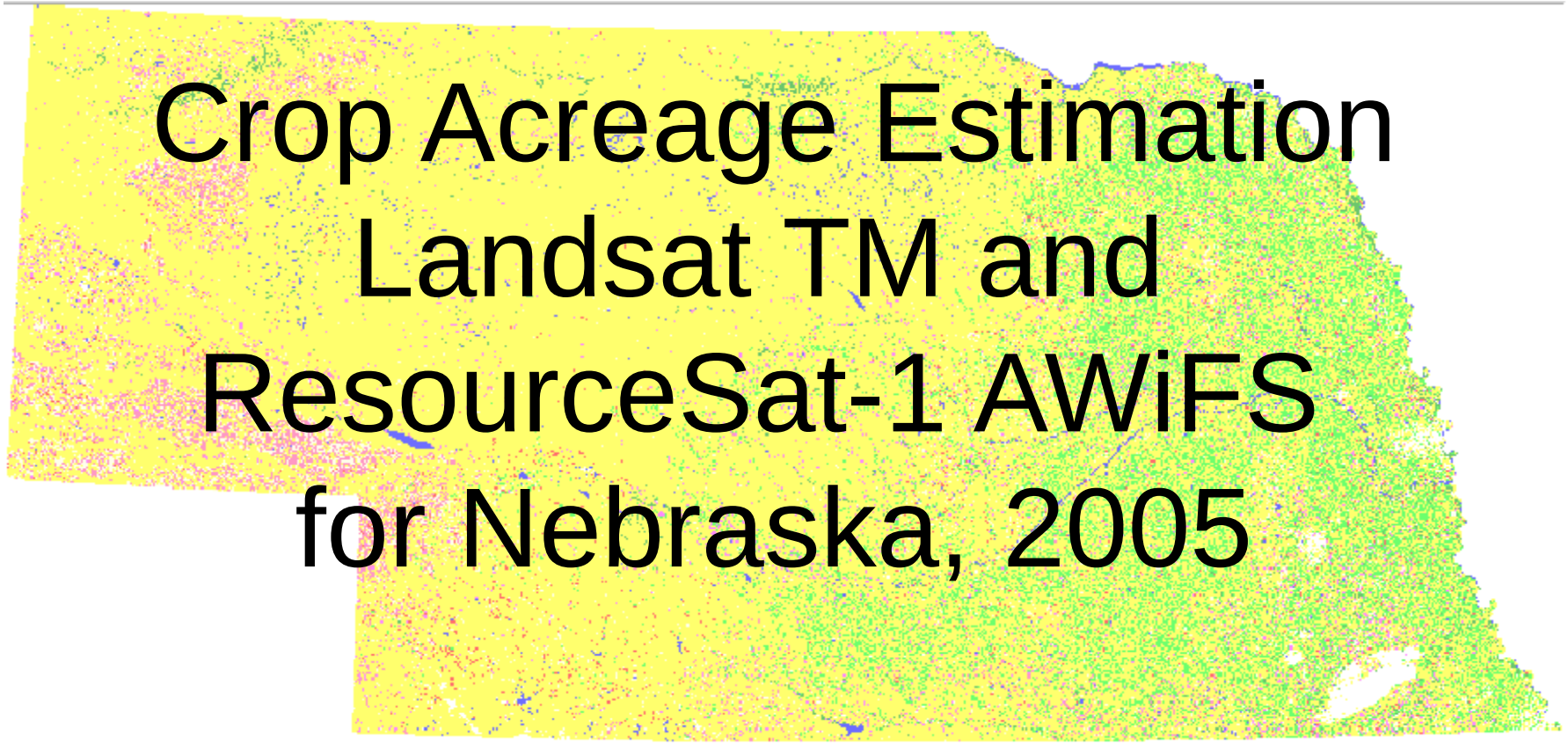
# Crop Acreage Estimation Landsat TM and ResourceSat-1 AWiFS for Nebraska, 2005



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**National Agricultural Statistics Service**
**Research and Development Division**

NASS
FACT FINDERS FOR AGRICULTURE
UNITED STATES DEPARTMENT OF AGRICULTURE

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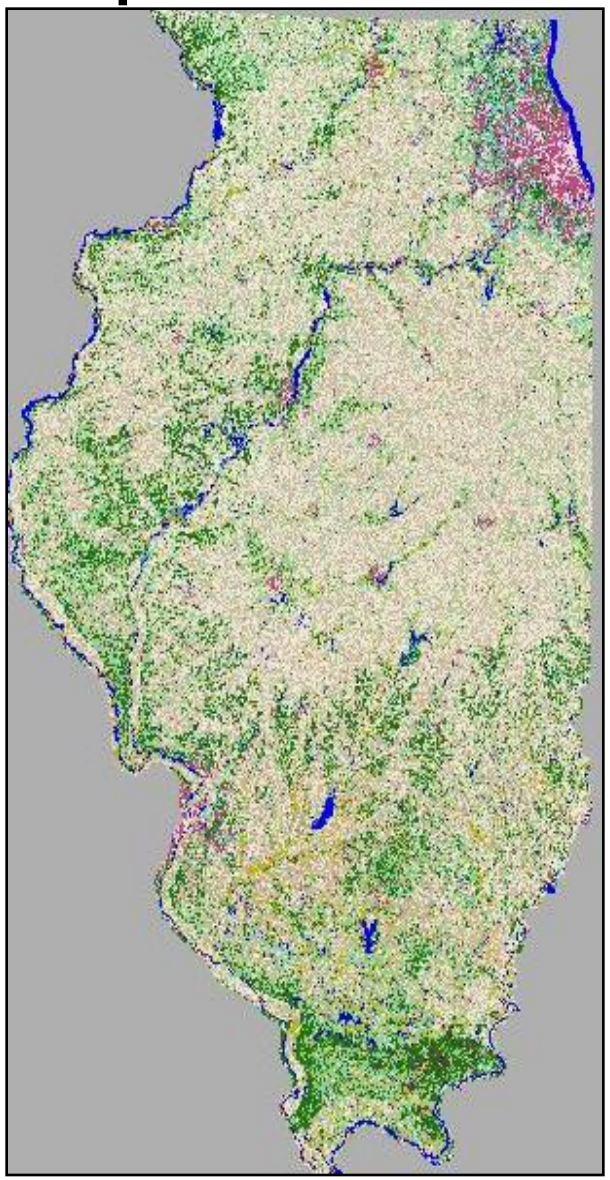
UNITED STATES DEPARTMENT OF AGRICULTURE

*"Responsible for providing statistical data on US agriculture"*

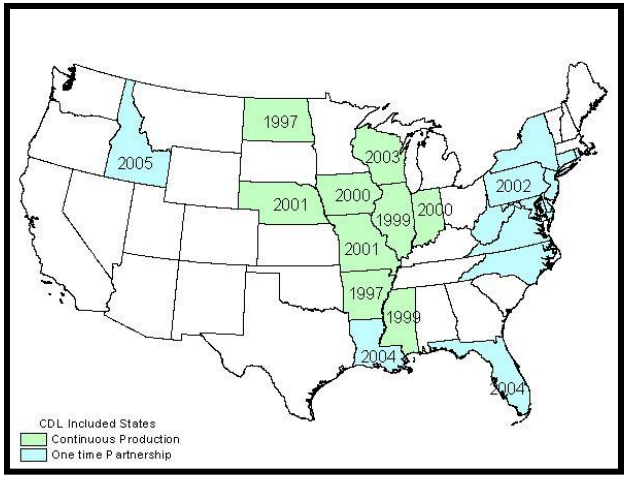
- **Produce acreage estimates with reduced error rates over the June Agricultural Survey.**
- **Create and distribute the Cropland Data Layer Product.**

