

# Research to Operational: A Paradigm Shift for Remote Sensing Based Acreage Estimates

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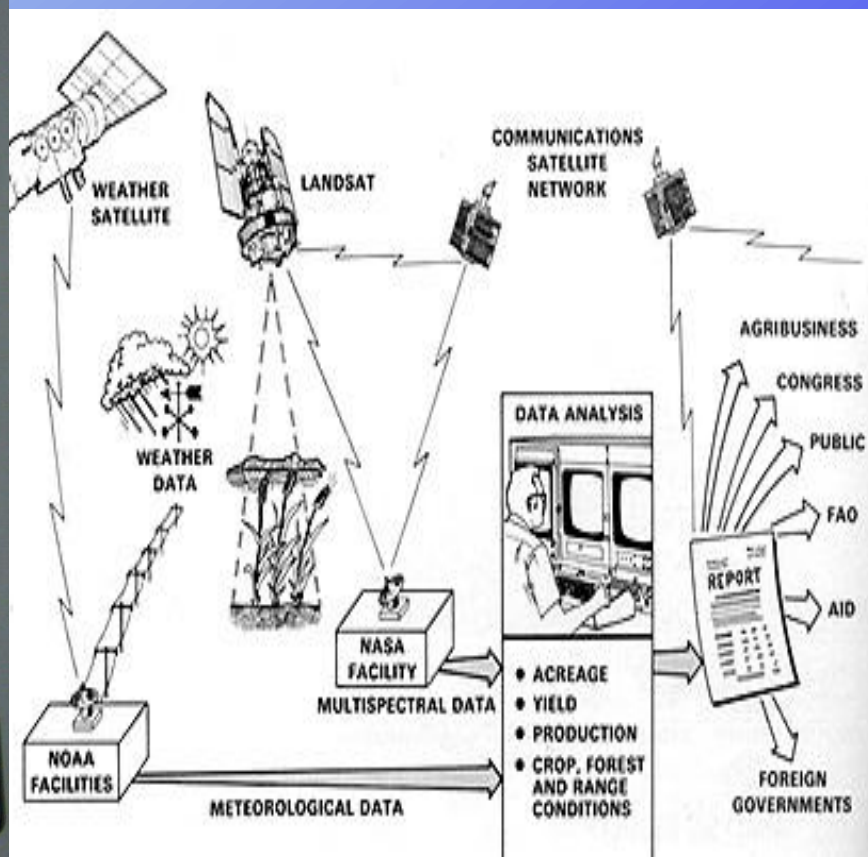
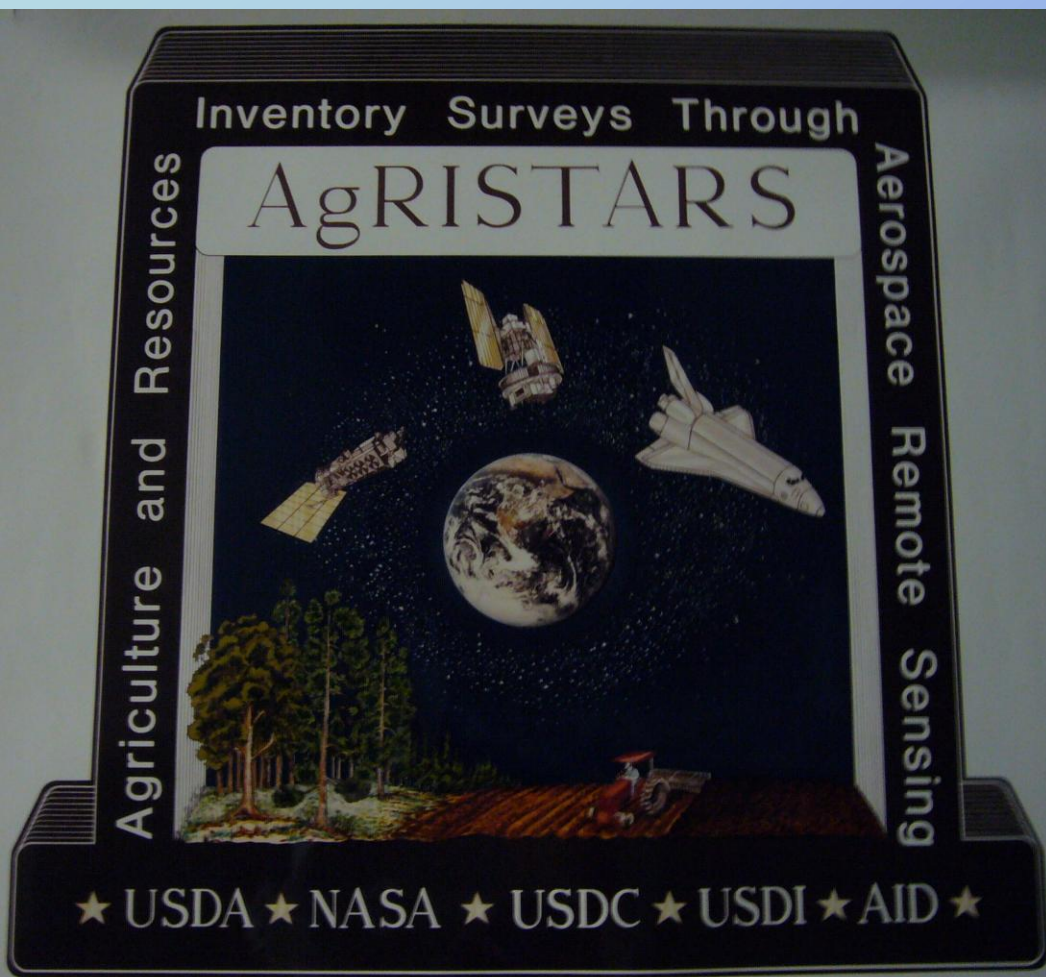
ASPRS 2008 Annual Conference

