**Dave M. Johnson**
**Geographer**

**United States Department of Agriculture**
**National Agricultural Statistics Service**
**Research and Development Division**
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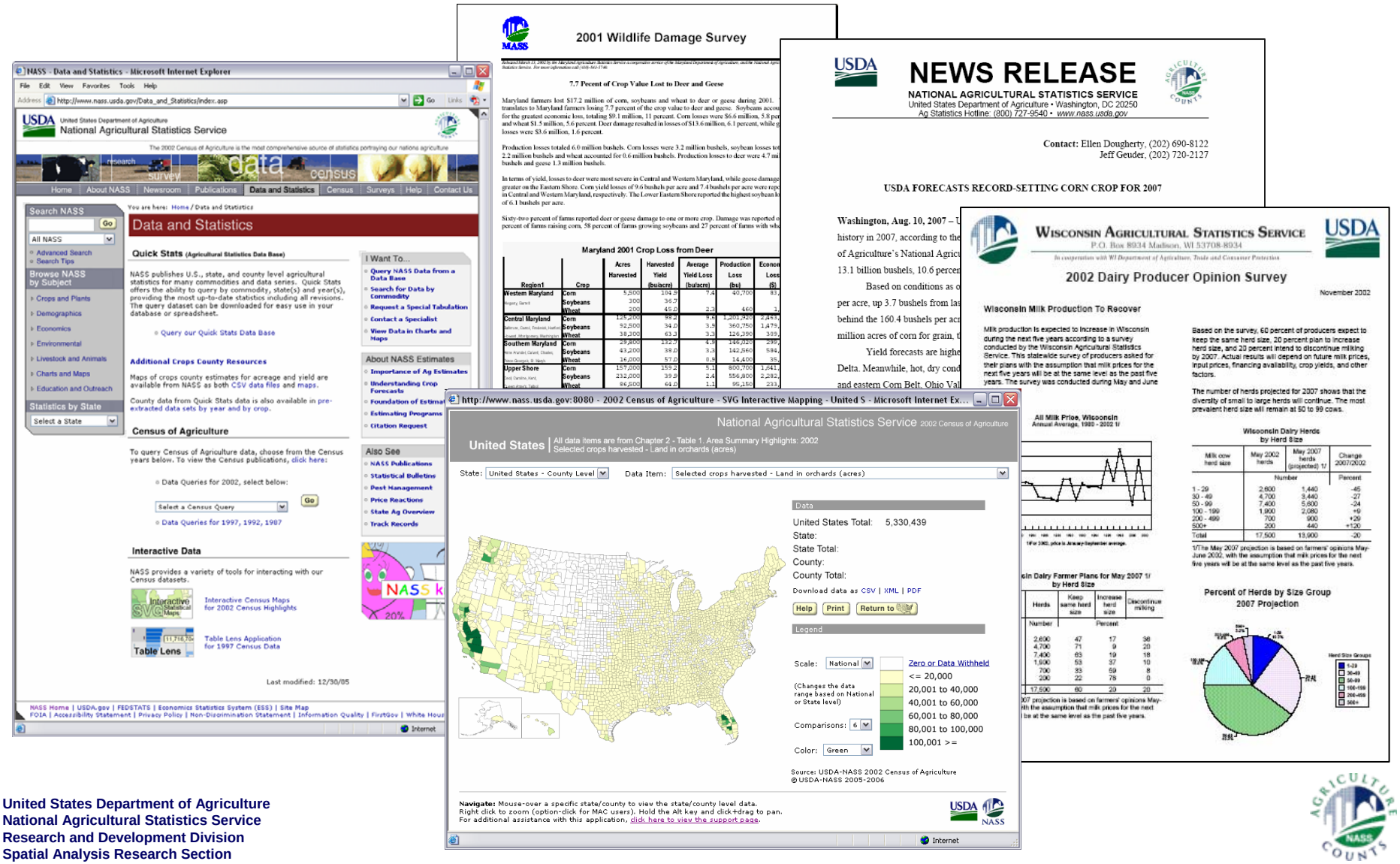
# The 2007 Cropland Data Layer

# NASS Overview

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

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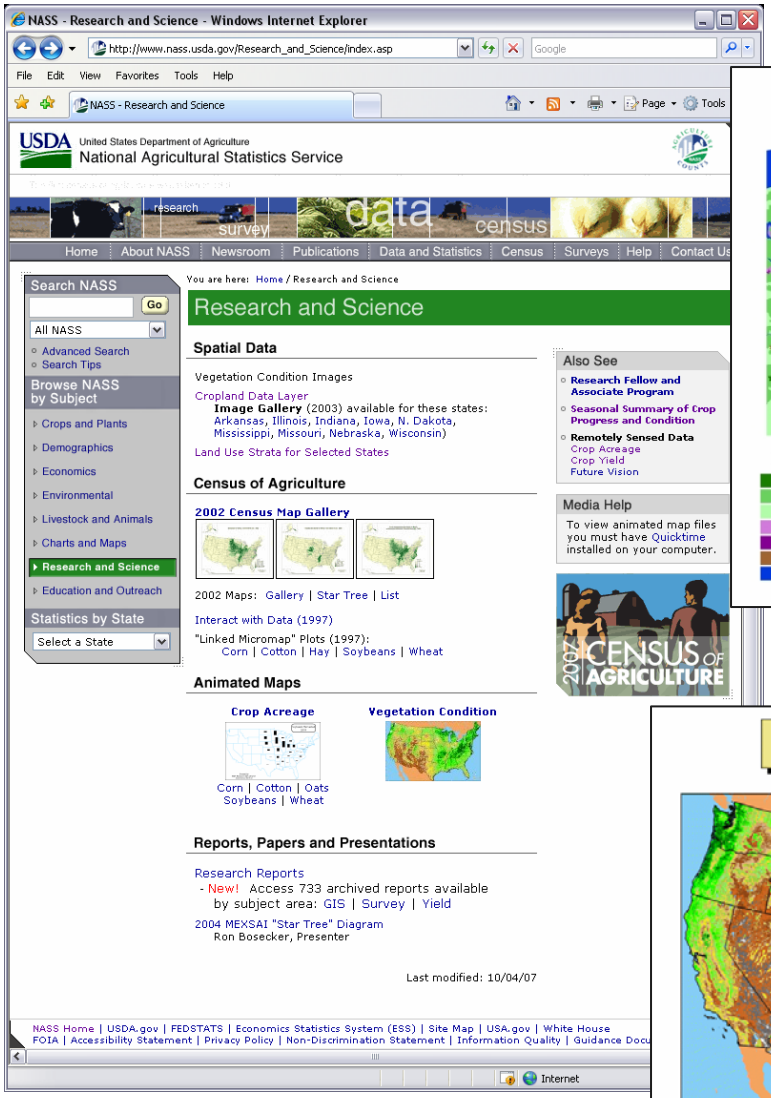
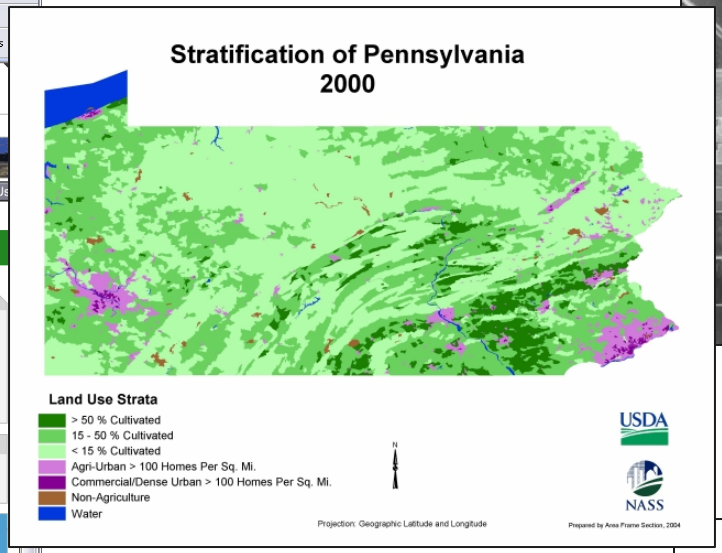
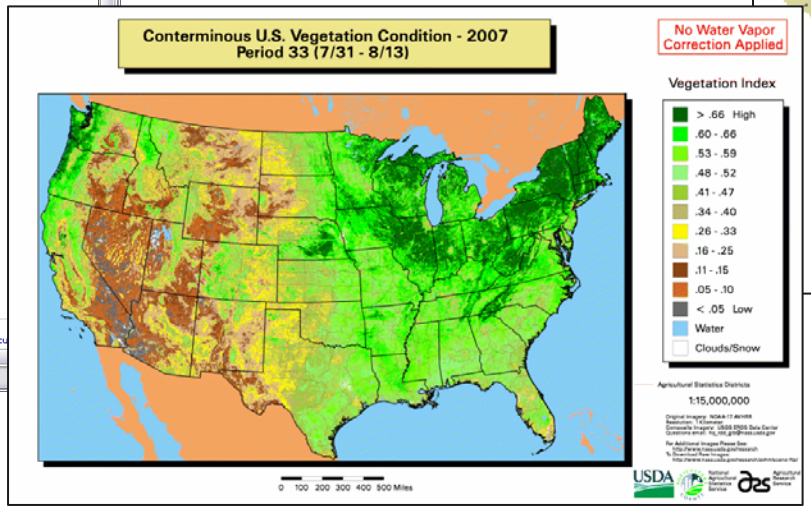
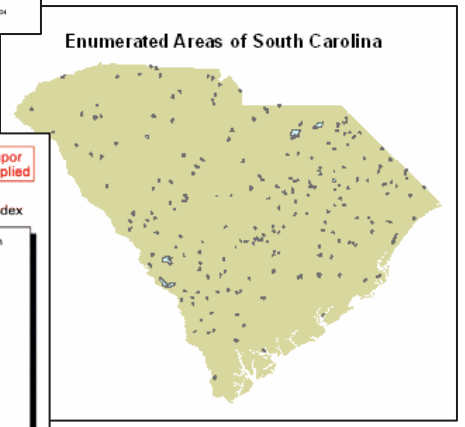
# Research and Development Division

