

USDA NASS Geospatial Data

Patrick Willis

National Agricultural Statistics Service



“ . . . providing timely, accurate, and useful statistics in service to U.S. agriculture.”



Who is NASS?

- statistical survey agency of the USDA
 - non-political
 - non-policy making
 - independent-objective-unbiased
 - appraisers of U.S. agriculture

- collects and disseminates data on all facets of agriculture



Who uses NASS official statistics?

farmers

individual & corporate farmers
growers' associations
farmer cooperatives

agribusinesses

seed companies
equipment companies
chemical companies
warehouse & storage companies
transportation companies
food processors
feed processors
other suppliers & buyers

economic firms

banks & lending institutions
commodity traders
insurance companies
marketing firms

university researchers

government policy makers

media

newspapers
magazines
radio
television



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

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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Browse NASS by Subject

- Crops and Plants
- Demographics
- Economics
- Environmental
- Livestock and Animals
- Charts and Maps
- Education and Outreach

Statistics by State

Select a State

Data and Statistics

Quick Stats (Agricultural Statistics Data Base)

NASS publishes U.S., state, and county level statistics for many commodities and data offers the ability to query by commodity providing the most up-to-date statistics. The query dataset can be downloaded to a database or spreadsheet.

Query our Quick Stats Data Base

Additional Crops County Resources

Maps of crops county estimates for acre available from NASS as both CSV data files and interactive maps.

County data from Quick Stats data is also 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 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. Soybeans account 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 yield loss of 6.1 bushels per acre.

Sixty-two percent of farms reported deer or geese damage to one or more crops. Damage was reported on 1 percent of farms raising corn, 58 percent of farms growing soybeans and 27 percent of farms with wheat.

Maryland 2001 Crop Loss from Deer

USDA **NEWS RELEASE** **AGRICULTURE**

NATIONAL AGRICULTURAL STATISTICS SERVICE
United States Department of Agriculture • Washington, DC 20250
Ag Statistics Hotline: (800) 727-9540 • 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 history of Agriculture's National Agricultural Statistics Service.

WISCONSIN AGRICULTURAL STATISTICS SERVICE
P.O. Box 8934 Madison, WI 53708-8934

Wisconsin's Department of Agriculture, Trade and Consumer Protection

Wisconsin Dairy Herd Survey

November 2002

collects data by a variety of survey methods including mail, phone, personal interview, or internet

Farmer Opinion Survey

Based on the survey, 60 percent of producers expect to keep the same herd size, 20 percent intend 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.

Selected crops harvested - Land in orchards (acres)

State: United States - County Level Data Item: Selected crops harvested - Land in orchards (acres)

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

United States Total: 5,330,439

State:

State Total:

County:

County Total:

Download data as CSV | XML | PDF

Help Print Return to

Legend

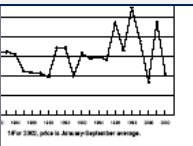
Scale: National Zero or Data Withheld

- <= 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.](#)



Wisconsin Dairy Herds by Herd Size

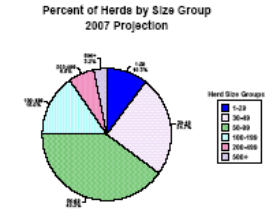
Milk cow herd size	May 2002 herds	May 2007 herds (projected) %	Change 2007/2002
1-29	2,800	1,440	-46
30-49	4,700	3,440	-27
50-99	7,400	5,800	-24
100-199	1,900	2,080	+9
200-499	700	600	-29
500+	200	440	+120
Total	17,500	15,900	-20

1/7The 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

Herds	Keep same herd size	Increase herd size	Discontinue milking
Number	Percent	Percent	Percent
2,600	47	17	36
4,700	71	9	20
7,400	65	19	18
1,900	53	37	10
700	33	59	8
200	22	78	0
17,500	62	29	20

1/7The 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.

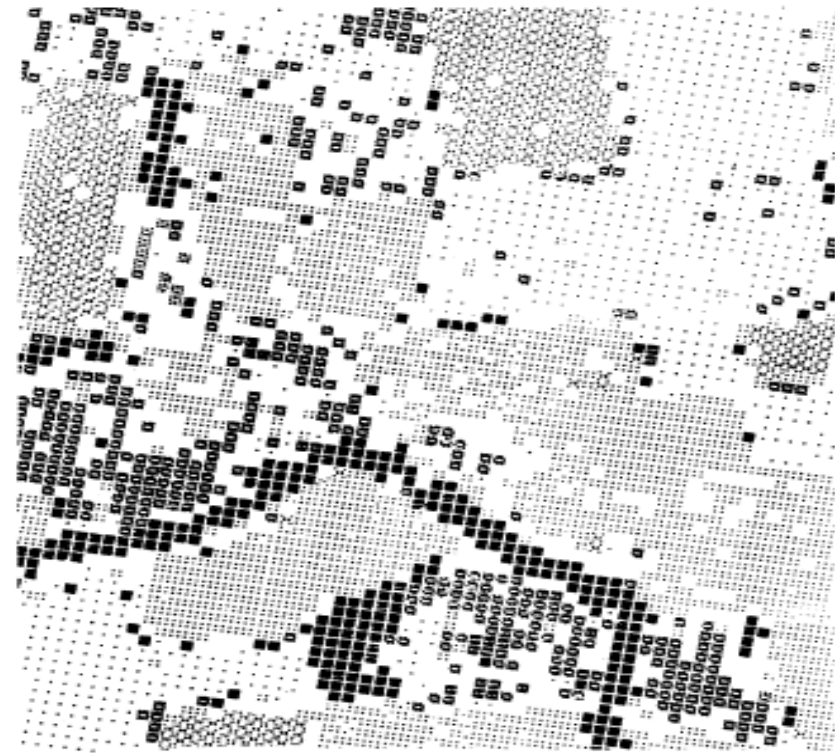
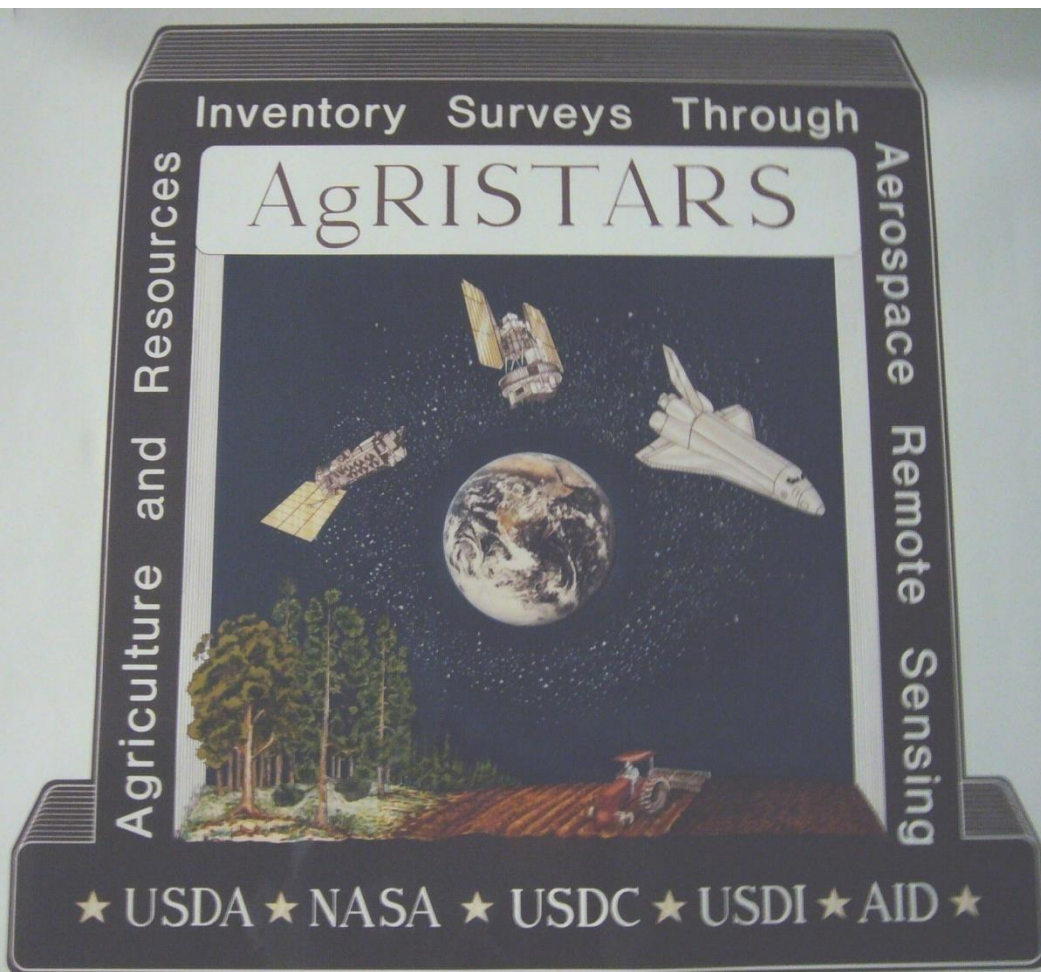


University of Illinois Research Park
November 20, 2013



Spatial Analysis Research Section

Early limitations: Budget/Satellites/Technology



- Small Grains
- ===== Other Crops
- 00000000 Rice
- 00000000 Hay
- >0000000 Permanent Plantings
- 00000000 Pasture
- 00000000 Non-Agricultural Land

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- Education and Outreach

Statistics by State

Select a State

You are here: Home / Research and Science

Research, Science, and Technology

Spatial Data

Crop Scape

CropScape is a geospatial data service which offers advanced tools such as interactive visualization, web-based data dissemination and geospatial queries and automated data delivery to systems such as Google Earth.

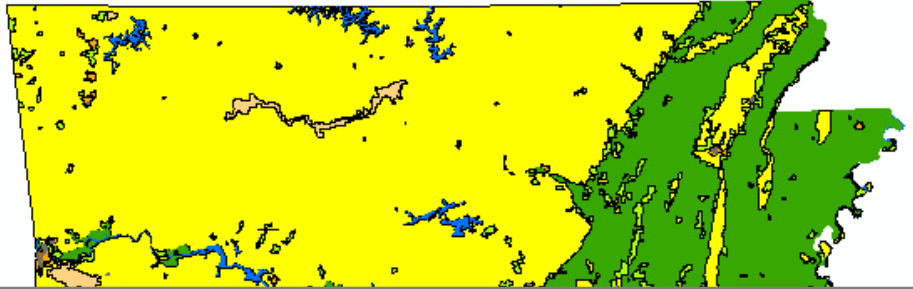
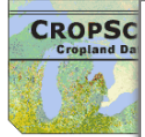
CropScape was developed in cooperation with the Center for Spatial Information Science and Systems at George Mason University and is hosted on their website.

Vegscape - Vegetation Condition

Vegscape is a geospatial data service which offers automated updates of vegetative condition at daily, weekly, and biweekly intervals. VegScape delivers interactive vegetation indices that enable quantification of U.S. crop conditions for exploring, visualizing, querying, and disseminating via interactive maps. The interface and functionality is similar to CropScape's.

VegScape was developed in cooperation with the Center for Spatial Information Science and Systems at George Mason University.

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



[Land Use Strata for Selected States](#)

Animated Maps

Crop Progress and Condition

Animated U.S. choropleth maps of crop progress and condition state-level estimates greatly enhance current NASS offerings regarding crop progress and condition by more effectively showing the crop story to data users. Condition maps' sequential hues portray percent "good + excellent" for the crop by state, with weekly animated change. Their legend includes national condition. Progress maps' monochromatic shades portray percent progress for the crop data item by state, and their legend also includes the national 5-year average progress.



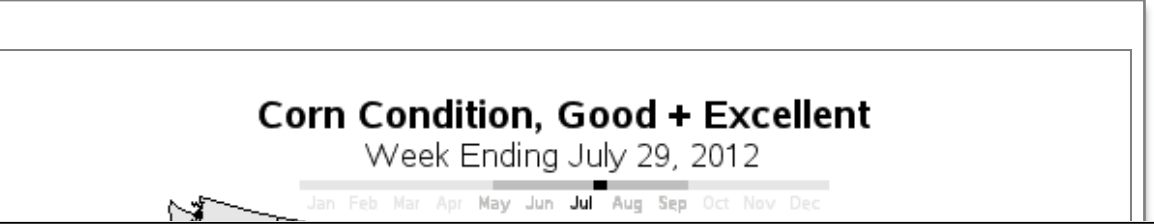
Reports, Papers and Presentations

- Research Reports** by Date | by Title
- Archived Research Reports GIS | Survey | Yield
- Presentations
- Conferences
- Remote Sensing Uses - White Papers
- Technology Papers

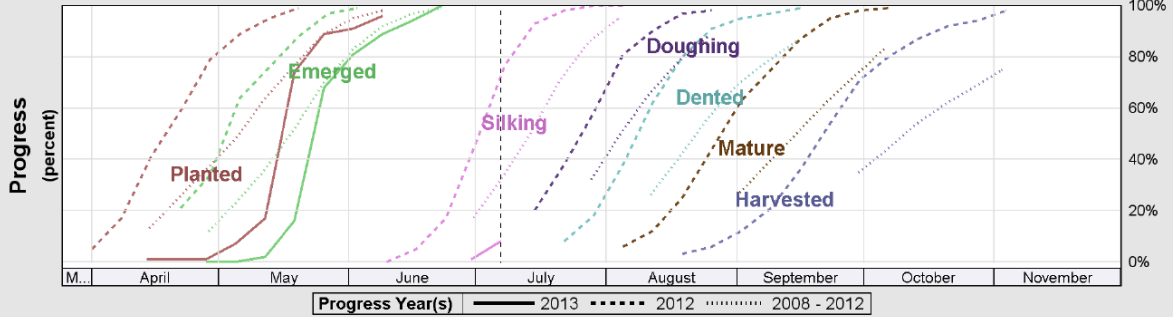
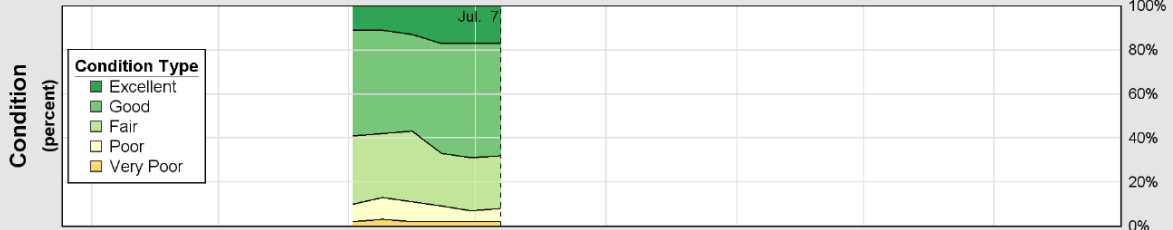
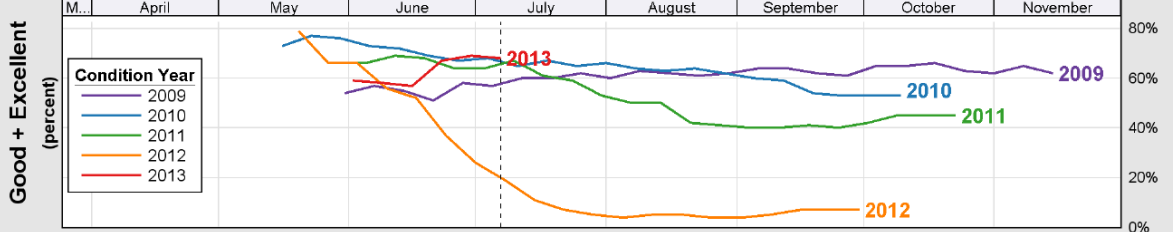
Census of Agriculture

- Interact with Data (1997)
- 2002 Maps: Gallery | Star Tree | List
- "Linked Micromap" Plots (1997):
- Corn | Cotton | Hay | Soybeans | Wheat

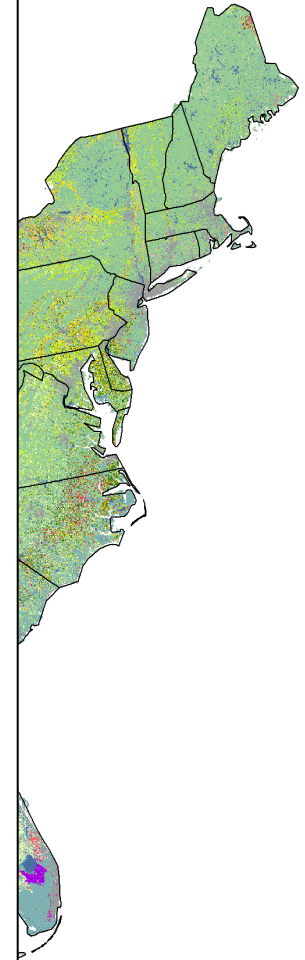
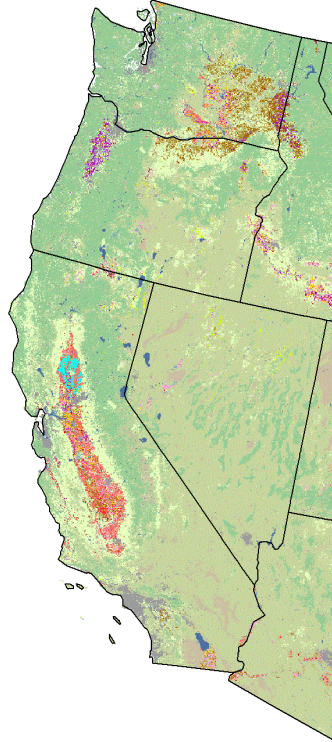
2007 Census Map Gallery



USDA Crop Progress and Condition: Corn in Illinois, 2013 NASS



2011 Continental United States Land Cover Categories (by decreasing acreage)



Agriculture

- | | | |
|--------------------------|----------------------------|-----------------------------|
| Pasture/Grass | Triticale | Dbl Crop Lettuce/Cotton |
| Corn | Citrus | Mustard |
| Soybeans | Safflower | Plums |
| Winter Wheat | Pistachios | Dbl Crop Barley/Sorghum |
| Fallow/Idle Cropland | Blueberries | Broccoli |
| Other Hay/N on Alfalfa | Christmas Trees | Radishes |
| Alfalfa | Dbl Crop Barley/Soybeans | Garlic |
| Cotton | Tomatoes | Speltz |
| Spring Wheat | Onions | Vetch |
| Sorghum | Flaxseed | Apricots |
| Dbl Crop WinWht/Soybeans | Dbl Crop Oats/Corn | Caneberries |
| Rice | Pop or Orn Corn | Greens |
| Barley | Herbs | Nectarines |
| Oranges | Misc Veggies & Fruits | Cucumbers |
| Oats | Olives | Other Small Grains |
| Sunflower | Other Tree Crops | Turnips |
| Dry Beans | Dbl Crop Corn/Soybeans | Dbl Crop Lettuce/Cantaloupe |
| Peanuts | Sweet Potatoes | Camelina |
| Durum Wheat | Peaches | Cauliflower |
| Sugarbeets | Cranberries | Rape Seed |
| Potatoes | Tobacco | Honeydew Melons |
| Canola | Cantaloupes | Celery |
| Sugarcane | Prunes | Dbl Crop Durum Wht/Sorghum |
| Almonds | Dbl Crop Barley/Corn | Eggplants |
| Sod/Grass Seed | Dbl Crop Soybeans/Cotton | Gourds |
| Grapes | Pears | Dbl Crop Lettuce/Barley |
| Apples | Lettuce | |
| Rye | Dbl Crop Lettuce/Durum Wht | |
| Peas | Watermelons | |
| Millet | Switchgrass | |
| Walnuts | Asparagus | |
| Lentils | Carrots | |
| Pecans | Strawberries | |
| Dbl Crop WinWht/Cotton | Pumpkins | |
| Dbl Crop WinWht/Sorghum | Squash | |
| Sweet Corn | Cabbage | |
| Aquaculture | Peppers | |
| Clover/Wildflowers | Dbl Crop Soybeans/Oats | |
| Other Crops | Hops | |
| Dbl Crop WinWht/Com | Mint | |
| Cherries | Pomegranates | |

Non-Agriculture

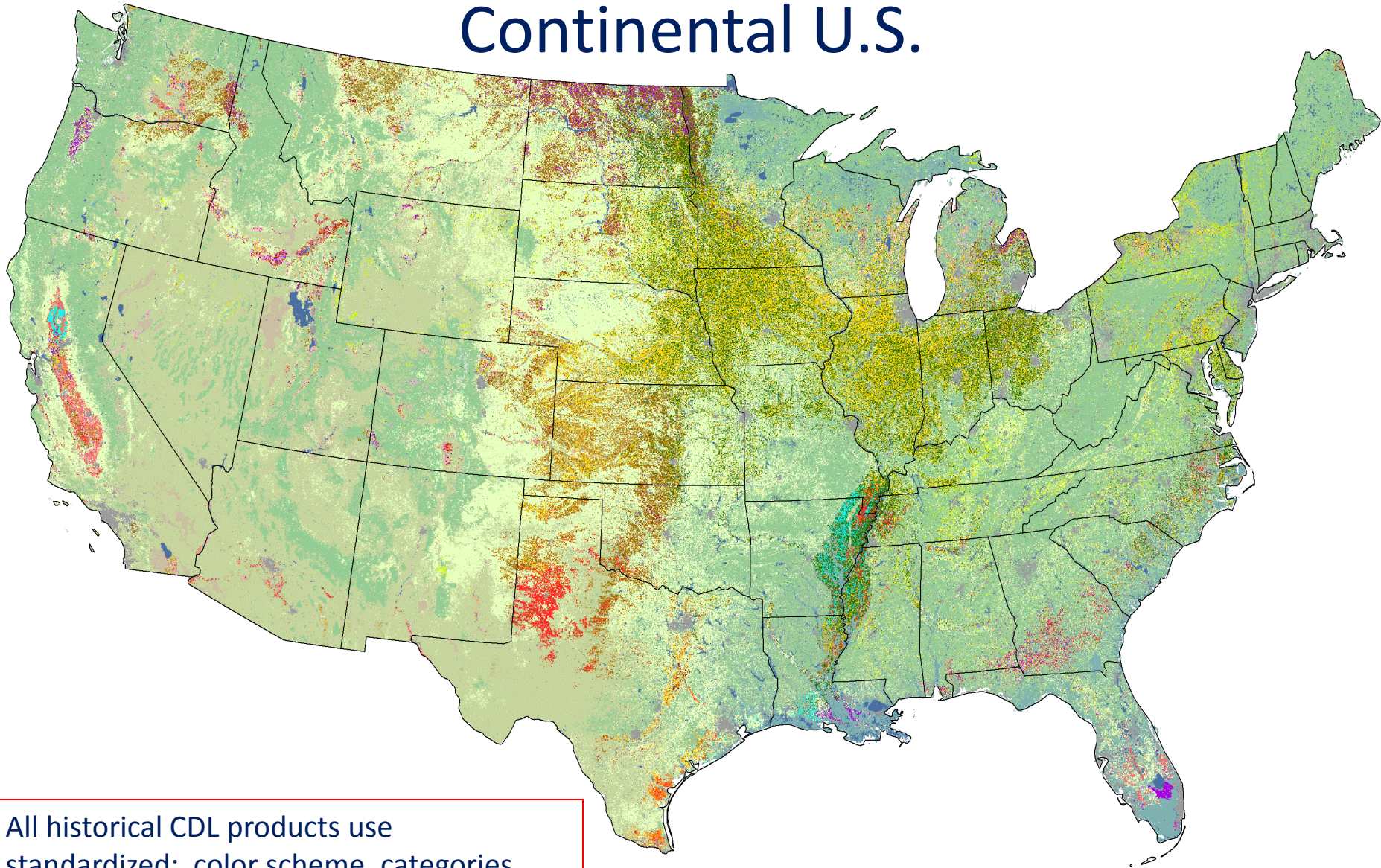
- Forest
- Shrubland
- Developed
- Wetlands
- Water
- Barren
- Perennial Ice/Snow

Agriculture

- Pasture/Grass
- Corn
- Soybeans
- All Wheat
- Other Hay

- Barren
- Perennial Ice/Snow

2008 – 2012 Coverage: Continental U.S.



All historical CDL products use
standardized: color scheme, categories
names and codes, projection, metadata.

CDL Basics

- Crop-specific land cover data layer
- Annual
- 30 meter spatial resolution
- GIS-ready
 - Georeferenced
 - Raster
- Interagency collaborations
 - Illinois Interagency Landscape Classification (IILC) Project
 - Illinois Department of Natural Resources (IDNR)
 - Illinois Department of Agriculture (IDA)
 - Foreign Ag Service (FSA), Satellite Image Archive
 - Farm Service Agency (FAS), Common Land Unit
 - US Geological Survey (USGS), National Land Cover Dataset



Purpose of the Cropland Data Layer (CDL) Program

The CDL program goals are:

- 1) Combine remote sensing imagery, USDA/Farm Service Agency reported data and NASS survey data to produce supplemental, unbiased independent acreage estimates for the state's major commodities.
- 2) Production of a crop-specific digital land cover data layer for distribution in industry standard formats.

