

# Research to Operational: A Paradigm Shift for the 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

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

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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**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 a 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

NASS Home | USDA.gov | FEDSTATS | Economics Statistics System (ESS) | Site Map  
FOIA | Accessibility Statement | Privacy Policy | Non-Discrimination Statement | Information Quality | FirstGov | White House

**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 losses 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 to 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 2 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 (bu)	Economic Loss (\$)
Western Maryland	Corn	9,500	114.9	7.4	40,700	83
	Soybeans	300	36.7	3.0	1,000	1
	Wheat	200	45.7	2.3	460	1
Central Maryland	Corn	124,200	98.4	9.6	1,201,200	2,413
	Soybeans	92,500	34.2	3.0	360,750	1,479
	Wheat	38,200	63.3	3.3	126,290	309
Southern Maryland	Corn	29,800	112.9	4.9	146,220	299
	Soybeans	43,200	39.0	3.3	142,460	584
	Wheat	16,000	57.0	0.9	14,400	36
Upper Shore	Corn	157,800	159.2	5.1	800,700	1,611
	Soybeans	232,000	39.8	2.4	856,000	2,232
	Wheat	86,500	64.0	1.1	95,250	233

**USDA NEWS RELEASE**

**NATIONAL AGRICULTURAL STATISTICS SERVICE**  
United States Department of Agriculture • Washington, DC 20250  
Ag Statistics Hotline: (800) 727-8540 • [www.nass.usda.gov](http://www.nass.usda.gov)

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

**USDA FORECASTS RECORD-SETTING CORN CROP FOR 2007**

Washington, Aug. 10, 2007 – U.S. history in 2007, according to the U.S. Department of Agriculture's National Agricultural Statistics Service, is that the nation's corn crop is projected to reach 13.1 billion bushels, 10.6 percent more than the 11.8 billion bushels harvested in 2006.

Based on conditions as of August 10, the 2007 corn crop is projected to average 131 bushels per acre, up 3.7 bushels from last year's 127.3 bushels per acre. The 2007 corn crop is projected to total 1.31 billion acres of corn for grain, 1.1 billion acres for silage and 210 million acres for other uses.

Yield forecasts are highest for the Delta, Midwest, hot, dry corn belt, and eastern Corn Belt, Ohio Valley, and the Southeast.

**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 Agricultural 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.

<http://www.nass.usda.gov:8080> - 2002 Census of Agriculture - SVG Interactive Mapping - United S - Microsoft Internet Explorer

**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 Total:

County Total:

County Total:

Download data as CSV | XML | PDF

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Legend

Scale: National | Zero or Data Withheld

(Changes the data range based on National or State level)

Comparisons: 6 | Color: Green

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

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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.](#)

**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
Number <td></td> <td></td> <td>Percent</td>			Percent
1-29	2,800	1,440	-45
30-49	4,700	3,440	-27
50-99	7,400	5,800	-24
100-199	1,800	2,080	+9
200-499	700	900	+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**  
by Herd Size

Herds	Keep same herd size	Increase herd size	Discontinue milking
Number			Percent
2,600	47	17	58
4,700	71	9	20
7,400	65	19	18
1,800	53	37	10
700	33	59	8
200	22	78	0
Total	17,500	60	20

07 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**

Herd Size Groups

- 1-29
- 30-49
- 50-99
- 100-199
- 200-499
- 500+

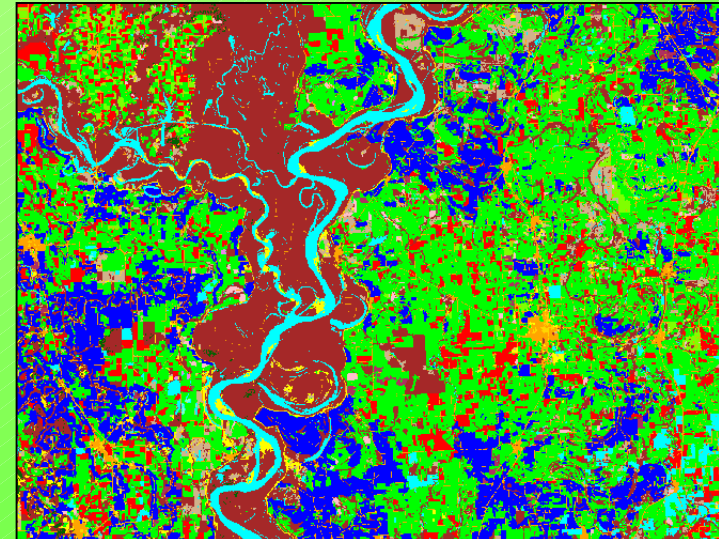
# Agenda



- Acreage Program Updates
  - AWiFS & MODIS sensors
  - Ground truth: FSA/CLU + 578 & non-ag
  - Commercial software suite
- What's next

