Using Topography and Veris in Zone Management

The MZB Zone Management System™

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

Presented by:
Wade Marzahn, CCA
Agronomy Training &
Marketing Manager

MZB System

- In the field - 1999
- Jamestown, ND
- Most successful first year introduction
  - 27,000 acres
- MZB Technologies – 2001
- Moved to Watertown, SD – 2003
- Retail Agricultural Suppliers
- Use of Topo, EC, and Yield – Patent Protected
- 70% or 100,000 were existing customers

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

MZB Network

- Sales Support
- Data Logging
- Computer Software (Free)
  - Retailer
  - Grower
- Agronomy and Software Support
  - Agronomy Training
  - Software Training
    - Network Streaming

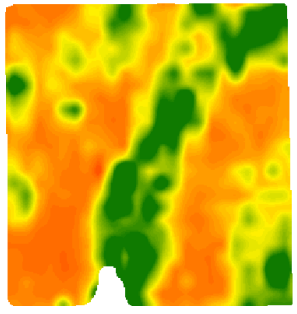
MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

Precision Trends

- Directed Soil Sampling
  - Use Meaningful Information
  - Less Soil Samples Needed
    - Reduces Cost vs. Grid
  - University Research – Multiple Data Layers

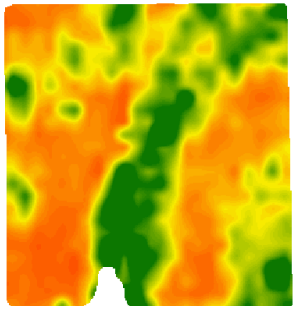
MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

Multiple Layers of Data



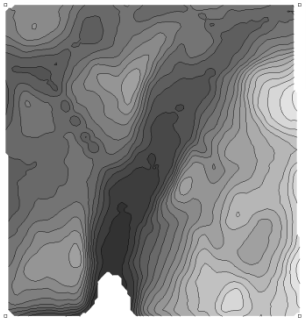
EC Surface

+



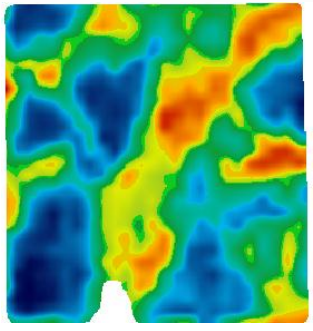
EC Deep

+



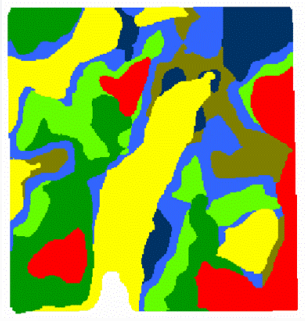
Elevation

+

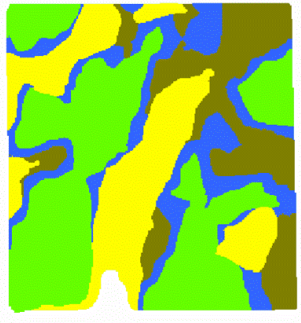


Satellite Imagery
or
Yield Data

=



The MZB System



MZB Lite

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

Patent Protected


MZB
TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

Keys to Successful Precision

- Zones are foundation
  - Nutrient Variability
  - Yield Variability
  - Annually Repeatable /Predictable Values
- Flexible – Ground Truthing
- Powerful Agronomy
- Speed
- Archiving

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

Topography

- Most Important layer
  - Residual Nutrients
    - Water, water, water
    - Erosion
  - Crop Productivity
    - VR Seeding Maps
    - VR Fertilizer Prescriptions

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

Single Layer Zone Delineation

- Correlation to Nitrogen

Table 1. Correlation of zone delineation method with base nitrate results from a 110 ft. systematic grid sampling, Valley City, ND, 2001 and 2002.

Comparison – Method vs nitrate sampling data	Correlation (r)
2001 topography	0.39
2002 topography	0.41
2001 yield	0.47
2002 yield	0.36
2001 EC	0.28
2002 EC	0.24
2001 Order 1 survey	0.24
2002 Order 1 survey	0.46
2001 Satellite image	0.41
2002 Satellite image	0.35
2001 Aerial photo	0.38
2002 Aerial photo	0.16

Franzen et.al.
NDSU

Topography in MZB System

- RTK Collected with Veris
  - Ability to identify upland depressions
  - Hilltops and ridges not highest in field
- Topography approach

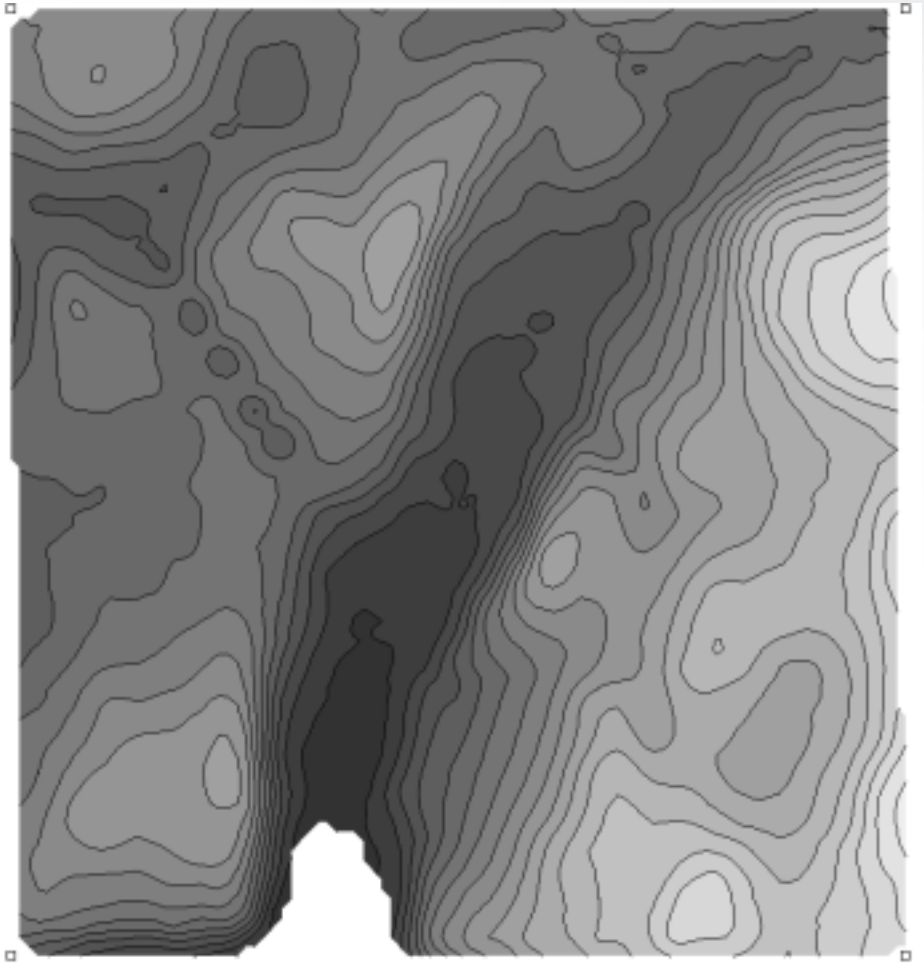
MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

Topography in MZB System

- Measured elevation values
  - Make sure zones are accurate
- Soil test accuracy
  - Depressions – High Phosphorus
    - Flooding/Water-logging
  - Hilltops/Ridges – Thinner Topsoil
    - Less Water
    - Nutrient Movement

