

# Remote Sensing of Agriculture

## NASS' Cropland Data Layer Program

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USDA/NASS



# NASS Overview

## Provider of timely, accurate, and useful statistics in service to U.S. agriculture

**NASS - Data and Statistics - Microsoft Internet Explorer**

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Address [http://www.nass.usda.gov/Data\\_and\\_Statistics/index.asp](http://www.nass.usda.gov/Data_and_Statistics/index.asp)

**USDA** United States Department of Agriculture  
**National Agricultural Statistics Service**

The 2002 Census of Agriculture is the most comprehensive source of statistics portraying our nation's agriculture

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- Crops and Plants
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- Environmental
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- Statistics by State

Select a State

**Data and Statistics**

**Quick Stats** (Agricultural Statistics Data Base)

NASS publishes U.S., state, and county level agricultural statistics for many commodities and data series. Quick Stats offers the ability to query by commodity, state(s) and year(s), providing the most up-to-date statistics including all revisions. The query dataset can be downloaded for easy use in your database or spreadsheet.

Query our Quick Stats Data Base

**Additional Crops County Resources**

Maps of crops county estimates for acreage and yield are available from NASS as both CSV data files and maps.

County data from Quick Stats data is also available in pre-extracted data sets by year and by crop.

**Census of Agriculture**

To query Census of Agriculture data, choose from the Census years below. To view the Census publications, click here:

Data Queries for 2002, select below:

Select » Census Query

Data Queries for 1997, 1992, 1987

**Interactive Data**

NASS provides a variety of tools for interacting with our Census datasets.

**Interactive Statistical Maps**

Interactive Census Maps for 2002 Census Highlights

**Table Lens**

Table Lens Application for 1997 Census Data

Last modified: 12/30/05

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**2001 Wildlife Damage Survey**

**7.7 Percent of Crop Value Lost to Deer and Geese**

Maryland farmers lost \$17.2 million of corn, soybeans and wheat to deer or geese during 2001, translates to Maryland farmers losing 7.7 percent of the crop value to deer and geese. Soybean acres for the greatest economic loss, totaling \$9.1 million, 11 percent. Corn losses were \$6.6 million, 5.8 percent and wheat \$1.5 million, 5.6 percent. Deer damage resulted in losses of \$13.6 million, 6.1 percent, while geese losses were \$3.6 million, 1.6 percent.

Production losses totaled 6.0 million bushels. Corn losses were 3.2 million bushels, soybean losses are 2.2 million bushels and wheat accounted for 0.6 million bushels. Production losses to deer were 4.7 million bushels and geese 1.3 million bushels.

In terms of yield, losses to deer were most severe in Central and Western Maryland, while geese damage greater on the Eastern Shore. Corn yield losses of 9.6 bushels per acre and 7.4 bushels per acre were reported in Central and Western Maryland, respectively. The Lower Eastern Shore reported the highest soybean loss of 6.1 bushels per acre.

Sixty-two percent of farms reported deer or geese damage to one or more crop. Damage was reported on percent of farms raising corn, 58 percent of farms growing soybeans and 27 percent of farms with wheat.

**Maryland 2001 Crop Loss from Deer**

Region	Crop	Acres Harvested	Harvested Yield (bushels)	Average Yield Loss (bushels)	Production Loss (bushels)	Economic Loss (\$)
Western Maryland	Corn	5,200	124,4	7.4	40,700	83
	Soybeans	304	36,7	2.5	460	1
	Wheat	200	45,2	3.3	660	1
Central Maryland	Corn	124,200	2,824	9.6	1,201,200	2,493
	Soybeans	92,200	34,0	3.6	360,760	1,475
	Wheat	38,200	63,3	3.3	126,390	316
Southern Maryland	Corn	25,800	112,2	4.9	146,200	299
	Soybeans	43,200	38,0	3.0	142,560	584
	Wheat	13,200	57,0	0.9	14,400	16
Upper Shore	Corn	137,800	159,2	5.1	800,700	1,641
	Soybeans	13,300	18,8	1.4	18,400	73

**USDA**

**NEWS RELEASE**

**NATIONAL AGRICULTURAL STATISTICS SERVICE**  
United States Department of Agriculture • Washington, DC 20250  
Ag Statistics Hotline: (800) 727-9540 • [www.nass.usda.gov](http://www.nass.usda.gov)

Contact: Ellen Dougherty, (202) 690-8122  
Jeff Gender, (202) 720-2127

**USDA FORECAST**

Washington, Aug. 10, 2007

history in 2007, according to of Agriculture's National Ag

13.1 billion bushels, 10.6 per

Based on conditions: per acre, up 3.7 bushels from behind the 160.4 bushels per million acres of corn for grain

Yield forecasts are for Delta. Meanwhile, hot, dry and eastern Corn Belt, Ohio

**WISCONSIN AGRICULTURAL STATISTICS SERVICE**  
P.O. Box 8034 Madison, WI 53708-8034  
In cooperation with WI Department of Agriculture, Trade and Consumer Protection

**2002 Dairy Producer Opinion Survey**

November 2002

**Wisconsin Milk Production To Recover**

Milk production is expected to increase in Wisconsin during the next five years according to a survey conducted by the Wisconsin Agriculture Statistics Service. This statewide survey of producers asked for their plans with the assumption that milk prices for the next five years will be at the same level as the past five years. The survey was conducted during May and June 2002.

Based on the survey, 60 percent of producers expect to keep the same herd size, 20 percent plan to increase herd size, and 20 percent intend to discontinue milking by 2007. Actual results will depend on future milk prices, input prices, financing availability, crop yields, and other factors.

The number of herds projected for 2007 shows that the diversity of small to large herds will continue. The most prevalent herd size will remain at 50 to 99 cows.

**All Milk Price, Wisconsin**  
Annual Average, 1985 - 2002

**Wisconsin Dairy Herds by Herd Size**

Milk cow herd size	May 2002 herds	May 2007 herds (projected) %	Change 2007/2002
1 - 29	2,800	1,440	-45
30 - 49	4,700	3,440	-27
50 - 99	7,400	5,600	-24
100 - 199	1,900	2,080	+9
200 - 499	700	600	-29
500+	200	440	+120
Total	17,500	19,900	+20

17The May 2007 projection is based on farmers' opinions May-June 2002, with the assumption that milk prices for the next five years will be at the same level as the past five years.

**Wisconsin Dairy Farmer Plans for May 2007 1/ by Herd Size**

Milk cow herd size	Herds	Keep same herd size	Increase herd size	Discontinue milking
1 - 29	2,800	47	17	38
30 - 49	4,700	71	9	20
50 - 99	7,400	65	19	18
100 - 199	1,900	53	37	10
200 - 499	700	33	59	8
500+	200	22	78	0
Total	17,500	62	29	20

1The May 2007 projection is based on farmers' opinions May-June 2002, with the assumption that milk prices for the next five years will be at the same level as the past five years.

**Percent of Herds by Size Group 2007 Projection**

**United States** | All data items are from Chapter 2 - Table 1. Area Summary Highlights: 2002  
Selected crops harvested - Land in orchards (acres)

State: United States - County Level

Data Item: Selected crops harvested - Land in orchards (acres)

United States Total: 5,330,439

State:

State Total:

County Total:

Download data as CSV | XML | PDF

Help Print Return to

**Legend**

Scale: National

Zero or Data Withheld

<= 20,000

20,001 to 40,000

40,001 to 60,000

60,001 to 80,000

80,001 to 100,000

100,001 >=

Color: Green

Source: USDA-NASS 2002 Census of Agriculture  
© USDA-NASS 2005-2006

Navigate: Mouse-over a specific state/county to view the state/county level data. Right click to zoom (option-click for MAC users). Hold the Alt key and click+drag to pan. For additional assistance with this application, click here to view the support page.

USDA NASS

Internet



# Research and Development Division

## Geospatial Information Branch

### Spatial Analysis Research

NASS - Research and Science - Windows Internet Explorer

http://www.nass.usda.gov/Research\_and\_Science/index.asp

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NASS - Research and Science

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National Agricultural Statistics Service

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### Research and Science

**Spatial Data**

Vegetation Condition Images

**Cropland Data Layer**

**Image Gallery** (2003) available for these states:  
Arkansas, Illinois, Indiana, Iowa, N. Dakota,  
Mississippi, Missouri, Nebraska, Wisconsin)

**Land Use Strata for Selected States**

**Census of Agriculture**

**2002 Census Map Gallery**

2002 Maps: Gallery | Star Tree | List

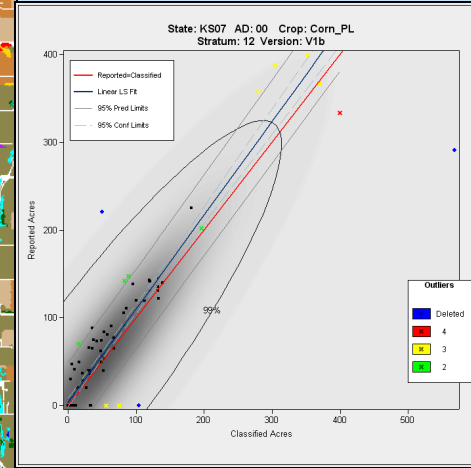
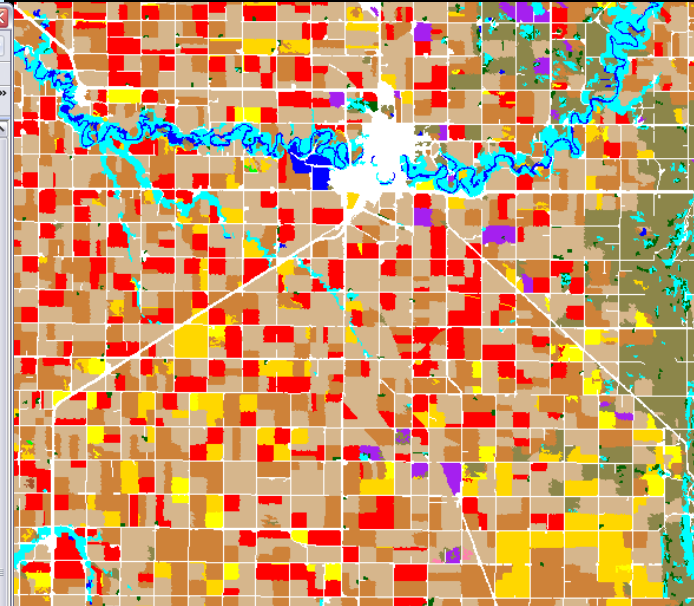
Interact with Data (1997)

**Also See**

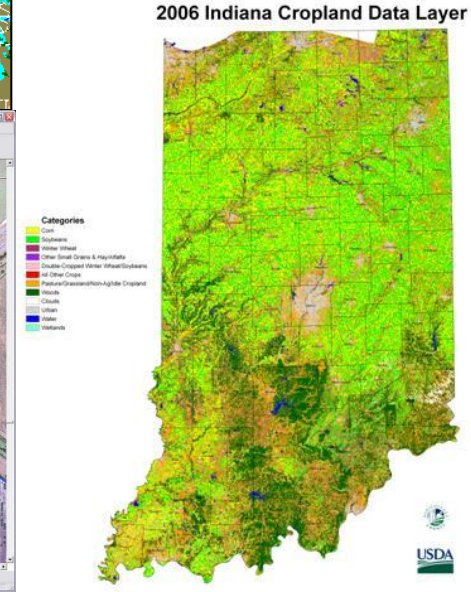
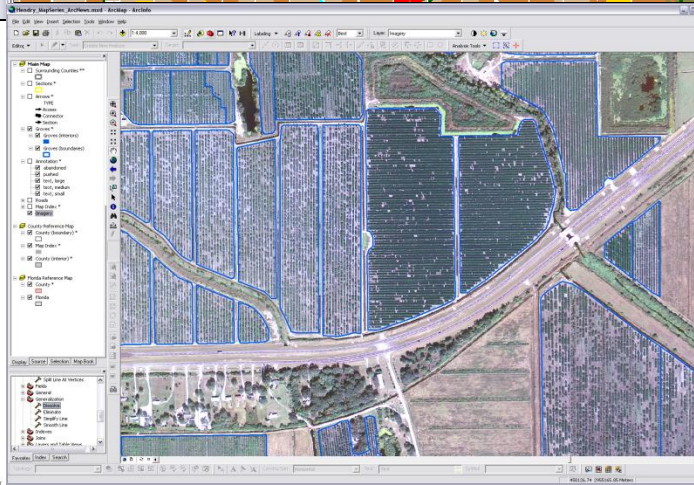
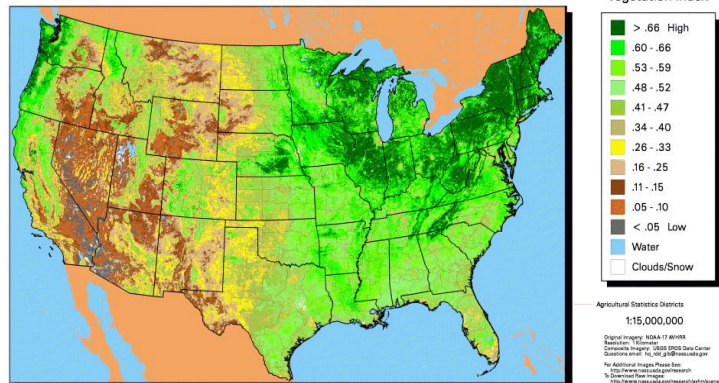
- Research Fellow and Associate Program
- Seasonal Summary of Crop Progress and Condition
- Remotely Sensed Data
- Crop Acreage
- Crop Yield
- Future Vision