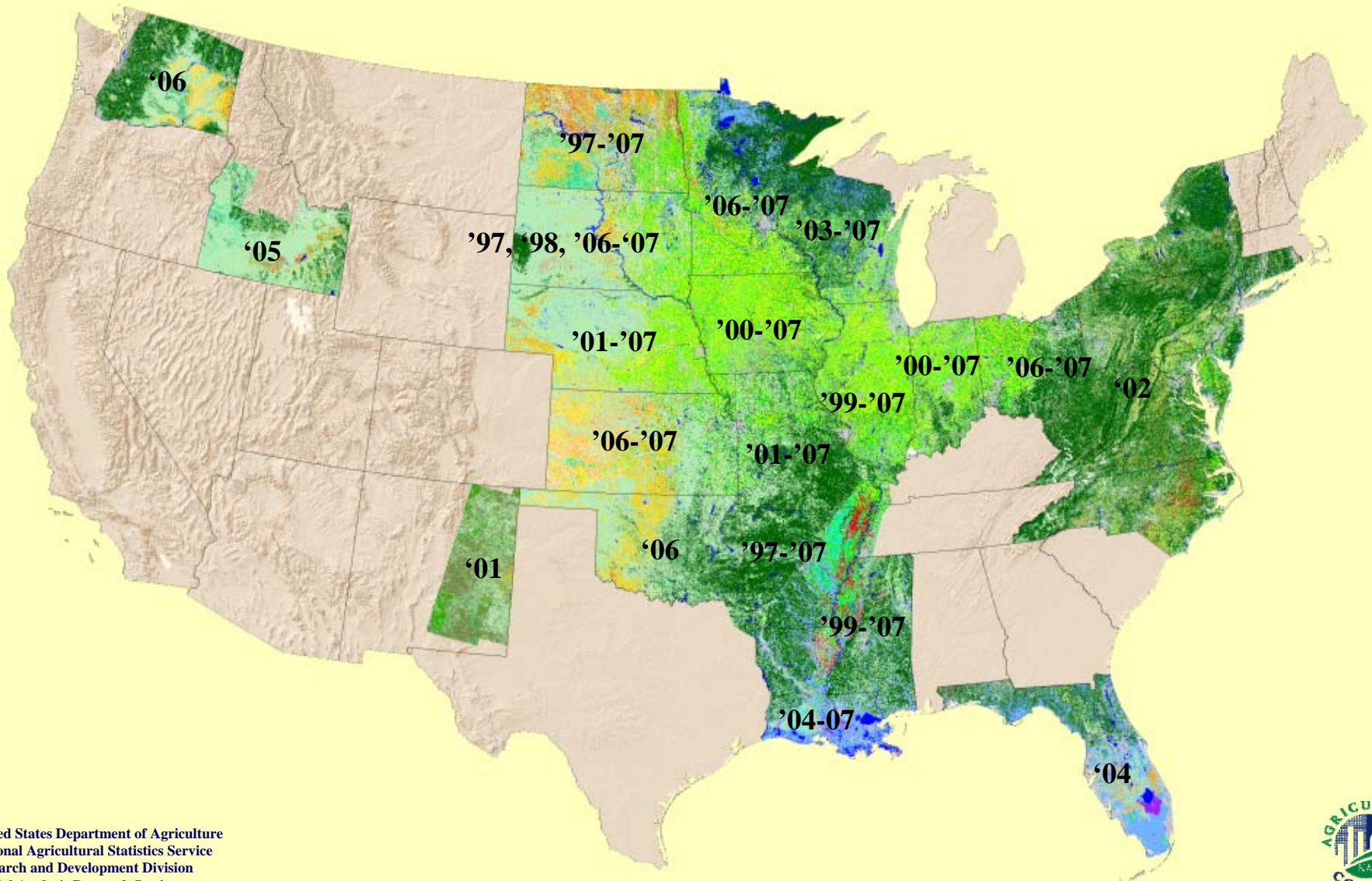
# Remote Sensing Program Objectives

- “Census by Satellite”
  - Without area duplication
  - Cover major producing corn and soybean regions
  - Indications reflect actual location of the crops
    - Not address on record
- Provide timely, accurate, useful independent indications
  - Measurable error
  - Unbiased/independent estimator
  - County & state level
- Deliver indications 75 days earlier
  - For October Agricultural Statistics Board
  - Versus end-of-year December estimates