May, 2, 2008

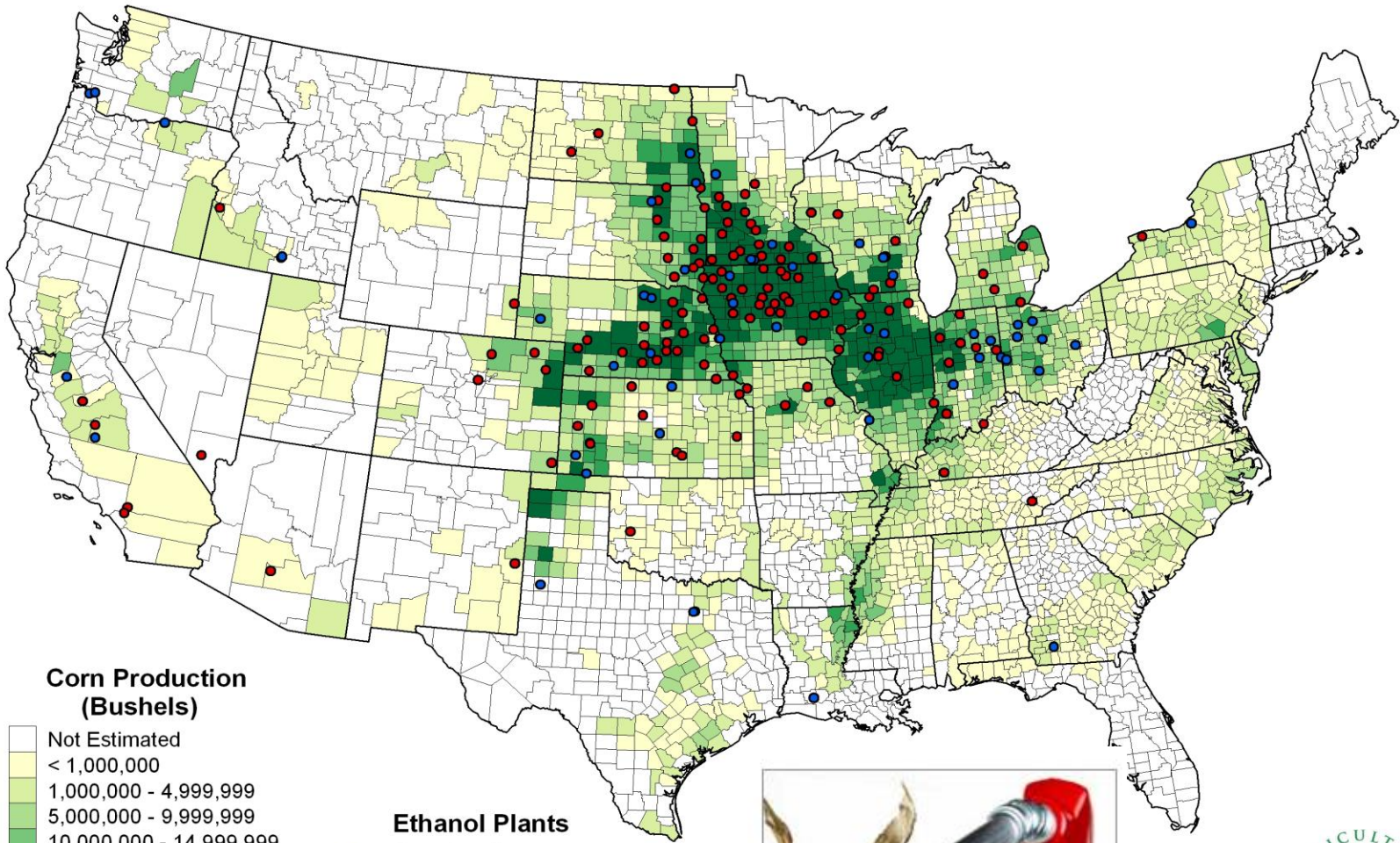


# Cropland Data Layer (CDL) Discussion

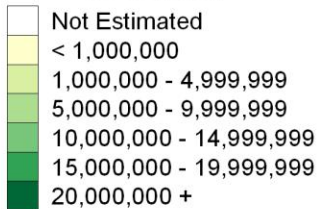
- Legacy program
  - Issues: Budget/Satellites/Agency Support/Technology



## Corn for Grain 2007 Production by County and Location of Ethanol Plants



### Corn Production (Bushels)



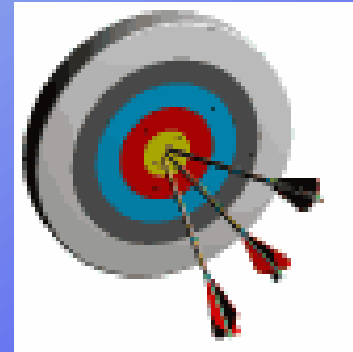
### Ethanol Plants

- Construction
- Producing



# CDL Program Objectives

- “Census by Satellite”
  - Annually cover major producing corn and soybean regions
  - Indications reflect actual location of the crops
    - Not address on record via survey
- Provide timely, accurate, useful indications
  - Measurable error
  - Unbiased/independent estimator
  - County, state and watershed level
- Operationalize indications delivery
  - For June, August, and October
    - Ag Statistics Board



# CDL Program Inputs

- Resourcesat-1 A WiFS imagery
- Farm Service Agency – Common Land Unit
- Ancillary data
- Commercial software suite