Annual CDL states traditionally focused in the Midwest and Mississippi Delta States
- Corn, Cotton, Rice, Soybeans, Winter Wheat



Corn

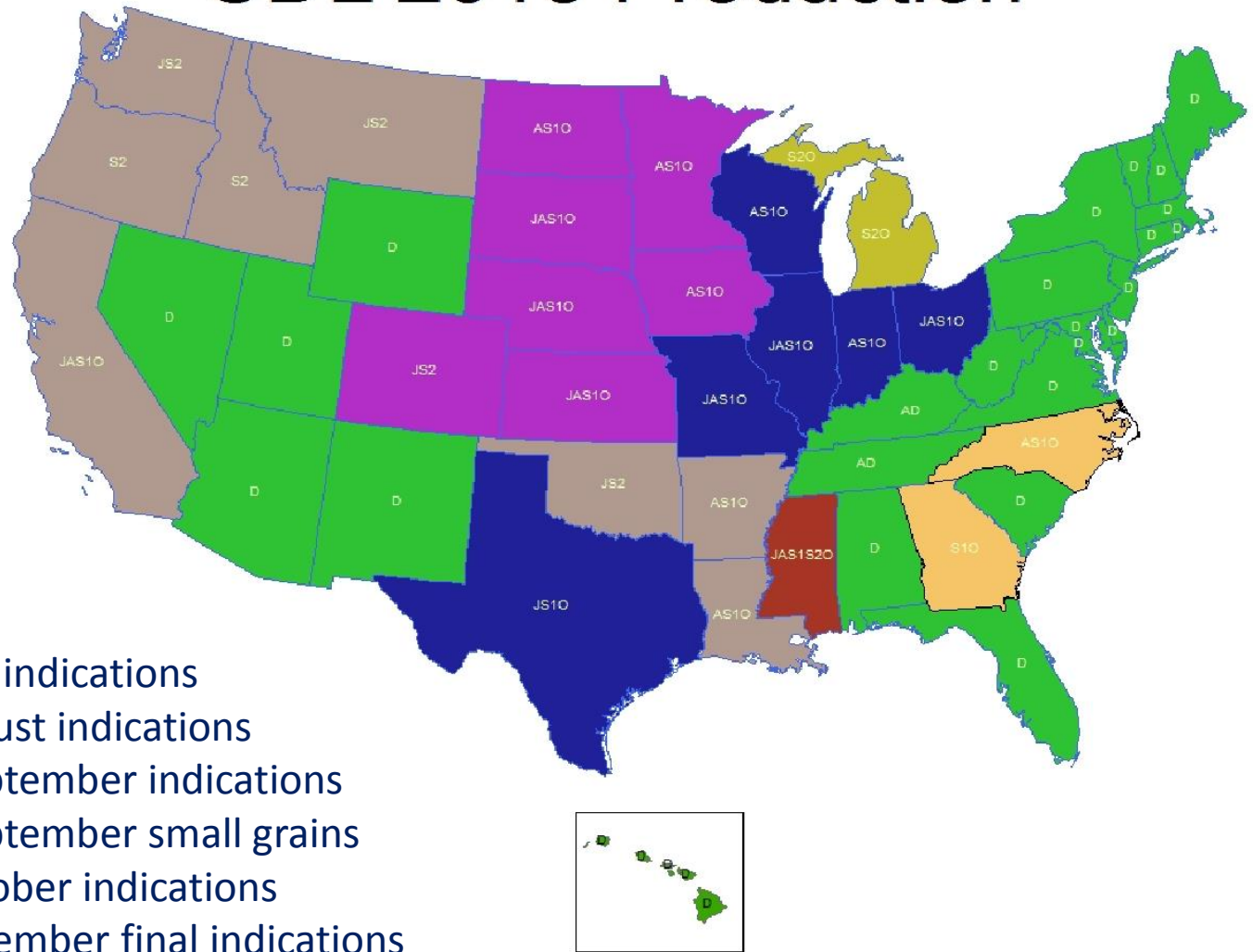


Soybeans



CDL 2013 Production

- In-season acreage indications



J = June indications
A = August indications
S1 = September indications
S2 = September small grains
O = October indications
D = December final indications



University of Illinois Research Park
November 20, 2013



Methodology

- “Stack” satellite imagery and ancillary data layers within a raster GIS
 - 30 meter grid cells, Albers Conic Equal Area projection
- Sample spatially from stack within known ground truth from FSA and NLCD
- Data-mine samples using Boosted Classification Tree Analysis to derive best fitting decision rules
- Apply derived decision rules back to input data stack
- Create land cover map
- Create probability map
- Assess map accuracy
- Derive acreage estimates



Methodology (continued)

- Satellite Imagery
 - Landsat 8, Disaster Monitoring Constellation (DMC)
 - NASA Terra MODIS 16-day composite NDVI
 - Past sensors (IRS ResourceSat-1 AWiFS, Landsat 5 & 7)
- Ancillary data layers
 - USGS National Elevation Dataset (NED)
 - USGS NLCD Impervious and Tree Canopy layers
- Ground Truth
 - Agricultural training & validation
 - Farm Service Agency (FSA) Common Land Unit (CLU)
 - Non-Agricultural training & validation
 - USGS 2006 National Land Cover Dataset (NLCD)
 - State-specific
 - USBR, WDA, UPGA, Gallo
- Software
 - Ground Truth Preparation: ESRI ArcGIS and SAS
 - Imagery Preparation: ERDAS Imagine
 - Decision-Tree Software: Rulequest See 5.0
 - Classification: NLCD Mapping Toolkit and ERDAS Imagine
 - Acreage Estimation: SAS





Satellite Sensors

1999 - 2011

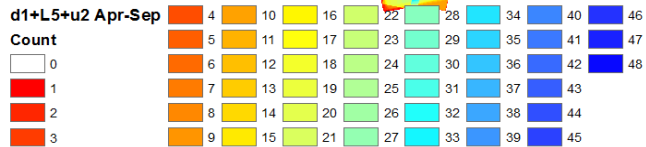
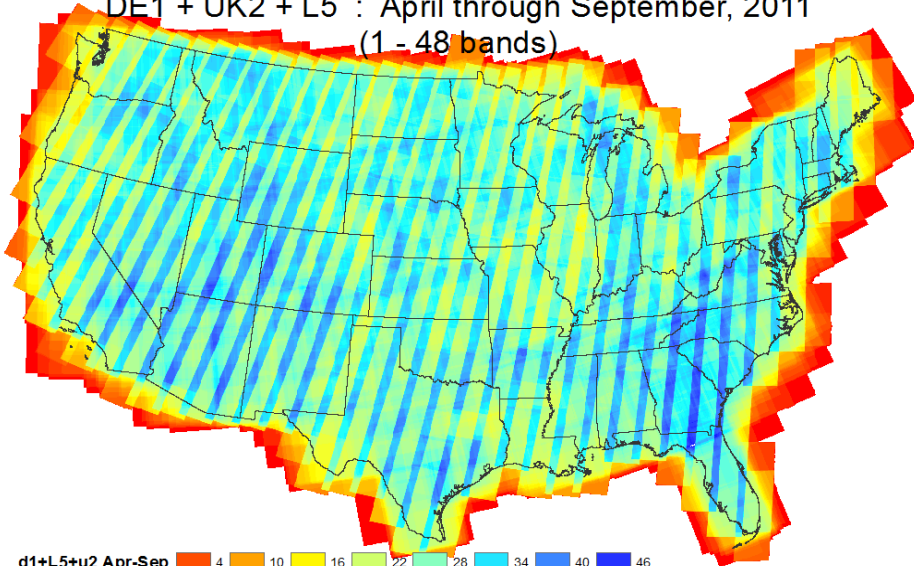
2006 - 2010

2011- Current

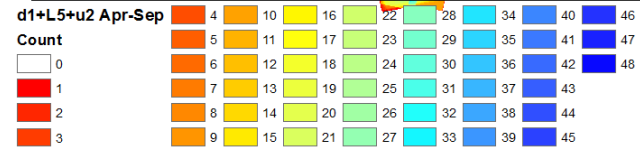
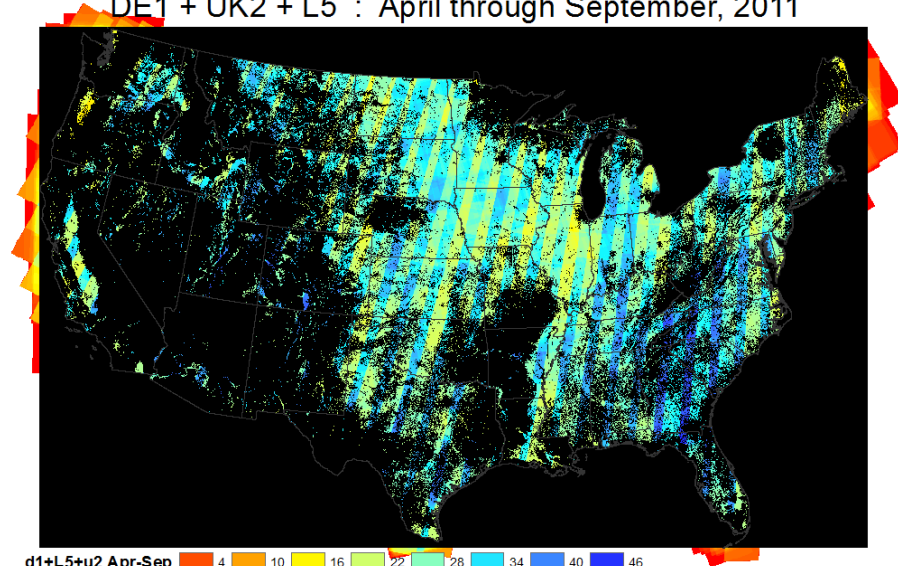
2013 - Current

	<u>TM</u>	<u>AWiFS</u>	<u>DMC</u>	<u>Landsat 8</u>
Equatorial crossing time	9:45 ± 15 minutes	10:30 ± 5 minutes	10:30 ± 5 minutes	10:00 ± 15 minutes
Temporal Resolution	16 days	5 days	2 - 3 days	16 days
Spatial Resolution	30 x 30 m (reflective) 120 x 120 m (thermal)	56 x 56 m	22 x 22 m (resampled to 30)	30 x 30 m (reflective) 100 x 100 m (thermal)
Radiometric Resolution	8 bit (256)	10 bit (1024)	10 bit (1024)	12 bit (4096)
Spectral Resolution	6 (B, G, R, NIR, SWIR, MIR) + Thermal IR	4 (G, R, NIR, SWIR)	3 (G, R, NIR)	10 (B, G, R, NIR, SWIR, MIR) + Thermal IR
Swath wide	185 km	737 km	600 km	185 km

DE1 + UK2 + L5 : April through September, 2011
(1 - 48 bands)



DE1 + UK2 + L5 : April through September, 2011



2011 Available Imagery:

Landsat 5	3972 Scenes
<u>DMC</u>	<u>1262 Scenes</u>
<i>Total</i>	<i>5234 Scenes</i>

Ground Truth (20

Agriculture Ground Truth

Provided by Farm Service Agency

USDA programs (crop subsidy, disaster relief)

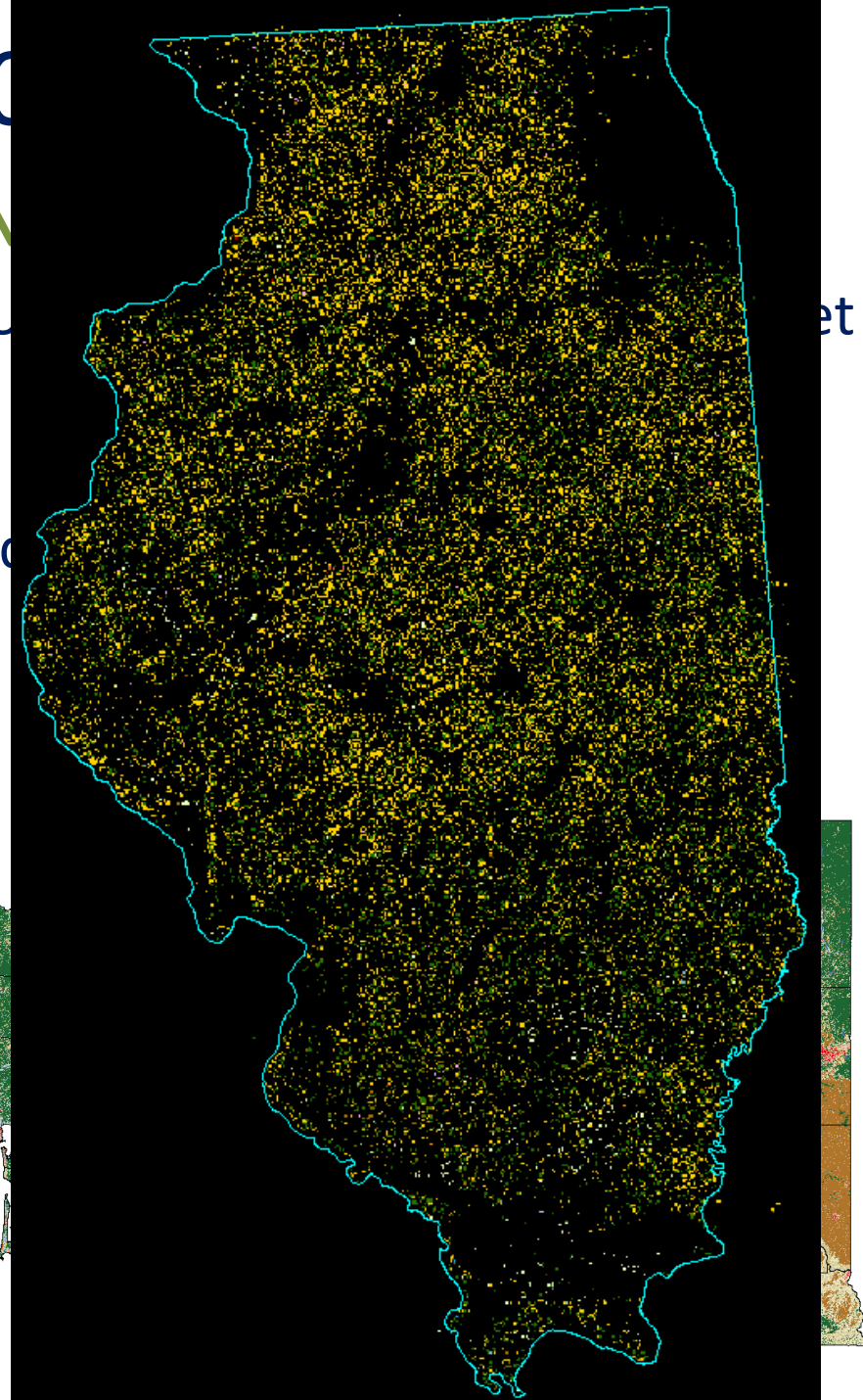
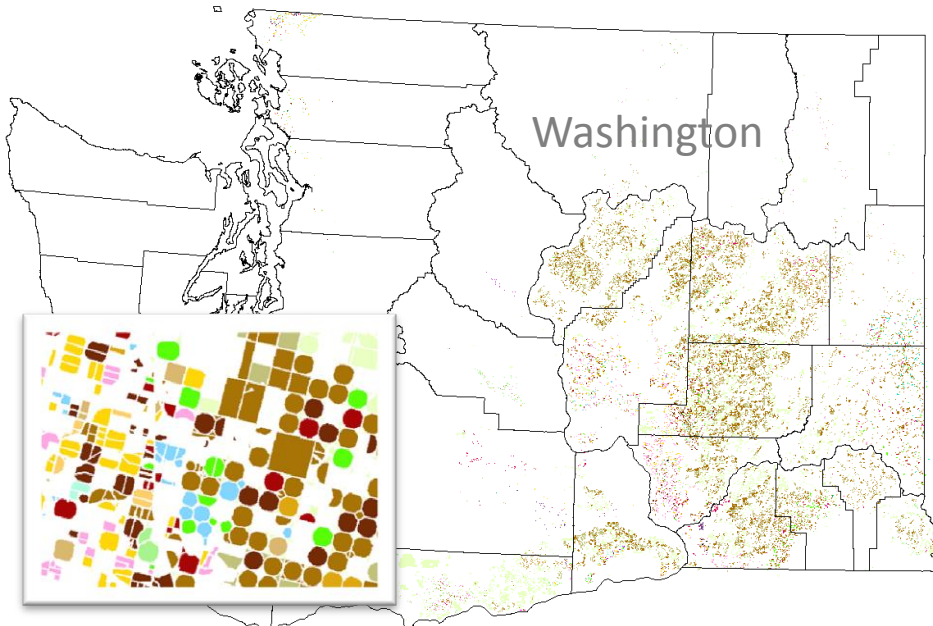
Program crops (may under report specialty crops)

GIS-ready (less labor intensive for NASS)

Divide known fields into 2 sets

70% used for training

30% used for validation

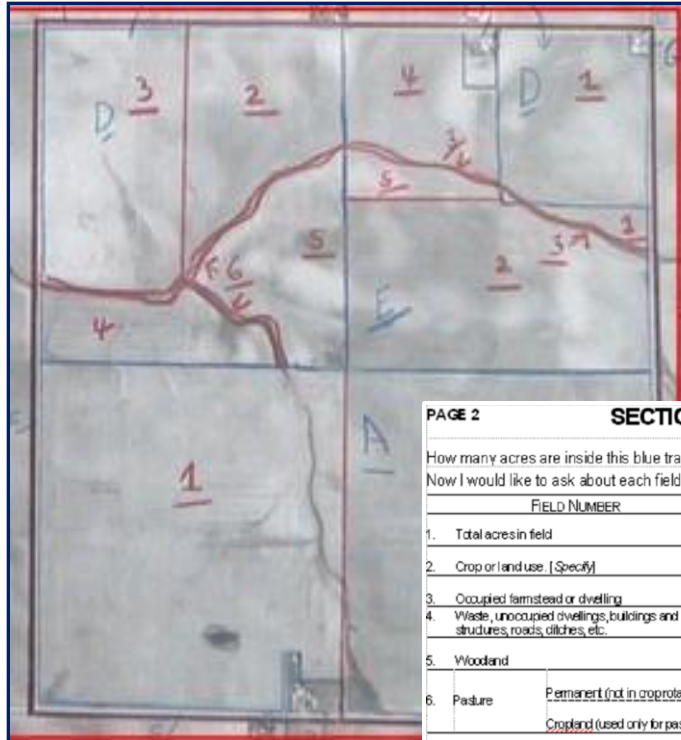


Old Ground Truth (1997 – 2006 CDLs)

June Agricultural Survey (JAS) – National in Scope

- 41,000 farms visited, 11,000 one-square mile sample area segments

- Illinois ~ 400 segments statewide

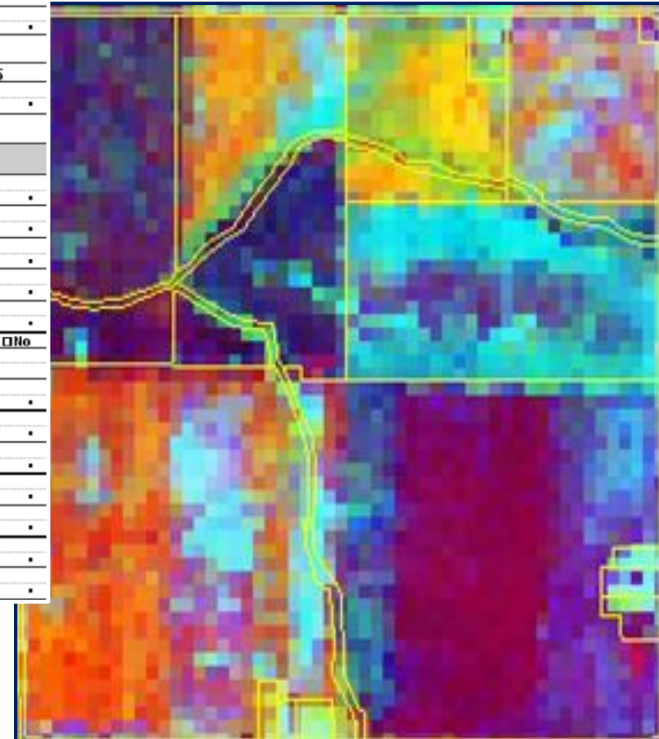


PAGE 2 SECTION D - CROPS AND LAND USE ON TRACT 17

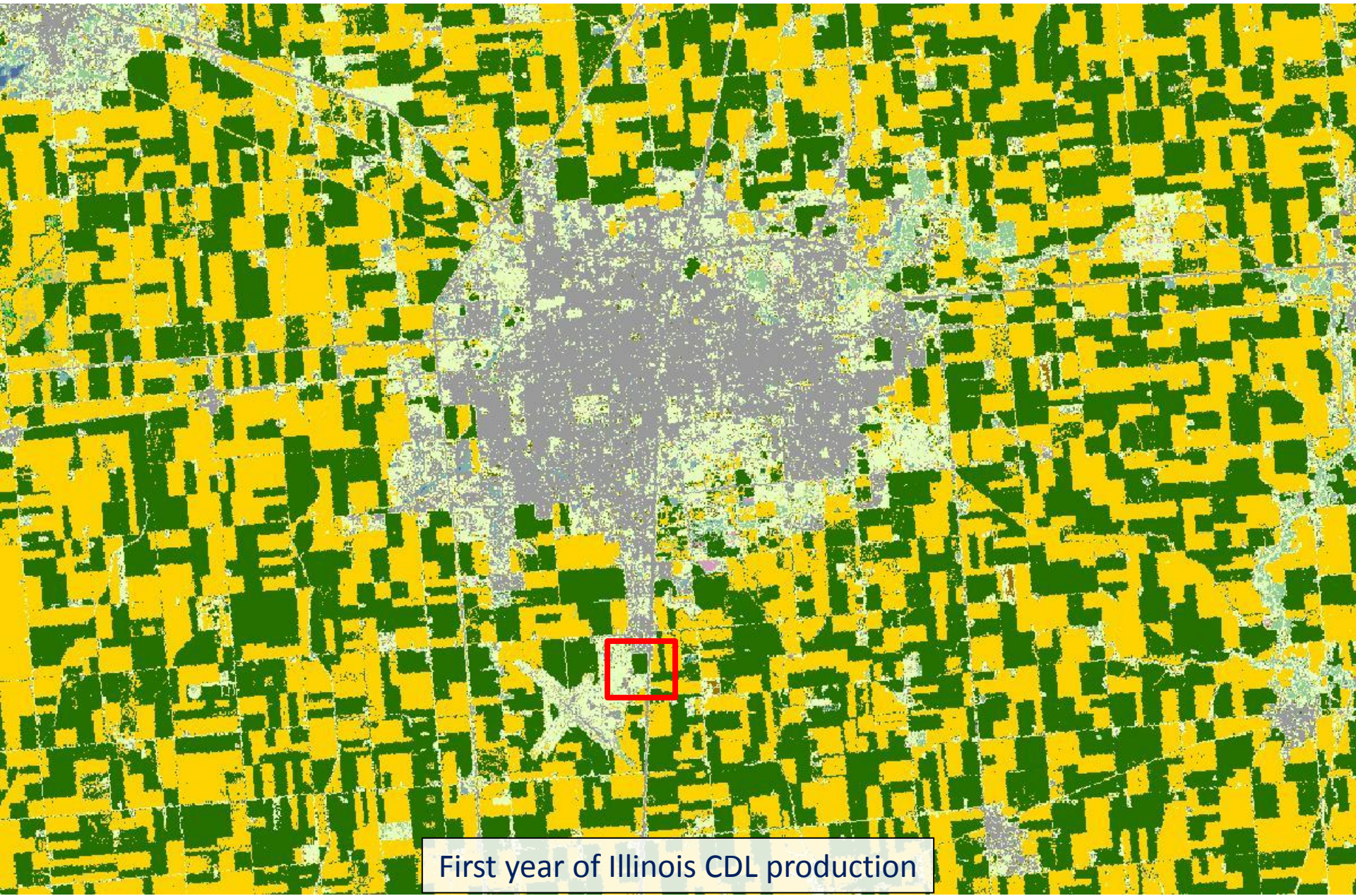
How many acres are inside this blue tract boundary drawn on the photo (map)?

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

FIELD NUMBER	01	02	03	04	05
1. Total acres in field	828	828	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	831	831
6. Pasture	842	842	842	842	842
	856	856	856	856	856
8. Idle cropland - Idle all during 2000	857	857	857	857	857
9. Two crops planted in this field or two uses of the same crop. [Specify second crop or use]	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
	844	844	844	844	844
10. Acres left to be planted	810	810	810	810	810
11. Acres irrigated and to be irrigated. [If double cropped, include acreage of each crop irrigated]	620	620	620	620	620
16. Winter Wheat (include cover crop)	Planted	540	540	540	540
	For grain or seed	541	541	541	541
18. Rye (include cover crop) [Exclude ryegrass]	Planted	547	547	547	547
	For grain or seed	548	548	548	548



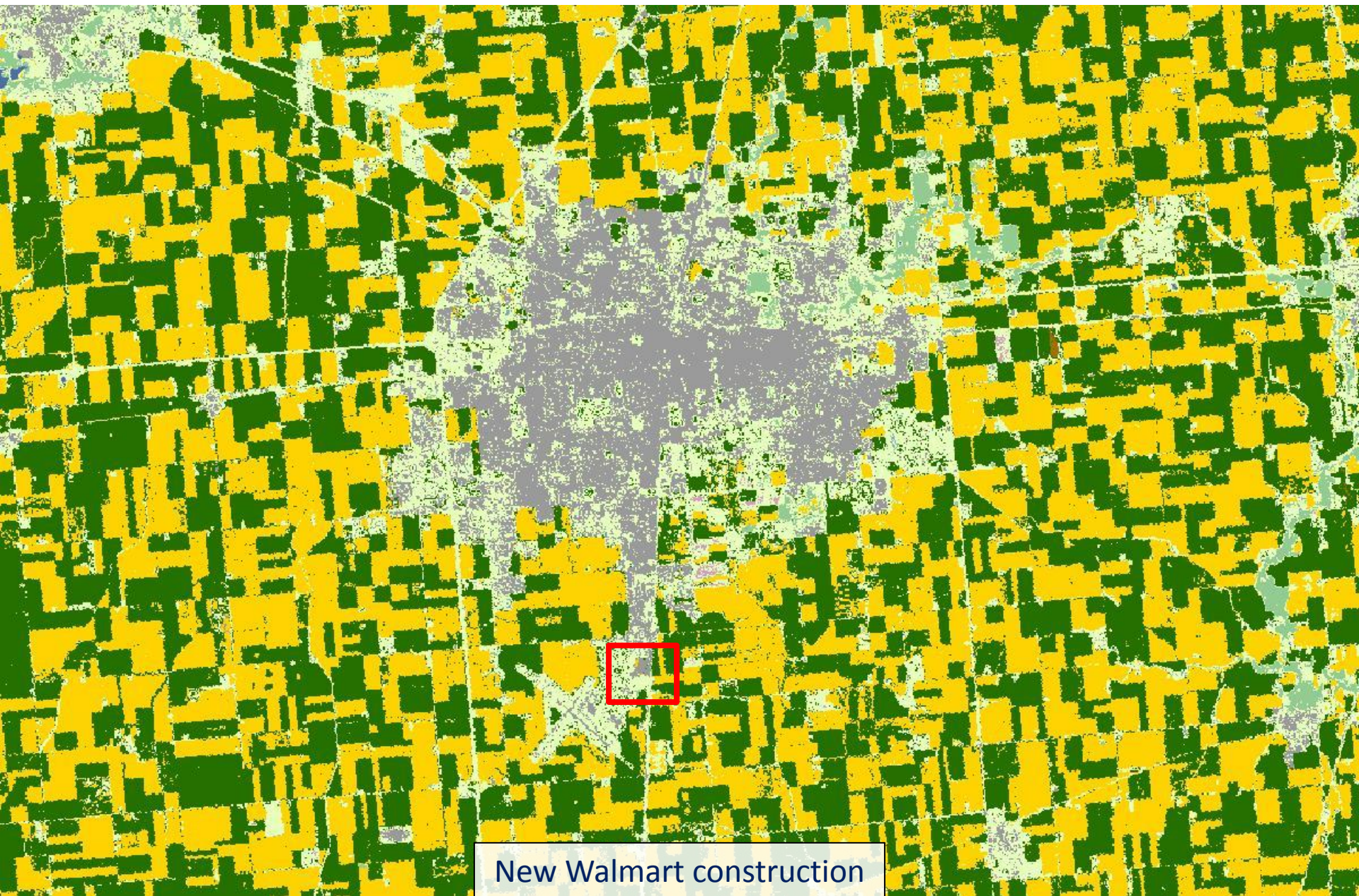
1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 1999