# Purpose of the Cropland Data Layer

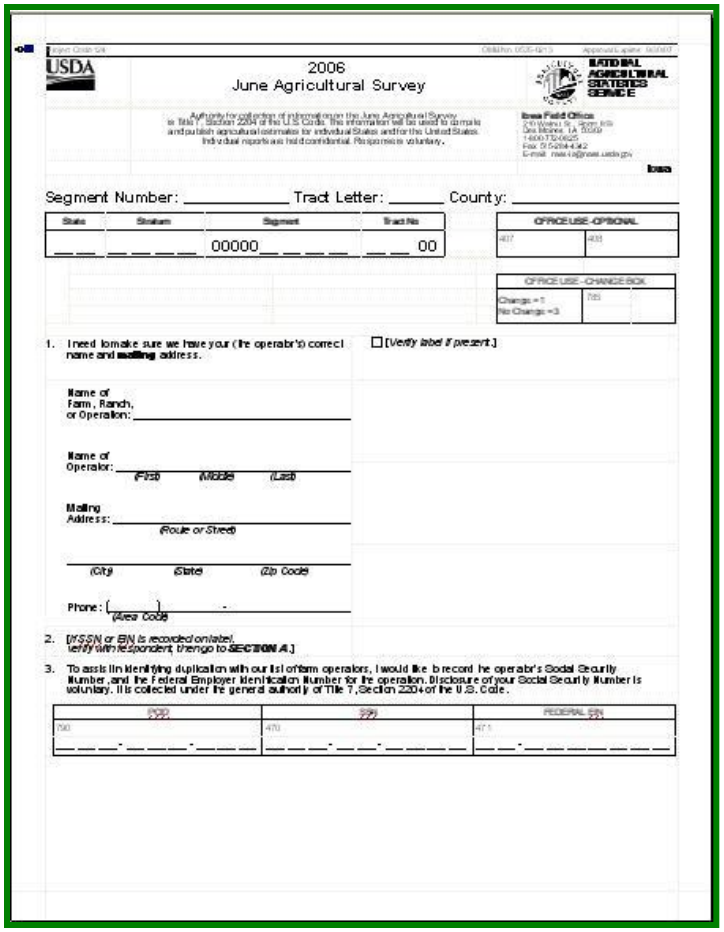


**1. Combine remote sensing imagery and NASS survey data to produce *supplemental* acreage estimates for the state's major commodities**

**2. Production of a crop-specific digital land cover data layer for distribution in industry standard GeoTiff format**



# June Agricultural Survey



2006
June Agricultural Survey

USDA

NATIONAL AGRICULTURAL STATISTICS SERVICE

Segment Number: _____ Tract Letter: _____ County: _____

| State | Stratum | Segment | Tract No |
|---|---|---|---|
| | | 00000 | 00 |

OFFICE USE -OPTIONAL

OFFICE USE - CHANGE BOX
Change = 1
No Change = 3

1. I need to make sure we have your (the operator's) correct name and mailing address. ☐ [Verify label if present.]

Name of Farm, Ranch, or Operation: _____

Name of Operator: _____ (First) (Middle) (Last)

Mailing Address: _____ (Route or Street)

_____ (City) (State) (Zip Code)

Phone: (___) ___ - ____ (Area Code)

2. [If SSN or EIN is recorded or listed, verify with respondent, then go to SECTION A.]

3. To assist in identifying duplication with our list of farm operators, I would like to record the operator's Social Security Number, and the Federal Employer Identification Number for the operation. Disclosure of your Social Security Number is voluntary. It is collected under the general authority of Title 7, Section 2204 of the U.S. Code.

| SSN | EIN | FEDERAL EIN |
|---|---|---|
| ___-___-____ | ___-___-____ | ___-_____ |

## June Agricultural Survey (JAS) – National in Scope

- **41,000 farms visited**
- **11,000 one-square mile sample area segments visited**
- **Most states contain between 150 – 400 segments**
- **Planted acreage estimate**

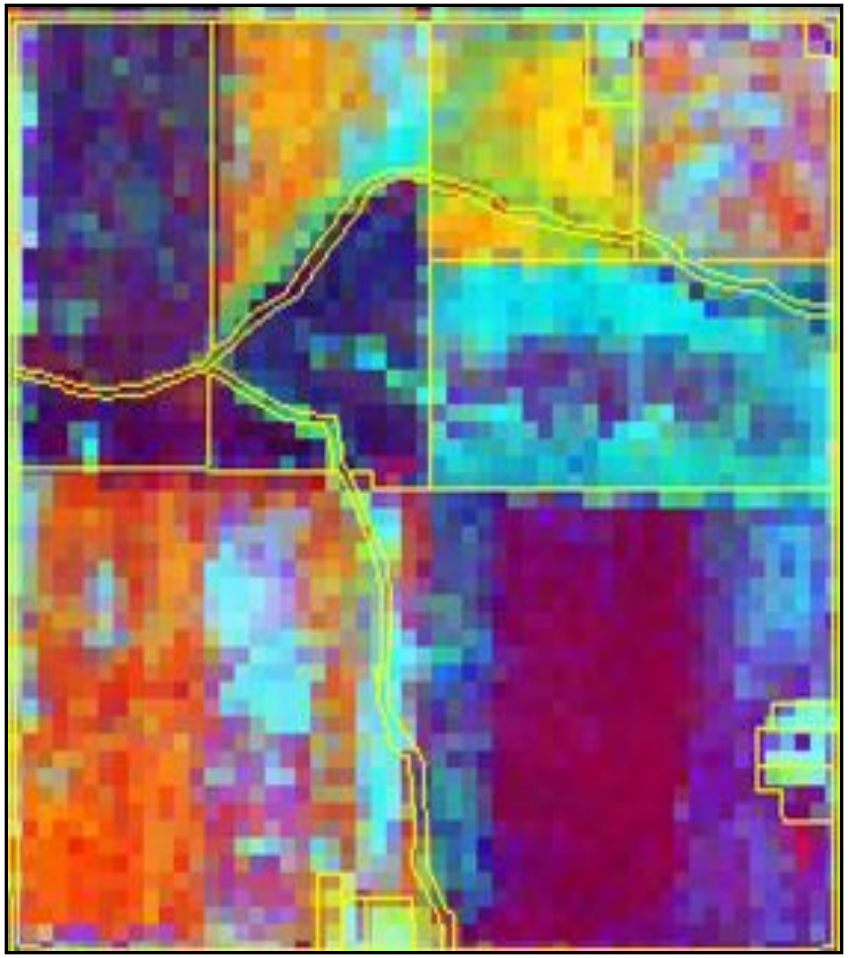
## Cropland Data Layer depends on the JAS data

- Unbiased statistical estimator of crop area
  - **State and county level estimates**

