USDA NASS Geospatial Data

CropScape & VegScape

Patrick Willis

National Agricultural Statistics Service

Purpose of today's talk

- Raise public awareness of free USDA NASS geospatial data

Topics

- What is NASS?
- NASS Geospatial Products
- Cropland Data Layer (CDL)
- CropScape Web Portal
- VegScape Web Portal

What is NASS?

- the statistical survey agency of the U.S. Department of Agriculture
  - non-political
  - non-policy making
  - independent-objective-unbiased
  - appraisers of U.S. agriculture
- collects and disseminates data on all facets of agriculture
- gathers demographic, environmental, and economic data related to agriculture
- collects data by a variety of methods including mail, phone, personal interview, or internet

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

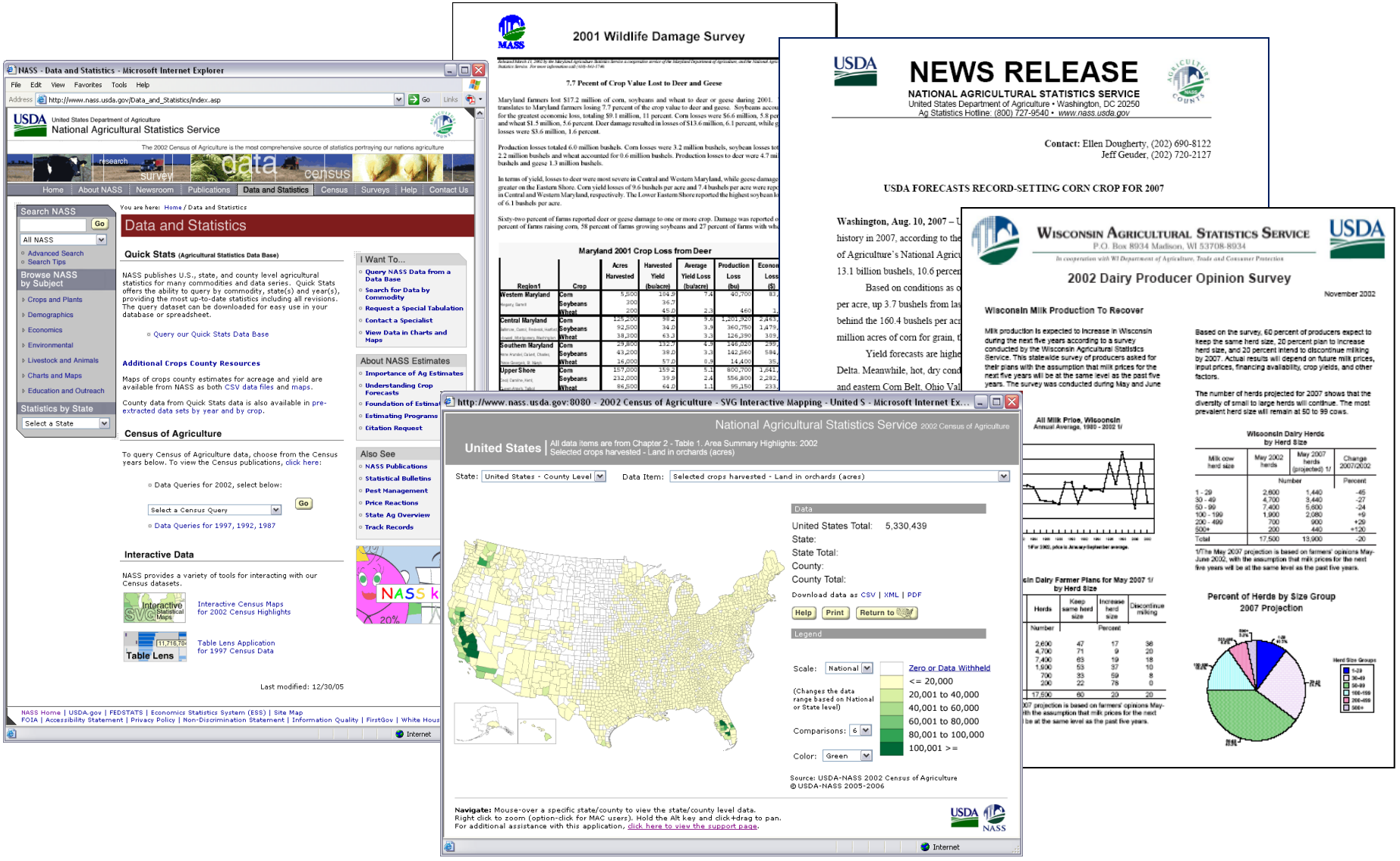
university researchers

government policy makers

media

newspapers
magazines
radio
television

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



(USDA) United States Department of Agriculture
(NASS) National Agricultural Statistics Service
(RDD) Research and Development Division
(GIB) Geospatial Information Branch
(SARS) Spatial Analysis Research Section

Search NASS
Google™ Custom Search
All NASS Go
Advanced Search
Search Tips
Browse NASS by Subject
Crops and Plants
Demographics
Economics and Prices
Environmental
Livestock and Animals
Charts and Maps
Research, Science, and Technology
Education and Outreach
Statistics by State
Select a State

Research, Science, and Technology

Spatial Data

CropScape

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.

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.

Vegetation Condition

Crop Acreage

Reports, Papers and Presentations

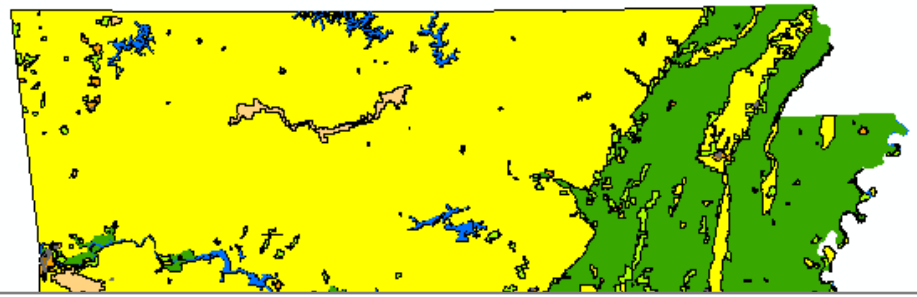
Research Reports by Date | by Title
Archived Research Reports GIS | Survey | Yield
Presentations
Conferences
Remote Sensing Uses - White Papers
Technology Papers

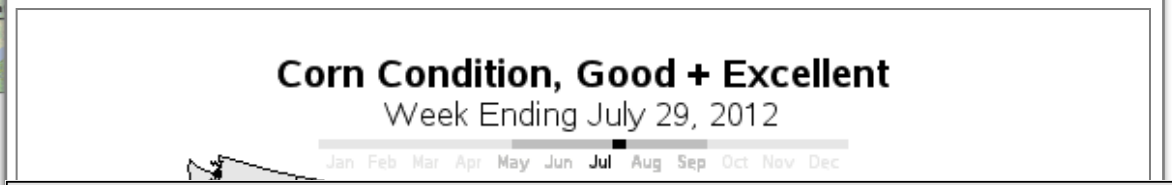
Census of Agriculture

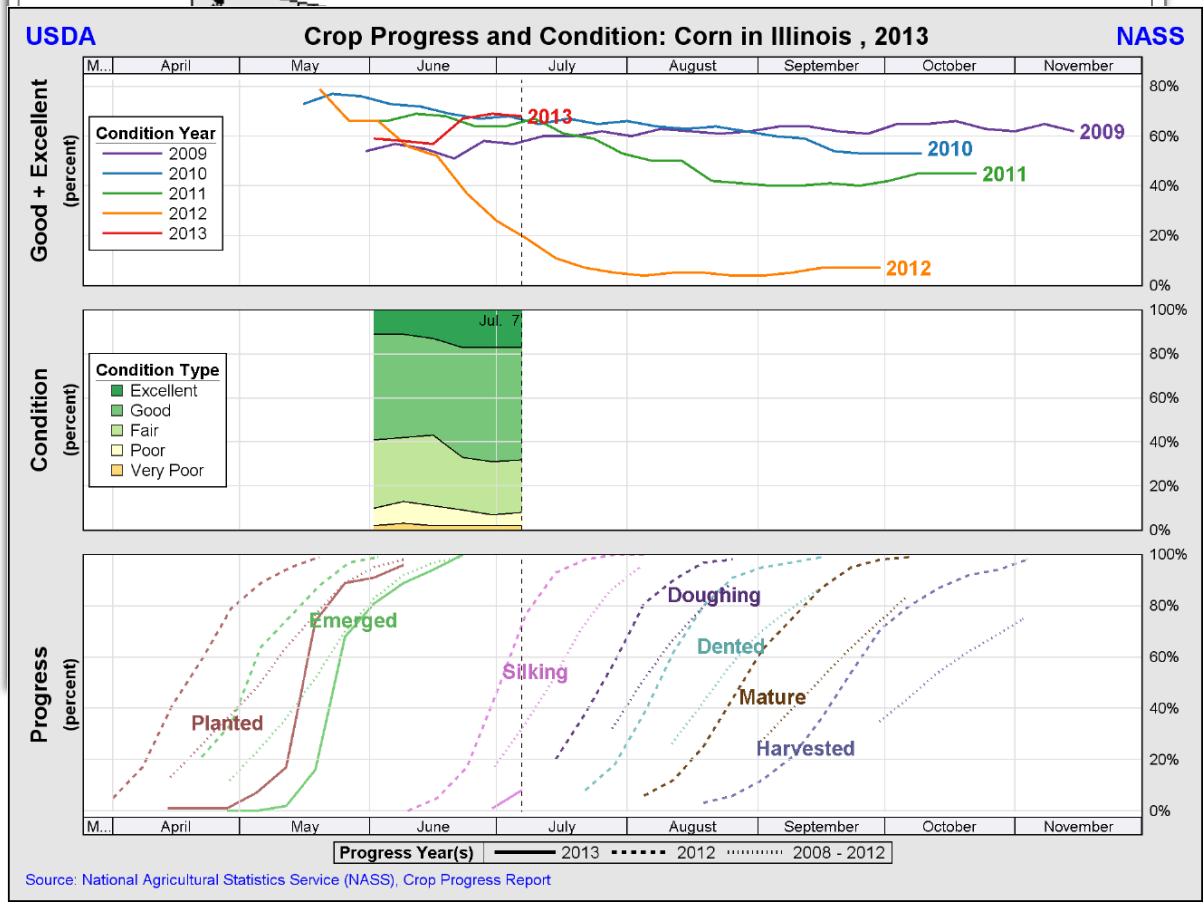
Interact with Data (1997)
2002 Maps: Gallery | Star Tree | List
"Linked Micromap" Plots (1997):
Corn | Cotton | Hay | Soybeans | Wheat

2007 Census Map Gallery

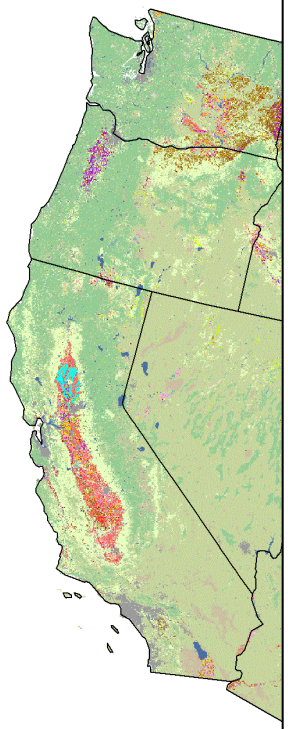
Also See
- Research Fellow and Associate Program
- Seasonal Summary of Crop Progress and Condition
- Remotely Sensed Data
- Crop Acreage
- Crop Yield
- Future Vision







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



Agriculture

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

Agriculture

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

Non-Agriculture

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

- Barren
- Perennial Ice/Snow

2010 Cropland Data Layer
McLean County, IL

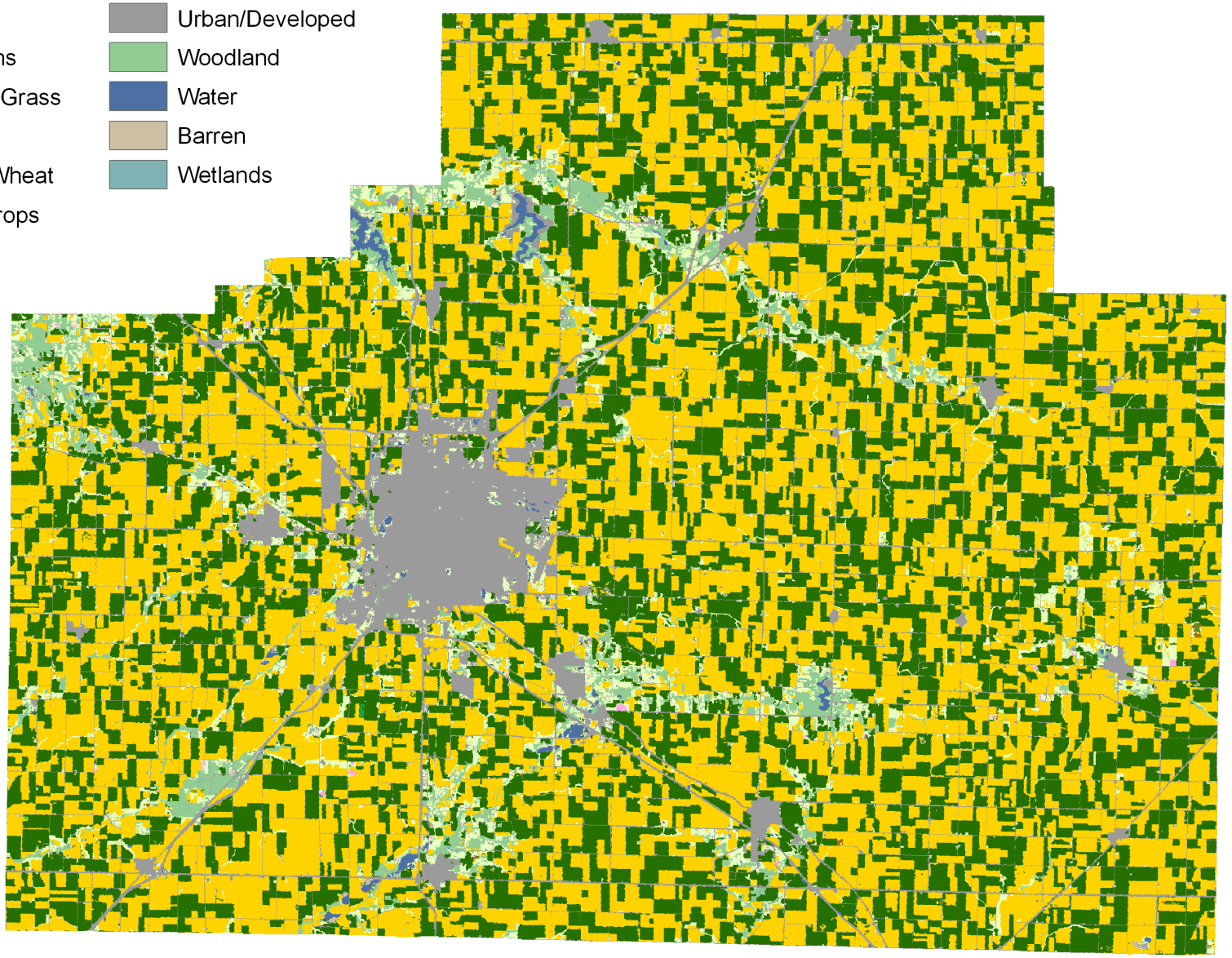
Land Cover Categories
(by decreasing acreage)

Agriculture

- Corn
- Soybeans
- Pasture/Grass
- Alfalfa
- Winter Wheat
- Other Crops

Non-Agriculture

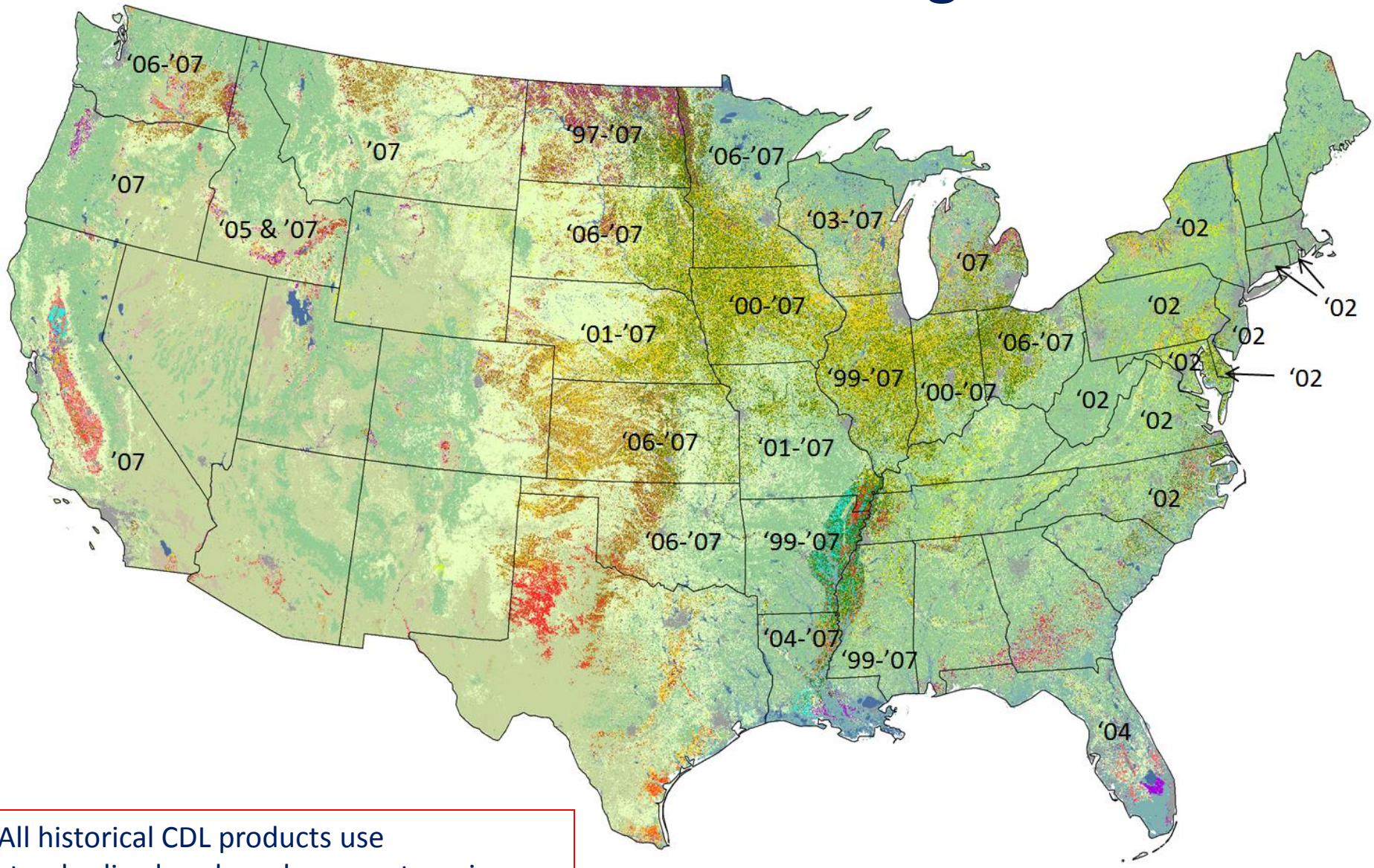
- Urban/Developed
- Woodland
- Water
- Barren
- Wetlands