# IRS Resourcesat-1 A WiFS Imagery

340 km swath per head  
740 km combined

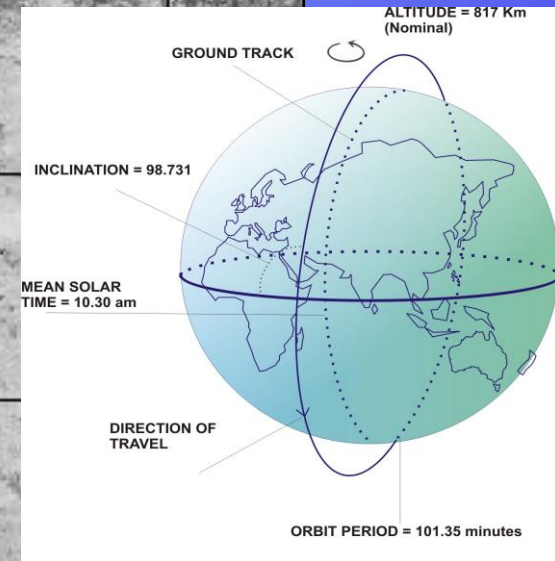
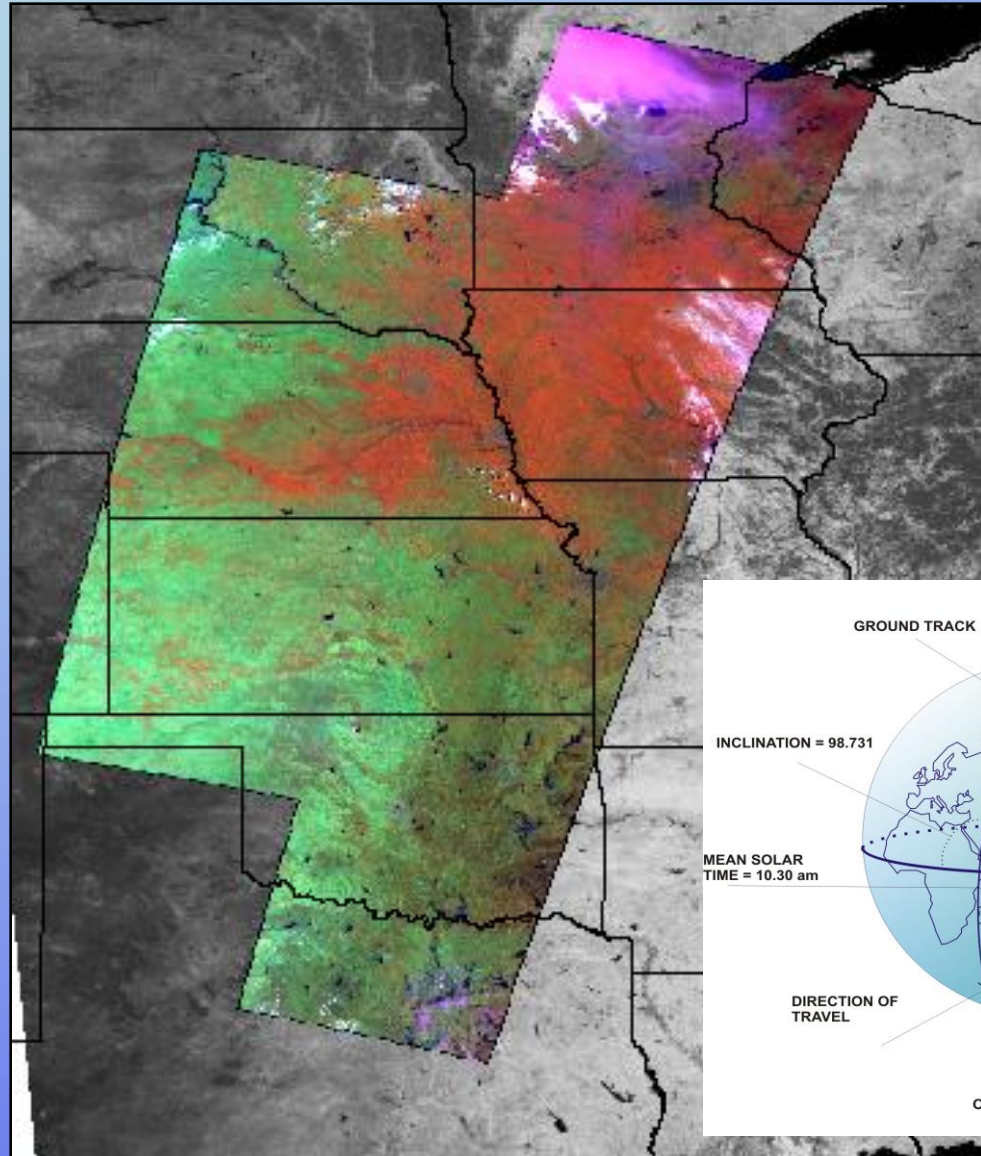
5-day revisit

