

Precision Agriculture in an Energy Intensive World



Energy Impacts Ag

- Energy = “Bottom-Line”
 - Transportation
 - Agro-chemicals
 - Irrigation
 - Tillage

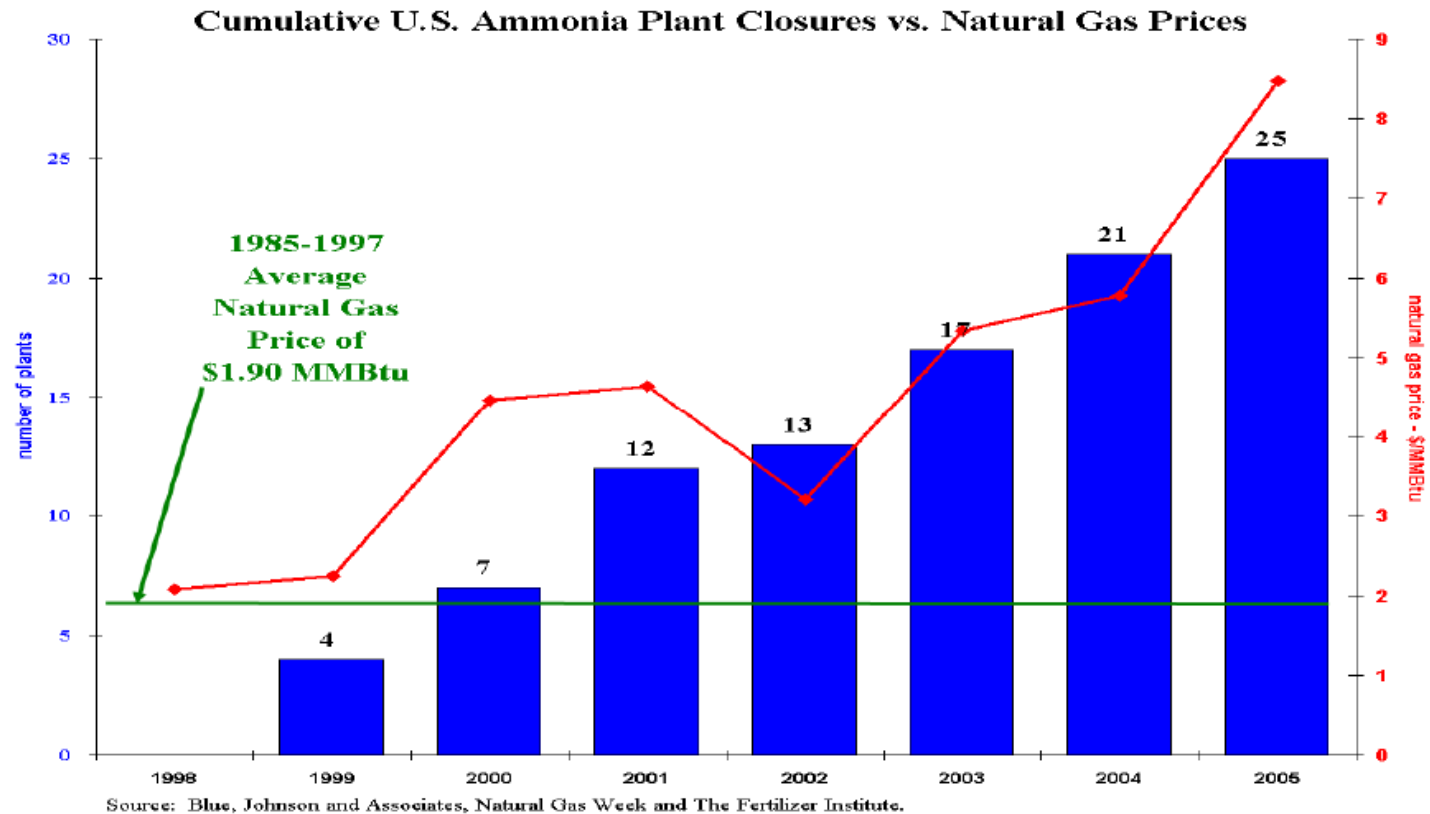


Energy Impacts Ag

- **Focus on Fertilizer**
 - Prices have more than doubled since 2000
 - Natural Gas ~ 85-90 % of total cost
 - Import nearly 50% of our N
 - Weak U.S. \$ in a global market

Source: NCGA Fertilizer Outlook: Supply and Demand Trends. 14 Feb. 2008 Fertilizer Webinar

Energy Impacts Ag



Vroomen, H. 2008, Domestic supply and demand trends.

Energy Impacts Ag

- **Focus on Fertilizer**
 - Some good news
 - Some commodity prices of increased with Fertilizer cost.
 - EQIP Energy Cost Assistance (2006)
 - Strategies that conserve energy and the bottom-line.

