A Web Service based U.S. Cropland Visualization, Dissemination and Querying System

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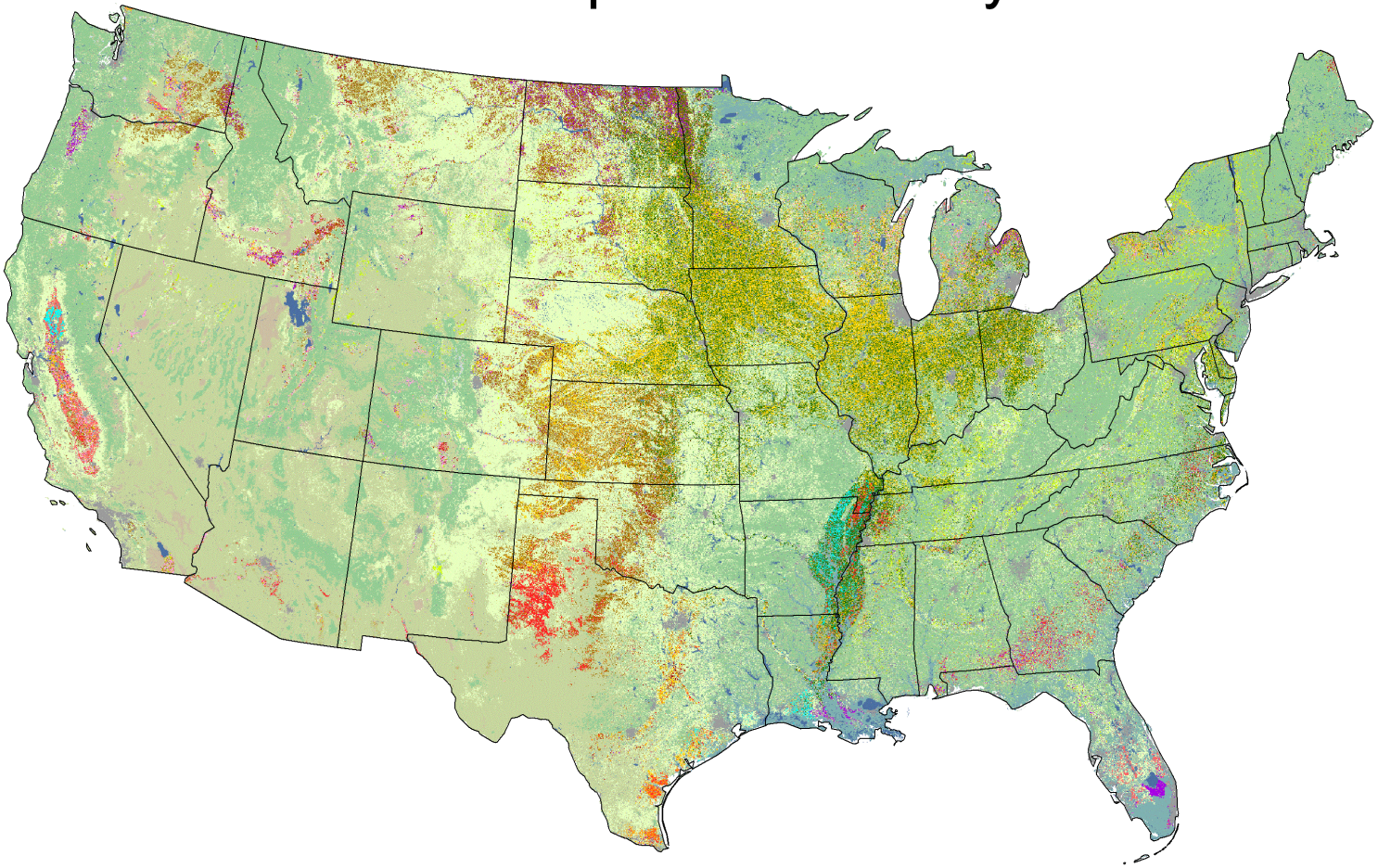
The Cropland Data Layer