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

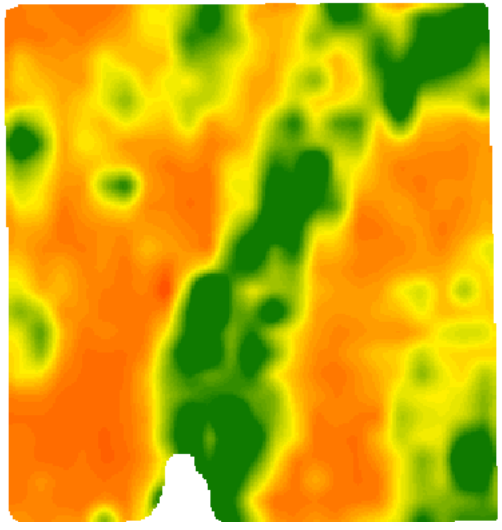
RTK Elevation



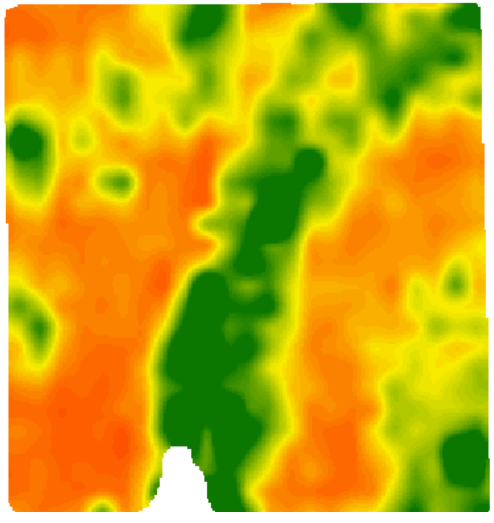
- Topography
  - Hilltops, Depressions
- Correlation to N
  - Relative Elevation
  - 39-41%
    - Franzen

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

Veris Electrical Conductivity



0-12 inch Depth

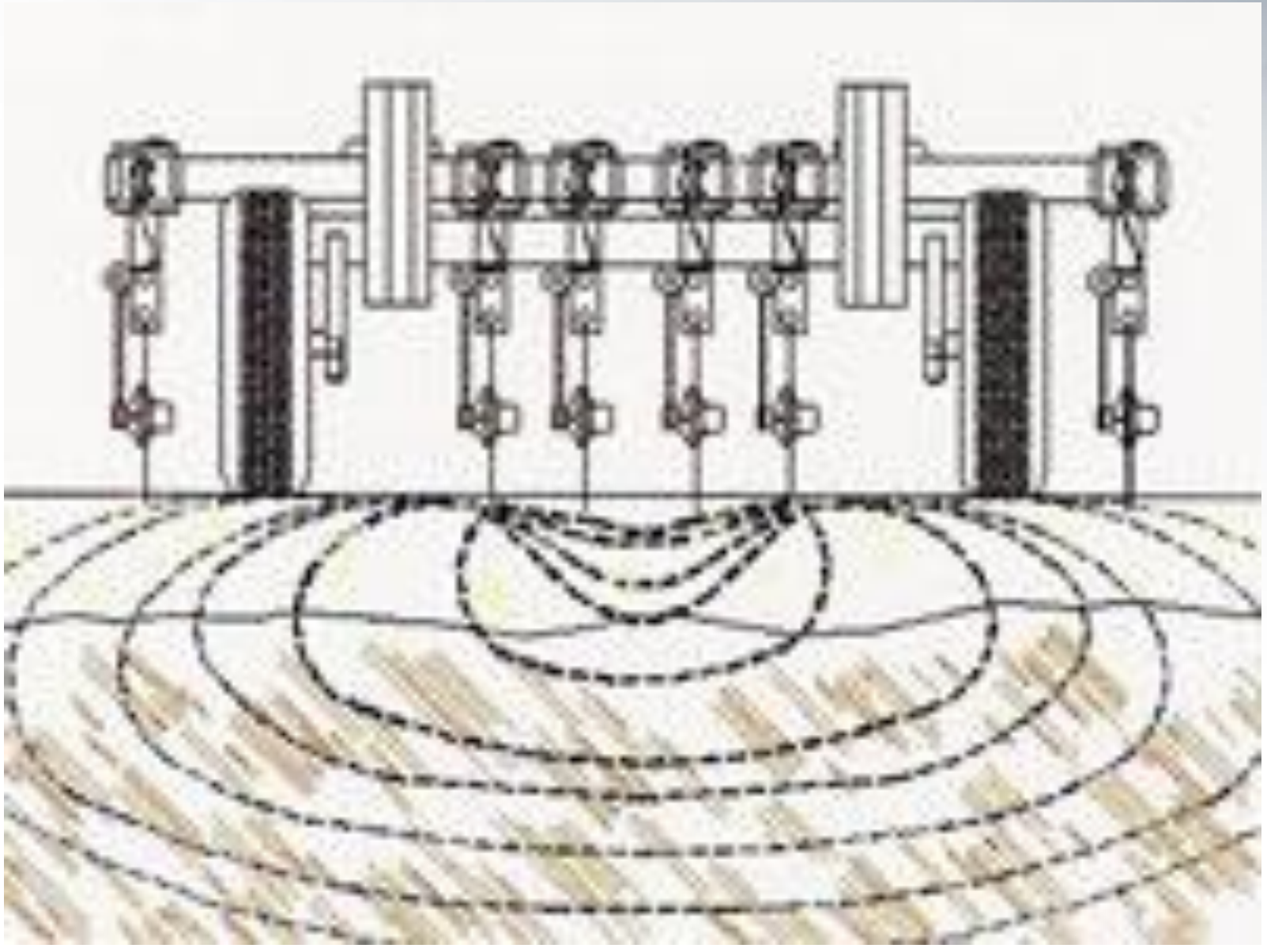


0-36 inch Depth

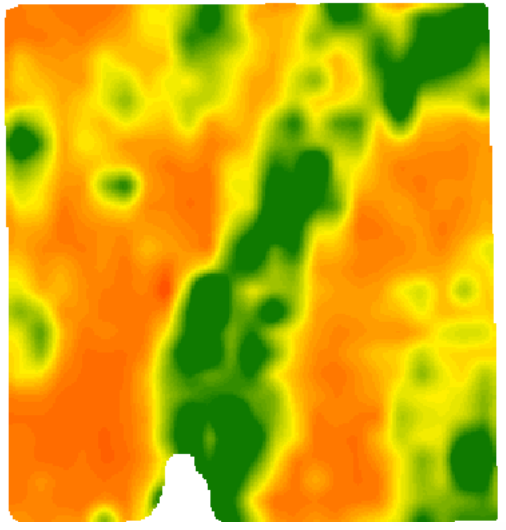
- Soil Property
  - Size, OM, Salts
- Group Data
  - Green - higher EC – fine, salts
  - Orange - lower EC - coarse

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

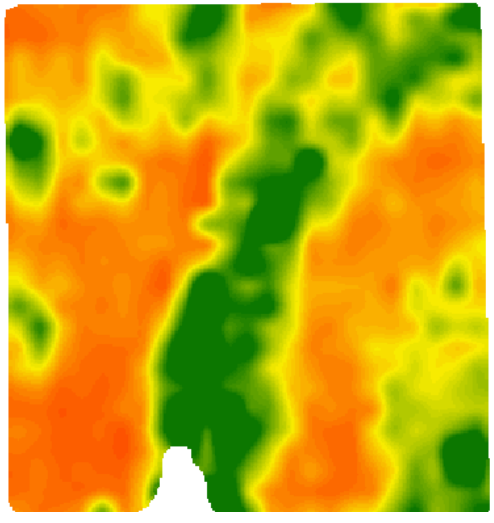
Veris 3100 Electrical Array



Veris Electrical Conductivity



0-12 inch Depth



0-36 inch Depth

- Correlation to N
  - 24-28%
    - Franzen
  - Very poor layer used alone

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

Veris Electrical Conductivity

- Areas between Hilltops and Depressions
  - Fine soils
    - Less leaching
    - Slower OM Break Down
    - Higher pH Values
  - Coarse soils
    - Higher leaching potential
    - Low OM
    - Low pH

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

Veris Electrical Conductivity

- Normal Range – 1-80 Ms/m
  - Sand 1-12 Ms/m
  - Silt 5-40 Ms/m
  - Clay 30-80 Ms/m
- Salinity Range – Above 60 Ms/m
  - Values Higher than 100 Ms/m common