First year of Illinois CDL production

Cropland Data Layer - Champaign-Urbana, Illinois

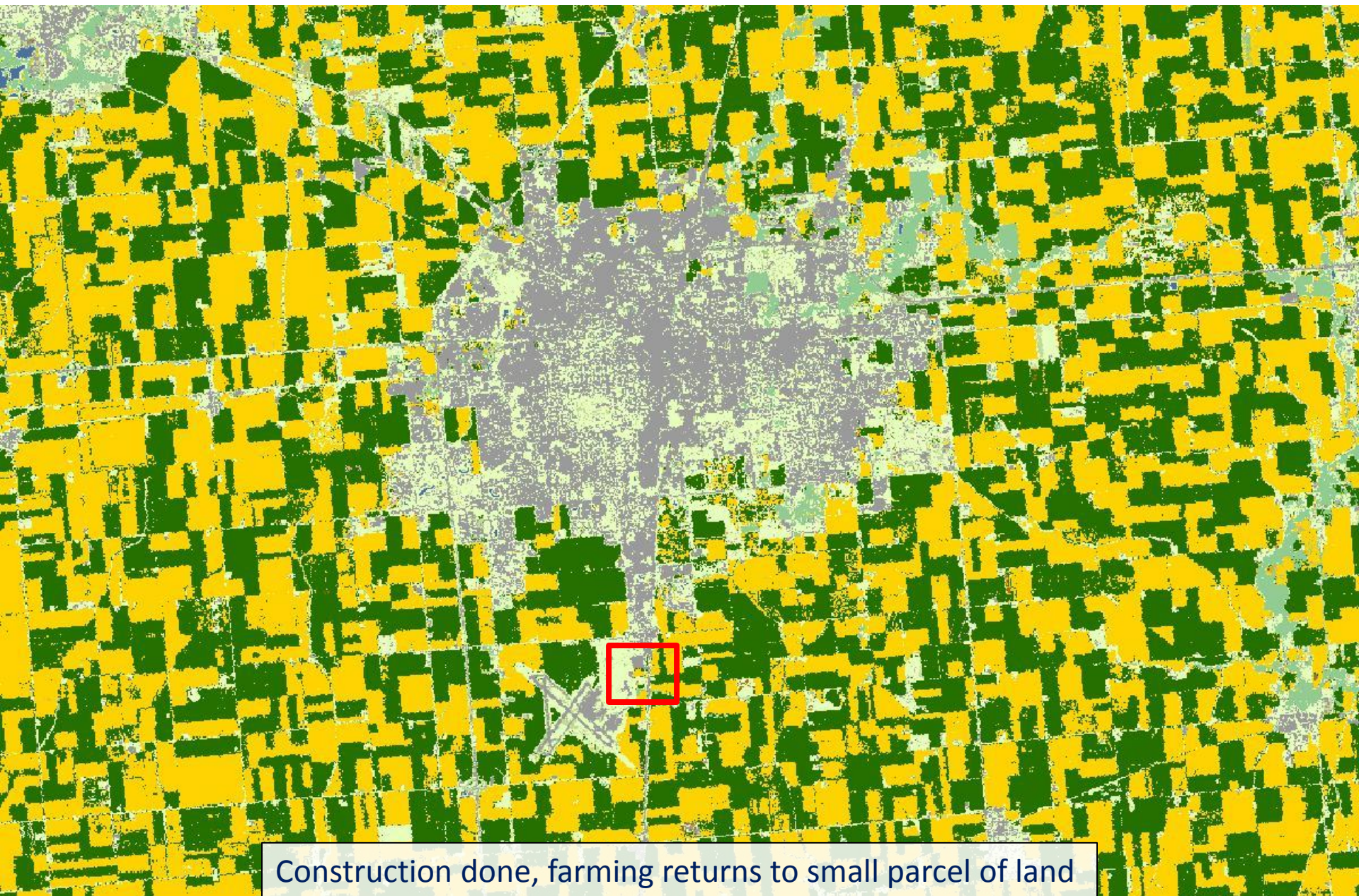
1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 1999



New Walmart construction

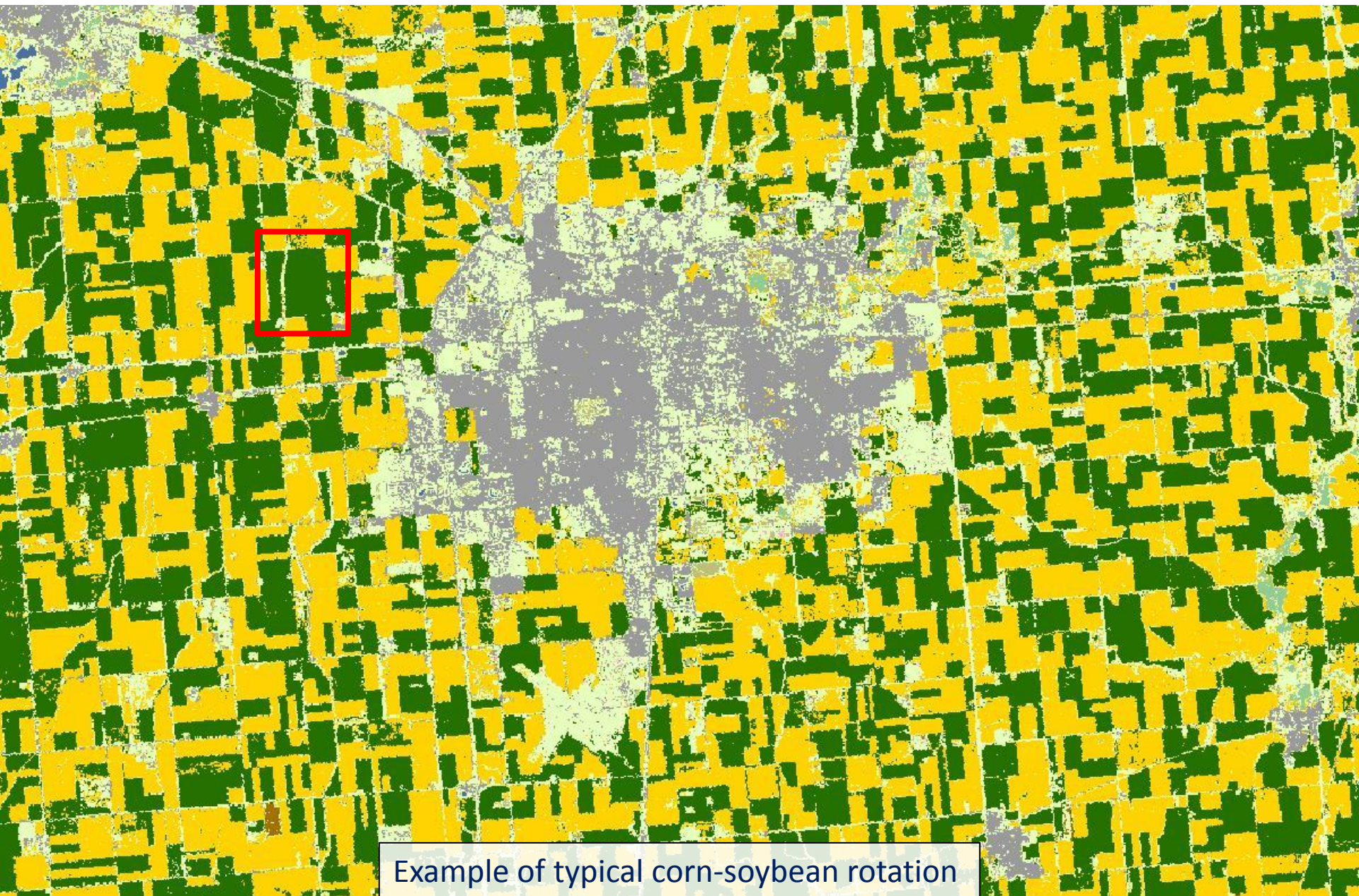
Cropland Data Layer - Champaign-Urbana, Illinois

1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 1999



Cropland Data Layer - Champaign-Urbana, Illinois

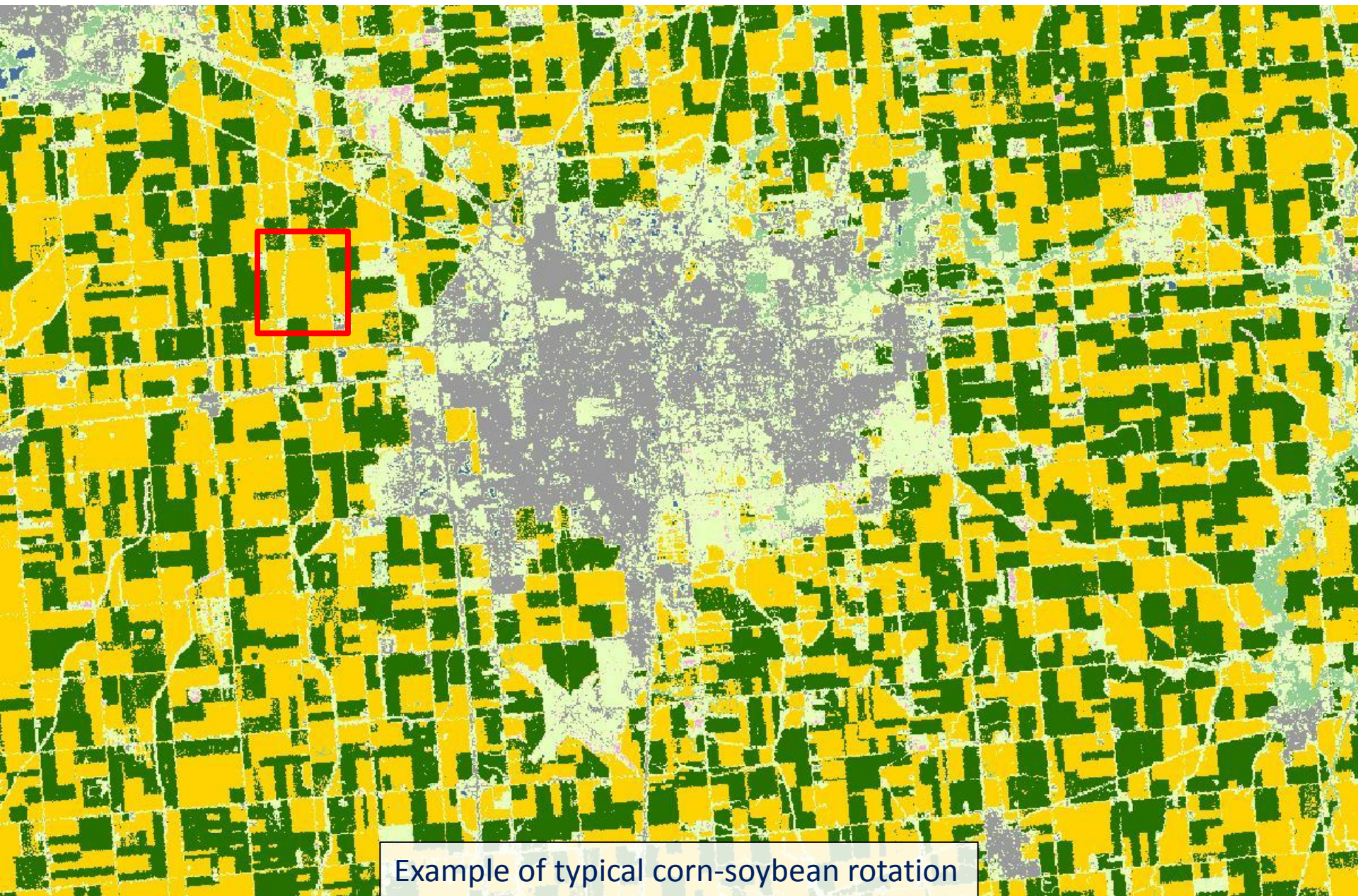
1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 1999



Example of typical corn-soybean rotation

Cropland Data Layer - Champaign-Urbana, Illinois

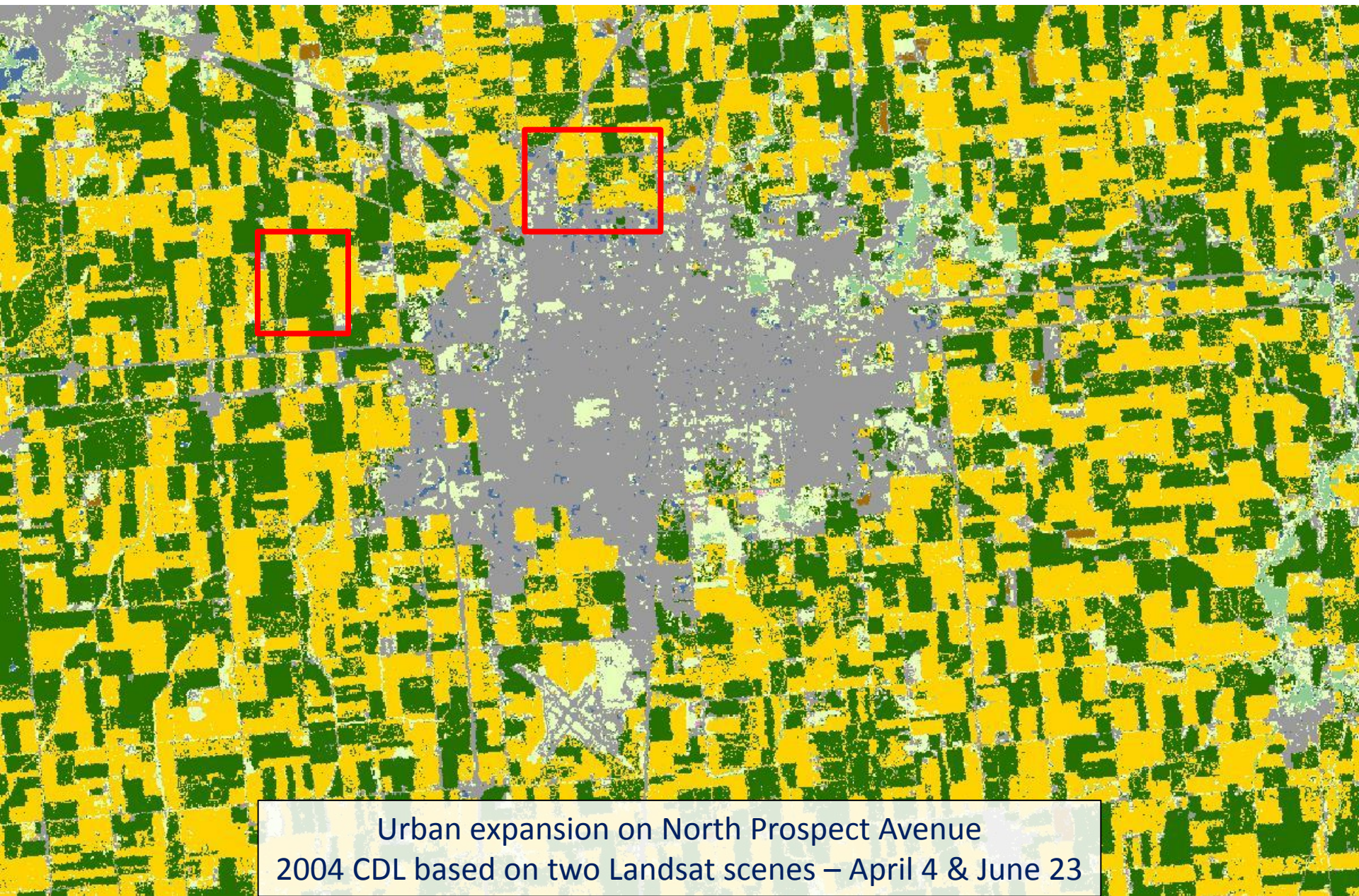
1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 1999



Example of typical corn-soybean rotation

Cropland Data Layer - Champaign-Urbana, Illinois

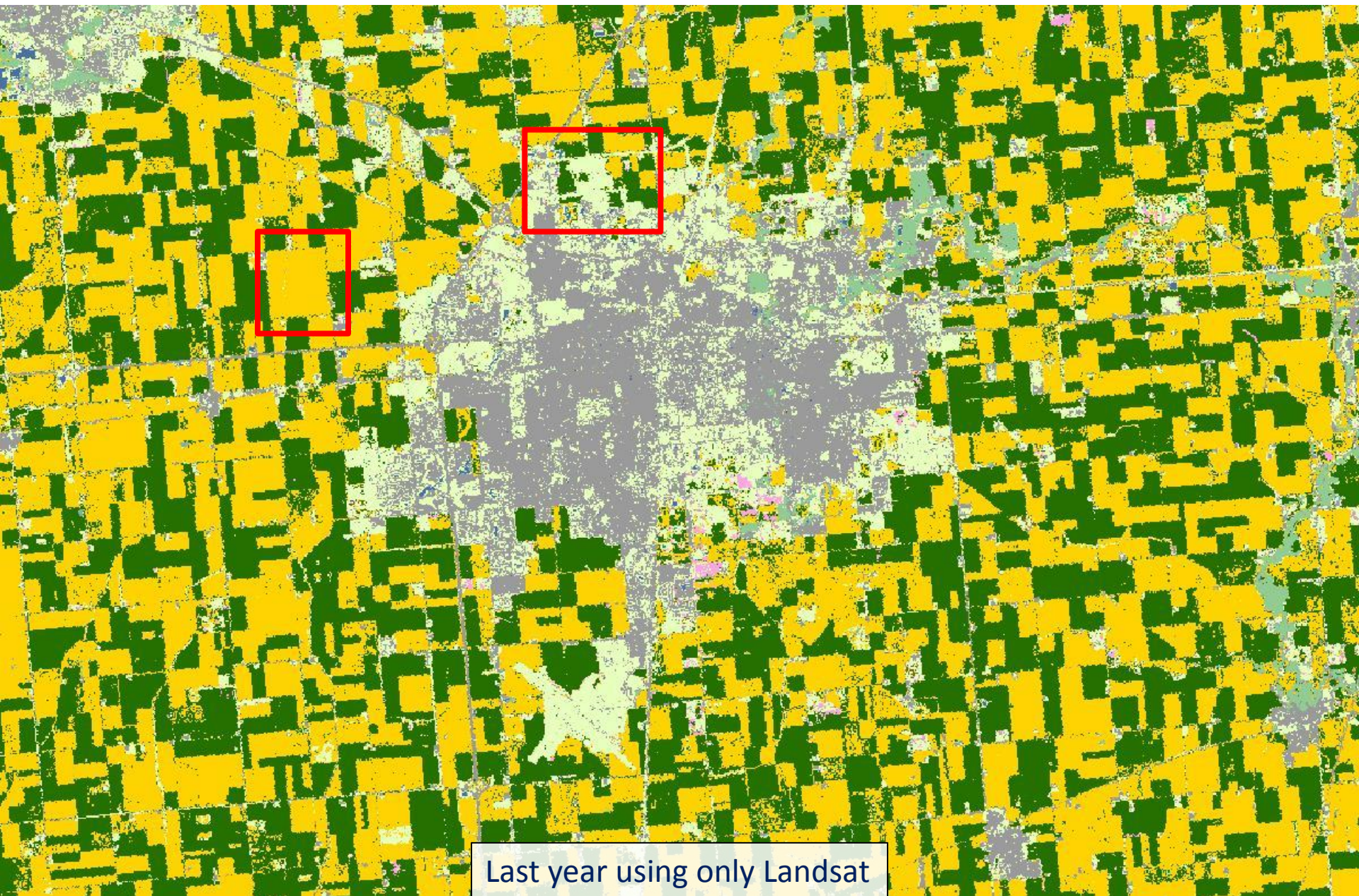
1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 1999



Urban expansion on North Prospect Avenue
2004 CDL based on two Landsat scenes - April 4 & June 23

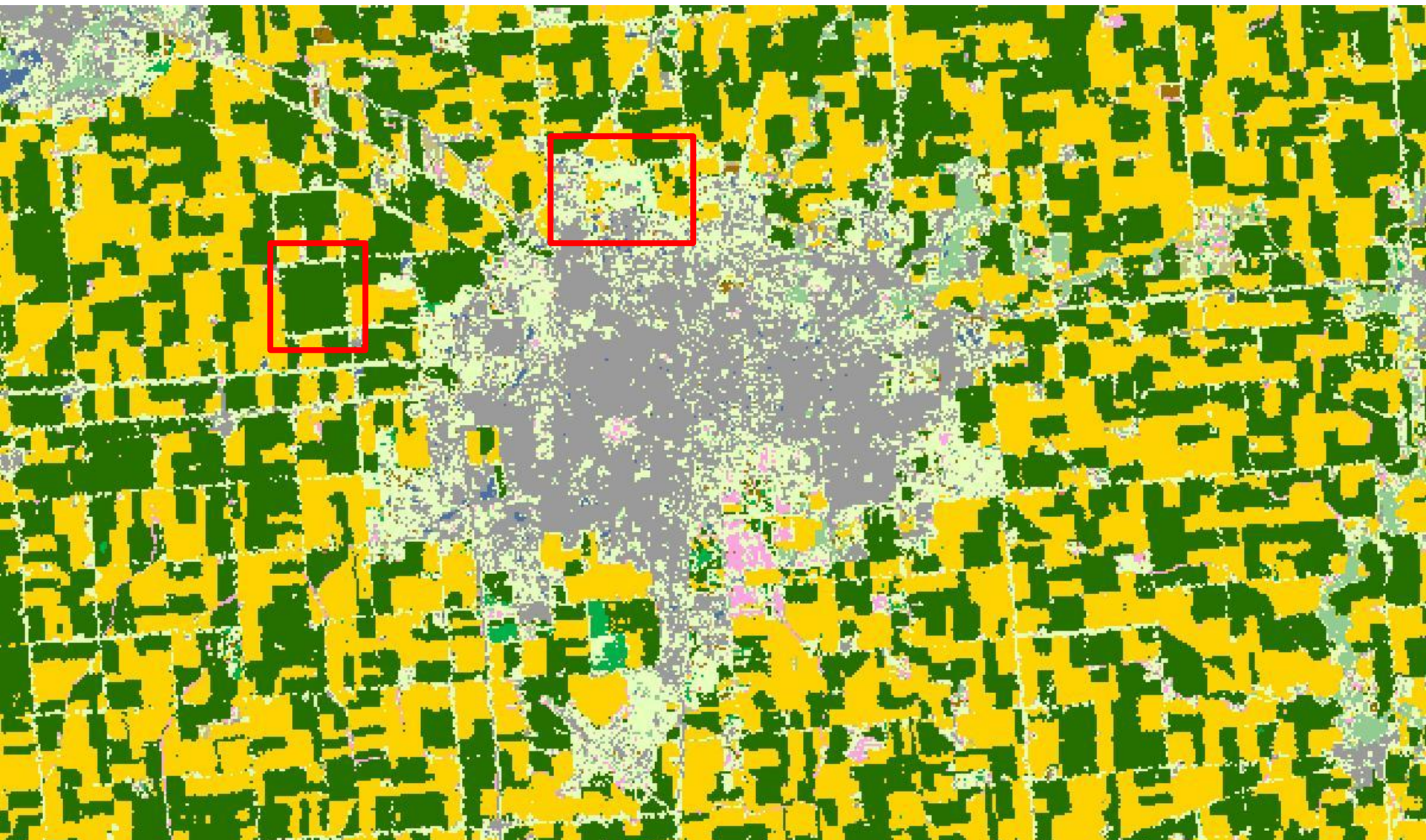
Cropland Data Layer - Champaign-Urbana, Illinois

1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 1999



Cropland Data Layer - Champaign-Urbana, Illinois

1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 1999



First year using AWiFS imagery in addition to Landsat,
still using old maximum likelihood classifier and June Area Survey as ground truth

Cropland Data Layer - Champaign-Urbana, Illinois

1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 1999



First year using new decision-tree based classifier, first year using Farm Service Agency (FSA) Common Land Unit (CLU) and the 2001 NLCD for ground truth

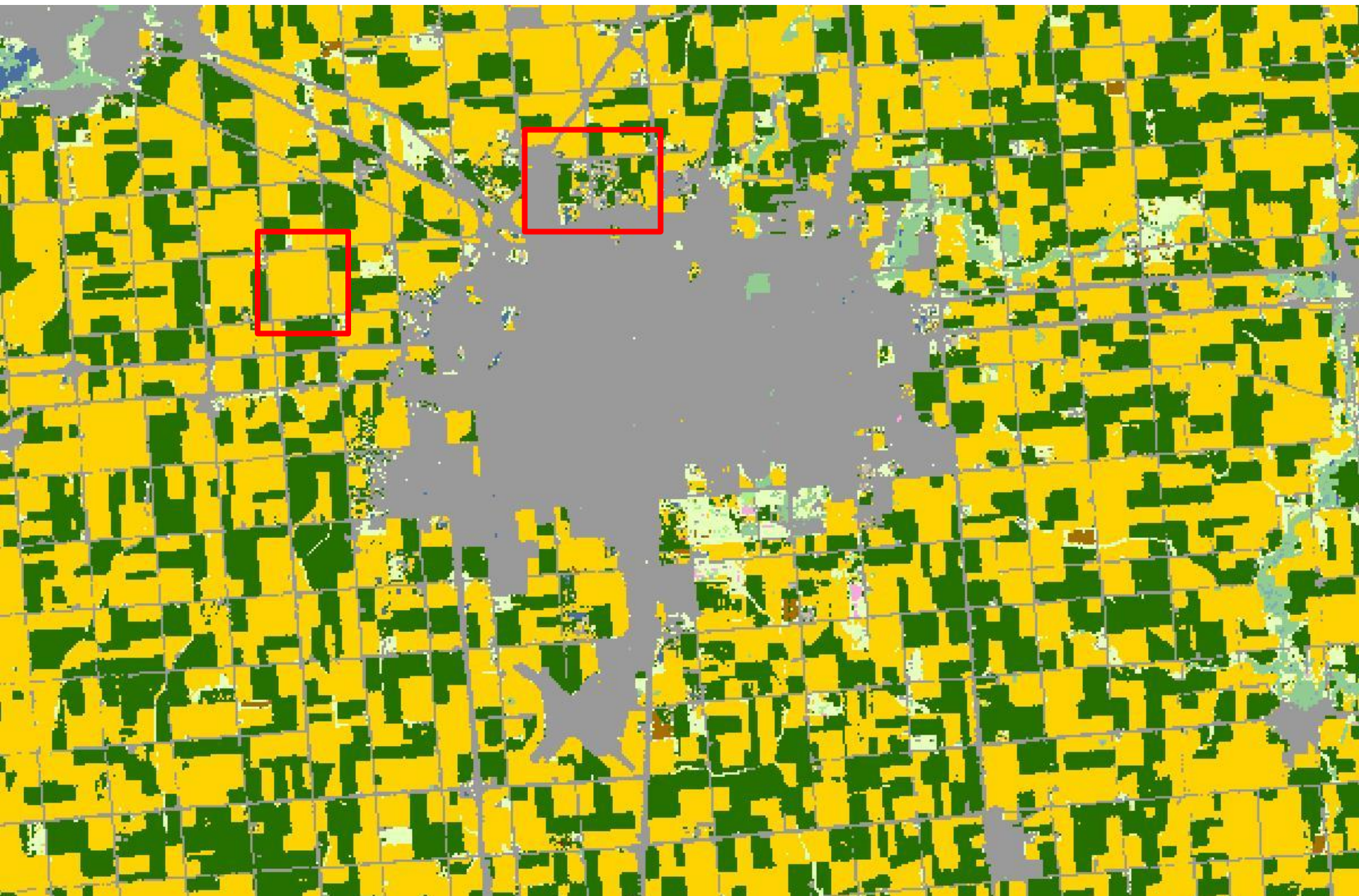
Cropland Data Layer - Champaign-Urbana, Illinois

