# Remote Sensing Experience in Production Fields*

*Funding provided by Wisconsin Corn Promotion Board, Wisconsin Soybean Marketing Board and North Central Soybean Research Program. The UW-Madison Environmental Remote Sensor Center provided support for processing remotely sensed data.

# Objectives:

- Evaluate remotely sensed data and relate to anomalies found on the ground
- Evaluate multi-spectral and hyper-spectral remotely sensed data with respect to crop health
- Evaluate issues associated with collecting remotely sensed data on production fields

# Application of Remote Sensing in Precision Agriculture

- Improve crop scouting efficiency by identifying field anomaly locations

- Identify cause of the field anomaly

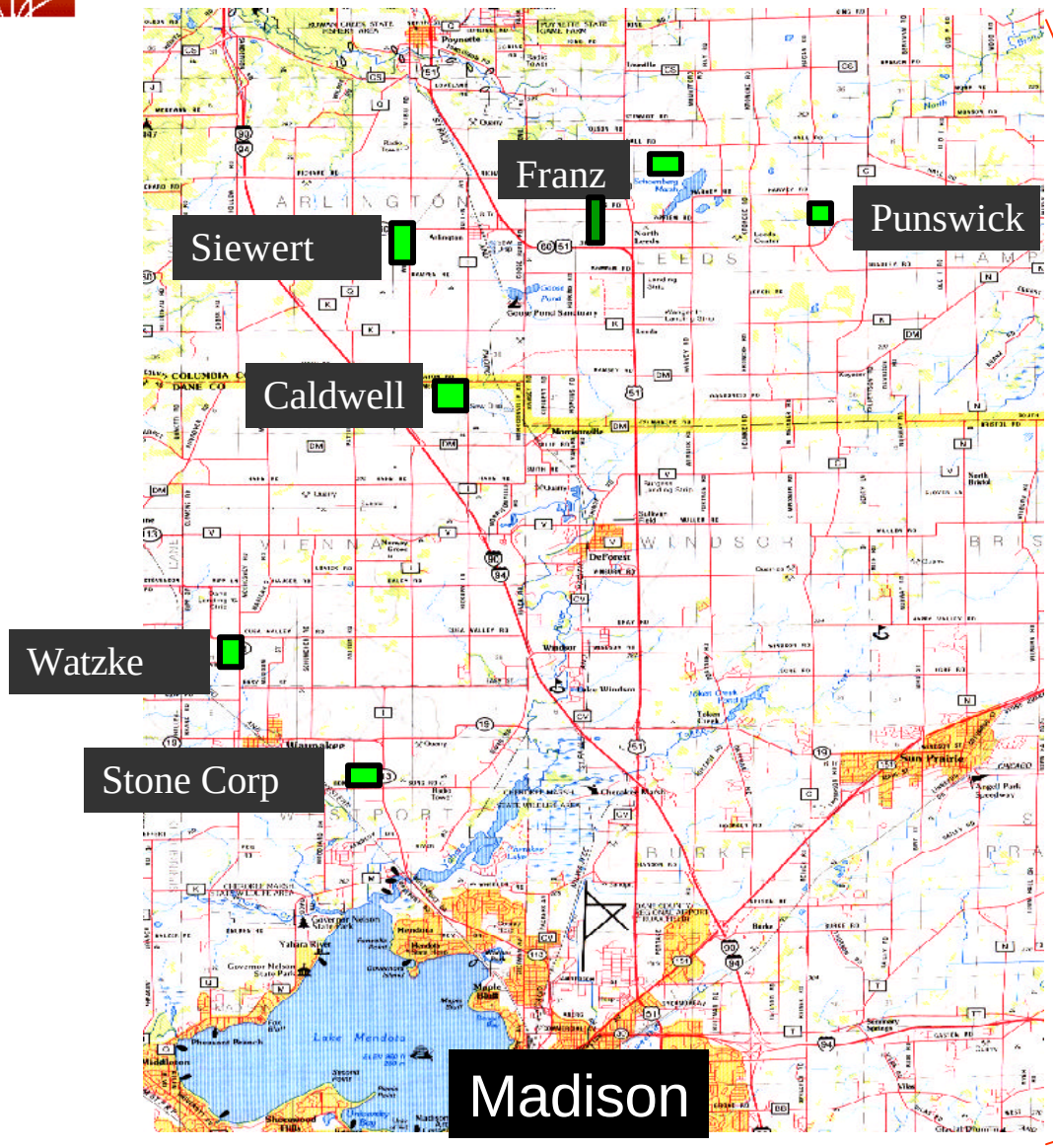
# Characteristics of Remote Sensing

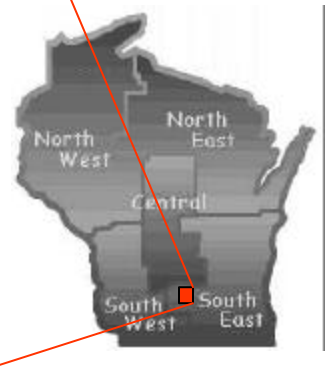
- Spatial resolution - size of smallest object observed
- Spectral response - spectral bands - color (visible) and infrared
- Spectral resolution - differentiate between spectral bands
- Frequency of coverage

# Data Collection

- Fields(Seven crop production fields in corn soybean rotations from 35 to 105 acres)
- Field data
- Remotely sensed data
- Duration - 2 to 5 seasons