USDA

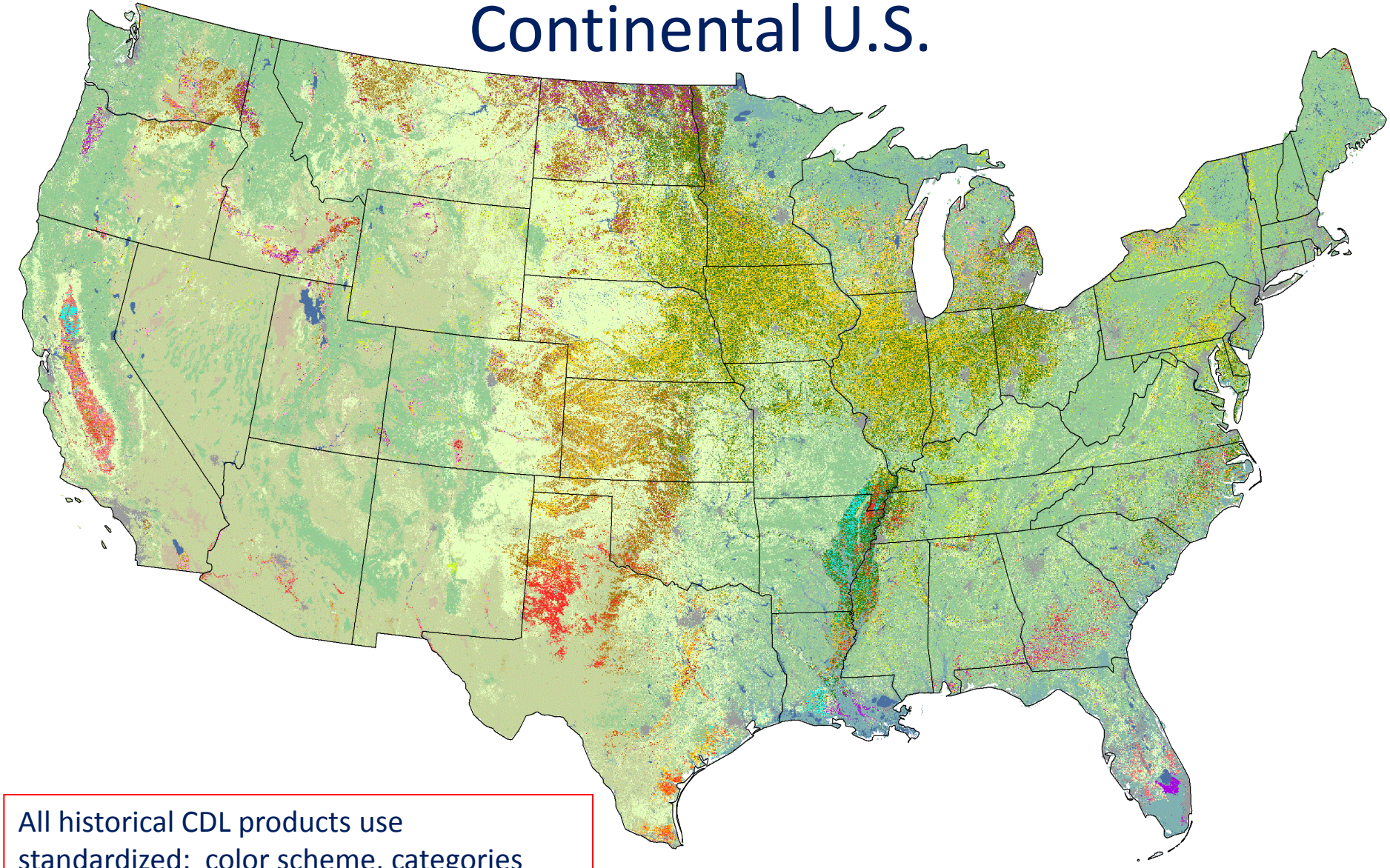
AGRICULTURE COUNTS NASS

1997 – 2007 Coverage:



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

2008 – 2012 Coverage: Continental U.S.



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

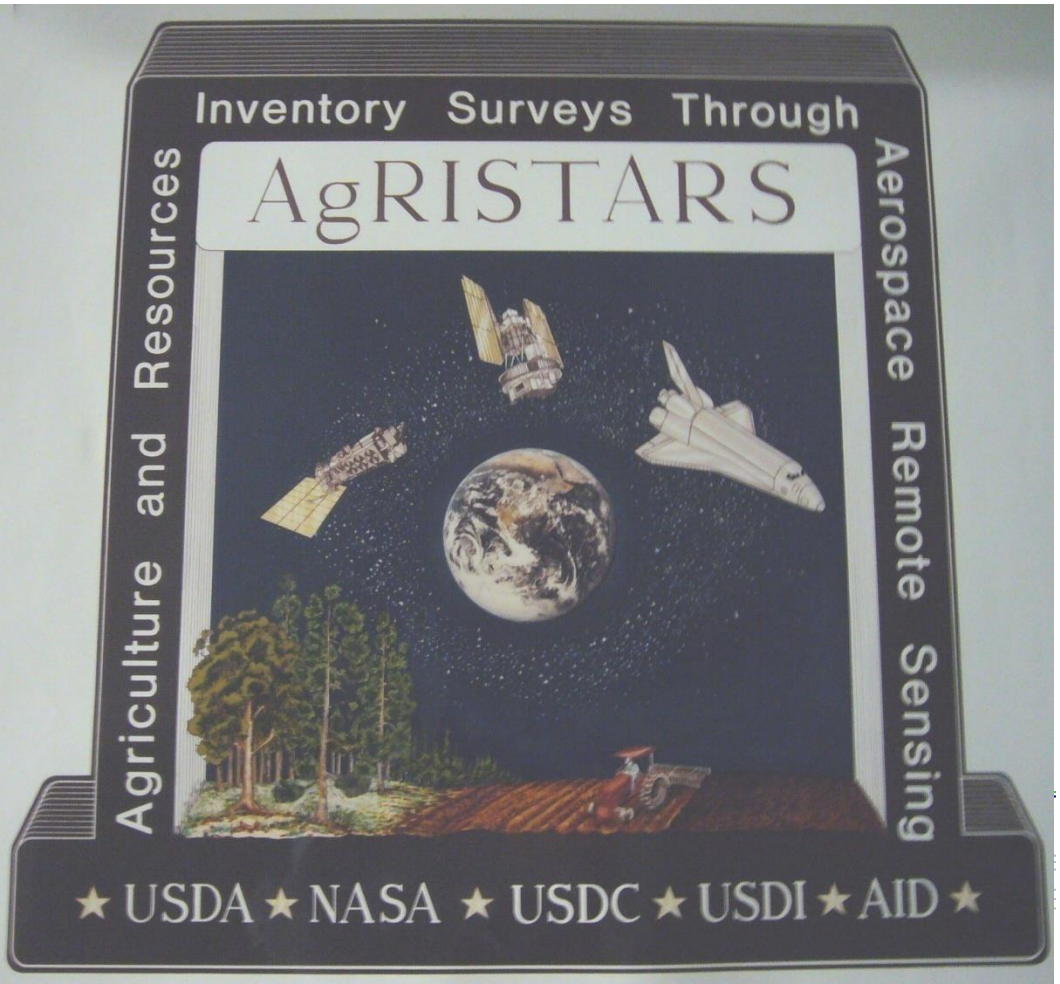
CDL Basics

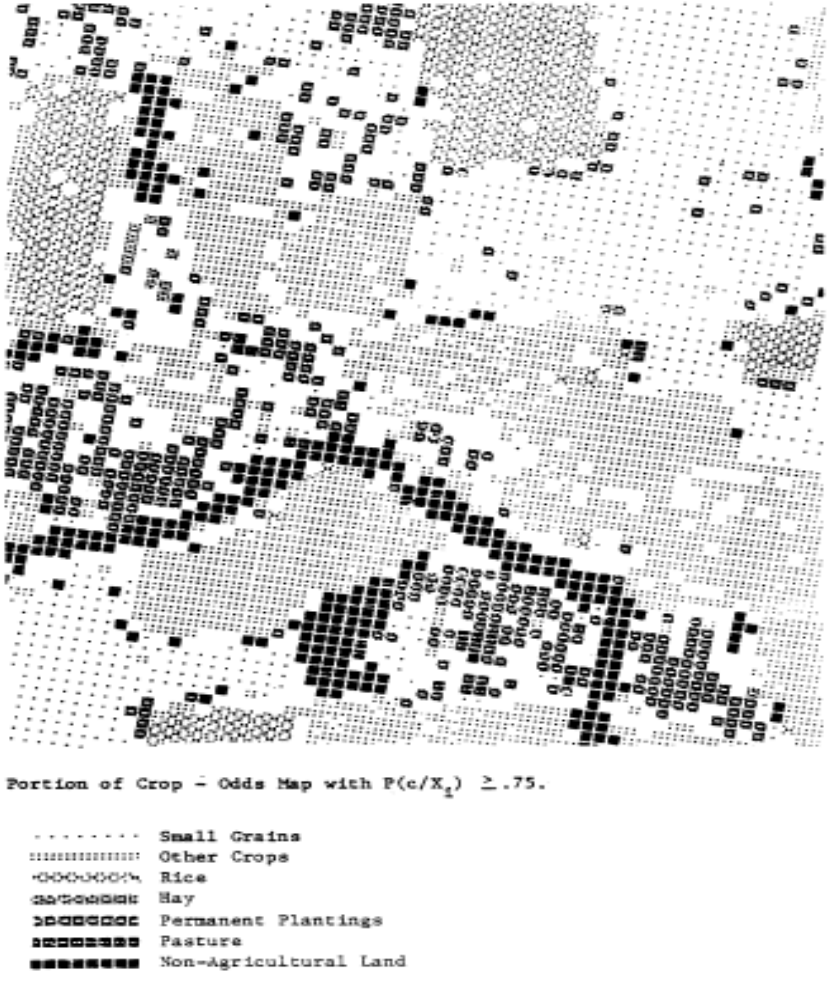
- Crop-specific land cover data layer
- Annual
- 30 meter spatial resolution
- GIS-ready
  - Georeferenced
  - Raster
- Interagency collaborations
  - Illinois Interagency Landscape Classification (IILC) Project
    - Illinois Department of Natural Resources (IDNR)
    - Illinois Department of Agriculture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

Cropland Data Layer (CDL) History

- Legacy program

  Early limitations: Budget/Satellites/Technology





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.

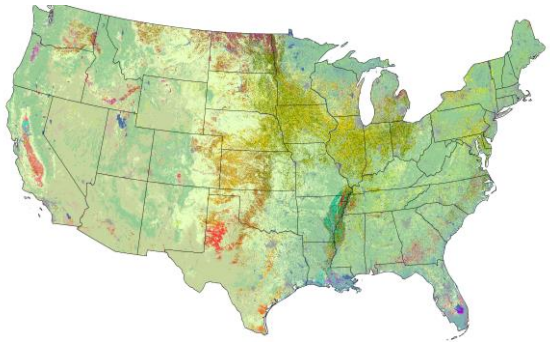
Annual CDL states traditionally focused in the Midwest and Mississippi Delta States
- Corn, Cotton, Rice, Soybeans, Winter Wheat

Corn

Soybeans

CDL Program Objectives

- **"Census by Satellite"**
  Annually cover major program crops and regions
  Crops accurately geo-located



- **Operationalize indications delivery**
  Deliver in-season June, August, September and October
    - Agricultural Statistics Board
    - Field Offices

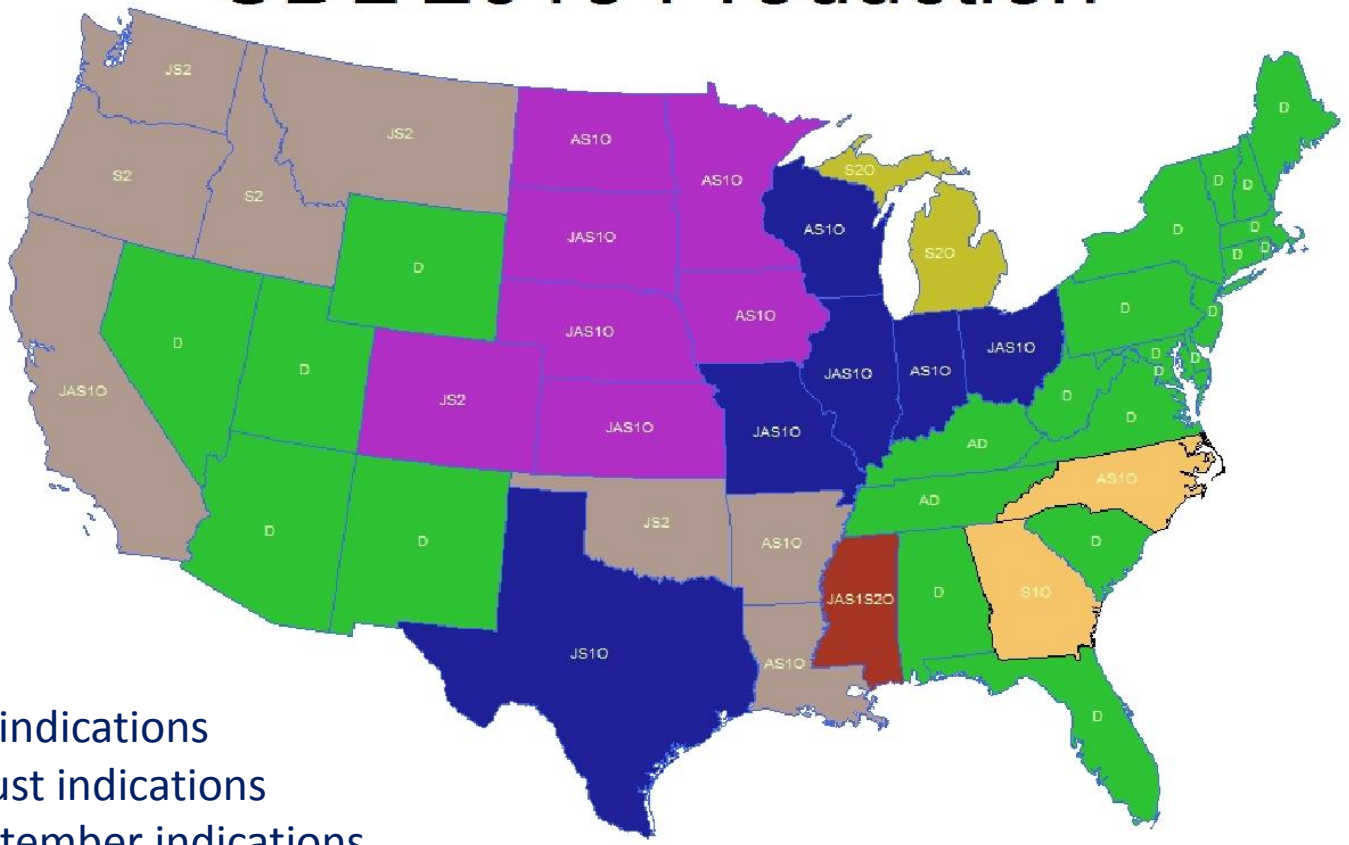
  Update planted area

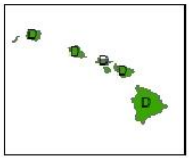
- **Provide timely, accurate, useful indications**
  Measurable error
  Unbiased/independent estimator
  State, County, Agricultural Statistics Districts

- **Distribute to public at no cost**
  CropScape

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

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

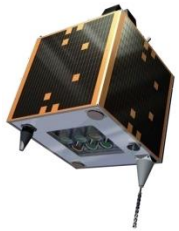
Methodology (continued)

- Ground Truth
  - Agricultural training & validation
    - Farm Service Agency (FSA) Common Land Unit (CLU)
  - Non-Agricultural training & validation
    - USGS 2006 National Land Cover Dataset (NLCD)

- 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

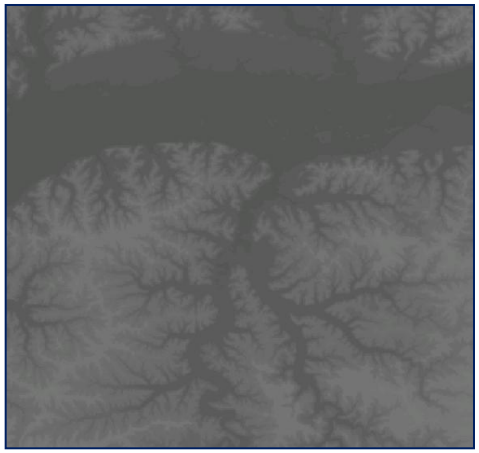
- Software
  - Ground Truth Preparation: ESRI ArcGIS
  - Imagery Preparation: ERDAS Imagine
  - Decision-Tree Software: Rulequest See 5.0
  - Classification: NLCD Mapping Toolkit
  - Acreage Estimation: SAS



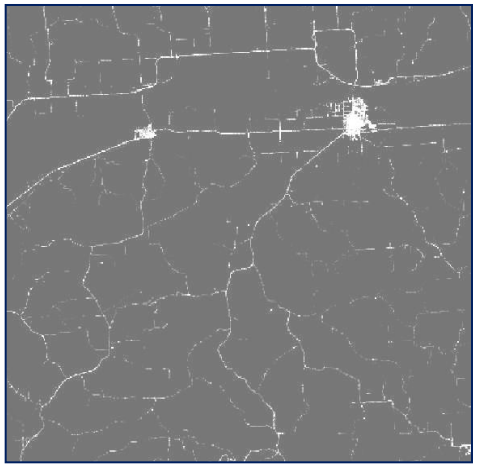
Satellite Sensors

	1999 - 2005	2006 - 2010	2011- Current	2013 - Current
	TM	**AWiFS**	**DMC**	**Landsat 8**
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