1999 2000 2001 2002 2003 2004 2005 2006 2007 **2008** 2009 2010 2011 2012 1999



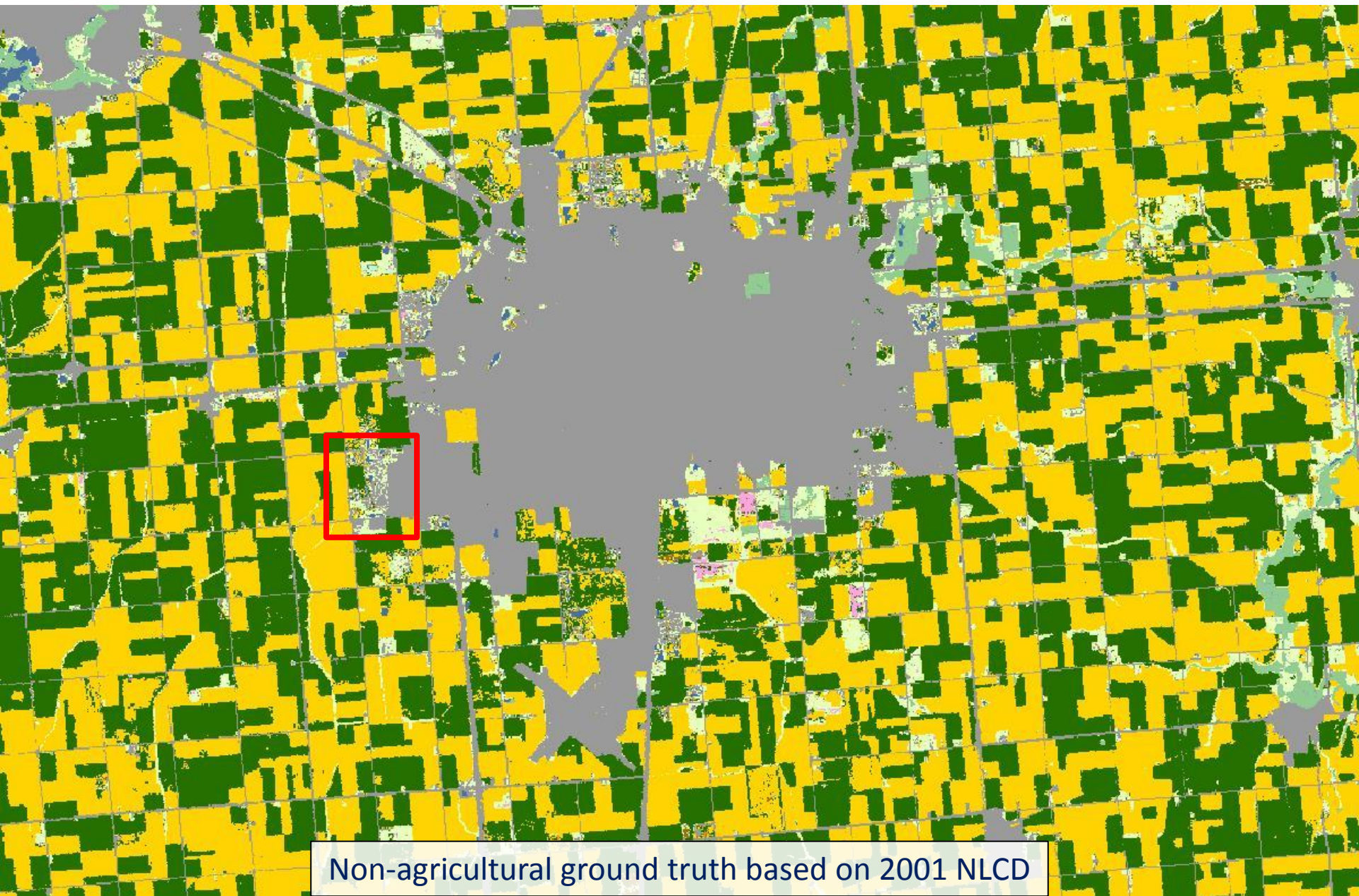
Cropland Data Layer - Champaign-Urbana, Illinois

1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 1999



Cropland Data Layer - Champaign-Urbana, Illinois

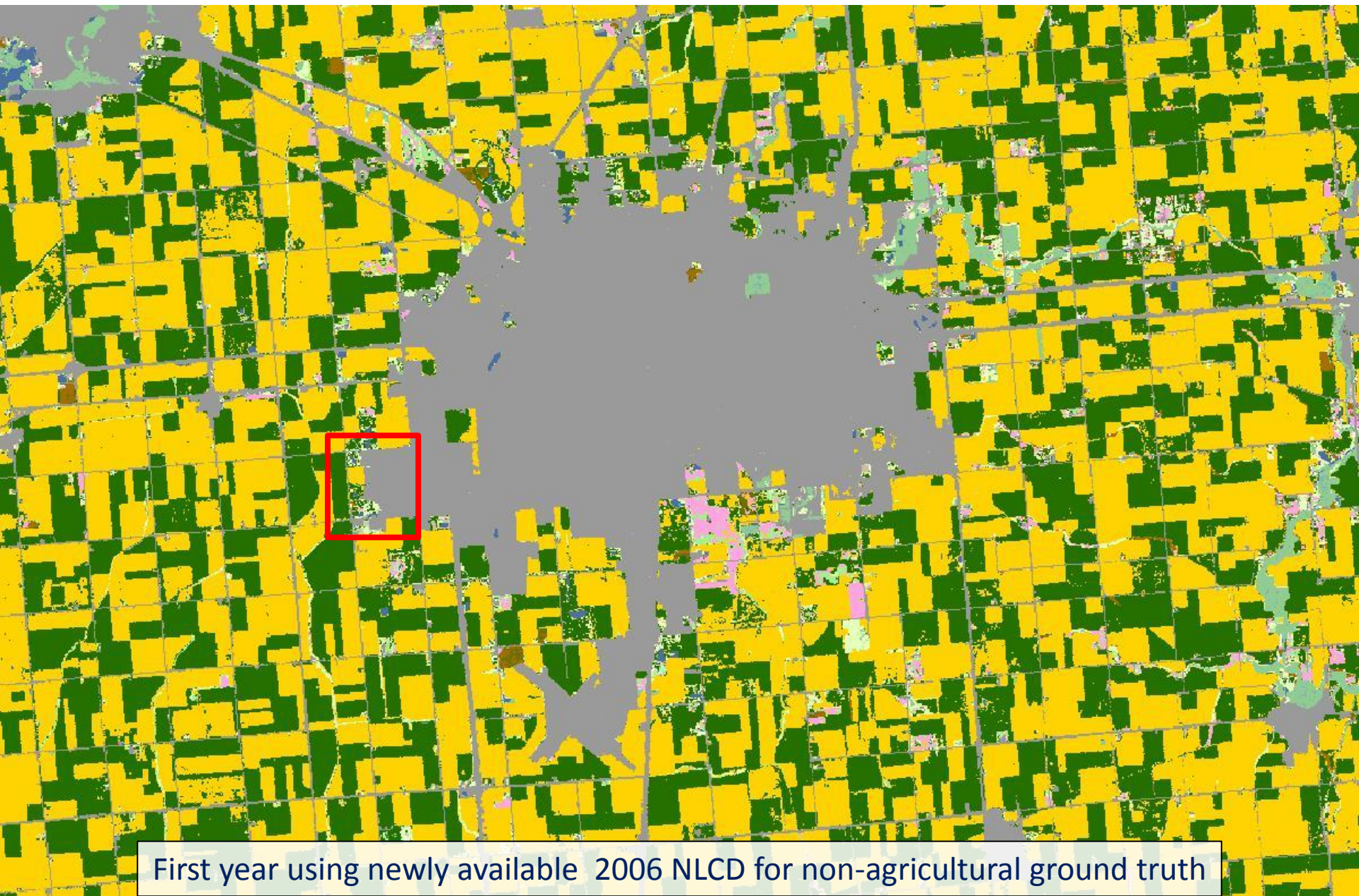
1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 1999



Non-agricultural ground truth based on 2011 NLCD

Cropland Data Layer - Champaign-Urbana, Illinois

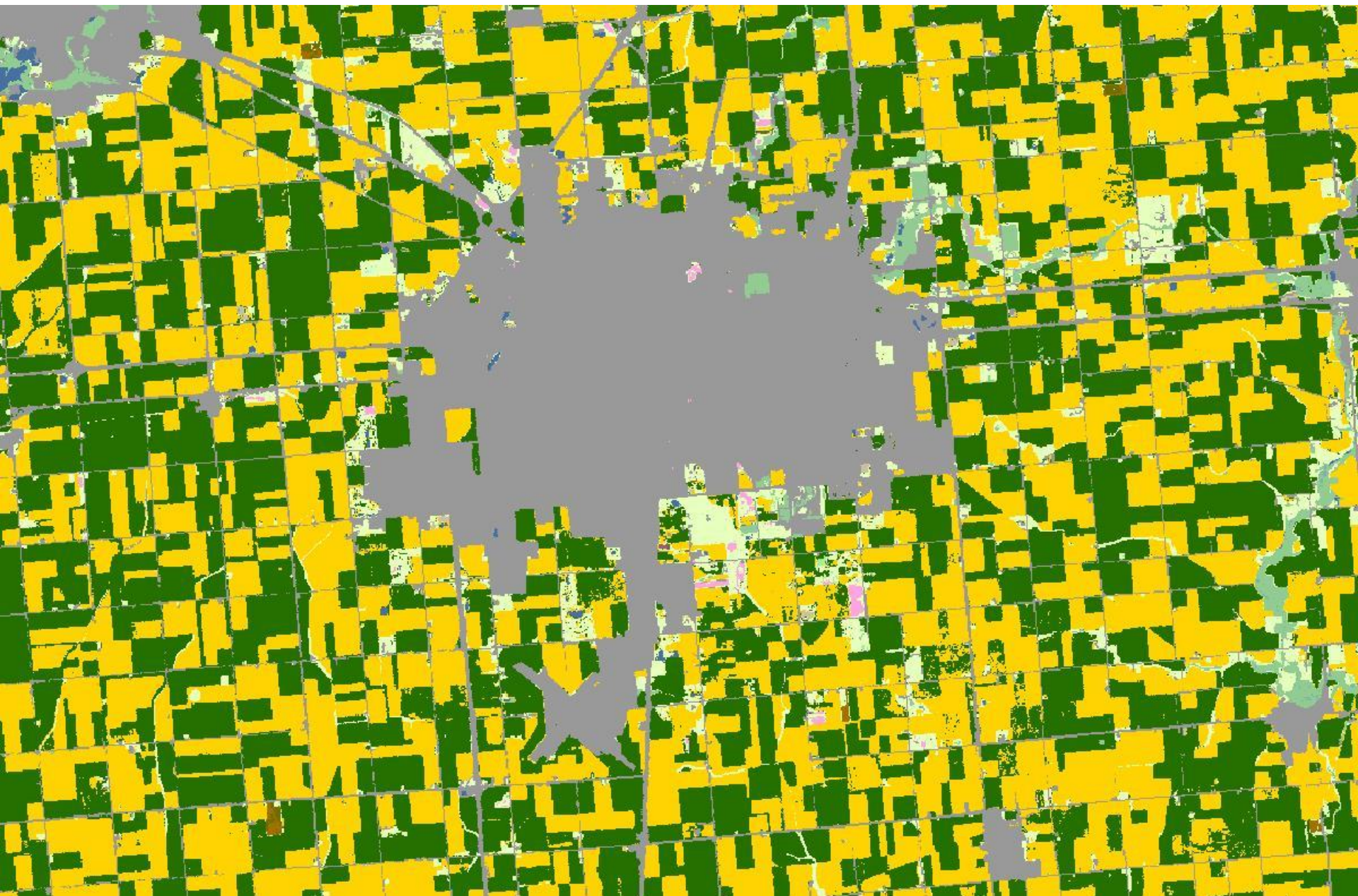
1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 1999



First year using newly available 2006 NLCD for non-agricultural ground truth

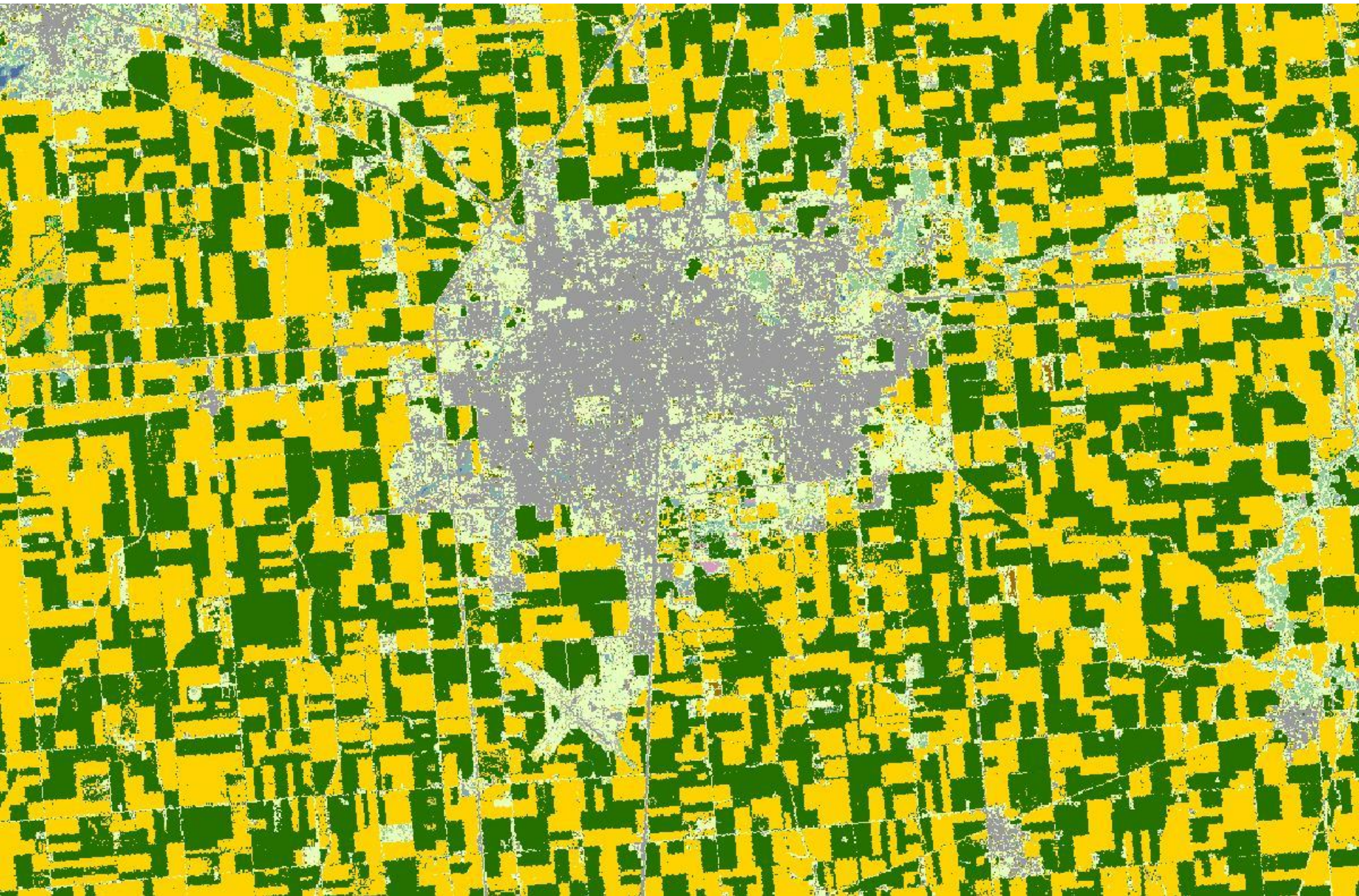
Cropland Data Layer - Champaign-Urbana, Illinois

1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 1999



Cropland Data Layer - Champaign-Urbana, Illinois

1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 1999



Cropland Data Layer - Champaign-Urbana, Illinois

Accuracy Assessment

USDA, National Agricultural Statistics Service, 2012 Illinois Cropland Data Layer
STATEWIDE AGRICULTURAL ACCURACY REPORT



Crop-specific covers only	*Correct	Accuracy	Error	Kappa
OVERALL ACCURACY**	651,381	92.8%	7.2%	0.865

Cover Type	Attribute Code	*Correct Pixels	Producer's Accuracy	Omission Error	Kappa	User's Accuracy	Commission Error	Cond'l Kappa
Corn	1	394316	97.69%	2.31%	0.96	96.01%	3.99%	0.93
Rice	3	0	0.00%	100.00%	0.00	0.00%	100.00%	0.00
Sorghum	4	40	6.83%	93.17%	0.07	67.80%	32.20%	0.68
Soybeans	5	241126	96.39%	3.61%	0.95	94.66%	5.34%	0.93
Sunflower	6	0	0.00%	100.00%	0.00	n/a	n/a	n/a
Tobacco	11	0	0.00%	100.00%	0.00	0.00%	100.00%	0.00
Sweet Corn	12	86	33.86%	66.14%	0.34	84.31%	15.69%	0.84
Pop or Orn Corn	13	560	47.22%	52.78%	0.47	97.56%	2.44%	0.98
Barley	21	0	0.00%	100.00%	0.00	0.00%	100.00%	0.00
Winter Wheat	24	1826	60.22%	39.78%	0.60	73.69%	26.31%	0.74
Dbl Crop WinWht/Soybeans	26	11609	90.03%	9.97%	0.90	82.40%	17.60%	0.82
Rye	27	7	12.50%	87.50%	0.12	63.64%	36.36%	0.64
Oats	28	21	15.67%	84.33%	0.16	56.76%	43.24%	0.57
Millet	29	0	0.00%	100.00%	0.00	n/a	n/a	n/a
Alfalfa	36	976	30.47%	69.53%	0.30	59.62%	40.38%	0.59
Other Hay/Non Alfalfa	37	239	7.04%	92.96%	0.07	35.30%	64.70%	0.35
Dry Beans	42	41	67.21%	32.79%	0.67	69.49%	30.51%	0.69
Potatoes	43	100	42.19%	57.81%	0.42	92.59%	7.41%	0.93
Other Crops	44	0	0.00%	100.00%	0.00	0.00%	100.00%	0.00
Watermelons	48	0	0.00%	100.00%	0.00	n/a	n/a	n/a
Cucumbers	50	3	30.00%	70.00%	0.30	75.00%	25.00%	0.75
Peas	53	1	6.25%	93.75%	0.06	50.00%	50.00%	0.50
Herbs	57	14	25.93%	74.07%	0.26	73.68%	26.32%	0.74
Clover/Wildflowers	58	29	10.74%	89.26%	0.11	70.73%	29.27%	0.71
Sod/Grass Seed	59	4	3.92%	96.08%	0.04	40.00%	60.00%	0.40
Switchgrass	60	0	0.00%	100.00%	0.00	0.00%	100.00%	0.00
Fallow/Idle Cropland	61	3	0.64%	99.36%	0.01	15.00%	85.00%	0.15
Peaches	67	0	0.00%	100.00%	0.00	n/a	n/a	n/a
Apples	68	0	0.00%	100.00%	0.00	n/a	n/a	n/a
Grapes	69	0	0.00%	100.00%	0.00	n/a	n/a	n/a
Christmas Trees	70	0	0.00%	100.00%	0.00	0.00%	100.00%	0.00
Walnuts	76	63	46.32%	53.68%	0.46	90.00%	10.00%	0.90
Aquaculture	92	0	0.00%	100.00%	0.00	n/a	n/a	n/a
Triticale	205	0	n/a	n/a	n/a	0.00%	100.00%	0.00
Cantaloupes	209	0	0.00%	100.00%	0.00	n/a	n/a	n/a
Peppers	216	0	0.00%	100.00%	0.00	n/a	n/a	n/a
Strawberries	221	0	n/a	n/a	n/a	0.00%	100.00%	0.00
Squash	222	0	0.00%	100.00%	0.00	0.00%	100.00%	0.00
Dbl Crop WinWht/Corn	225	6	4.03%	95.97%	0.04	50.00%	50.00%	0.50
Dbl Crop Oats/Corn	226	0	0.00%	100.00%	0.00	n/a	n/a	n/a
Pumpkins	229	231	57.61%	42.39%	0.58	90.59%	9.41%	0.91
Dbl Crop WinWht/Sorghum	236	2	3.17%	96.83%	0.03	66.67%	33.33%	0.67
Dbl Crop Soybeans/Oats	240	0	0.00%	100.00%	0.00	n/a	n/a	n/a
Dbl Crop Corn/Soybeans	241	77	30.08%	69.92%	0.30	89.53%	10.47%	0.90
Gourds	249	1	10.00%	90.00%	0.10	100.00%	0.00%	1.00
Dbl Crop Barley/Soybeans	254	0	0.00%	100.00%	0.00	n/a	n/a	n/a

*Correct Pixels represents the total number of independent validation pixels correctly identified in the error matrix.
 **The Overall Accuracy represents only the FSA row crops and annual fruit and vegetables (codes 1-61,66-80 and 200-255).
 FSA-sampled grass and pasture, aquaculture, and all NLCD-sampled categories (codes 62-65 and 81-199) are not included in the Overall Accuracy.



Acreage not just about counting pixels

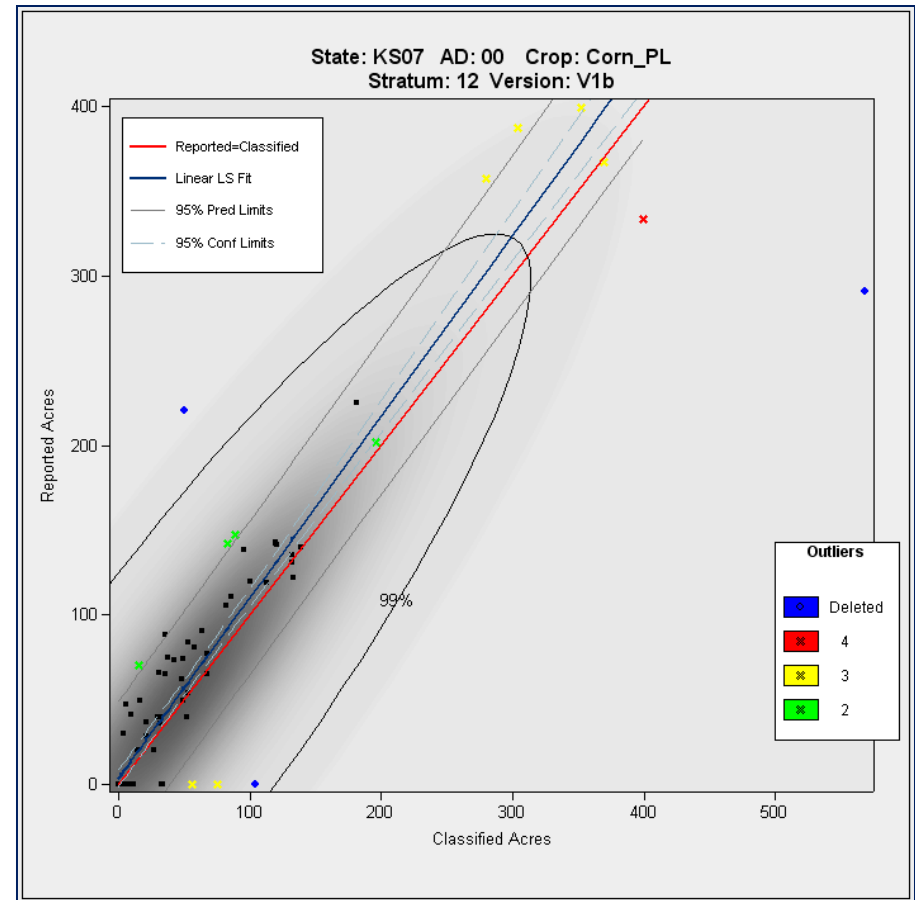
Regression-based Acreage Estimator

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

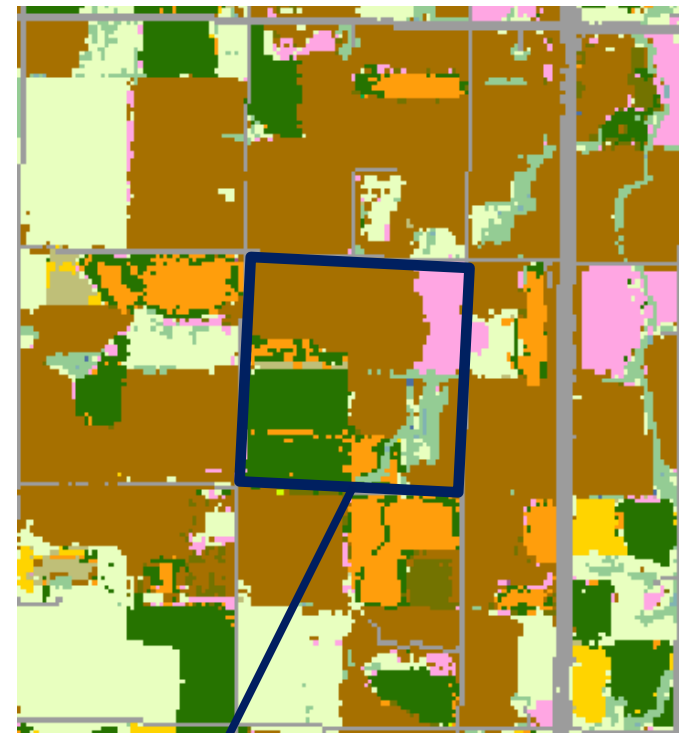
Outlier segment detection - correction or removal from regression analysis