# Segments

**Enumerated**


**Digitized**



# The Landsat Data Gap

## Landsat 7 ETM+

## Landsat 5 TM

USGS
science for a changing world

News Release

November 30, 2005 Ron Beck

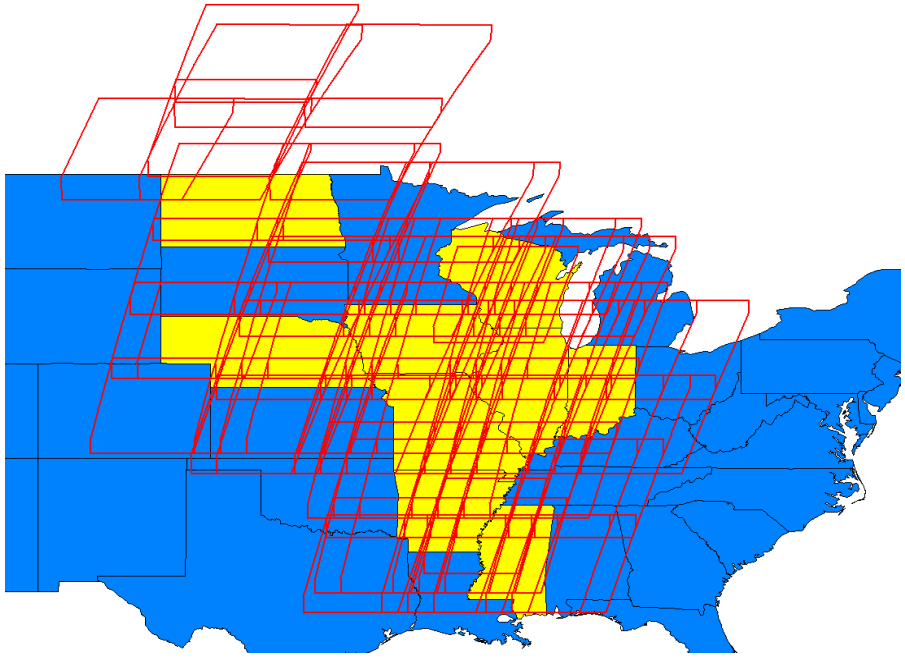
### Landsat 5 Experiencing Technical Difficulties

On November 26, 2005, the back-up solar array drive on Landsat 5 began exhibiting unusual behavior. The solar array drive maintains the proper pointing angle between the solar array and the sun. The rotation of the solar array drive became sporadic and the solar array was not able to provide the power needed to charge the batteries. Maintaining power to the batteries is critical to sustain proper operation of the spacecraft. The primary solar array drive failed under similar circumstances last January. As a result of this current situation, imaging operations will be suspended for at least the next two weeks or until attempts to solve the problem have been resolved.

**Source: USGS, Landsat Project:**
http://landsat.usgs.gov/slc_enhancements/slc_off_level1_standard.php

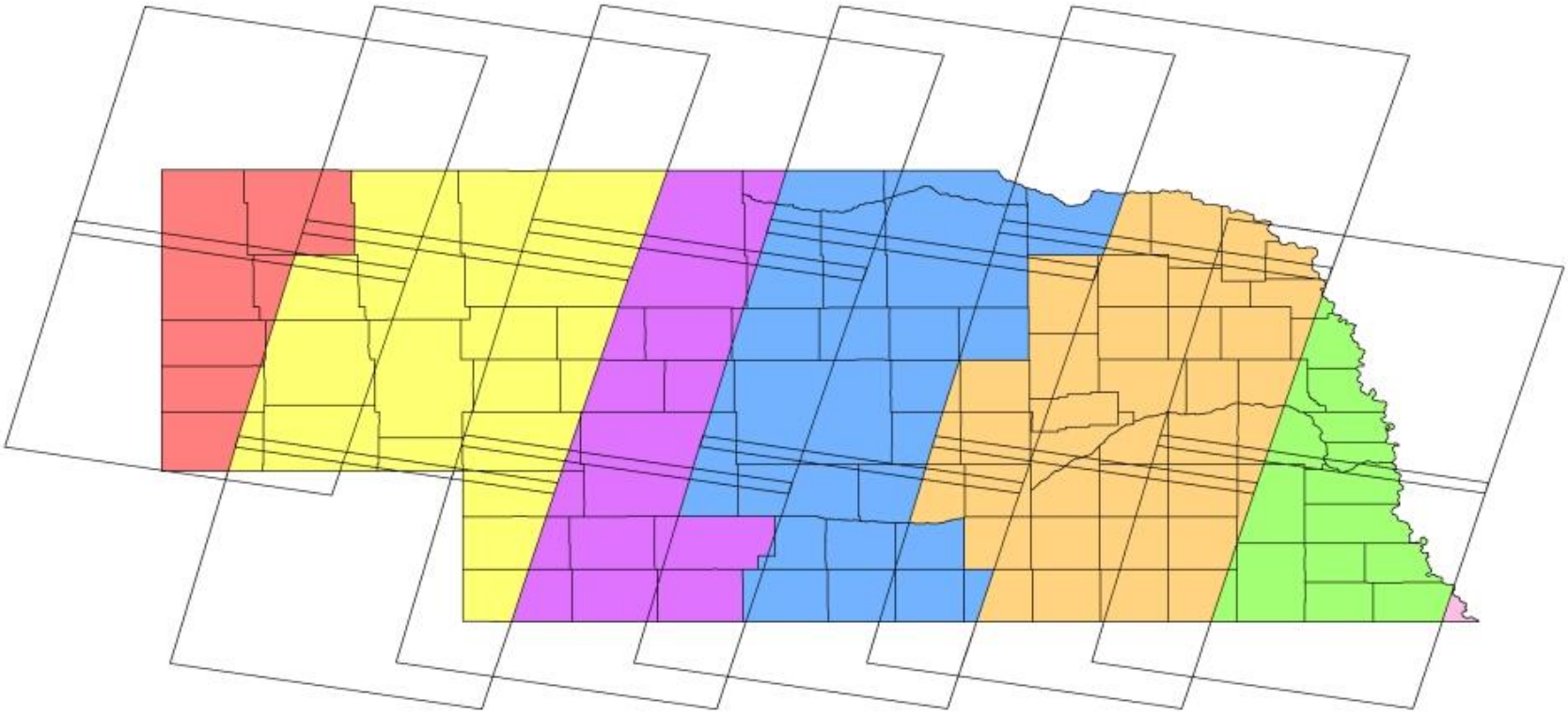
# Indian Remote Sensing Satellite:
# RESOURCESAT-1
# Advanced Wide Field Sensor (AWiFS)

- **AWiFS:** Swath: 370 km each head, 740 km combined, 56 m resolution at nadir, 70 m resolution at field edges.
- **Spectral Bands**
- **B2: 0.52-0.59 (Visible Green)**
- **B3: 0.62-0.68 (Visible Red)**
- **B4: 0.77-0.86 (Near Infrared**
- **B5: 1.55-1.70 (Middle infrared)**