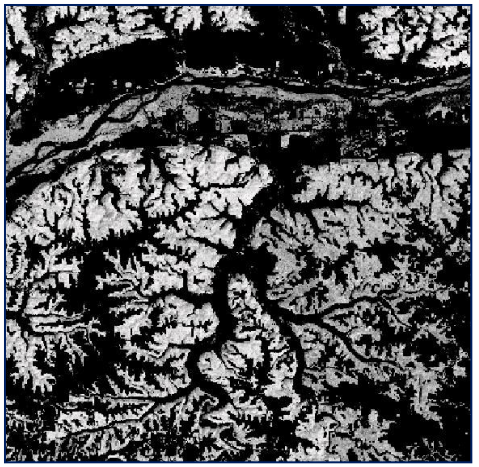
Ancillary Data – USGS & NASA Products



Elevation

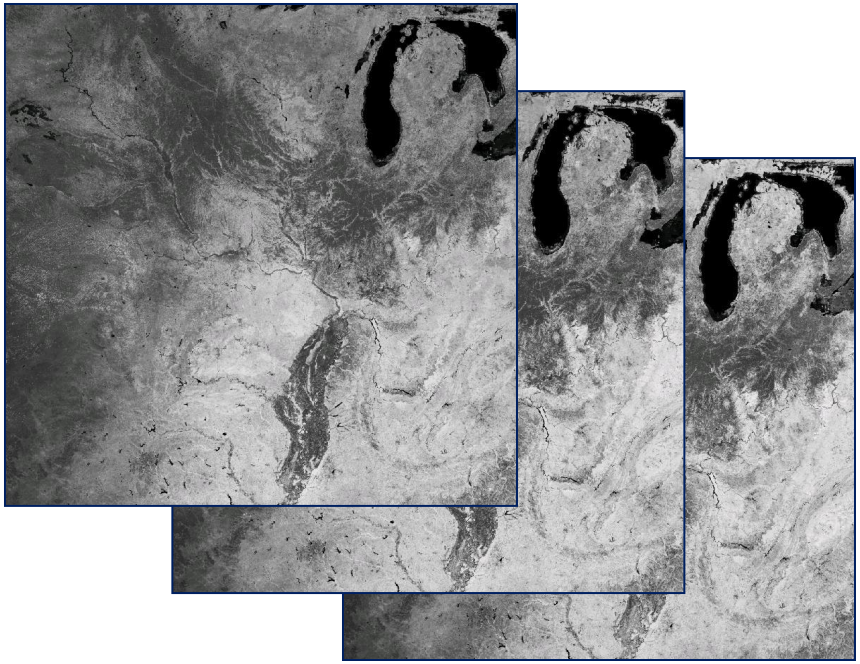


Imperviousness

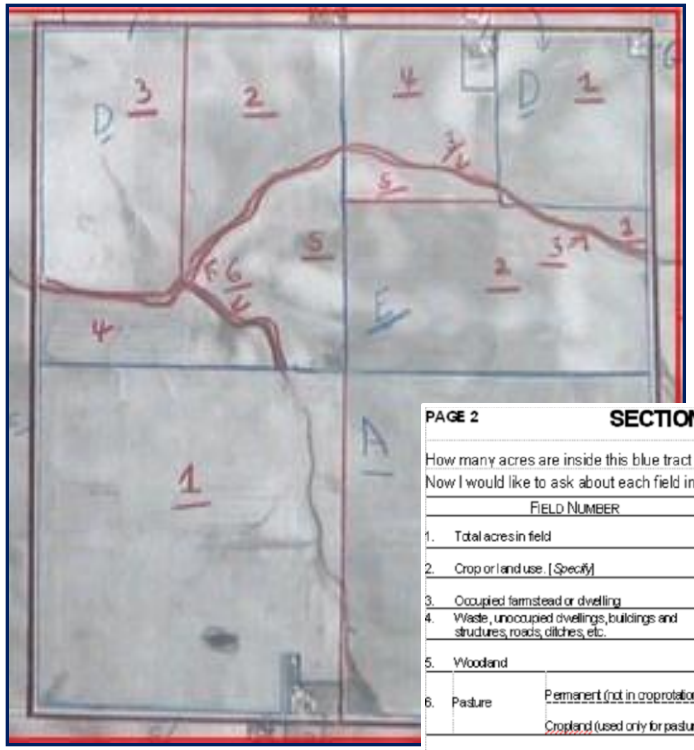


Forest Canopy

- **NASA MODIS 16-day 250m NDVI composites**
- **Start in fall of previous year for winter wheat**



Old Ground Truth (1997 – 2006 CDLs)



June Agricultural Survey (JAS) – National in Scope

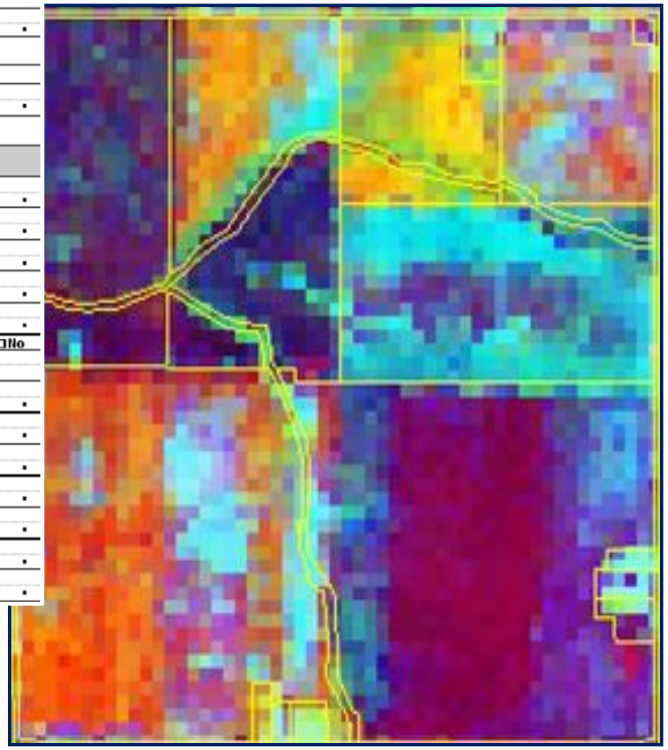
- **41,000 farms visited, 11,000 one-square mile sample area segments**
- **Illinois ~ 400 segments statewide**

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	Permanent (not in crop rotation)	842 .	842 .	842 .	842 .	842 .
	Cropland (used only for pasture)	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.		☐Yes ☐No	☐Yes ☐No	☐Yes ☐No	☐Yes ☐No	☐Yes ☐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 .	540 .
17.	For grain or seed	541 .	541 .	541 .	541 .	541 .
18. **Rye** (Include cover crop) [Exclude ryegrass]	Planted	547 .	547 .	547 .	547 .	547 .
19.	For grain or seed	548 .	548 .	548 .	548 .	548 .



Ground Truth (2

Agriculture Ground Truth

Provided by Farm Service Agency

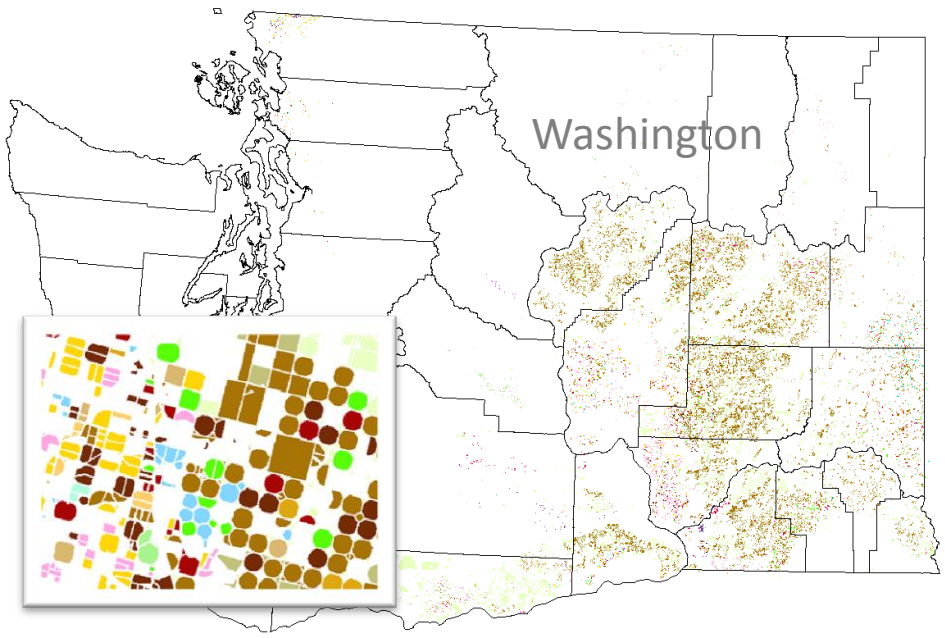
- USDA programs (crop subsidy, disaster relief)
- Program crops (may under report specialty crops)
- GIS-ready (less labor intensive for NASS)

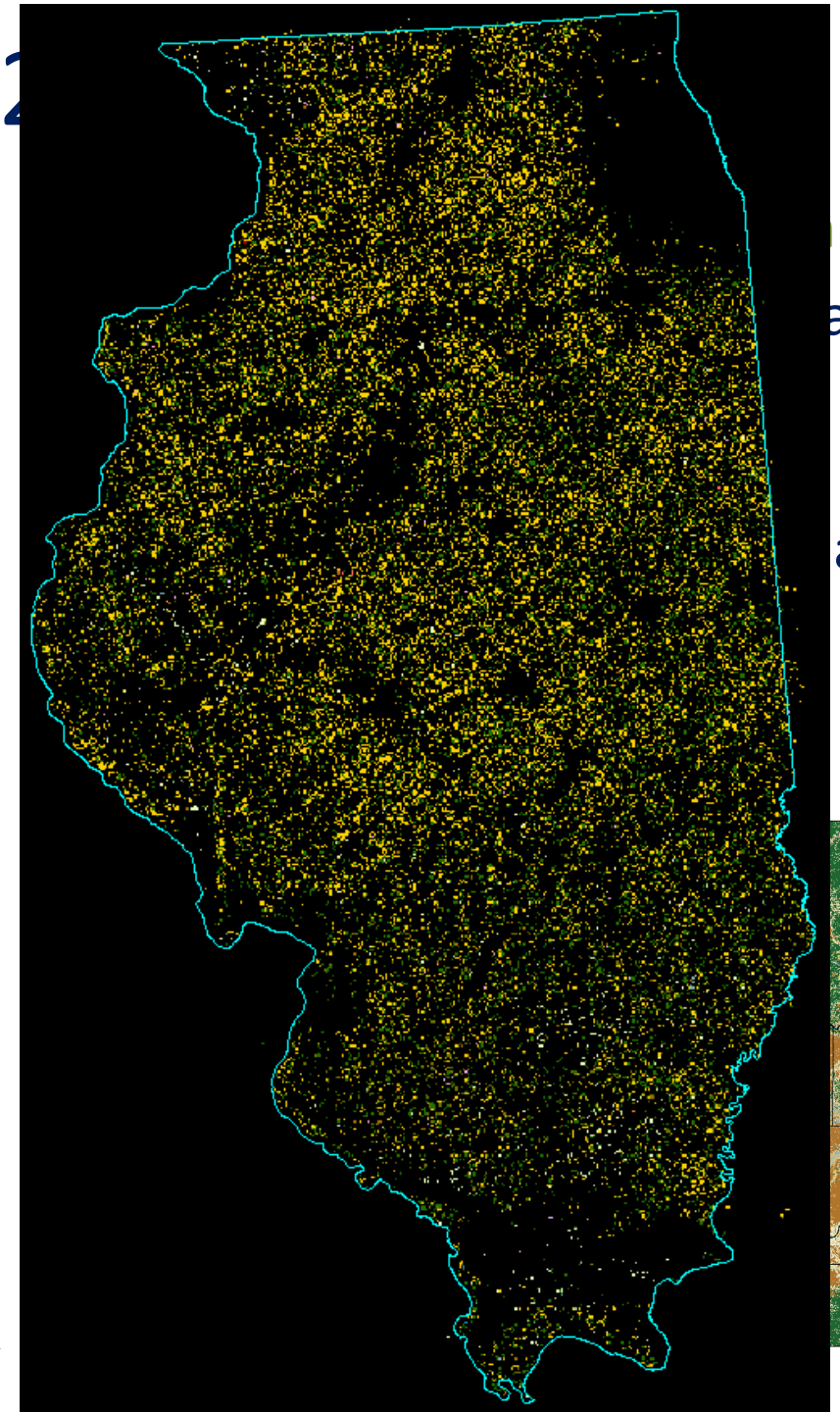
Divide known fields into 2 sets

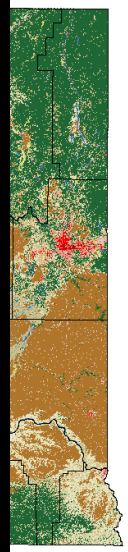
- 70% used for training software
- 30% used for validating results

aset

and







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.

USDA

AGRICULTURE COUNTS NASS

Acreage not just about counting pixels

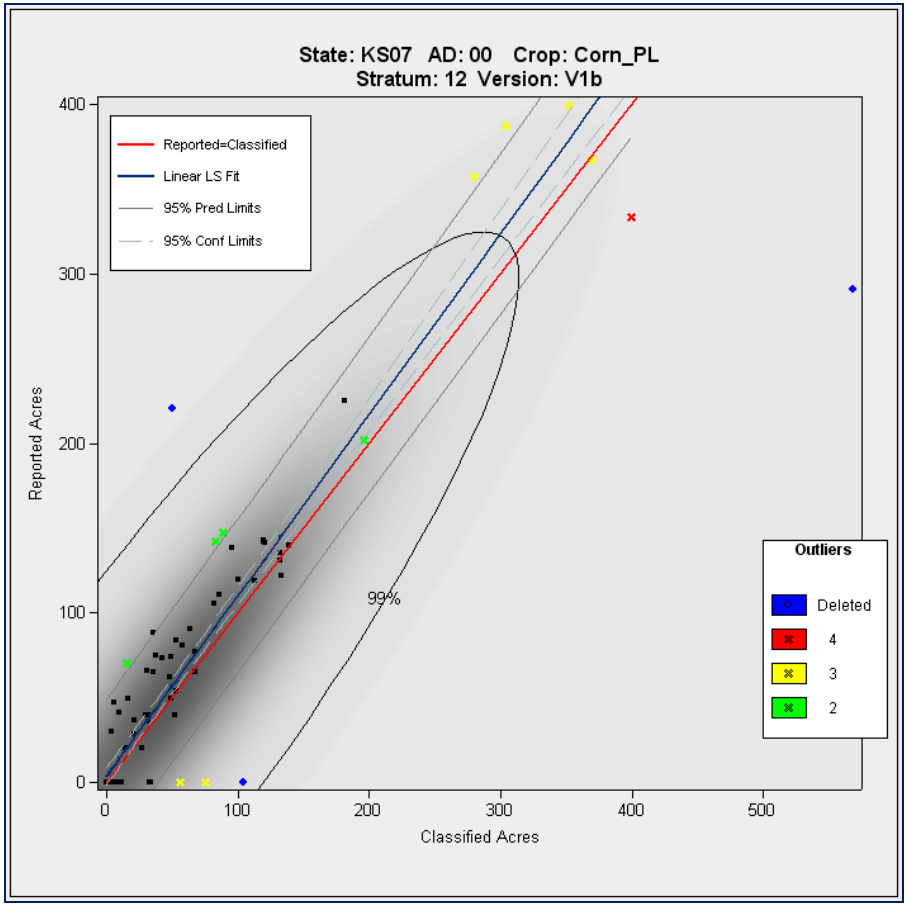
Regression-based Acreage Estimator

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



PAGE 2

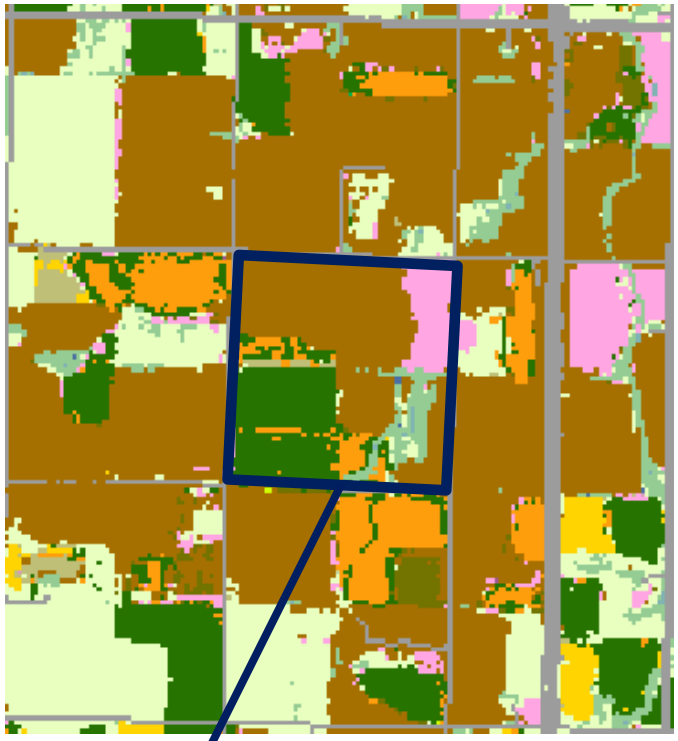
SECTION D - CROPS AND LAND USE ON TRACT

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	Permanent (not in crop rotation)	842	842	842	842	842
	Cropland (used only for pasture)	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.		☐Yes ☐No	☐Yes ☐No	☐Yes ☐No	☐Yes ☐No	☐Yes ☐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	540
17.	For grain or seed	541	541	541	541	541
18. **Rye** (*include cover crop*) [*Exclude ryegrass*]	Planted	547	547	547	547	547
19.	For grain or seed	548	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