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	03	04	05
1. Total acres in field	828	828	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	831	831
6. Pasture	Permanent (not in crop rotation)	842	842	842	842
	Cropland (used only for pasture)	856	856	856	856
8. Idle cropland - idle all during 2000	857	857	857	857	857
9. Two crops planted in this field or two uses of the same crop.	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
	[Specify second crop or use]				
Acres	844	844	844	844	844
10. Acres left to be planted	610	610	610	610	610
11. Acres irrigated and to be irrigated [If double cropped, include acreage of each crop irrigated]	620	620	620	620	620
16. Winter Wheat (include cover crop)	Planted	540	540	540	540
	For grain or seed	541	541	541	541
18. Rye (include cover crop) [Exclude ryegrass]	Planted	547	547	547	547
	For grain or seed	548	548	548	548



REGRESSION VARIABLES:

Dependent
Y

Independent
X

	Enumerated JAS Segments	CDL Classified Acres
Soybeans	227	273
Wheat	337	541

CDL Metadata

- Detailed metadata files for each CDL state/year available online at: <http://www.nass.usda.gov/research/Cropland/metadata/meta.htm>

Raster		Attribute Domain Values and Definitions: ROW CROPS 1-20																						
<p> Map_Projection_Name: Albers Conical Equal Area Albers_Conical_Equal_Area: Standard_Parallel: 29.500000 Standard_Parallel: 45.500000 Longitude_of_Central_Meridian: -96.000000 Latitude_of_Projection_Origin: 23.000000 False_Easting: 0.000000 False_Northing: 0.000000 Planar_Coordinate_Information: Planar_Coordinate_Encoding_Method: row and column Coordinate_Representation: Abscissa_Resolution: 56 Ordinate_Resolution: 56 Planar_Distance_Units: meters Geodetic_Model: Horizontal_Datum_Name: North American Datum of 1983 Ellipsoid_Name: Geodetic Reference System 80 Semi-major_Axis: 6378137.000000 Denominator_of_Flattening_Ratio: 298.257223563 </p>	<table border="1"> <thead> <tr> <th>Classification Code</th> <th>Land Cover</th> </tr> </thead> <tbody> <tr><td>"1"</td><td>Corn</td></tr> <tr><td>"2"</td><td>Cotton</td></tr> <tr><td>"3"</td><td>Rice</td></tr> <tr><td>"4"</td><td>Sorghum</td></tr> <tr><td>"5"</td><td>Soybeans</td></tr> <tr><td>"6"</td><td>Sunflowers</td></tr> <tr><td>"10"</td><td>Peanuts</td></tr> <tr><td>"11"</td><td>Tobacco</td></tr> <tr><td>"12"</td><td>Sweet Corn</td></tr> <tr><td>"13"</td><td>Popcorn or Ornamental Corn</td></tr> </tbody> </table>	Classification Code	Land Cover	"1"	Corn	"2"	Cotton	"3"	Rice	"4"	Sorghum	"5"	Soybeans	"6"	Sunflowers	"10"	Peanuts	"11"	Tobacco	"12"	Sweet Corn	"13"	Popcorn or Ornamental Corn	<p> CLASSIFICATION INPUTS: AWIFS DATE 20080413 PATH 264 ROW(S) &QUADRANT(S) 35b 40d 45bd AWIFS DATE 20080418 PATH 265 ROW(S) &QUADRANT(S) 35bd 40abcd 45abd 49b AWIFS DATE 20080427 PATH 262 ROW(S) &QUADRANT(S) 40bd AWIFS DATE 20080428 PATH 267 ROW(S) &QUADRANT(S) 40d 45bd AWIFS DATE 20080503 PATH 268 ROW(S) &QUADRANT(S) 35bd 40bcd 45abcd 49bd AWIFS DATE 20080512 PATH 265 ROW(S) &QUADRANT(S) 40bcd 45abd AWIFS DATE 20080517 PATH 266 ROW(S) &QUADRANT(S) 35d 40bd 45b AWIFS DATE 20080606 PATH 270 ROW(S) &QUADRANT(S) 40d 45b AWIFS DATE 20080614 PATH 262 ROW(S) &QUADRANT(S) 35bd 40bd 45b AWIFS DATE 20080625 PATH 269 ROW(S) &QUADRANT(S) 40d 45b 50bd AWIFS DATE 20080629 PATH 265 ROW(S) &QUADRANT(S) 40bd 45b AWIFS DATE 20080704 PATH 266 ROW(S) &QUADRANT(S) 35a 40d 45bd AWIFS DATE 20080713 PATH 263 ROW(S) &QUADRANT(S) 35abcd 40abd 45b AWIFS DATE 20080715 PATH 273 ROW(S) &QUADRANT(S) 35cd 40abcd 45abd 50b AWIFS DATE 20080802 PATH 267 ROW(S) &QUADRANT(S) 35d 40abcd 45abd AWIFS DATE 20080808 PATH 273 ROW(S) &QUADRANT(S) 35d 40bc 45a AWIFS DATE 20080812 PATH 269 ROW(S) &QUADRANT(S) 35c 40ac 45a AWIFS DATE 20080904 PATH 264 ROW(S) &QUADRANT(S) 40bd 45bd AWIFS DATE 20080909 PATH 265 ROW(S) &QUADRANT(S) 35bd 40bd AWIFS DATE 20080914 PATH 266 ROW(S) &QUADRANT(S) 40d 45bd AWIFS DATE 20080915 PATH 271 ROW(S) &QUADRANT(S) 45bd 50b MODIS 16 DAY NDVI COMPOSITE DATE 20071016 MODIS 16 DAY NDVI COMPOSITE DATE 20071101 MODIS 16 DAY NDVI COMPOSITE DATE 20071117 MODIS 16 DAY NDVI COMPOSITE DATE 20080305 MODIS 16 DAY NDVI COMPOSITE DATE 20080321 MODIS 16 DAY NDVI COMPOSITE DATE 20080406 MODIS 16 DAY NDVI COMPOSITE DATE 20080422 MODIS 16 DAY NDVI COMPOSITE DATE 20080508 MODIS 16 DAY NDVI COMPOSITE DATE 20080524 MODIS 16 DAY NDVI COMPOSITE DATE 20080609 USGS, NATIONAL ELEVATION DATASET ELEVATION USGS, NATIONAL LAND COVER DATASET 2001 TREE CANOPY USGS, NATIONAL LAND COVER DATASET 2001 IMPERVIOUSNESS </p>
Classification Code	Land Cover																							
"1"	Corn																							
"2"	Cotton																							
"3"	Rice																							
"4"	Sorghum																							
"5"	Soybeans																							
"6"	Sunflowers																							
"10"	Peanuts																							
"11"	Tobacco																							
"12"	Sweet Corn																							
"13"	Popcorn or Ornamental Corn																							

Future of the CDL Program?



- Expand geographic scope?
 - Testing Hawaii in 2013
- Improved categories?
 - Grassland
 - Pasture/hay/grass
 - Specialty Crops
- Imagery?
 - Future sensors
 - Finer spatial resolution
- Derivatives?
 - Cultivated Data Layer (Crop Mask)
 - Crop rotation patterns
- Other ancillary data?
 - Soils
 - Climate
- Improved online distribution
 - CropScape

CDL Visualization, Dissemination and Querying Needs

- Prior Distribution Methods:
 - Online bulk FTP downloading via NRCS Geospatial Data Gateway
 - Online, telephone and mail requests:
 - Printed maps
 - CD/DVD delivery
- NASS Needed...
 - Capabilities for on-line geospatial crop information access, geospatial query and on-line analytics via interactive maps
 - Disseminate all data to decision makers and users via real time retrieval, processing and publishing over the web through standards-based geospatial web services



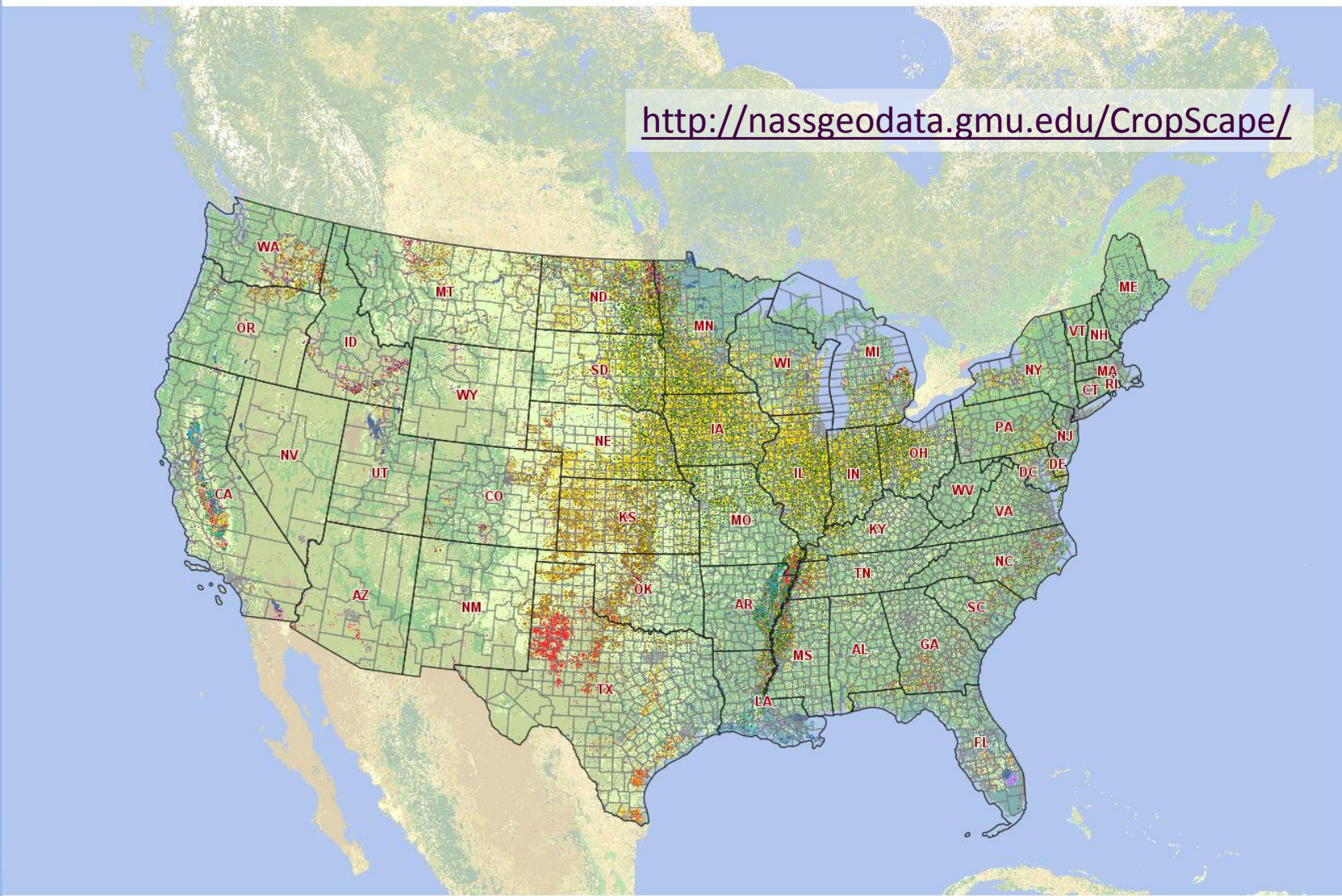
Solution - CropScape

- A web service based interactive map visualization, dissemination and querying system for U.S. cropland
 - No burden on users
 - No client software development & installation
 - No special software tools needed
- Collaboration with George Mason University/ Center for Spatial Information Science and Systems



<http://nassgeodata.gmu.edu/CropScope/>

- Layers
- Legend
- Background Layers
 - Global Land Cover
 - None
- Cropland Data Layers
 - 2012
 - 2011
 - 2010
 - 2009
 - 2008
 - 2007
 - 2006
 - 2005
 - 2004
 - 2003
 - 2002
 - 2001
 - 2000
 - 1999
 - 1998
 - 1997
- Crop Mask Layer
 - Crop Mask Layer
 - Crop Mask Layer (2007-20)
- Boundary Layers
 - County
 - ASD
 - State
- Water Layers
 - Rivers
 - Lakes
- Road Layers
 - Freeway System (National)
 - Major Highways (Regional)



CropScape Functions

- Select any historical CDL by state and year circa 1997
- Zoom in/out & Pan
- Search by county and year
- Sub-setting by state, county, and year
- Sub-setting for any area of interest
- Re-projecting data to a user specified map projection
 - Albers, Geographic, UTM
- Download the CDL subset in GeoTiff format
- Exporting selected CDL subset to Google Earth (KML)



CropScape Functions –Cont.

- Online pixel counting & acreage statistics
- Online statistics graphing/charting
- Maps showing the change of crop types for a state, county, or any area specified between any two years of CDL
- On-the-fly single/multi crop map generation, display and download
- Web service implemented
 - Geospatial query statistics data delivery
 - CDL map AOI data delivery





Layers Legend

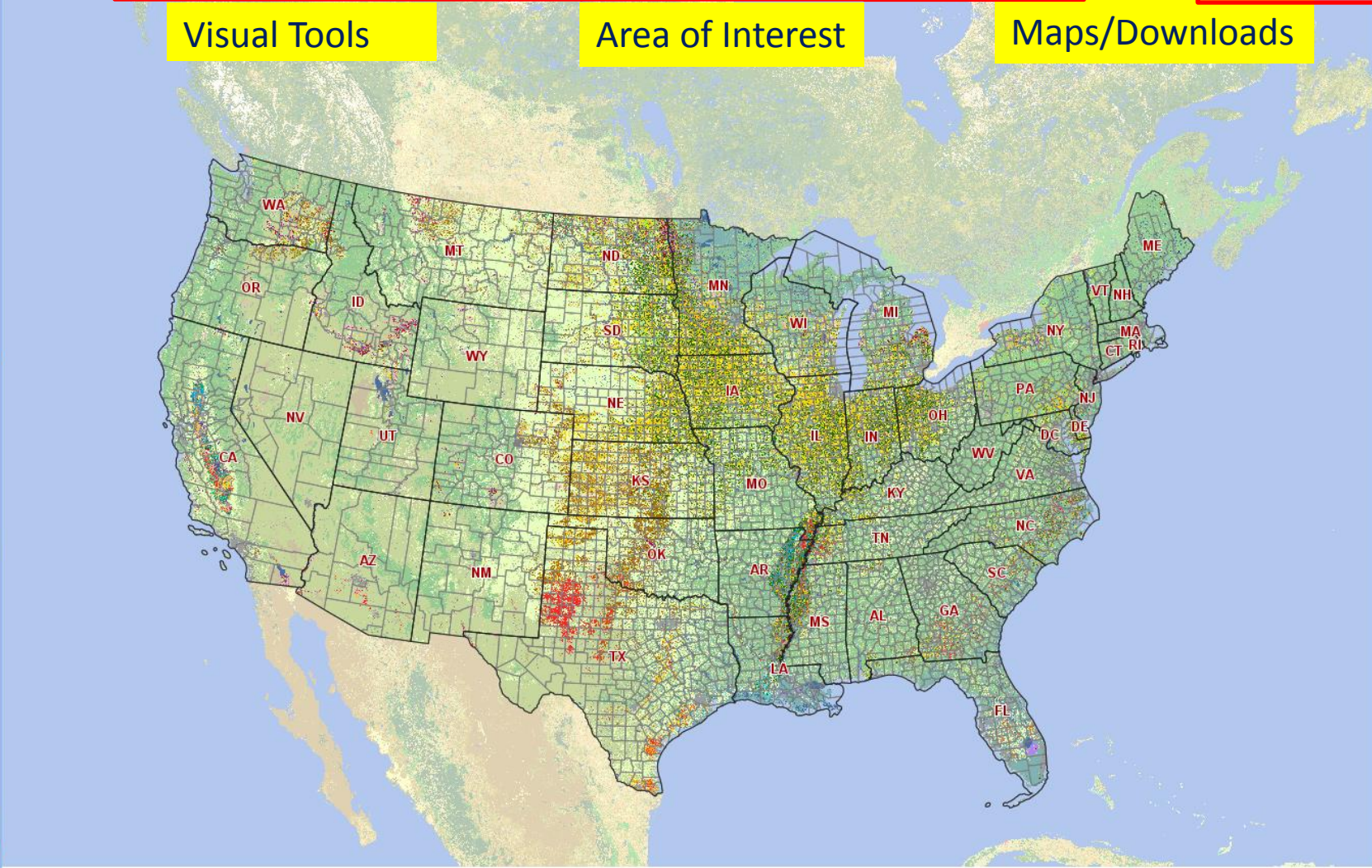


Visual Tools

Area of Interest

Maps/Downloads

- Cropland Data Layers
 - 2012
 - 2011
 - 2010
 - 2009
 - 2008
 - 2007
 - 2006
 - 2005
 - 2004
 - 2003
 - 2002
 - 2001
 - 2000
 - 1999
 - 1998
 - 1997
- Crop Mask Layer
 - Crop Mask Layer (2007-2012)
- Boundary Layers
 - County
 - ASD
 - State
- Water Layers
 - Rivers
 - Lakes
- Road Layers
 - Freeway System (National)
 - Major Highways (Regional)



200 km
100 mi



USDA United States Department of Agriculture
National Agricultural Statistics Service

CropScape

Layers Legend

- Background Layers
 - Global Land Cover
 - None
- Cropland Data Layers
 - 2012
 - 2011
 - 2010
 - 2009
 - 2008
 - 2007
 - 2006
 - 2005
 - 2004
 - 2003
 - 2002
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- Boundary Layers
 - County
 - ASD
 - State
- Water Layers
 - Rivers
 - Lakes
- Road Layers
 - Freeway System (National)
 - Major Highways (Regional)

Pixel
Count
estim
crop a

Data Preview of Soybeans

Download Close

Define Area of Interest By State/ASD/County

Select a State

State:

an ASD...

	Acreage
081	245096.9
076	128738.9
2	0.4
5	1.1
21	4.7
021	538.4
039	142.1
20	4.4
9	2
060	561292.4

cial estimates.
t in biased area
rrection. Official
/

Title: 2012 CDL, Sangamon, Illinois

Paper Size: Letter - 11x8.5 in

Submit

Cancel



2012 CDL, Sangamon, Illinois



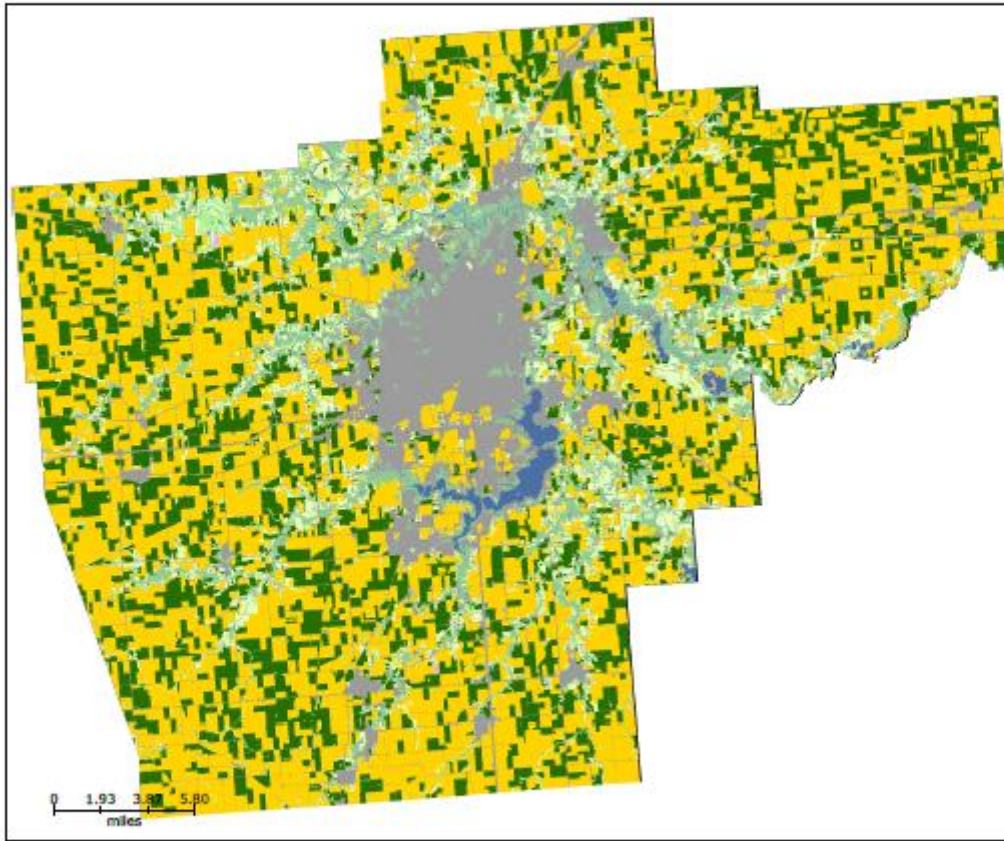
Land Cover Categories
(by decreasing acreage)

AGRICULTURE*

- Corn
- Soybeans
- Pasture/Hay
- Other Hay/Non-Alfalfa
- Winter Wheat
- Alfalfa
- Grassland Herbaceous
- Oil Crop Win/Wht/Soybeans
- Fallow/Idle Cropland
- Potatoes
- Pop or Orn Corn
- Rye
- Pumpkins
- Clover/Wildflowers
- Sod/Grass Seed
- Cobs

NON-AGRICULTURE**

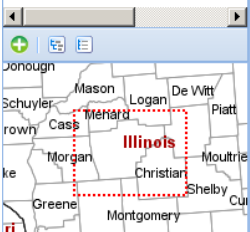
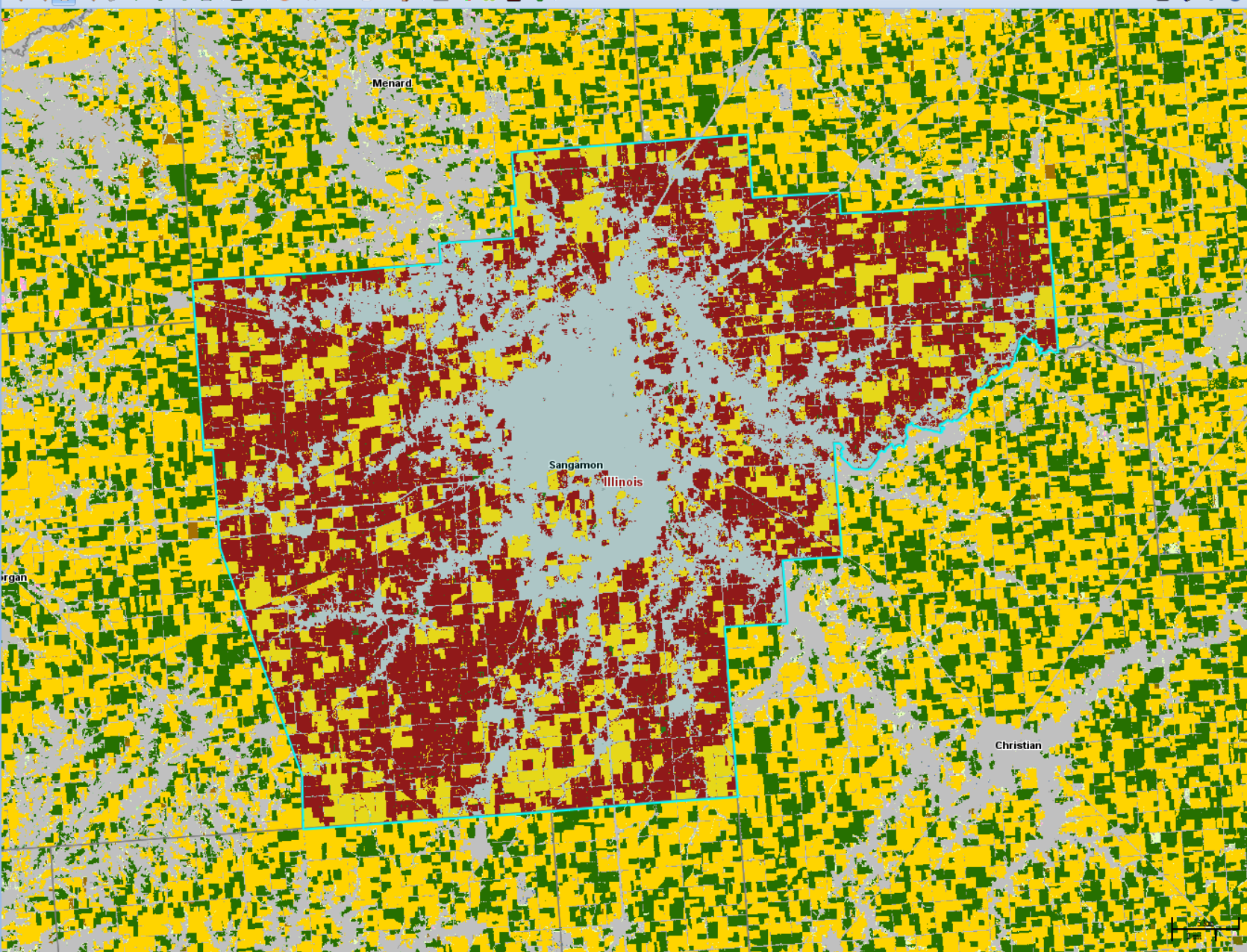
- Deciduous Forest
- Developed/Low Intensity
- Developed/Open Space
- Developed/Medium Intensity
- Open Water
- Developed/High Intensity



Download

Close

- Background Layers
 - Global Land Cover
 - None
- Cropland Data Layers
 - 2012
 - 2011
 - 2010
 - 2009
 - 2008
 - 2007
 - 2006
 - 2005
 - 2004
 - 2003
 - 2002
 - 2001
 - 2000
 - 1999
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- Crop Mask Layer
 - Crop Mask Layer (2007-2012)
- Boundary Layers
 - County
 - ASD
 - State
- Water Layers
 - Rivers
 - Lakes
- Road Layers
 - Freeway System (National)
 - Major Highways (Regional)
- Other Layers
 - CDL_clip_compare_201307



CropScape Download & Export

The screenshot displays the Google Earth interface with a CropScape data overlay. The main map shows a satellite view of the Springfield, Missouri area, with a yellow and green grid overlay representing crop data. The grid is centered on Springfield and extends to the Sangamon River. The map includes labels for several counties: Menard, Logan, Morgan, and Macon. The city of Springfield is marked with a red dot, and the Sangamon River is shown in blue. The interface includes a search bar, a layers panel on the left, and a toolbar at the top. The layers panel shows the following options:

- Primary Database
- Borders and Labels
- Places
- Photos
- Roads
- 3D Buildings
- Ocean
- Weather
- Gallery
- Global Awareness
- More

The status bar at the bottom of the map shows the coordinates: 39°52'43.89" N 89°38'26.69" W, an elevation of 592 ft, and an eye altitude of 60.87 mi. The text "Image Landsat © 2013 Google" is visible in the bottom right corner of the map area.