## Geospatial Information Branch





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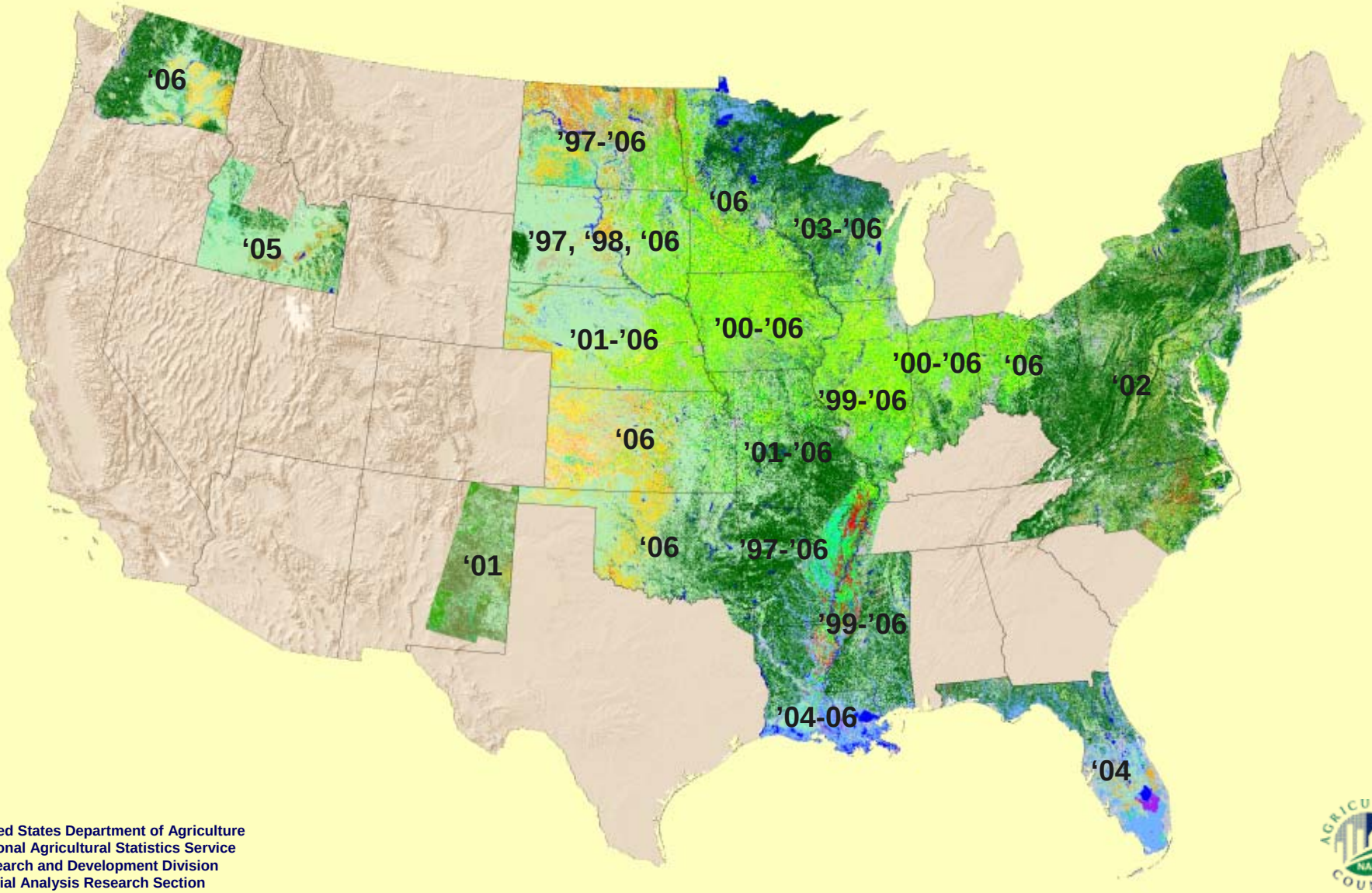
# Cropland Data Layers

## The first decade: 1997 - 2006

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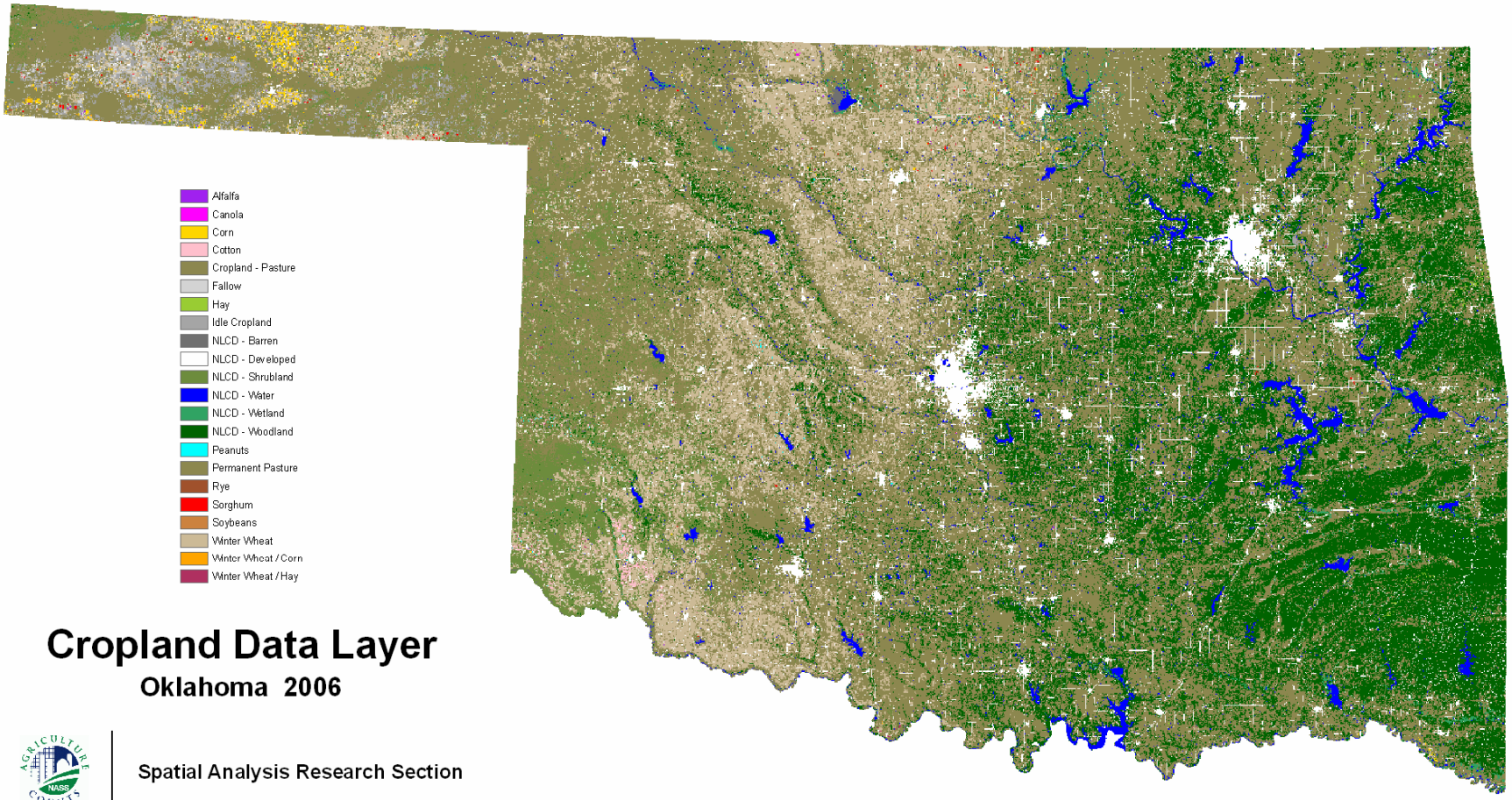
# Example Statewide CDL