# WI Soybean Project Fields



# Field data

- Soil sampling, 1 acre grid, once during initial season
- Plant stand
- Plant height
- Field scouting-anomalies
- Yield
- Moisture

# Sources of Remotely Sensed Data

- Aircraft
  - NASA-ATLAS (15)*
  - Airborne Data Systems(7)
  - 3di LLC(16)
  - Spectral Visions(120)
- Satellite(4)
- Radiometer, Handheld(8)

* Number of bands

# Sources of Remotely Sensed Data(cont.)

## NASA ATLAS Spectral Coverage(15 bands)

**Visible - 4**

| | | | | |
|---|---|---|---|---|
| Wavelength (nm)* | 450-520 | 520-600 | 600 - 630 | 630 - 690 |
| Color | Blue | Green | Orange | Red |

**Infrared (Near) - 4**

| | | | | |
|---|---|---|---|---|
| Wavelengths (nm) | 690 - 760 | 760 - 900 | 1550 - 1750 | 2080 - 2350 |

**Infrared (Thermal) - 6**

| | | | | |
|---|---|---|---|---|
| Wavelengths (nm) | 8200 - 8600 | 8600 - 9000 | 9000-9400 | 9600-10200 |
| | 10200-11200 | 11200 - 12200 | | |

nm-nanometers

# Sources of Remotely Sensed Data(cont.)

- Spectral Visions:
  - Number of Bands: 120
  - Range: 471-828 nm (3 nm widths)
- 3di LLC:
  - Number of Bands: 16
  - Range: 530 - 900 nm
- Airborne Data Systems
  - Number of Bands: 7
  - Range: 400 - 1400 nm

# Sources of Remotely Sensed Data(cont.)

Okonos:

- Number of Bands: 4
- Visible - 3(480, 551, 665),NIR - 1(805)

# Sources of Remotely Sensed Data(cont.)

Okonos:

- Number of Bands: 4
- Visible - 3(480, 551, 665),NIR - 1(805)

Radiometer(Handheld)

- Number of Bands: 8
- Range: 460-810

# Image Data Collected of Targeted Agricultural Fields

UNIVERSITY OF WISCONSIN MADISON

| | | |
|---|---|---|
| **1997** | | |
| | 1. May 12 | Airborne Data Systems Multispectral and Thermal |
| | 2. July 5 | Airborne Data Systems Multispectral |
| | 3. September 9 | Airborne Data Systems Multispectral |
| | 4. September 26 | ATLAS 15-band and CIR photography |
| **1998** | | |
| | 1. July 20 | Airborne Data Systems Multispectral |
| | 2. September 9 | Airborne Data Systems Multispectral<br>ATLAS 15-Band with CIR photography |
| **1999** | | |
| | 1. September 16 | Spectral Visions Hyperspectral |
| **2000** | | |
| | 1. July 12 | Radiometer, Handheld |
| | 2. August 5 | Airborne Data Systems Multispectral |
| **2001** | | |
| | 1.May 5 | Ikonos |
| | 2. July 10 | Ikonos |
| | 3. August 21 | 3di Multispectral |
| | 4. August 23 | Ikonos |