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

Data provided by Arctic Slope  
Regional Corporation

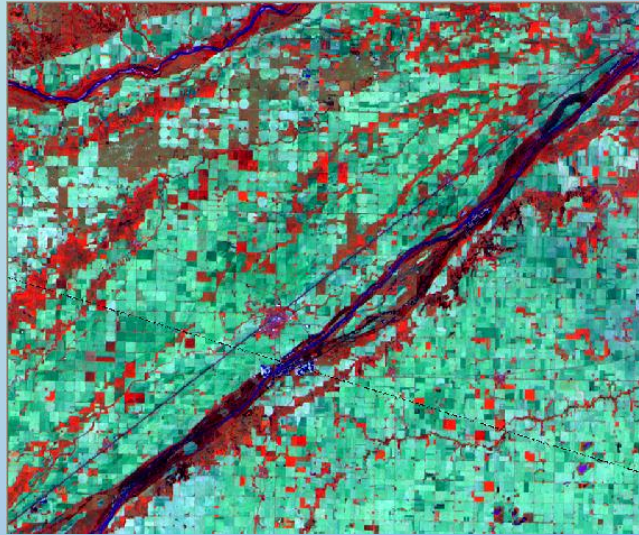


13 Aug 2007

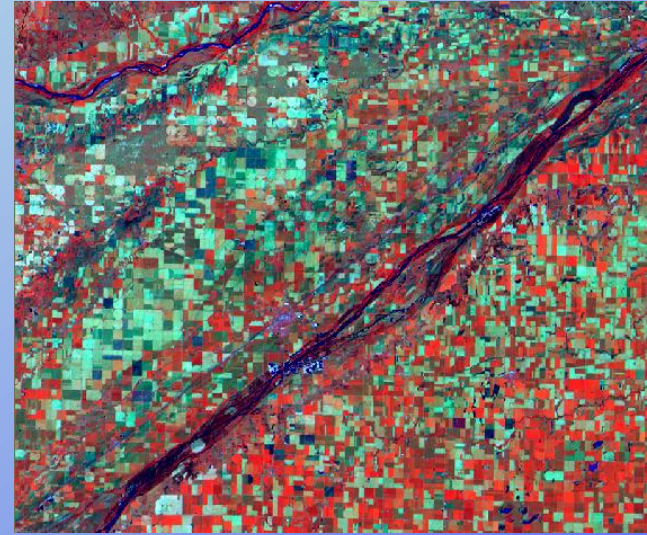


Department of Space  
Indian Space Research Organisation

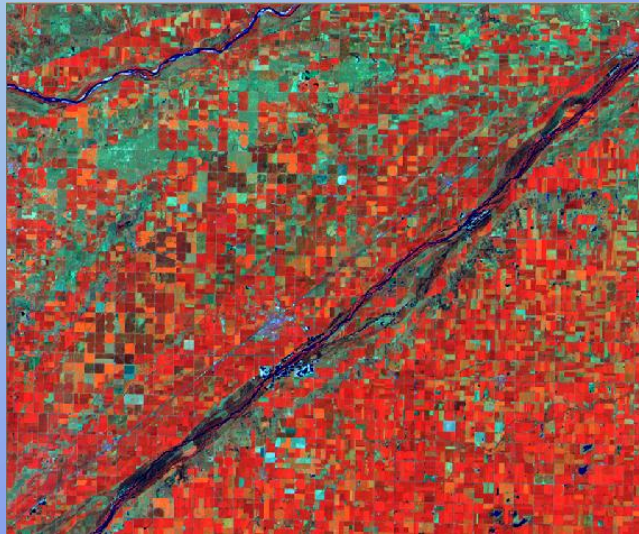