**Cropland Data Layer**

**Oklahoma 2006**

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# Cropland Data Layer Uses

## Within NASS

- Refined state-wide acreage estimates
- Improved county-wide acreage estimates
- Tightened confidence intervals on all survey derived acreage estimates

## Outside NASS

- Watershed runoff modeling
- Agribusiness planning
- Ground truth
- Change detection
- Water use mapping
- Epidemiological research
- Habitat monitoring
- Carbon sequestration analysis
- …..and more

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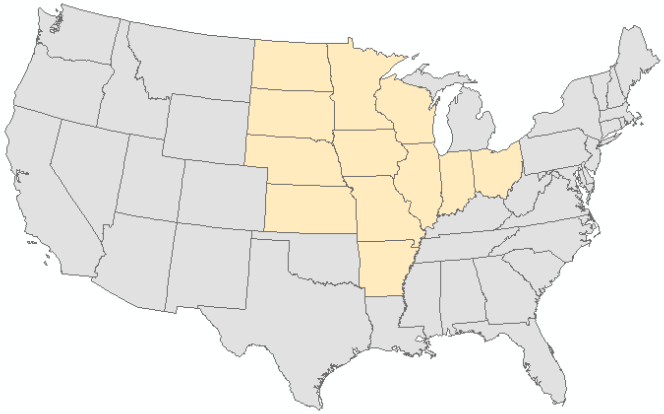
# Goals for 2007 CDL

- Document/map growing season land cover for majority of the US intensive agricultural area



- Derive large area acreage estimates for two dominant commodities

Corn

Soybeans

- Complete by early October

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# Classification Categories

**Cropland**

- Corn
- Soybeans
- Winter Wheat
- Cotton
- Spring Wheat
- Sorghum
- Oats
- Barley
- Rice
- Sunflowers
- Durum Wheat
- Dry Beans
- … and more

**Non-Cropland**

- Water
- Developed
- Barren
- Woodland
- Shrubland
- Grassland
- Wetland

# 2007 CDL Inputs

- IRS Resourcesat-1 AWiFS Imagery (raw reflectance)
  - Minimum of three scenes during growing season
- NASA MODIS Terra (16-day NDVI composite derivative)
  - Time series of current growing season
  - Fall scenes from previous year
- USGS Ancillary datasets
  - National Land Cover Dataset (NLCD)
    - Impervious
    - Canopy
  - National Elevation Dataset (NED)
    - Elevation
    - Slope
    - Aspect