- "Census by Satellite"
  - *Annually* cover major program crops and regions
  - Crops accurately geo-located
- Deliver in-season remote sensing acreage estimates
  - NASS Official Reports
  - Update planted area
  - Reduce respondent burden
- Provide timely, accurate, useful estimates
  - Measurable error
  - Unbiased/independent/robust estimator
  - State, District, County

2010 Cropland Data Layers



Major Land Cover Categories

Agriculture

- Pasture/Grass
- Corn
- Soybeans
- All Wheat
- Other Hay
- Fallow/Idle Cropland
- Alfalfa
- Cotton
- Other Crops
- Vegetables/Fruits/Nuts
- Sorghum
- Other Small Grains
- Rice

Non-Agriculture

- Woodland
- Shrubland
- Urban/Developed
- Wetlands
- Water
- Barren
- Perennial Ice/Snow

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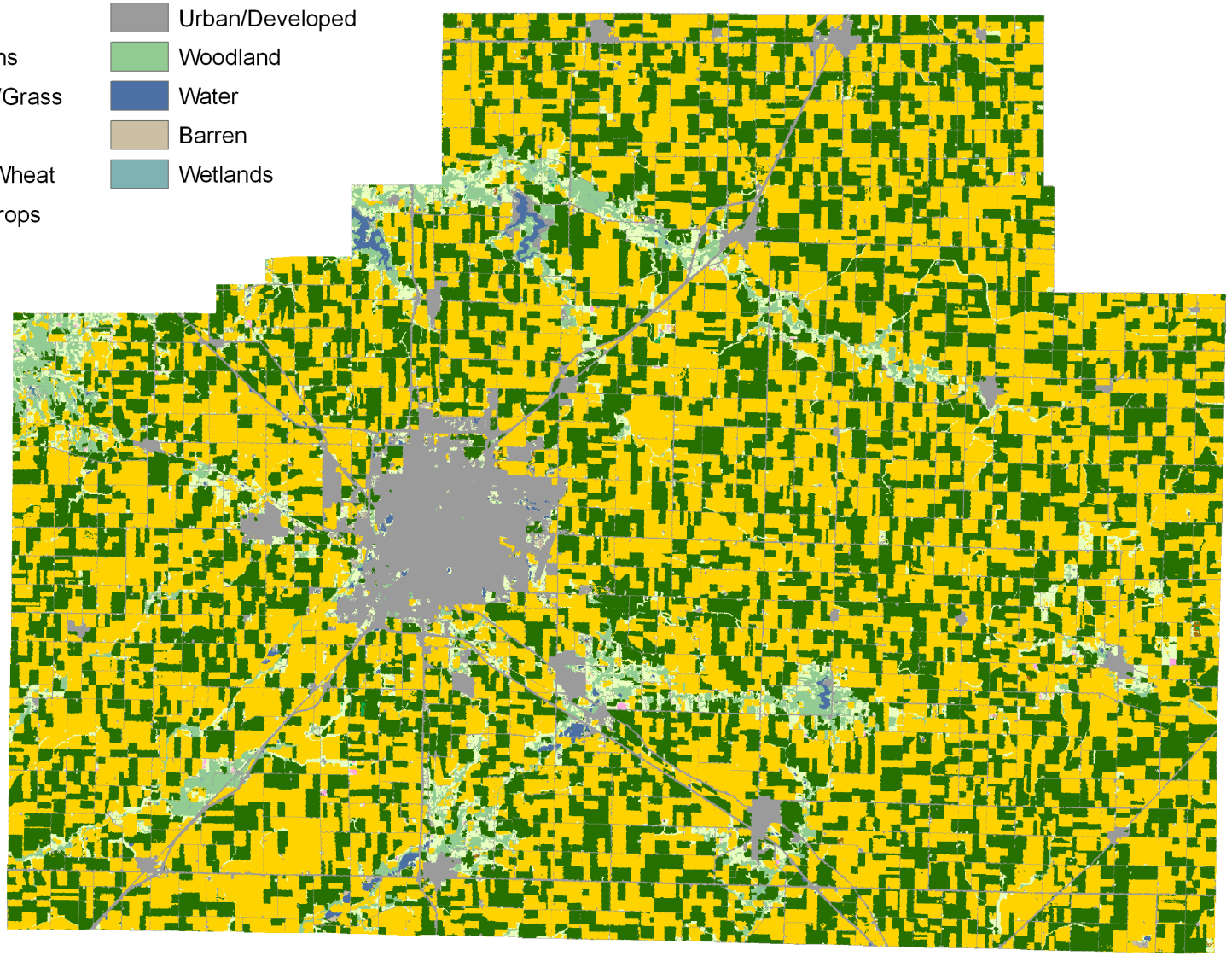
AGRICULTURE COUNTS NASS