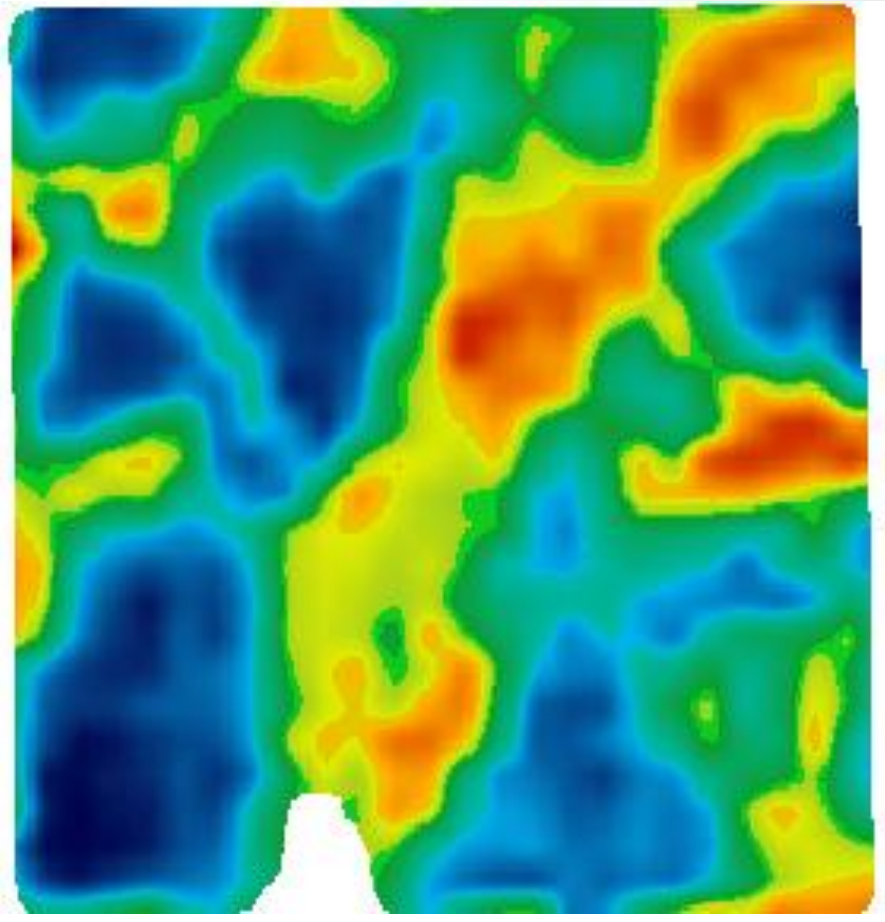
MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

Veris Electrical Conductivity

- Mechanical method – Soil Property
  - Very Accurate
  - Pattern Extractor
- Soil Test Validation

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

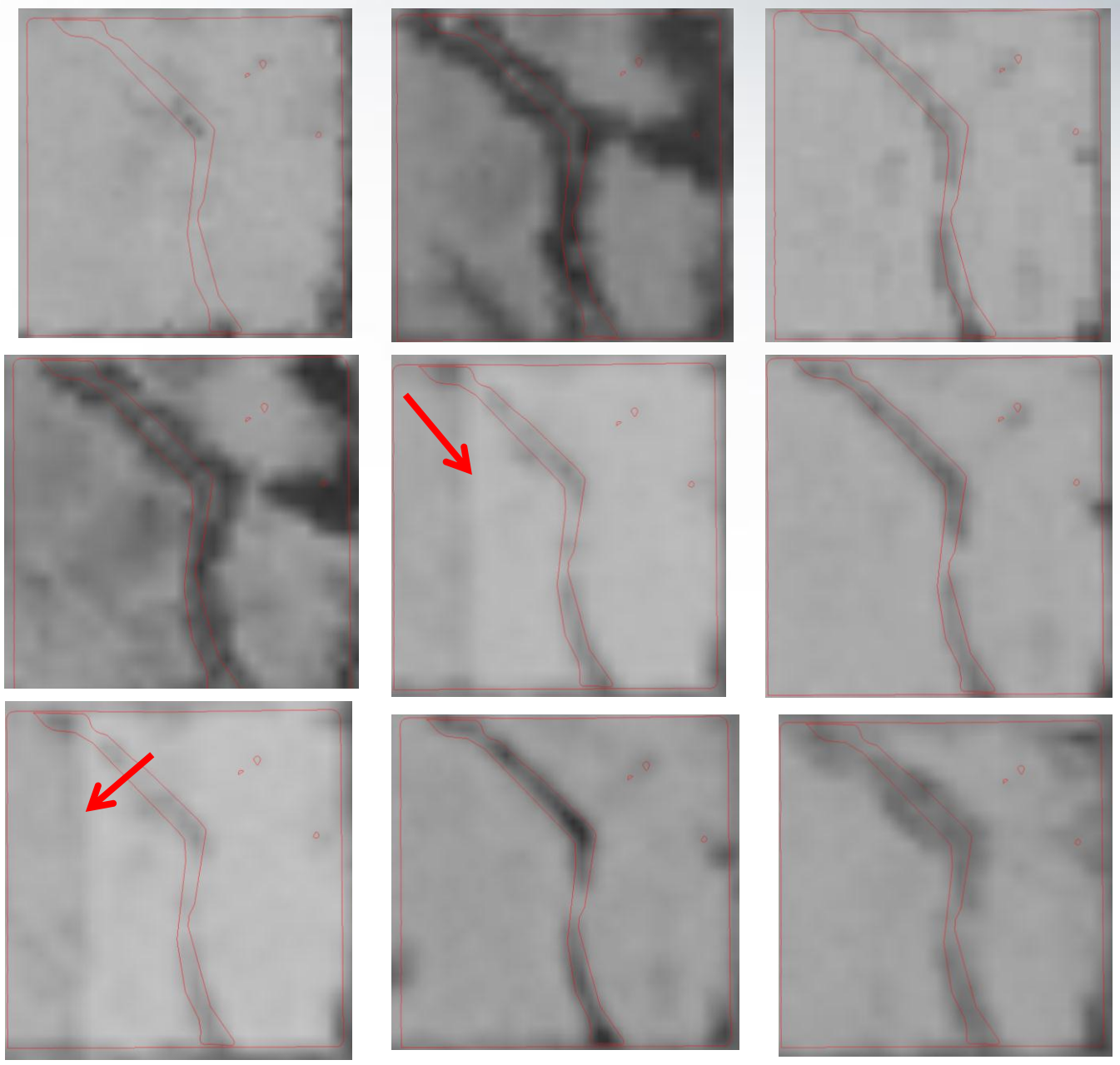
Satellite Imagery or Yield Data



- GNDVI
  - Green Normalized Difference Vegetation Index
  - Chlorophyll
    - Healthier, larger plants
  - Corr. well to yield potential
- Correlation to N
  - 35-41%