Categorization 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
```

```
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
```

```
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
```

Future of the CDL Program?

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

CDL Visualization, Dissemination and Querying Needs

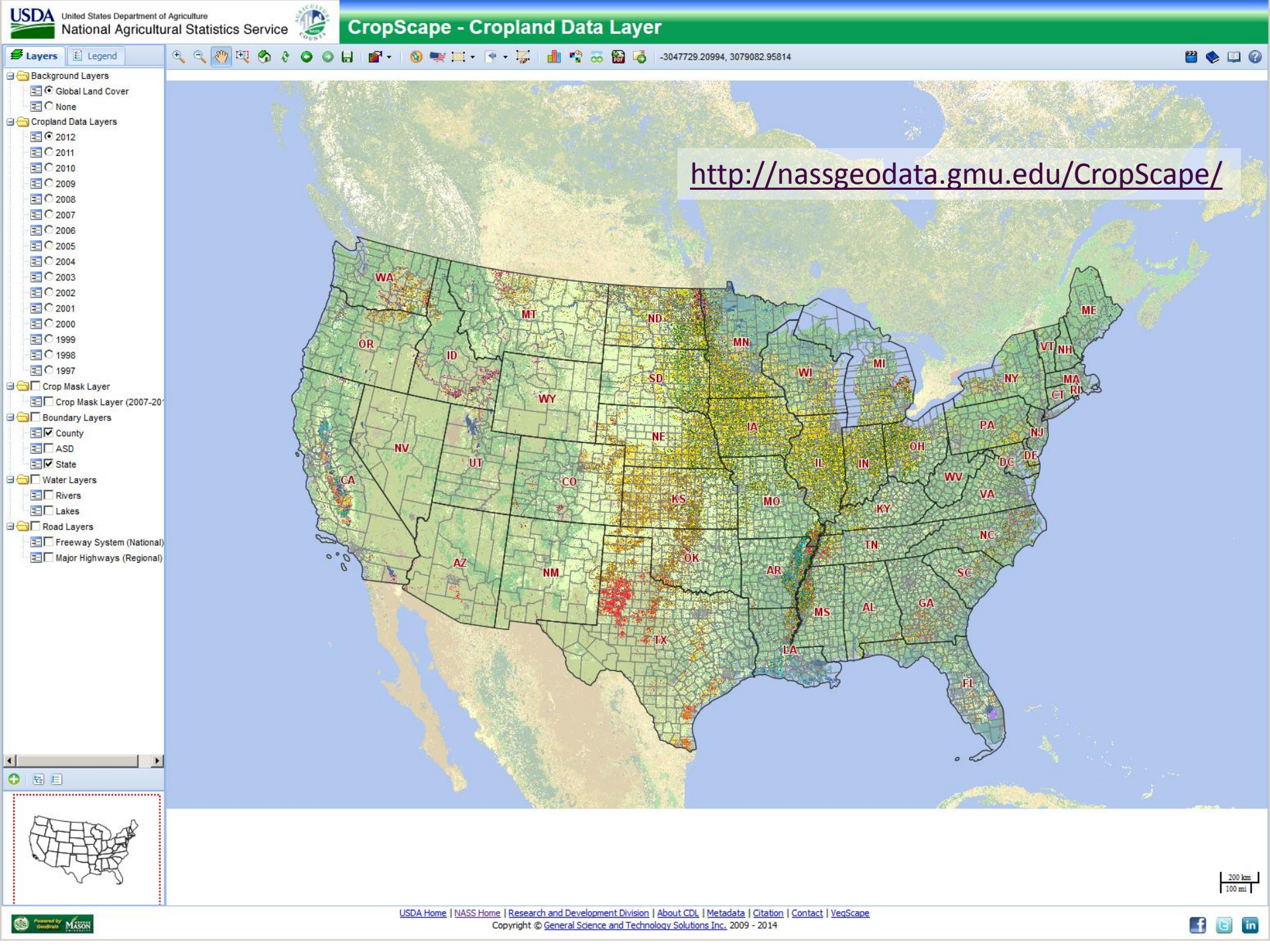
- Prior Dissemination Method:
  - Online bulk FTP downloading via NRCS Geospatial Data Gateway
  - Special request & delivery
    - Printed maps
    - CD/DVD delivery
    - Email generated

- 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


USDA United States Department of Agriculture
National Agricultural Statistics Service
CropScape - Cropland Data Layer
Layers
Legend
-3047729.20994, 3079082.95814
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 (2007-20
Boundary Layers
County
ASD
State
Water Layers
Rivers
Lakes
Road Layers
Freeway System (National)
Major Highways (Regional)
http://nassgeodata.gmu.edu/CropScape/
WA
OR
CA
ID
NV
MT
WY
UT
AZ
CO
NM
ND
SD
NE
KS
OK
TX
MN
IA
MO
AR
LA
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MS
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IN
KY
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AL
OH
WV
GA
FL
SC
NC
VA
PA
NY
ME
VT
NH
MA
RI
CT
NJ
DE
DC
200 km
100 mi
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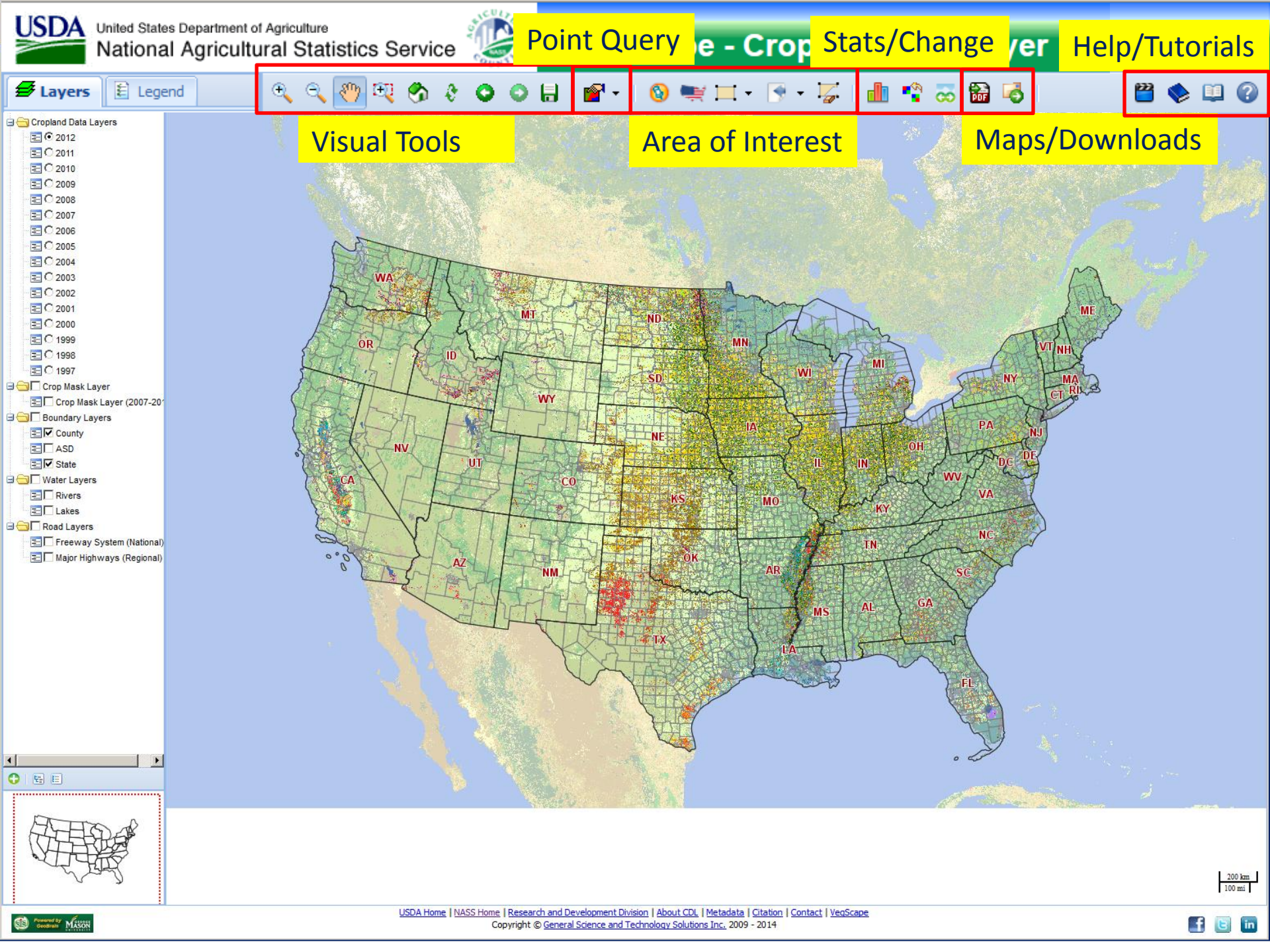
CropScape Functions

- 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


USDA
United States Department of Agriculture
National Agricultural Statistics Service
Point Query
Stats/Change
Help/Tutorials
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 (2007-20
Boundary Layers
County
ASD
State
Water Layers
Rivers
Lakes
Road Layers
Freeway System (National)
Major Highways (Regional)
WA
OR
CA
ID
NV
MT
WY
UT
AZ
CO
NM
ND
SD
NE
KS
OK
TX
MN