**Media Help**

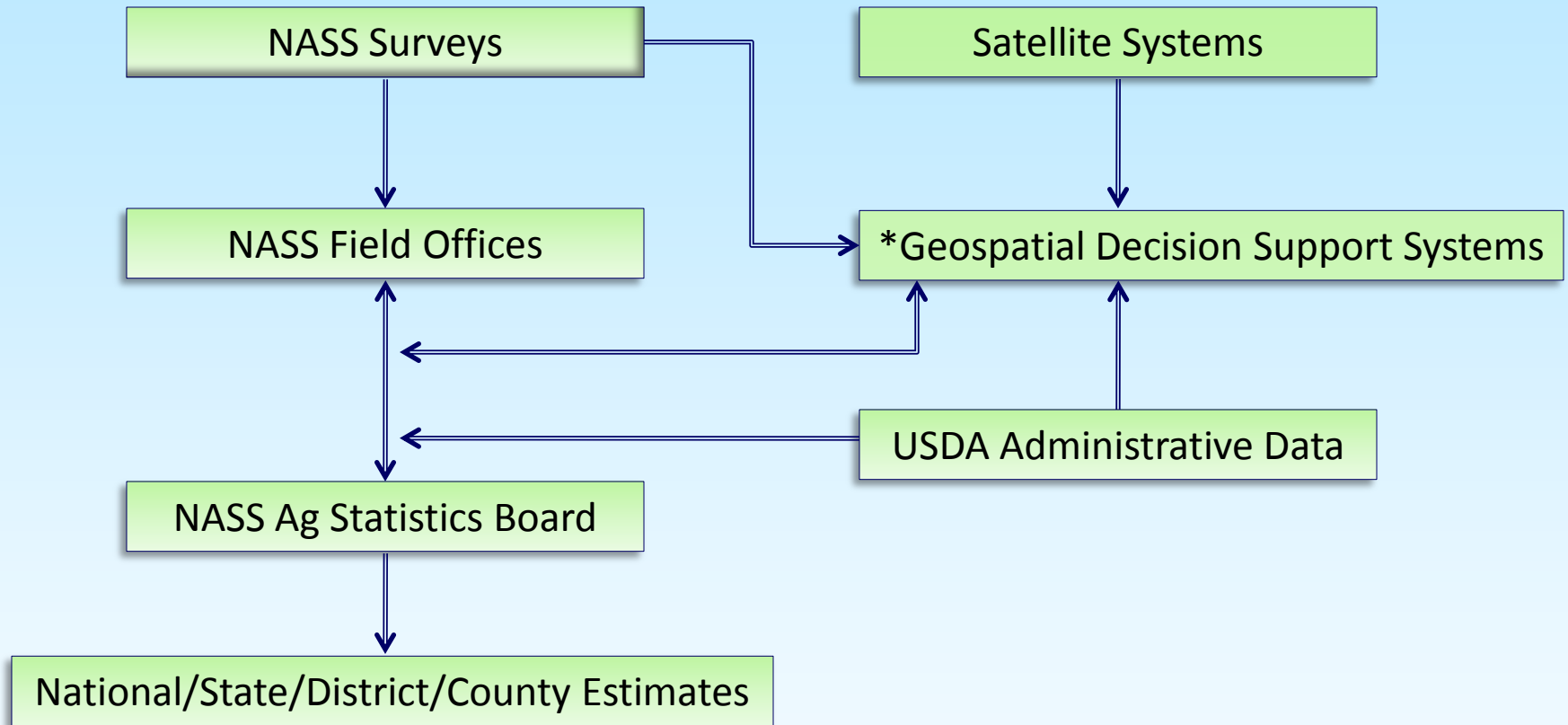
To view animated map files you must have Quicktime installed on your computer.



Conterminous U.S. Vegetation Condition - 2007  
Period 33 (7/31 - 8/13)



# NASS Estimation Systems



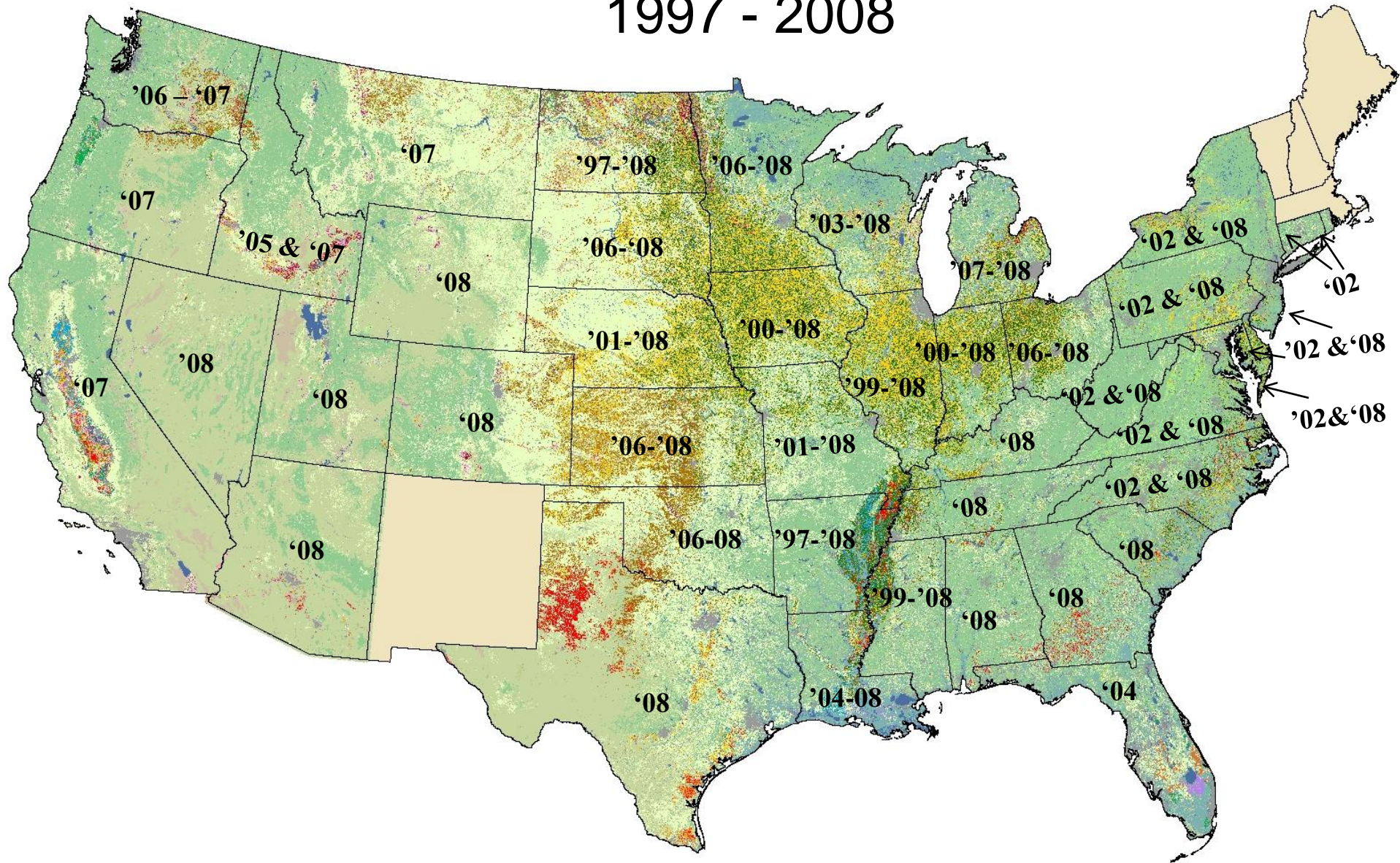
\*NASS uses Geospatial Decision Support Systems to provide updated information to the Ag Statistics Board and data users.

# Cropland Data Layer Program Objectives

- “Census by Satellite”
  - Without area duplication
  - Major corn and soybean regions
- Provide timely, accurate, useful independent estimates
  - Measurable error
  - County and state level
- Output crop specific Cropland Data Layer
  - Distribute free to public [NRCS Geospatial Data Gateway](http://www.nrcs.usda.gov/Research_and_Science/) or [http://www.nass.usda.gov/Research\\_and\\_Science/](http://www.nass.usda.gov/Research_and_Science/)
  - Publish accuracy statistics/metadata
  - County and state level

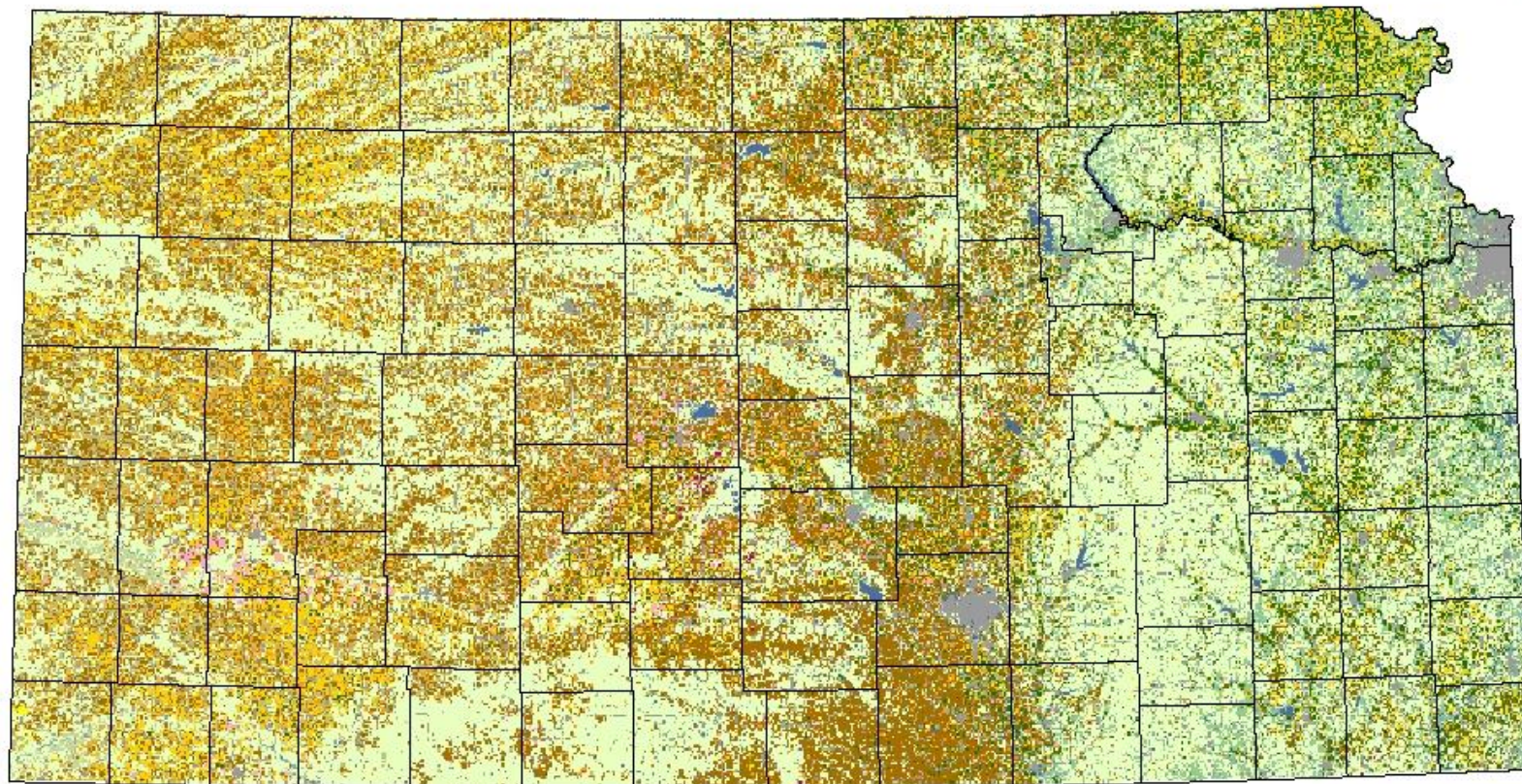


# Cropland Data Layers 1997 - 2008












# Kansas 2008 Cropland Data Layer










## Land Cover Categories

(Ordered by Decreasing Acreage)


### Agriculture

-  Pasture/Grass
-  Winter Wheat
-  Corn
-  Fallow/Idle Cropland
-  Sorghum
-  Soybeans
-  Alfalfa

-  W. Wht./Soy. Dbl. Crop.
-  Sunflowers
-  Rye
-  Cotton
-  Other Small Grains
-  Clover/Wildflowers
-  Oats

-  Potatoes
-  Seed/Sod Grass
-  Canola
-  Millet
-  Other Crops
-  Barley
-  Other Tree Nuts & Fruits

### Non-Agriculture

-  Urban/Developed
-  Woodland
-  Water
-  Wetlands
-  Shrubland
-  Barren


















# Brown County, Kansas 2008 Cropland Data Layer











## Land Cover Categories

(Ordered by Decreasing Acreage)

### Agricultural

-  Soybeans
-  Corn/Sweet Corn
-  Winter Wheat
-  Alfalfa
-  Win. Wht./Soyb. Dbl. Cropped
-  Sorghum
-  Clover/Wildflowers
-  Other Crops/Grass Seed/Sod
-  Other Small Grains
-  Sunflowers
-  Oats
-  Cotton
-  Barley
-  Seed/Sod Grass
-  Other Tree Nuts

### Non-Agricultural

-  Grass/Pasture/Non-Ag
-  Woodland
-  Urban/Developed
-  Water
-  Wetlands
-  Barren
-  Fallow/Idle Cropland
-  Shrubland



# Cropland Data Layer Program Components



- Advanced Wide Field Sensor (AWiFS) data
- Ground truth: FSA/CLU + 578 & NLCD
- Ancillary data sets
- Commercial Software Suite
- See5 Decision Tree Methodology
- Estimation

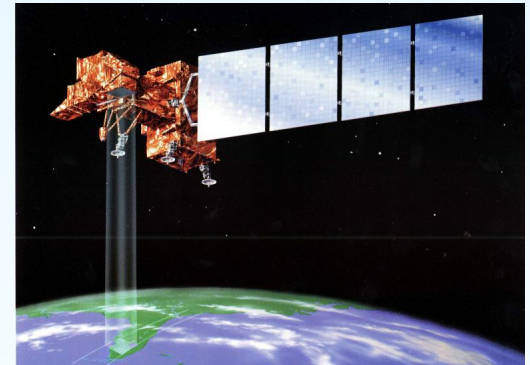
# Landsat Imagery

## 1997-2005, 2008-2009

Landsat 5 launched 1984 (3 yr design life!)