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

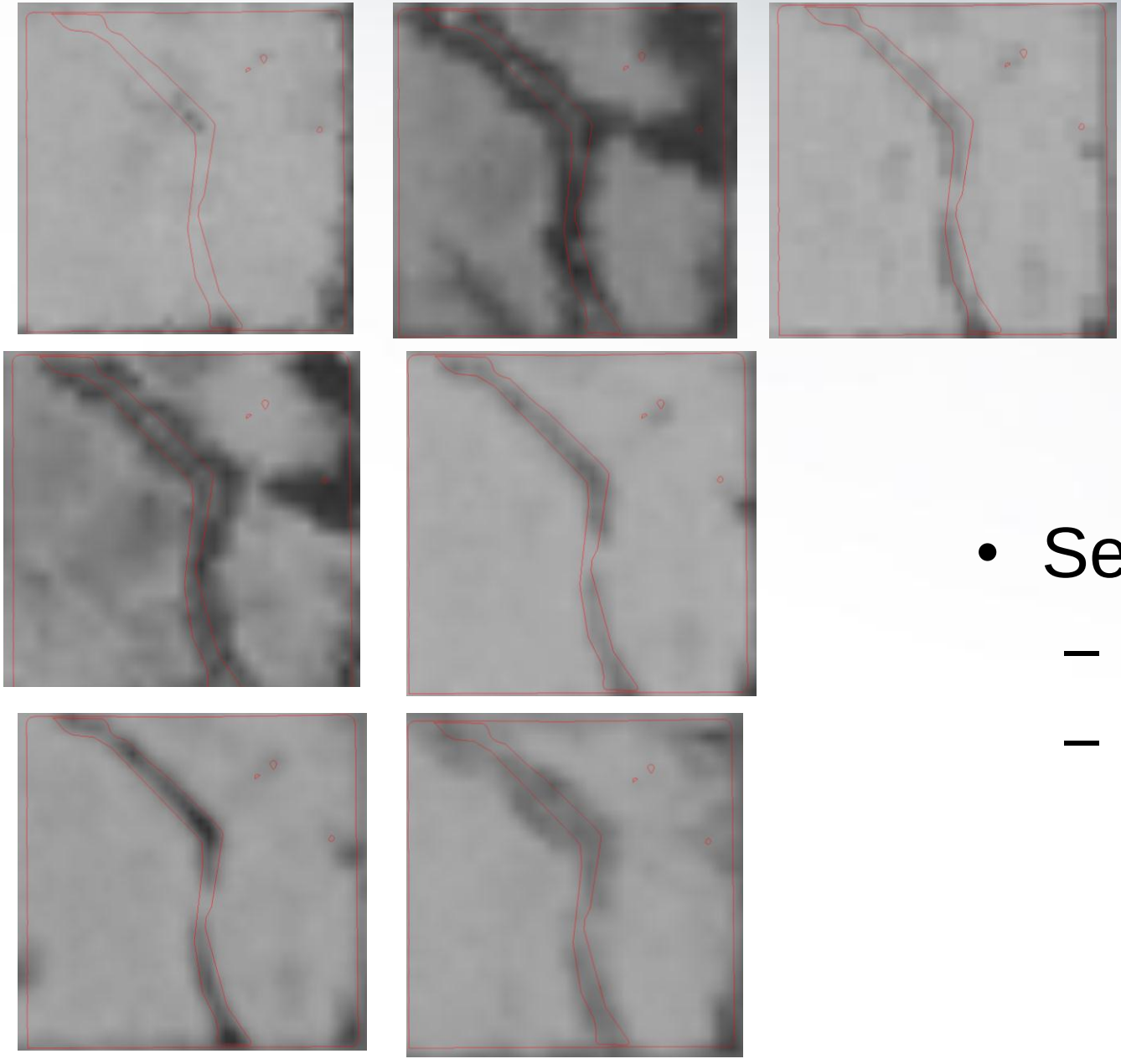
Satellite Imagery Normalization



- Raw Imagery
  - Multiple years
- Remove
  - Man-made

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

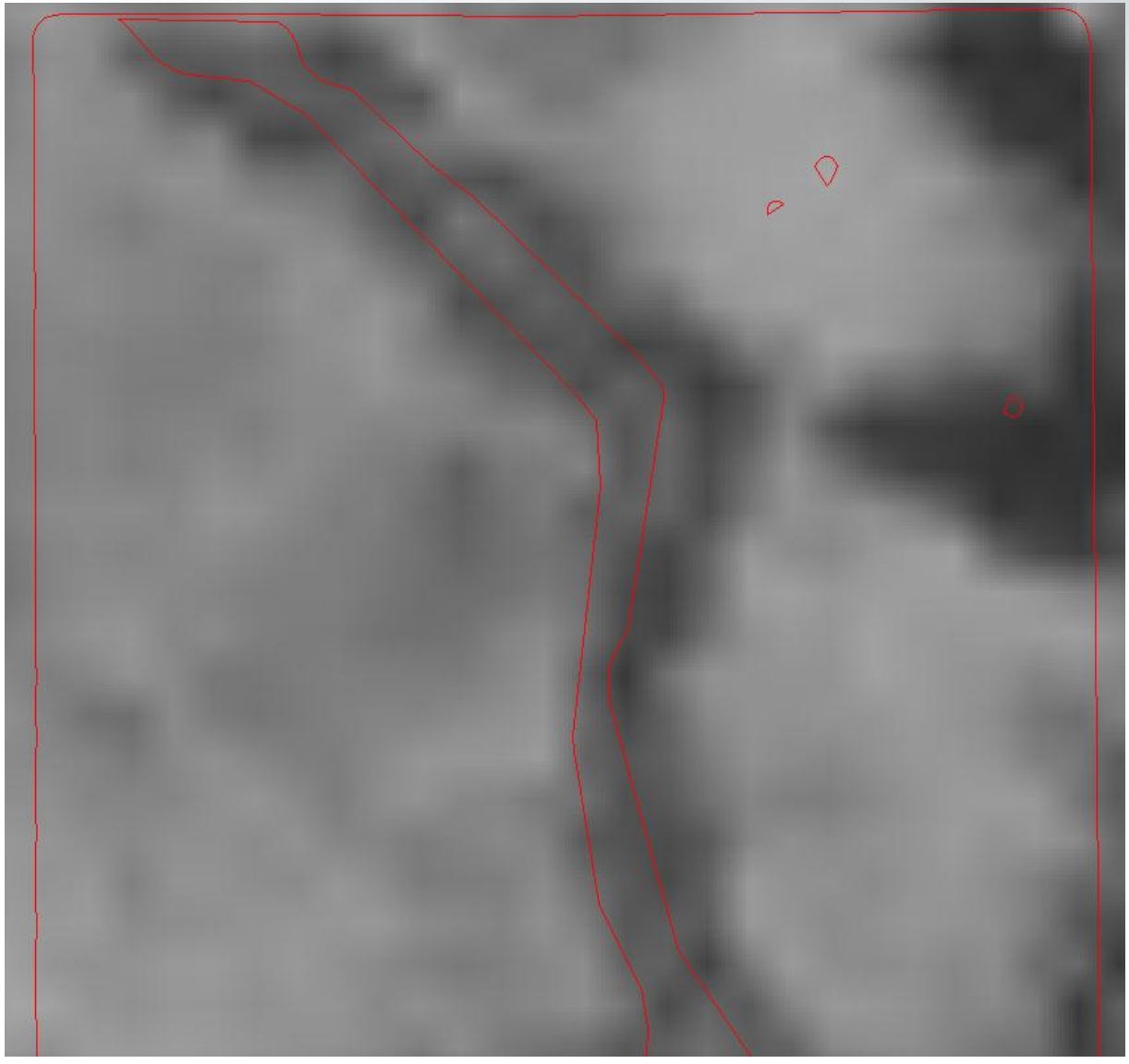
Satellite Imagery Normalization



- Selection
  - Most variable
  - Normal Pattern

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

Satellite Imagery Normalization



- Selection
  - Most variable
  - Normal Pattern

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

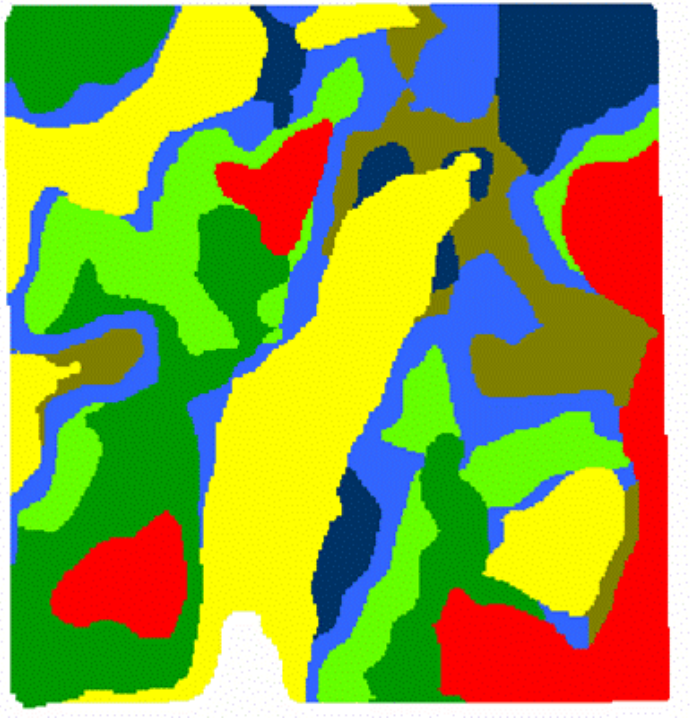
Combination Component Comparisons

Method vs Nitrate grid data	Correlation (r)
Topo+Yield+Remote Sensing	0.50
Topo+EC+Yield	0.48
Topo+EC+ Remote Sensing	0.47
Topo+EC	0.42

Franzen et. al.