Energy Impacts Ag

- **Conservation Strategies**
 - Nutrient Management (\$85 ac⁻¹)
 - Irrigation (\$9-41 ac⁻¹)
 - IPM (\$40 ac⁻¹)
 - **PRECISION AGRICULTURE (\$13 ac⁻¹)**

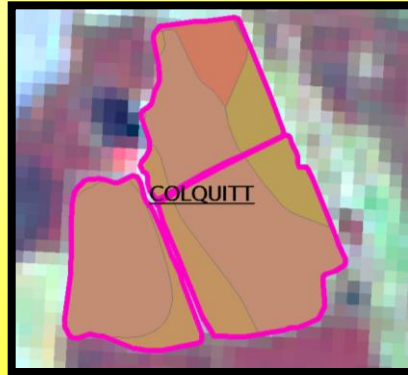
Source: No-Till Farmer, 2008.

Precision Ag

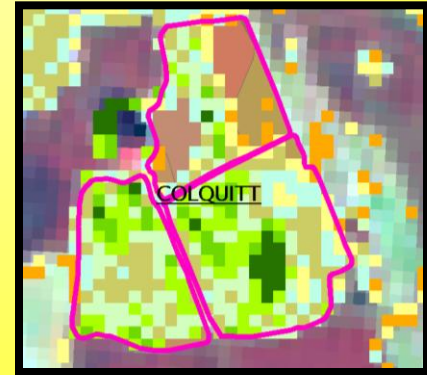
- Tailors Inputs to Expected Outputs
- Core Component = **Management Zone**



Imagery



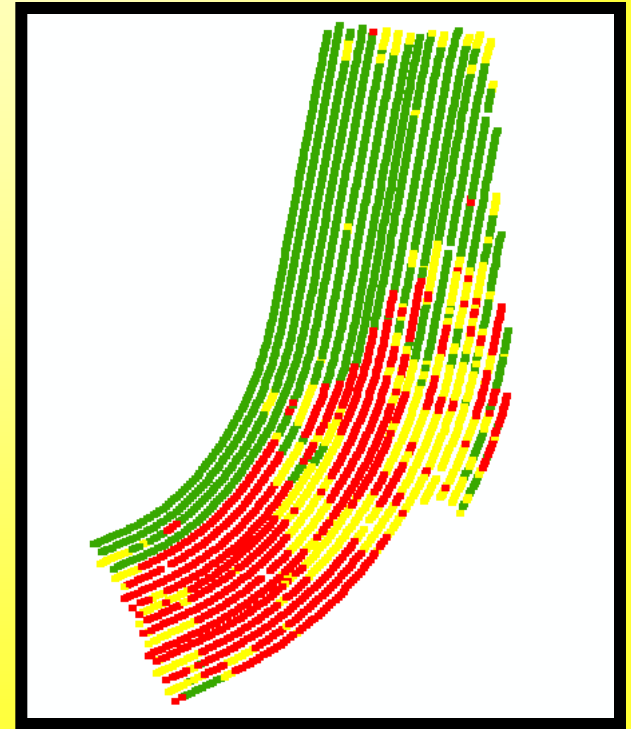
Soils



Yield

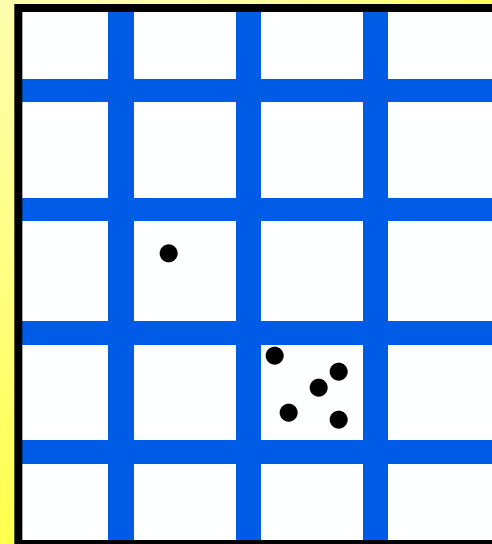
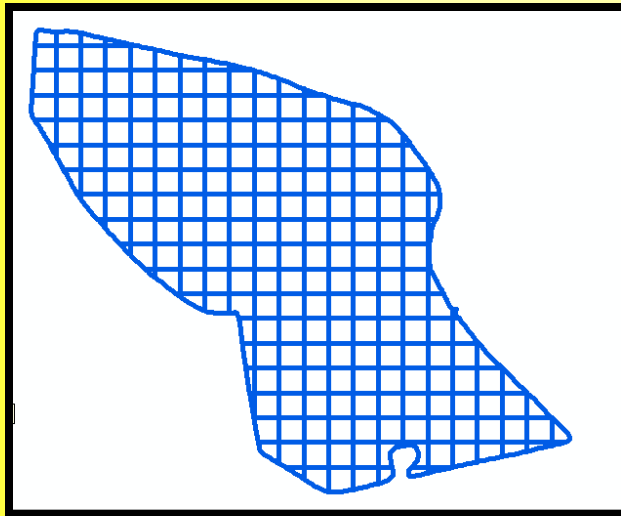
Precision Ag