- Thematic Mapper (TM) Sensor

Landsat 7 launched 1999 Thematic Mapper (ETM+) Sensor





# The Landsat Data Gap

## Landsat 7 ETM+



## Landsat 5 TM



### 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:**

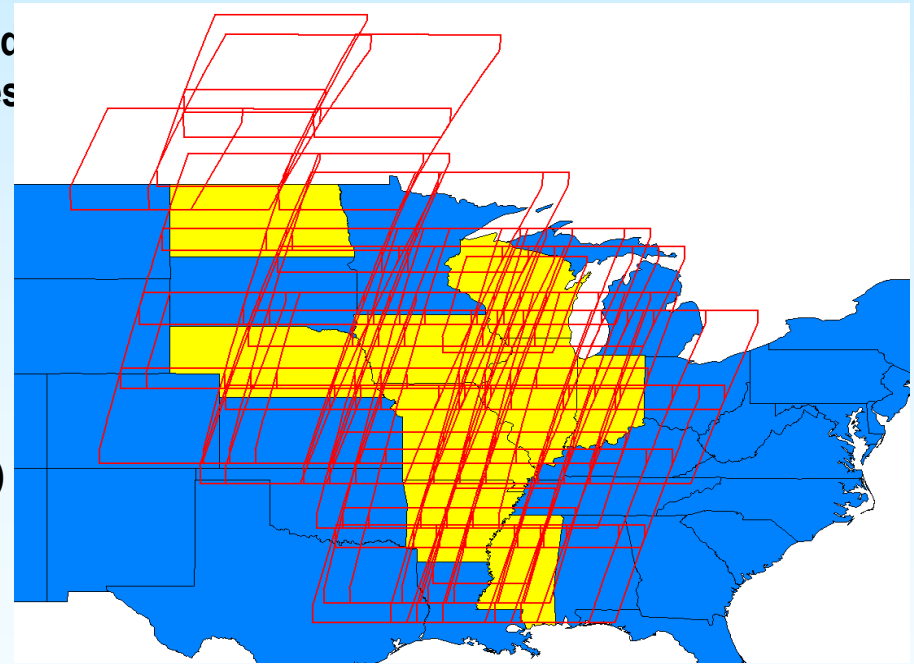
[http://landsat.usgs.gov/slc\\_enhancements/slc\\_off\\_level1\\_standard.php](http://landsat.usgs.gov/slc_enhancements/slc_off_level1_standard.php)

# Indian Remote Sensing Satellite: RESOURCESAT-1

## Advanced Wide Field Sensor (AWiFS)

### States Targeted for Data Collection in August 2004

- **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 (Shortwave Infrared)**
- **Temporal Resolution (5 Days)**



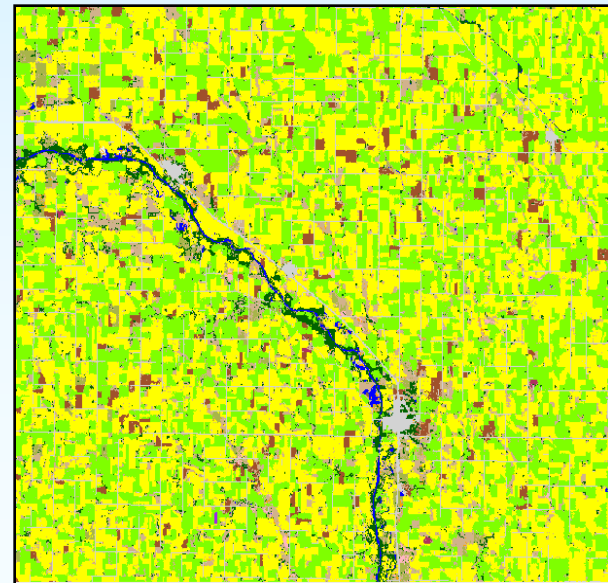
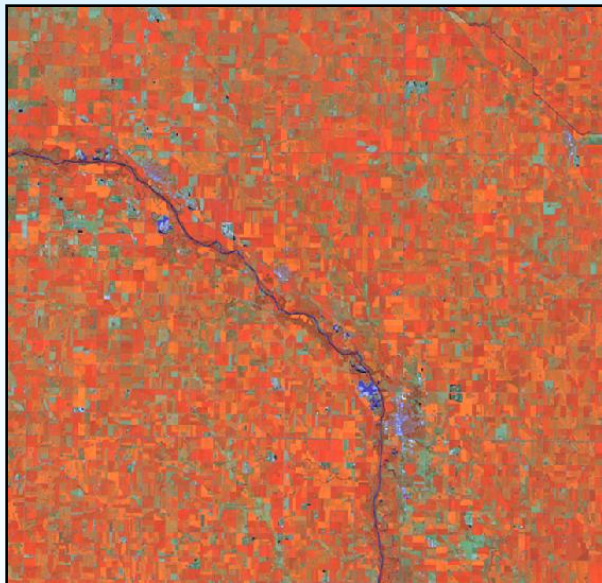


# Sensor Specifications Compared

	<u><b>TM</b></u>	<u><b>AWiFS</b></u>
<b>Altitude</b>	705 km	817 km
<b>Equatorial crossing time</b>	9:45 $\pm$ 15 minutes	10:30 $\pm$ 5 minutes
<b>Temporal Resolution</b>	16 days	5 days
<b>Spatial Resolution</b>	30 x 30 m (reflective) 120 x 120 m (thermal)	56 x 56 m
<b>Radiometric Resolution</b>	8 bit (256)	10 bit (1024)
<b>Spectral Resolution</b>	6 (B, G, R, NIR, SWIR, MIR) + Thermal IR	4 (G, R, NIR, SWIR)
<b>Swath wide</b>	185 km	737 km
<b>Scene size</b>	184 x 152 km	370 x 370 km

# Crop Acreage Estimation: Landsat TM and AWiFS Assessments 2004-2005

- Nebraska, 2004
- Arkansas (Delta Region), 2005
- Nebraska, 2005
- Coincident studies (AR, IL, IA) 2005

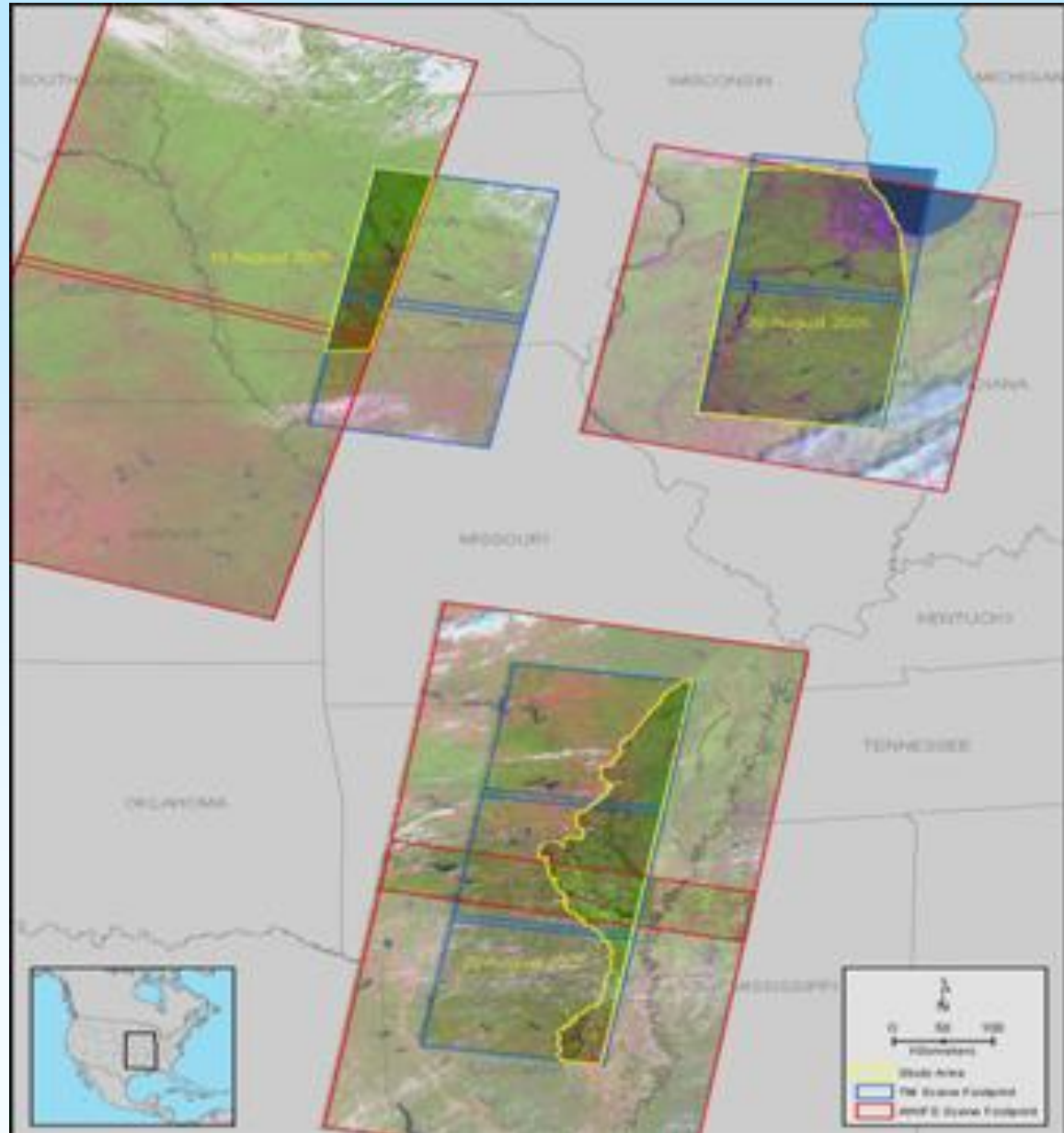




# Coincident study sites

Three coincident areas chosen for analysis:

- Arkansas
  - 20 August 2005
- Iowa,
  - 18 August 2005
- Illinois
  - 29 August 2005



# Need for Coincident Imagery

The best classification comparison would use not only data from the **same area** but from the **same time**. Thus controlling for variables including:



## Atmospherics conditions

- Clouds
- Haze
- Smoke

## Ground conditions

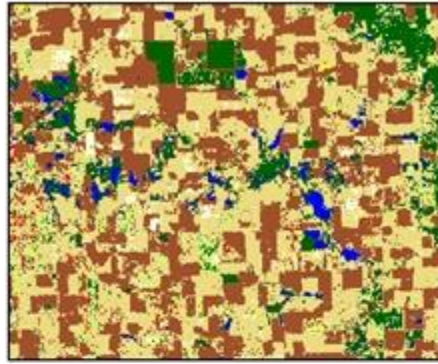
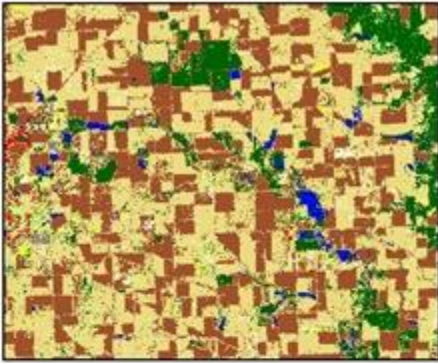
- Soil moisture
- Vegetation phenology

## Sun angle

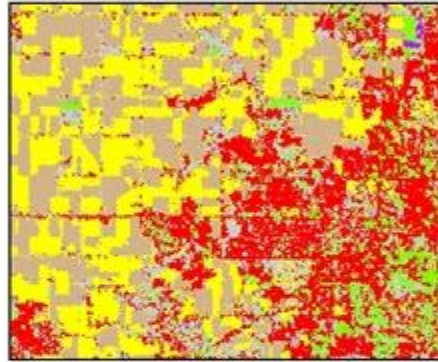
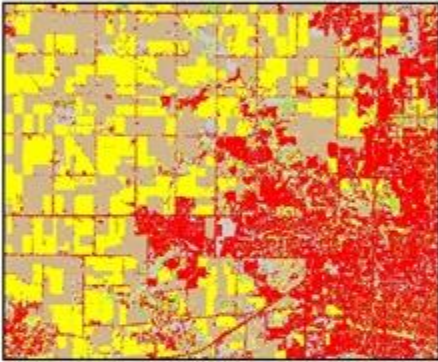
- Seasonal variation



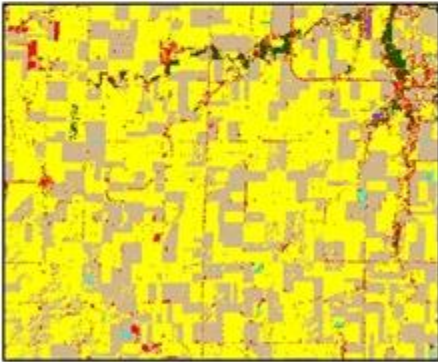
Arkansas



Iowa

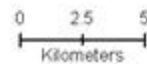
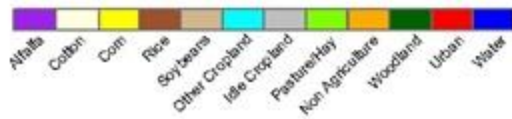


Illinois



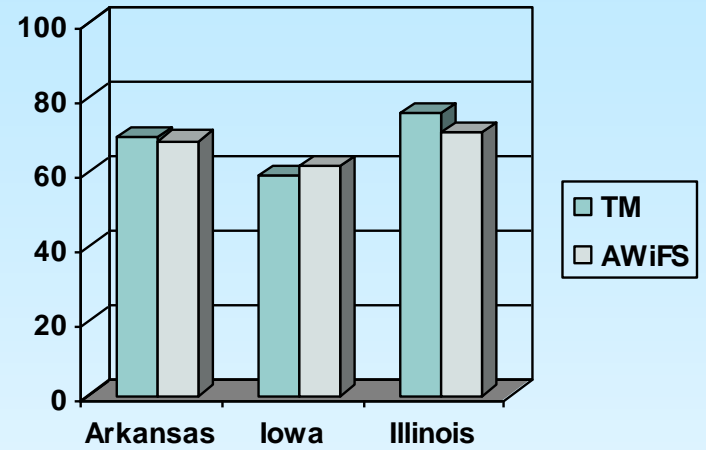
Landsat-5 TM

Resourcesat-1 AWiFS

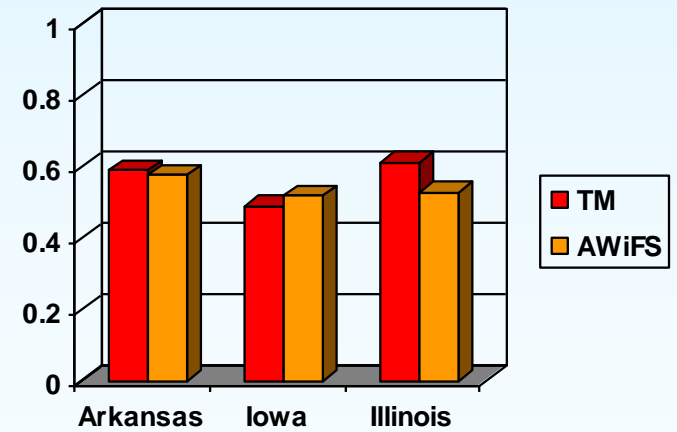


# Results

Overall Accuracy



Overall Kappa



# Conclusions:

## AWiFS vs. TM evaluations 2004-2005

- AWiFS data are acceptable for crop acreage estimation over large crop areas such as the Midwest, the Delta and the Northern Great Plains.
- Improvements in classification accuracy are achieved due to increased temporal frequency of the AWiFS sensor (5 day) vs. the TM sensor (16 day) repeat cycle.
- The large footprint of the AWiFS sensor provides the opportunity to utilize training and ancillary data over large areas which leads to improved classification accuracies and production efficiencies.