Other data sets:
- Dane Co. 1m orthophotos
- Assorted GIS coverages

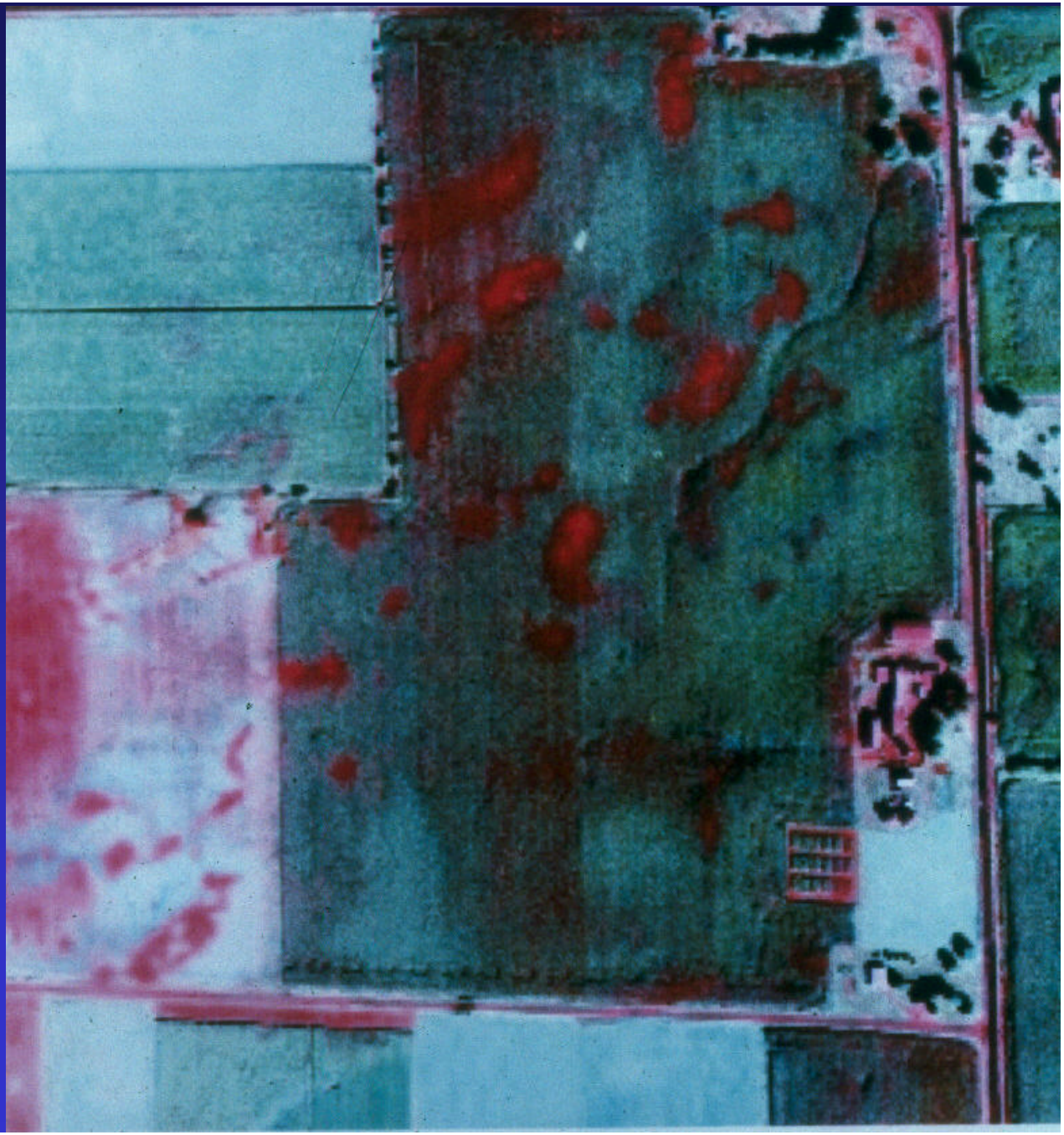
NASA-
ATLAS
Near-Infrared

(nm)