# A WiFS Imagery Time Series



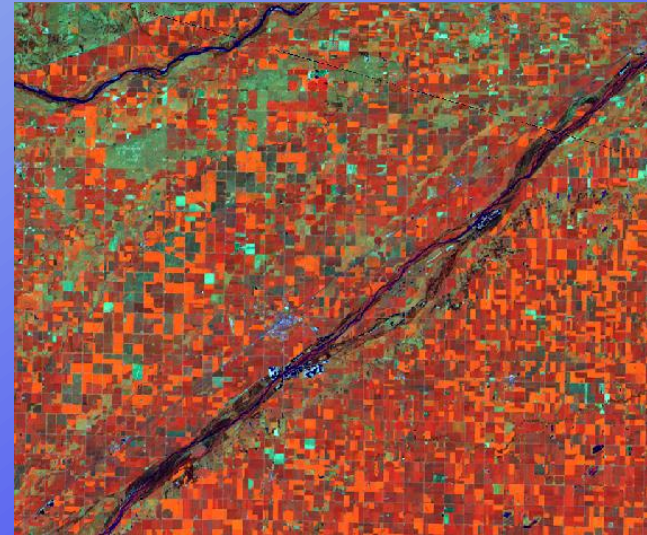
May 18



June 21

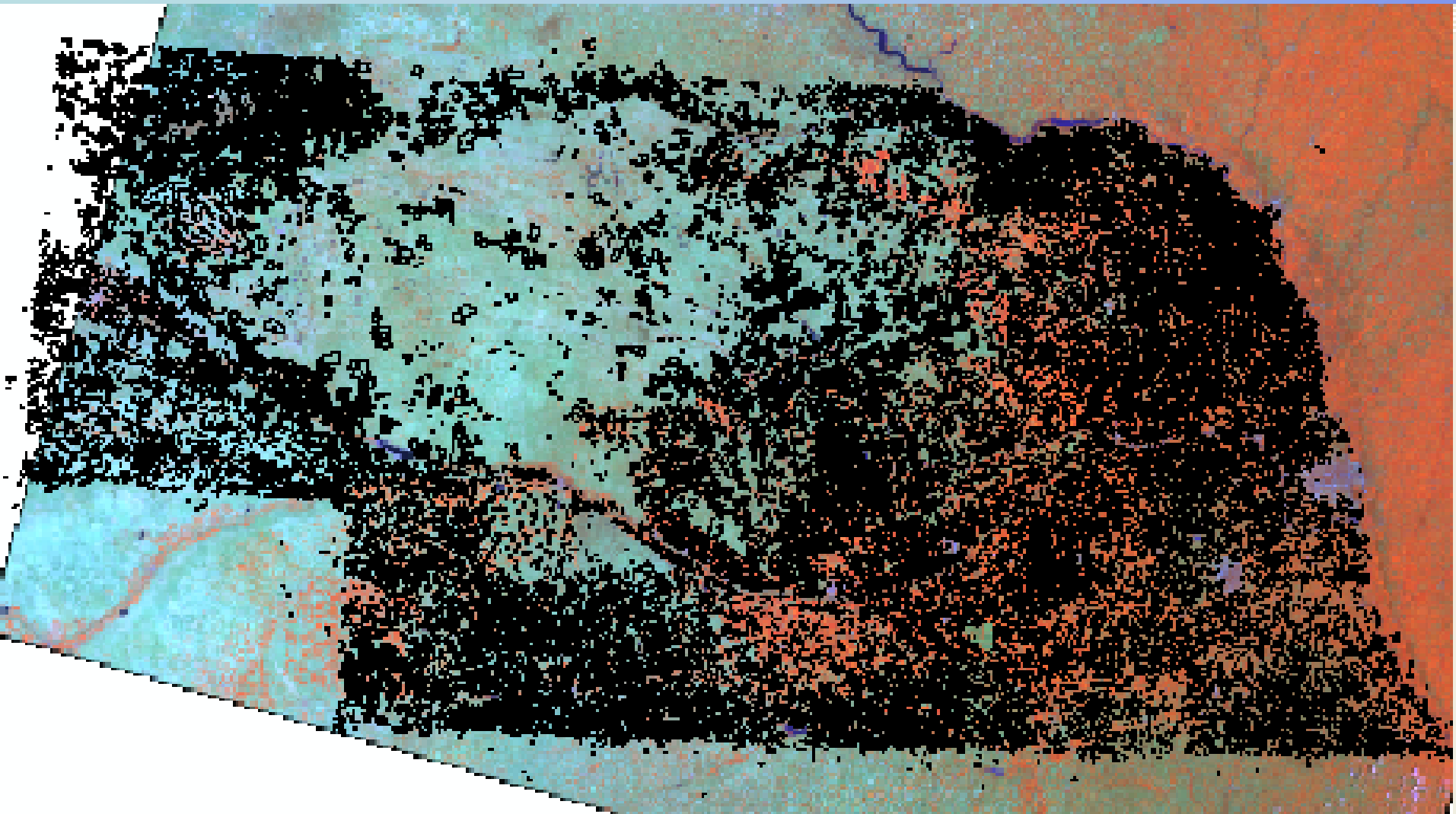


July 15



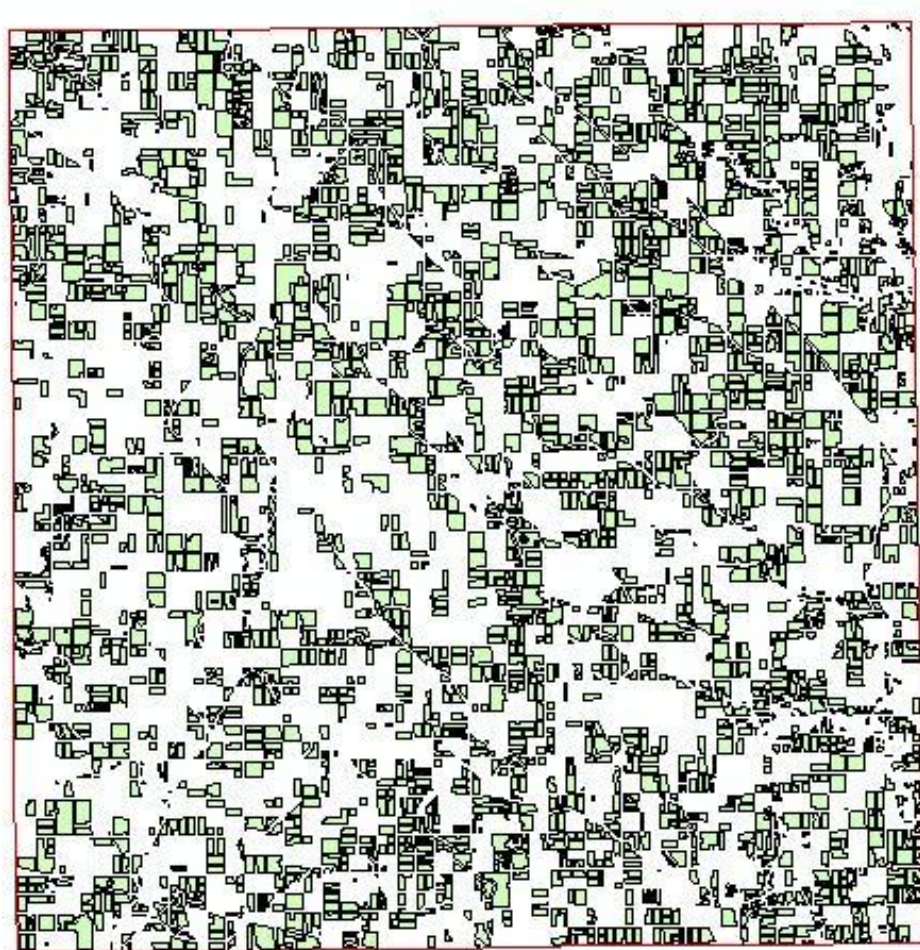
August 27

# Ground Truth - Agriculture



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





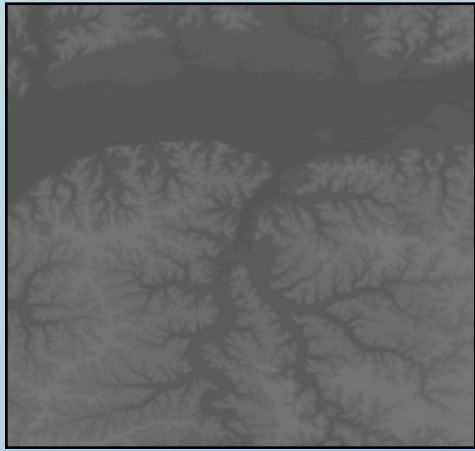
Matching CLU's used for  