# IRS Resourcesat-1 A WiFS Imagery

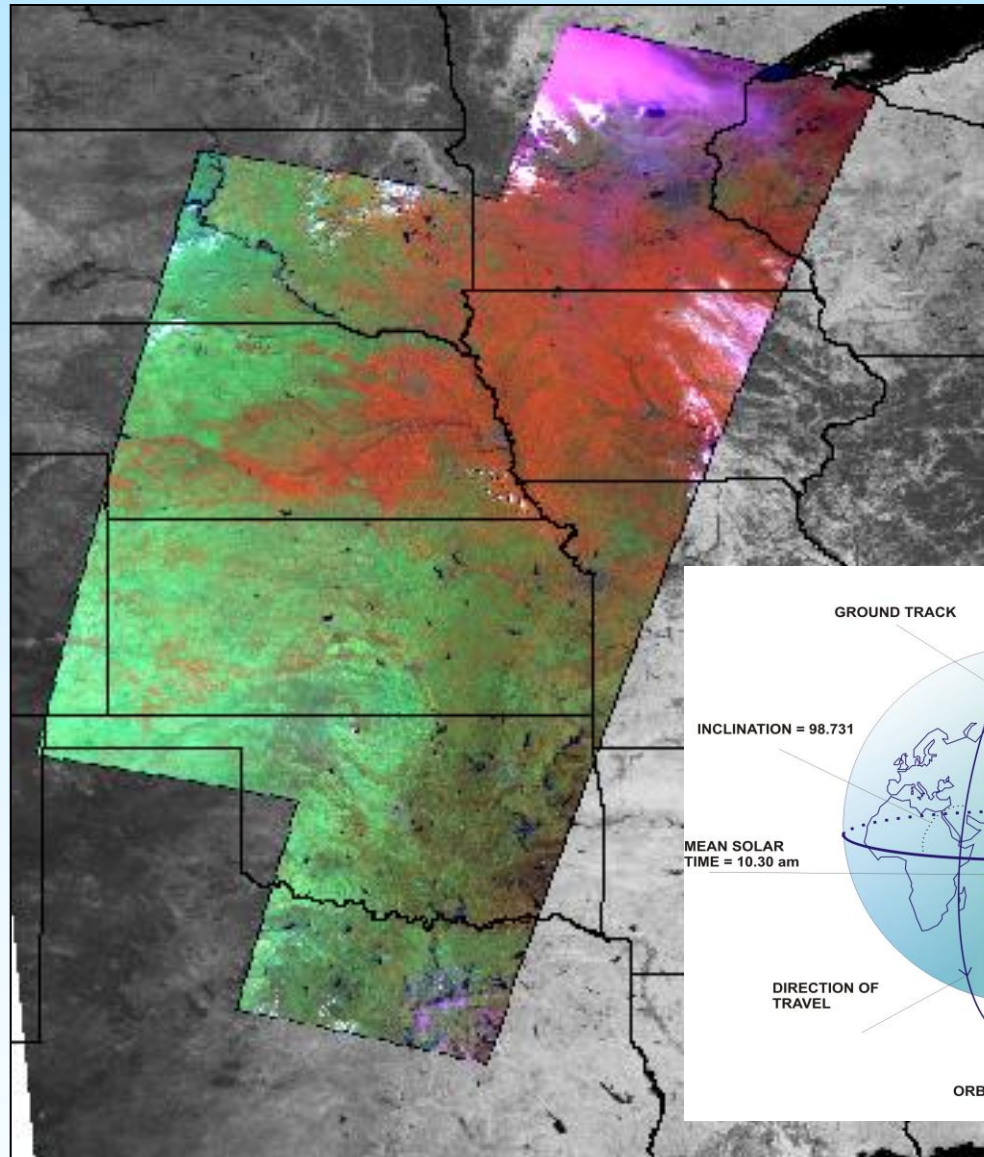
340 km swath per head  
740 km combined

5-day revisit

4 spectral bands

- B2: 0.52 - 0.59
- B3: 0.62 - 0.68
- B4: 0.76 - 0.86
- B5: 1.55 - 1.7

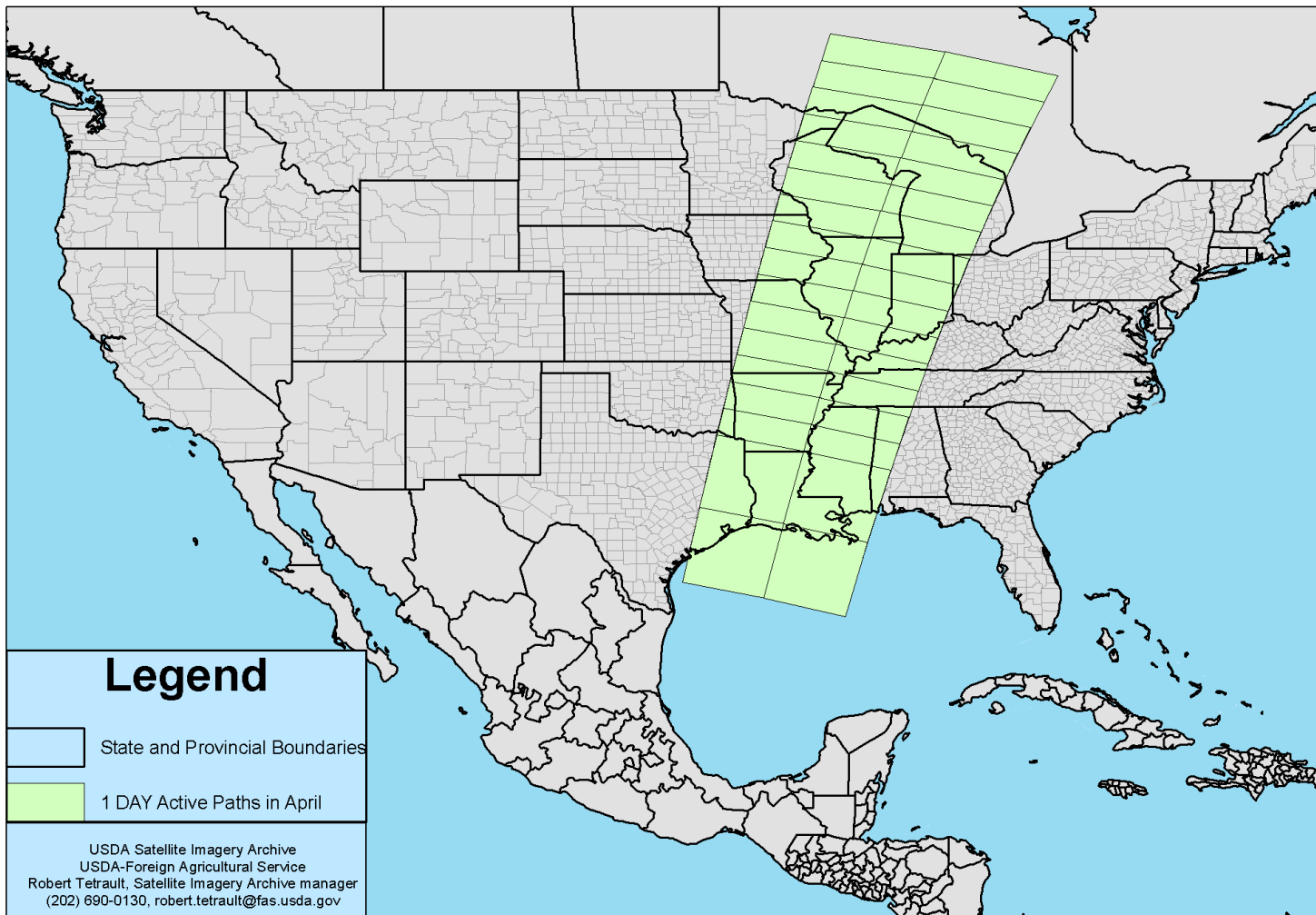
56 m nadir/70 m field edges



13 Aug 2007

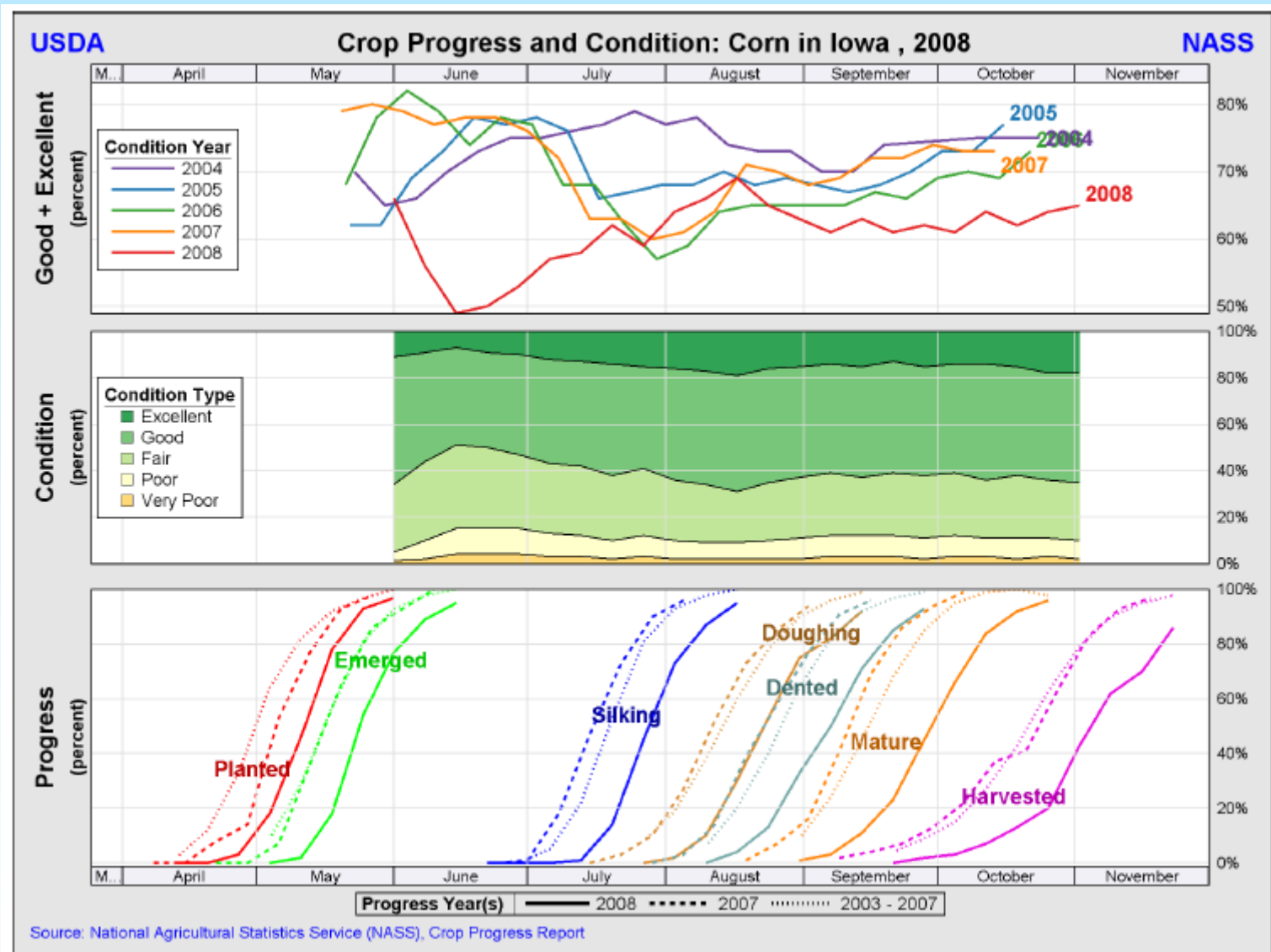
# USDA Satellite Image Archive

## Active Paths for P6-AWiFS CONUS



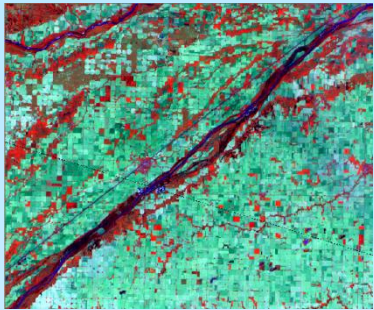


# Image Timing

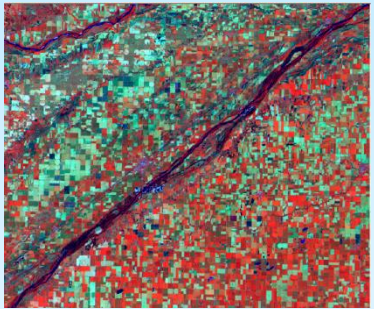


[http://www.nass.usda.gov/Charts and Maps/Crop Progress & Condition/](http://www.nass.usda.gov/Charts_and_Maps/Crop_Progress_&_Condition/)