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MO
AR
LA
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IL
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MI
IN
KY
TN
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GA
FL
SC
NC
VA
PA
NY
ME
VT
NH
MA
CT
RI
NJ
DE
DC
200 km
100 mi
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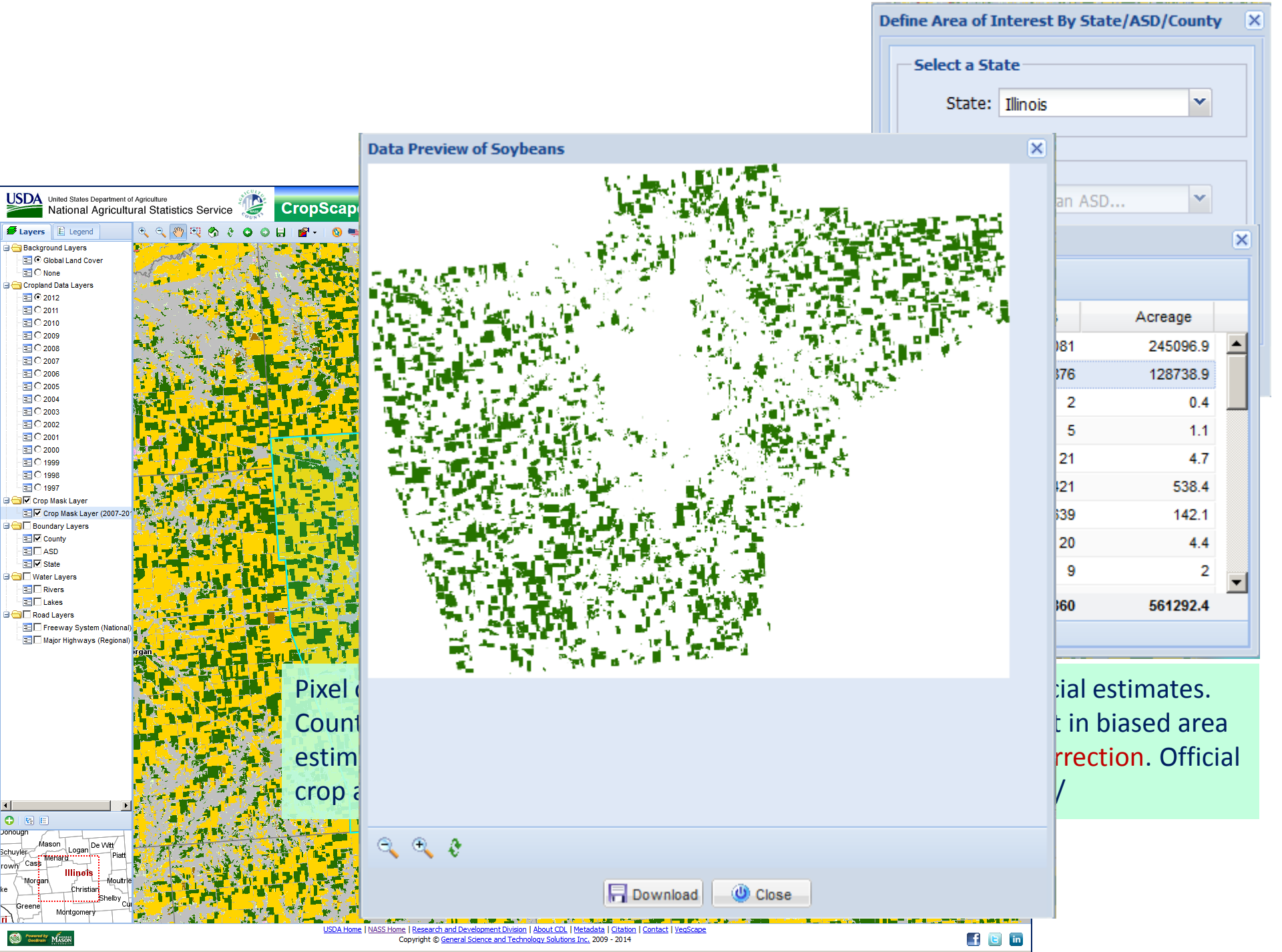
Define Area of Interest By State/ASD/County
Select a State
State: Illinois
Data Preview of Soybeans
Acreage
245096.9
128738.9
0.4
1.1
4.7
538.4
142.1
4.4
2
561292.4
Download
Close
USDA
United States Department of Agriculture
National Agricultural Statistics Service
CropScape
Layers
Legend
Background Layers
Global Land Cover
None
Cropland Data Layers
2012
2011
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1998
1997
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)
Illinois
USDA Home | NASS Home | Research and Development Division | About CDL | Metadata | Citation | Contact | VegScape
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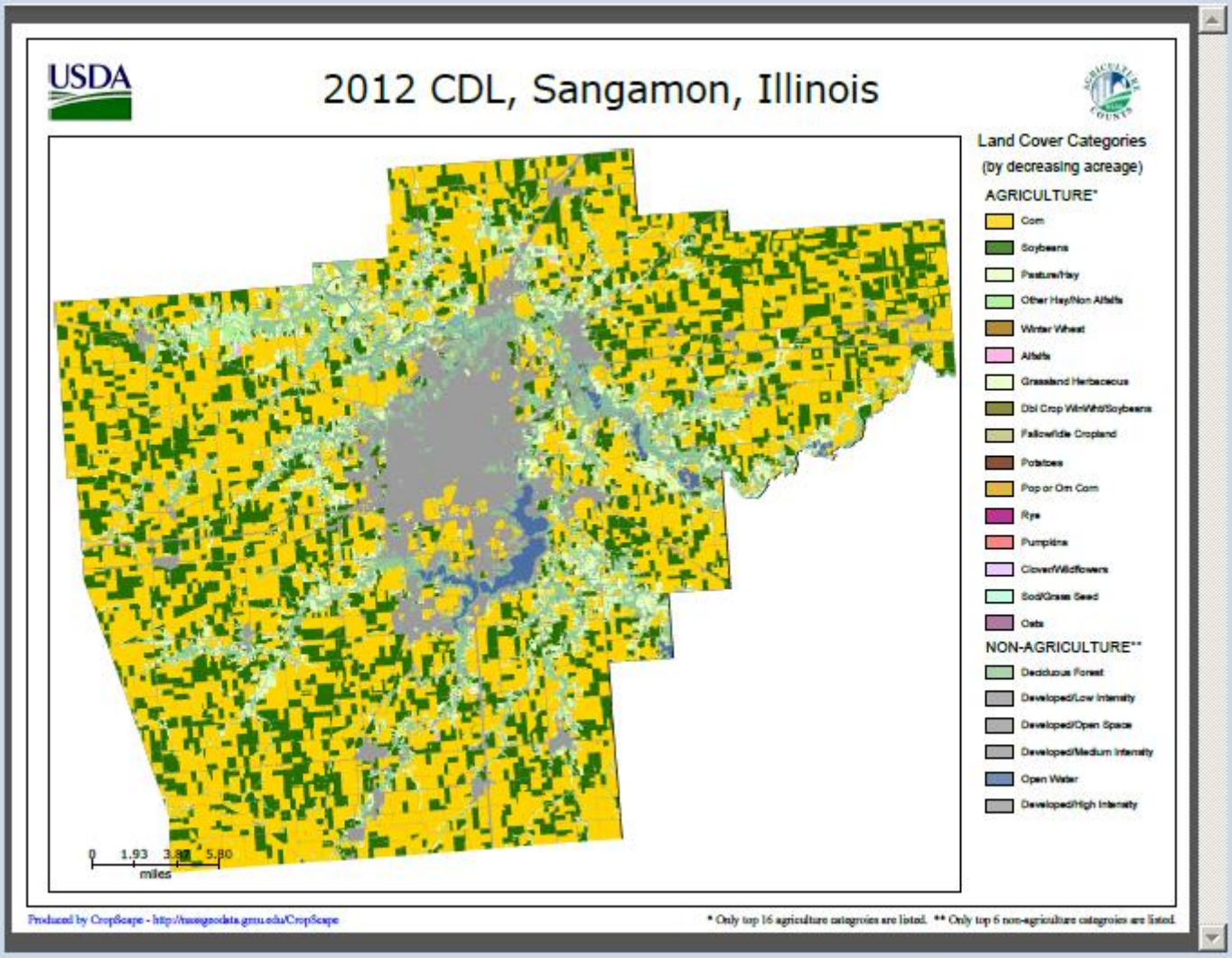
Create PDF File

Title: 2012 CDL, Sangamon, Illinois

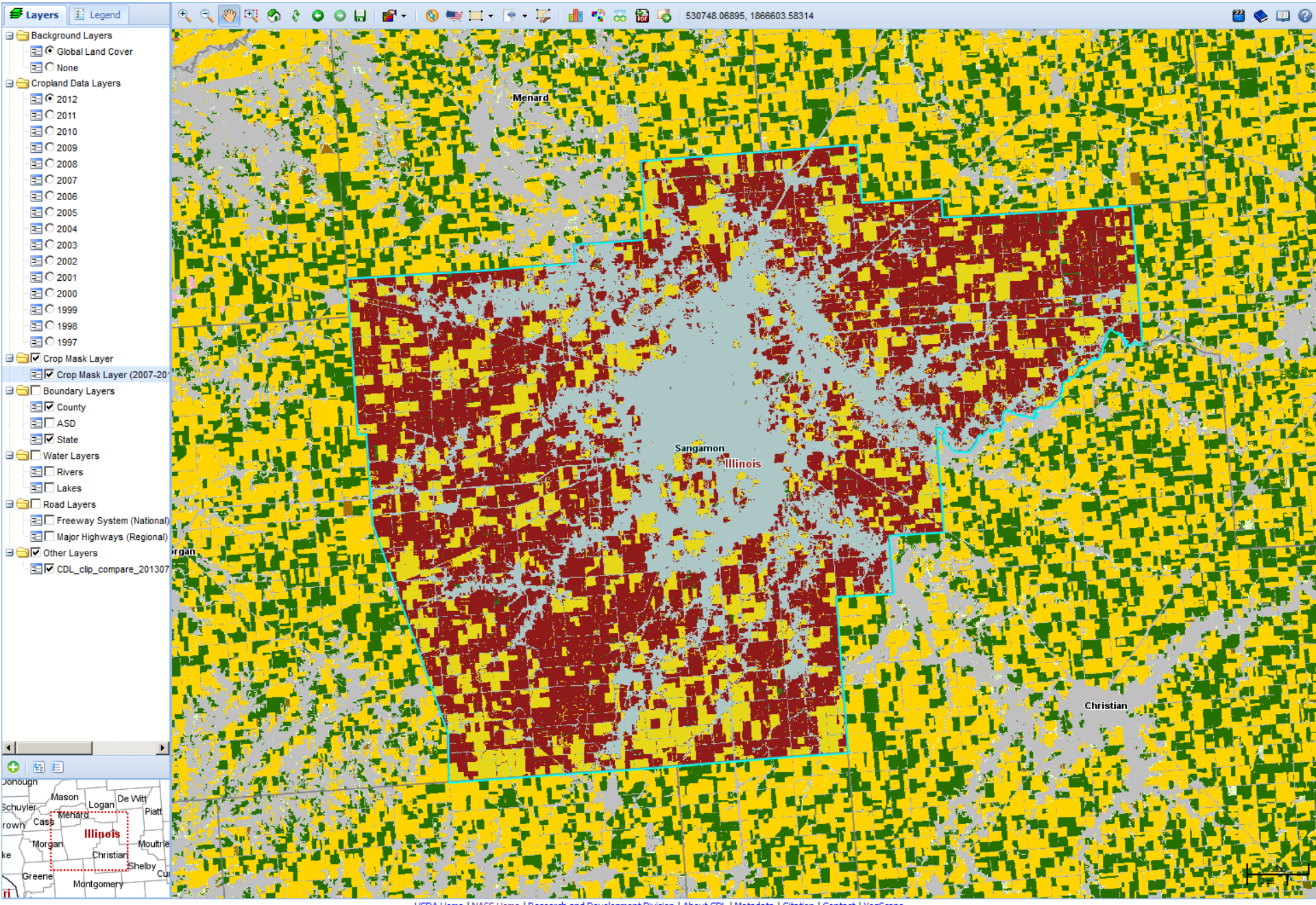
Paper Size: Letter - 11x8.5 in

Submit Cancel

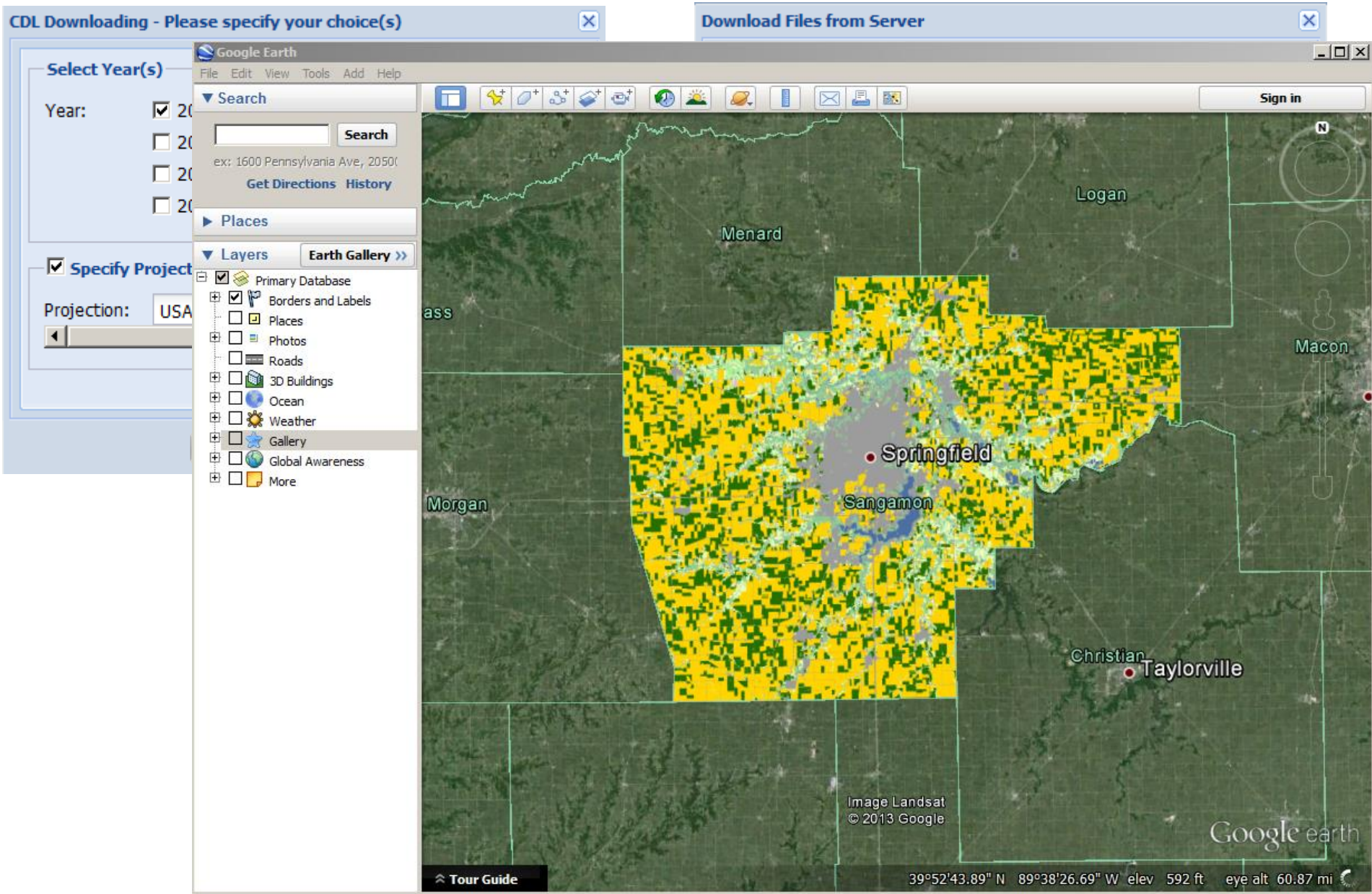
PDF Preview



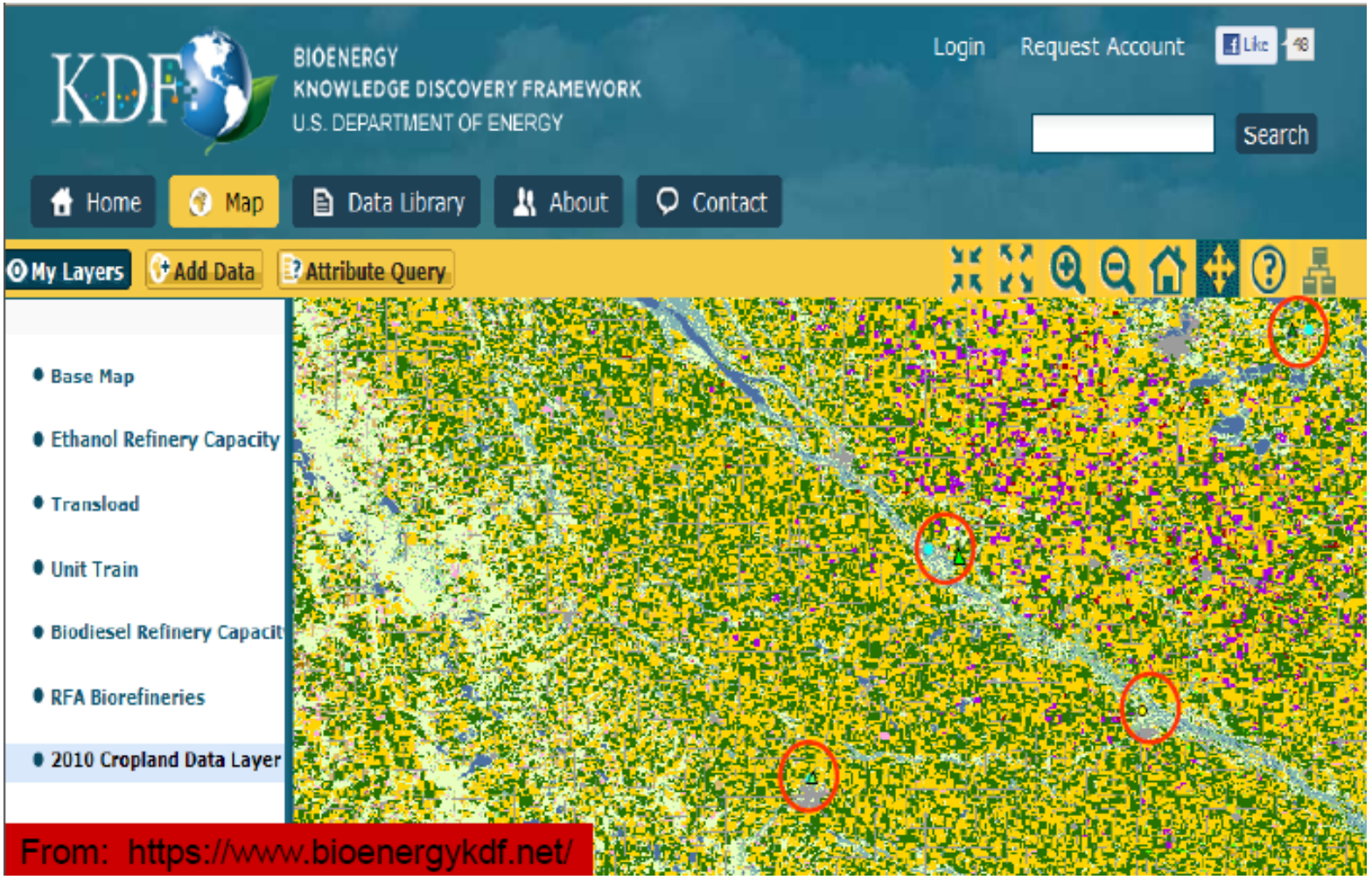
Download Close



CropScape Download & Export



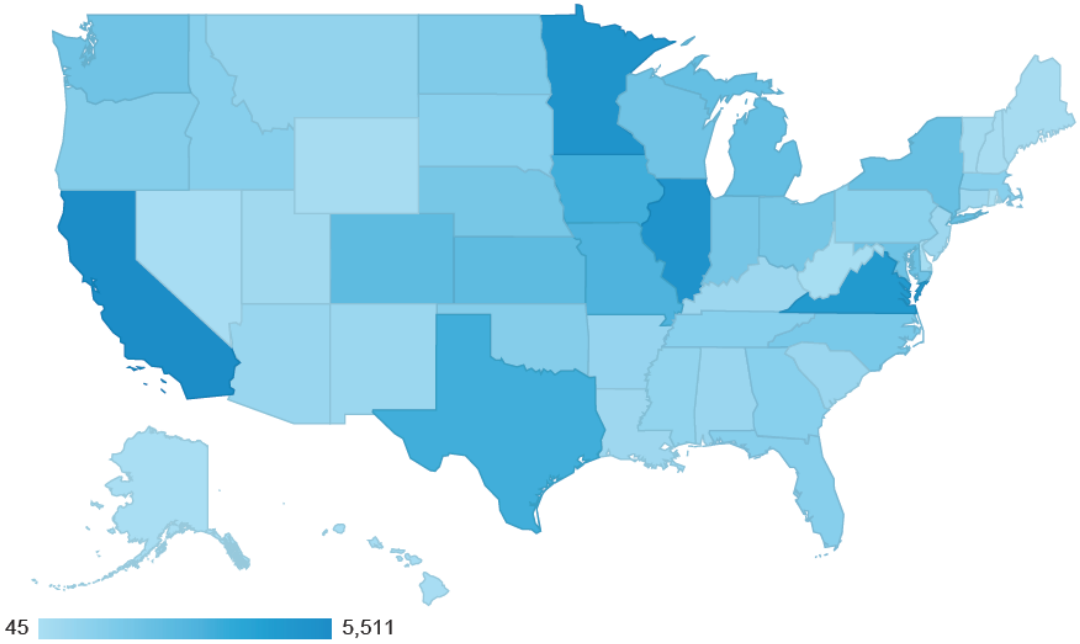
CropScape “Mashups”



CropScape Future Improvements

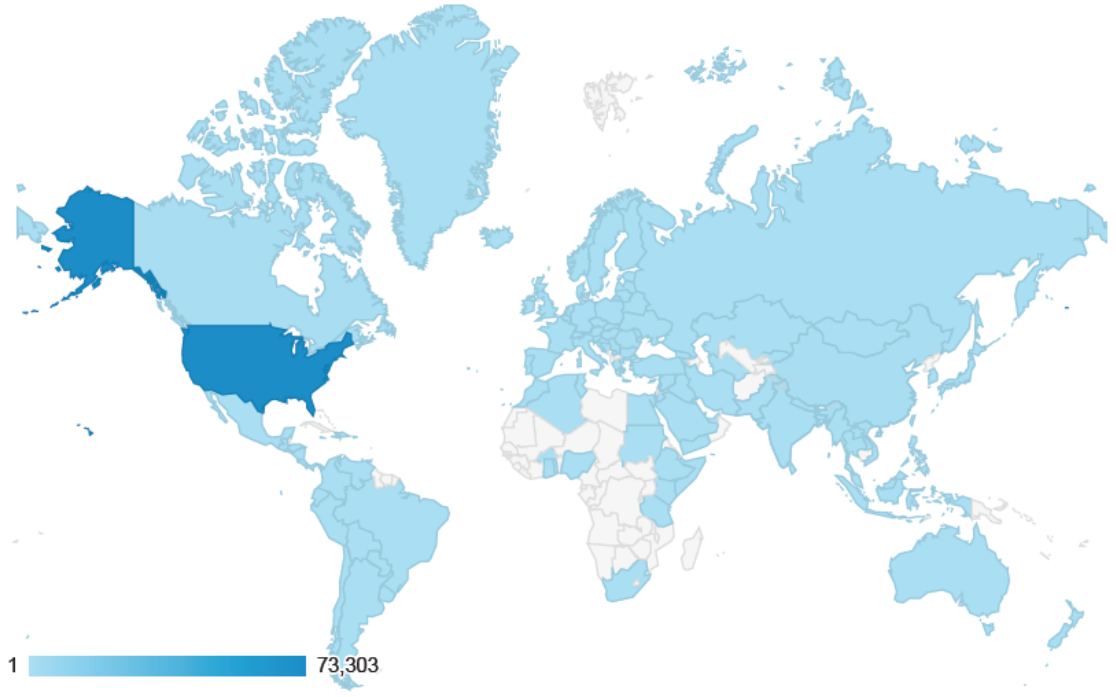
- Additional GIS layers
  - watershed, congressional districts
- More analysis functions
- Improved map production/printing services

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%

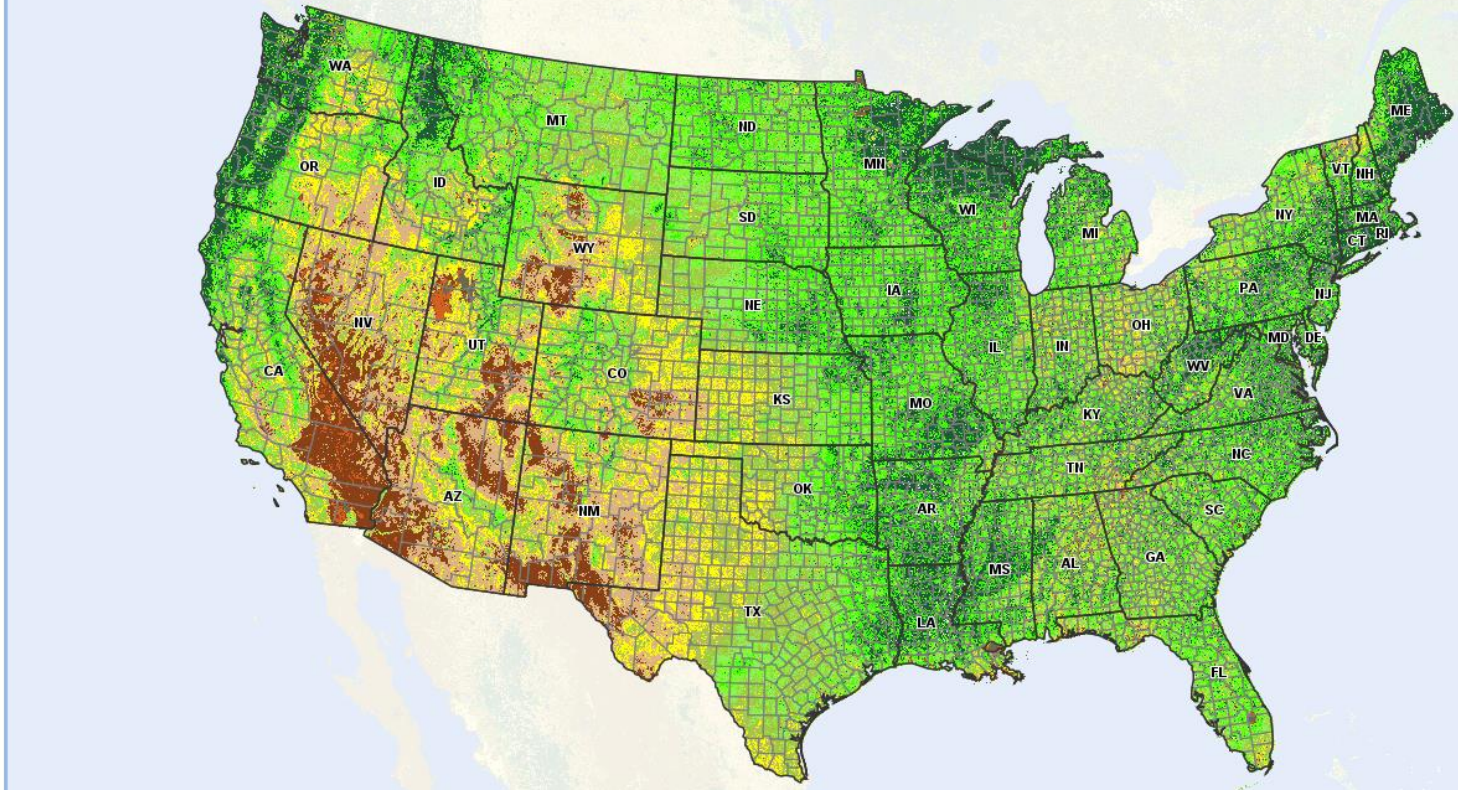
VegScape - Vegetation Condition Explorer

Layers | Products | Legends

-3056849.39307, 3247806.34598

Type: NDVI
Period: Weekly
Year: 2013