# NEBRASKA - 2005 TM

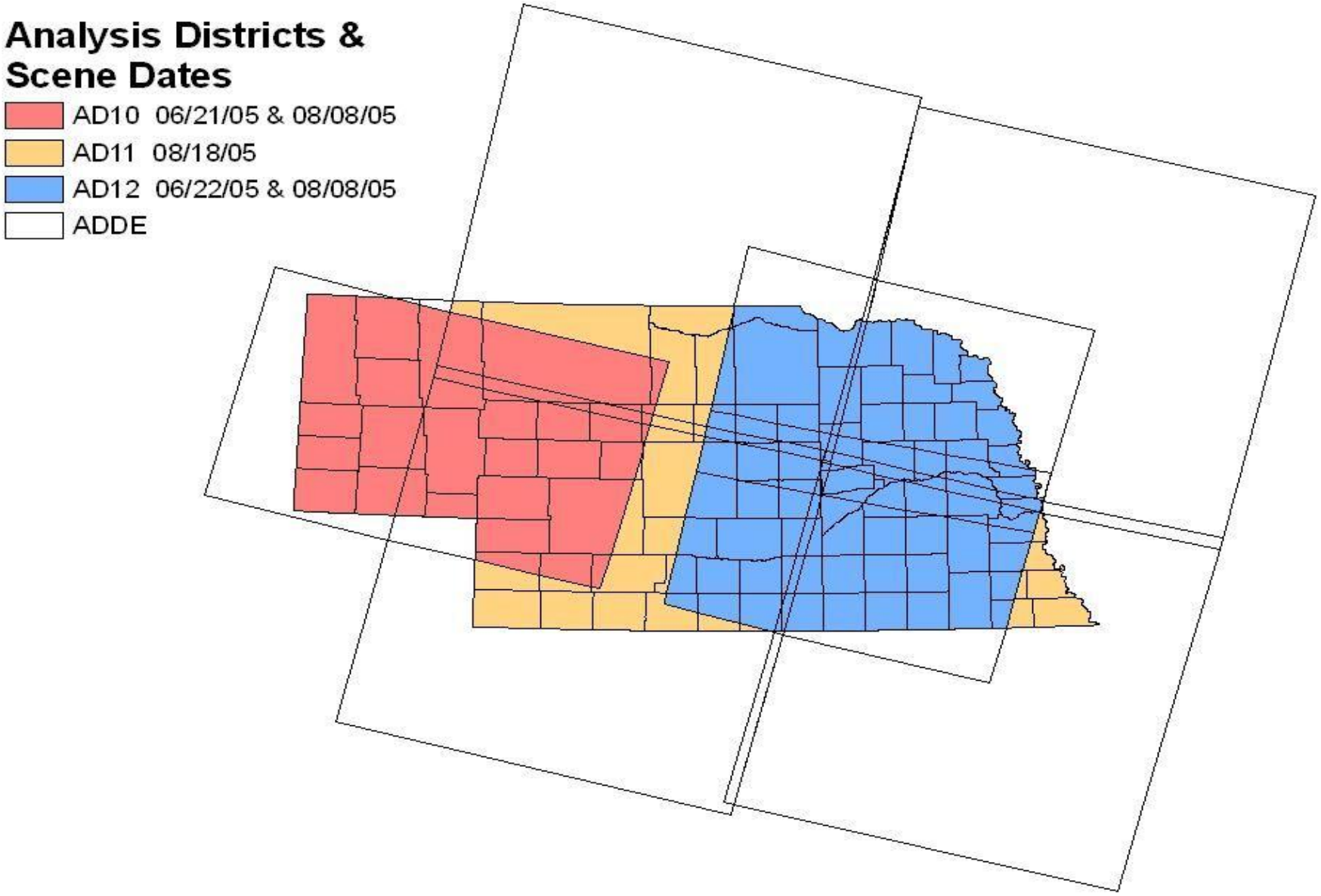
Analysis Districts and
Scene Observation Dates



**Analysis Districts, Sensor & Scene Dates**

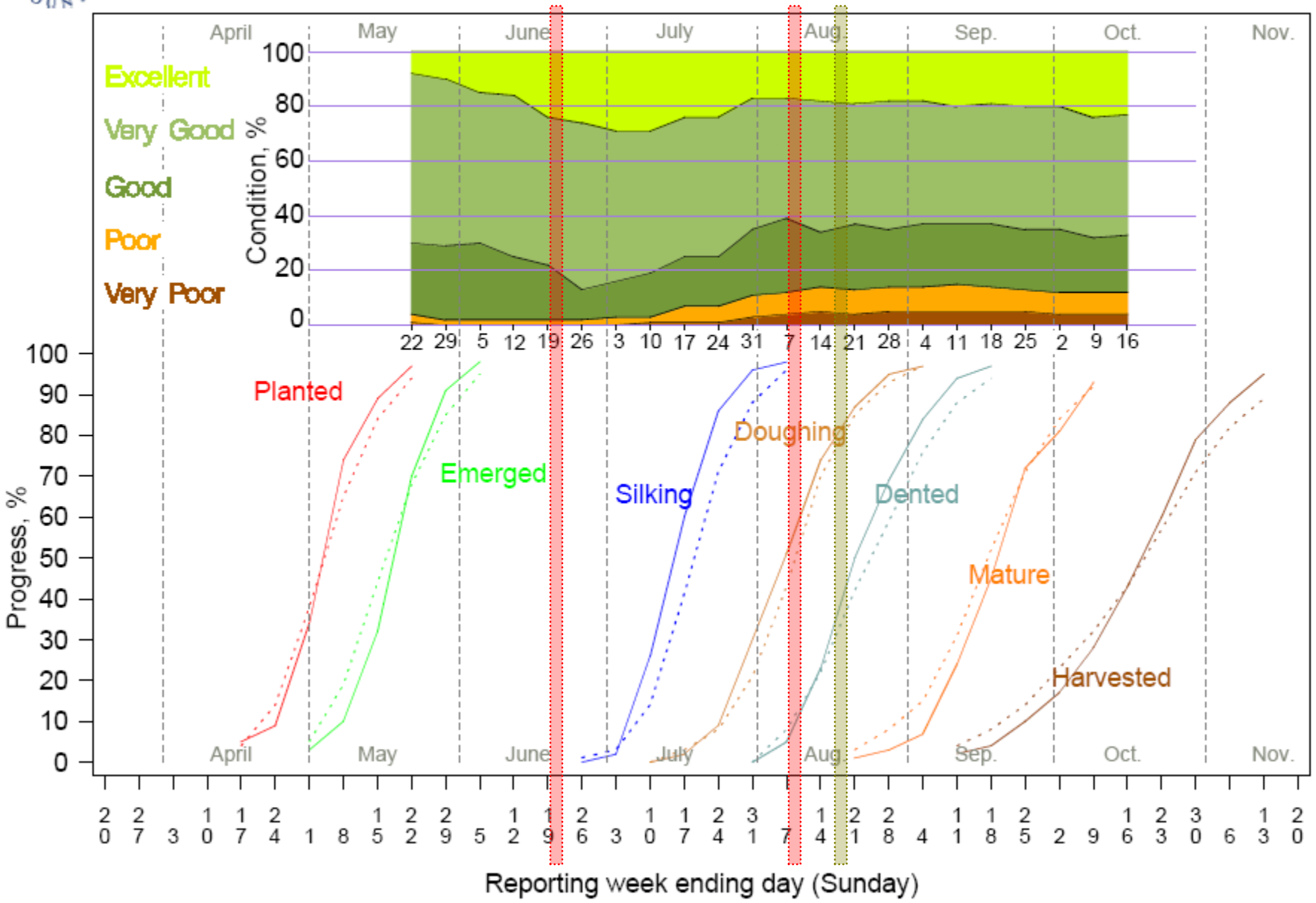
- AD01 TM 05/15/05 & 07/02/05
- AD02 TM 04/06/05 & 08/28/05
- AD03 TM 08/05/05
- AD04 TM 06/27/05 & 08/30/05
- AD05 TM 06/20/05 & 08/07/05
- AD07 TM 09/01/05
- ADIA TM 06/06/05 & 09/10/05
- ADDE