- Targeted Soil Sampling
- Variable Rate:
 - Irrigation
 - Seeding
 - Harvest
 - Lime
 - Pesticides
 - Fertilizer



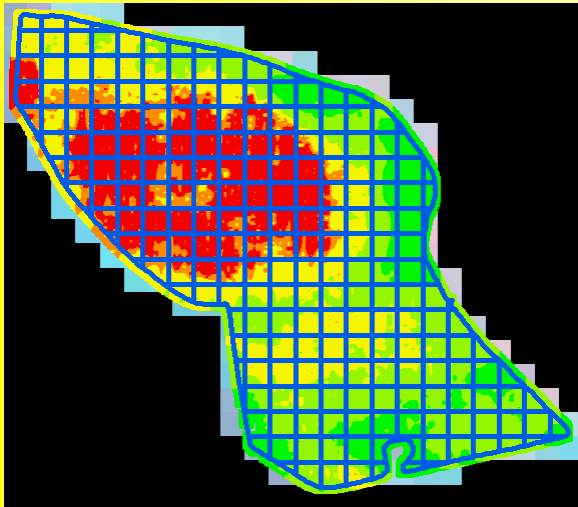
Delineating Management Zones

- **Grid Sampling**
 - Grid Cell Vs. Grid Center

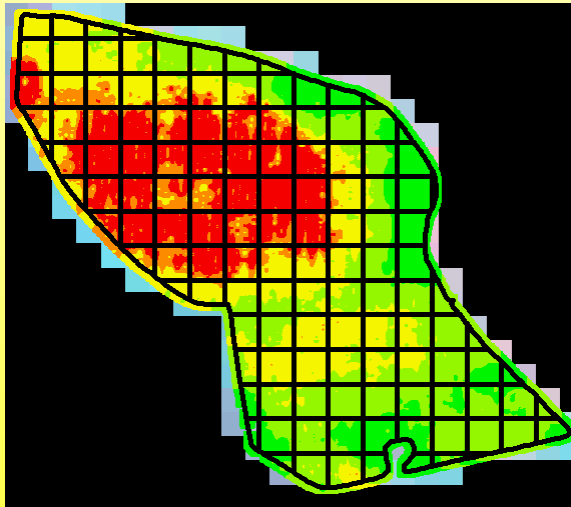


Delineating Management Zones

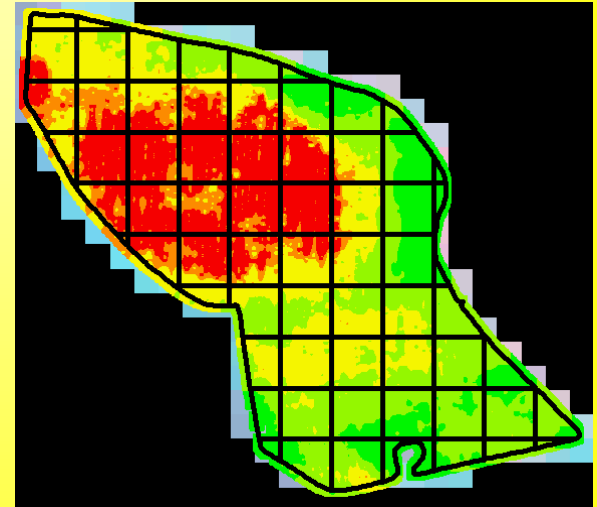
- **Grid Considerations!**
 - Number of Samples - Time and Expense