690-760

760-900

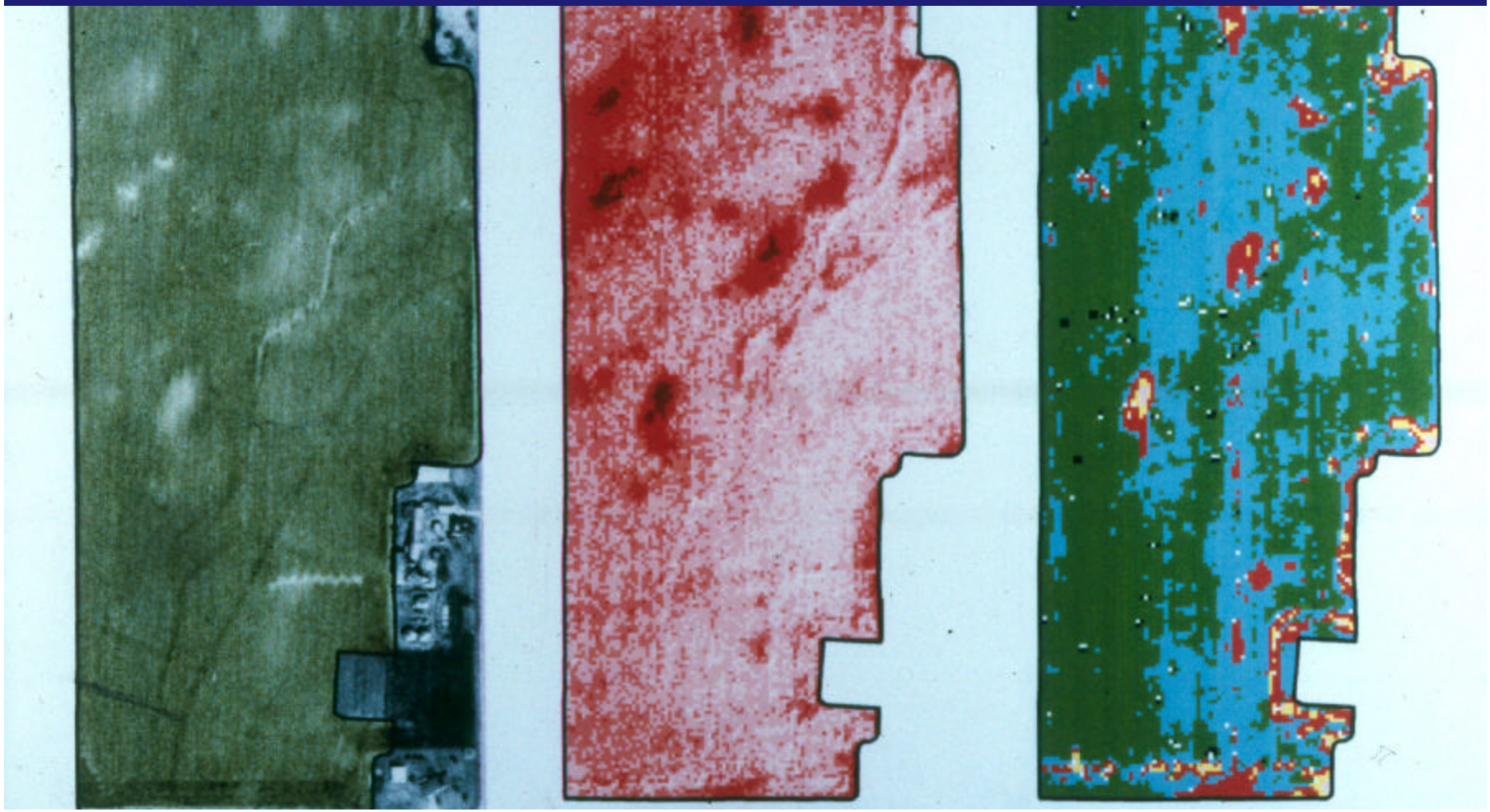
1550-1750



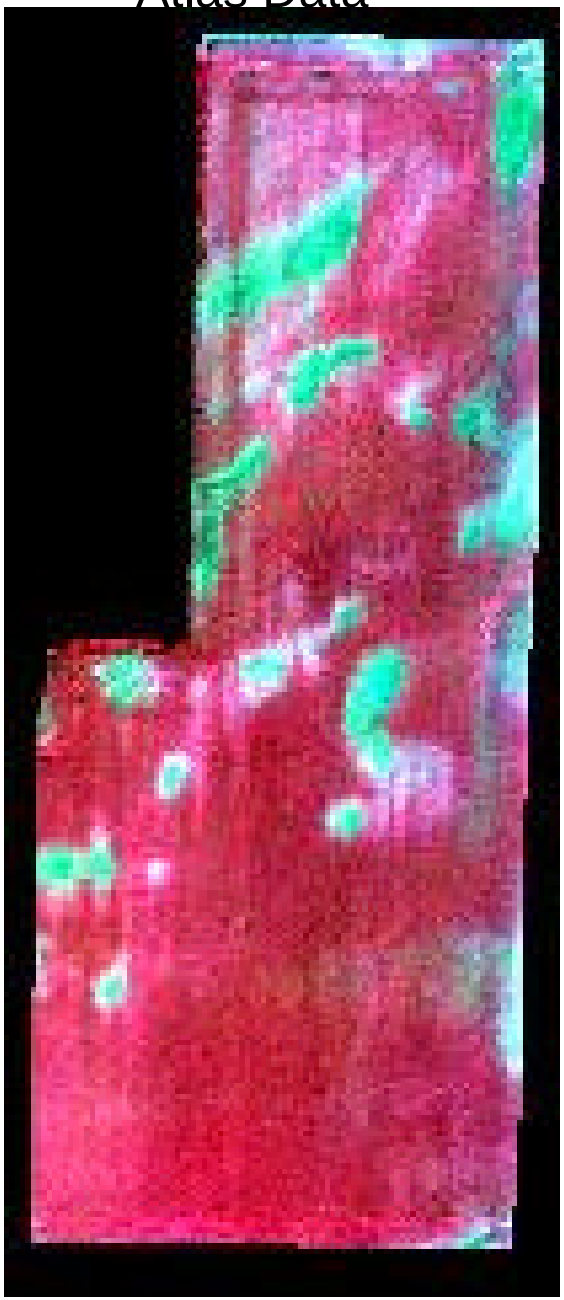
Visible Spectrum
Bare Soil

Remote Data