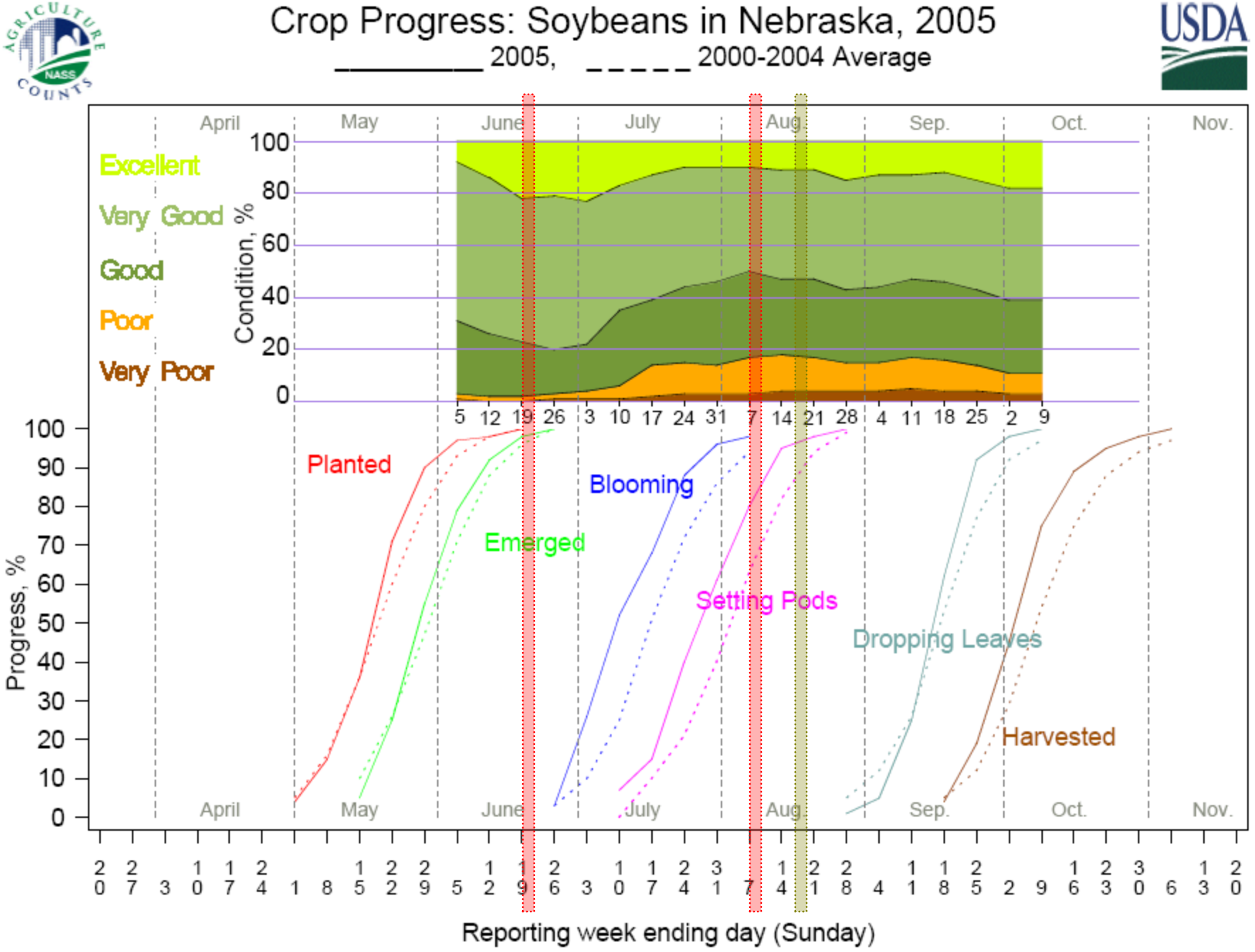
# Nebraska 2005 - Analysis Districts and AWIFS Scene Observation Dates