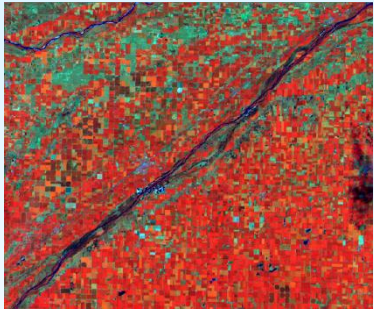
# AWiFS Imagery Time Series



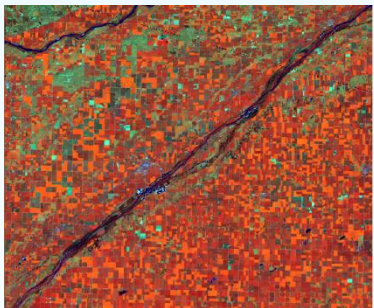
May 18



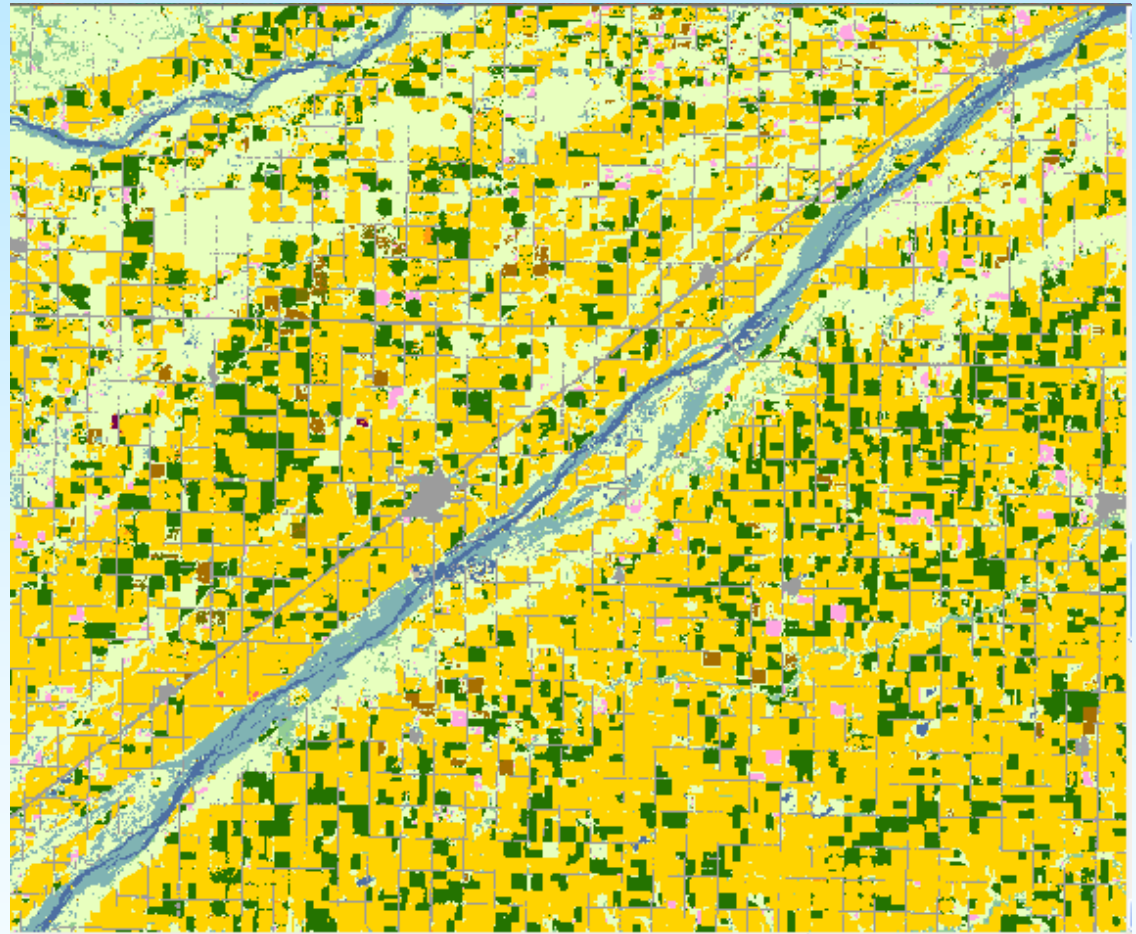
June 21



July 15



Aug 27



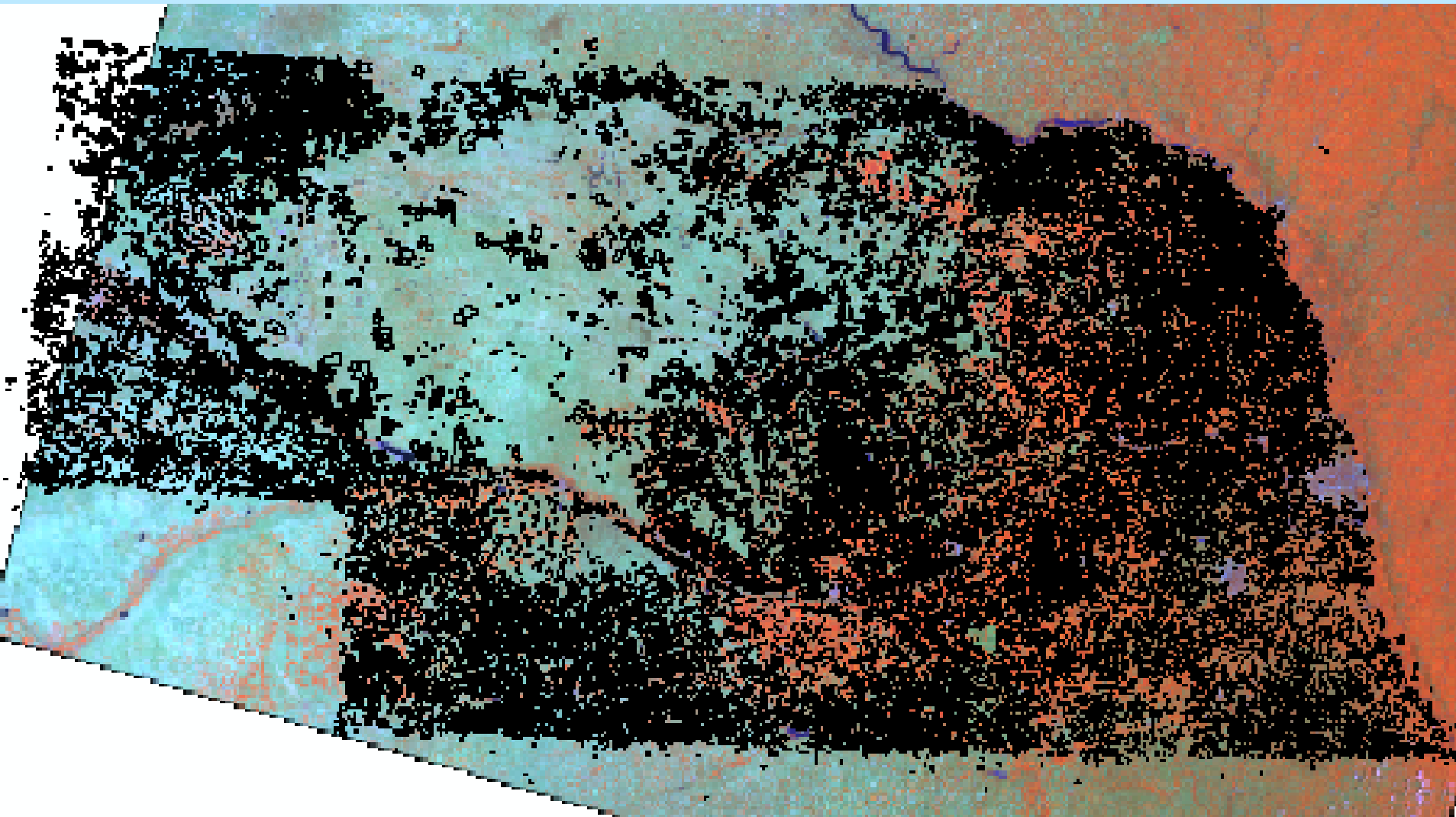


# Cropland Data Layer Program Components

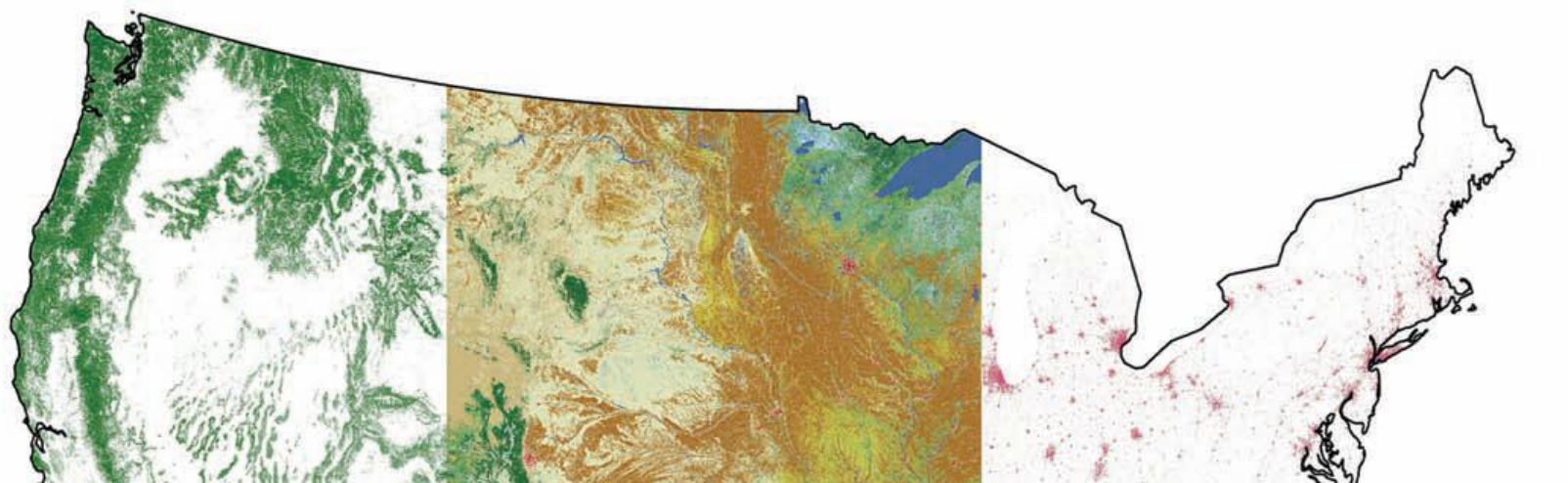


- Advanced Wide Field Sensor (AWiFS)
- Ground truth: FSA/CLU + 578 & NLCD
- Ancillary data sets
- Commercial Software Suite
- See5 Decision Tree Methodology
- Estimation

# Ground Truth - Agriculture

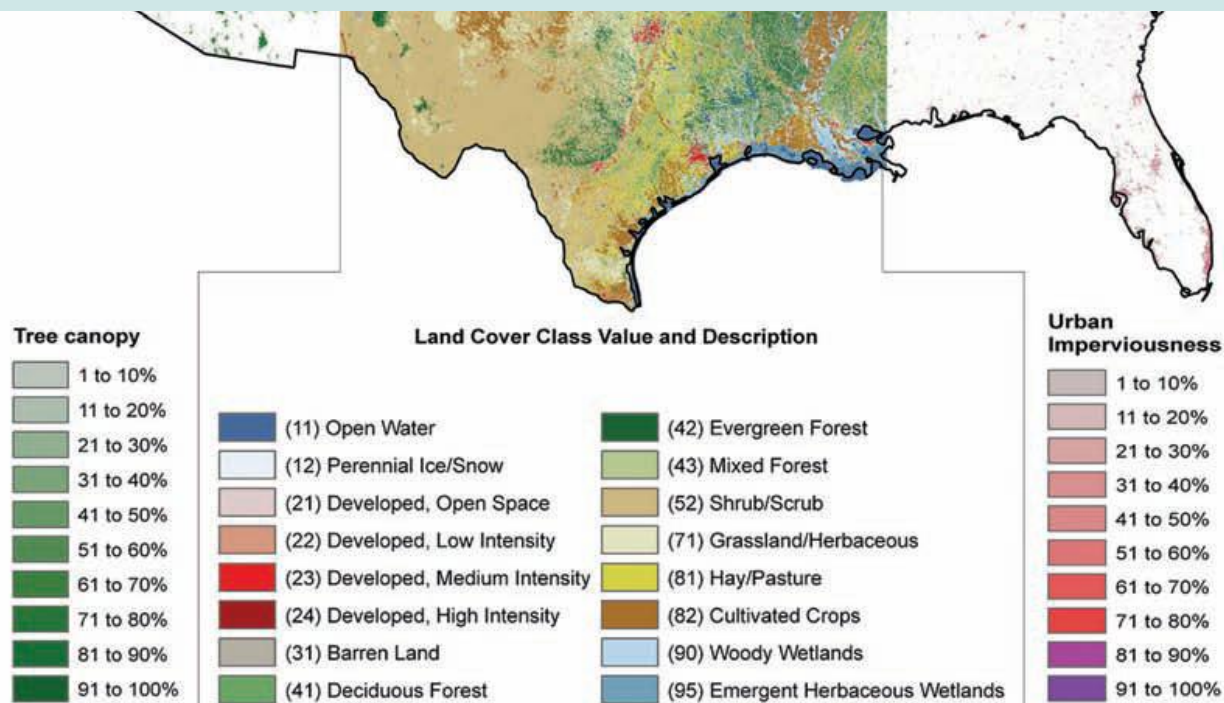


NASS June Agricultural Survey (JAS) data still  
used for acreage estimation



# Non-Agricultural Ground Truth

## USGS, National Land Cover Dataset 2001



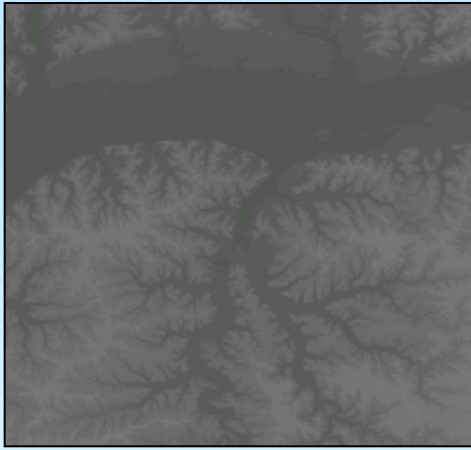


# Cropland Data Layer Program Components

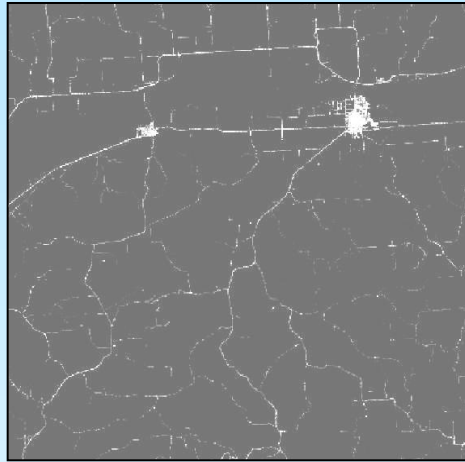


- Landsat TM and ETM+ vs. Advanced Wide Field Sensor (AWiFS)
- Ground truth: FSA/CLU + 578 & NLCD
- Ancillary data
- Commercial Software Suite
- See5 Decision Tree Methodology