CropScape “Mashups”

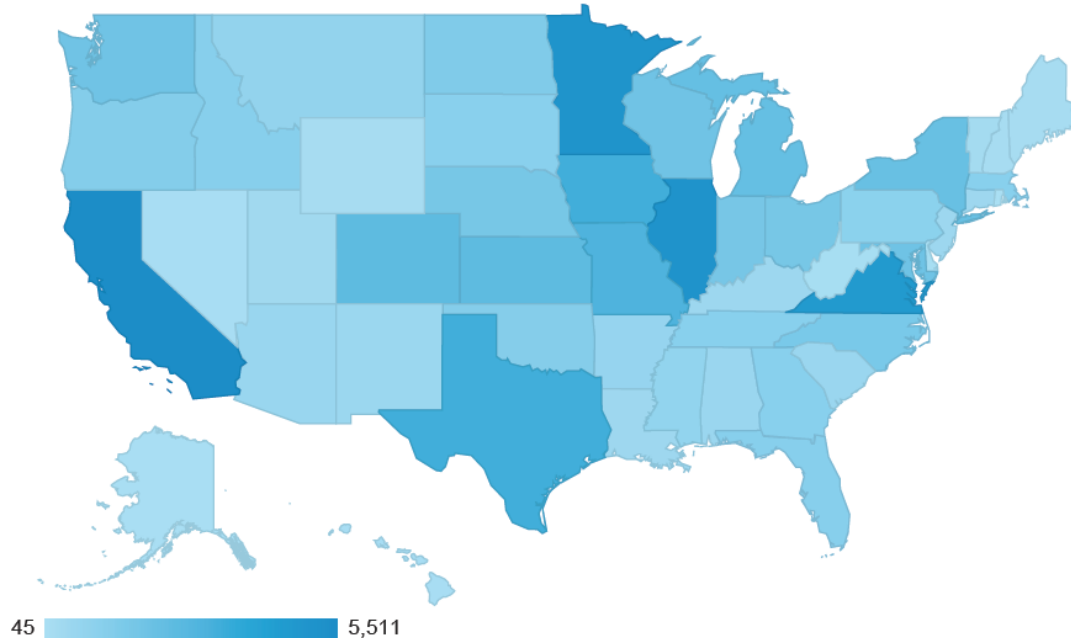
The screenshot displays the KDF Bioenergy Knowledge Discovery Framework website. The header includes the KDF logo, the text "BIOENERGY KNOWLEDGE DISCOVERY FRAMEWORK U.S. DEPARTMENT OF ENERGY", and navigation links for "Login", "Request Account", and a search bar. Below the header is a navigation menu with "Home", "Map", "Data Library", "About", and "Contact". A secondary menu contains "My Layers", "Add Data", and "Attribute Query". The main content area features a map with several layers listed on the left: "Base Map", "Ethanol Refinery Capacity", "Transload", "Unit Train", "Biodiesel Refinery Capacity", "RFA Biorefineries", and "2010 Cropland Data Layer". The map itself is a colorful, pixelated representation of land use, with several red circles highlighting specific areas. A red banner at the bottom of the map area contains the text "From: <https://www.bioenergykdf.net/>".

CropScape Future Improvements

- Additional GIS layers
 - watershed, congressional districts
- More analysis functions
- Improved map production/printing services

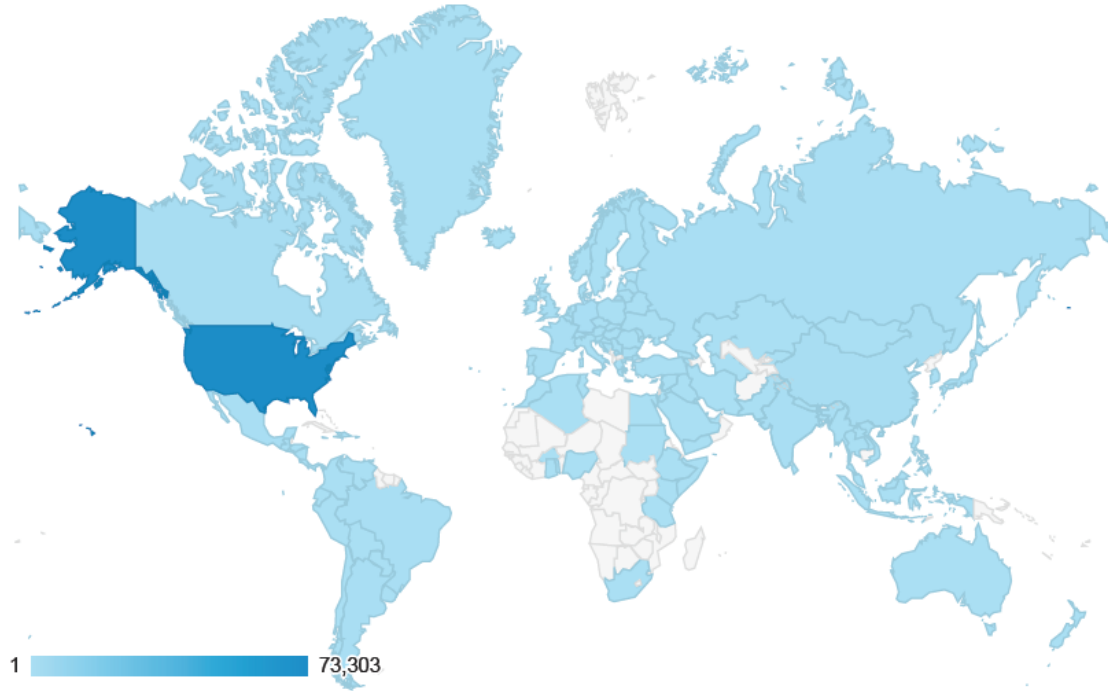


CropScape Google Analytics



Region	Visits	Pages / Visit	Avg. Visit Duration	% New Visits	Bounce Rate
	73,303 % of Total: 89.78% (81,650)	1.21 Site Avg: 1.20 (0.32%)	00:01:23 Site Avg: 00:01:21 (1.85%)	57.84% Site Avg: 58.66% (-1.40%)	86.33% Site Avg: 86.52% (-0.22%)
1. California	5,511	1.22	00:01:26	62.98%	85.18%
2. Illinois	5,018	1.21	00:01:24	59.65%	86.59%
3. Minnesota	4,962	1.15	00:01:03	52.58%	88.98%
4. Virginia	4,616	1.46	00:02:22	36.55%	83.71%
5. Iowa	3,270	1.20	00:01:27	58.01%	86.06%
6. Texas	3,253	1.20	00:01:20	54.75%	85.24%
7. Missouri	2,979	1.17	00:01:11	57.67%	88.02%
8. Colorado	2,438	1.19	00:01:27	53.57%	85.81%
9. Kansas	2,421	1.17	00:01:26	50.06%	87.40%
10. District of Columbia	2,375	1.18	00:01:02	62.15%	86.61%

CropScape Google Analytics



Country / Territory	Visits	Pages / Visit	Avg. Visit Duration	% New Visits	Bounce Rate
	81,650 % of Total: 100.00% (81,650)	1.20 Site Avg: 1.20 (0.00%)	00:01:21 Site Avg: 00:01:21 (0.00%)	58.69% Site Avg: 58.66% (0.04%)	86.52% Site Avg: 86.52% (0.00%)
1. United States	73,303	1.21	00:01:23	57.84%	86.33%
2. Canada	1,100	1.16	00:01:07	67.36%	88.36%
3. China	913	1.25	00:01:28	60.24%	82.58%
4. Germany	502	1.12	00:00:47	58.76%	91.24%
5. United Kingdom	441	1.15	00:01:02	64.40%	89.57%
6. Argentina	393	1.13	00:00:57	48.60%	91.09%
7. France	388	1.25	00:01:30	62.11%	86.34%
8. Brazil	362	1.15	00:01:03	68.78%	87.85%
9. Spain	300	1.14	00:00:47	69.00%	90.00%
10. Mexico	291	1.19	00:01:37	54.64%	86.60%

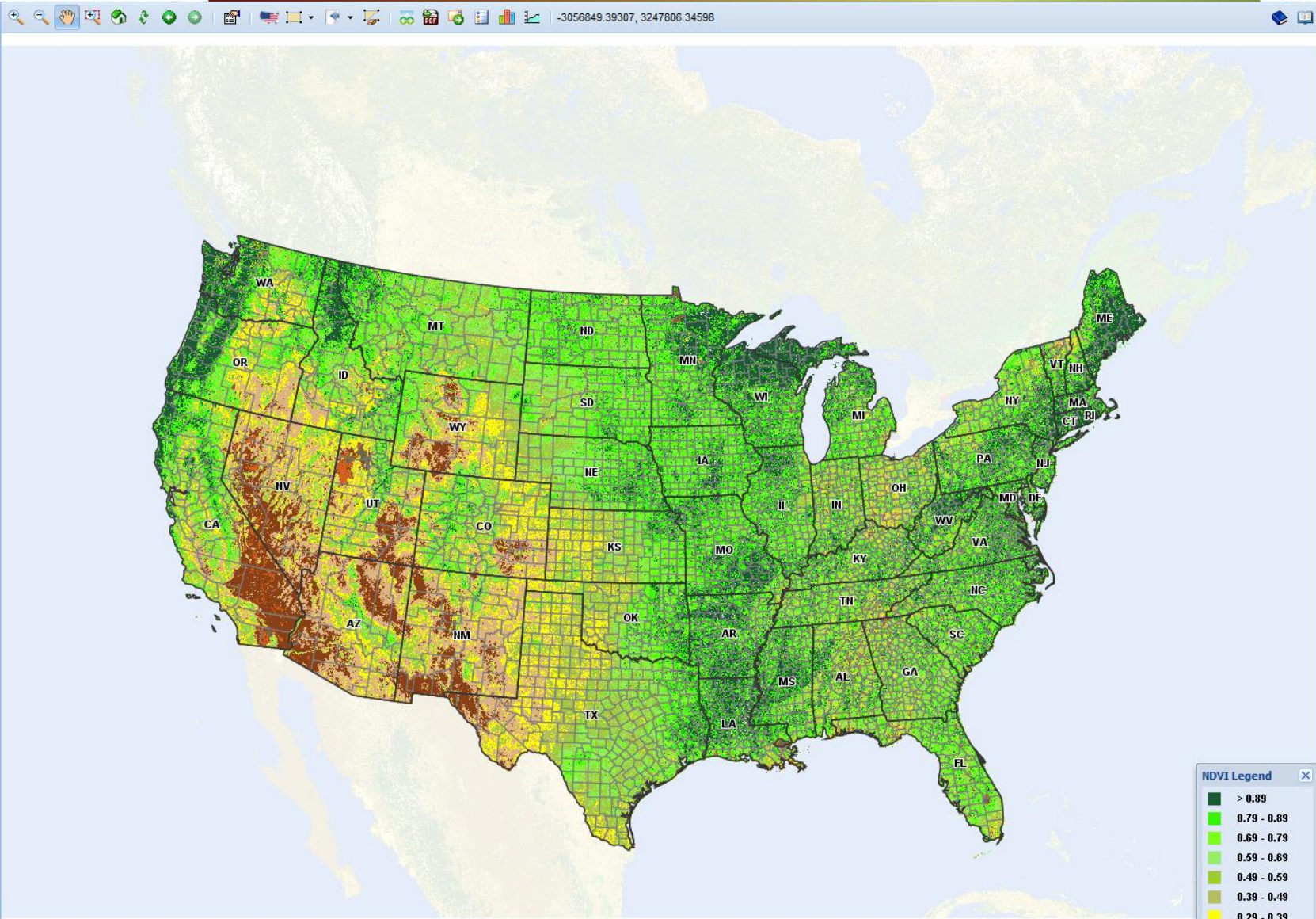
Layers **Products** Legends

Type: NDVI

Period: Weekly

Year: 2013

Date: 27(07.02_07.08)_21



NDVI Legend

- > 0.89
- 0.79 - 0.89
- 0.69 - 0.79
- 0.59 - 0.69
- 0.49 - 0.59
- 0.39 - 0.49
- 0.29 - 0.39
- 0.19 - 0.29
- 0.05 - 0.19
- < 0.05
- No Data



200 km
 100 mi



Purpose of VegScape

- On-line satellite-based U.S. crop condition vegetation assessment and monitoring
- Improve objectivity, robustness, quantification, and defensibility of nationwide crop condition monitoring program
- Provide tools for data exploration and visualization
- Publically disseminate geospatial vegetation condition at *daily, weekly, and biweekly* time periods
- Supports ethos of data democratization
 - free and open access to digital geospatial data layers
 - open geospatial standards
 - supporting transparent and collaborative government initiatives



You are here: Home / Research and Science / Vegetation Condition Maps

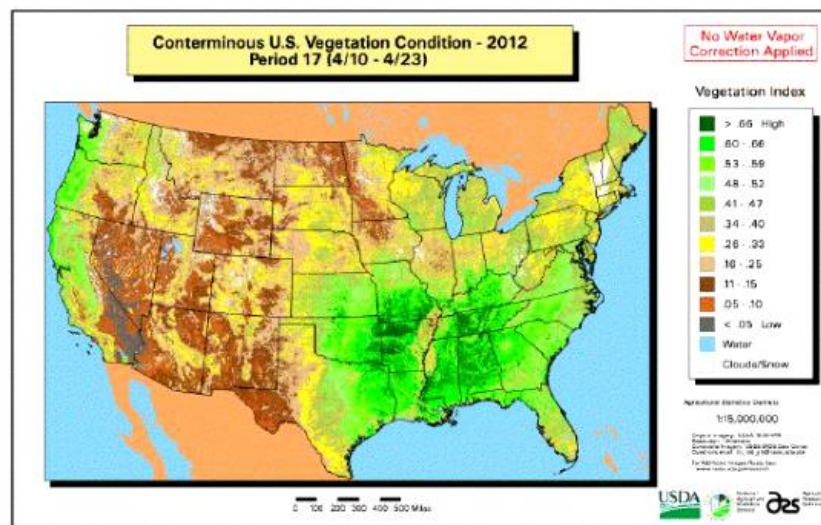
Research and Science

2012 Vegetation Condition Map Animations

Click Year to Play*

- 2012
- 2011
- 2010
- 2009
- 2008
- 2007
- 2006
- 2005
- 2004
- 2003
- 2002
- 2001
- 2000 NA
- 1999
- 1998
- 1997
- 1996
- 1995

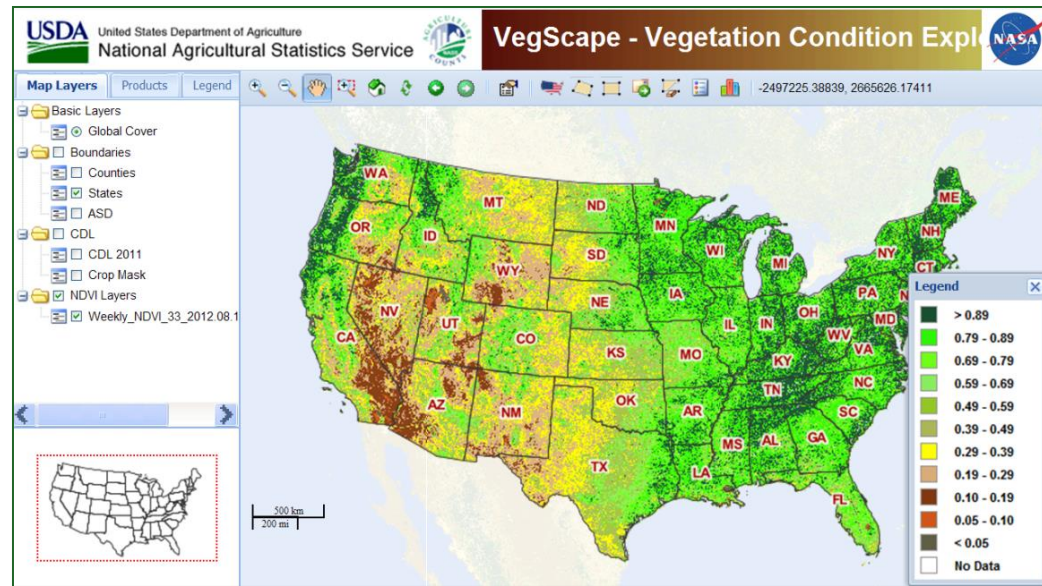
*Requires QuickTime (Free)



Navigation controls including play, stop, and volume buttons. A timeline shows dates from March 06 to Oct 09. Below the timeline, it says "Click Date to View 1024x663 Image (~300 KB)".

- 1995-2012
- NDVI Vegetative Condition
- Static Maps
- Based on AVHRR sensor (1.1 km spatial resolution)

- 2013
- **VegScape** – web service
- Multiple vegetation indices
- Interactive web mapping: navigate, download, etc.
- MODIS sensor: daily repeat, 250m resolution (~15 acres /6.25 hectares)
- Composites: daily, weekly, bi-weekly

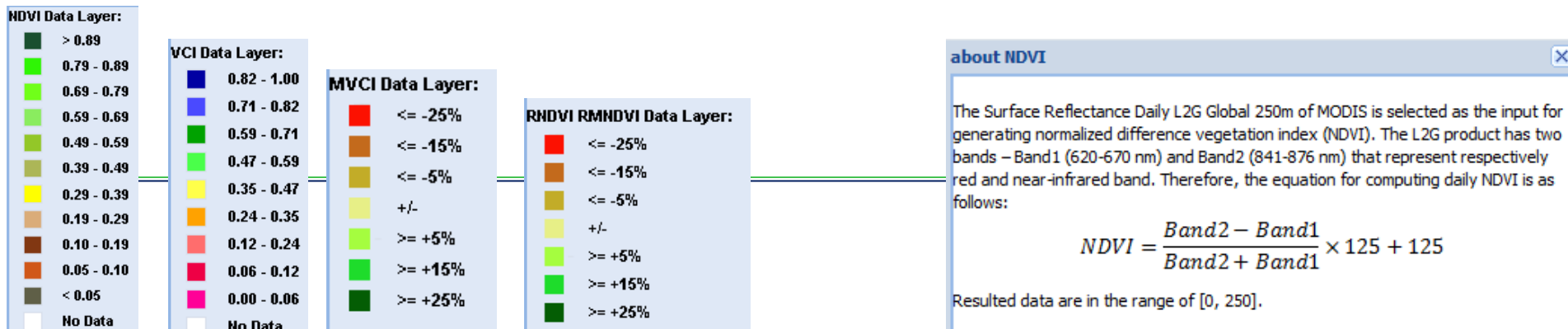


Built on CropScape framework/architecture

- Web-based interactive mapping
- Derive daily/weekly/biweekly composites
- Automated updates
- Online navigation, zooming, panning, downloading
- Hosted/maintained by George Mason University/Center for Spatial Information Science and Systems

Vegetation Indices

- The Normalized Difference Vegetation Index (NDVI) is used to measure and monitor plant growth, vegetative cover, and biomass production
- NDVI values range from 0 to 1, where higher values indicate stronger plant vigor and high chlorophyll content
 - Lower values indicate low vegetative content/plant heartiness
- Additional derivative vegetation indices can be displayed: Vegetative Condition Index; Ratio VCI; Ratio Median VCI; Mean VCI



Vegetation Indices

- ▶ **NDVI** – Normalized Difference Vegetation Index
 $NDVI = (IR - Red) / (IR + Red)$ = Shows greenness
Healthy vegetation has high NDVI ratio values (1.0 max)
low red light & high near-infrared reflectance values
- ▶ **RNDVI** -NDVI change ratio to previous year
- ▶ **RMNDVI** - NDVI change ratio to median
- ▶ **VCI** - Relative NDVI change with respect to minimum historical (referenced) NDVI value
- ▶ **MVCI** - Mean referenced VCI (vegetation condition index)

Zoom in

Zoom out

Pan

Drag zoom

Home

Refresh

Previous view

Next view

Identify pixel value

Define state/county AOI

Define rectangle AOI

Import AOI

Clear AOI

Swipe layer

Create PDF map

Download AOI

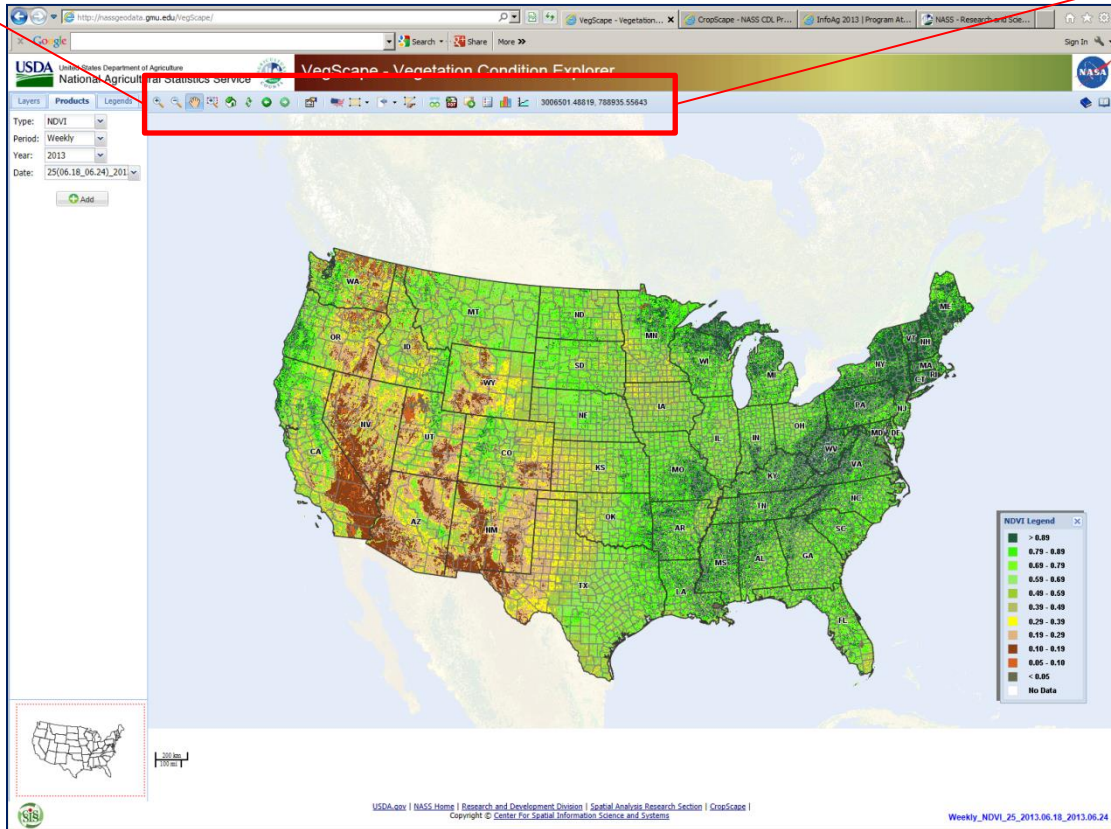
Show/hide legend

Statistics

NDVI Profile



VegScape GUI



Load VegScape Indices

1) Select vegetative index

The 'Products' dropdown menu is open, showing a list of vegetative indices. The 'MVIC' option is currently selected and highlighted in blue. Other options in the list include NDVI, VCI, RVC, RMVIC, and MVCI.

2) Time period

The time period selection interface shows four dropdown menus. The 'Type' is set to 'NDVI', 'Period' is 'Weekly', 'Year' is 'Daily', and 'Date' is 'Biweekly'.

3) Year

The year selection interface shows four dropdown menus. The 'Type' is 'NDVI', 'Period' is 'Weekly', 'Year' is '2013', and 'Date' is '2000'. The 'Date' dropdown menu is open, showing a list of years from 2000 to 2003.

4) Date

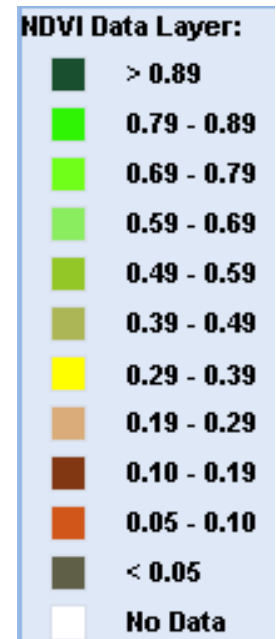
The date selection interface shows four dropdown menus. The 'Type' is 'NDVI', 'Period' is 'Weekly', 'Year' is '2013', and 'Date' is '05(01.29_02.04)_20'. The 'Date' dropdown menu is open, showing a list of dates for 2013: 01(01.01_01.07)_2013, 02(01.08_01.14)_2013, and 03(01.15_01.21)_2013.

The final product selection interface shows four dropdown menus. The 'Type' is 'NDVI', 'Period' is 'Weekly', 'Year' is '2013', and 'Date' is '05(01.29_02.04)_20'. Below the dropdowns is a green '+ Add' button.