# Crop Progress: Corn in Nebraska, 2005

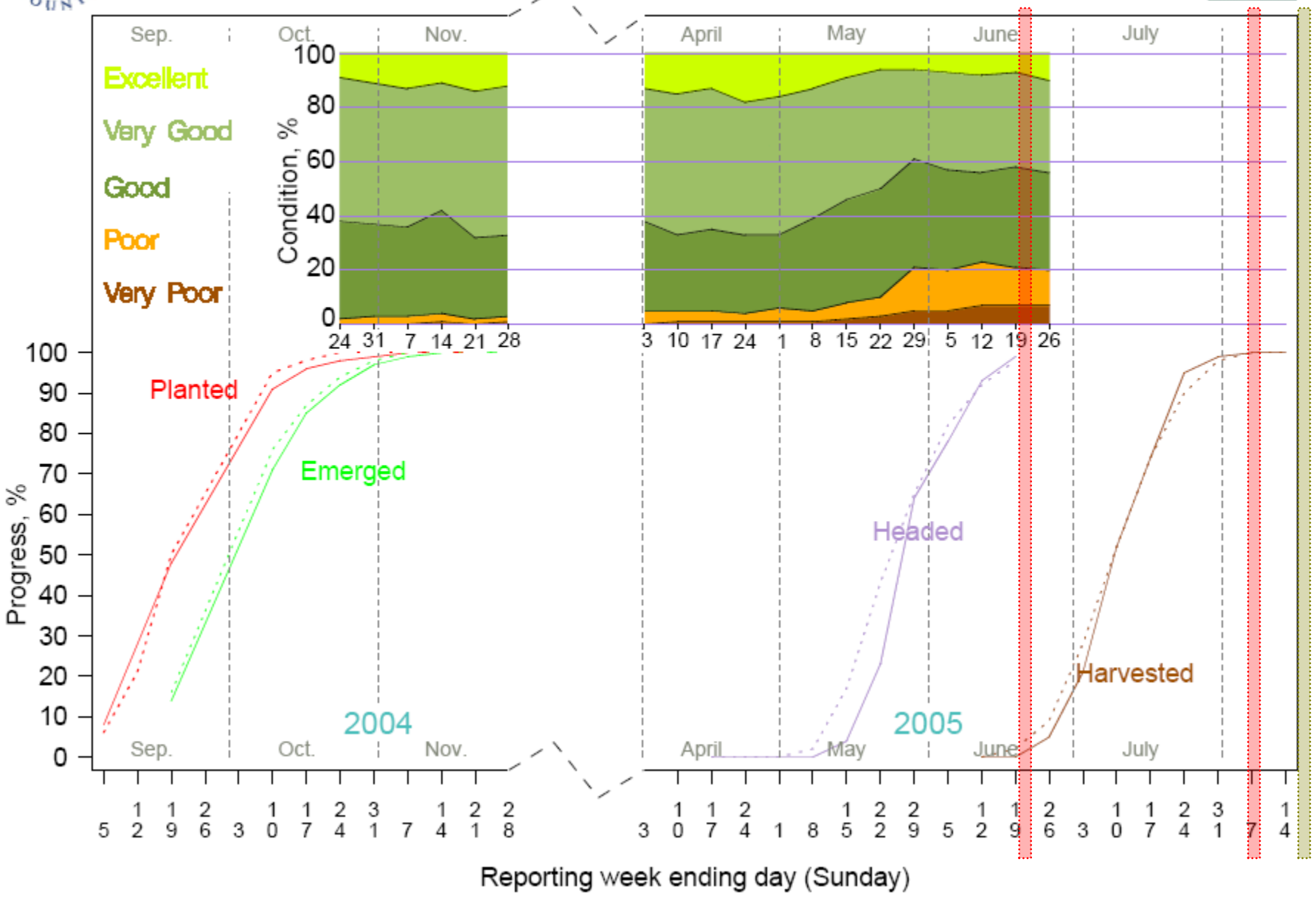
_____ 2005, _ _ _ _ _ 2000-2004 Average




Crop Progress: Soybeans in Nebraska, 2005
_____ 2005, _ _ _ _ _ 2000-2004 Average
USDA
Excellent
Very Good
Good
Poor
Very Poor
Condition, %
100
80
60
40
20
0
April
May
June
July
Aug
Sep.
Oct.
Nov.
5 12 19 26 3 10 17 24 31 7 14 21 28 4 11 18 25 2 9
Planted
Emerged
Blooming
Setting Pods
Dropping Leaves
Harvested
Progress, %
100
90
80
70
60
50
40
30
20
10
0
20 27 3 10 17 24 1 8 15 22 29 5 12 19 26 3 10 17 24 31 7 14 21 28 4 11 18 25 2 9 16 23 30 6 13 20
Reporting week ending day (Sunday)

# Crop Progress: Winter Wheat in Nebraska, 2005

_____ 2005, _ _ _ _ _ 2000-2004 Average

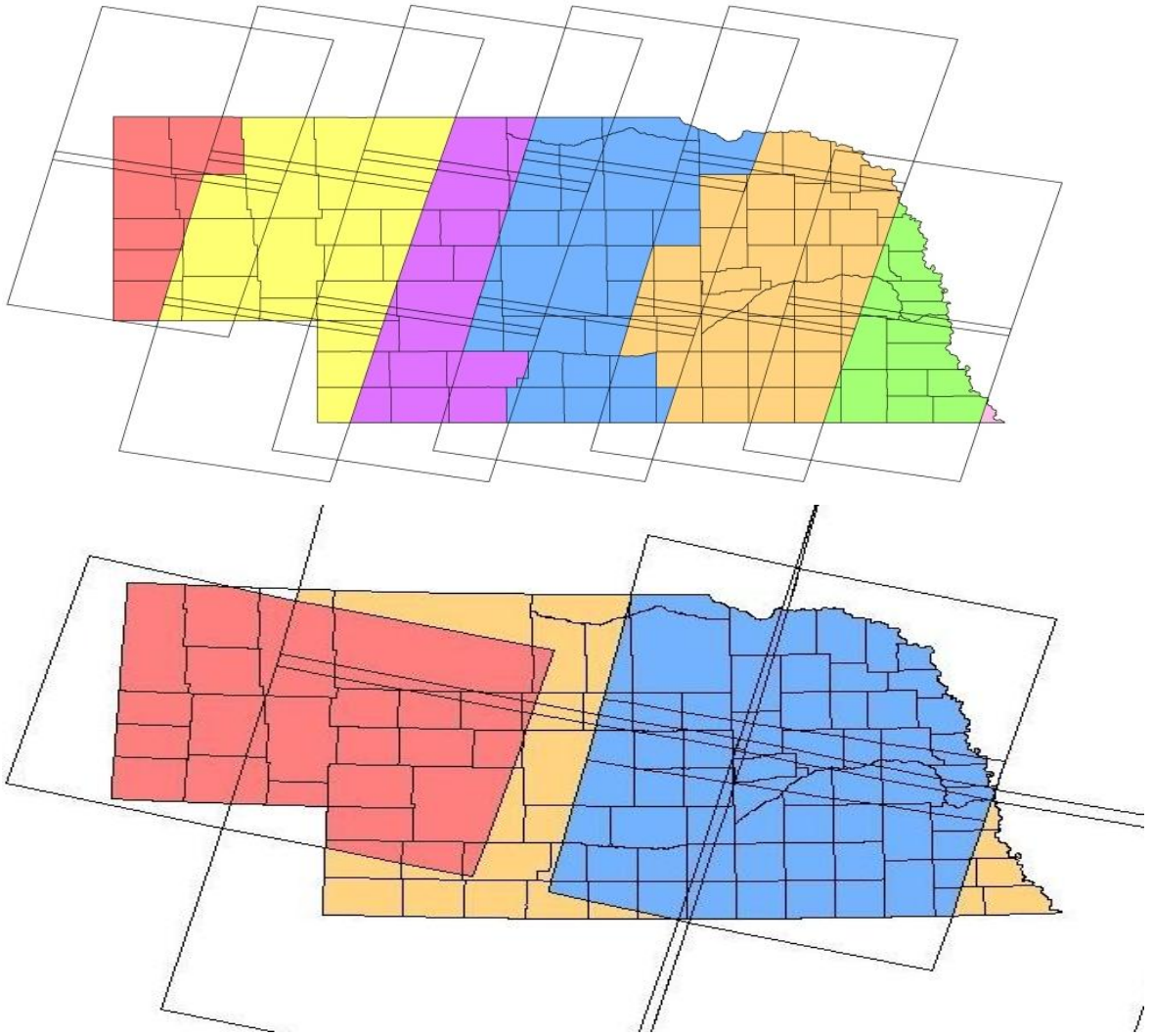


# Kappa Statistics and Pixel Counts for Nebraska 2005 Classifier Accuracy

| Analysis District | Kappa | | Training Pixels* | |
|---|---|---|---|---|
| | Corn | Soybeans | Corn | Soybeans |
| | Landsat TM | | | |
| AD01 | 97.5 | . | 2,014 | . |
| AD02 | 89.7 | 99.9 | 9,635 | 888 |
| AD03 | 75.7 | 81.4 | 18,440 | 2,814 |
| AD04 | 88.5 | 95.7 | 39,219 | 19,693 |
| AD05 | 92.3 | 90.4 | 81,409 | 50,103 |
| AD07 | 70.3 | 91.1 | 30,181 | 20,769 |
| | | | | |
| | AWiFS | | | |
| AD10 | 95.3 | 98.3 | 3,510 | 347 |
| AD11 | 83.7 | 87.7 | 36,959 | 19,703 |
| AD12 | 87.5 | 91.3 | 27,786 | 17,247 |