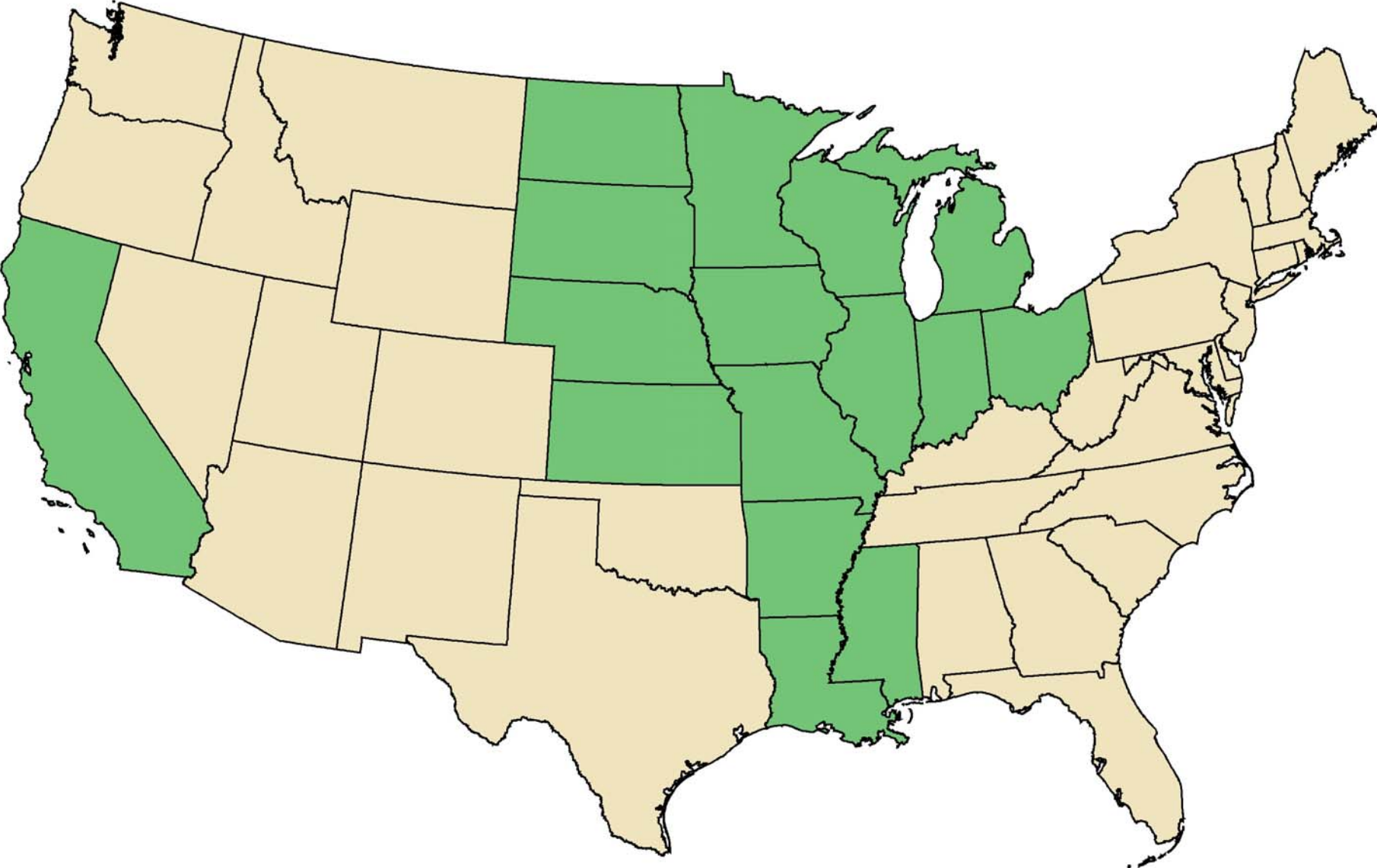


# Cropland Data Layers

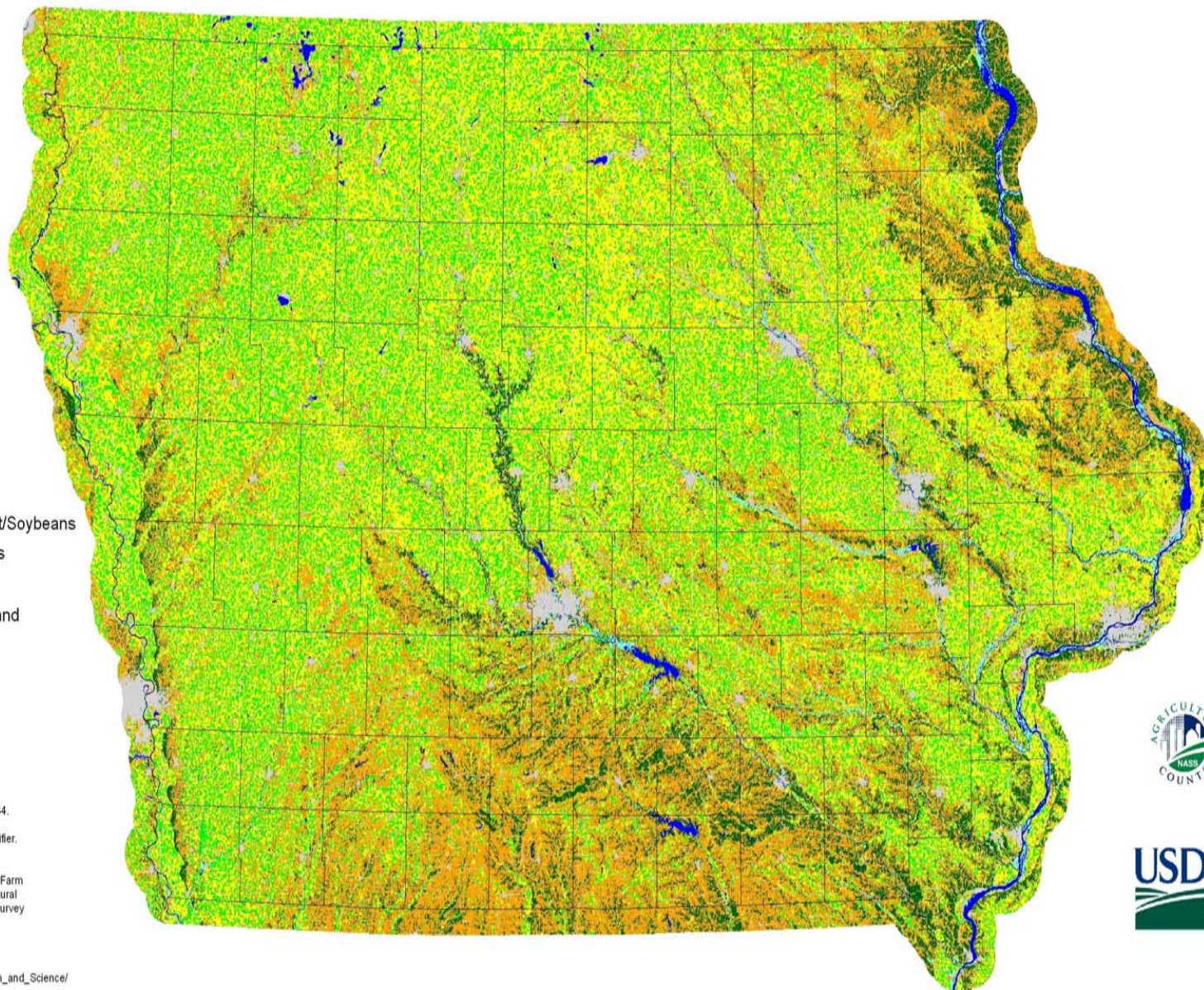
1997 - 2007



# 2007 Cropland Data Layer Coverage



# 2007 Iowa Cropland Data Layer



## Categories

- Corn
- Soybeans
- Winter Wheat
- Double-Cropped, Winter Wheat/Soybeans
- Alfalfa, Hay, Other Small Grains
- All Other Crops
- Pasture, Grassland, Idle Cropland
- Woods
- Wetlands
- Urban
- Water

Data Source: Resourcesat-1 AWIFS satellite imagery.

Projection: UTM zone 15, spheroid WGS84, datum WGS84.

Image Processing: Rulequest's See5.0 decision-tree classifier.  
Minimum mapping unit of 20 acres.

Ground Truth: Agricultural training and validation from the Farm Service Agency Common Land Unit Program. Non-Agricultural training and validation from the United States Geological Survey National Land Cover Dataset 2001.

Map Production: ArcGIS 9.2.

Additional information: [http://www.nass.usda.gov/Research\\_and\\_Science/](http://www.nass.usda.gov/Research_and_Science/)