Red, 630-690nm

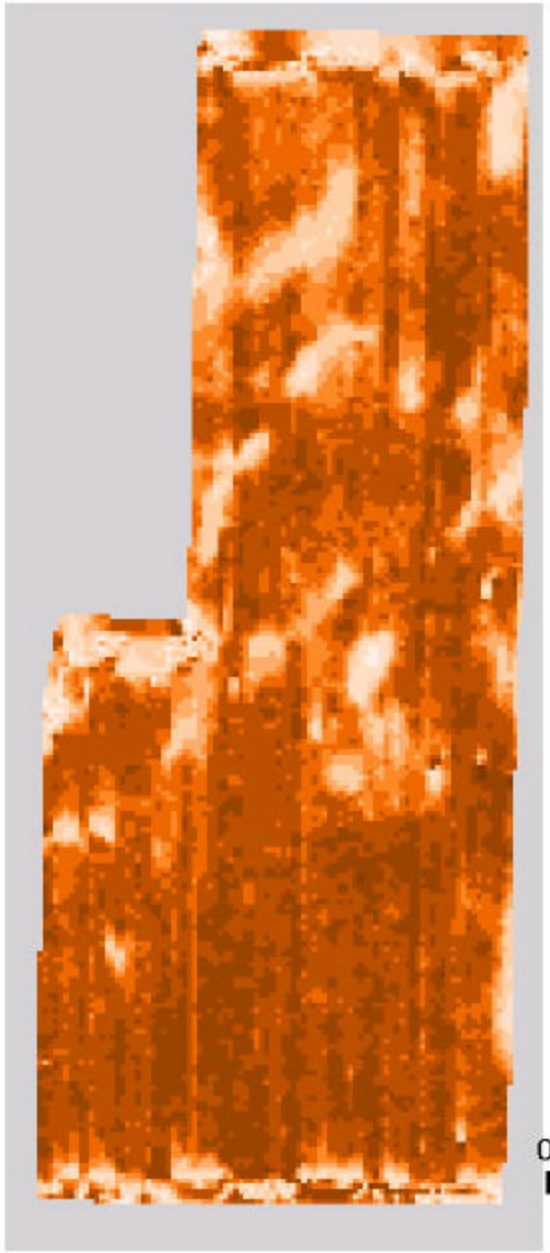
Yield



Atlas Data

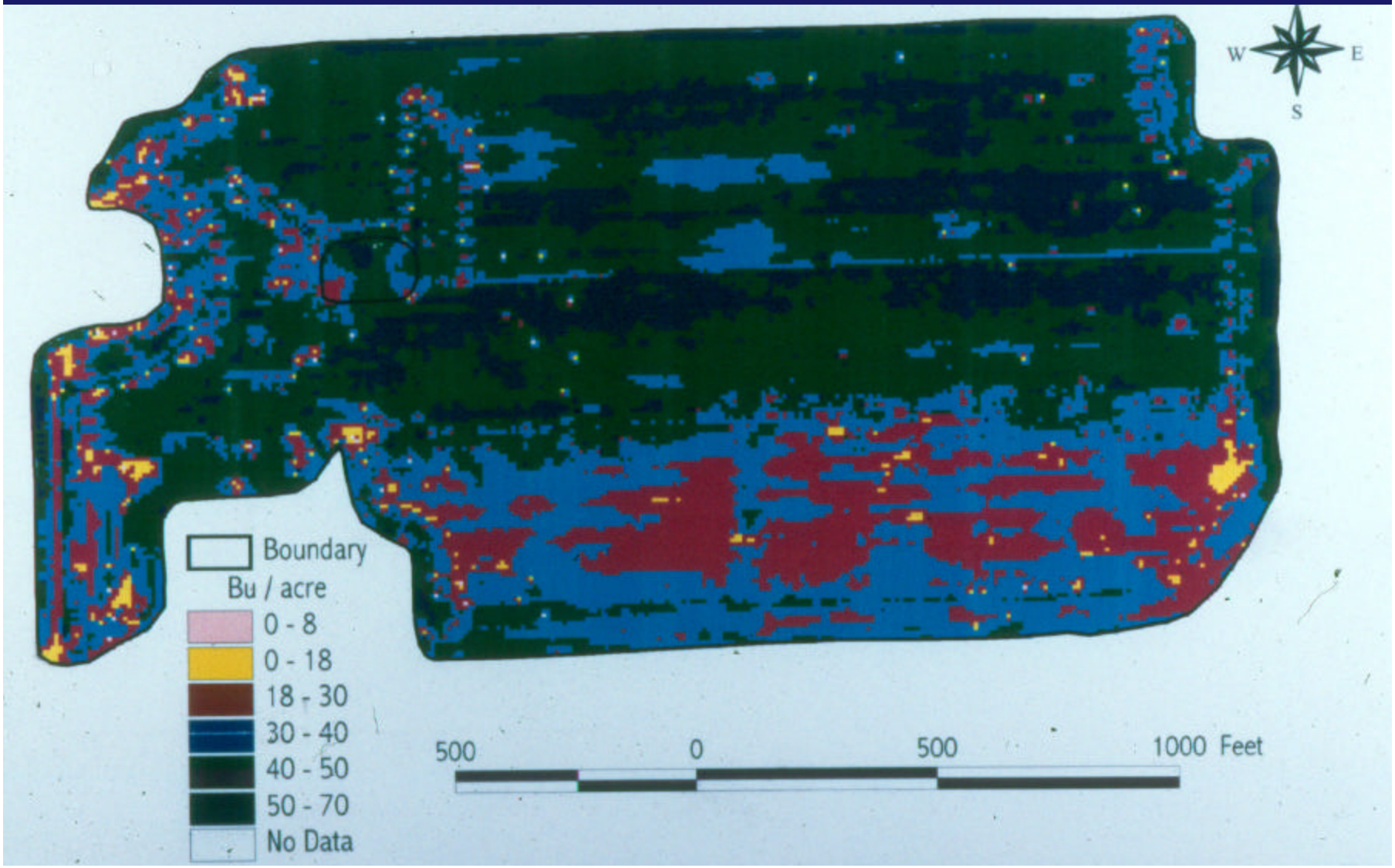


Corn Yield, 1998




Watzke