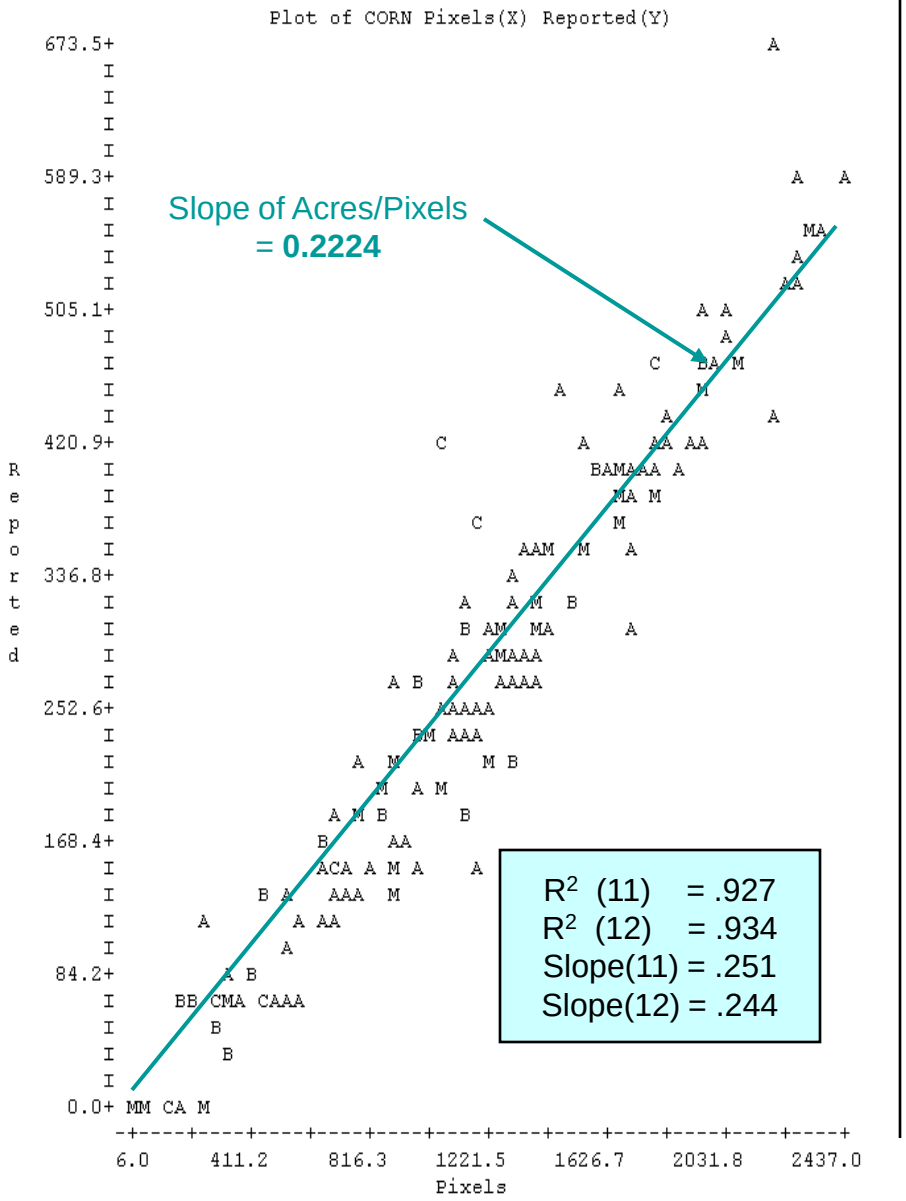
# Nebraska 2005

Analysis Districts



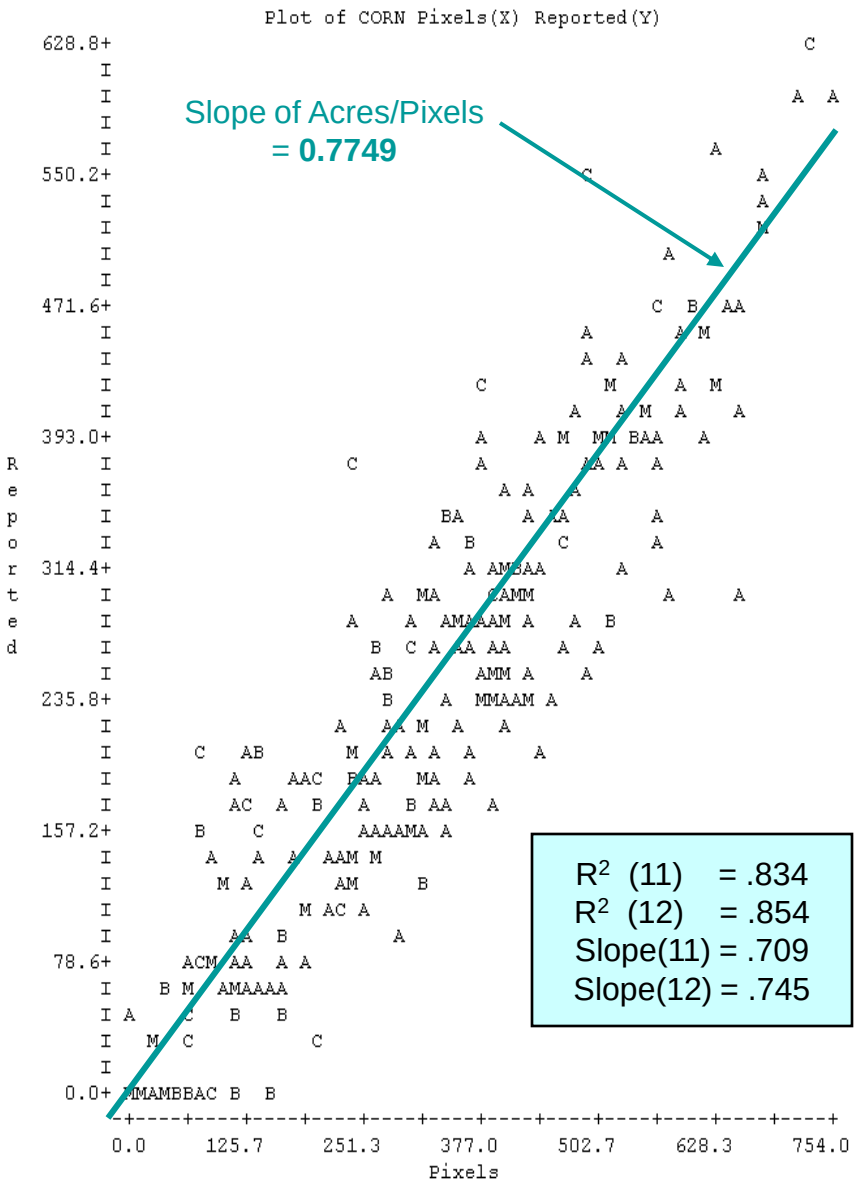
# Regression Analysis from Sample Estimation