# Cropland Data Layer Components



- AWiFS sensor



# IRS Resourcesat-1 AWiFS Imagery

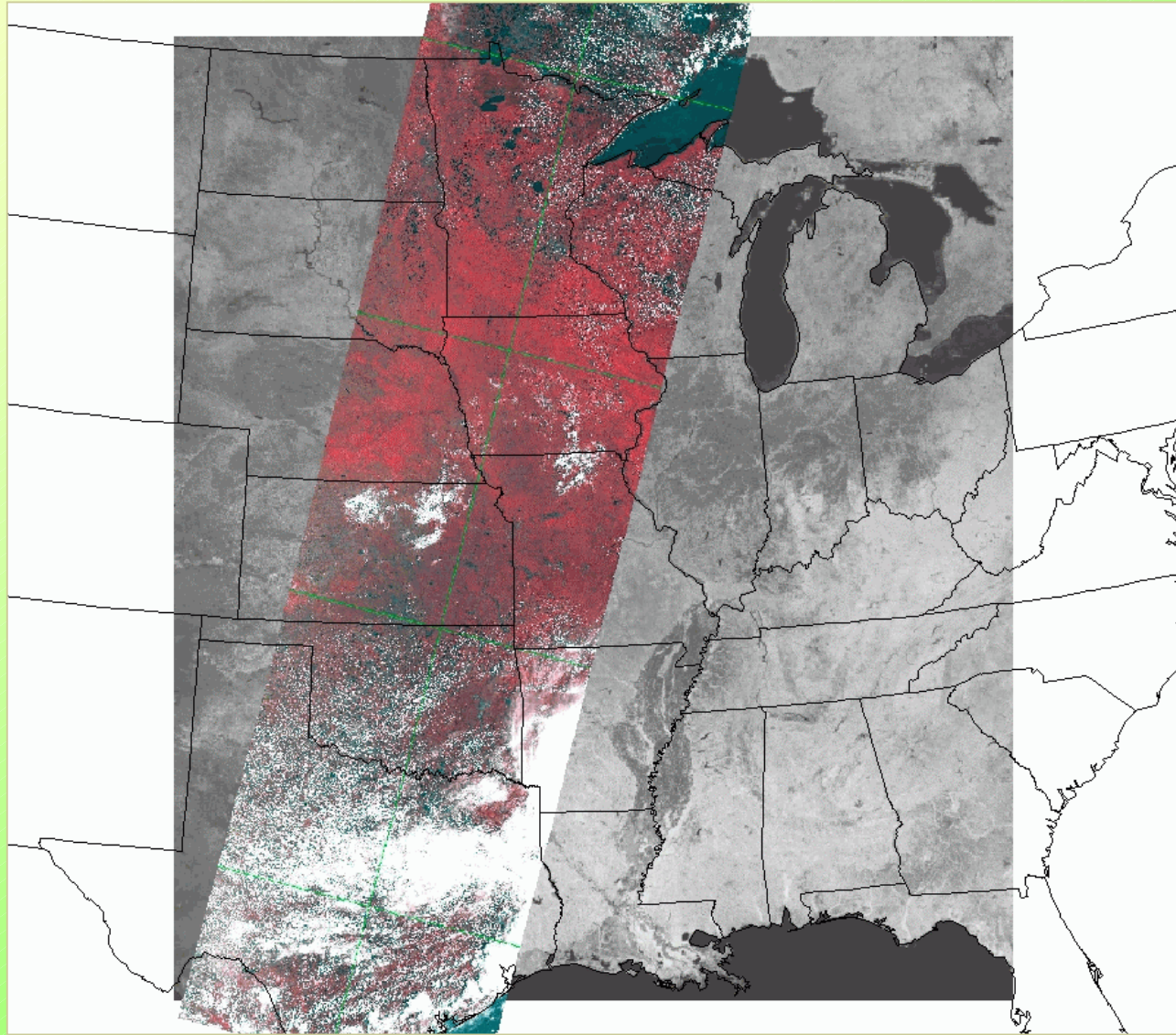
Eliminate clouds

5-day revisit

Key spectral bands

Large area coverage

Resolution adequate



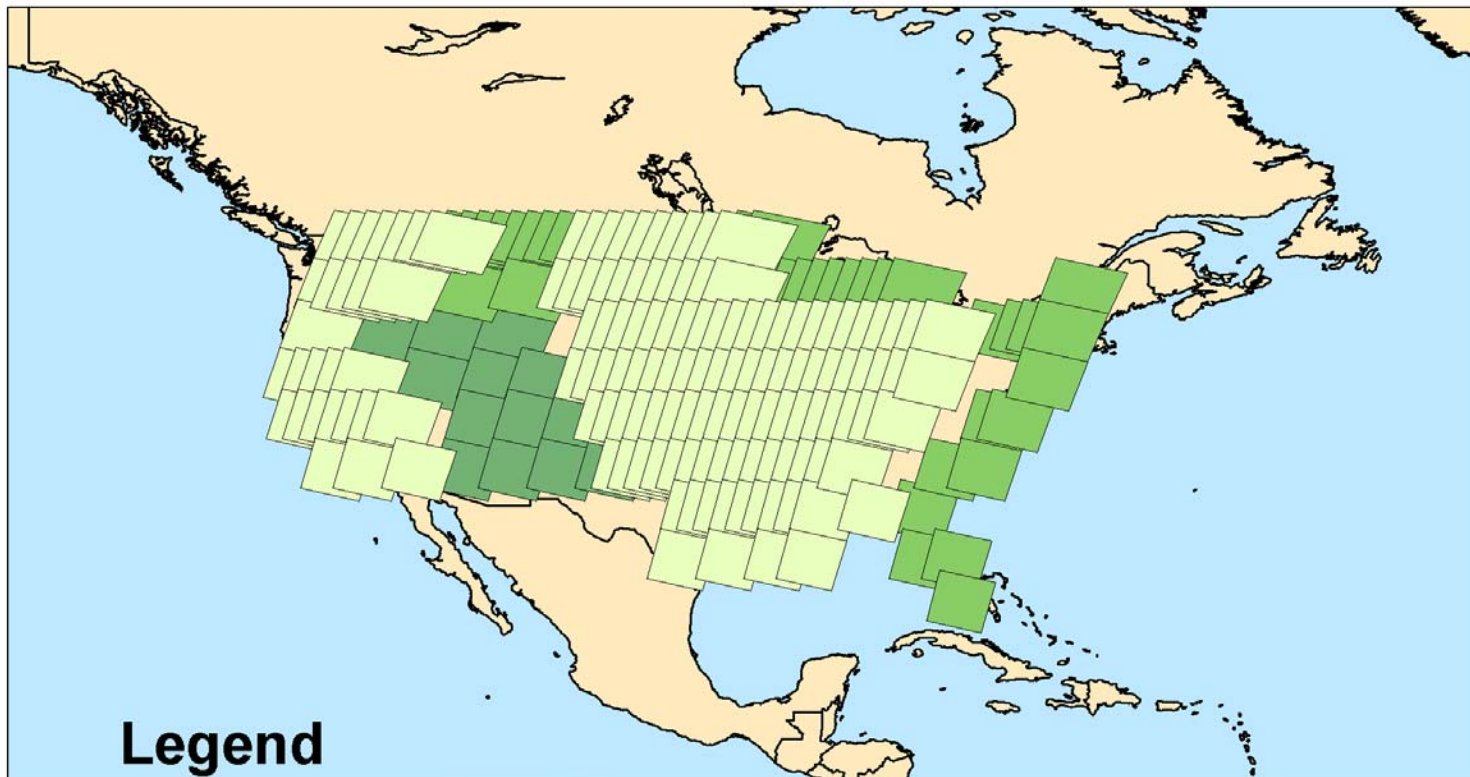
6 July 2007







**Department of Space**  
Indian Space Research Organisation

# Foreign Ag Service Cooperation

USDA's US Standing Order: Resourcesat-1 AWiFS in FY2007  
June 1 to Sept. 30



## Legend

-  FY2007\_USA\_07 April
-  FY2007\_USA\_07 May
-  FY2007\_USA\_07 June
-  International Border\_ESRI



The USDA's P6-AWiFS US standing order is displayed; however, only the scenes which are <50% cloudy are purchased.

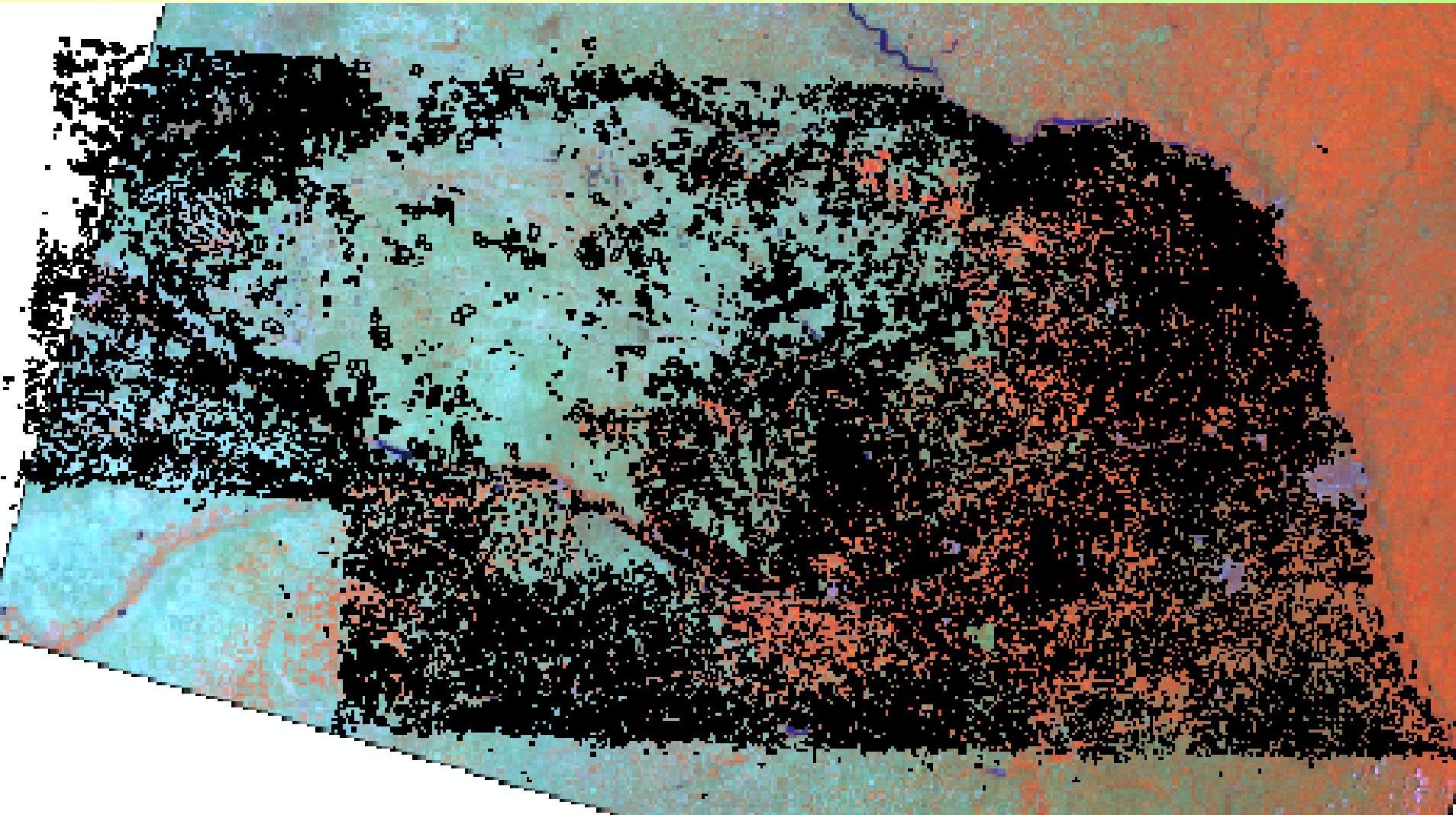
For more information, please contact  
Robert Tetraut (202) 690-0130 [robert.tetraut@usda.gov](mailto:robert.tetraut@usda.gov)

# Cropland Data Layer Components



- *AWiFS* sensor
- Common Land Unit/578 Admin Data
  - USDA/Farm Service Agency
    - Training/testing datasets
  - Ancillary training datasets
    - MODIS, NLCD, NED, CDL