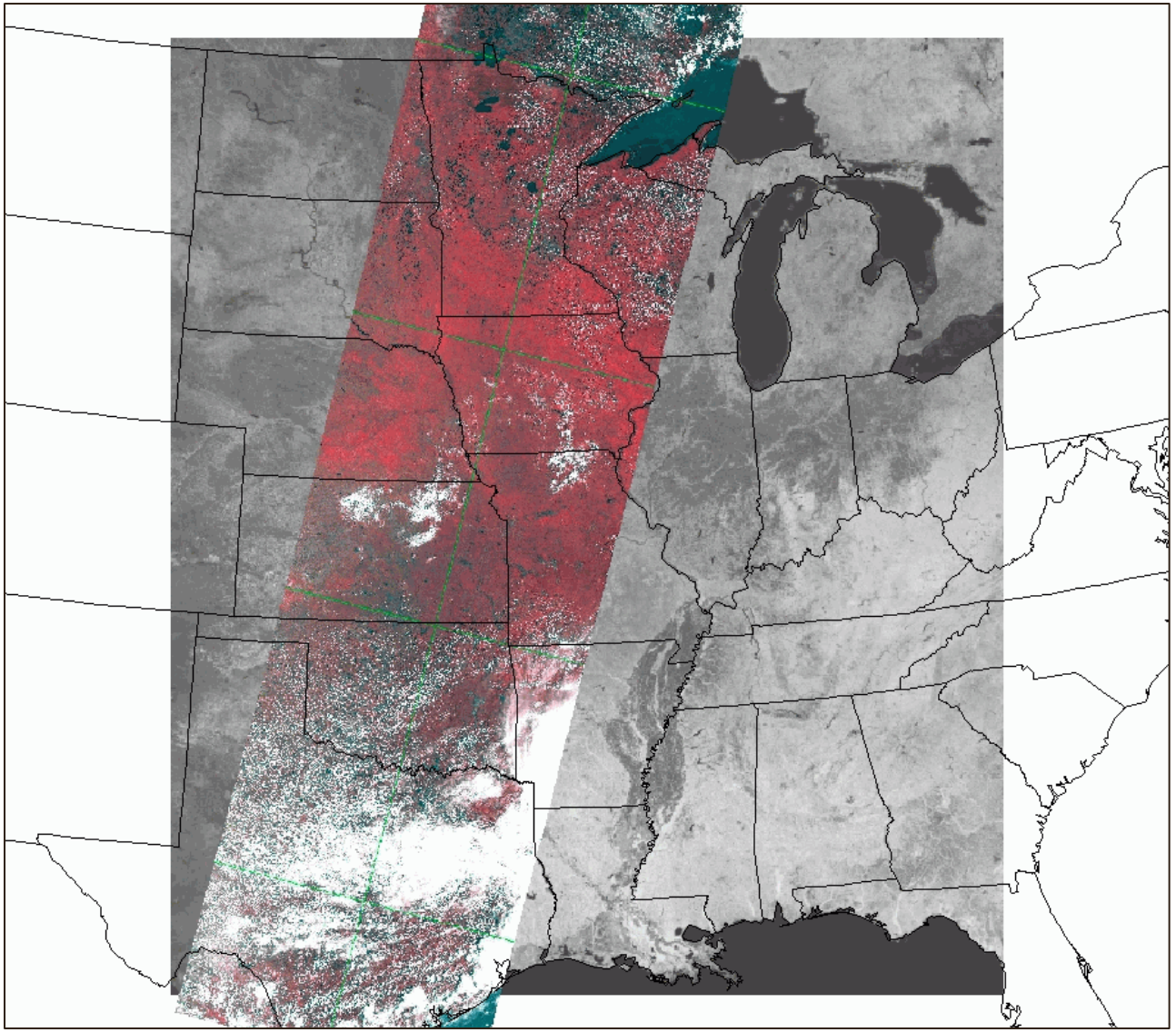
# IRS Resourcesat-1 AWiFS Imagery

740 km swath width

5-day revisit

4 spectral bands
- green
- red
- near-infrared
- short-wave infrared

56 m ground sample resolution



6 July 2007

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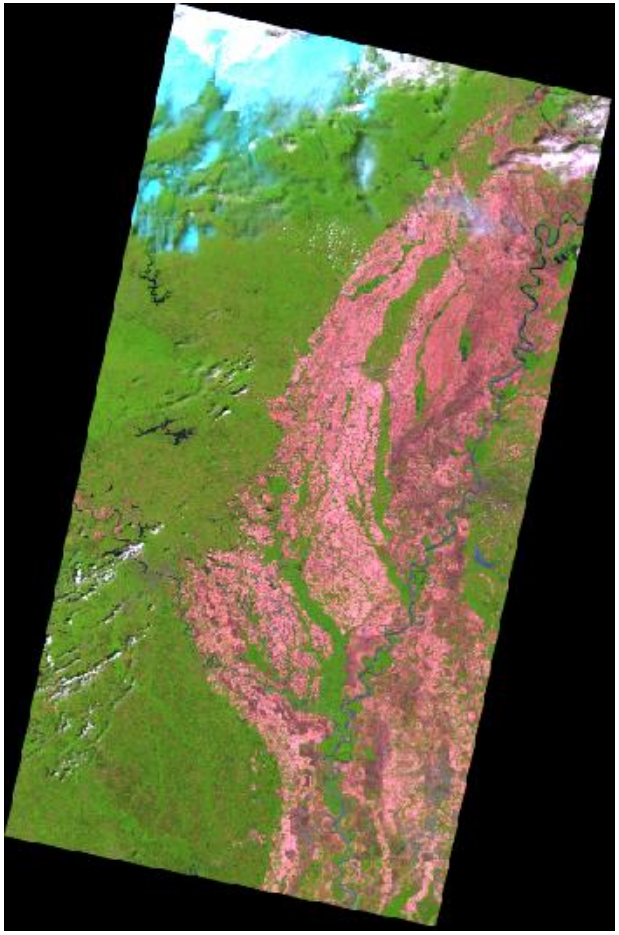
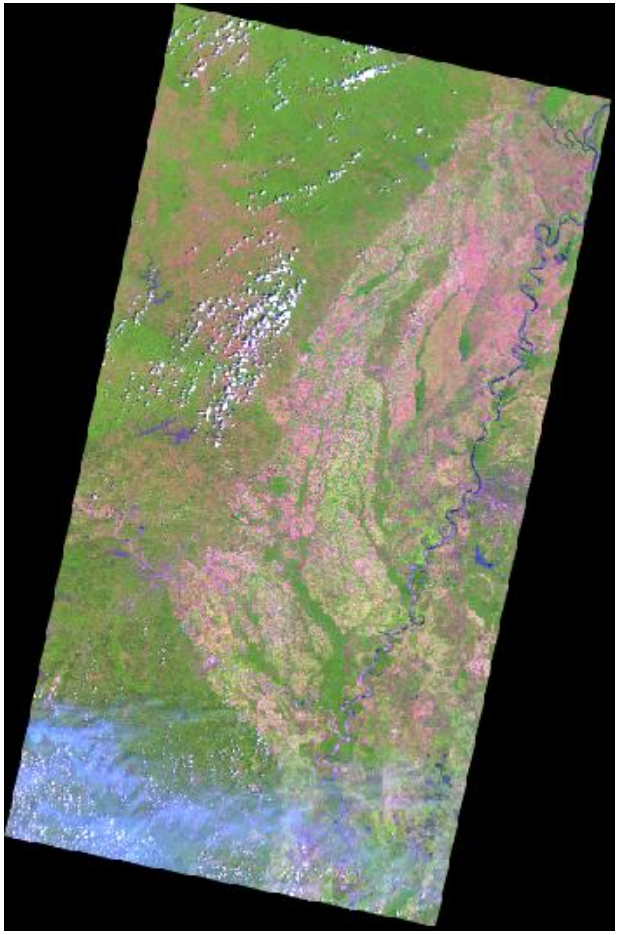
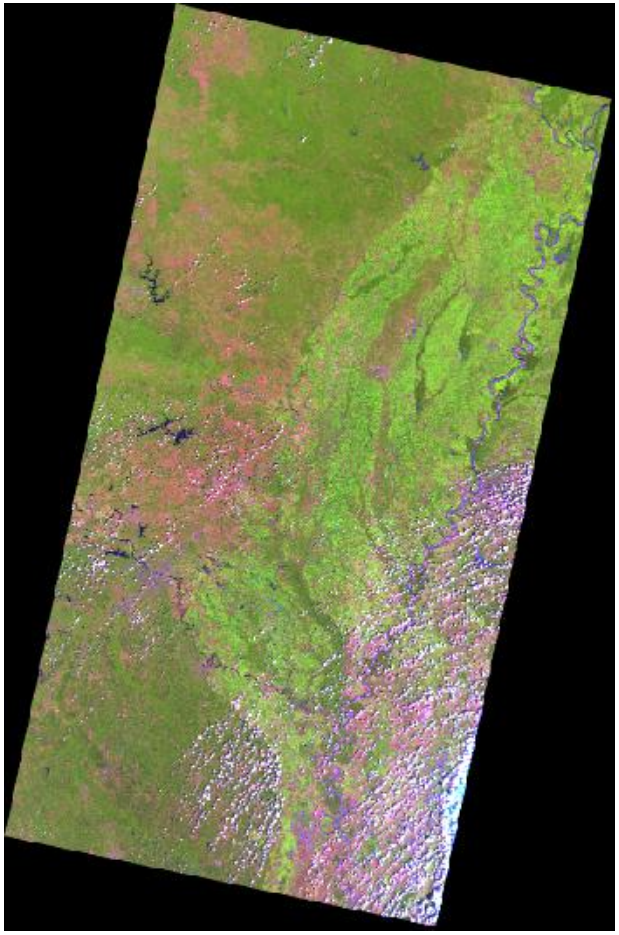
# AWiFS Imagery Time Series



May 20



July 2



July 31

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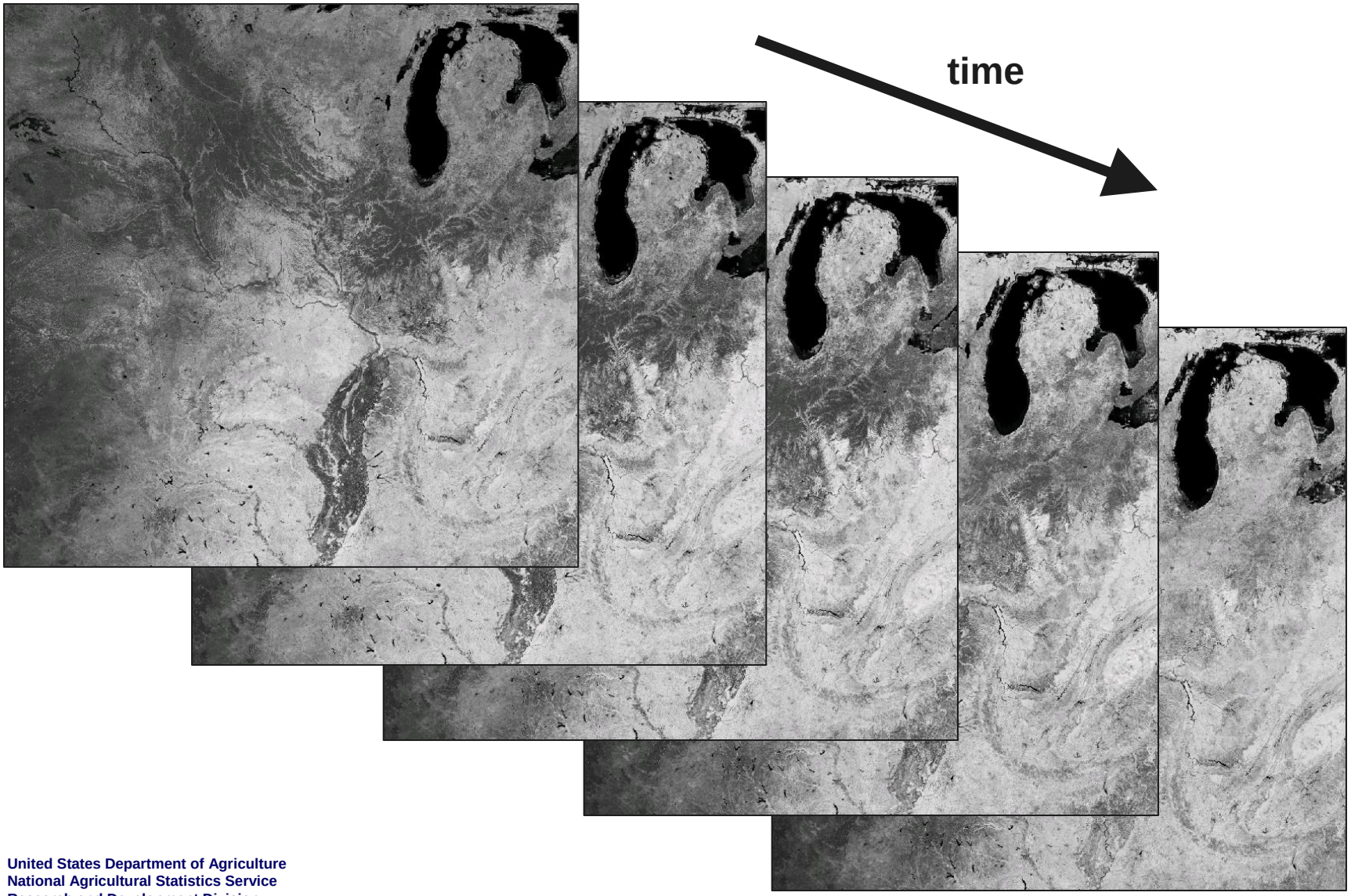
# MODIS NDVI Imagery