0.25 ac grid



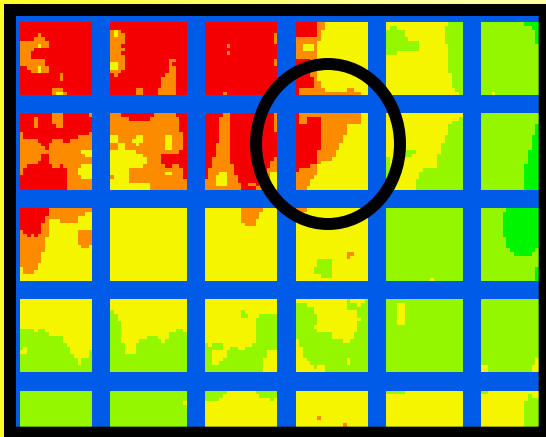
0.50 ac grid



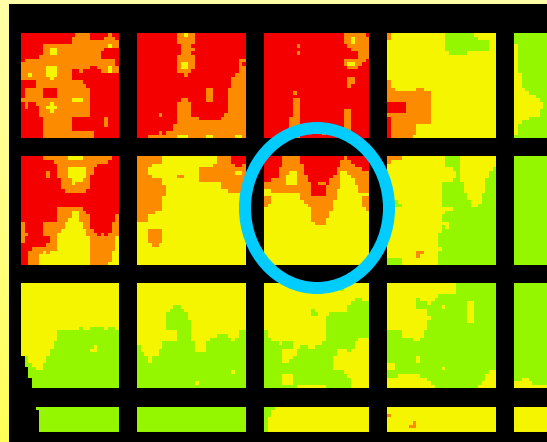
1 ac grid

Delineating Management Zones

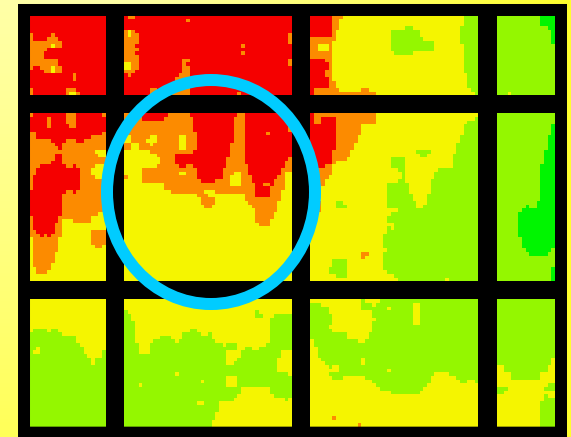
- **Grid Considerations!**
 - Data Quality



0.25 ac grid

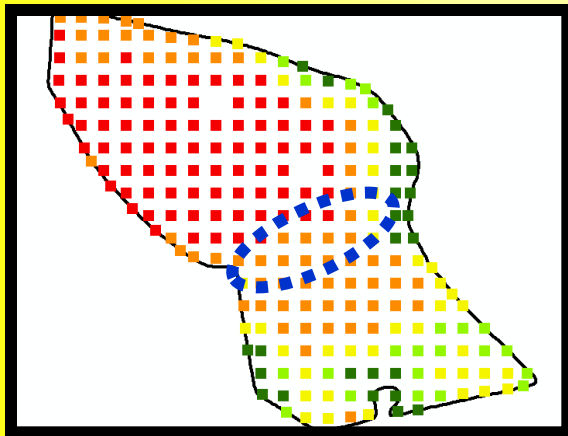
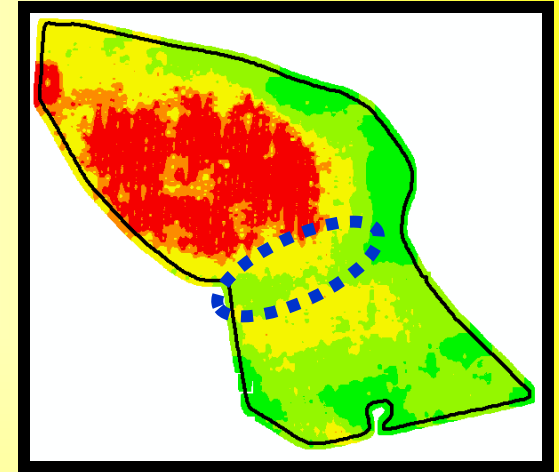