# Ground Truth - Agriculture



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

# Definitional Issues

NASS Segment Boundaries

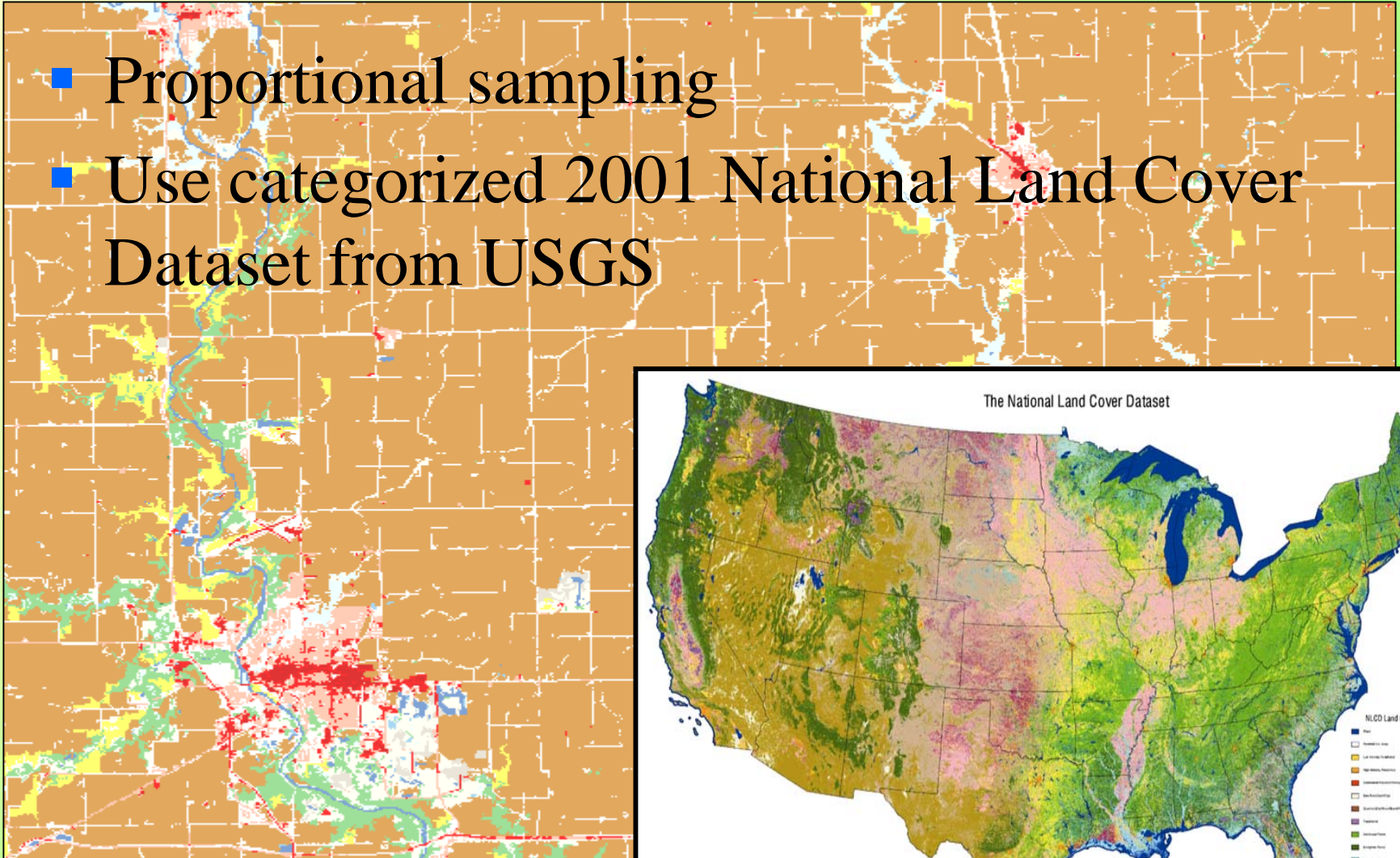


FSA Boundaries

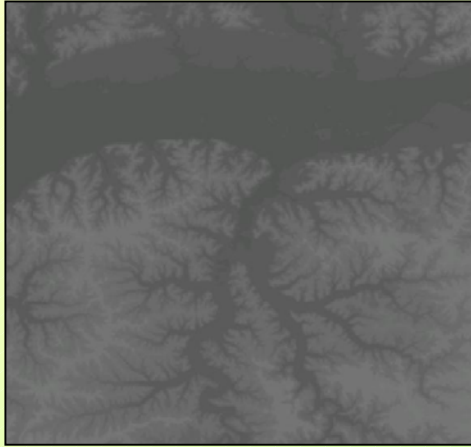


# Ground Truth – Non Agricultural

- Proportional sampling
- Use categorized 2001 National Land Cover Dataset from USGS