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



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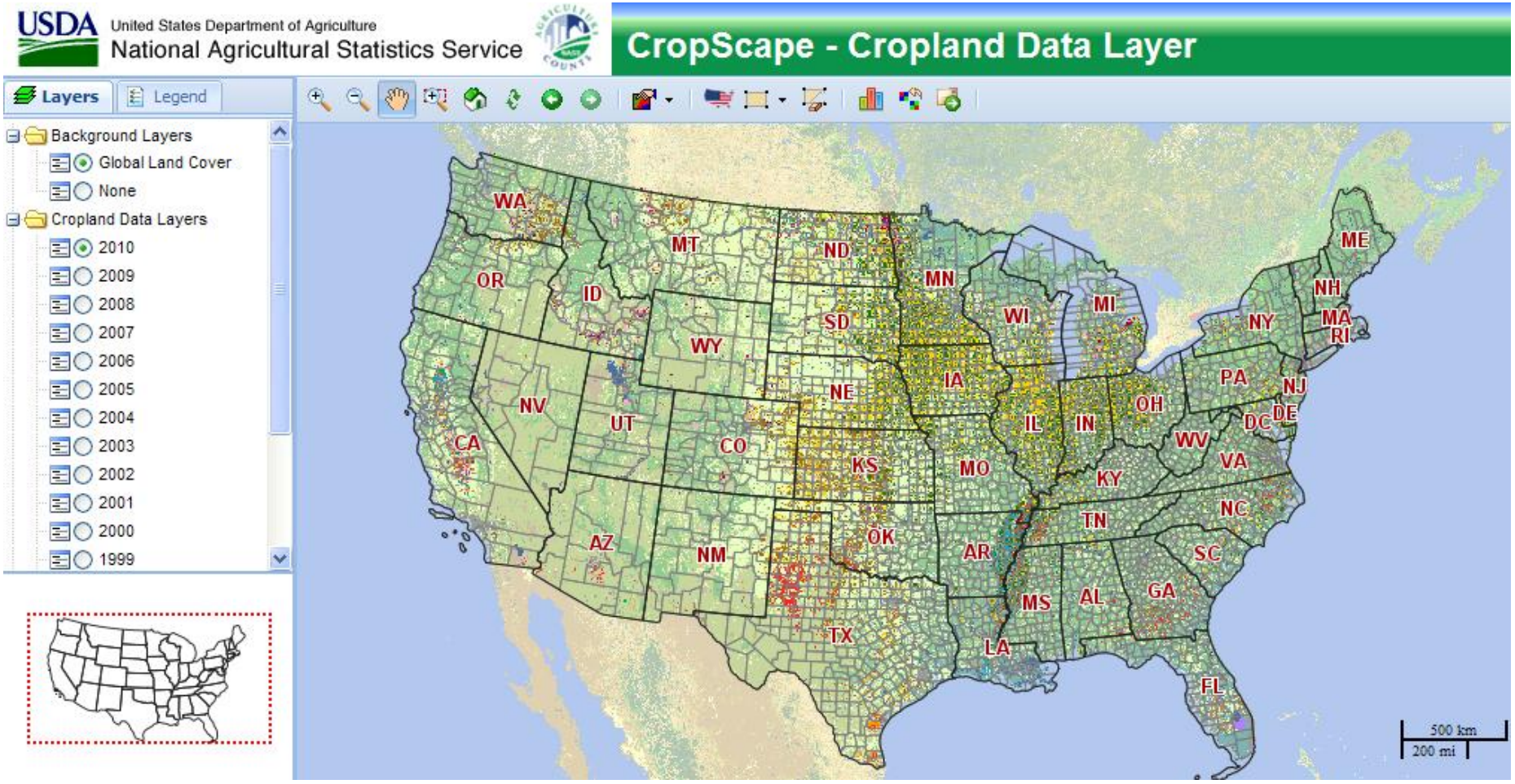
AGRICULTURE COUNTS NASS