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

The MZB System

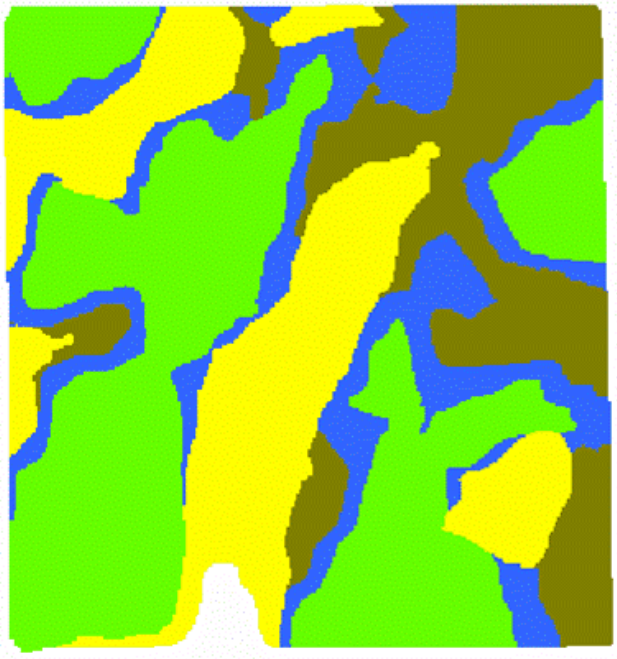


- Multiple Layers Data
- Up to 12 Zones / Field
- Most Accurate Method

- Best Fit
  - Long Term Management
  - Variable Rate Seeding

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

MZB Lite



- Multiple Layers
- 2-4 zones / Field

- Best Fit
  - Introduce Zone Management
  - Short Term Lease Agreements

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

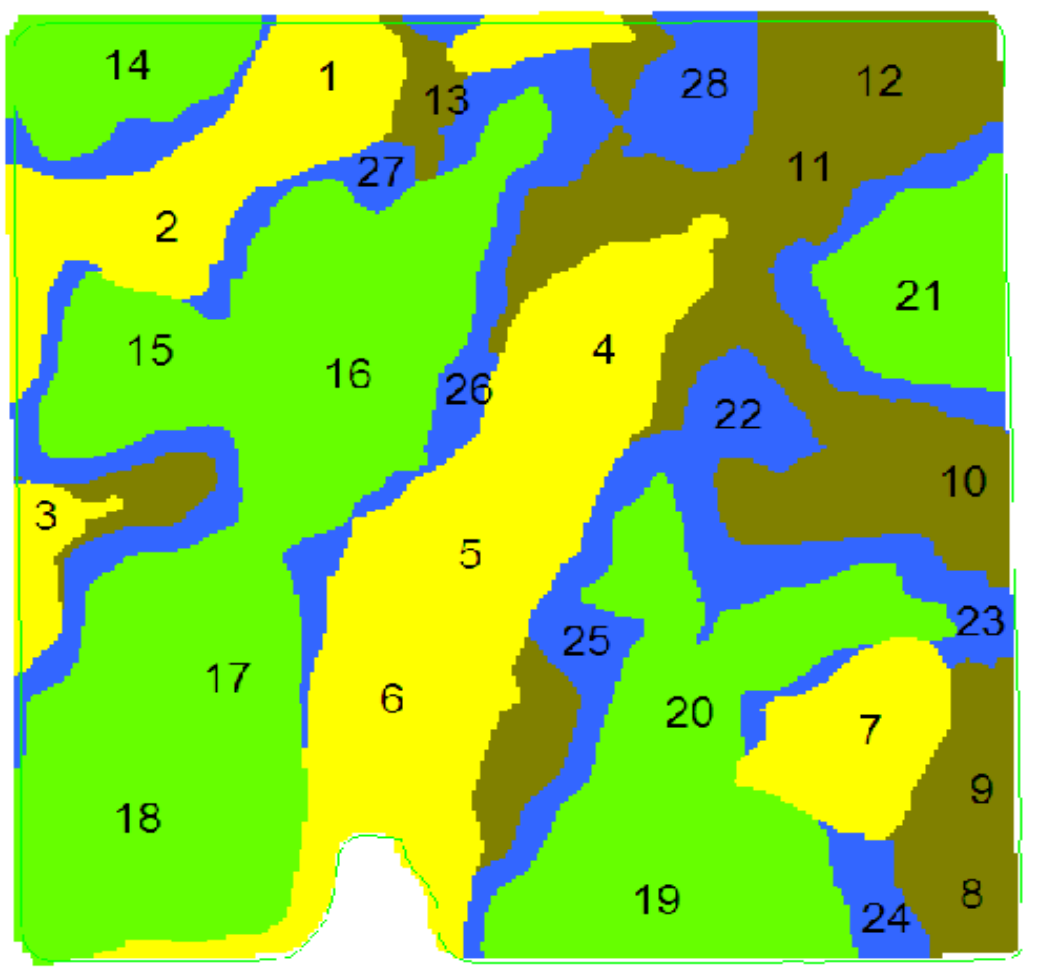
Geo-referenced Composite

- Geo-referenced Sampling Sites
- Same Sample Year to Year
- Measure Effect of Management

- Best Fit
  - Less Productive Fields
  - Small Fields (< 20 Acres)

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

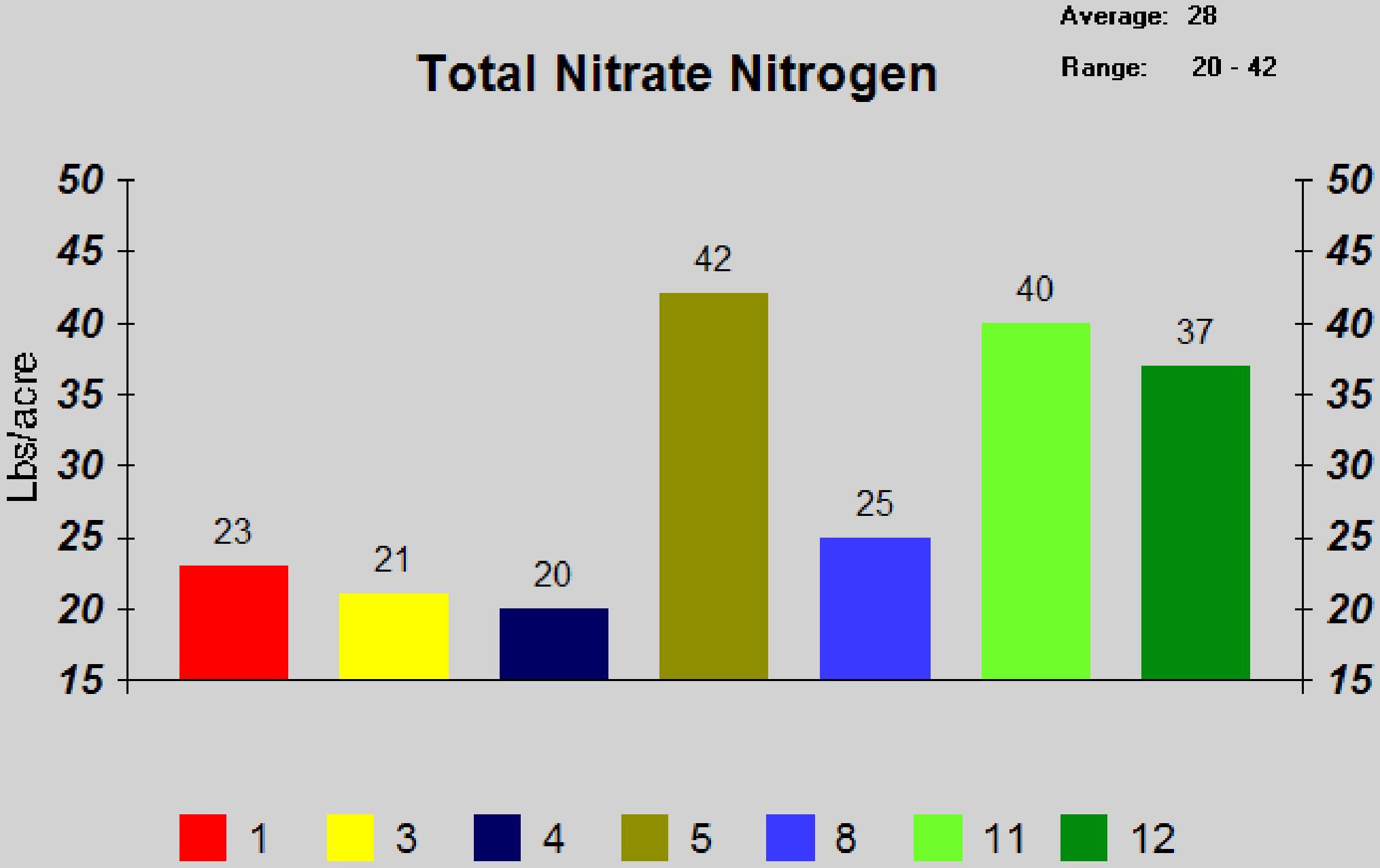
Soil Sampling



- Separate Sample for Each Zone
- Return to Same Sites
- Measure Effect of Management