sampling (i.e., testing/training)



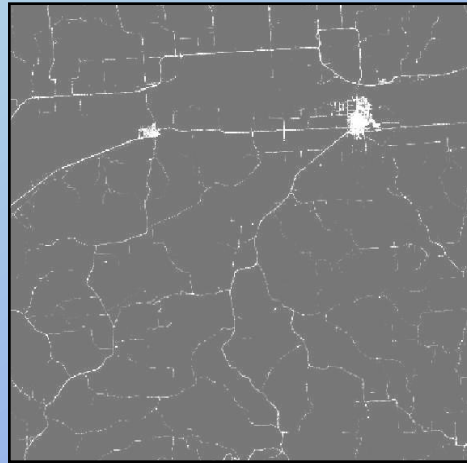
CDL Classification



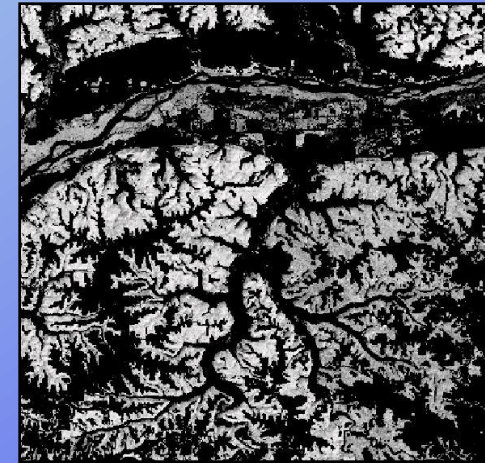
# Ancillary Data – USGS/NASA Products



Elevation

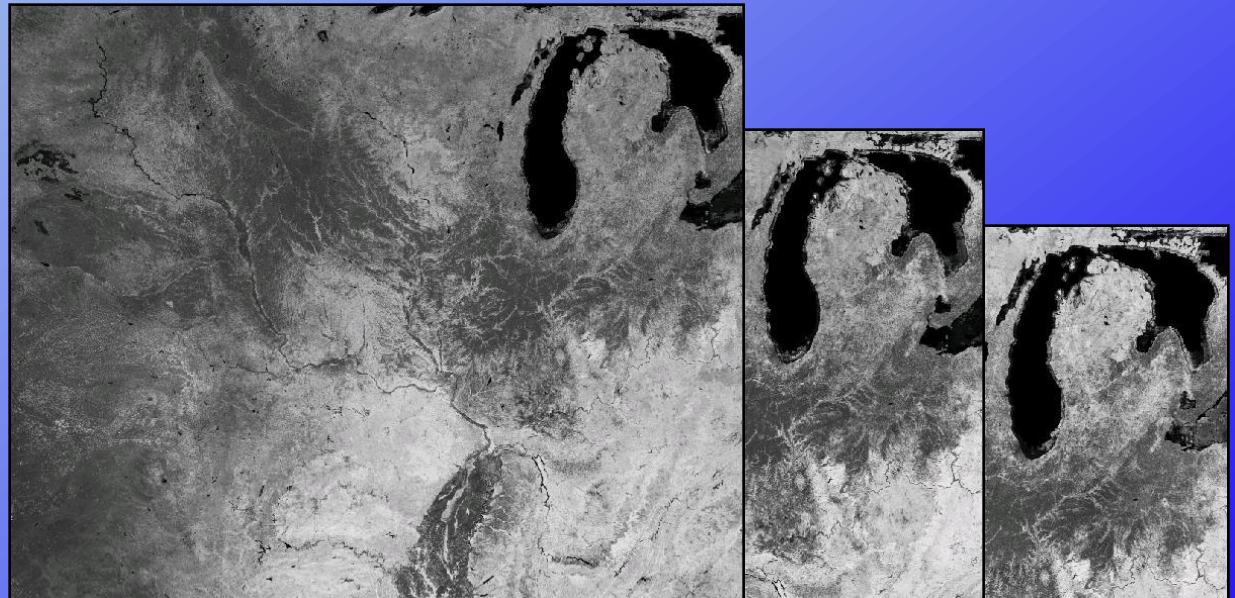


Imperviousness



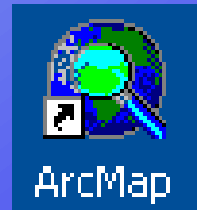
Forest Canopy

NASA MODIS Terra  
(16-day NDVI composite)