## Landsat TM Corn

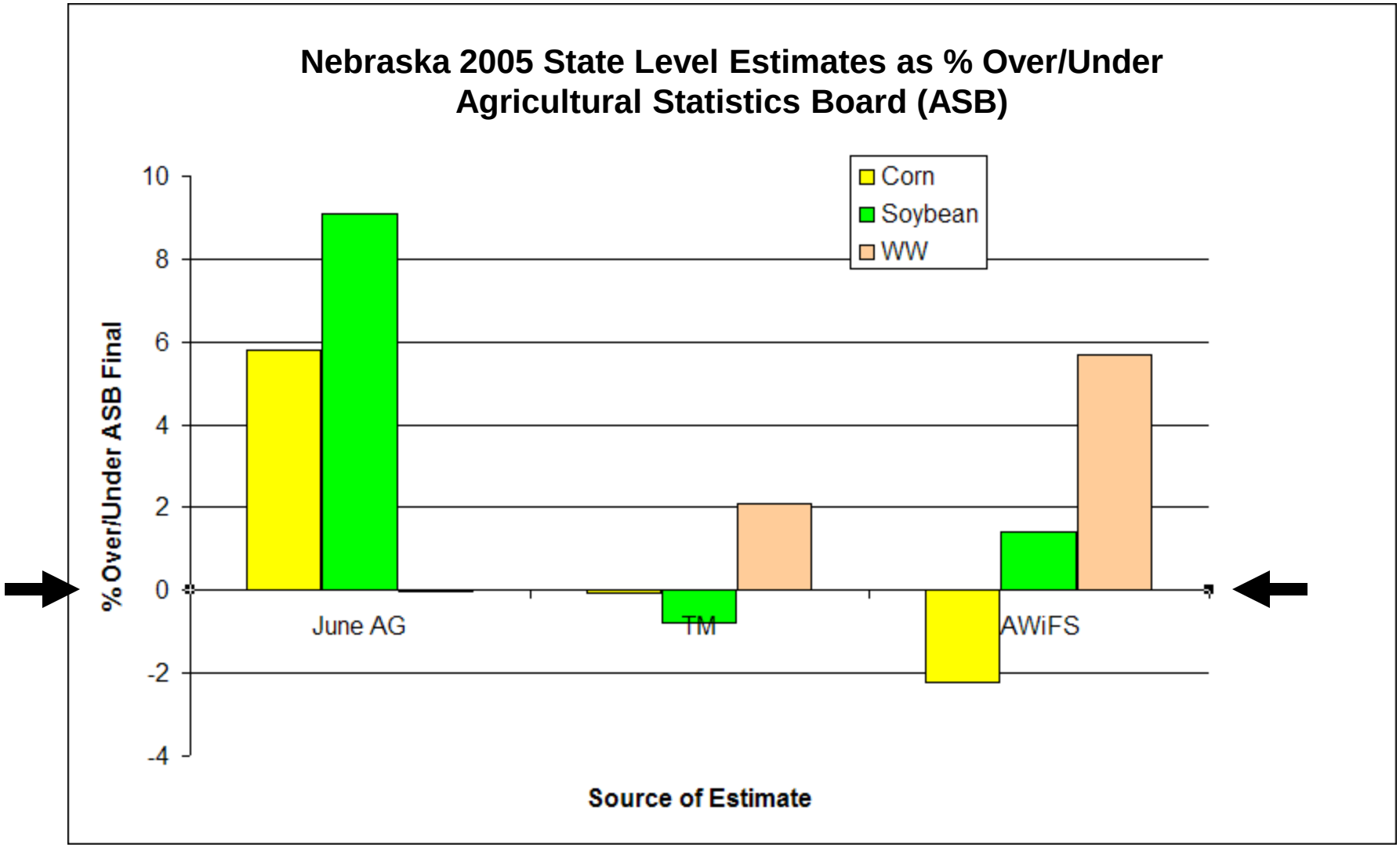



$R^2$ (11) = .927
$R^2$ (12) = .934
Slope(11) = .251
Slope(12) = .244

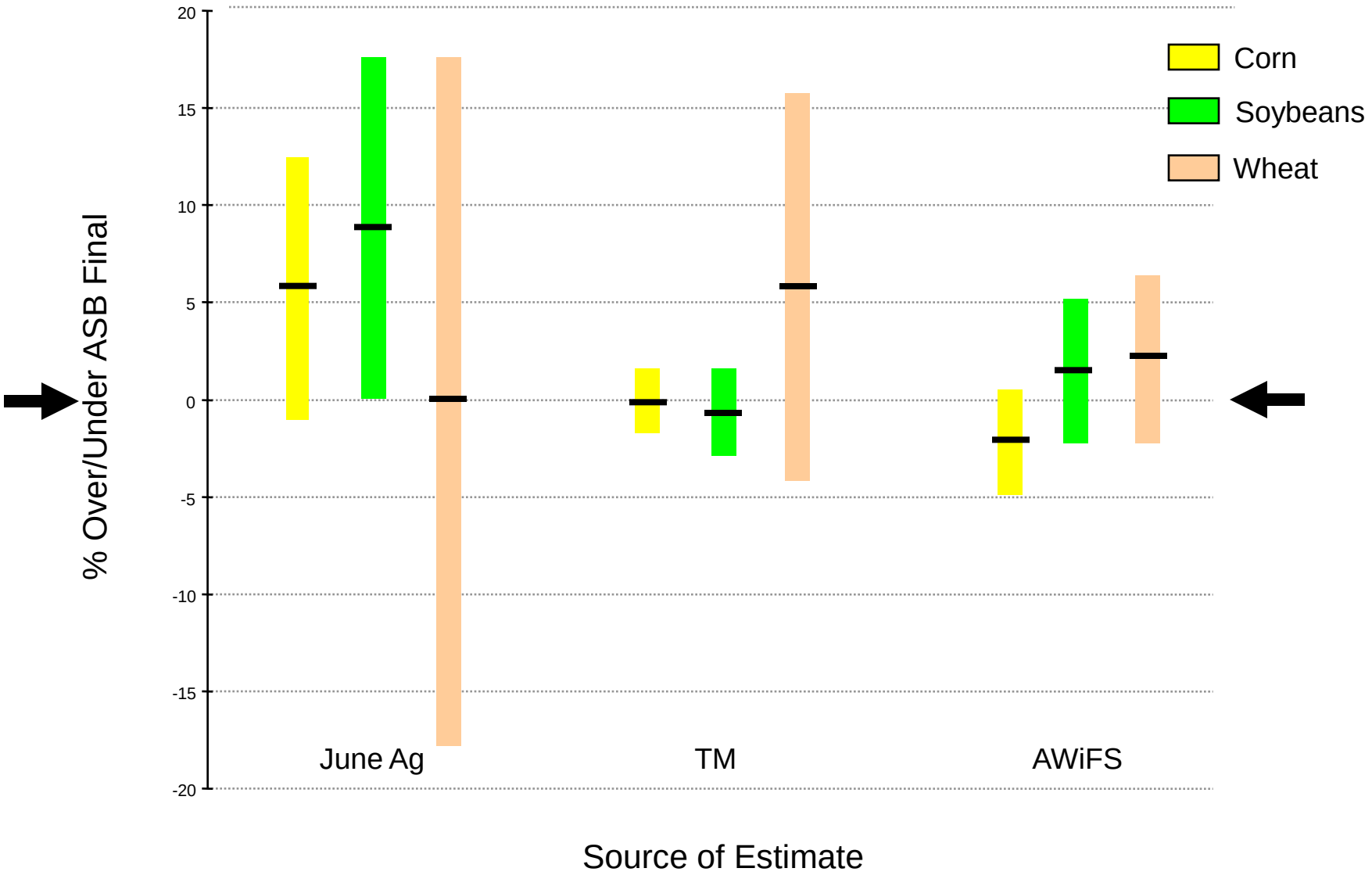
## AWiFS Corn




$R^2$ (11) = .834
$R^2$ (12) = .854
Slope(11) = .709
Slope(12) = .745


Nebraska 2005 State Level Estimates as % Over/Under
Agricultural Statistics Board (ASB)
Corn
Soybean
WW
10
8
6
4
2
0
-2
-4
% Over/Under ASB Final
June AG
TM
AWiFS
Source of Estimate

# Nebraska 2005 State Level Estimates +/- 2% CVs (Coefficient of Variation)



# Summary

Overall accuracy as measured by the Kappa statistic is not as high for AWiFS as for TM.

While state level CV are larger for AWiFS than for TM, they are still useful for the NASS estimation program.

AWiFS will provide more frequent cloud-free coverage providing more optimal dates for any crop.

## QuickStats and Crop Progess charts:

http://www.nass.usda.gov/research/CropProgress/cpindex.htm

## Cropland Data Layer digital product:

http://datagateway.nrcs.usda.gov/GatewayHome.html