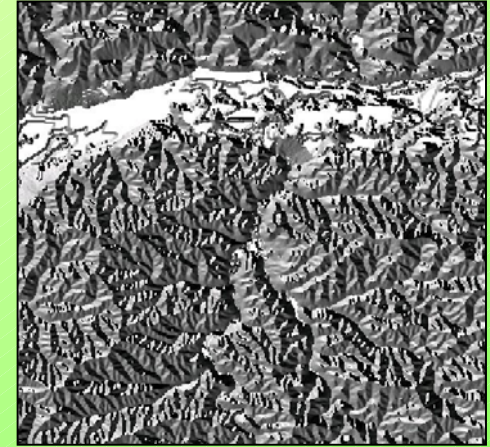
# Ancillary Data – USGS Products



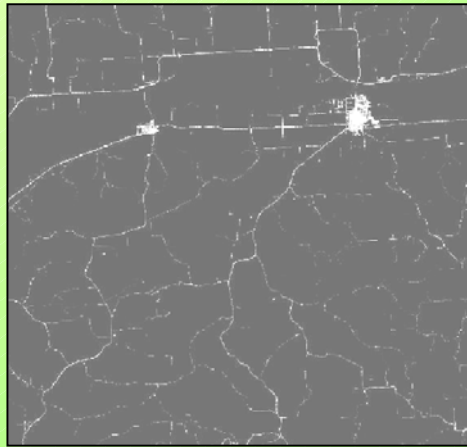
Elevation



Slope



Aspect

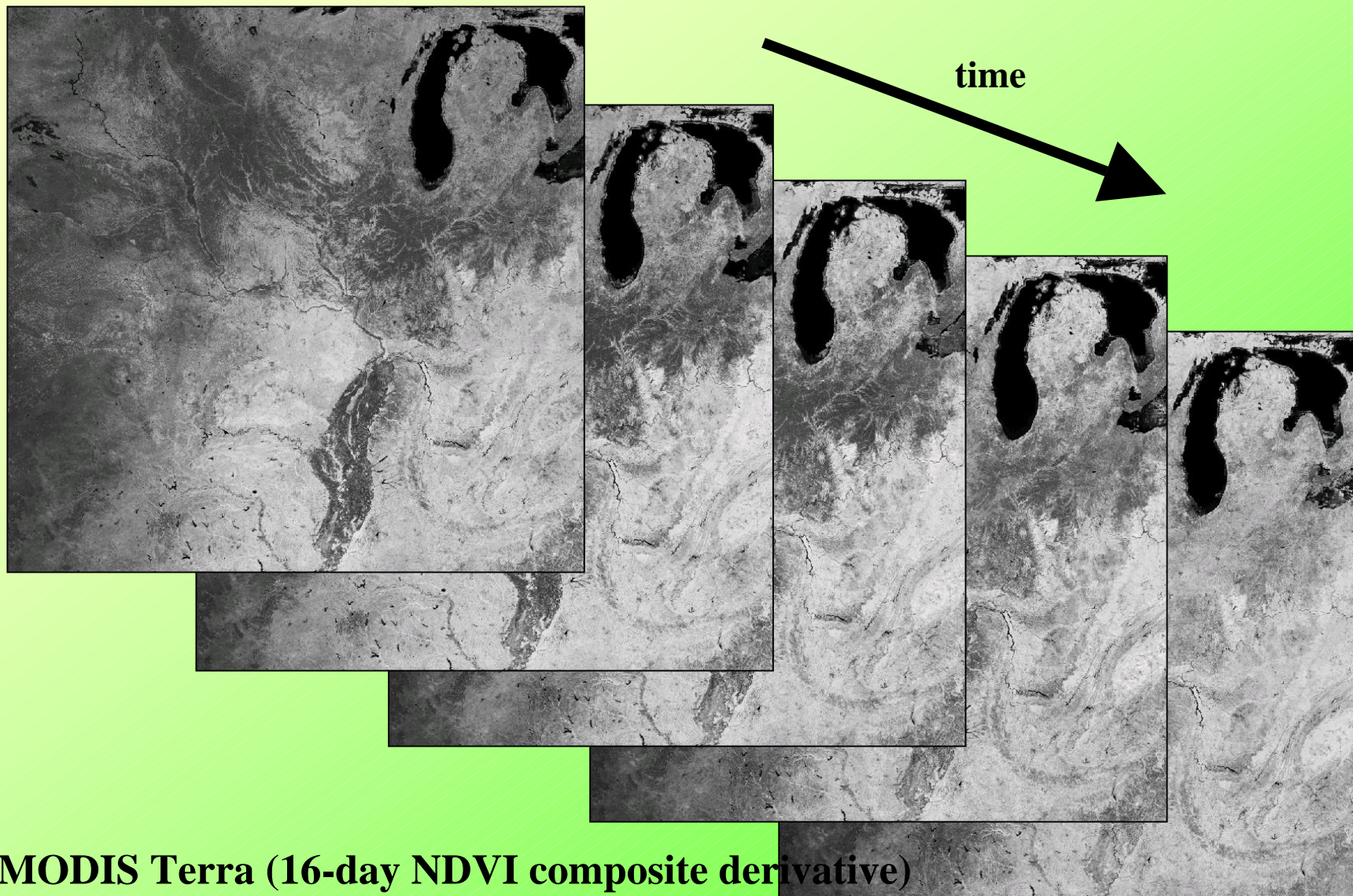


Impervious



Canopy

# MODIS NDVI Imagery



**NASA MODIS Terra (16-day NDVI composite derivative)**

**Time series of current growing season**

**Fall scenes from previous year**



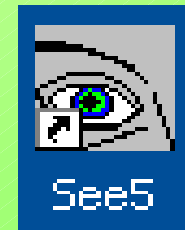
# Cropland Data Layer Components



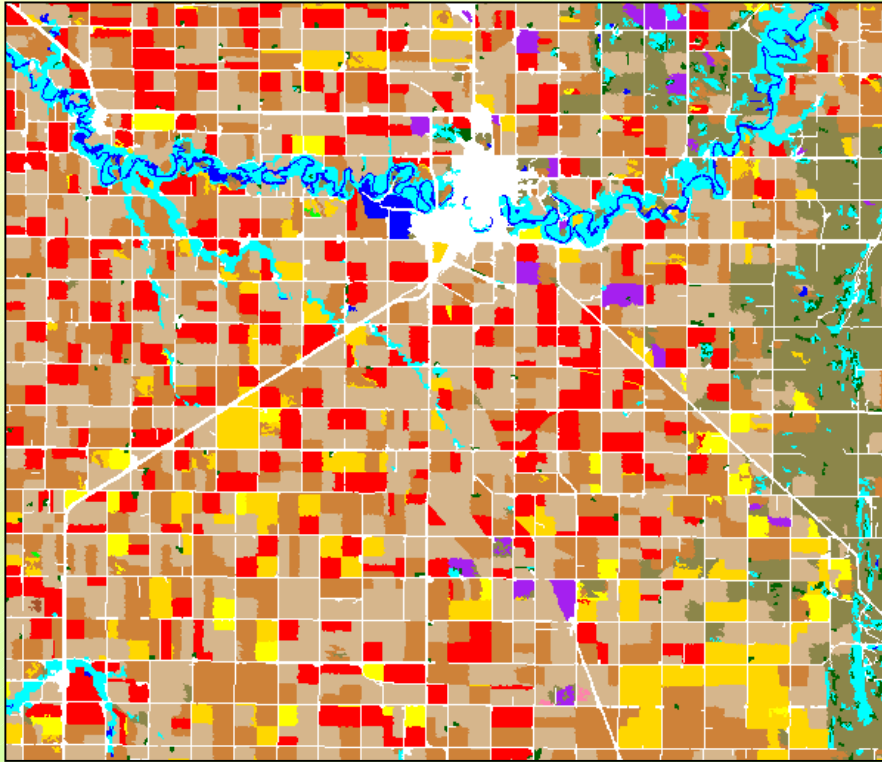
- *A WiFS sensor*
- *Common Land Unit/578 Admin Data*
  - *USDA/Farm Service Agency*
- **Commercial software suite**