# Commercial Software Suite

- Imagery Preparation
  - 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

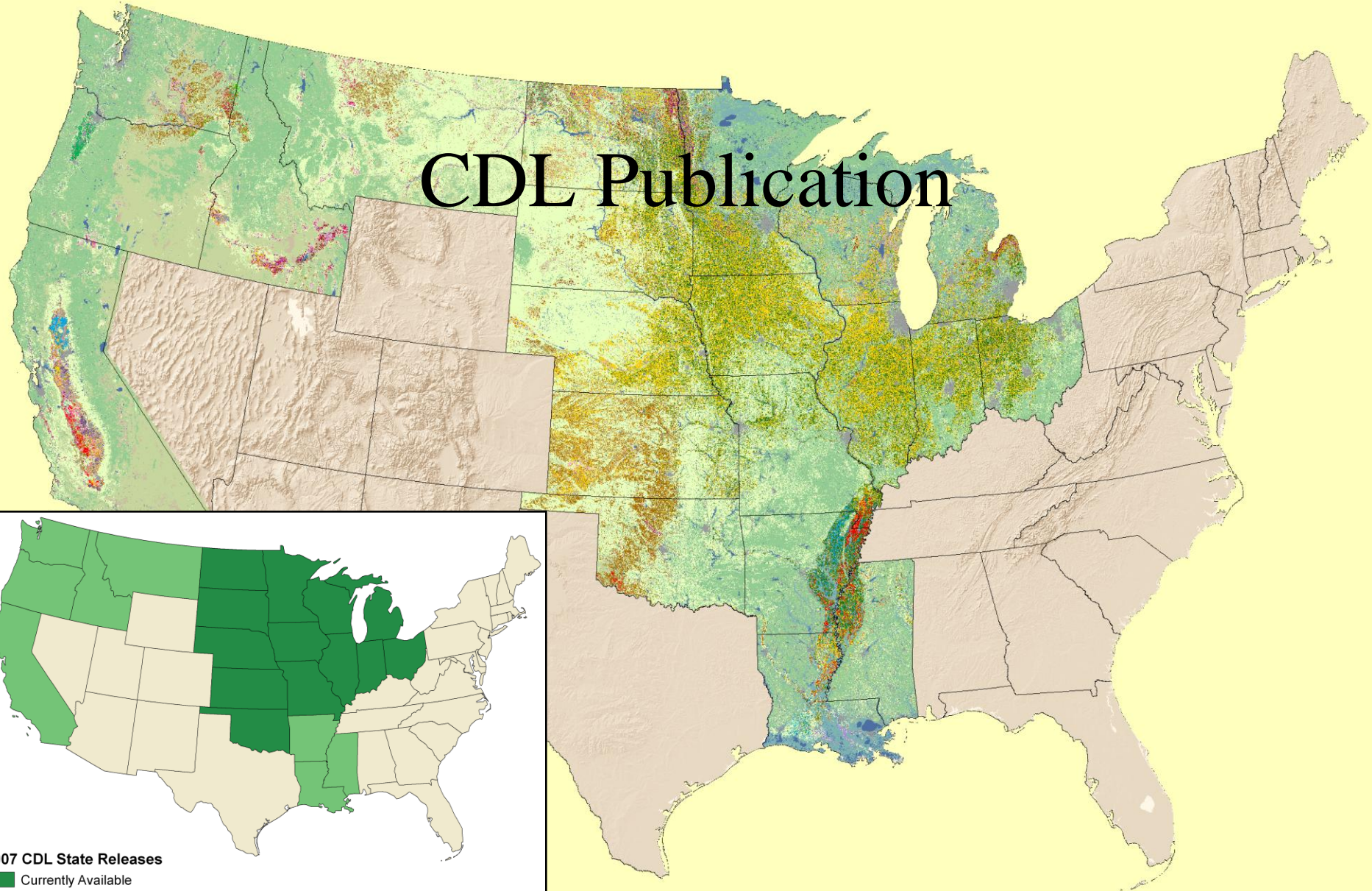




# Cropland Data Layers 2007



CDL Publication



**2007 CDL State Releases**

- Currently Available
- July 2008 Available



# Iowa 2007 Cropland Data Layer



## Land Cover Categories

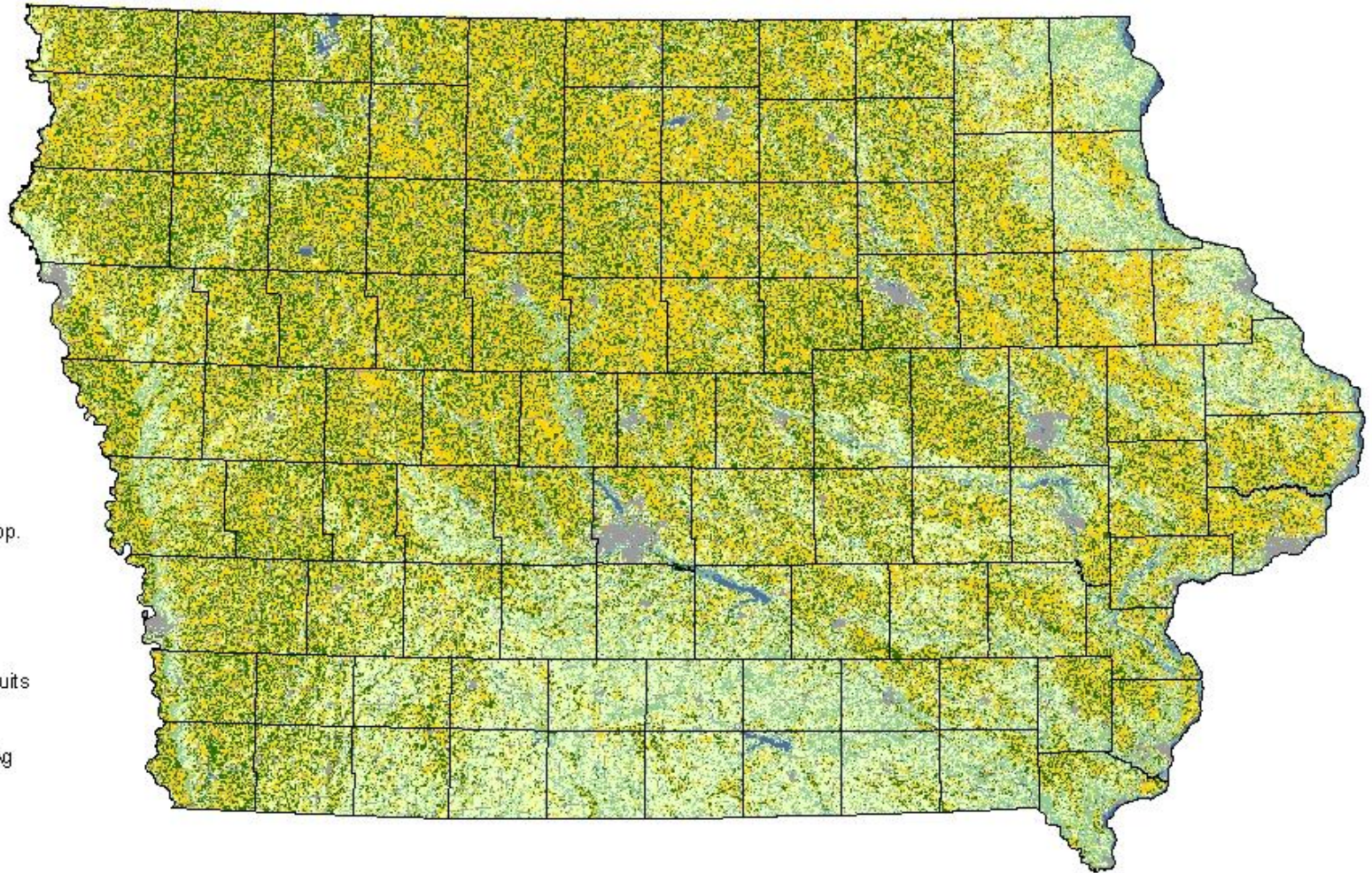
(Ordered by Decreasing Acreage)

### Agricultural

- Corn
- Soybeans
- Alfalfa
- Oats
- Winter Wheat
- Misc. Veggies. & Fruits
- Spring Wheat
- Dry Beans
- Clover/Wildflowers
- Rye
- Barley
- Other Crops
- Peas
- Potatoes
- Sorghum
- Millet
- Watermelon
- W. Wht./Soy. Dbl. Crop.
- Flaxseed
- Apples
- Other Small Grains
- Grapes
- Other Tree Nuts & Fruits