# Soybean Yield Map

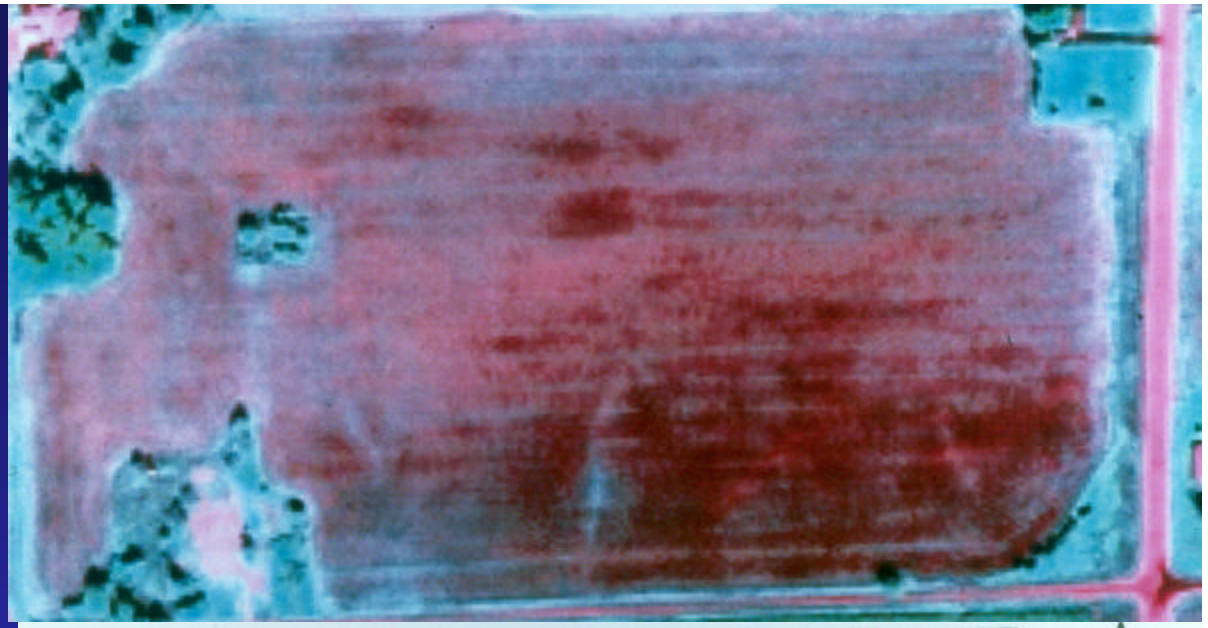


Remotely Sensed Data:

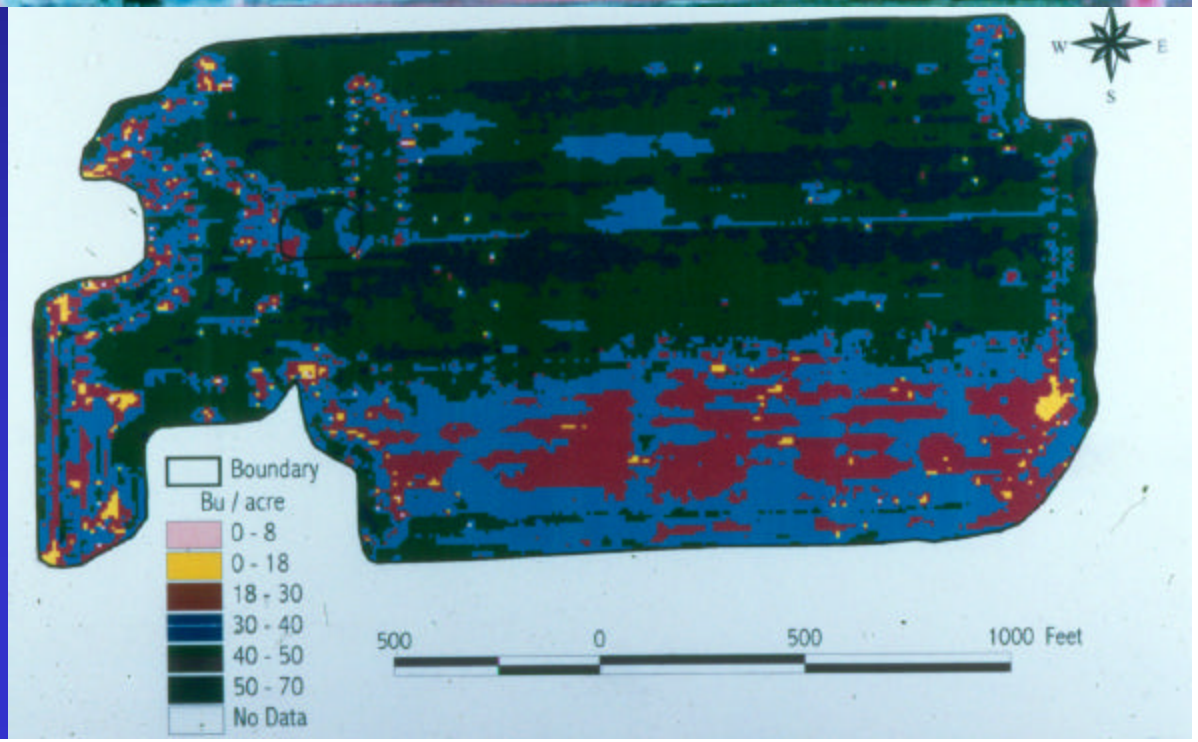
630-690(Red)

690-760(NIR)