Date: 27(07.02_07.08)_2(

Add



200 km
100 mi

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
0.10 - 0.19
0.05 - 0.10
< 0.05
No Data

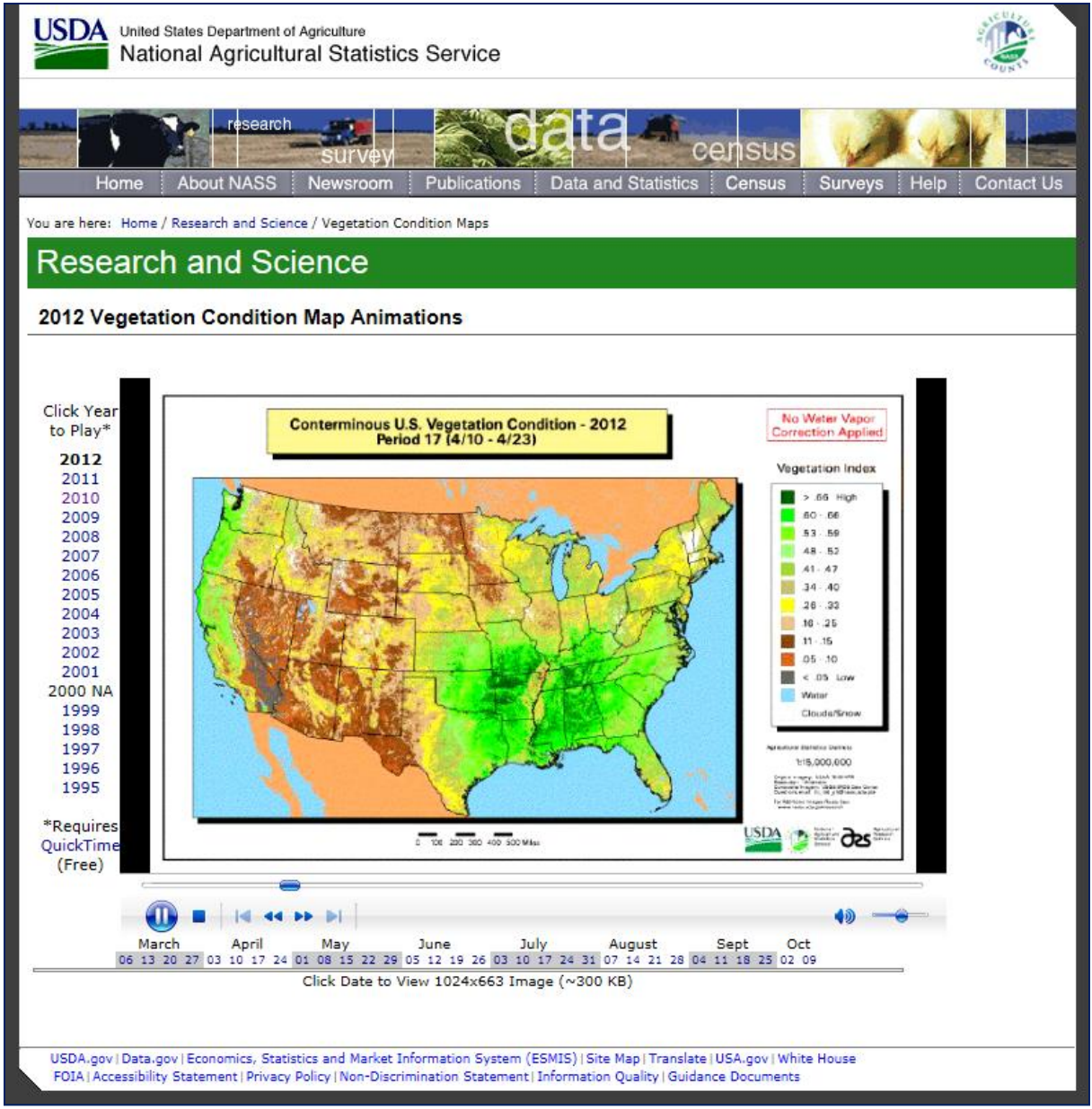
Weekly_NDVI_27_2013.07.02_2013.07.08

nassgeodata.gmu.edu/VegScape/#

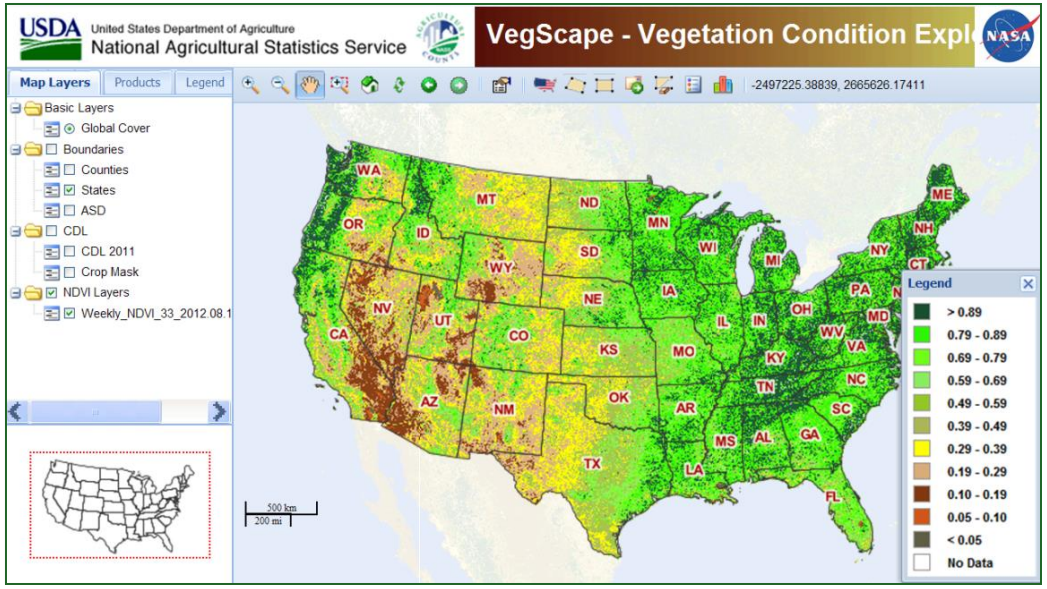
Purpose of VegScape

- 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

- 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

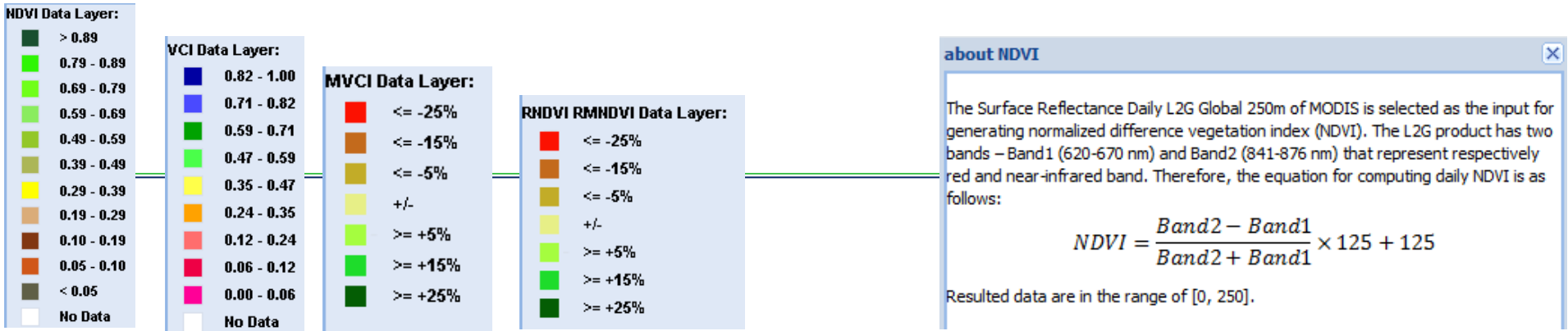
- Web-based interactive mapping
- Derive daily/weekly/biweekly composites
- Automated updates
- Online navigation, zooming, panning, downloading
- Hosted/maintained by George Mason University/Center for Spatial Information Science and Systems

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

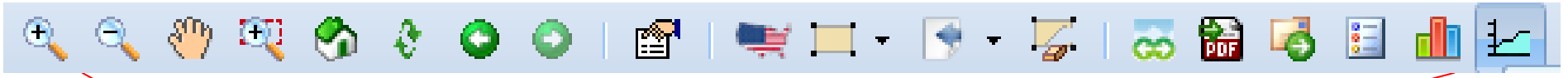
- Additional derivative vegetation indices can be displayed: Vegetative Condition Index; Ratio VCI; Ratio Median VCI; Mean VCI



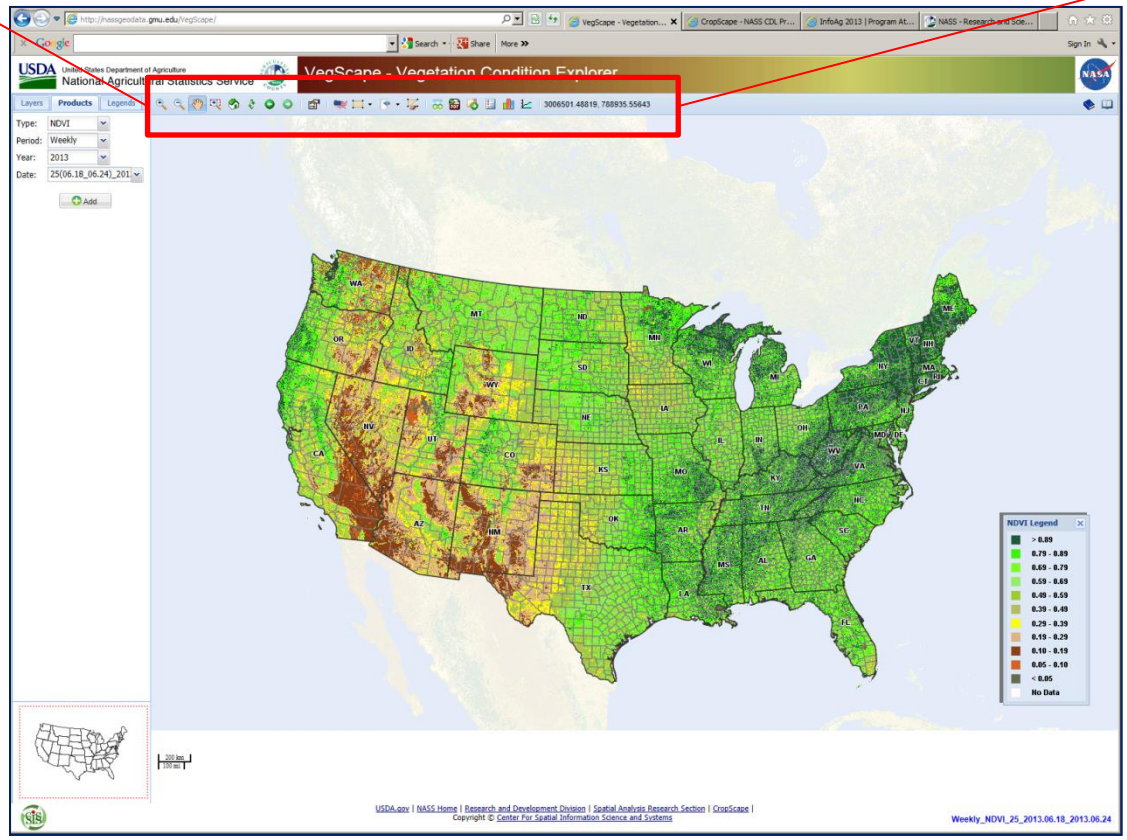
Vegetation Indices

- **NDVI** – Normalized Difference Vegetation Index
  NDVI = (IR - Red) / (IR + Red) = Shows greeness
  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



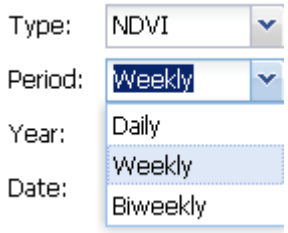
VegScape GUI



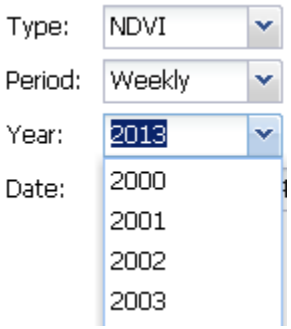
Load VegScape Indices

1) Select vegetative index

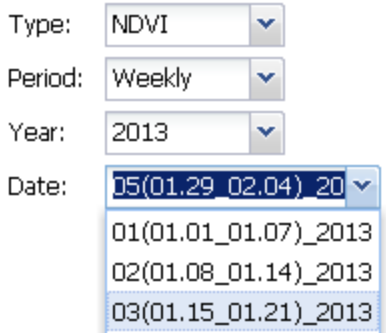
2) Time period



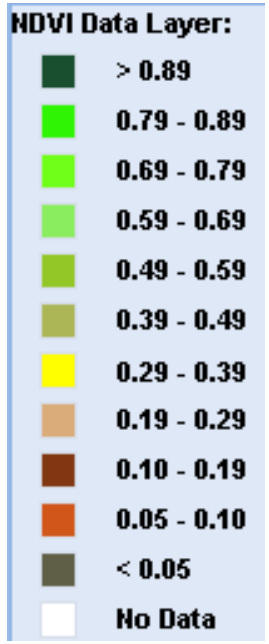
3) Year



4) Date



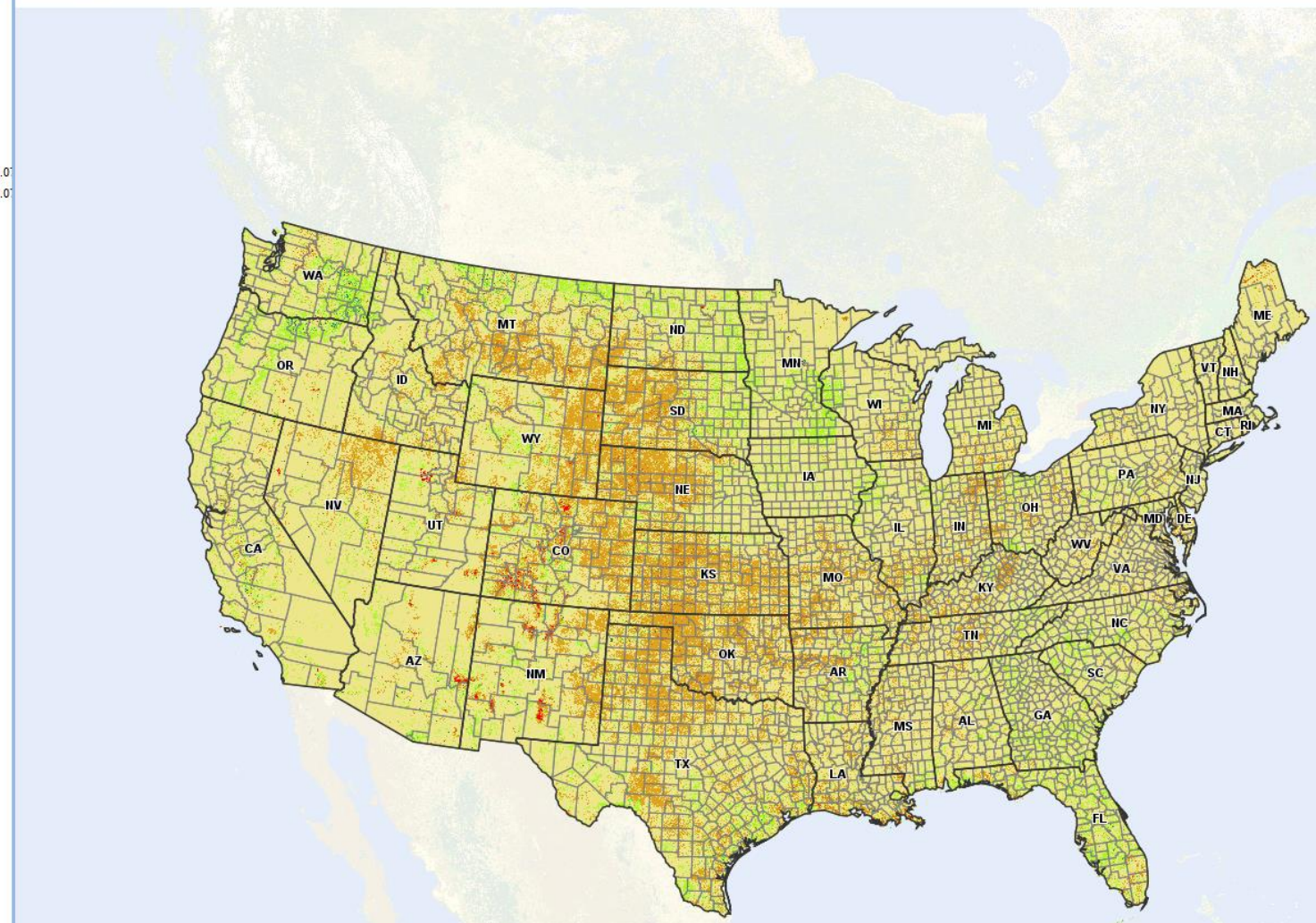
5) Add



VegScape - Vegetation Condition Explorer

-3029488.84369, 3758536.60105

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



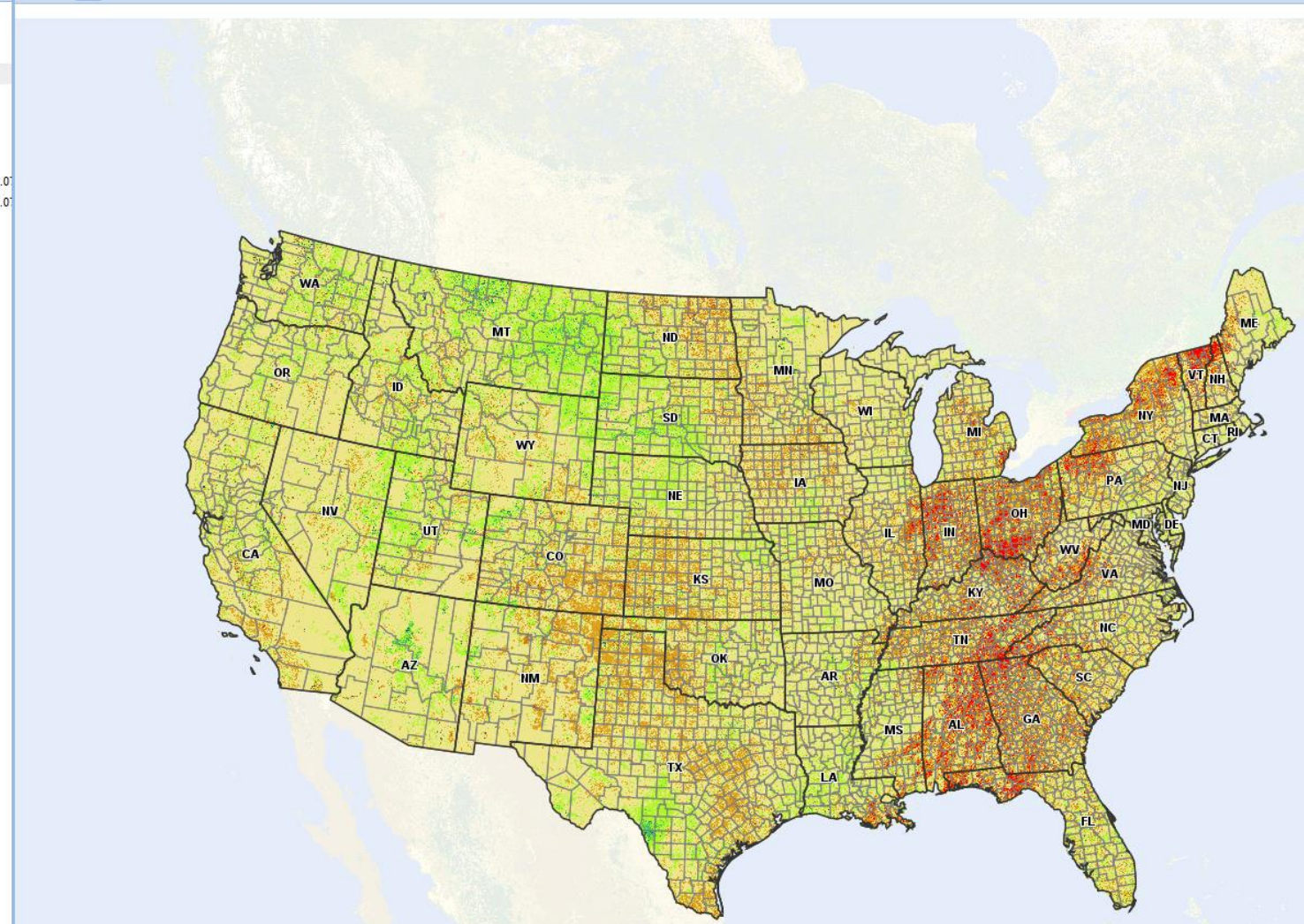
200 km
100 mi

RMVCI Legend

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

Weekly_RMVCI_27_2012.07.03_2012.07.09

VegScape - Vegetation Condition Explorer



200 km
100 mi

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