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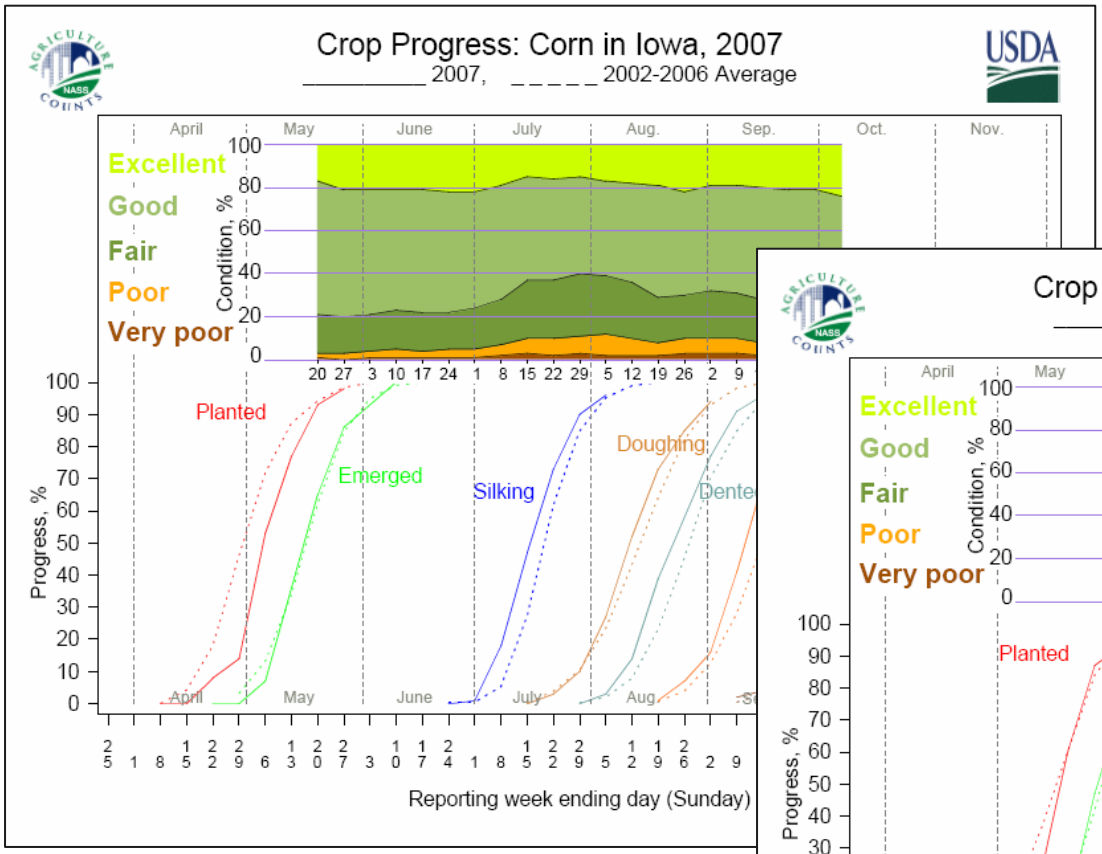
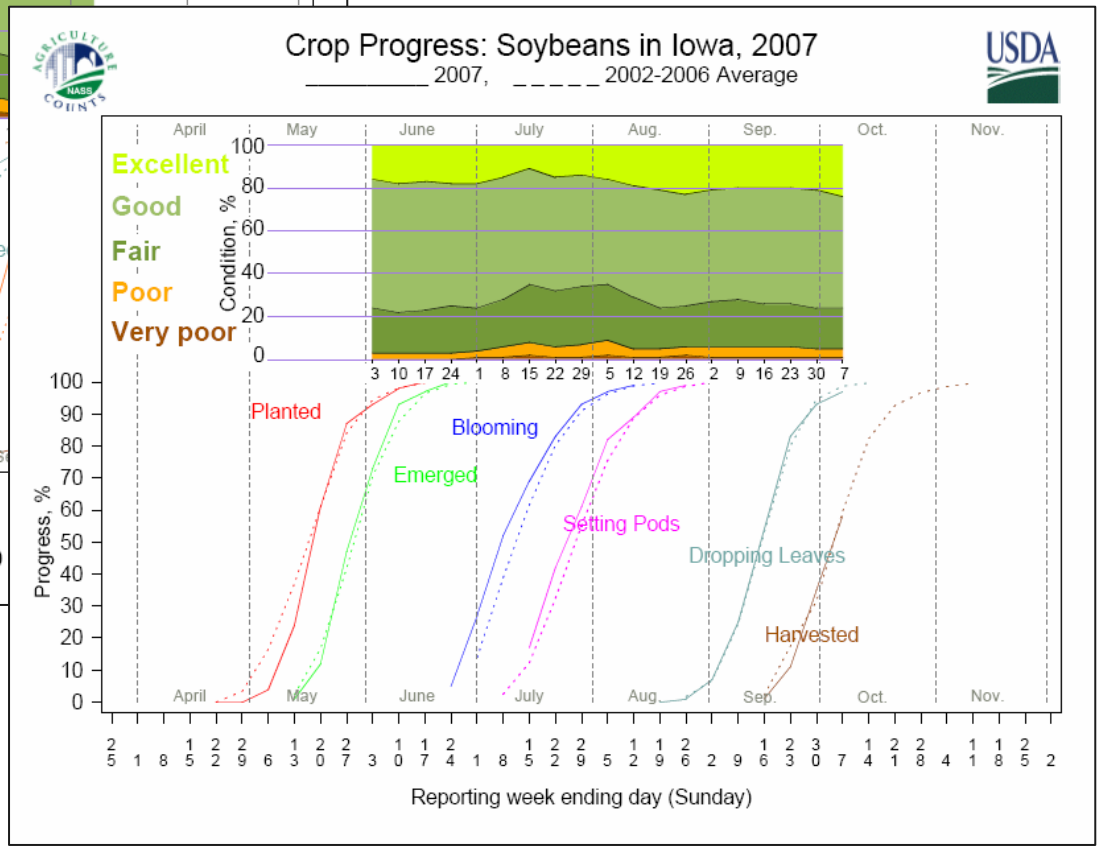
# Image Timing





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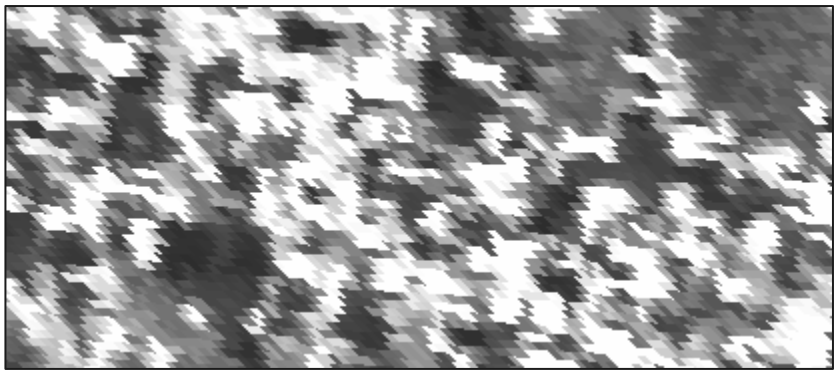
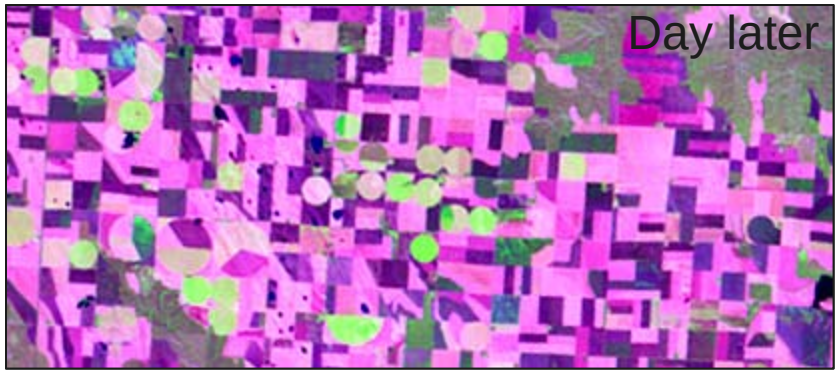
www.nass.usda.gov/research/CropProgress/cpindex.htm