# 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



# Example Classification Subset

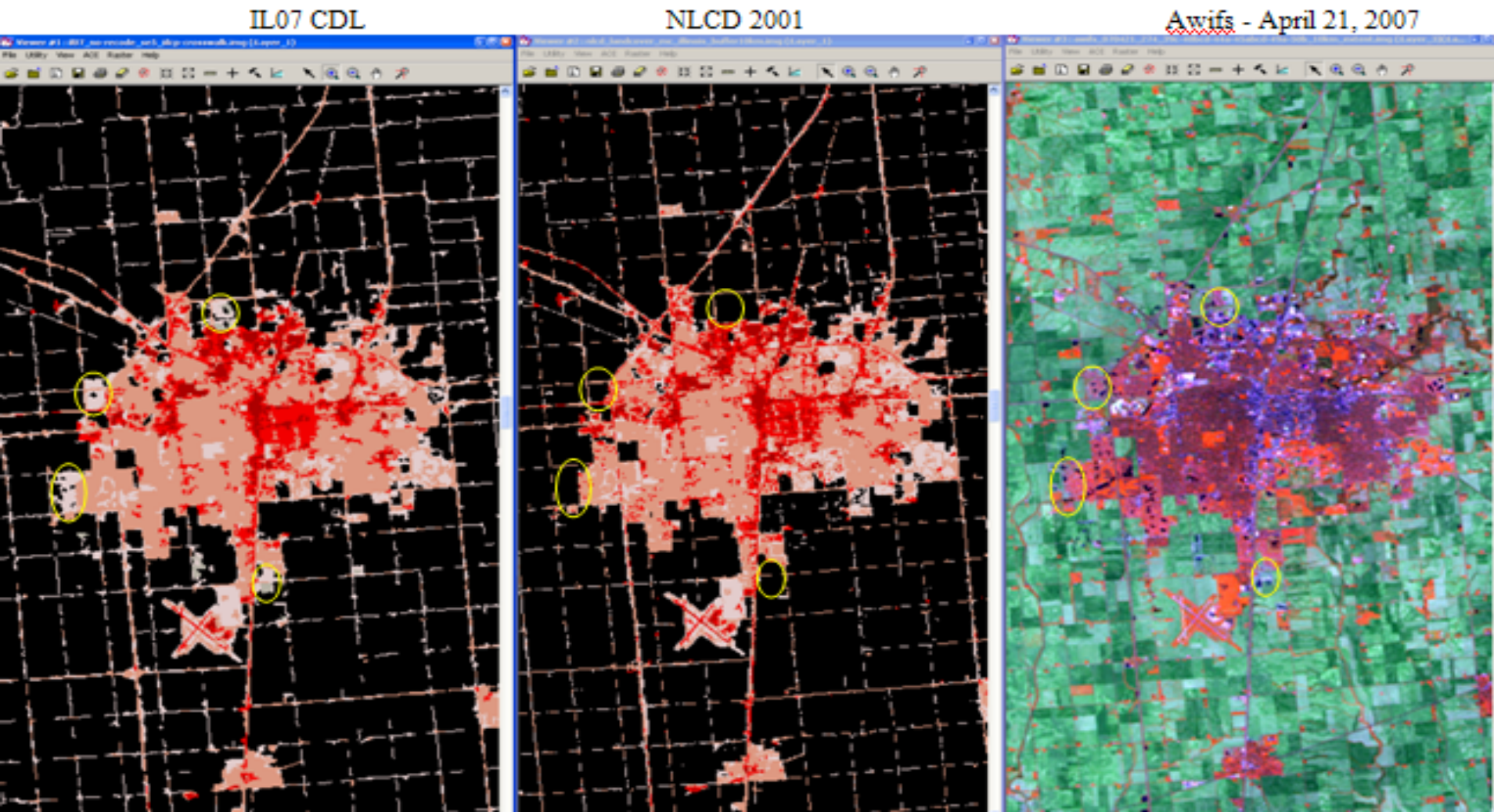


CDL Classification



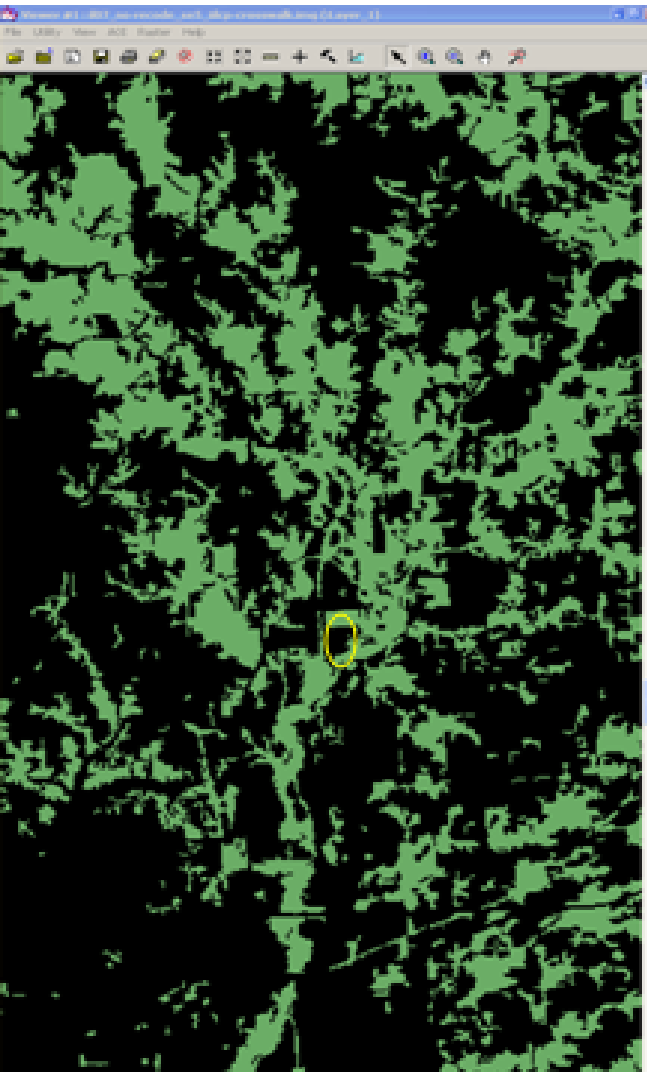
Resourcesat-1 AWiFS, 6 July 2007

# Non Ag NLCD Updates (urban sprawl)

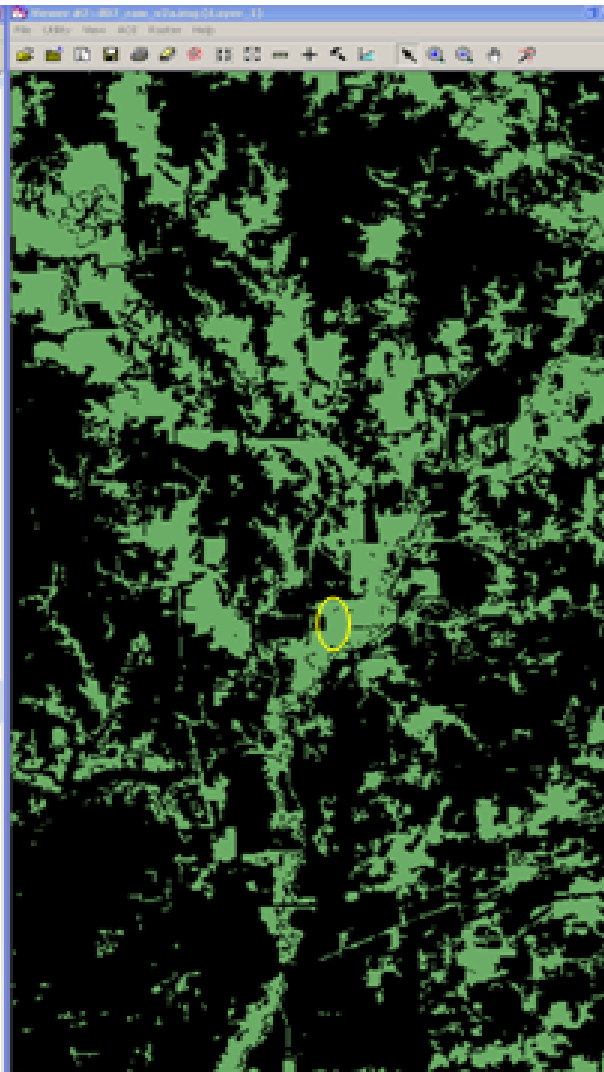


# Non Ag NLCD Updates (forest clearing)

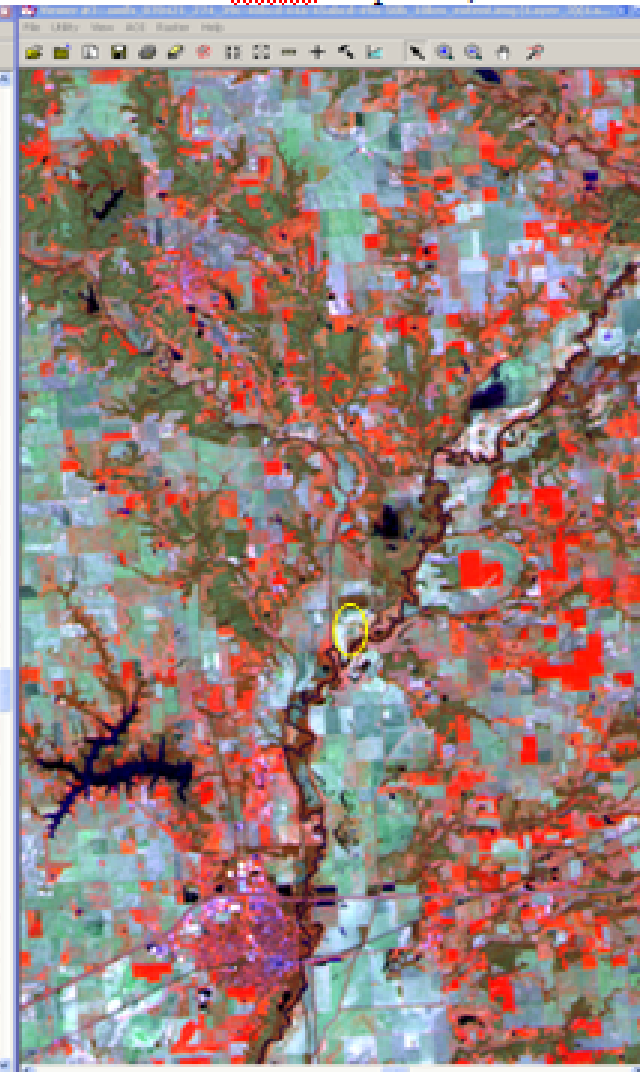
IL07 CDL



NLCD 2001

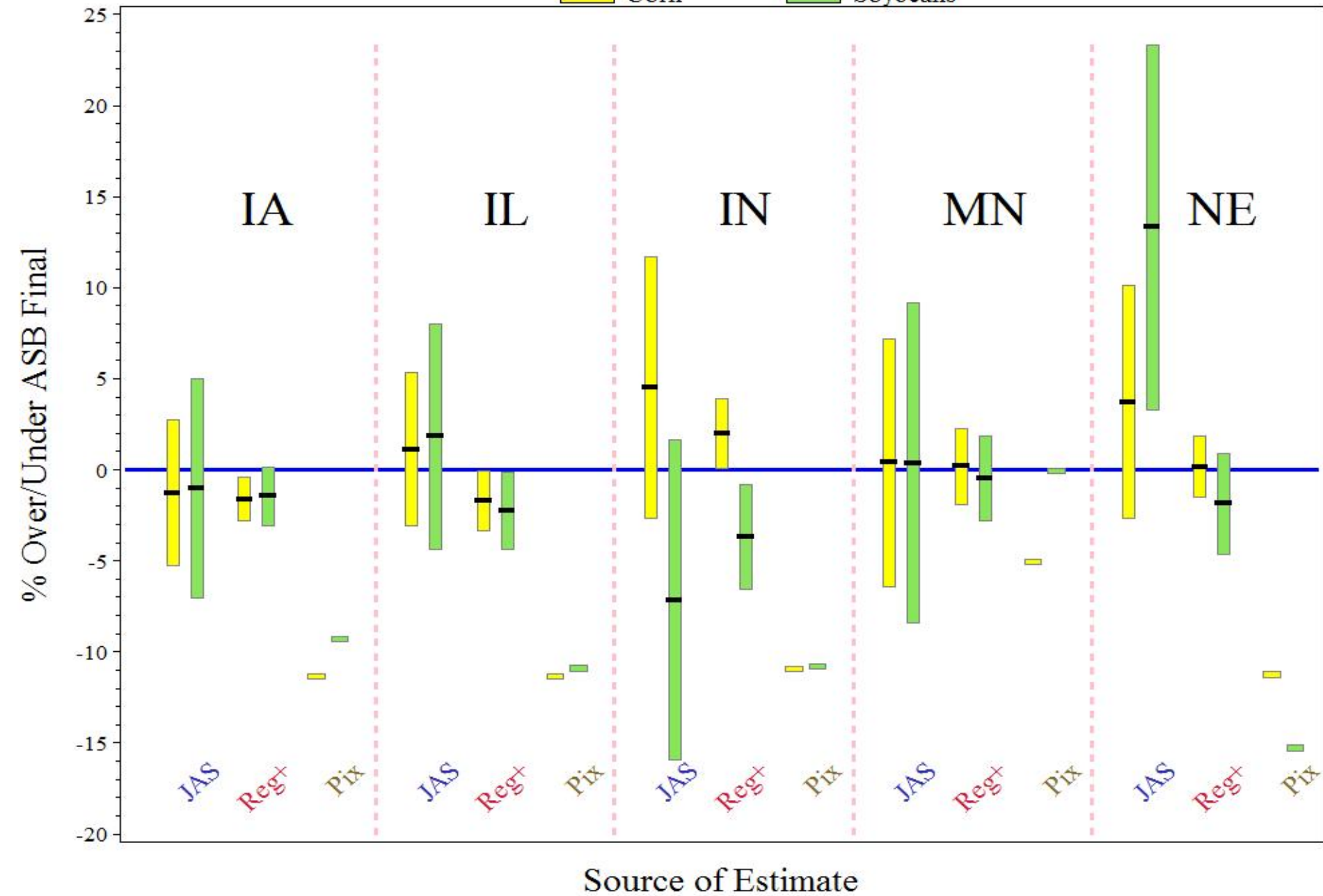


Awifs - April 21, 2007



# 2007 State Level Estimates +/- 2% CVs

Corn Soybeans

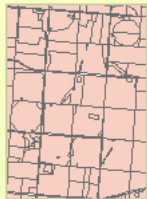


# Cropland Data Layer and Acreage Estimation Processing Flow

## Input Vector Data

NASS JAS segments

FSA CLU



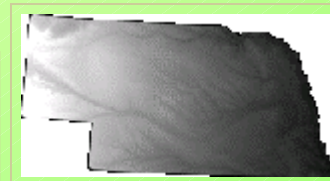
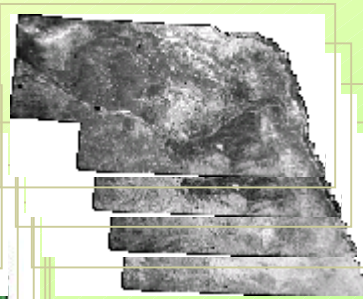
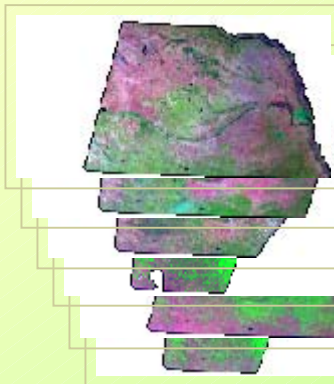
## Input Raster Data

IRS Resourcesat-1 raw AWiFS summer time series

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

USGS NLCD circa 2001 Impervious & Canopy

USGS NED Elevation



## Tabular Data

JAS eData

FSA 578

Segment ID	Area (Acres)	Perimeter (Miles)
1	1.000	0.100
2	2.000	0.200
3	3.000	0.300
4	4.000	0.400
5	5.000	0.500
6	6.000	0.600
7	7.000	0.700
8	8.000	0.800
9	9.000	0.900
10	10.000	1.000

Segment ID	Area (Acres)	Perimeter (Miles)
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3	3.000	0.300
4	4.000	0.400
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7	7.000	0.700
8	8.000	0.800
9	9.000	0.900
10	10.000	1.000

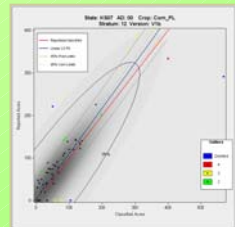
All Input layers gridded to common cell size, map projection and areal extent



Extract JAS intersecting pixels



Customized for acreage estimation



Pixel count v. reported acreage



Link and assess data sets



Ground truth



Manages and visualizes datasets