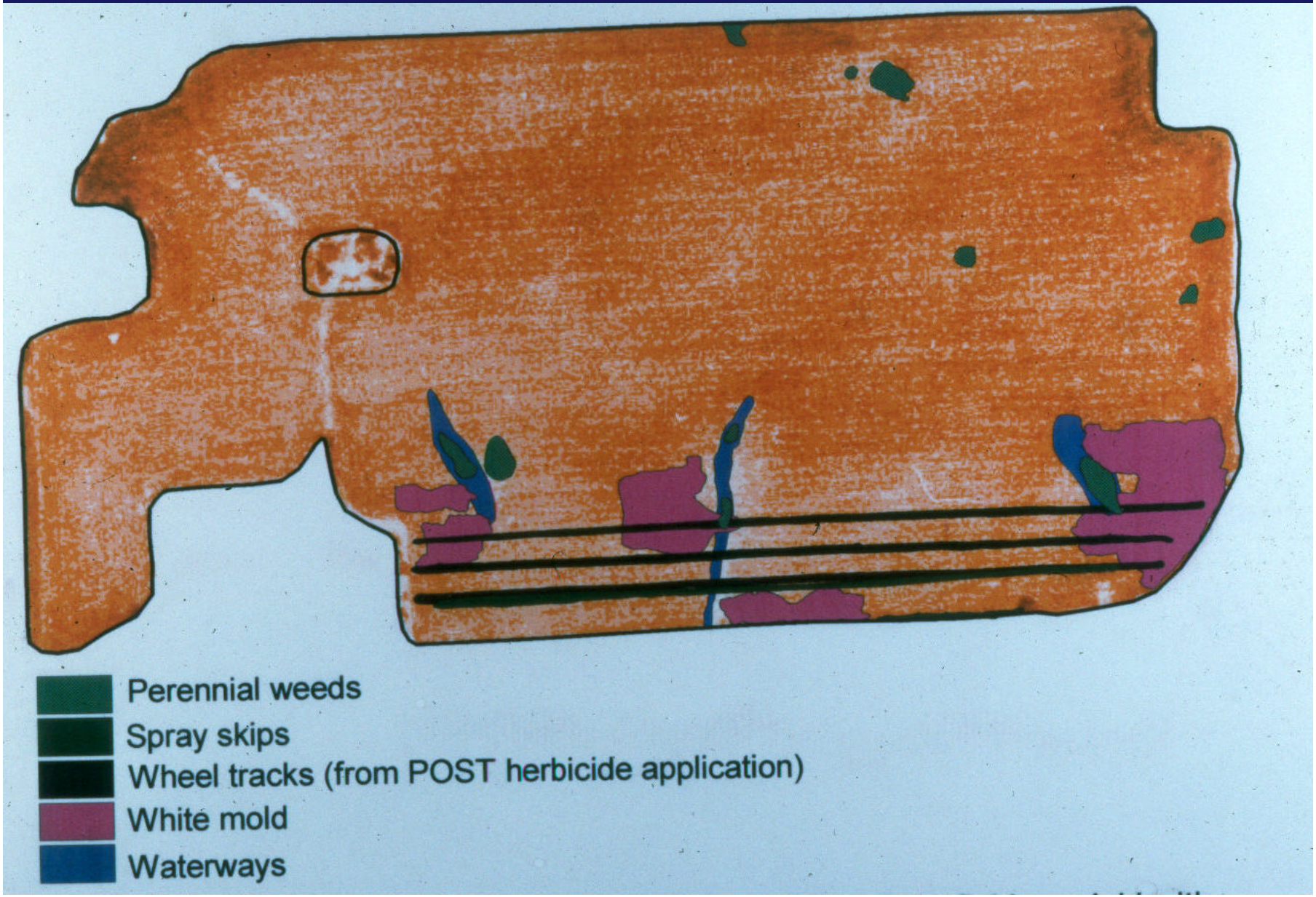
760-900(NIR)