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
- No online geospatial information access
  - No geospatial crop visualization & browsing
  - No geospatial query capability
  - No geospatial online analytics
- NASS Needs…
  - 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
  - Equitable cropland information access, automatic and timely delivery, geospatial navigation, retrieval, queries and dissemination
- Collaboration with George Mason University/ Center for Spatial Information Science and Systems



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Technology Under the Hood

- Open Standard Geospatial Information Science Technology
  - Adoption of specifications and standards from the OGC Sensor Web Enabled initiative: WFS, WCS, CSW, WMS, WPS etc.
  - Re-using of SEPSeb Processing Service (WPS)
- Web Service Based Service Oriented Architecture
- Service Integration
  - Support of workflows: BPEL execution engine
  - Re-use all algorithms published in WPS
- GeoBrain Technology(GMU developed)
  - Open, standards compliant, interoperable, distributed, web GIS
  - Re-use functions/algorithms developed in GeoBrain

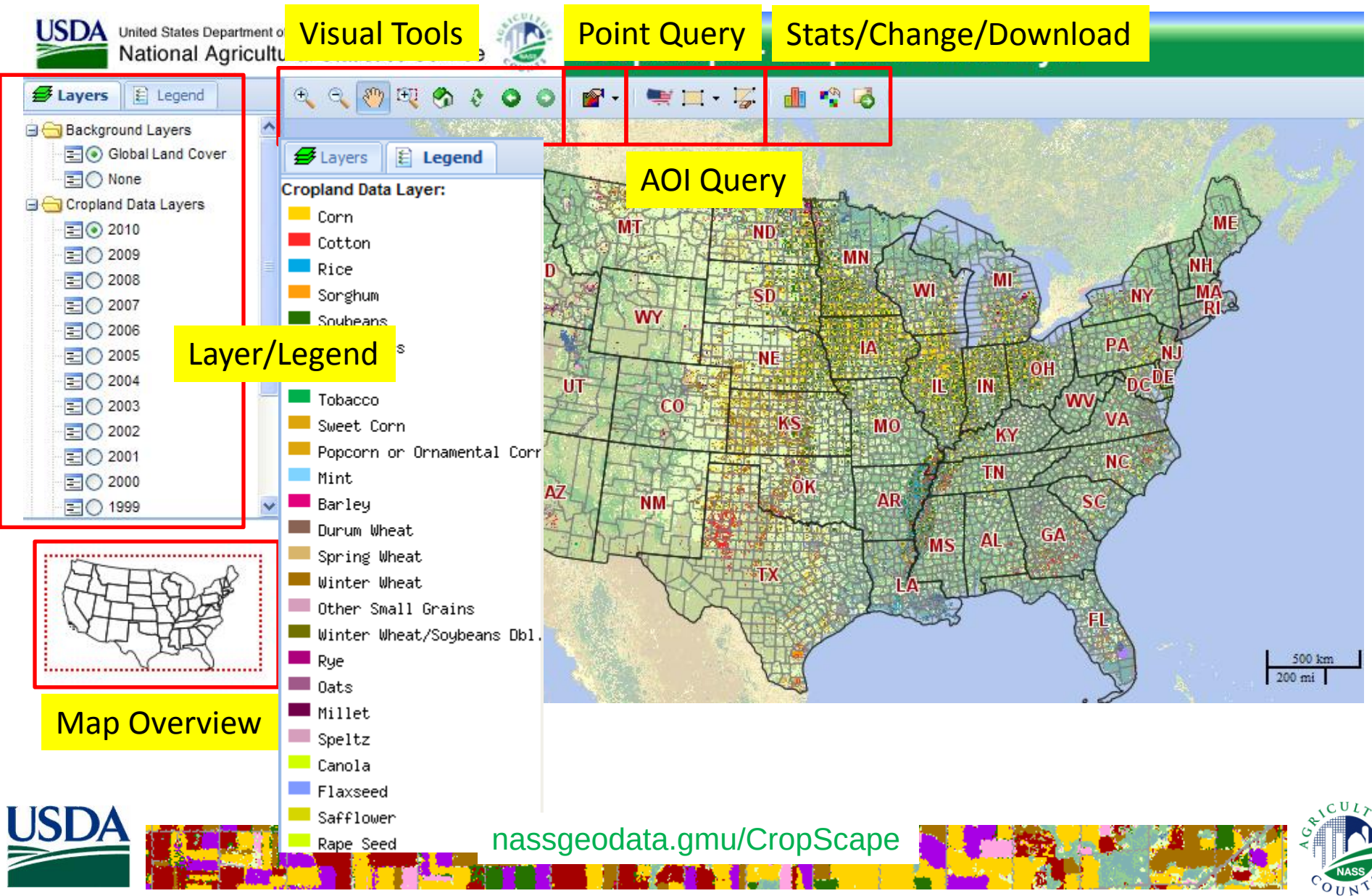
CropScape Functions

- 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 by a bounding box
- 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

CropScape Defined



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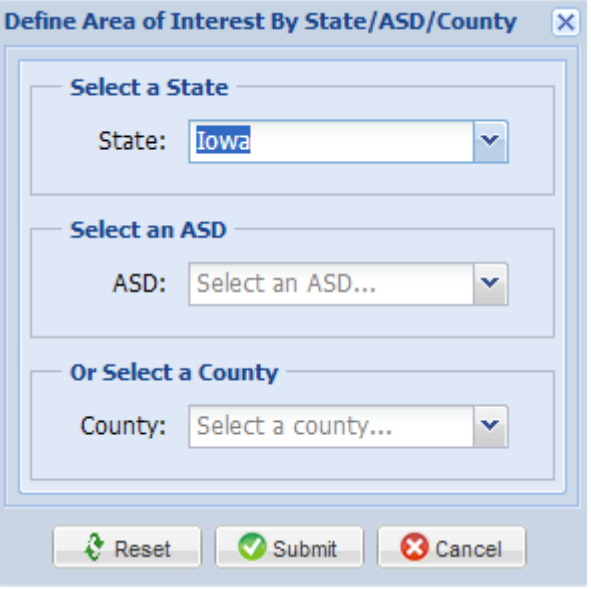
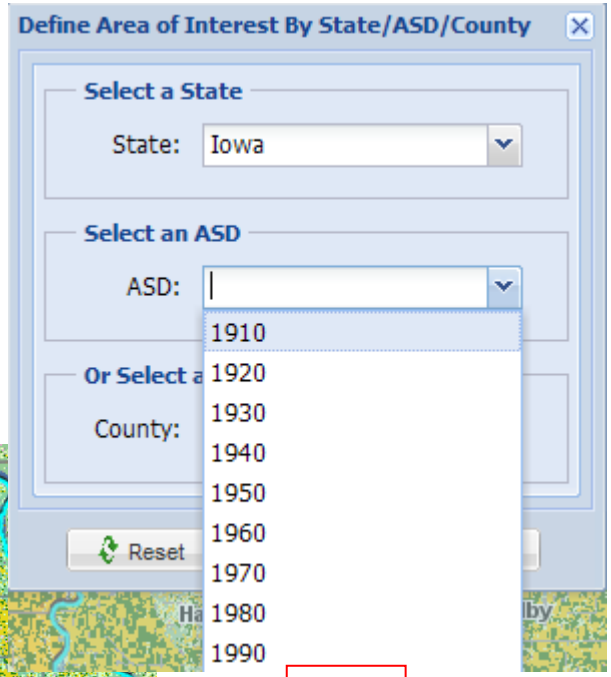
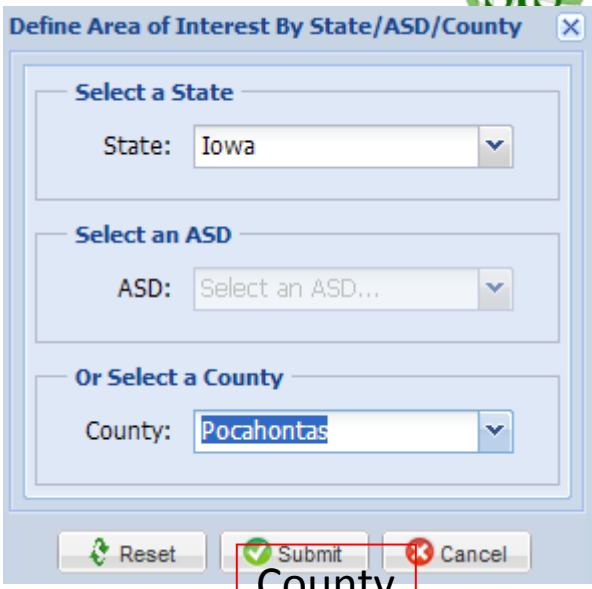
Select AOI



