old Sampling Method



Old Sampling Method



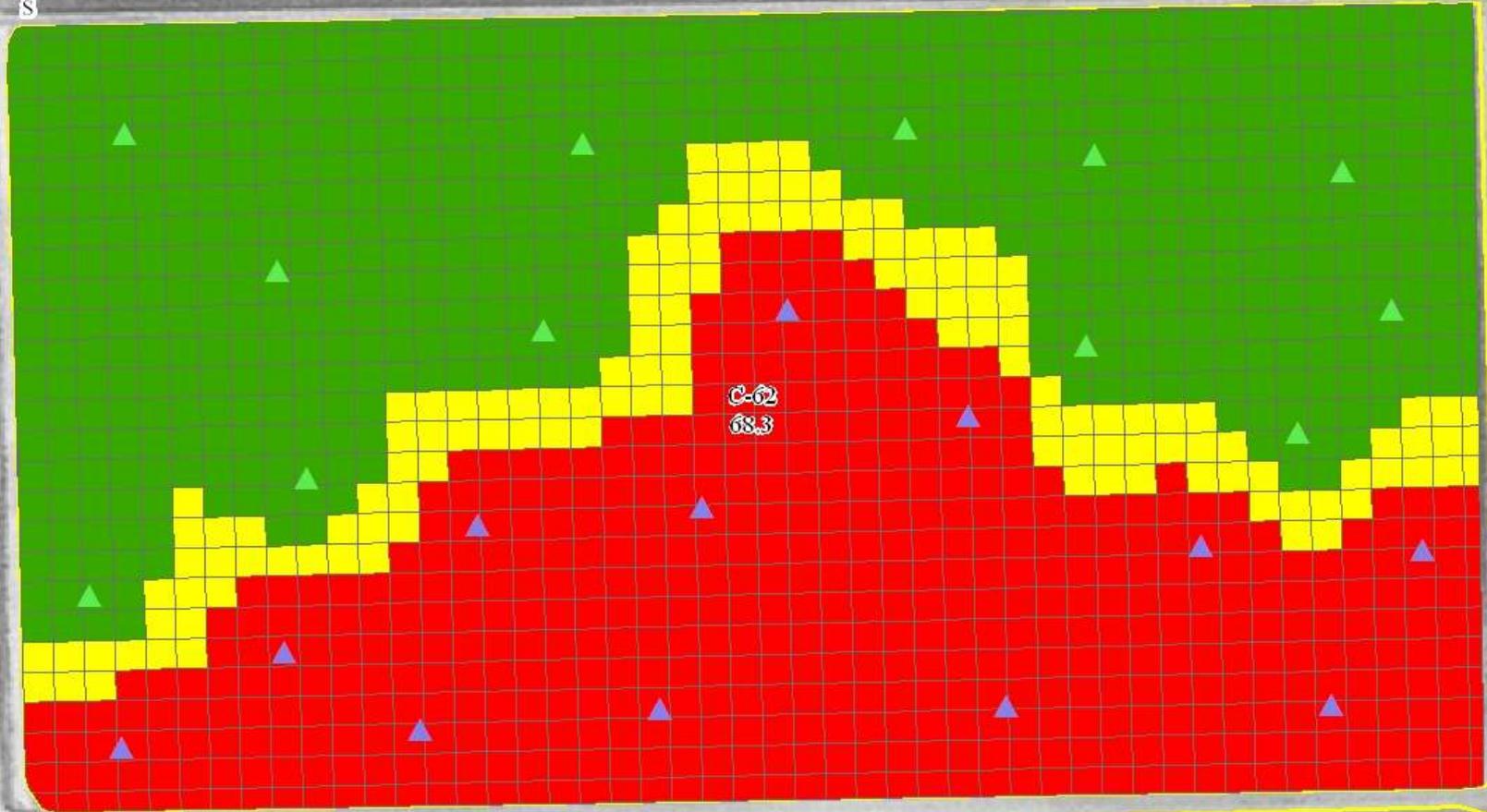
GIS Based Sampling Method



C-62
68.3

C-63
75.7

Variable Rate Application



Sulfur lbs/acre	
	200.1 - 422.2
	422.3 - 751.6
	751.7 - 1000.0

C-63
73.7

Free Resources

- <http://datagateway.nrcs.usda.gov/>
 - All your field boundaries have been digitized by the FSA and are free to download. Common Land Units (CLU)
 - High quality imagery for each year (NAIP) by county
 - 1 & 2 meter resolution color images
 - Transportation, hydrography, topology, etc.
- <http://www.atlas.ca.gov/>
- <http://www.mapmaker.com/>
 - Introductory GIS program.

Thank You

- Cannon Michael
 - cannon@bfarm.com
 - 209-827-3000
- Feel free to contact me with any questions or comments.
- Check out California Agricultural Leadership Foundation: <http://www.agleaders.org>
- Get involved with social media. Ag needs a voice! (<http://twitter.com/agleader>)