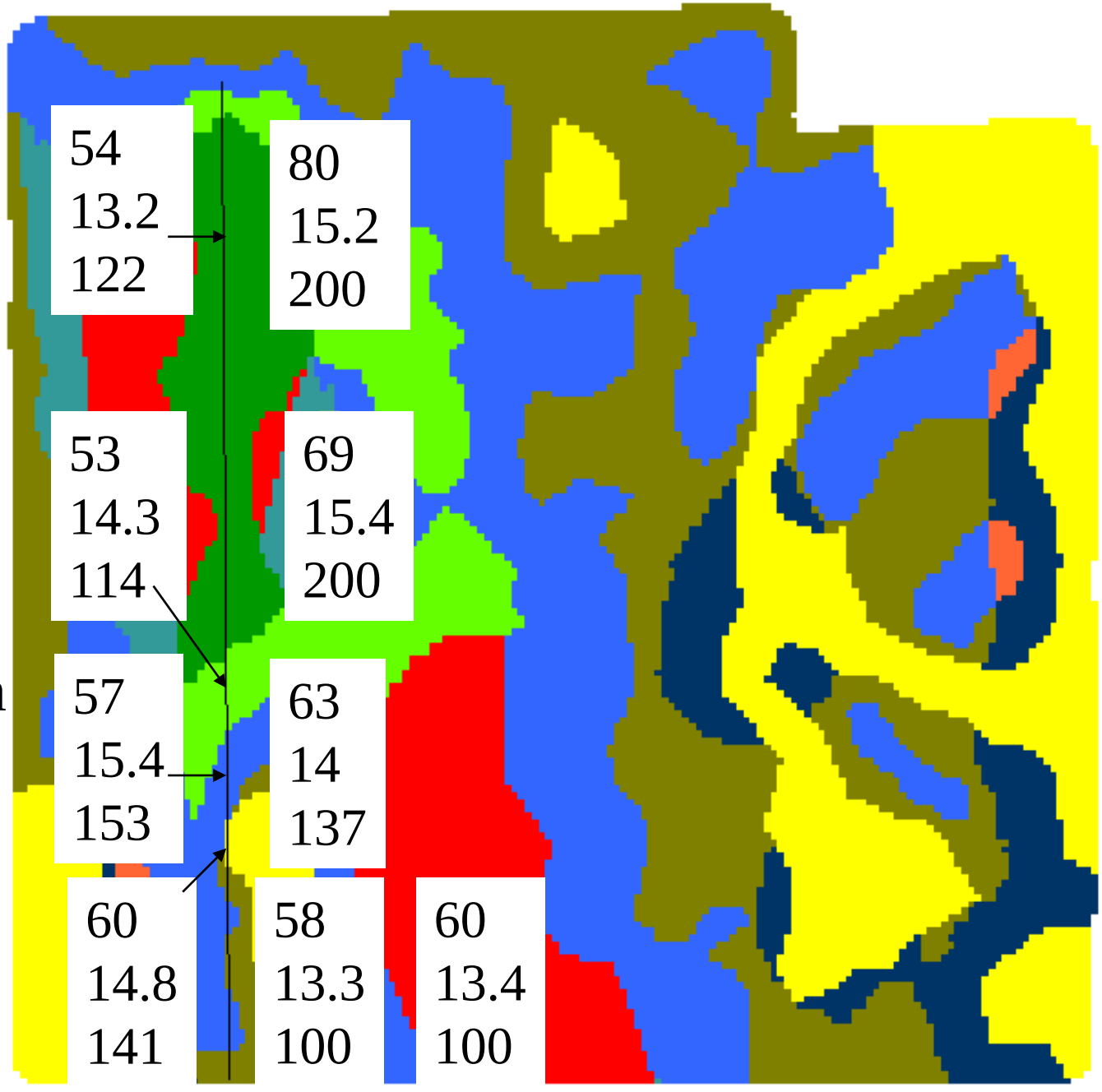
MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

MZB Soil Test Nitrogen



2001 Spring Wheat Response to VRT

Uniform Application Strip Trial

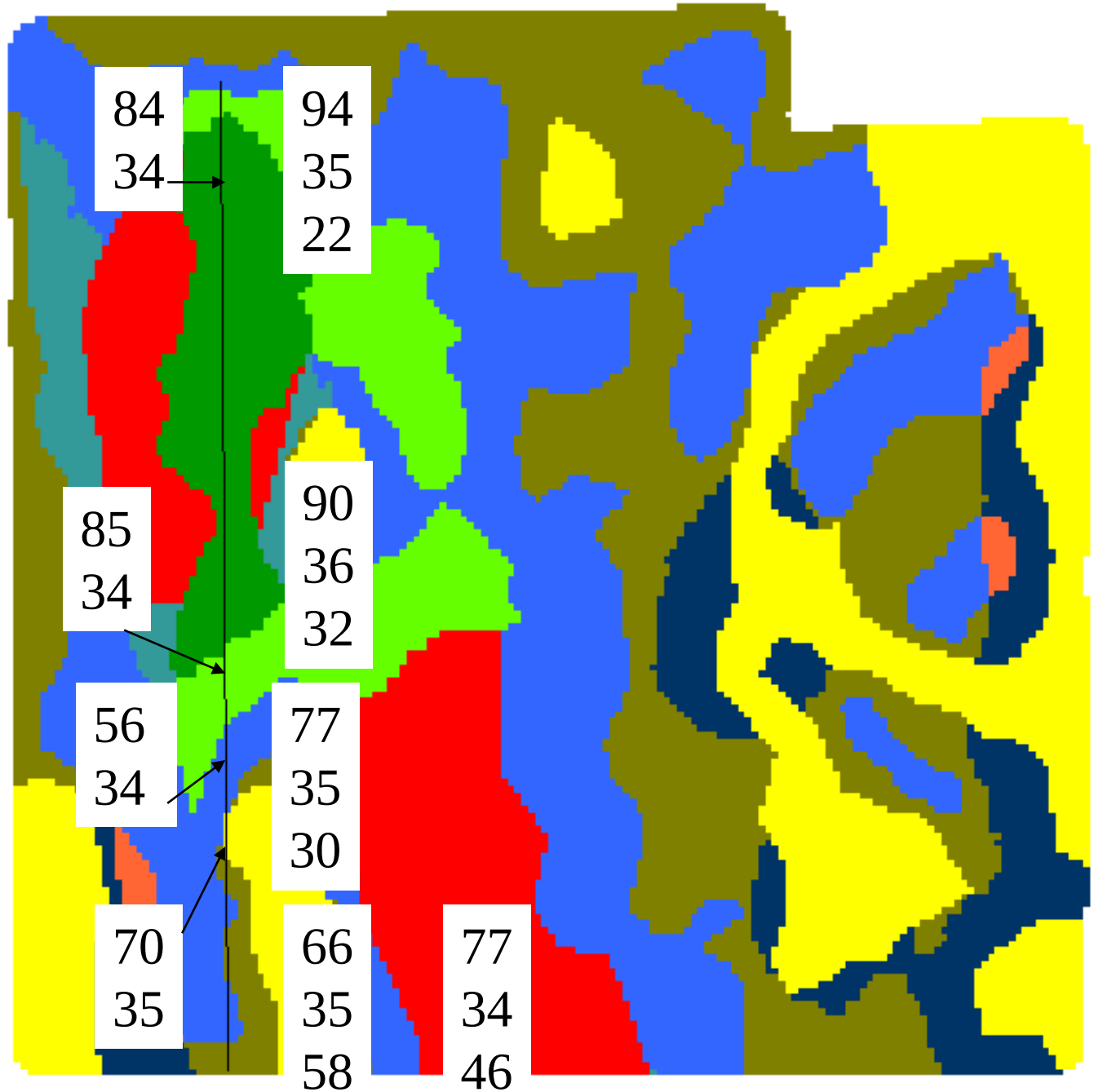


*Yield
*% protein
*Soil N + Fert.