Weekly_RMVCI_27_2013.07.02_2013.07.08

VegScape - Vegetation Condition Explorer

RMVCI Legend

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

Weekly_RMVCI_27_2012.07.03_2012.07.09

Layers | Products | Legends

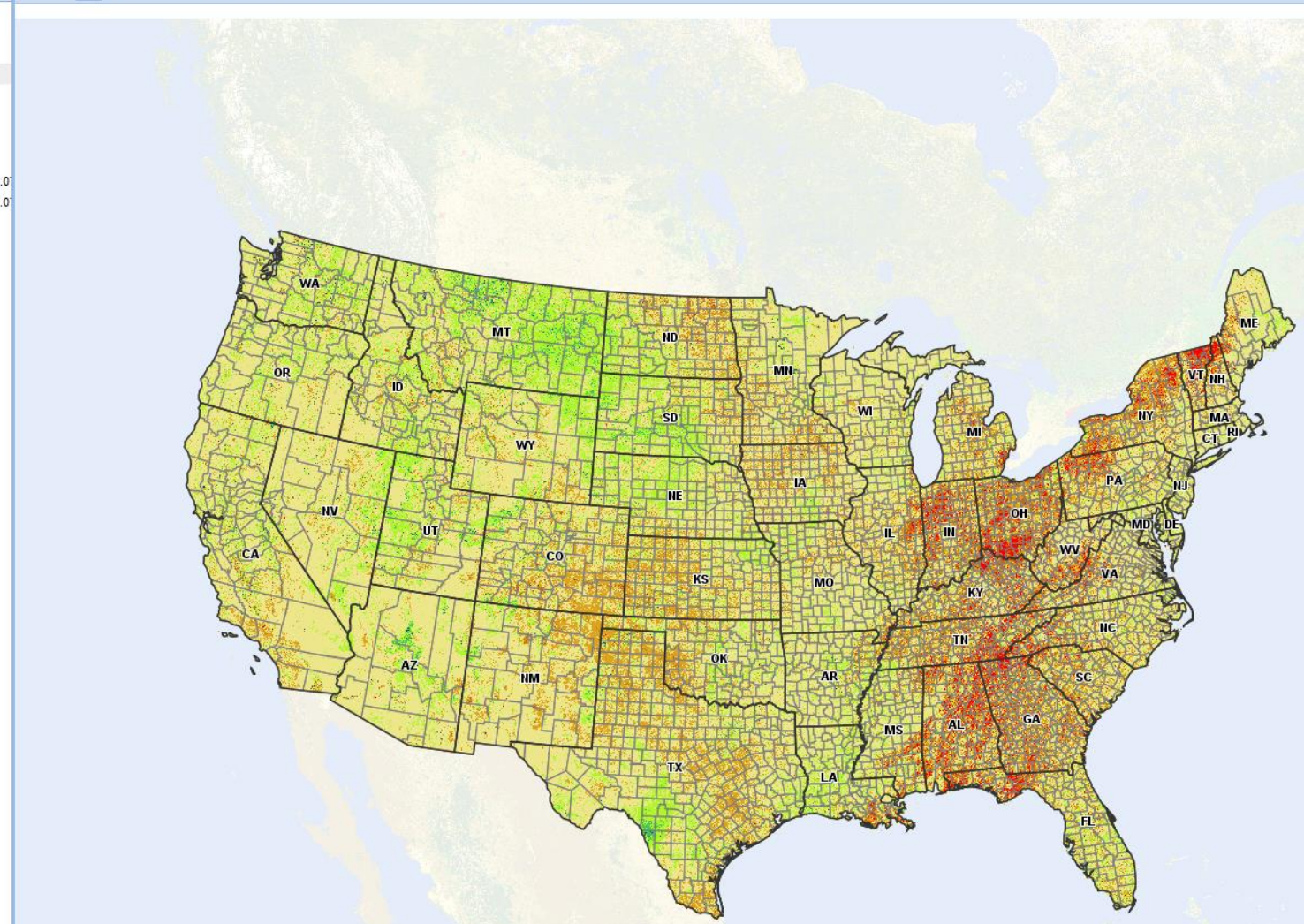
239811.80134, 1733570.94130

- 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_2013.07
  - Weekly_RMVCI_27_2012.07

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

Weekly_RMVCI_27_2013.07.02_2013.07.08

VegScape - Vegetation Condition Explorer



200 km
100 mi

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

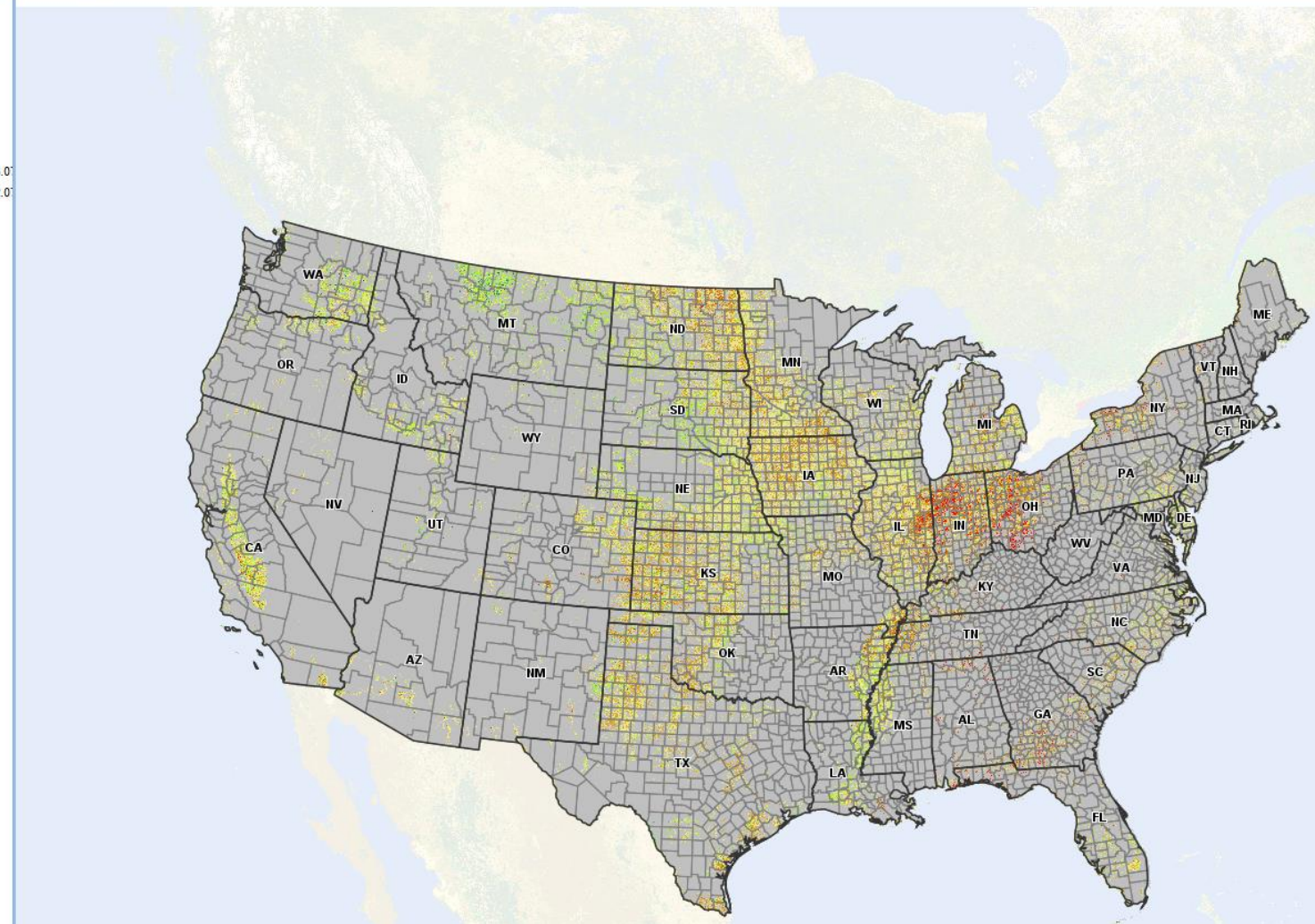
Weekly_RMVCI_27_2013.07.02_2013.07.08

VegScape - Vegetation Condition Explorer

Layers | Products | Legends

-3020368.66056, 3389169.18443

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



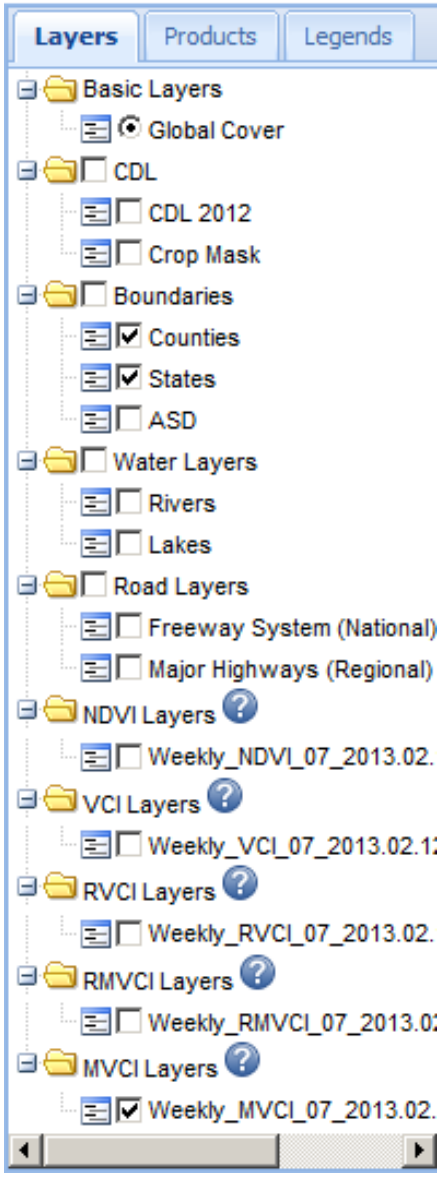
200 km
100 mi

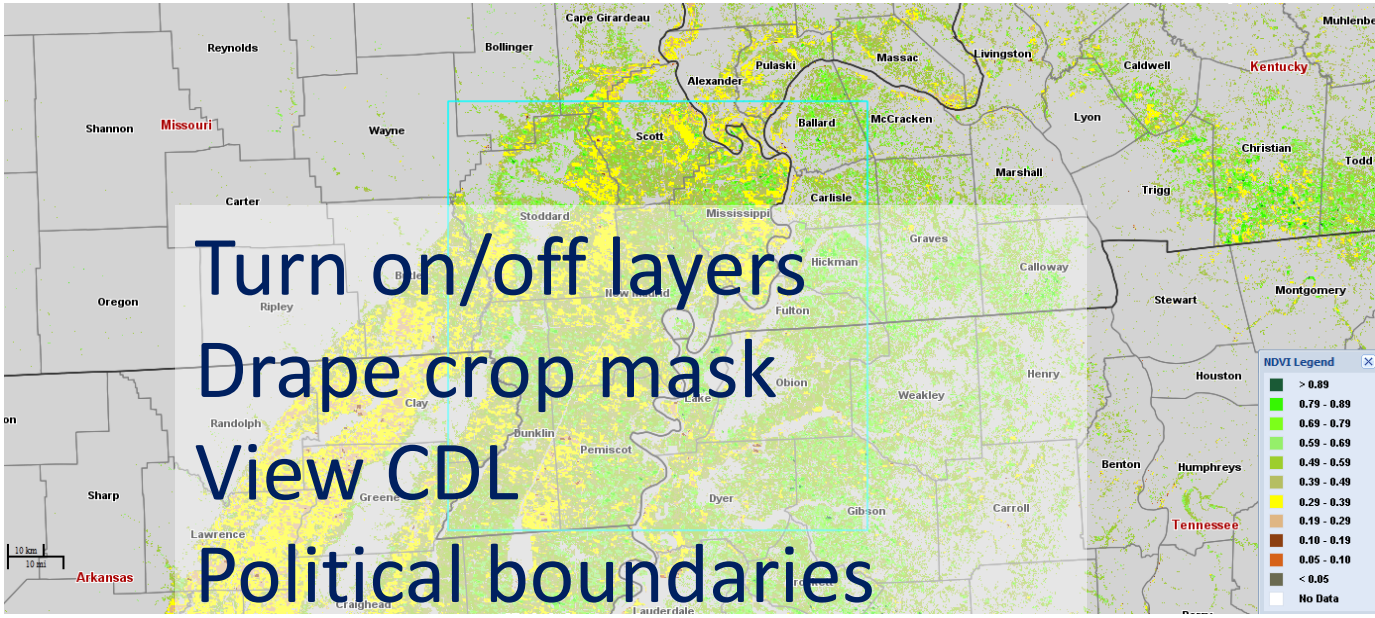
RMVCI Legend

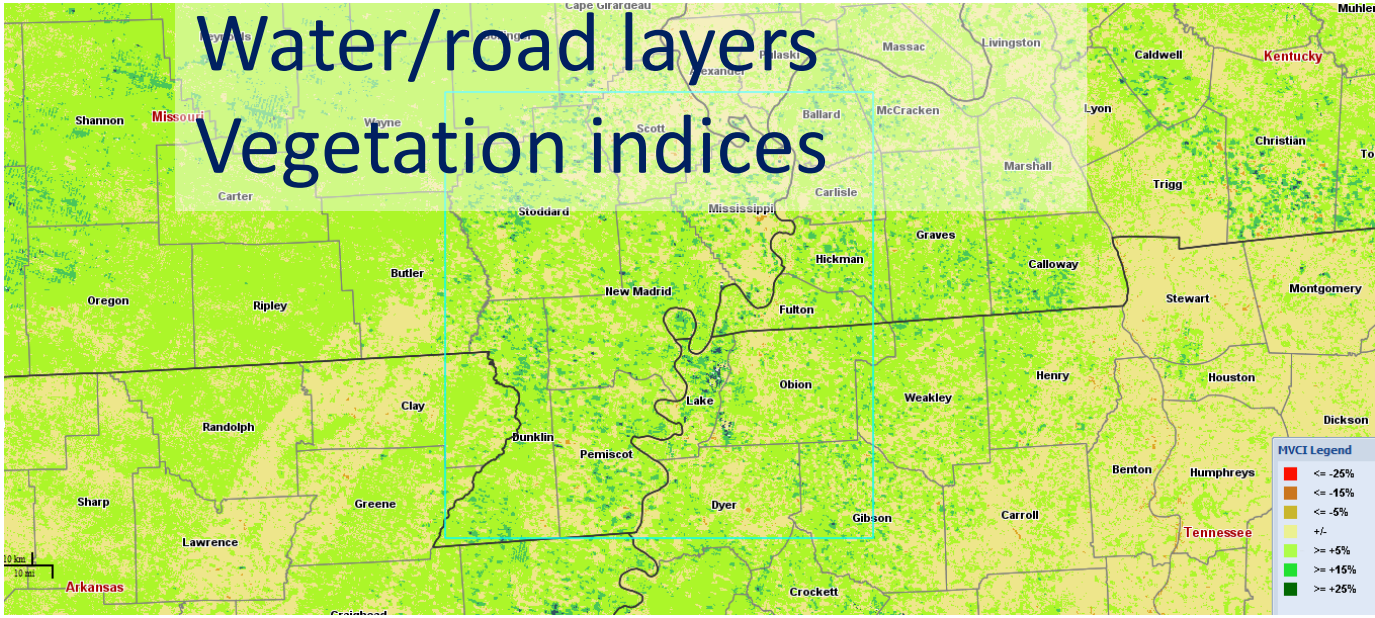
- <= -25%
- <= -15%
- <= -5%
- +/-
- >= +5%
- >= +15%
- >= +25%

Weekly_RMVCI_27_2013.07.02_2013.07.08

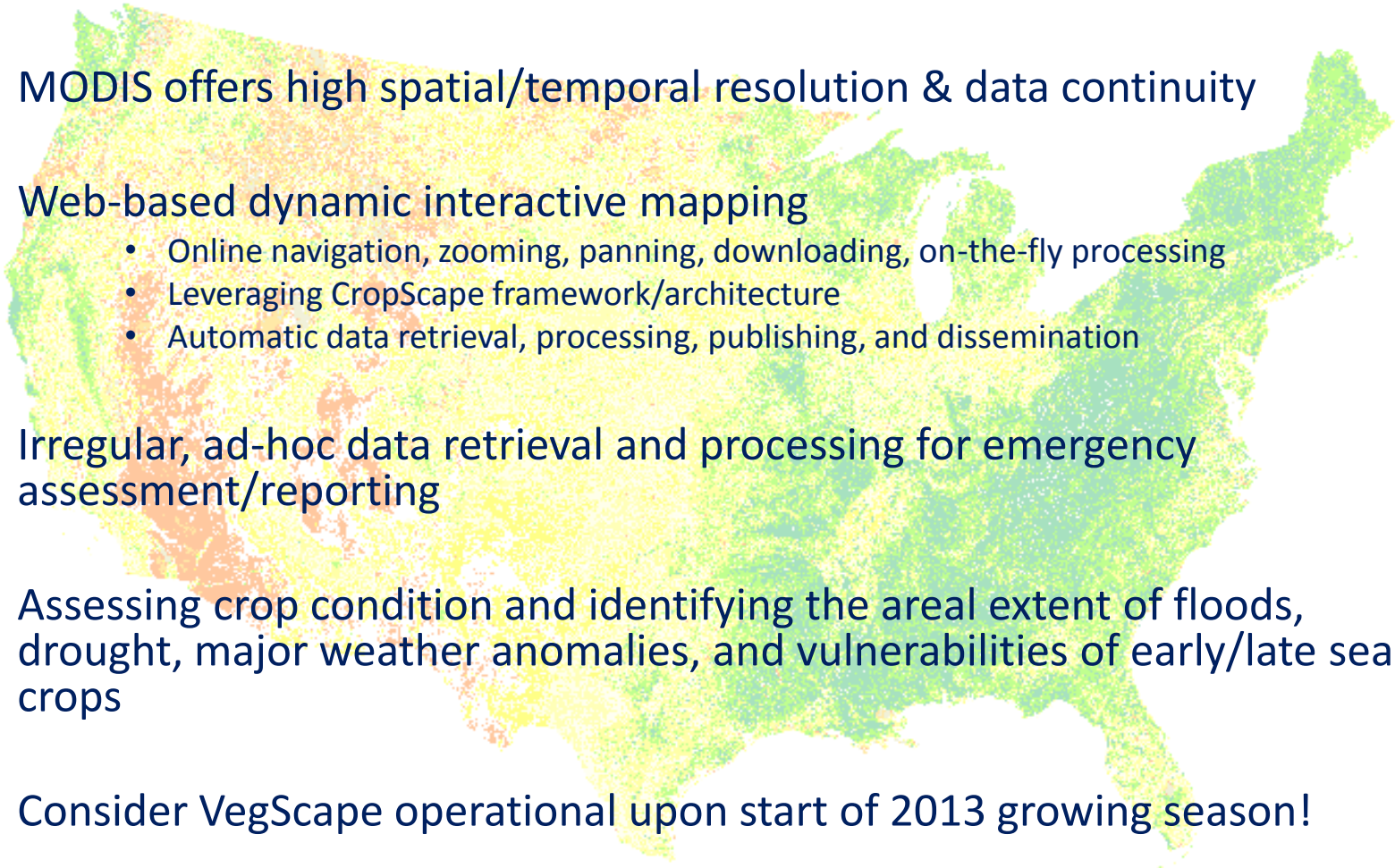
VegScape Layers/Products/Legends Tab



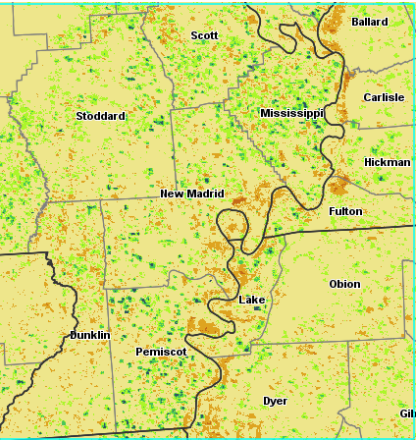




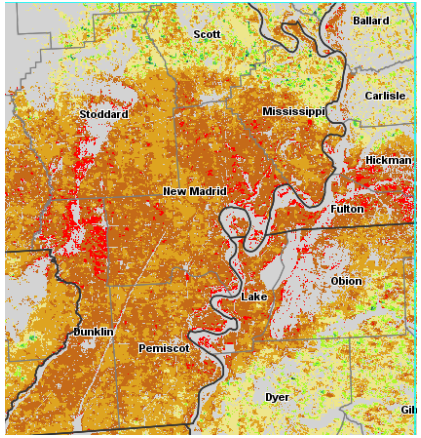
VegScape Summary



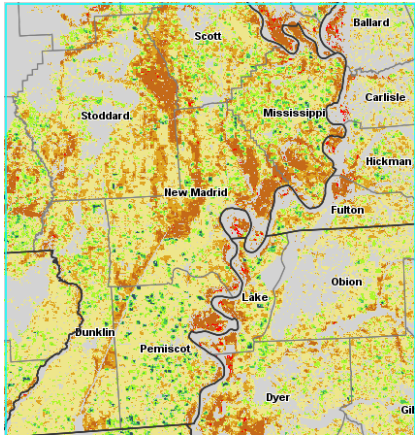
- MODIS offers high spatial/temporal resolution & data continuity
- Web-based dynamic interactive mapping
  - Online navigation, zooming, panning, downloading, on-the-fly processing
  - Leveraging CropScape framework/architecture
  - Automatic data retrieval, processing, publishing, and dissemination
- 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!



04/12-04/18/11



04/19-04/25/11



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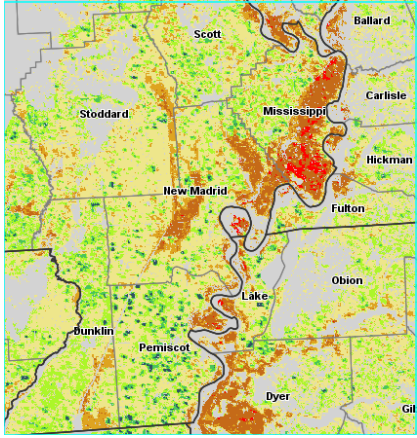

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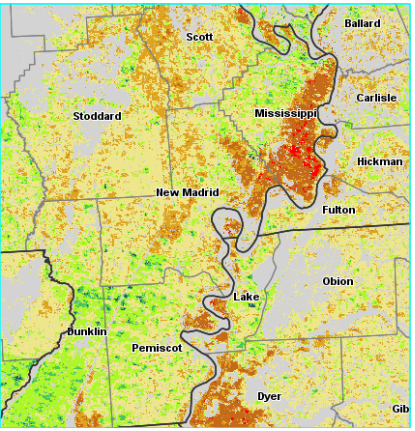