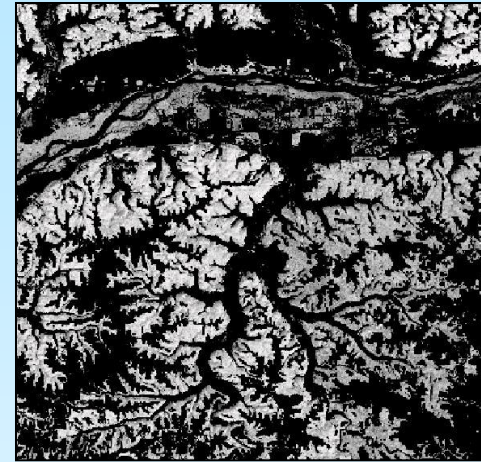
# Ancillary Data – USGS/NASA Products



Elevation

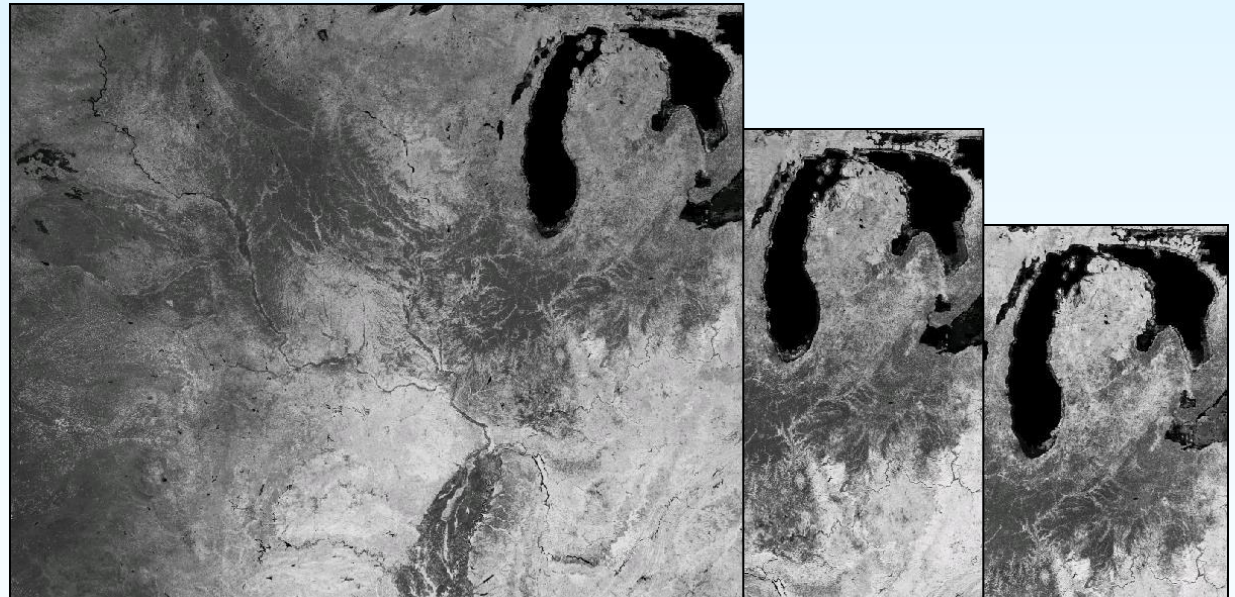


Imperviousness



Forest Canopy

NASA MODIS Terra  
(16-day NDVI composite)



# Cropland Data Layer Program Components

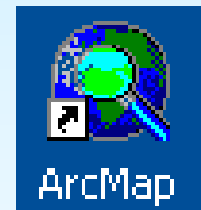


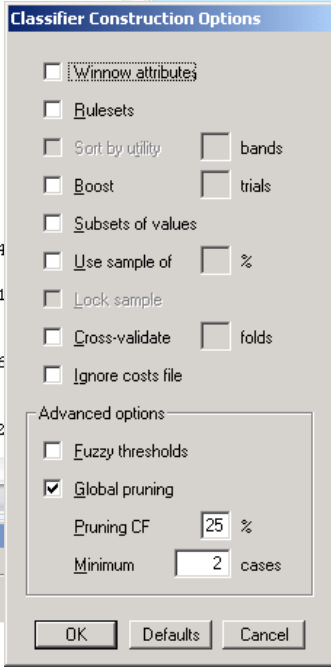
- Advanced Wide Field Sensor (AWiFS)
- Ground truth: FSA/CLU + 578 & NLCD
- Ancillary data sets
- Commercial Software Suite
- See5 Decision Tree Methodology
- Estimation



# Commercial Software Suite

- Imagery Preparation
  - Leica Geosystems ERDAS Imagine
- Image classification
  - Decision tree software
    - See5.0 [www.rulequest.com](http://www.rulequest.com)
- Ground Truth Preparation
  - ESRI ArcGIS
- Acreage Estimation
  - SAS/IML workshop





# State-of-the-art technique for image classification

- Incorporates a powerful ensemble method known as “boosting”

The “NLCD Mapping Tool” was integrated into ERDAS Imagine

- 
- The screenshot shows a software menu titled "NLCD Mapping Tool" with a red 'X' icon in the top right corner. The menu contains the following options: "Percent Calculation ...", "NLCD Sampling Tool ...", "Cubist Classifier...", "See5 Classifier...", "Accuracy Assessment...", "Smart Eliminate...", "Cubist Info", "See5 Info", and "Close". The "Close" button is highlighted with a dashed border.



# Accuracy Assessment

Crop-specific covers only	*Correct	Accuracy	Error	Kappa
OVERALL ACCURACY	740009	93.56%	6.44%	0.8488

Cover Type	Attribute Code	*Correct Pixels	Producer's Accuracy	Omission Error	Kappa	User's Accuracy	Commission Error	Cond'l Kappa
Corn	1	28358	95.36%	4.64%	0.9528	93.08%	6.92%	0.9297
Cotton	2	11757	95.08%	4.92%	0.9505	94.59%	5.41%	0.9456
Rice	3	2	28.57%	71.43%	0.2857	66.67%	33.33%	0.6667
Sorghum	4	21251	89.85%	10.15%	0.8972	92.46%	7.54%	0.9236
Soybeans	5	12885	86.15%	13.85%	0.8604	88.61%	11.39%	0.8851
Sunflowers	6	102	89.47%	10.53%	0.8947	99.03%	0.97%	0.9903
Peanuts	10	512	90.14%	9.86%	0.9014	92.09%	7.91%	0.9208
Barley	21	785	71.95%	28.05%	0.7194	97.39%	2.61%	0.9739
Durum Wheat	22	48	42.86%	57.14%	0.4286	100.00%	0.00%	1.0000
Spring Wheat	23	205	56.47%	43.53%	0.5647	99.03%	0.97%	0.9903
Winter Wheat	24	580437	97.54%	2.46%	0.9631	94.00%	6.00%	0.9117
Other Small Grains	25	1120	56.97%	43.03%	0.5694	93.57%	6.43%	0.9356
Win Wht /Soyb Dbl Crop	26	14758	79.51%	20.49%	0.7932	90.06%	9.94%	0.8996
Rye	27	13249	66.90%	33.10%	0.6664	91.39%	8.61%	0.9129
Oats	28	2941	64.85%	35.15%	0.6479	95.18%	4.82%	0.9517
Millet	29	439	77.02%	22.98%	0.7701	96.48%	3.52%	0.9648
Canola	31	337	75.90%	24.10%	0.7590	98.83%	1.17%	0.9883
Alfalfa	36	19653	88.21%	11.79%	0.8807	91.78%	8.22%	0.9168
Dry Beans	42	115	88.46%	11.54%	0.8846	93.50%	6.50%	0.9350
Potatoes	43	49	96.08%	3.92%	0.9608	100.00%	0.00%	1.0000
Other Crops	44	50	45.87%	54.13%	0.4587	80.65%	19.35%	0.8064
Misc Veggies & Fruits	47	33	54.10%	45.90%	0.5410	86.84%	13.16%	0.8684
Watermelon	48	24	77.42%	22.58%	0.7742	85.71%	14.29%	0.8571
Peas	53	188	72.59%	27.41%	0.7258	96.91%	3.09%	0.9691
Clover/Wildflowers	58	21	36.21%	63.79%	0.3621	75.00%	25.00%	0.7500
Fallow/Idle Cropland	61	30612	69.78%	30.22%	0.6922	90.48%	9.52%	0.9025
Peaches	67	9	36.00%	64.00%	0.3600	100.00%	0.00%	1.0000
Other Tree Nuts & Fruit	71	69	33.82%	66.18%	0.3382	83.13%	16.87%	0.8313

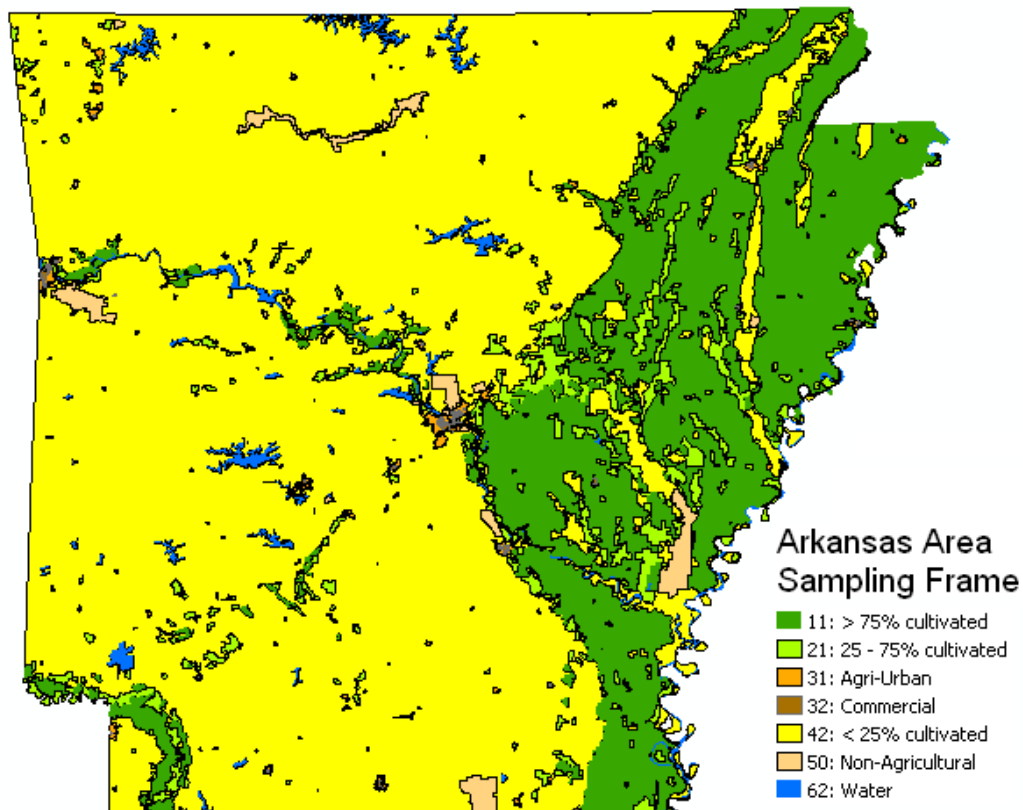
\*Correct Pixels represents the total number of independent validation pixels correctly identified in the error matrix.



# Cropland Data Layer Program Components



- Advanced Wide Field Sensor (AWiFS)
- Ground truth: FSA/CLU + 578 & NLCD
- Ancillary data sets
- Commercial Software Suite
- See5 Decision Tree Methodology
- Estimation



PAGE 2

## SECTION D - CROPS AND LAND USE ON TRACT

17

How many acres are inside this blue tract boundary drawn on the photo (map)? . . . . .