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

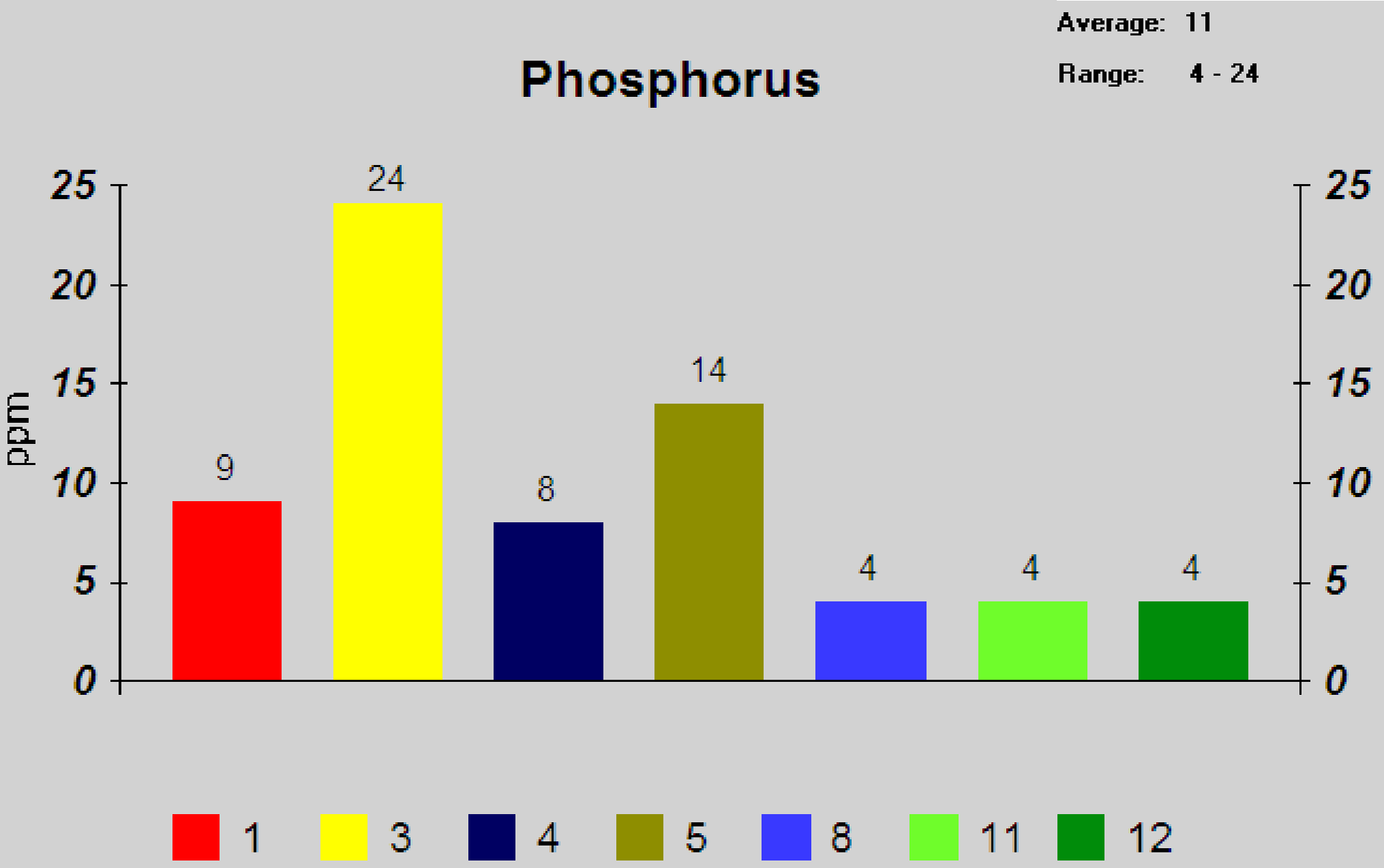
2001 Spring Wheat Vegetative Response to VRT

Uniform Application Strip Trial



MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

MZB Soil Test Phosphorus



Individual Zone Sampled Fields

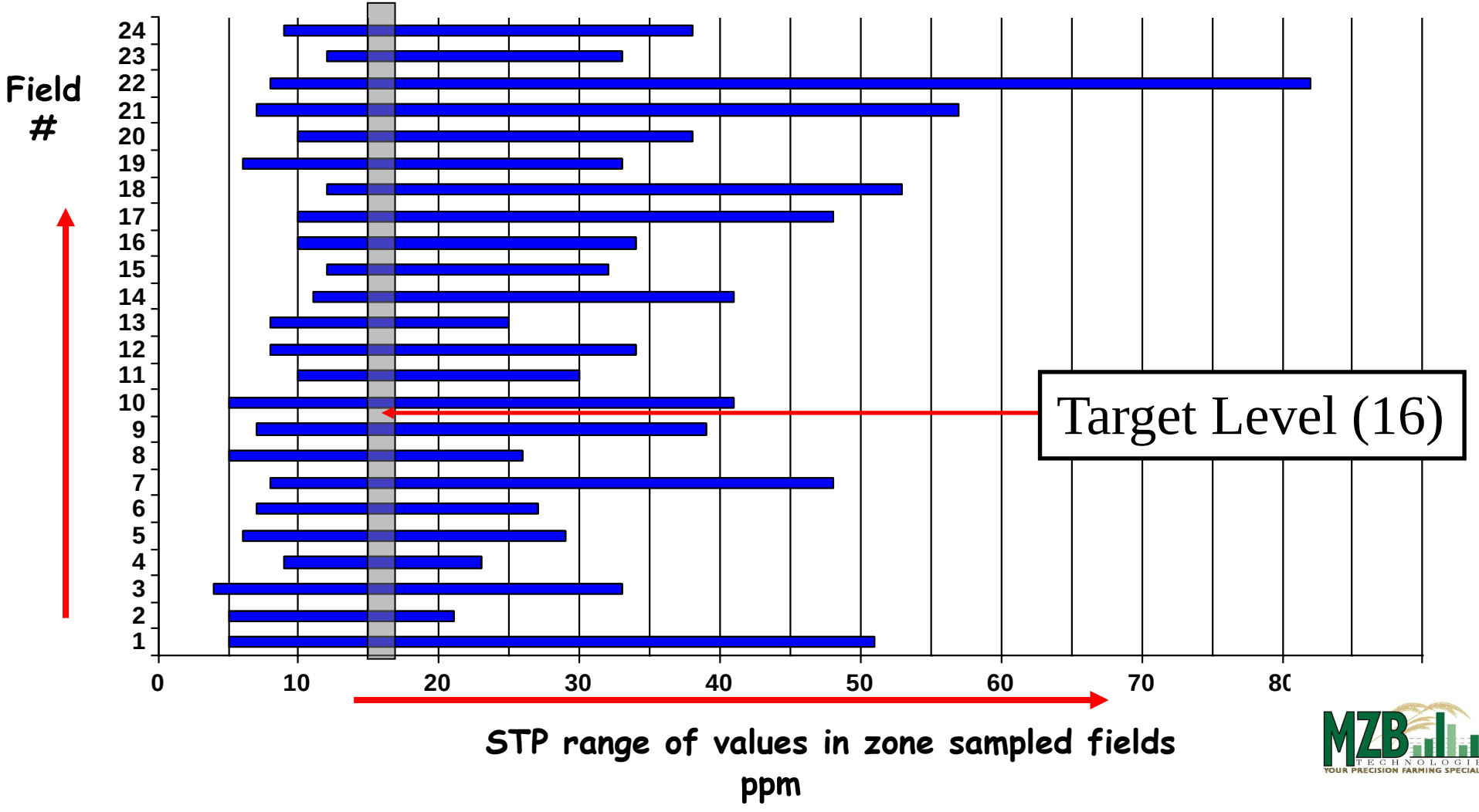
Averaging Between 13-16 ppm P

SD, MZB Fields (24 fields)

Zone Sampled fall 2003

(Olsen Test)

(2003 Average = 14)