Follow these five steps to add products for analysis

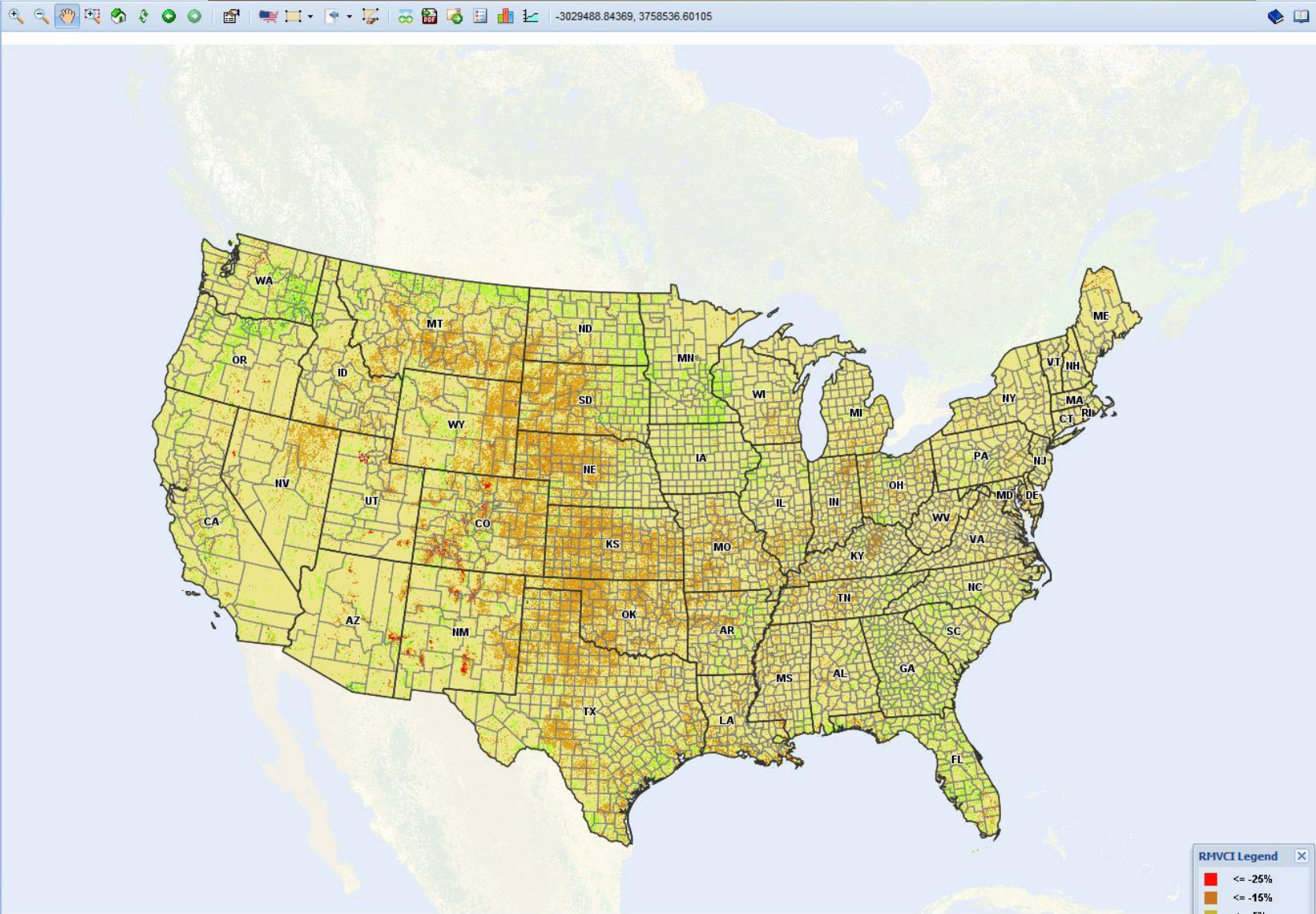
5) Add

A green '+ Add' button.



Layers | Products | Legends

- Basic Layers
- CDL
- Crop Mask
 - Crop Mask
- Boundaries
- Water Layers
- Road Layers
- RMVCI Layers
 - Weekly_RMVCI_27_2013.0
 - Weekly_RMVCI_27_2012.0



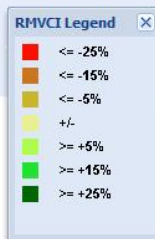
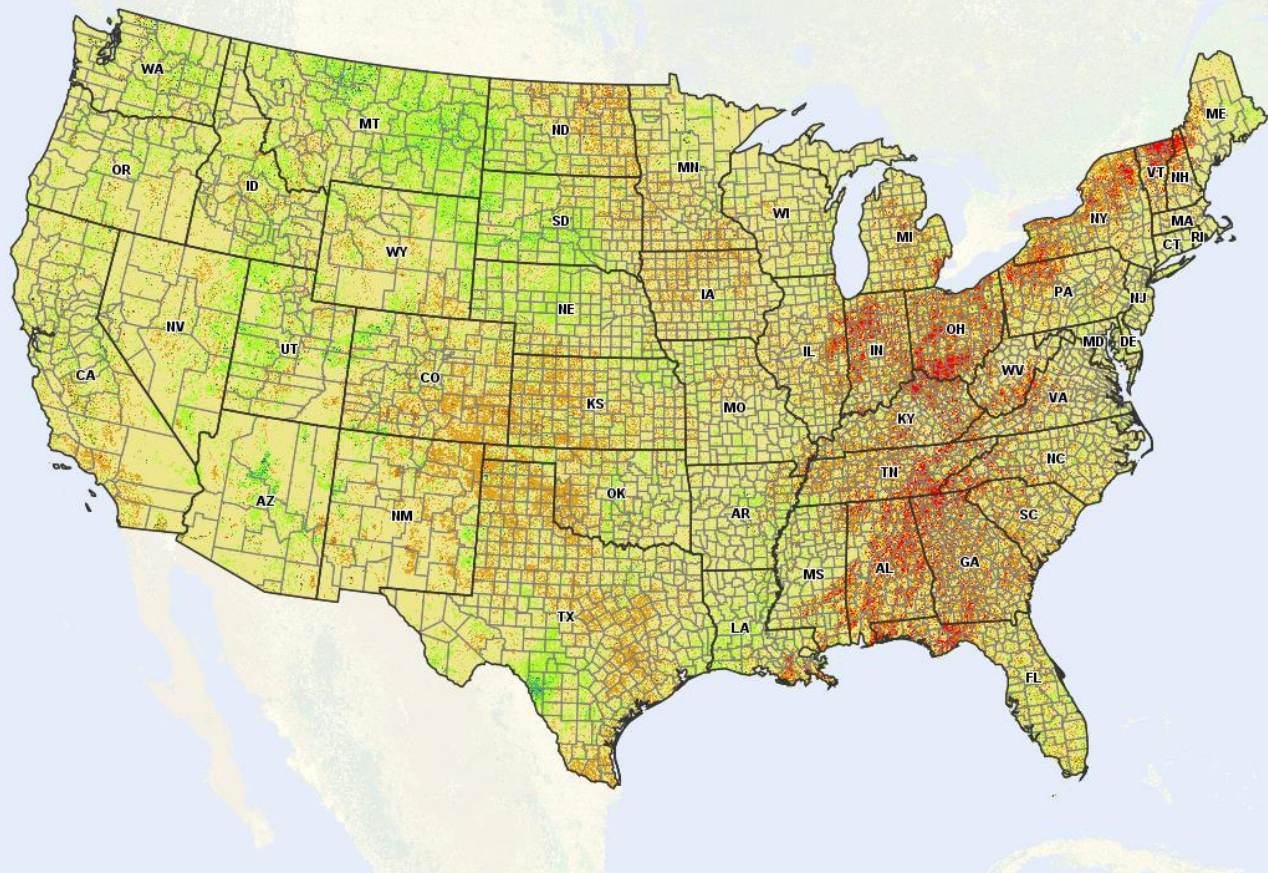

200 km
 100 mi

RMVCI Legend

	<= -25%
	<= -15%
	<= -5%
	+/-
	>= +5%
	>= +15%
	>= +25%

- Layers Products Legends
- Basic Layers
 - CDL
 - Crop Mask
 - Crop Mask
 - Boundaries
 - Water Layers
 - Road Layers
 - RMVCI Layers
 - Weekly_RMVCI_27_2013.07
 - Weekly_RMVCI_27_2012.07

-3020368.66056, 3311647.62786

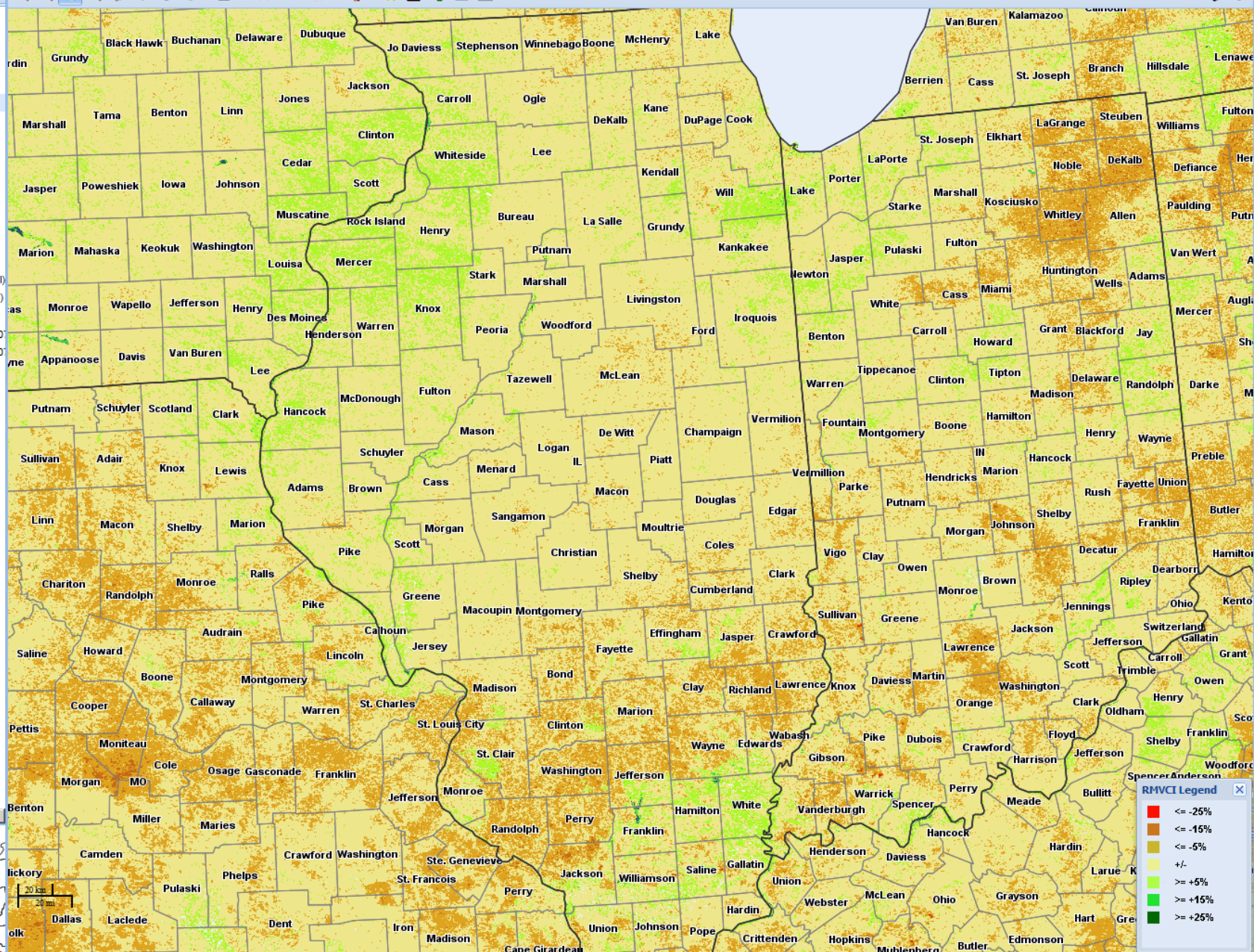




Layers Products Legends

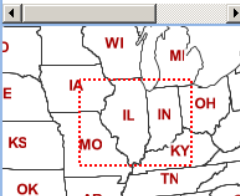
570988.45111, 2053917.37361

- Basic Layers
 - Global Cover
 - CDL
 - CDL 2012
 - Crop Mask
 - Crop Mask
 - Boundaries
 - Counties
 - States
 - ASD
 - Region
 - Water Layers
 - Rivers
 - Lakes
 - Road Layers
 - Freeway System (National)
 - Major Highways (Regional)
 - RMVCI Layers
 - Weekly_RMVCI_27_2013.0
 - Weekly_RMVCI_27_2012.0



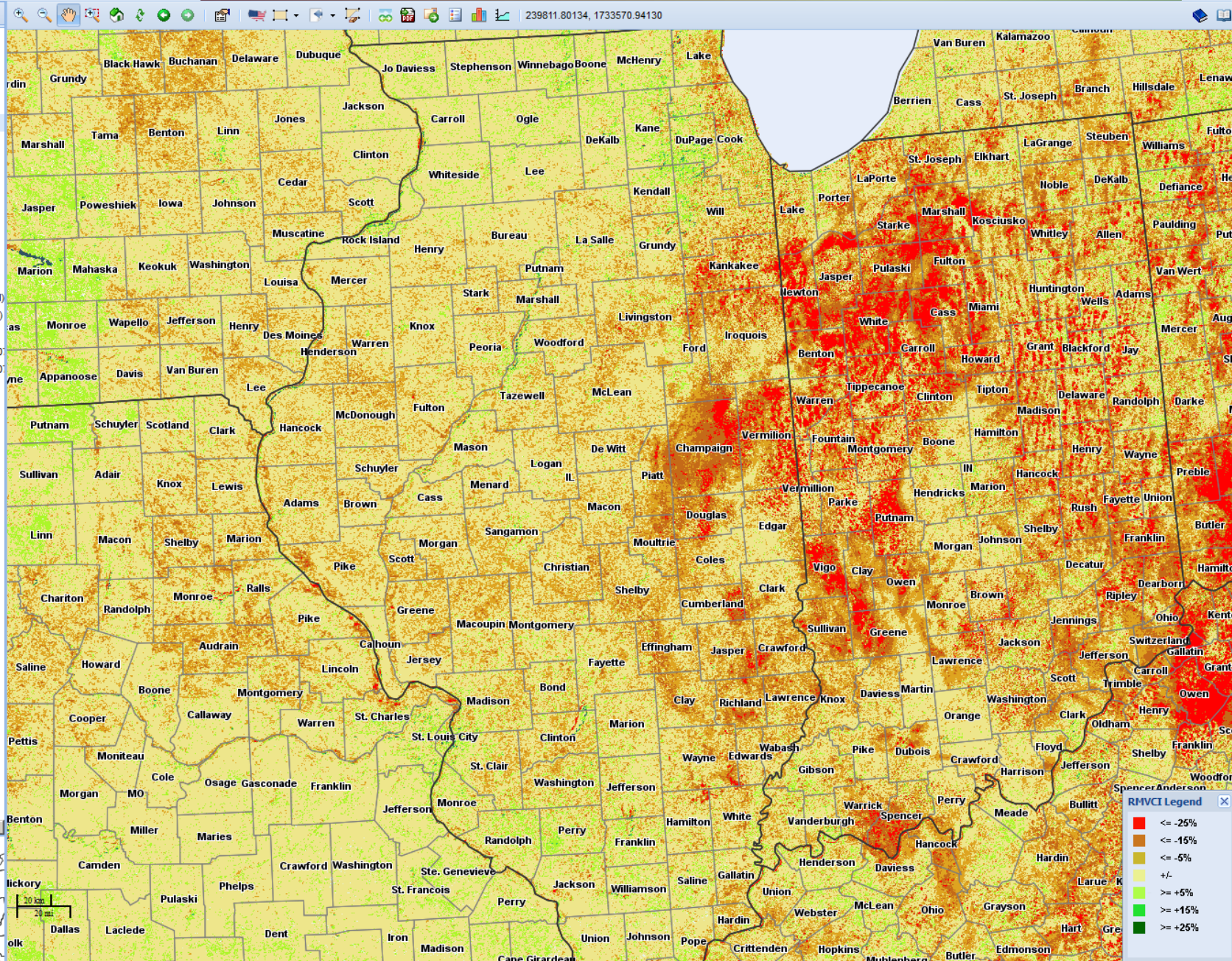
RMVCI Legend

Red	<= -26%
Orange	<= -16%
Yellow	<= -5%
Light Green	+/-
Green	>= +5%
Dark Green	>= +15%
Dark Green	>= +25%



Layers Products Legends

- Basic Layers
 - Global Cover
 - CDL
 - CDL 2012
 - Crop Mask
 - Boundaries
 - Counties
 - States
 - ASD
 - Region
 - Water Layers
 - Rivers
 - Lakes
 - Road Layers
 - Freeway System (National)
 - Major Highways (Regional)
- RMVCI Layers
 - Weekly_RMVCI_27_2013.0
 - Weekly_RMVCI_27_2012.0

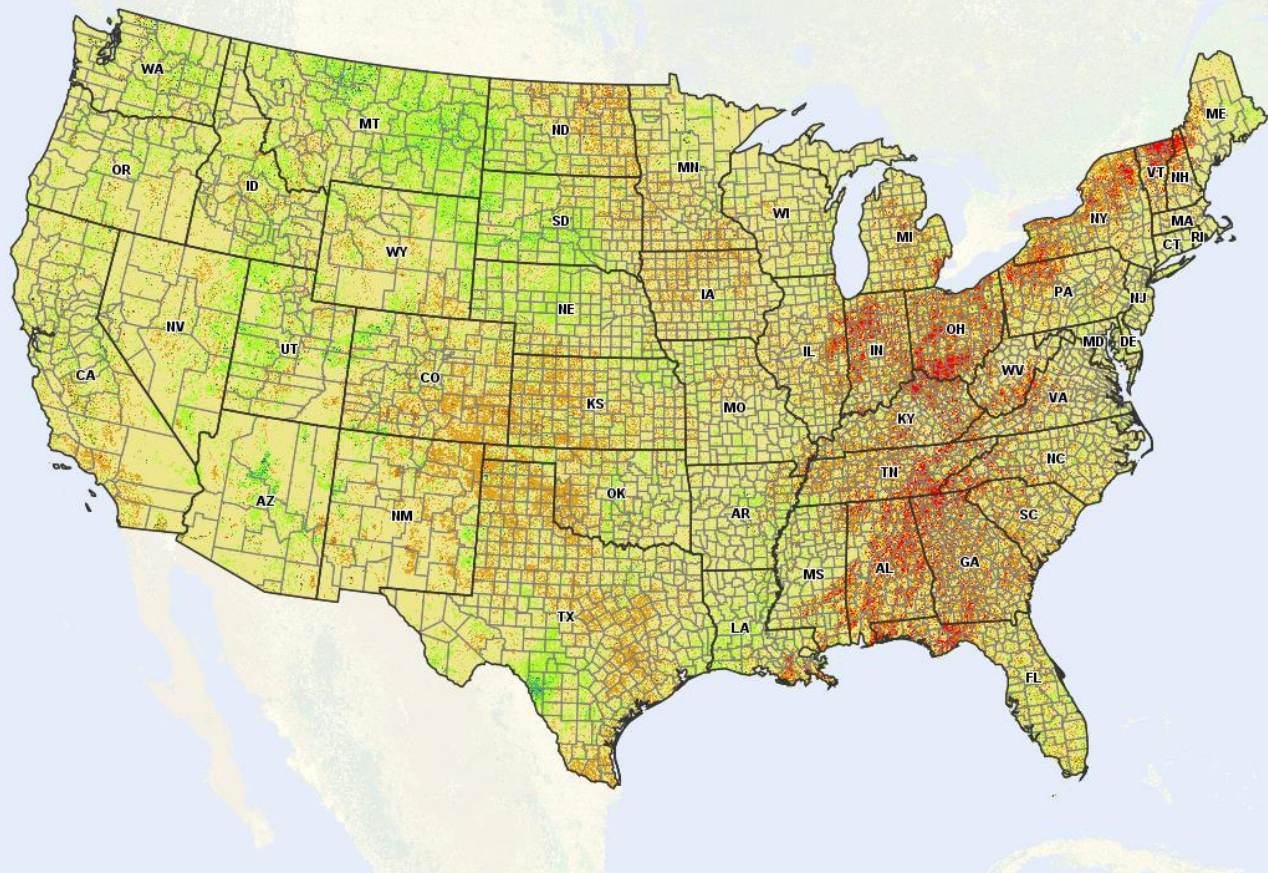


RMVCI Legend

- Red: $\leq -25\%$
- Orange: $\leq -15\%$
- Yellow: $\leq -5\%$
- Light Green: +/-
- Green: $\geq +5\%$
- Dark Green: $\geq +15\%$
- Very Dark Green: $\geq +25\%$

- Layers Products Legends
- Basic Layers
 - CDL
 - Crop Mask
 - Crop Mask
 - Boundaries
 - Water Layers
 - Road Layers
 - RMVCI Layers
 - Weekly_RMVCI_27_2013.07
 - Weekly_RMVCI_27_2012.07

-3020368.66056, 3311647.62786



RMVCI Legend

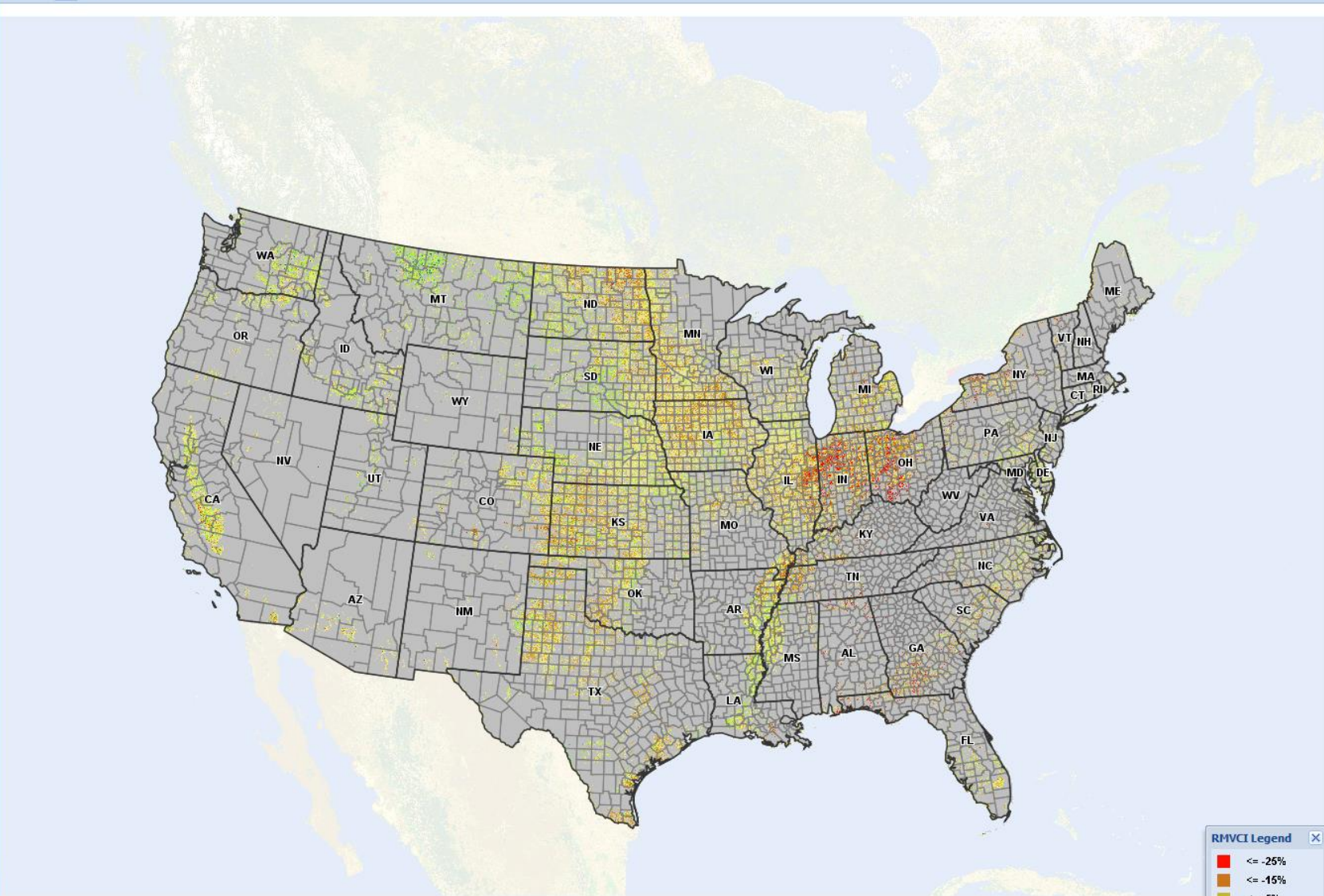
Red	<= -25%
Dark Orange	<= -16%
Light Orange	<= -5%
Yellow	+/-
Light Green	>= +5%
Green	>= +15%
Dark Green	>= +25%



Layers Products Legends

- Basic Layers
- CDL
- Crop Mask
 - Crop Mask
- Boundaries
- Water Layers
- Road Layers
- RMVCI Layers
 - Weekly_RMVCI_27_2013.0
 - Weekly_RMVCI_27_2012.0

-3020368.66056, 3389169.18443



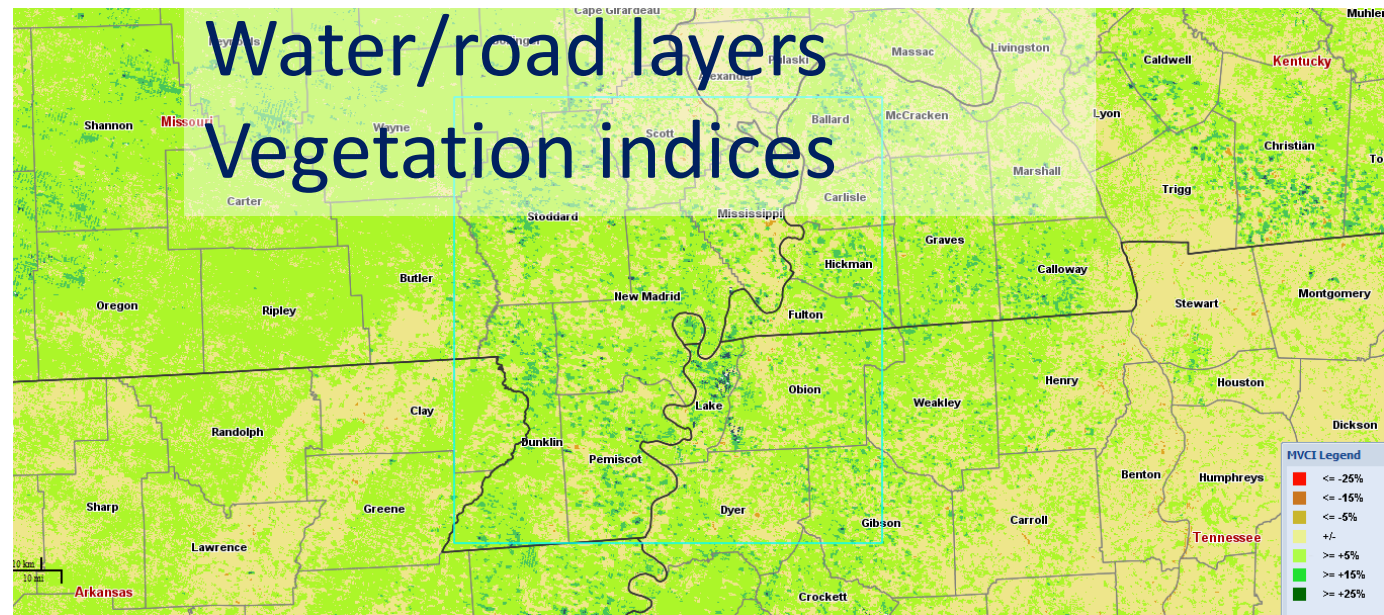
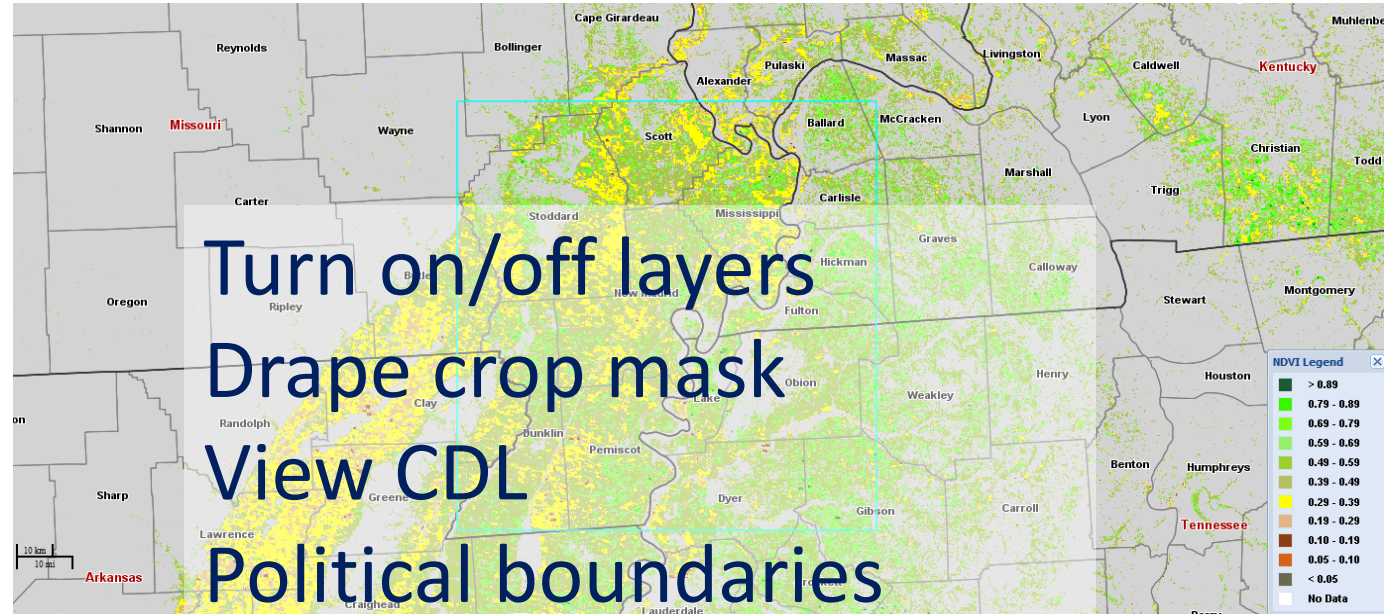
RMVCI Legend