Now I would like to ask about each field inside this blue tract boundary and its use during 2000

FIELD NUMBER		01	02	
1.	Total acres in field	828	828	828
2.	Crop or land use. [Specify]			
3.	Occupied farmstead or dwelling	843		
4.	Waste, unoccupied dwellings, buildings and structures, roads, ditches, etc.	---	---	---
5.	Woodland	831	831	831
6.	Pasture	842	842	842
	Permanent (not in crop rotation)	856	856	856

Estimation Components:  
Area Sampling Frame+  
June Ag Survey+  
Questionnaire

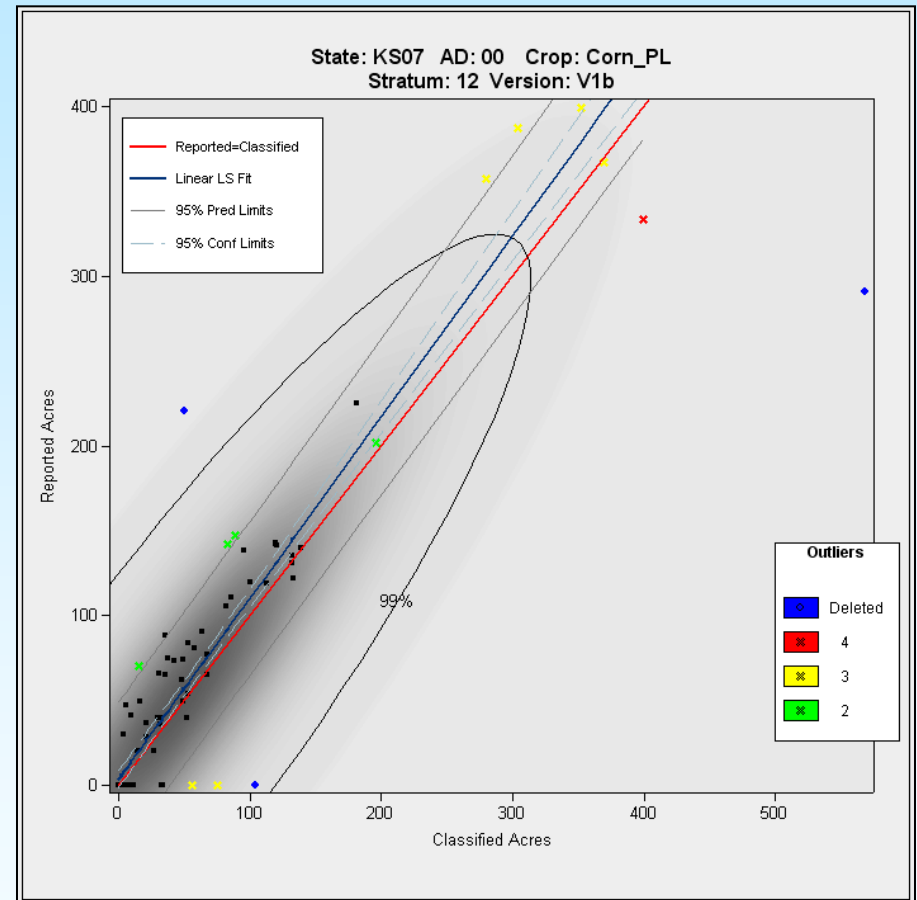
# Regression-based Acreage Estimator

Regression used to relate categorized pixel counts to the ground reference data

- **(X) – Cropland Data Layer (CDL) classified acres**
- **(Y) – June Agricultural Survey (JAS) reported acres**

Using both CDL and JAS acreage results in estimates with reduced error rates over JAS alone

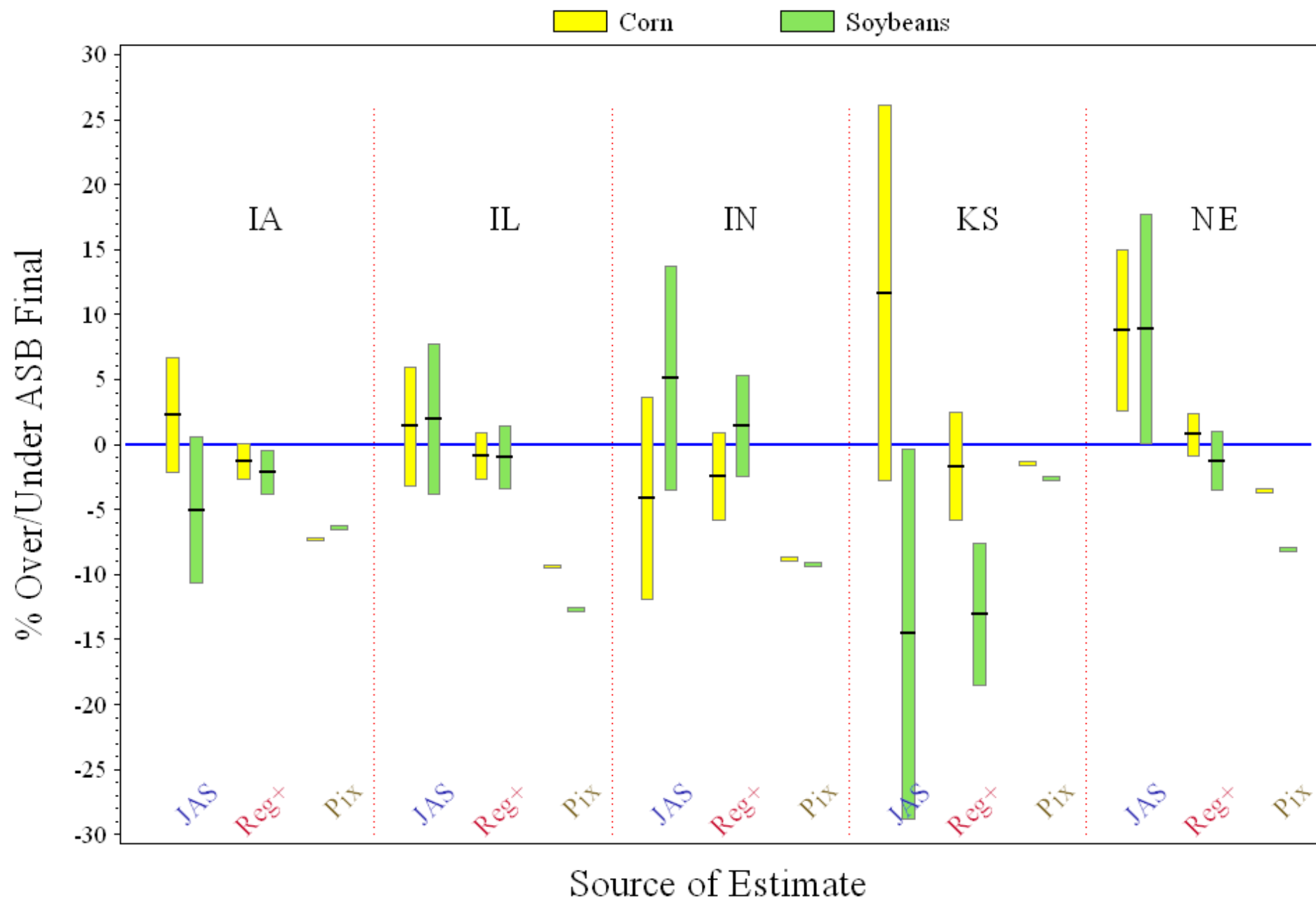
Outlier segment detection - removal from regression analysis



Acreage not just about counting pixels



# 2008 State Level Estimates +/- 2 CVs



January

Su Mo Tu We Th Fr Sa  
1 2 3 4 5

February

Su Mo Tu We Th Fr Sa  
1 2

March

Su Mo Tu We Th Fr Sa  
1

# CDL Production Schedule

8:● 15:○ 22:○ 30:○

6:● 13:○ 20:○ 28:○

7:● 14:○ 21:○ 29:○

April

Su Mo Tu We Th Fr Sa  
1 2 3 4 5  
6 7 8 9 10 11 12  
13 14 15 16 17 18 19  
20 21 22 23 24 25 26  
27 28 29 30

5:● 12:○ 20:○ 28:○

May

Su Mo Tu We Th Fr Sa  
1 2 3  
4 5 6 7 8 9 10  
11 12 13 14 15 16 17  
18 19 20 21 22 23 24  
25 26 27 28 29 30 31

5:● 11:○ 19:○ 27:○

June

Su Mo Tu We Th Fr Sa  
1 2 3 4 5 6 7  
8 9 10 11 12 13 14  
15 16 17 18 19 20 21  
22 23 24 25 26 27 28  
29 30

3:● 10:○ 18:○ 26:○

Acreage Report  
CDL winter wheat

July

Su Mo Tu We Th Fr Sa  
1 2 3 4 5

2:● 10:○ 18:○ 25:○

August

Su Mo Tu We Th Fr Sa  
1 2  
3 4 5 6 7 8 9  
10 11 12 13 14 15 16  
17 18 19 20 21 22 23  
24 25 26 27 28 29 30

1:● 8:○ 16:○ 23:○ 30:○

September

Su Mo Tu We Th Fr Sa  
1 2 3 4 5 6 7  
8 9 10 11 12 13 14  
15 16 17 18 19 20 21  
22 23 24 25 26 27 28  
29 30

7:○

Crop Production Report  
CDL cotton/rice/peanuts

Crop Production Report  
CDL corn/soybeans

Small Grains Annual Summary  
CDL small grains

October

Su Mo Tu We Th Fr Sa

7:○ 14:○ 21:○ 28:○

November

Su Mo Tu We Th Fr Sa

5:○ 13:○ 19:○ 27:○

Historical:

3 4 5 6  
0 11 12 13  
7 18 19 20  
4 25 26 27  
1

Crop Production Repo:  
CDL all crops

Crop Production Annual Summary  
CDL all crops/county estimates

# Cropland Data Layer and Acreage Estimation Processing Flow

## Input Vector Data

NASS JAS segments

FSA CLU

USGS NLCD

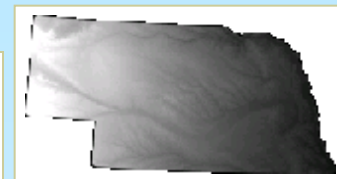
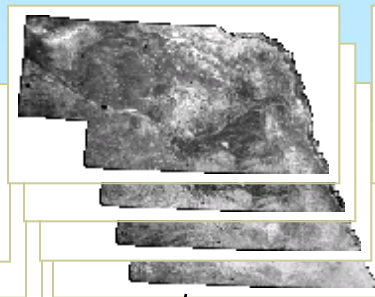
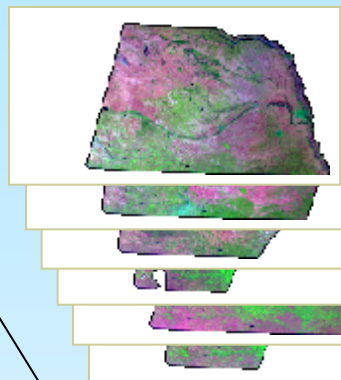
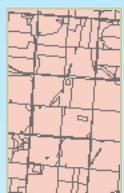
IRS Resourcesat-1 raw  
AWiFS summer time series

NASA Terra MODIS 16-day NDVI  
prior fall and summer time series

USGS NLCD 2001 Impervious &  
Canopy

## Input Raster Data

USGS NED Elevation



## Tabular Data

JAS eData

FSA 578

STATE	FSA	CLU	AREA
1	1	1	1000
1	1	2	2000
1	1	3	3000
1	1	4	4000
1	1	5	5000
1	1	6	6000
1	1	7	7000
1	1	8	8000
1	1	9	9000
1	1	10	10000
1	1	11	11000
1	1	12	12000
1	1	13	13000
1	1	14	14000
1	1	15	15000
1	1	16	16000
1	1	17	17000
1	1	18	18000
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1	1	20	20000
1	1	21	21000
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1	1	38	38000
1	1	39	39000
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1	1	43	43000
1	1	44	44000
1	1	45	45000
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1	1	93	93000
1	1	94	94000
1	1	95	95000
1	1	96	96000
1	1	97	97000
1	1	98	98000
1	1	99	99000
1	1	100	100000

STATE	FSA	CLU	AREA
1	1	1	1000
1	1	2	2000
1	1	3	3000
1	1	4	4000
1	1	5	5000
1	1	6	6000
1	1	7	7000
1	1	8	8000
1	1	9	9000
1	1	10	10000
1	1	11	11000
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1	1	92	92000
1	1	93	93000
1	1	94	94000
1	1	95	95000
1	1	96	96000
1	1	97	97000
1	1	98	98000
1	1	99	99000
1	1	100	100000



Extract JAS  
intersecting  
pixels



Link and assess data  
sets



Agricultural  
Ground truth

Non-agricultural  
Ground truth



Manages and visualizes  
datasets



Derives decision tree-based  
classification rules

STATE	FSA	CLU	AREA
1	1	1	1000
1	1	2	2000
1	1	3	3000
1	1	4	4000
1	1	5	5000
1	1	6	6000
1	1	7	7000
1	1	8	8000
1	1	9	9000
1	1	10	10000
1	1	11	11000
1	1	12	12000
1	1	13	13000
1	1	14	14000
1	1	15	15000
1	1	16	16000
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1	1	18	18000
1	1	19	19000
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1	1	67	67000
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1	1	89	89000
1	1	90	90000
1	1	91	91000
1	1	92	92000
1	1	93	93000
1	1	94	94000
1	1	95	95000
1	1	96	96000



# Research 2008-2009

## Single Crop Planting Intensity and Crop Rotation Assessment

Goal: To determine the specific counties with high percentages of single crop planting intensity and derive the predominant crop rotation patterns in Nebraska, Iowa and Illinois



**Corn**



**Soybeans**

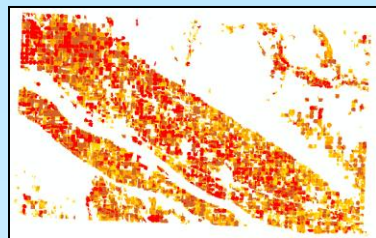
# Single Crop Planting Intensity Methodology



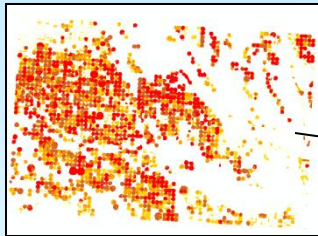
1. Inputs include: Cropland Data Layers (CDLs) for 2004-2008
2. CDLs are recoded such that crop under evaluation =1
3. The recoded CDL's are added together using the ERDAS Imagine Modeler
4. The output is the Crop Intensity Image which is ready for evaluation

# Corn Planting Intensity in Nebraska

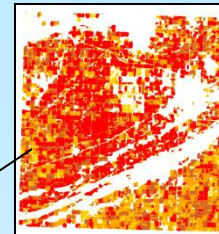
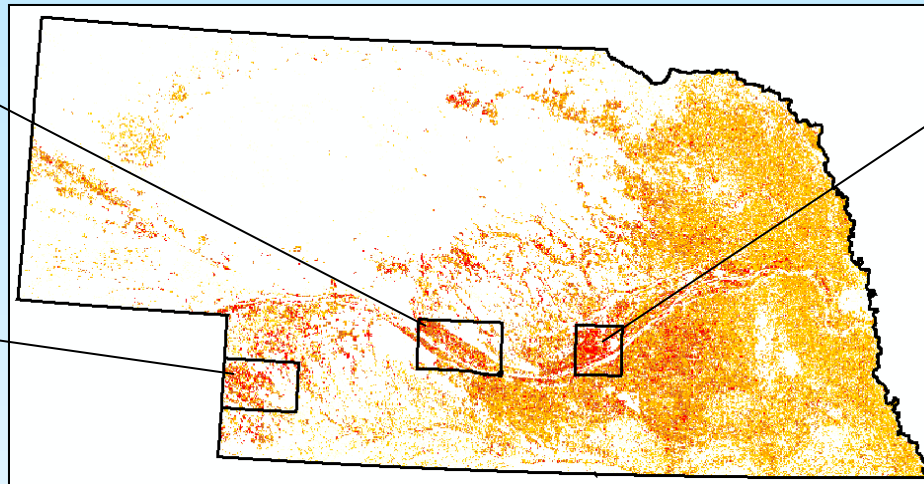
## 2004 - 2008