# AWiFS *vs.* MODIS

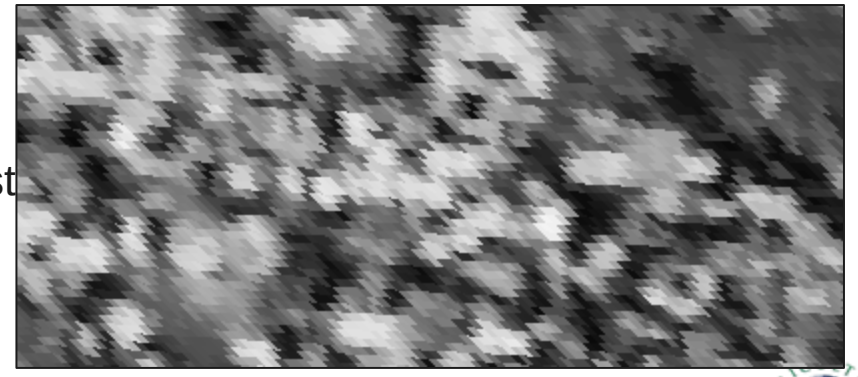
April






June

August



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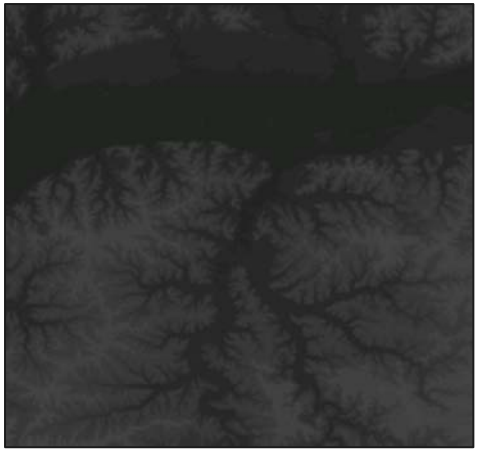
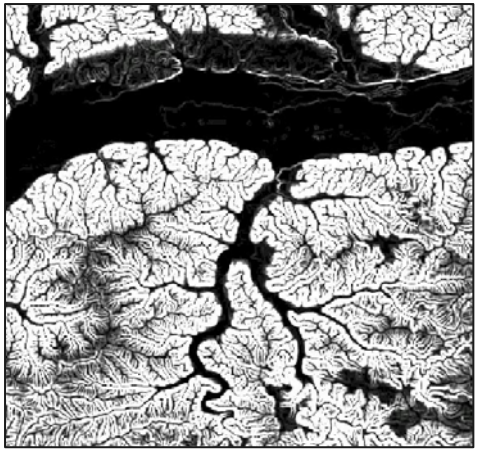
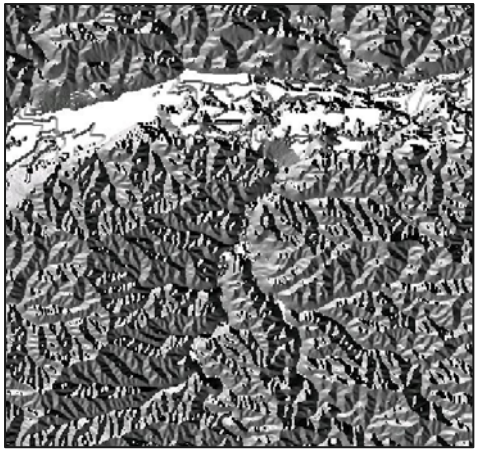
# Ancillary data – USGS products



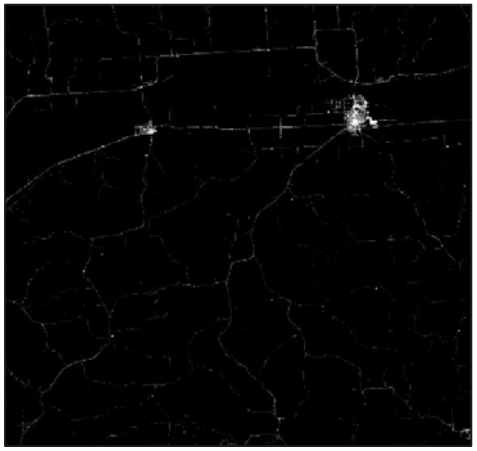
Elevation



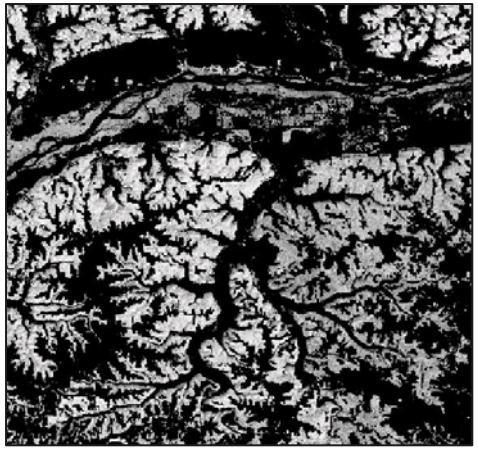
Slope



Aspect



Impervious



Canopy

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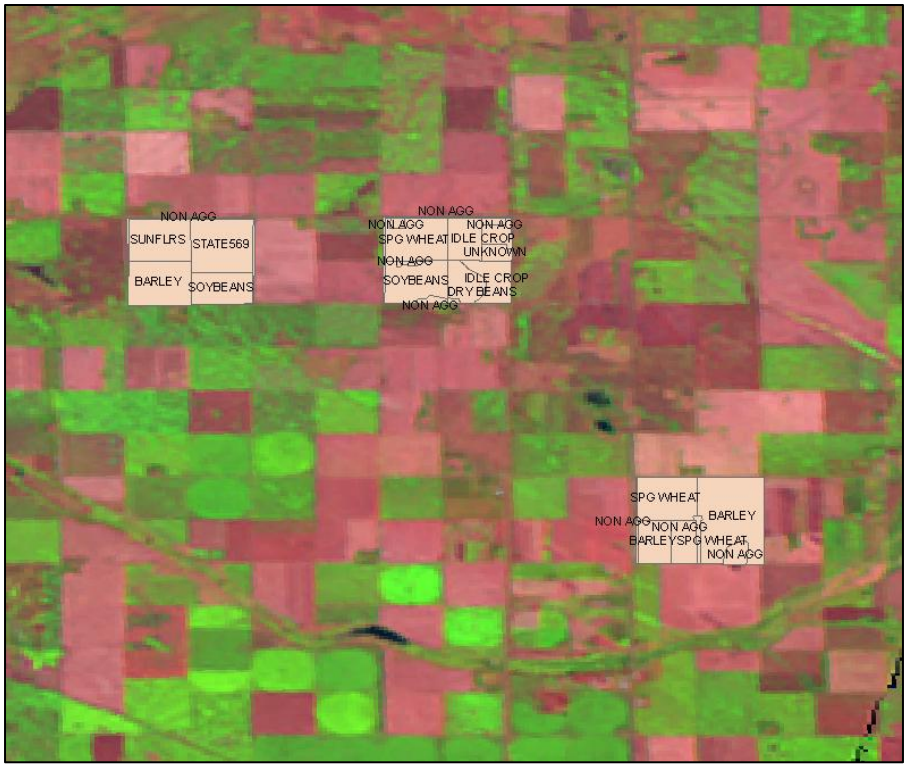
# Ground truth - agriculture

## Farm Service Agency (FSA)

- Common Land Unit (CLU)
- 578 reporting data


FSA




NASS

NASS June Agricultural Survey (JAS) data still used for acreage estimation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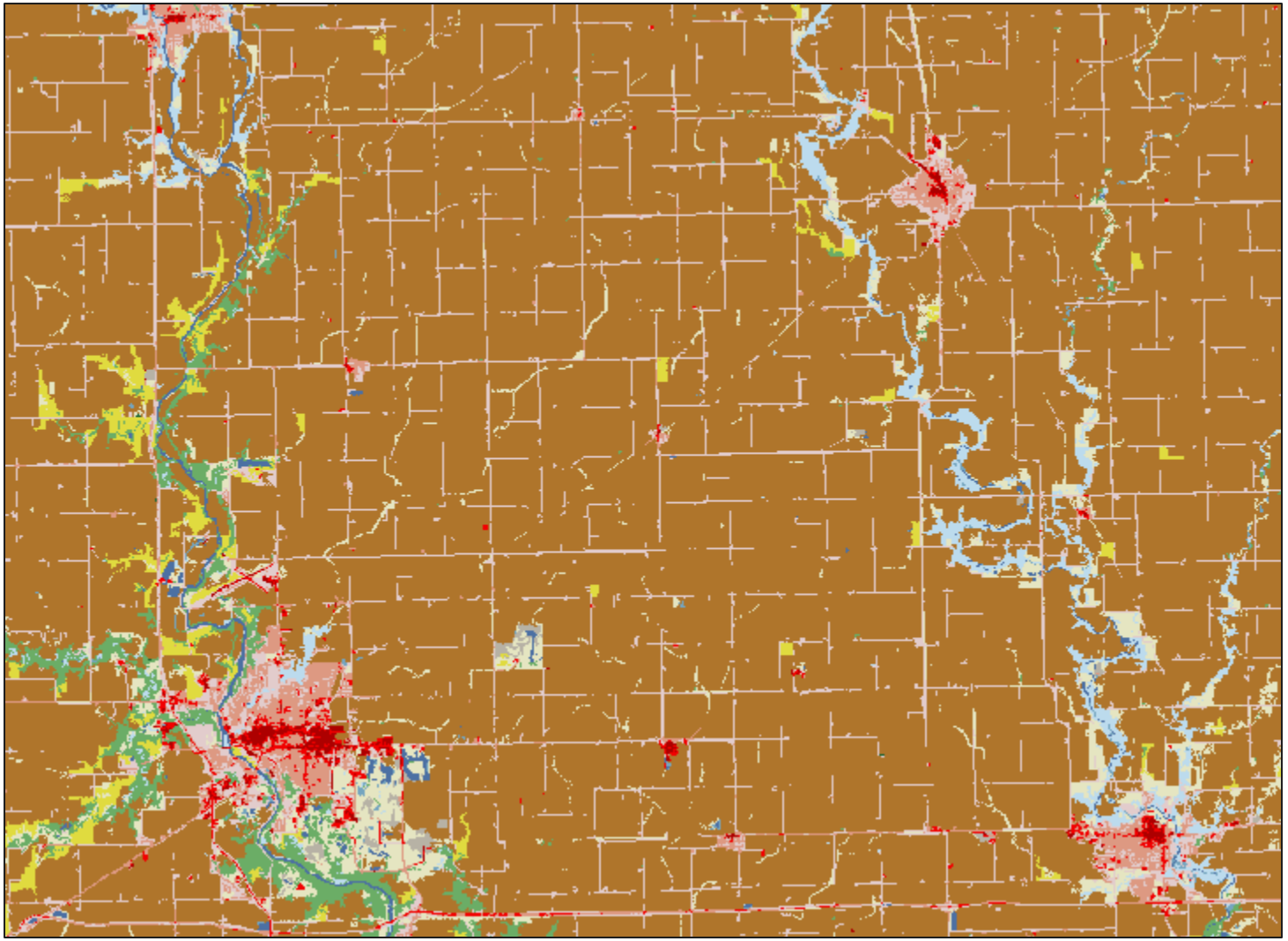
# Ground truth – non agriculture