- <= -25%
- <= -15%
- <= -5%
- +/-
- >= +5%
- >= +15%
- >= +25%



VegScape Layers/Products/Legends Tab

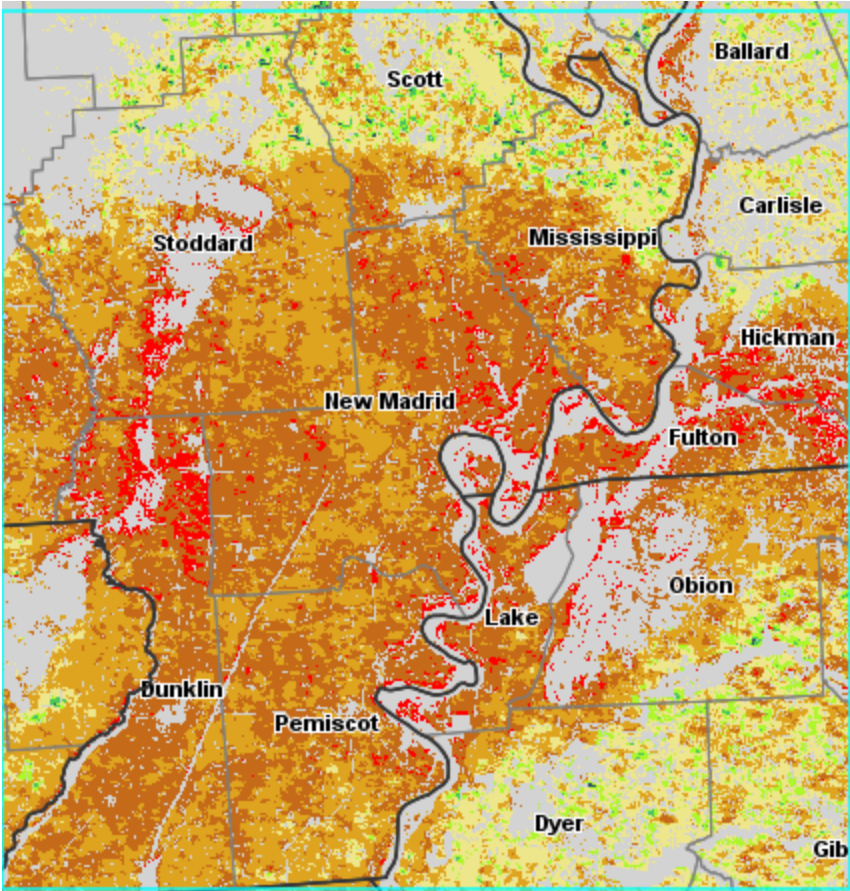
The screenshot shows the 'Layers' panel in the VegScape software. It features three tabs: 'Layers', 'Products', and 'Legends'. The 'Layers' tab is active, displaying a hierarchical list of layers. The layers are organized into folders: 'Basic Layers', 'CDL', 'Boundaries', 'Water Layers', 'Road Layers', 'NDVI Layers', 'VCI Layers', 'RVCI Layers', 'RMVCI Layers', and 'MVCI Layers'. Each folder contains specific sub-layers with checkboxes to toggle their visibility. For example, in the 'Basic Layers' folder, 'Global Cover' is checked. In the 'Boundaries' folder, 'Counties' and 'States' are checked. In the 'Water Layers' folder, 'Rivers' and 'Lakes' are unchecked. In the 'Road Layers' folder, 'Freeway System (National)' and 'Major Highways (Regional)' are unchecked. In the 'NDVI Layers' folder, 'Weekly_NDVI_07_2013.02.' is unchecked. In the 'VCI Layers' folder, 'Weekly_VCI_07_2013.02.1.' is unchecked. In the 'RVCI Layers' folder, 'Weekly_RVCI_07_2013.02.' is unchecked. In the 'RMVCI Layers' folder, 'Weekly_RMVCI_07_2013.0.' is unchecked. In the 'MVCI Layers' folder, 'Weekly_MVCI_07_2013.02.' is checked. A scroll bar is visible at the bottom of the panel.



VegScape Summary

- MODIS offers high spatial/temporal resolution & data continuity
- Web-based dynamic interactive mapping
 - Online navigation, zooming, panning, downloading, on-the-fly processing
 - Leveraging CropScape framework/architecture
 - Automatic data retrieval, processing, publishing, and dissemination
- Irregular, ad-hoc data retrieval and processing for emergency assessment/reporting
- Assessing crop condition and identifying the areal extent of floods, drought, major weather anomalies, and vulnerabilities of early/late season crops
- Consider VegScape operational upon start of 2013 growing season!

RatioMedian VCI- Area of Interest Statistics



Weekly_RMNDVI_18_2011.05.03_2011.05.09 Data Layer Statistics for the Defined Area of Interest

Note: Pixel and acreage counts are not official estimates.

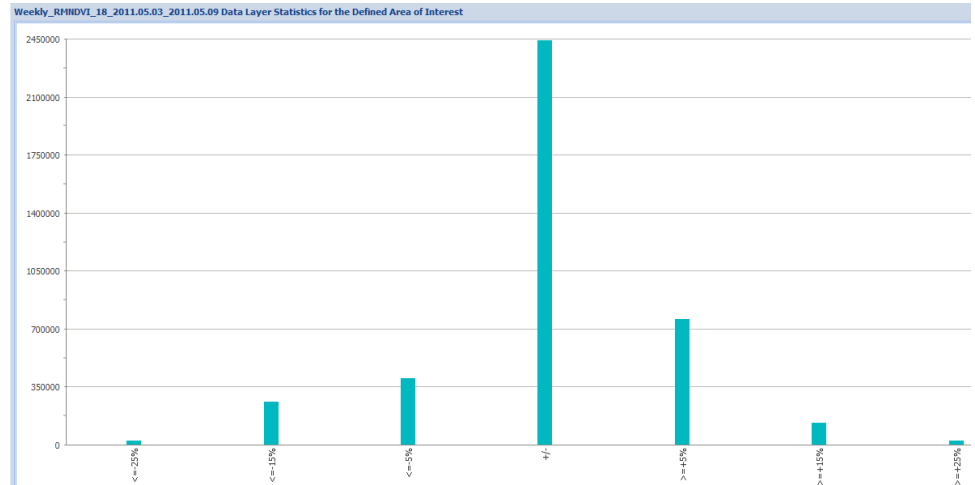
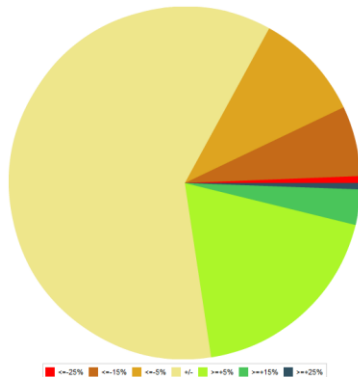
Value	Category	Pixel Counts	Acreage
0	<=-.25%	1931	25606.6
1	<=-.15%	19647	260535.3
2	<=-.5%	30411	403274.7
3	+/-	184180	2442377.2
4	>=+.5%	57280	759579.6
5	>=+.15%	9910	131414.7
6	>=+.25%	1765	23405.3
Total	7	305124	4046193.4

04/19-04/25/11

Quantify vegetative area condition

RMVCI Legend

- <= -.25%
- <= -.15%
- <= -.5%
- +/-
- >= +.5%
- >= +.15%
- >= +.25%



Other Geospatial Products

- Remote Sensing Yield
 - NASS cooperative research for over 15 years
 - Agricultural Research Service
 - Dr. Paul Doraiswamy
 - Tech transfer
 - Semi-operational for 4 years
 - Primary data source – MODIS sensor



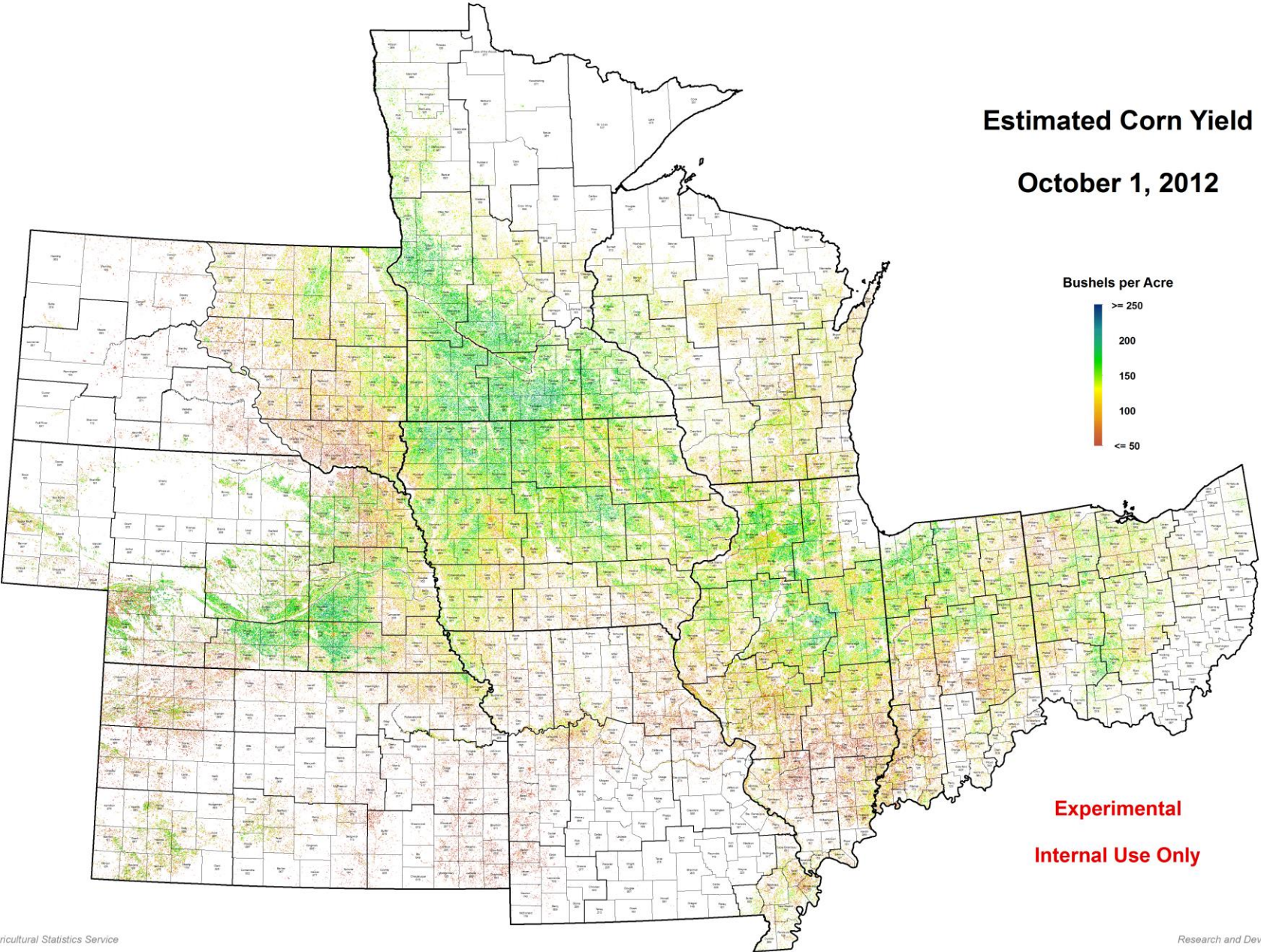
Yield Methodology

- Utilizes NASS county-level yields as “ground truth”
 1. Farmer reported survey data
 2. Objective yield survey
 - 100s of sample sites per state
 - biophysical plant/seed measurements obtained
 - Each plot revisited a multiple times per season
- Over Speculative corn and soybean region
- Examining timely possible predictor variables
 - NDVI (Normalized Difference Vegetation Index)
 - derived from Terra satellite MODIS surface reflectance imagery
 - LST (Land Surface Temperature) from day and night
 - derived from Aqua satellite MODIS thermal imagery
 - Precipitation
 - derived from NOAA/NWS Nexrad
- Utilizing 8-day composited mosaic products from 2006-2011
 - Mid-February through late September
- Forecasting solely using Rulequest Cubist software



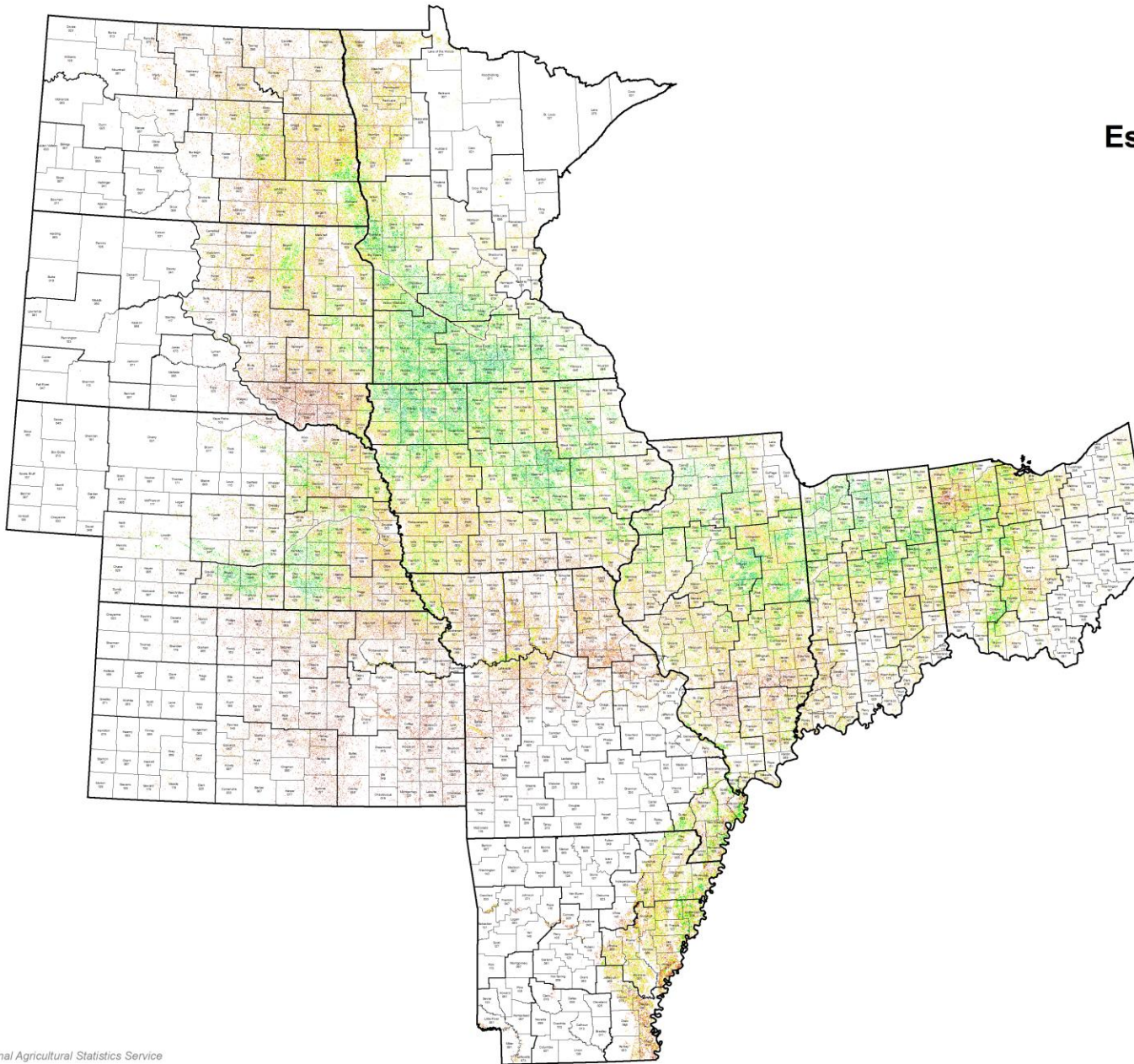
Estimated Corn Yield

October 1, 2012

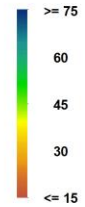


Estimated Soybean Yield

October 1, 2012



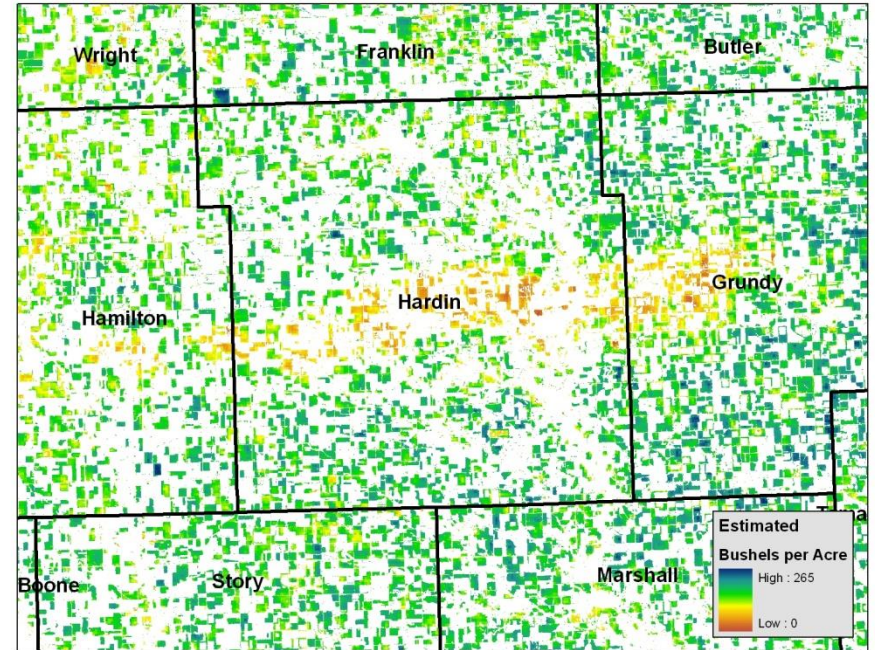
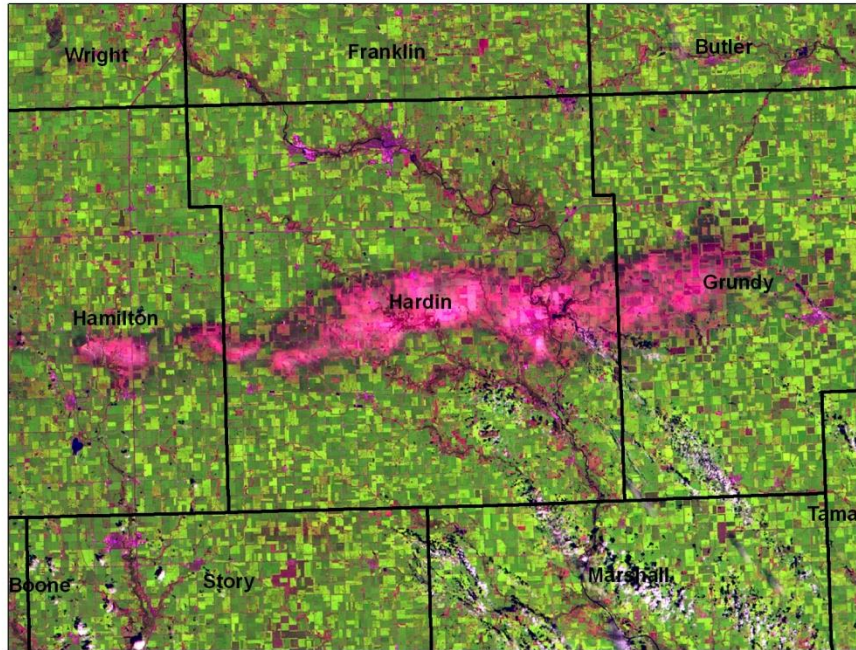
Bushels per Acre



Experimental

Internal Use Only

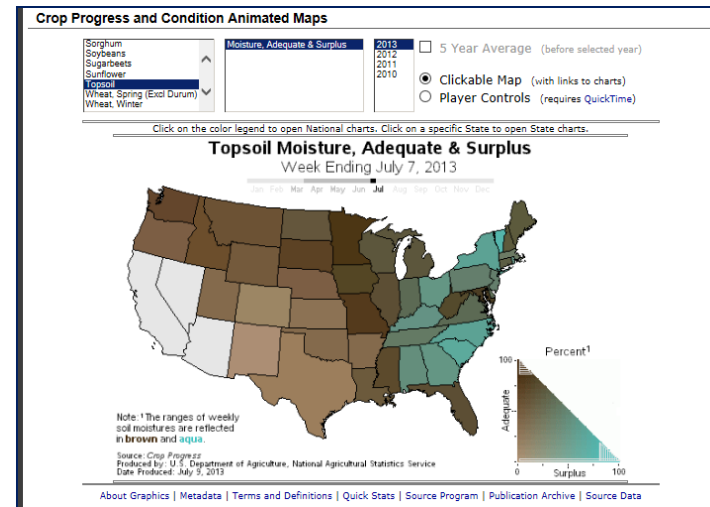
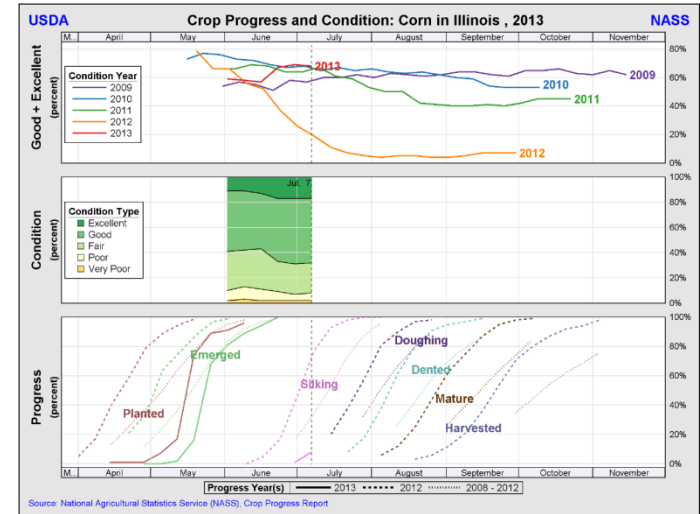
Reality check – detection of extreme weather events



Path of a large hailstorm

Future Geospatial Products?

- Improve and quantize:
 - Crop Progress
- Soil Moisture
 - NASA Soil Moisture Active Passive (SMAP) mission
- Expand yield forecasting program



Questions?



University of Illinois Research Park
November 20, 2013



Discussion Topic

- Beginning with the 2013 CDL we plan to collapse all grass/pasture categories into one new category
 - The old “land cover” versus “land use” issue
- Individual analysts decide how to use grass and pasture ground truth in their particular state/region/year – this has resulted in inconsistencies at state boundaries
- Intended to reduce end user confusion
- CDL codes collapsed
 - 62 (FSA pasture and grass)
 - 171 (NLCD herbaceous grassland)
 - 181 (NLCD pasture/hay)
- Entire CDL archive will be recoded and re-released in early 2014



1 Considerations when estimating United States grassland conversion

2 solely from the Cropland Data Layer

18 Several analyses have been undertaken recently to estimate possible land cover transition
19 in the United States (US) of grassland cover types to usage for planting commodity crops (Faber
20 et al., 2012; Johnston, 2013; Wright and Wimberly, 2013; Kline et al., 2013; Cox and Rundquist,
21 2013; DIS, 2013; AP?, 2013; Gibbs et al., 2013). All of the studies have used time-series
22 analysis of the Cropland Data Layer (CDL) (Johnson and Mueller, 2010; Boryan et. al., 2011) as
23 produced by the United States Department of Agriculture (USDA) National Agricultural
24 Statistics Service (NASS) for the basis. The consensus of the findings is that cropland has indeed
25 expanded in recent years onto grassland areas. The cause of this conversion is then ultimately
26 tied to economic or policy change, particular in terms of corn (commonly called maize outside of
27 the US). The overall concern of these conversions is that they are likely occurring on marginal
28 lands and negatively impacting ecosystems at a variety landscape scales. *The purpose of this*
29 *communication is not to confirm or rebut any of the individual findings but put into historical*
30 *perspective the development of CDL, caveat the utility of using it for area estimation*
31 *(particularly for non-crop types) and propose a path forward for clarity of mapping grassland*
32 *related cover types.*



NOVEMBER 20, 2013