0.50 ac grid

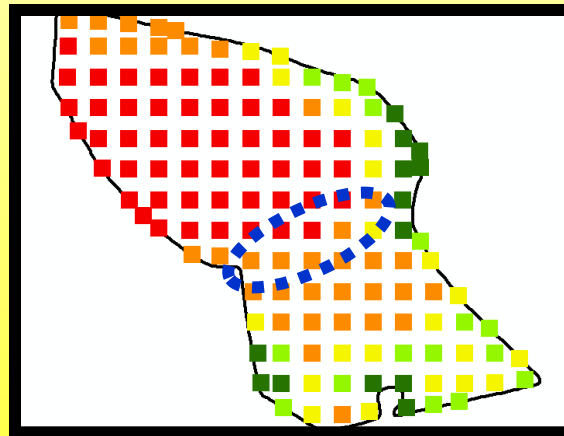


1 ac grid

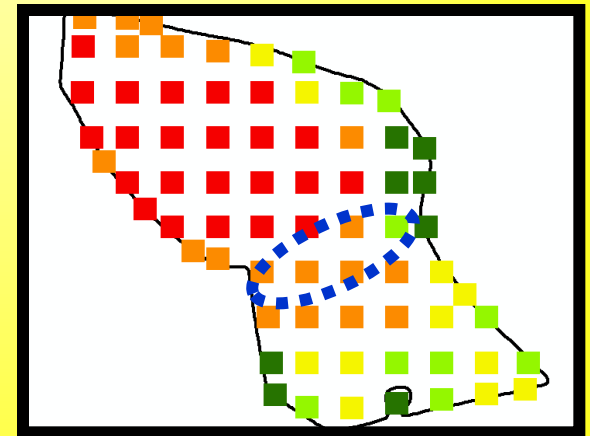
Delineating Management Zones



0.25 ac grid



0.50 ac grid



1 ac grid

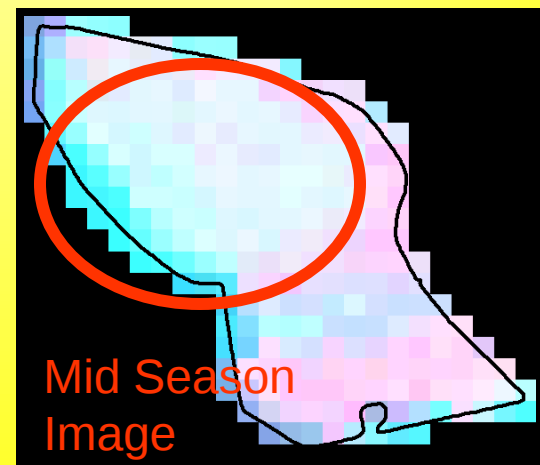
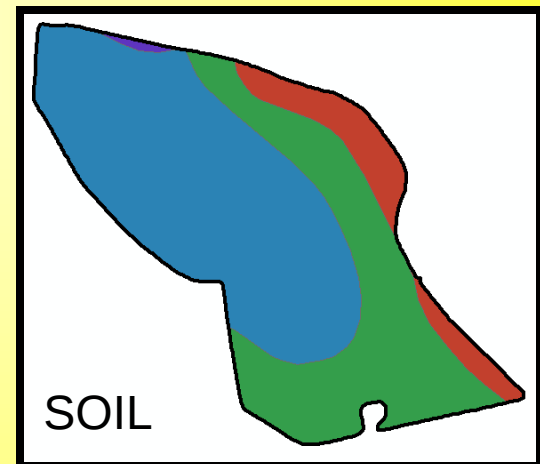
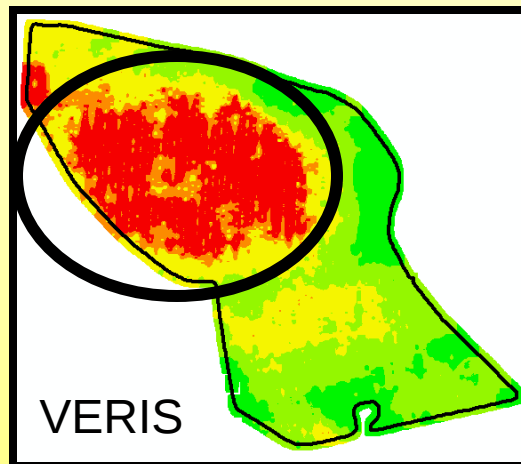
Delineating Management Zones

- Letting Data Drive Zones
 - Greater upfront investment
 - Gathering Data
 - Analysis
 - Defining Zones
 - Kinds of Data
 - Yield Maps
 - Aerial or Satellite imagery
 - Soil and Topo Maps
 - Site History