2001 National Land Cover Dataset

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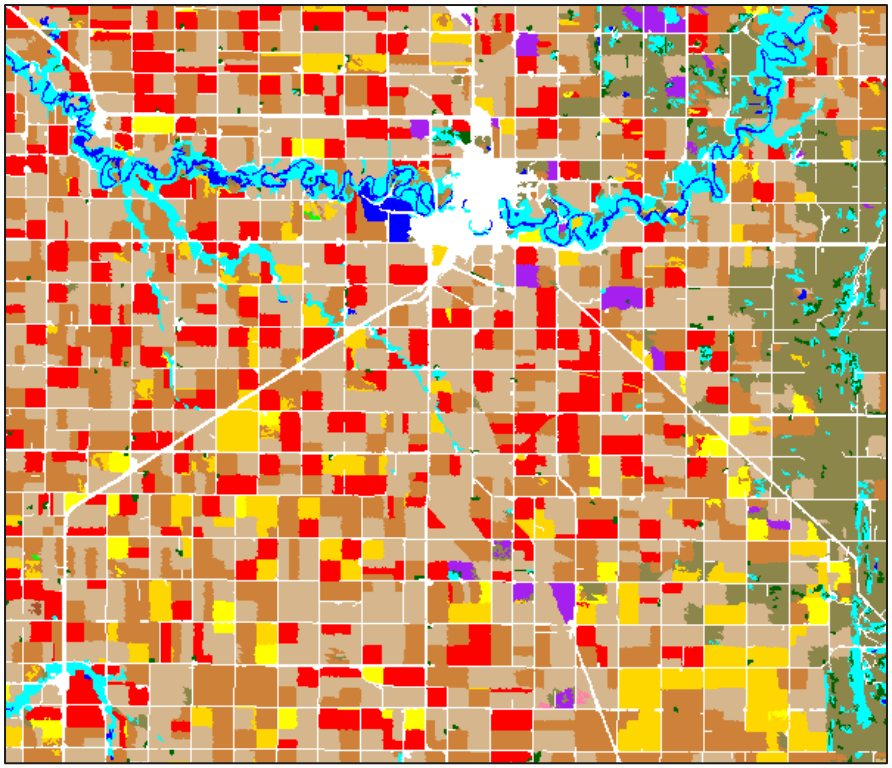
# Methodology

- Analyze areas by state
- “Stack” AWiFS, MODIS, and ancillary data layers within a raster GIS
  - 56 m grid cells, Albers Conic Equal Area projection
- Sample spatially from stack within known ground truth from FSA (for ag. categories) and NLCD (for non ag. categories)
- Data-mine samples using Boosted Classification Tree Analysis to derive best fitting decision rules
  - implemented with Rulequest See5.0
- Apply derived decision rules back to input data stack
- Create land cover map
- Create probability map
- Assess map accuracy
- Derive acreage estimates
  - utilizing customized SAS routines

# Example Classification Subset



CDL Classification

Resourcesat-1 AWiFS, 6 July 2007

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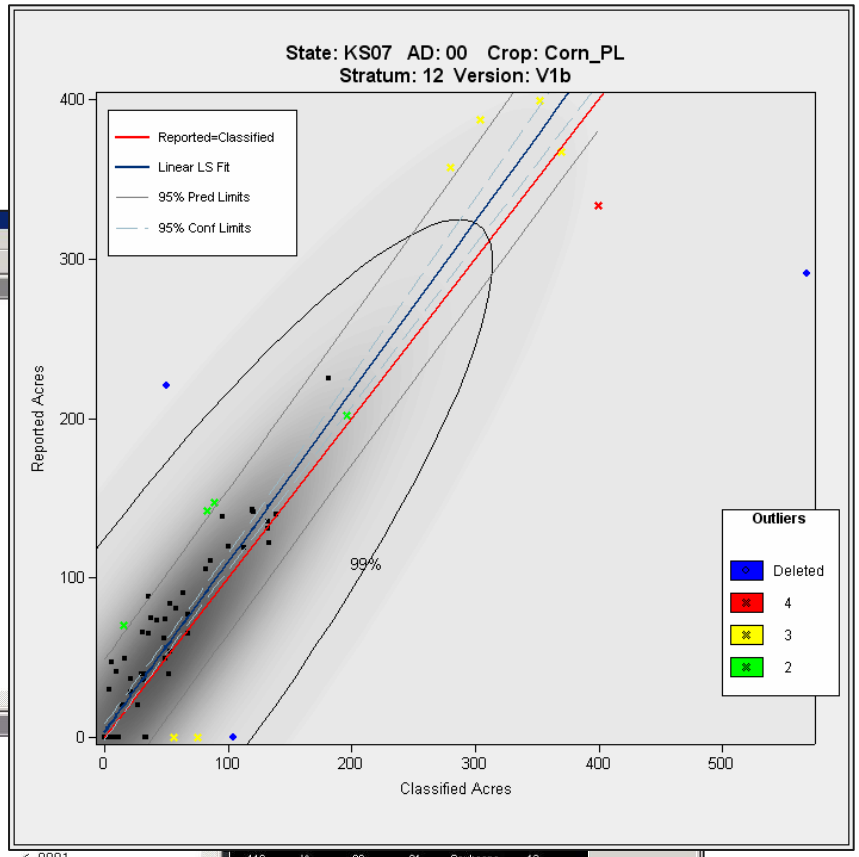
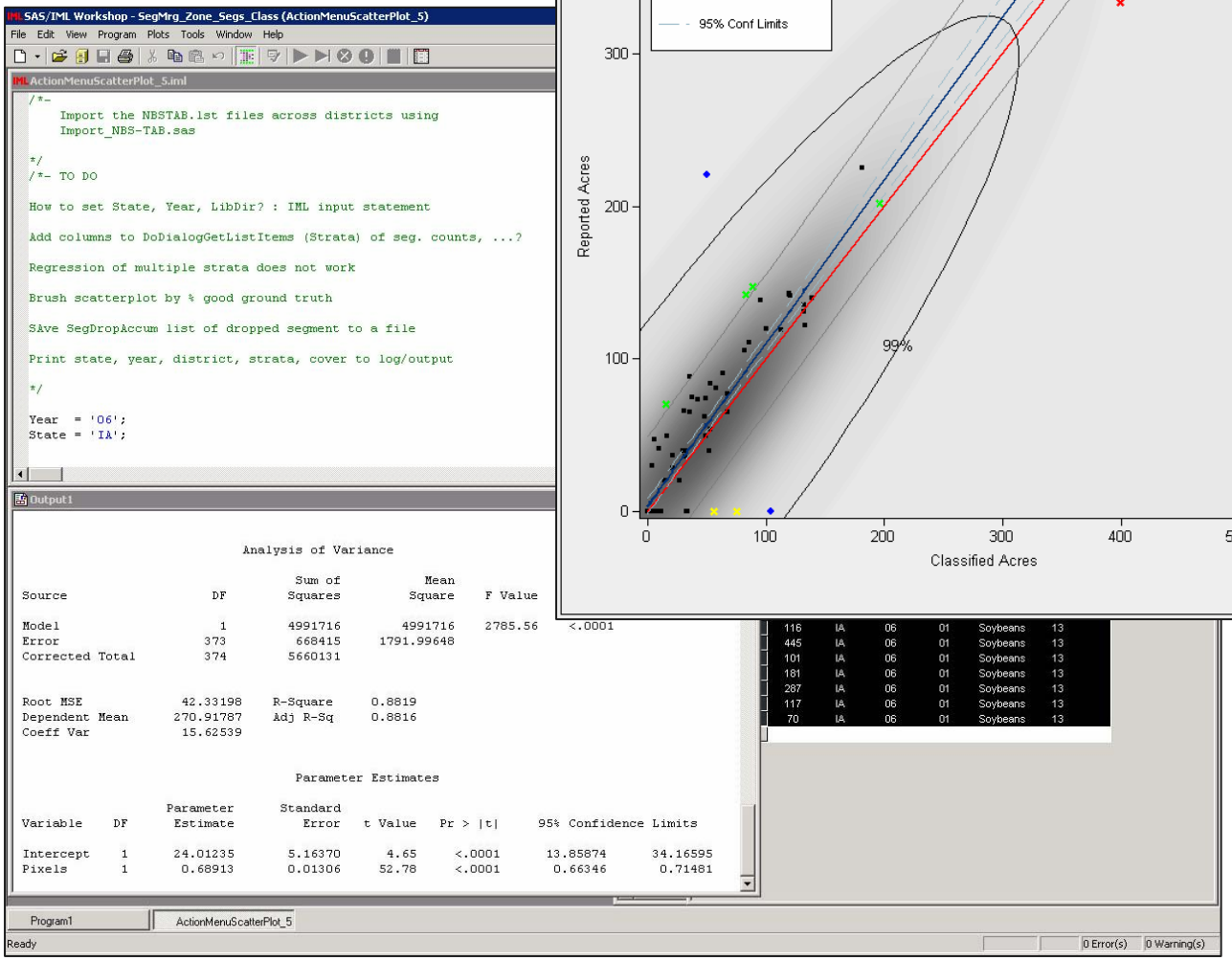
# Regression-based Acreage Estimator