### Non-Agricultural

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



# Accuracy Statistics

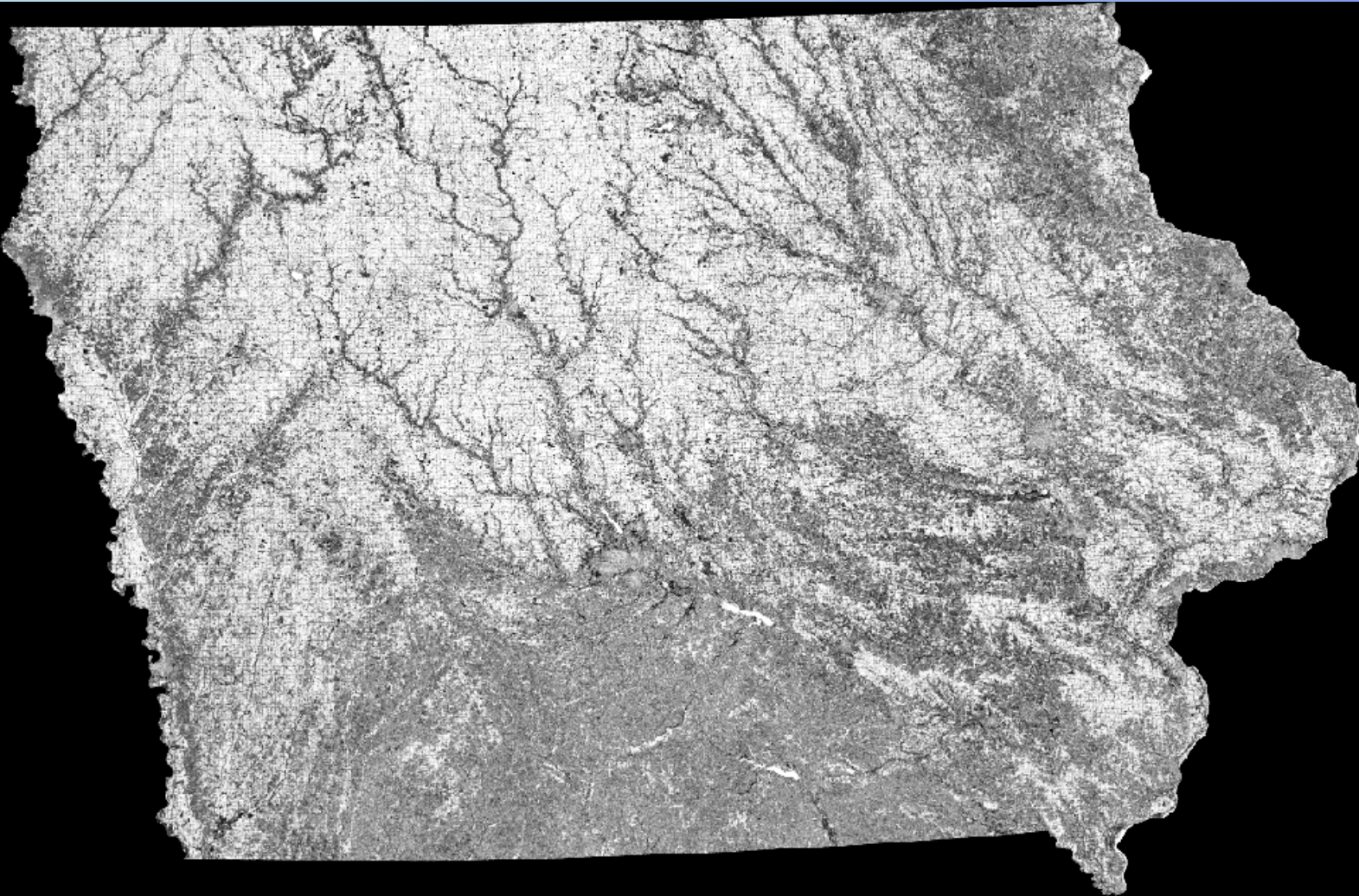
```

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'1 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.

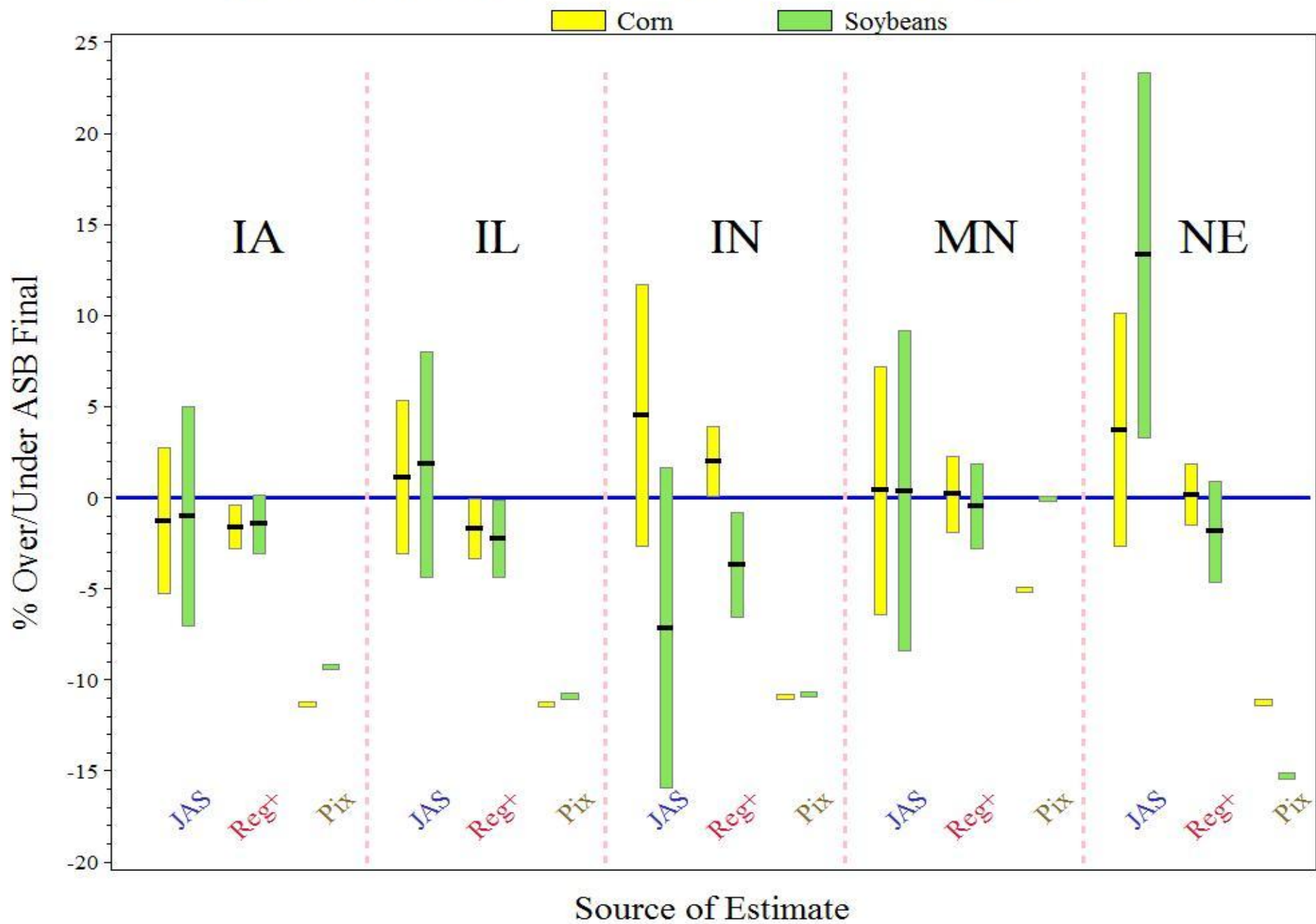
# Confidence Map



Light High  
Dark Low



# 2007 State Level Estimates +/- 2% CVs



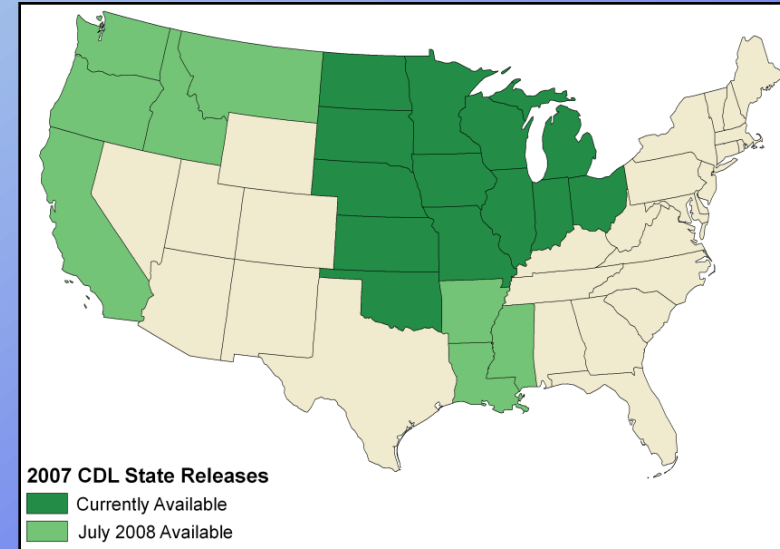




# Program Summary



- Cropland Data Layer Method
  - AWiFS imagery
  - FSA CLU dataset
  - Commercial software
  - Ancillary data
- CDL Stakeholder Distribution:
  - Annually after county estimates published
  - Metadata/accuracies/confidence layer
- Access:
  - <http://datagateway.nrcs.usda.gov>



The Geospatial Data Gateway provides One Stop Service for natural resources data. It allows users to browse and select data from anywhere, to download other products or shipped on CD or DVD.

Geospatial Data Gateway

Effective 13-DEC-06, for Step 1 and 2. The items 2 & 3 on h browser.