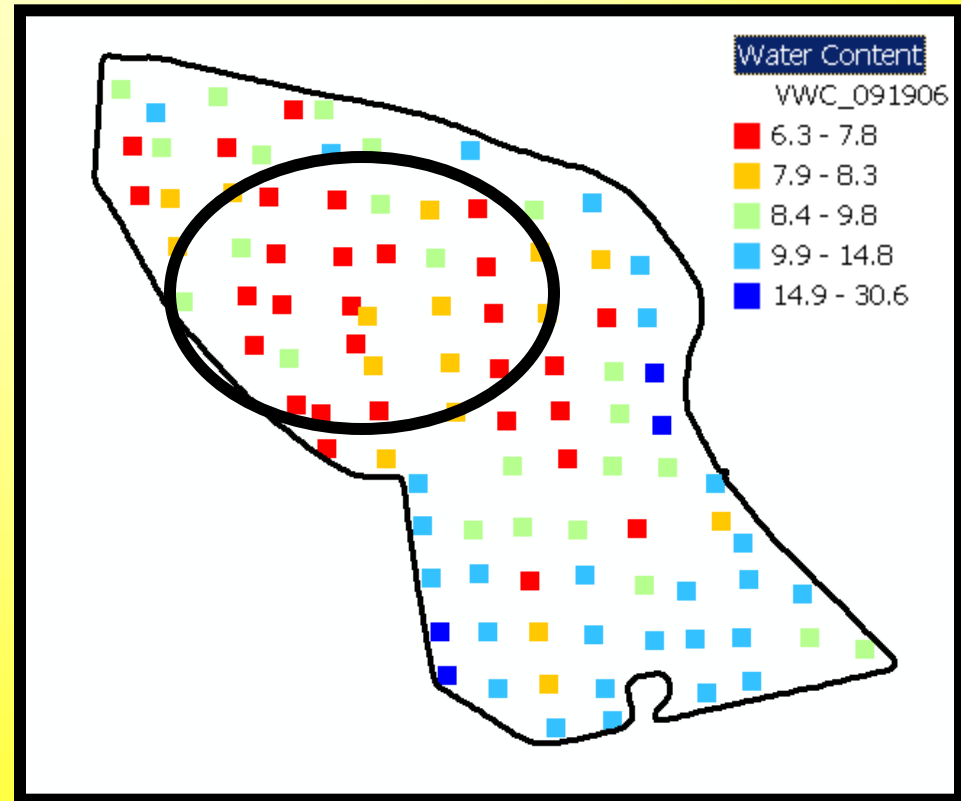
Delineating Management Zones



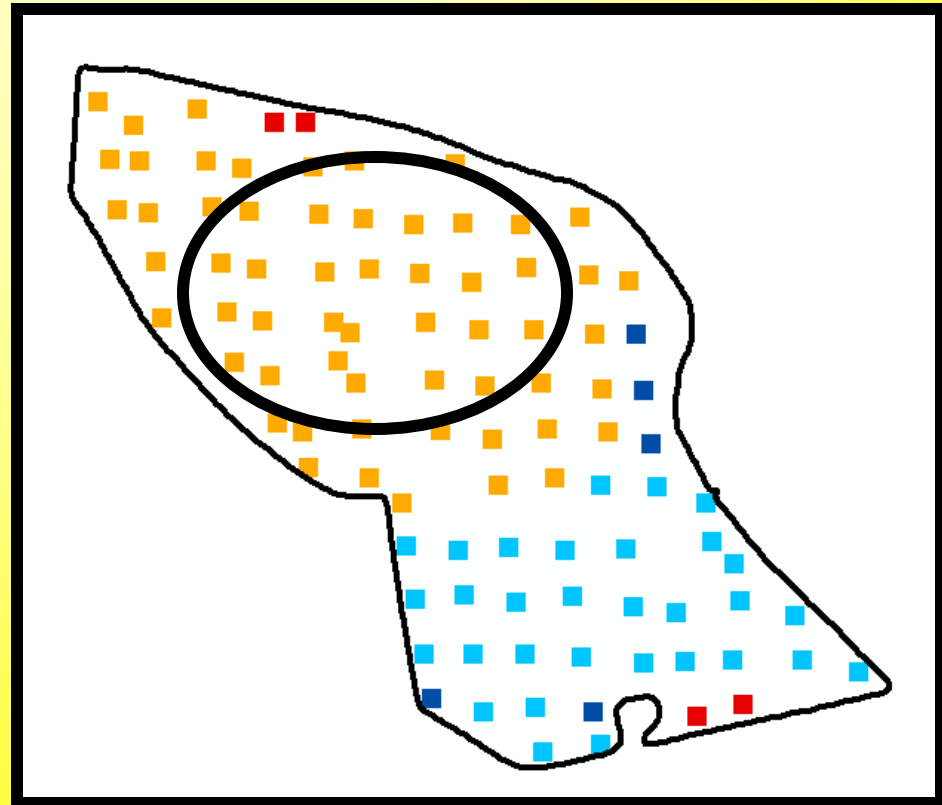
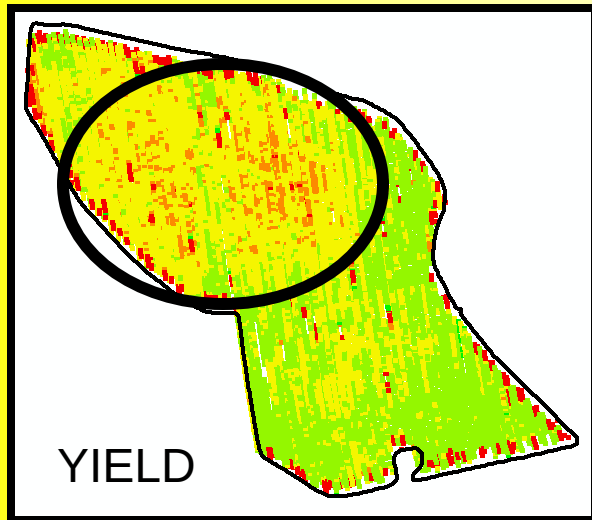
Delineating Management Zones



Delineating Management Zones



Delineating Management Zones



A Precision Ag Example

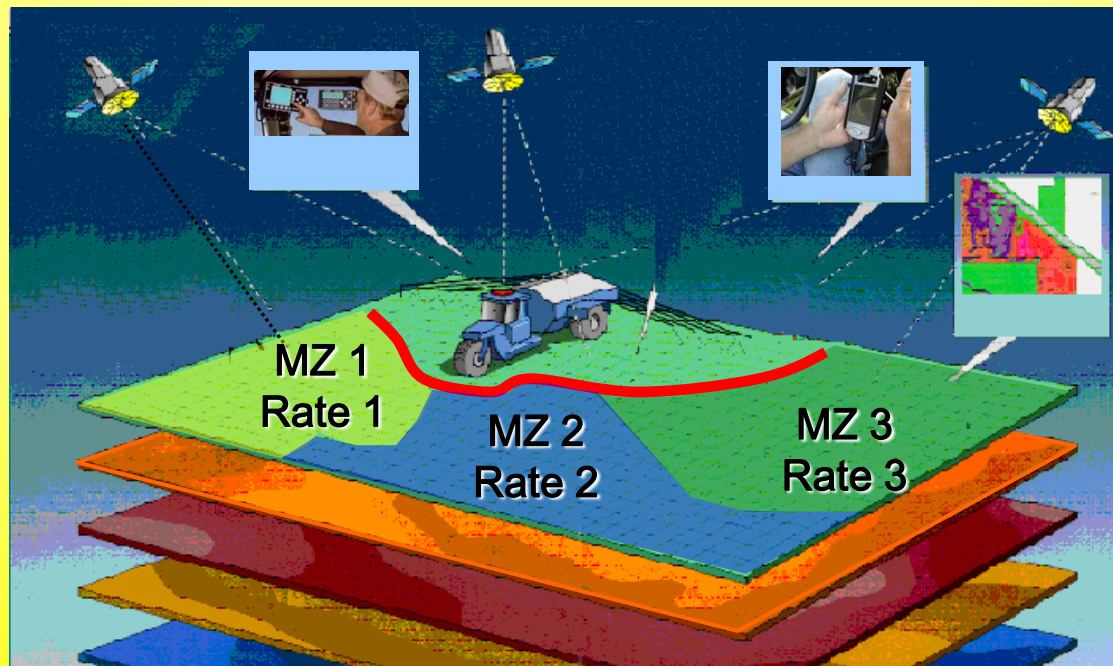
- Objective
 - What is the integrated effect of pest pressure, fertility, and landscape position on cotton yield???
 - Can we define zones that reflect these differences?
 - Is there an overwhelming “feature” that controls “expected” yield?