Derives decision tree-based classification rules



Generated rule set

**-- Cropland Data Layer --**  
[datagateway.nrcs.usda.gov](http://datagateway.nrcs.usda.gov)

State and county crop acreage statistics

Internal to NASS only

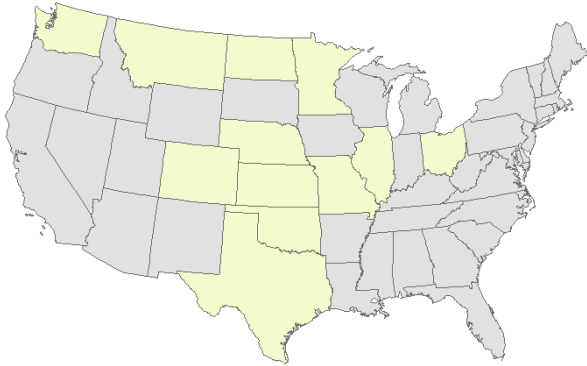
Confidence Layer

Accuracy Assessment

## Output

## Diagnostics

# CDL 2008?



Primary Wheat States



Primary Cotton States

- Expand geographic scope?
  - Wheat/cotton states next priority
  - Mid-Atlantic region (often asked about)
- Improved categories?
  - Grassland/Non Ag
- Imagery?
  - Future sensors
  - Finer resolution
- Other ancillary data?
  - Soils
  - Climate
- Derivatives?
  - Change detection
  - Crop rotation patterns
- Move up estimates delivery
  - Another 60 days to mid-August



# Thank You

Rick Mueller, Claire Boryan, Mike Craig, Dave Johnson,  
Bob Seffrin, Patrick Willis, Larry Beard, Zhengwei Yang

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



Geospatial Data Gateway

the one stop source of natural resources data

The Geospatial Data Gateway provides One Stop Service for natural resources or environmental data from anywhere, to anywhere, allowing you to choose the format, browse and select data, customize the format, and download or shipped on CD or DVD.

SYSTEM

All products and services are available normally. Due to unavailability of these products, orders will be processed within 30 days to complete. To download other products, please await NAIP completion.

NAIP 2003, 2004 are unavailable due to the data service site. For these products, please contact the data service site.

Effective 13-DEC-06 for Step 1 and 2. The data is available and installed [Here](#). **Items 2 & 3** on the data service site are available in your browser.