Soybean Yield Map



# Causes of some anomalies

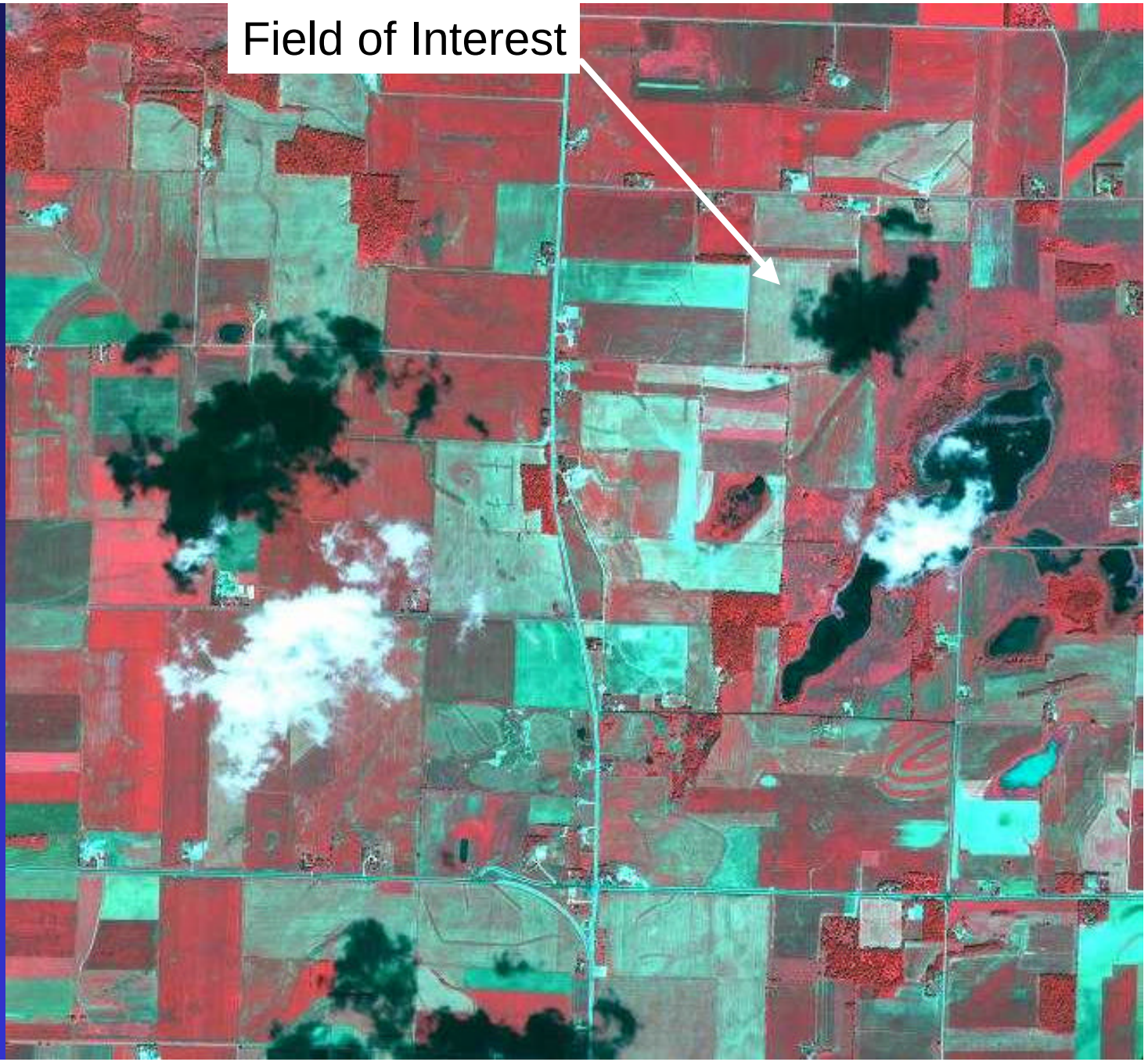


Need a cloudless sky

Satellite Image

July 10, 2001

File: Po-73601 nrg



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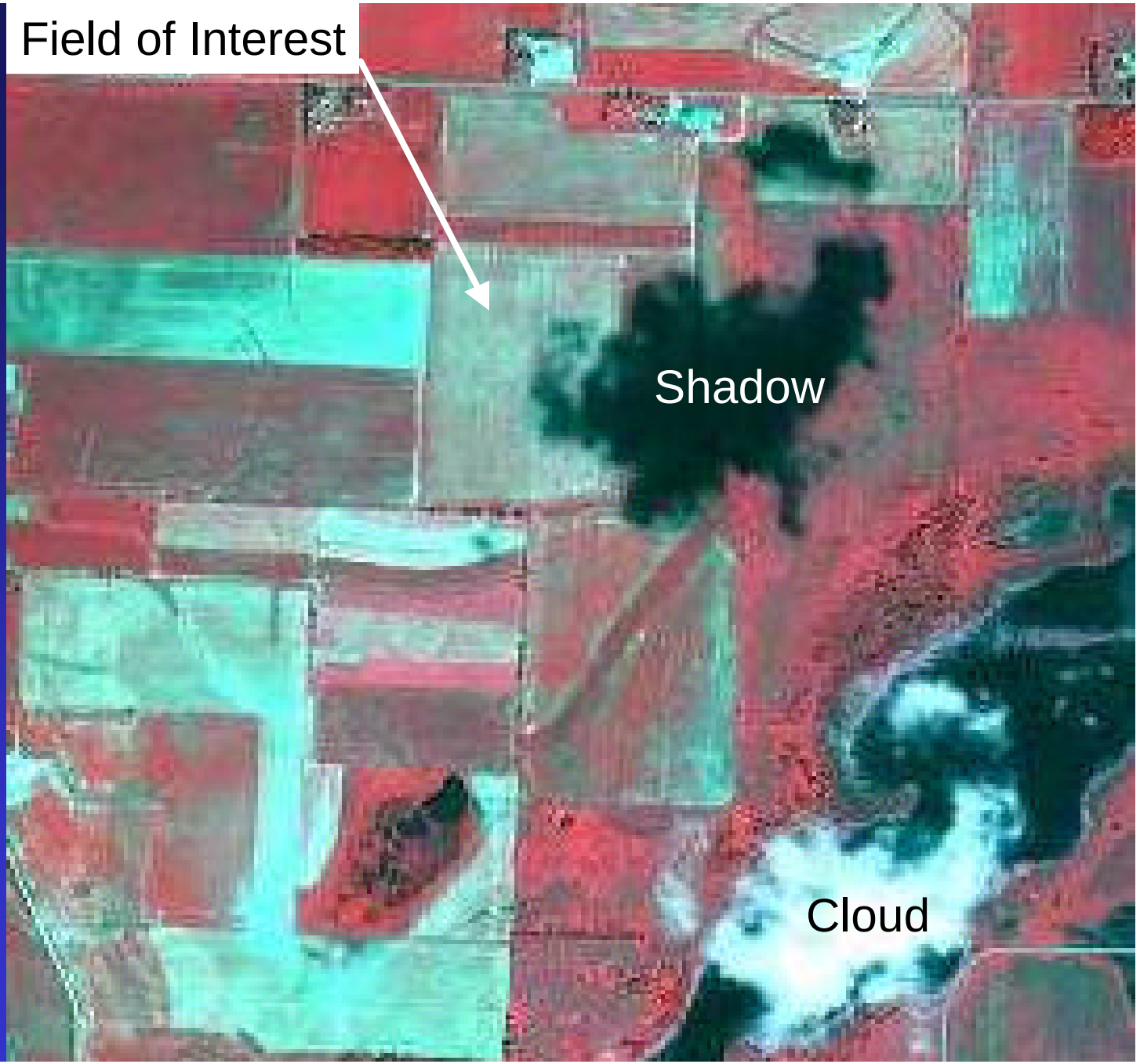
July 10, 2001



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