A Precision Ag Example

Can we manage cotton inputs site specifically?

Reduce Input

Maximize Returns \$\$

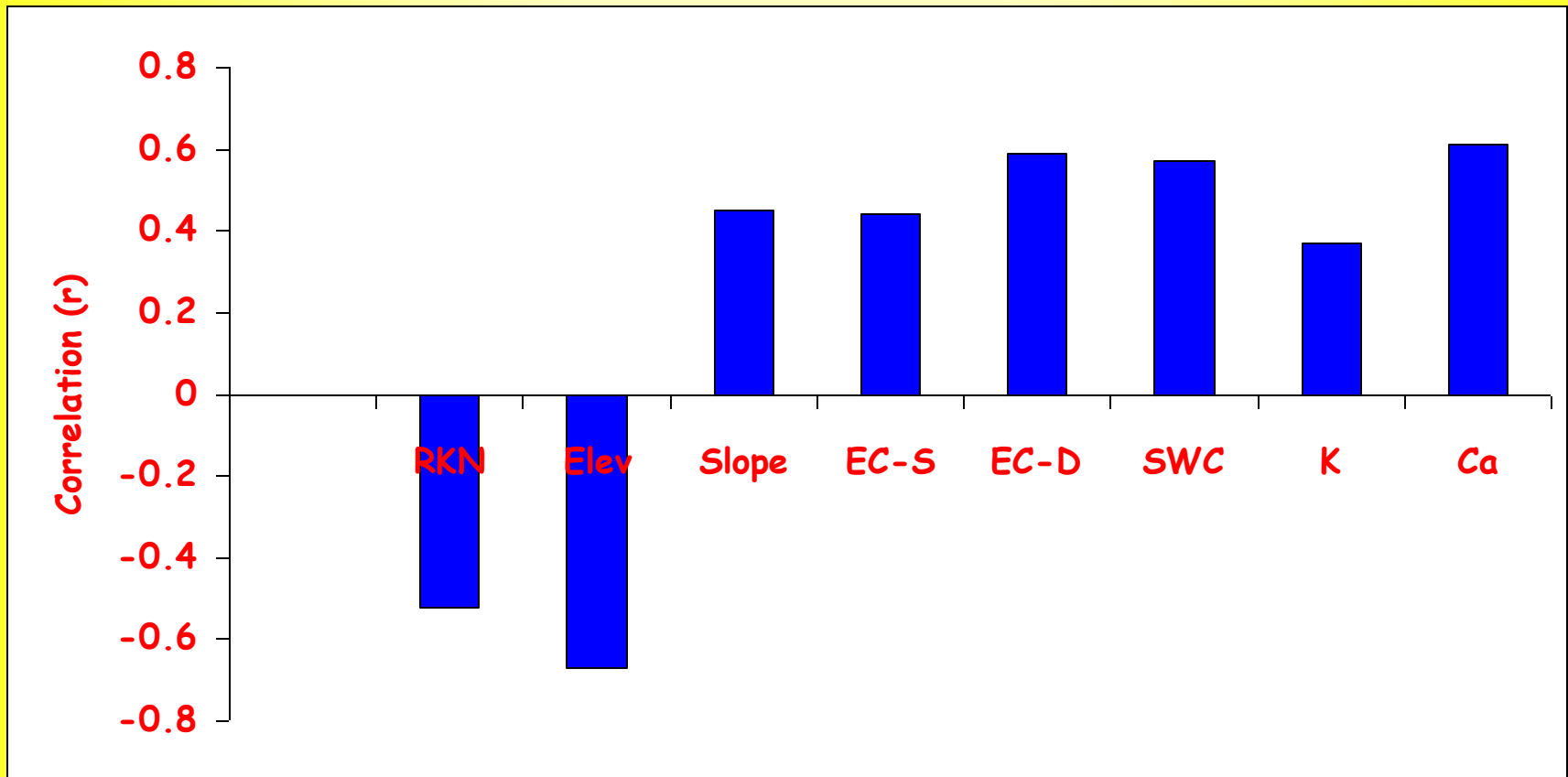


A Precision Ag Example

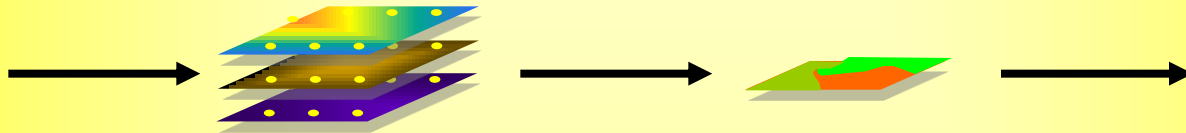
Site: SE Coastal Plain, GA
Soil: Loamy Sand
History: Root-knot Nematode Infested
Data:



A Precision Ag Example



A Precision Ag Example

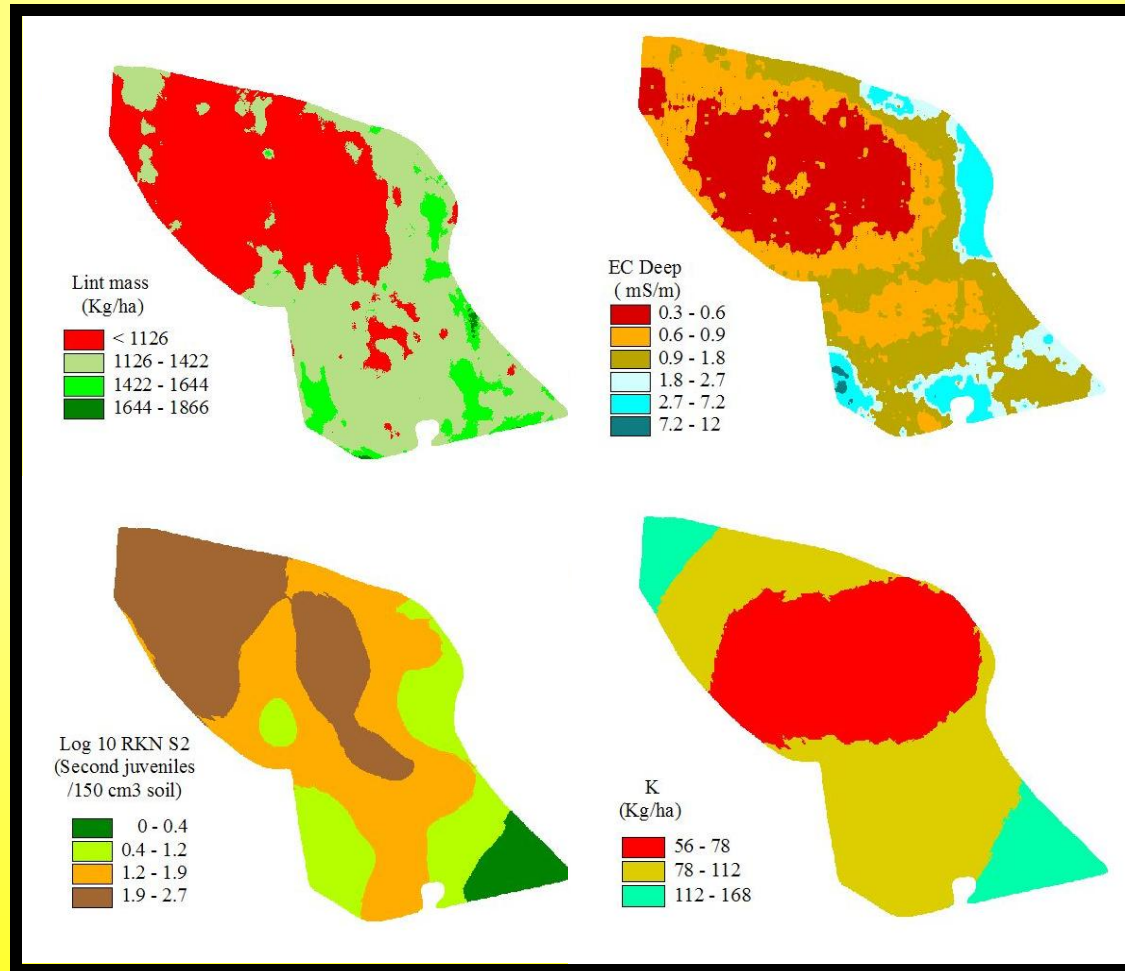


EC-deep, K, RKN = 54% of yield variability

EC-deep = 35% of yield variability

RKN = 12% of yield variability

A Precision Ag Example



In Summary

- **Soil Texture is correlated with:**
 - Water Availability
 - Fertility
 - Some Pests (RKN)
 - Most Importantly YIELD
- **Site specific mgmt of fertilizers shows promise as a tool to minimize inputs and maximize gains.**

In Summary

- Remember, tailoring inputs (fertilizer) works best when matched to EXPECTED yields.