Variability in Phosphorus

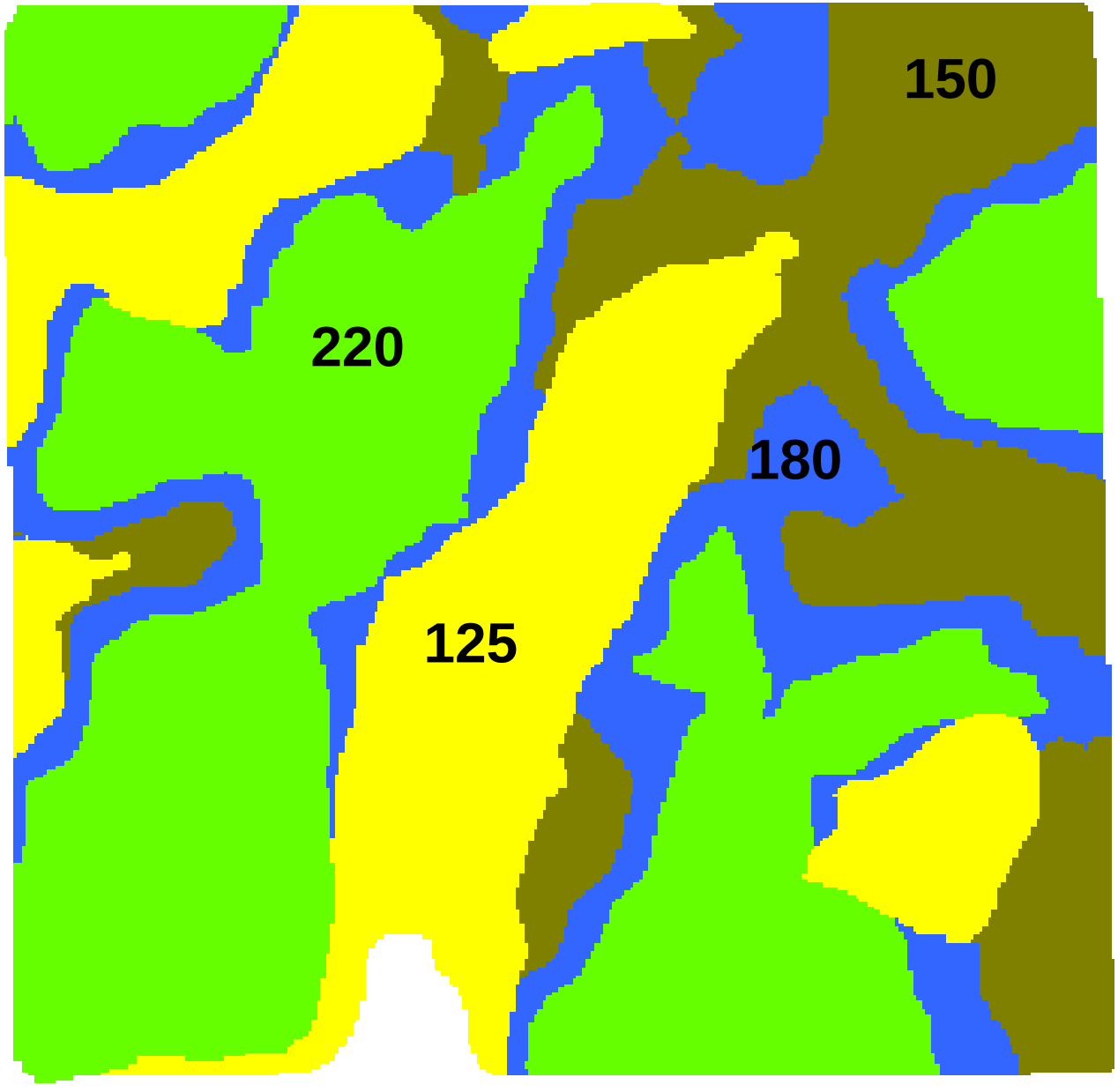
Summary of Residual Phosphorus Data from 475 Zone Sampled fields Representing 49,750 acres. First Year Zone Sampled.

Phos level (ppm)	Acres	Percent	Cumm %
V. Low (1-3)	2820	5.7	5.7
Low (4-7)	11850	23.8	29.5
Medium (8-11)	12750	25.6	55.1
High (12-15)	8330	16.7	71.9
V. High (16-20)	6275	12.6	84.5
Above (20)	7725	15.5	100

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

Zone Map/Yield Goals (Corn)

Ave Yield Goal
177 bu/acre



MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

MZB Application

Zone	Urea	MAP (11-52-0)	Zinc Sulfate	TOTAL
1	288	134	15	437
3	268	0	0	268
4	188	71	0	259
5	244	0	15	259
8	265	210	15	490
11	299	276	0	575
12	304	285	20	609
Field Totals	39,460	20,655	1,336	61,451
Prices	$500.00	$640.00	$ 1.00	
Costs/Acre	$ 68.08	$ 45.64	$ 9.23	$122.95
Total Cost	$17,815.46			

Zone	Corn-Grain Yield Goal	Soybeans Yield Goal
1	180	40
3	125	25
4	100	25
5	150	35
8	180	40
11	220	55
12	220	60
Average	170	40

- Reduce Over Application
- Reduce Under Application
- Increased Yield Potential

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

Application

- 4-6 bin Soilection
- VR Strip Till
- VR Anhydrous

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

MZB System Benefits

- No-Guessing
  - Single soil test not enough
- Less Over Application
- Less hidden Hunger

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

MZB System Benefits

46 Strip trials 2000-2001

- Yield Improvements
  - Corn 14.3%
  - Wheat 11.5%
- Quality Improvements
  - Corn 0.7% Protein
  - Wheat 0.75% Protein

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

MZB System Benefits

- Fertilizer Savings
  - 17-30%
- Variable Seeding Corn
  - 14% seed savings

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

Measuring Effectiveness

- University Research Support
  - Topography important layer
- Over 70% of new fields – Existing customers

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

Summary

- Precision Works for Growers
- Topography is Valuable Layer
- Veris is a very Effective Support Layer
- Multiple Layers should be used
  - Accurate Residual Fertility
  - Consistent Program Performance

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

Summary

Topography is the key to consistent performance

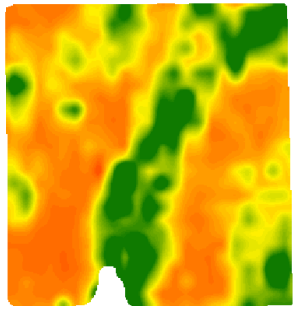
- -Hilltops and Depressions are unique
- -Improves Soil Test Variability
- -Fertilizer and seed rates

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST

MZB Technologies

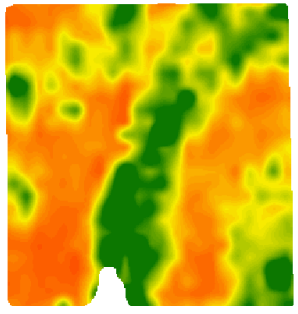
Watertown, SD

Questions?



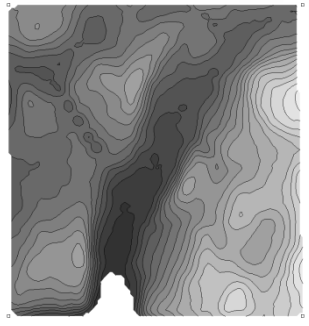
EC Surface

+



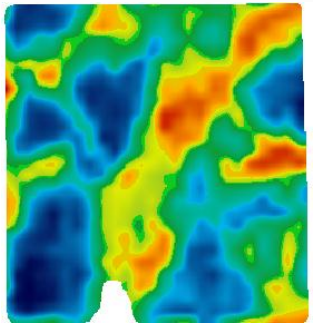
EC Deep

+



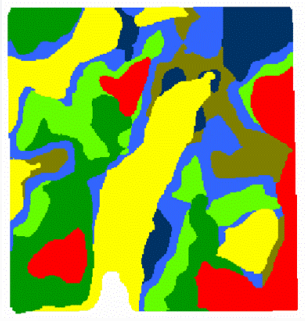
Elevation

+

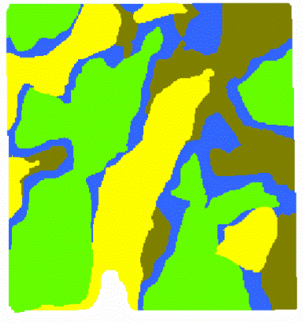


Satellite Imagery
or
Yield Data

=



The MZB System



MZB Lite

MZB TECHNOLOGIES
YOUR PRECISION FARMING SPECIALIST