## Acreage not just about counting pixels

## NASS Inputs

- June Survey summaries
- Area Sampling Frame
- CDLs





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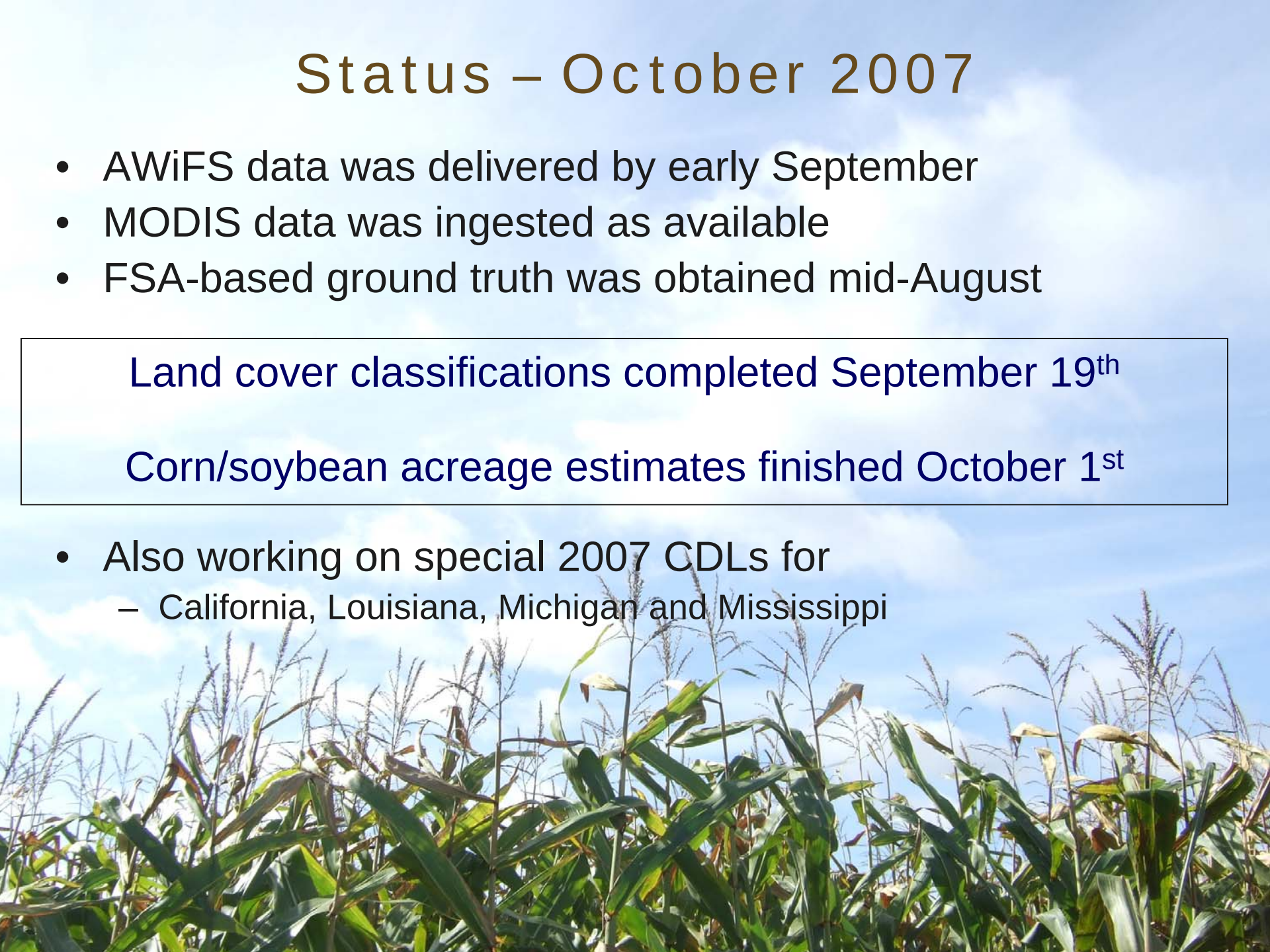
# Status – October 2007

- AWiFS data was delivered by early September
- MODIS data was ingested as available
- FSA-based ground truth was obtained mid-August

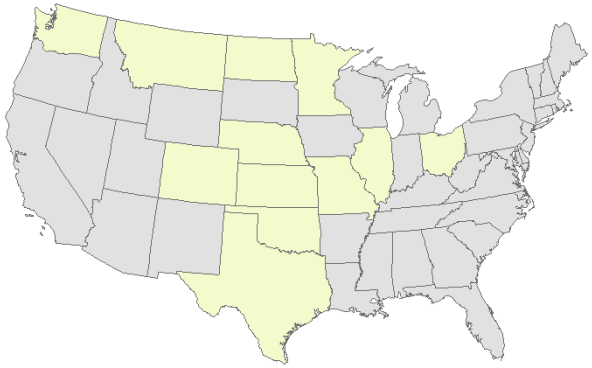
Land cover classifications completed September 19th

Corn/soybean acreage estimates finished October 1st

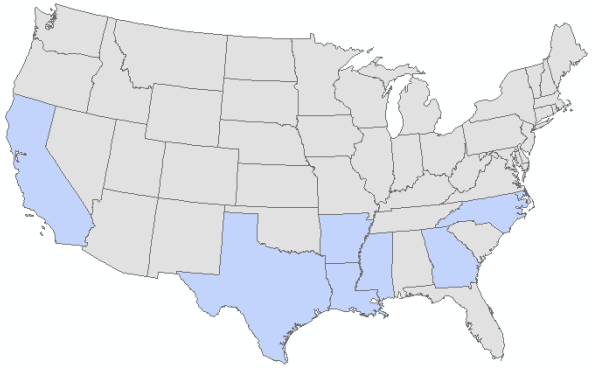
- Also working on special 2007 CDLs for
  - California, Louisiana, Michigan and Mississippi



# CDL 2008?



Primary Wheat States



Primary Cotton States

- Expand geographic scope?
  - Wheat states next priority
  - Mid-Atlantic region (often asked about)
- Improved categories?
  - Grassland
    - Pasture (chewed grass)
    - Hay (cut grass)
    - Natural (quasi-native)
- Imagery?
  - More frugal use of
  - Future sensors
  - Finer resolution
- Other ancillary data?
  - Soils
  - Climate
- Derivatives?
  - Change detection
  - Crop rotation patterns

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# Thank You

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