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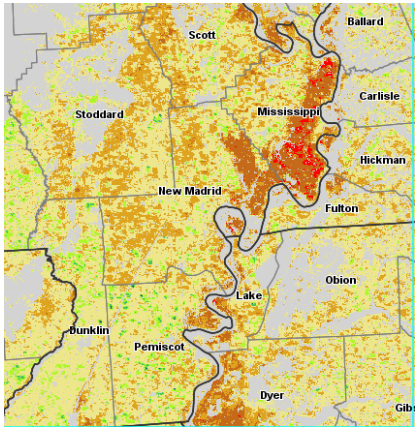

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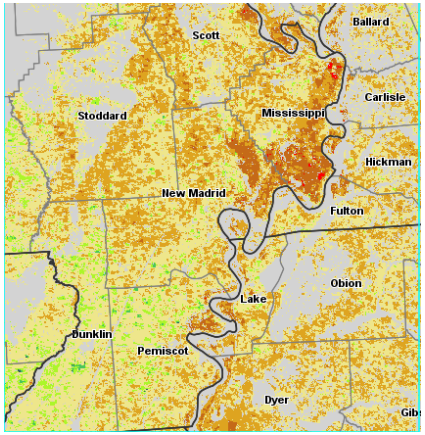

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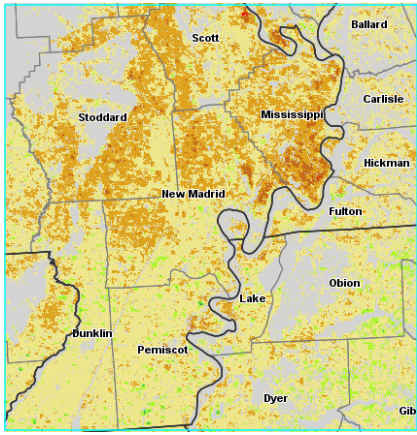

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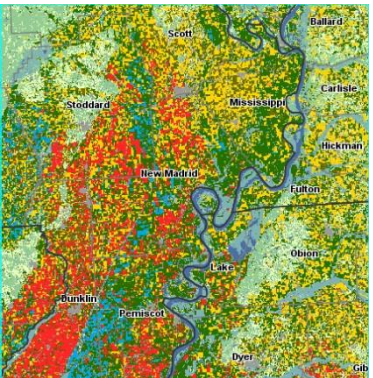
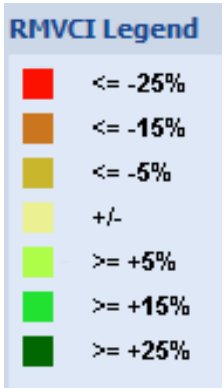
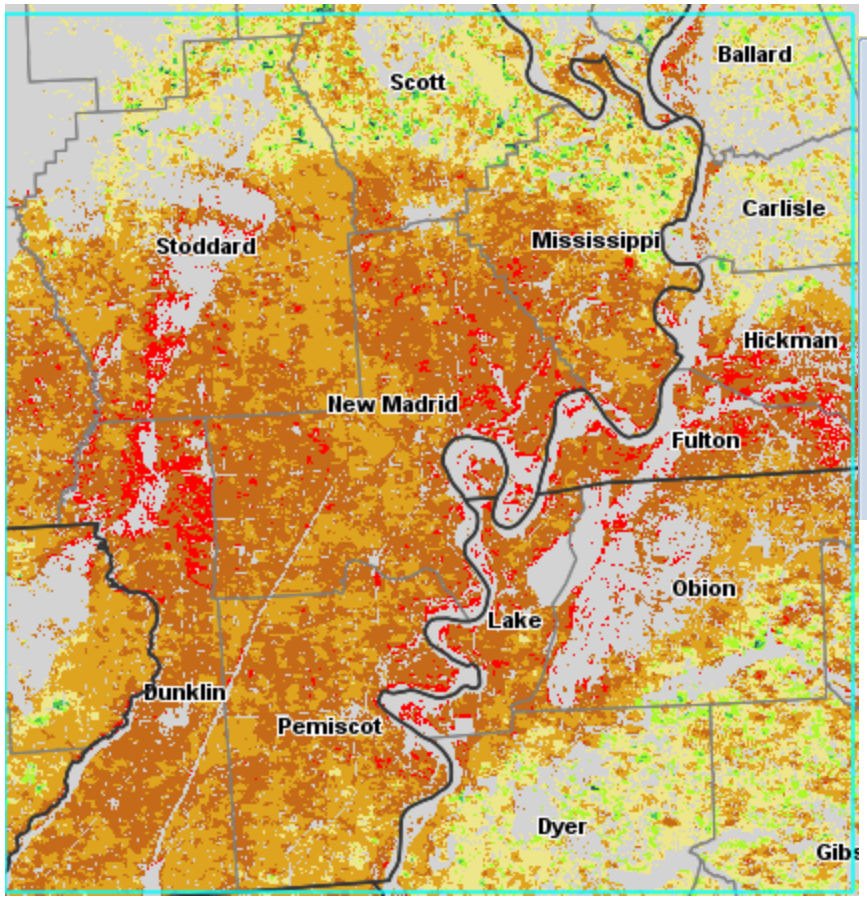


Cropland Data Layer



2011 Flood Missouri Bootheel Ratio Median NDVI (Median of 10 years NDVI)

RatioMedian VCI- Area of Interest Statistics



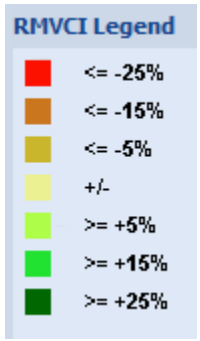
Weekly_RMNDVI_18_2011.05.03_2011.05.09 Data Layer Statistics for the Defined Area of Interest

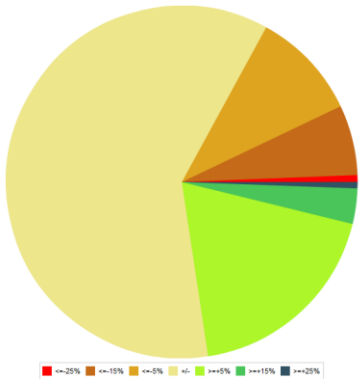
Note: Pixel and acreage counts are not official estimates.

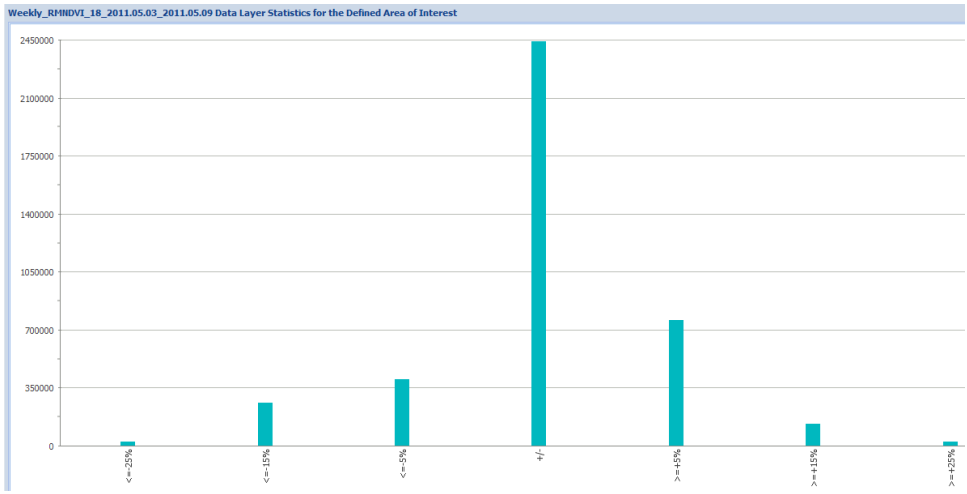
Value	Category	Pixel Counts	Acreage
0	<=-25%	1931	25606.6
1	<=-15%	19647	260535.3
2	<=-5%	30411	403274.7
3	+/-	184180	2442377.2
4	>=+5%	57280	759579.6
5	>=+15%	9910	131414.7
6	>=+25%	1765	23405.3
Total	**7**	**305124**	**4046193.4**

04/19-04/25/11

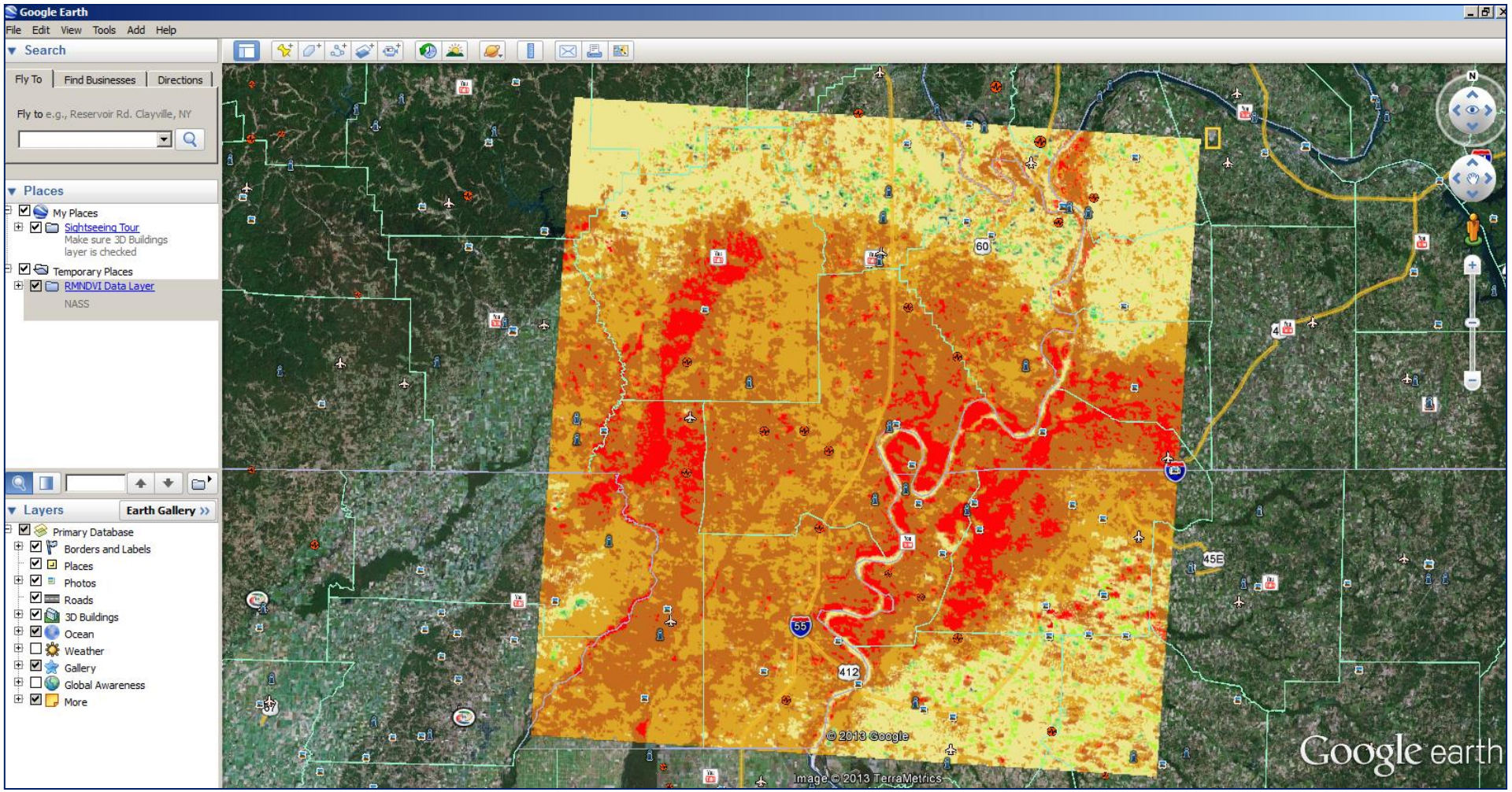
Quantify vegetative area condition







Web Mashup



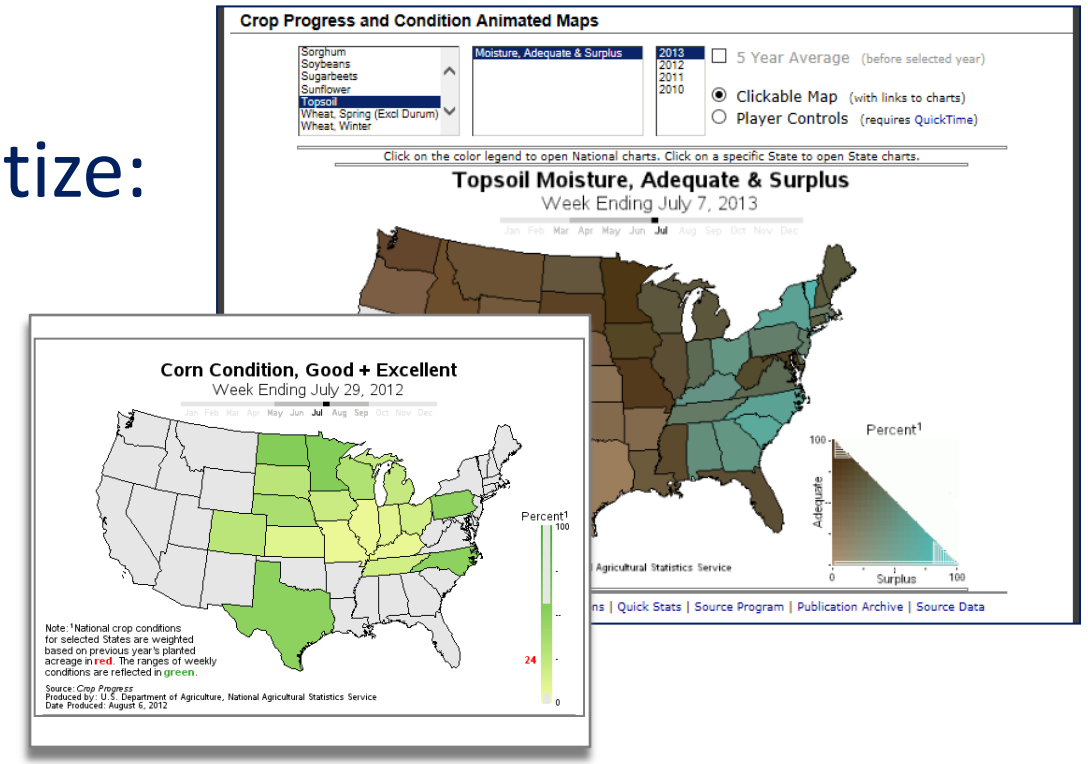
Download any selected index data directly into Google Earth

USDA

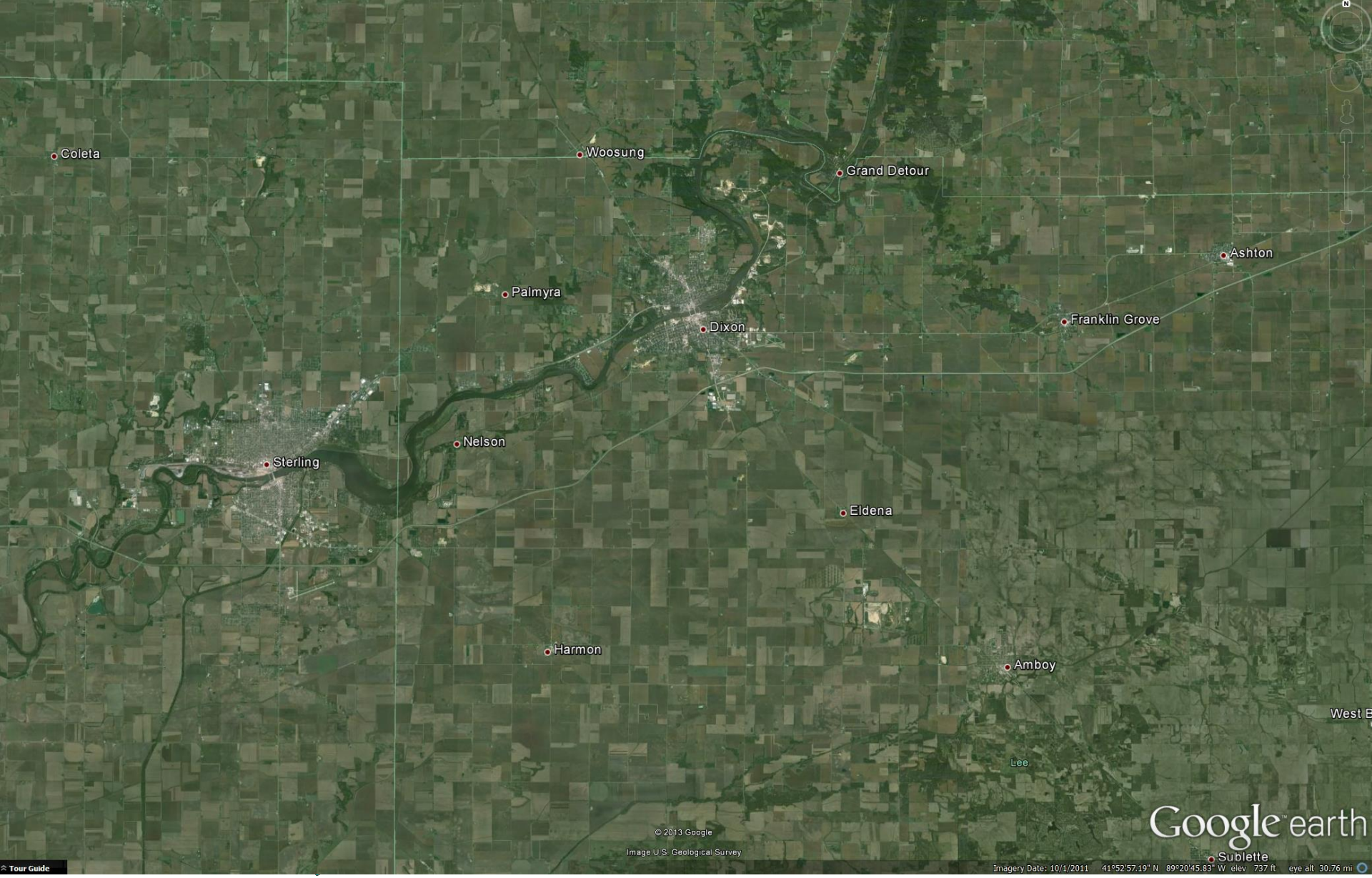
AGRICULTURE COUNTS NASS

Future Geospatial Products?

- Improve and quantize:
  - Crop Progress
  - Crop Condition
  - Soil Moisture



- Expand yield forecasting program


Coleta
Woosung
Grand Detour
Ashton
Palmyra
Dixon
Franklin Grove
Nelson
Sterling
Eldena
Harmon
Amboy
Lee
Sublette
© 2013 Google
Image U.S. Geological Survey
Google earth
Tour Guide
Imagery Date: 10/1/2011 41°52'57.19" N 89°20'45.83" W elev 737 ft eye alt 30.76 mi


Answers?
Questions?