Dawson, NE

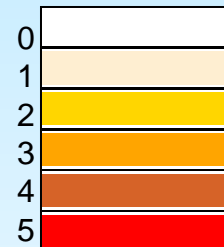


Chase, NE



Hall, NE

Years  
Planted  
to Corn



Hall County	Chase County	Dawson County	State Total
5 years in a row planted to corn: <b>43%</b>	5 years in a row planted to corn: <b>28%</b>	5 years in a row planted to corn: <b>21%</b>	5 years in a row planted to corn: <b>7%</b>
4 out of 5 years planted to corn: <b>22%</b>	4 out of 5 years planted to corn: <b>21%</b>	4 out of 5 years planted to corn: <b>29%</b>	4 out of 5 years planted to corn: <b>13%</b>



# Corn Planting Intensity, 2004 - 2008

## Hall County, Nebraska

### Hall County

5 years in a row planted  
to corn: **43%**

(5% > than 2003-2007)

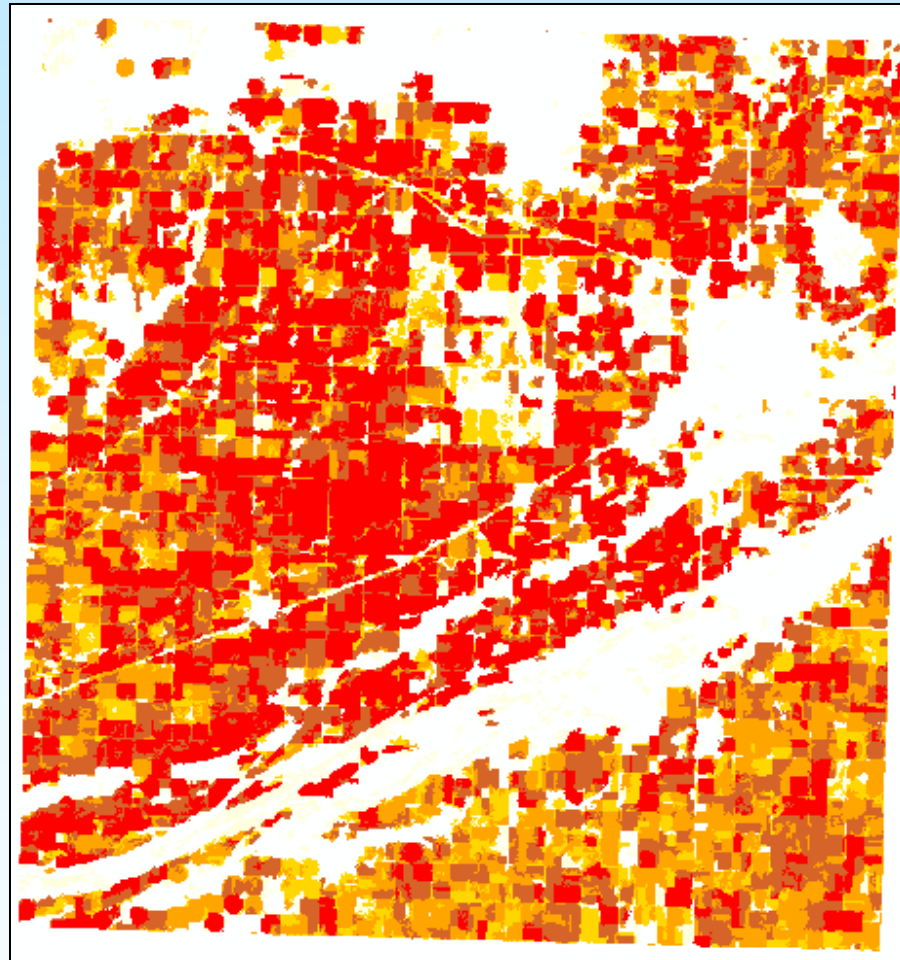
4 out of 5 years planted  
to corn: **22%**

(2% < than 2003-2007)

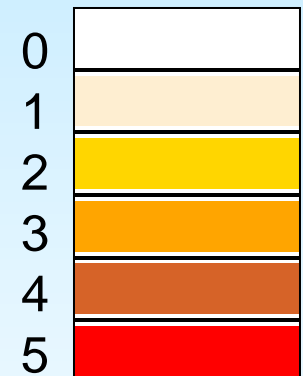
AWiFS 8/13/2007

Bands 3/4/2

Red/Green/Blue



Years  
Planted to Corn



Percentages derived from total acreage in corn production

# Corn Planting Intensity, 2004 - 2008

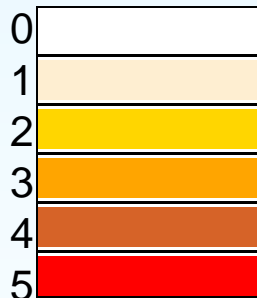
## Dawson County, Nebraska

### Dawson County

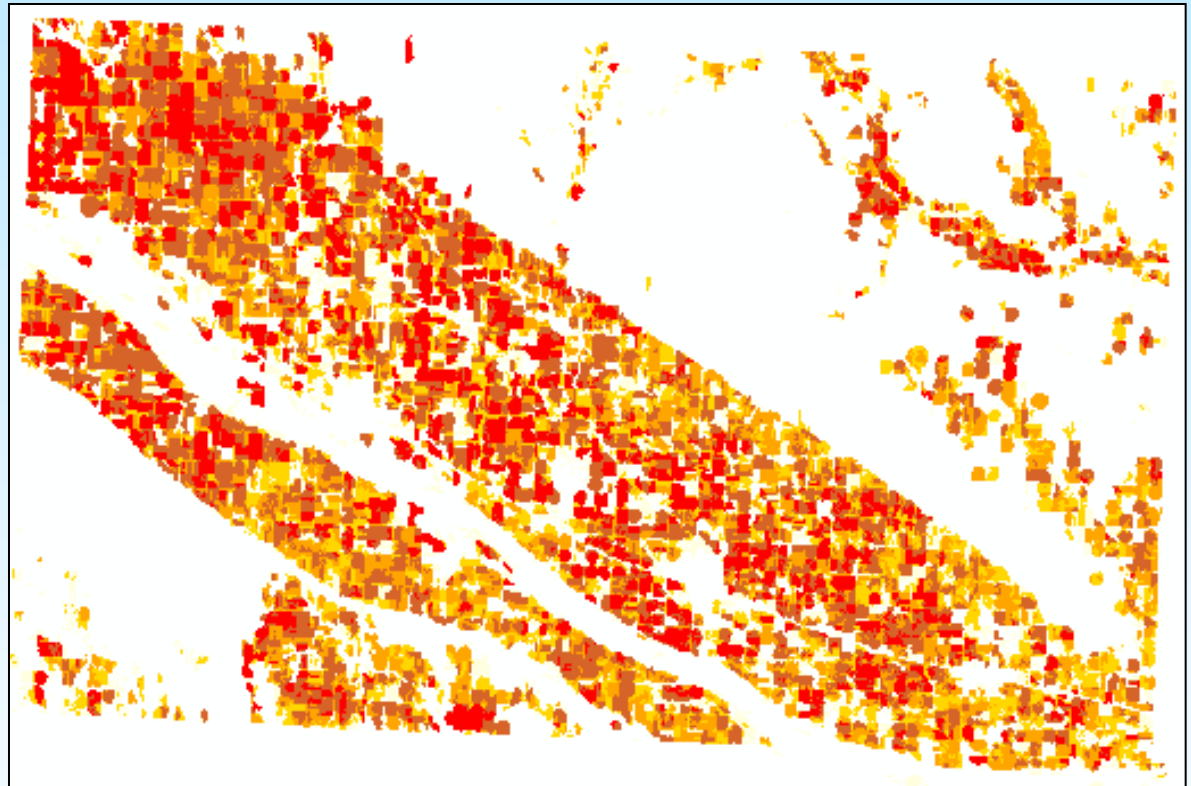
5 years in a row planted  
to corn: **21%**  
(1% > than 2003-2007)

4 out of 5 years planted  
to corn: **29%**  
(1% > than 2003-2007)

Years Planted  
to Corn



Percentages derived from total acreage in corn production



AWiFS 8/13/2007

Bands 3/4/2

Red/Green/Blue

# Crop Rotation Methodology

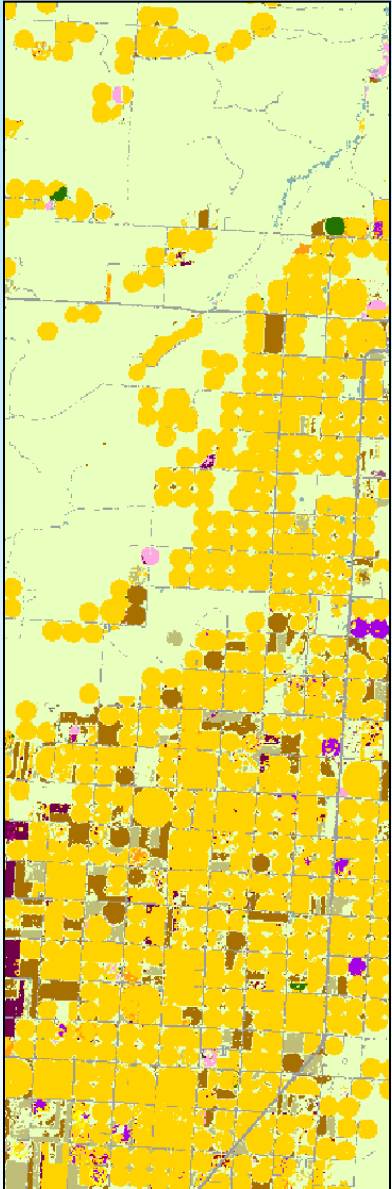


1. Inputs include: Cropland Data Layers (CDLs) for 2004 - 2008
2. CDLs are recoded to  
**2008:** Corn: 1, Soy: 2, Other: 3  
**2007:** Corn: 10, Soy: 20, Other: 30  
**2006:** Corn: 100, Soy: 200, Other: 300  
**2005:** Corn: 1,000, Soy: 2,000, Other: 3,000  
**2004:** Corn: 10,000, Soybeans: 20,000, Other: 30,000
3. The recoded CDLs are added together using the ERDAS Imagine Modeler
4. The output is the Crop Rotation Image which is ready for evaluation



# Crop Rotation Results Nebraska

**Crop Rotation Patterns (Corn and Soybean) 04- 08  
As Percentage of  
Total Cultivated Cropland**



<b>Corn (04), Soy (05), Corn (06), Soy (07), Corn (08)</b>	<b>10.1%</b>
<b>Soy (04), Corn (05), Soy (06), Corn (07), Soy (08)</b>	<b>9.3%</b>
<b>Corn (04), Corn (05), Corn (06), Corn (07), Corn (08)</b> (.3% < than 2003-2007)	<b>7.5%</b>
<b>Additional acreage into corn production (07):</b>	<b>309,688 acres</b>
<b>Additional acreage into corn production (08):</b>	<b>503,221 acres</b>

**Total Cultivated Cropland derived from NASS' Nebraska 2008 CDL**

# Cropland Data Layer Summary

# Operational Program since 2007

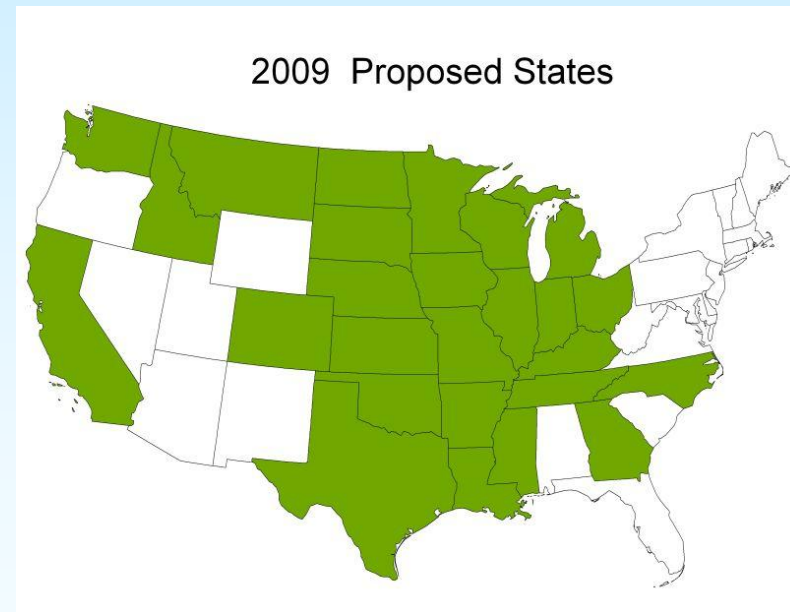
- Early delivery of estimates, 2008 and 2009
  - Winter Wheat – June
  - Corn and Soybeans – August & October
  - Small Grains – September
- Provides measureable statistical error
- Results considered for setting national acreage estimate

# Components

- AWiFS/MODIS/Landsat TM
- Farm Service Agency
  - Common Land Unit (training/testing)
- Commercial Software
- June Agricultural Survey
  - Regression estimator

# Distribution

- [datagateway.nrcs.usda.gov](http://datagateway.nrcs.usda.gov)
- [http://www.nass.usda.gov/Research\\_and\\_Science/](http://www.nass.usda.gov/Research_and_Science/)



# Thank You

**Claire Boryan, Rick Mueller, Mike Craig, Dave  
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Zhengwei Yang and Lee Ebinger**



**[www.nass.usda.gov](http://www.nass.usda.gov)  
[datagateway.nrcs.usda.gov](http://datagateway.nrcs.usda.gov)**