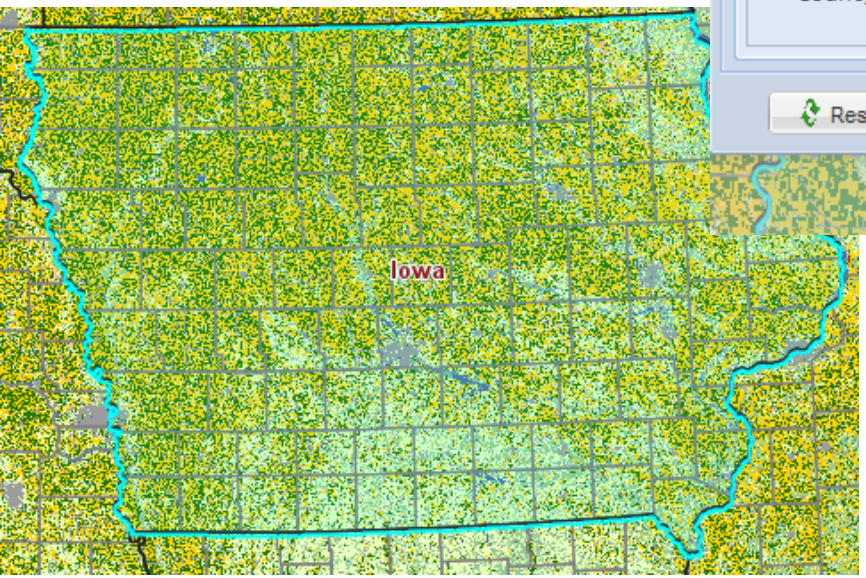
State

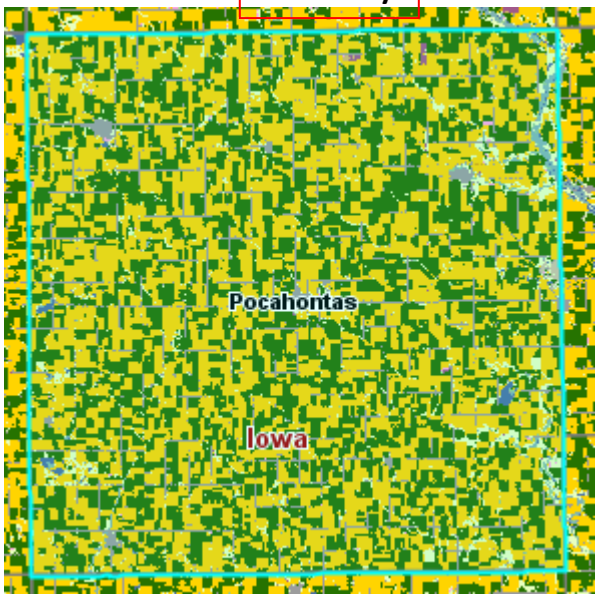


ASD



County





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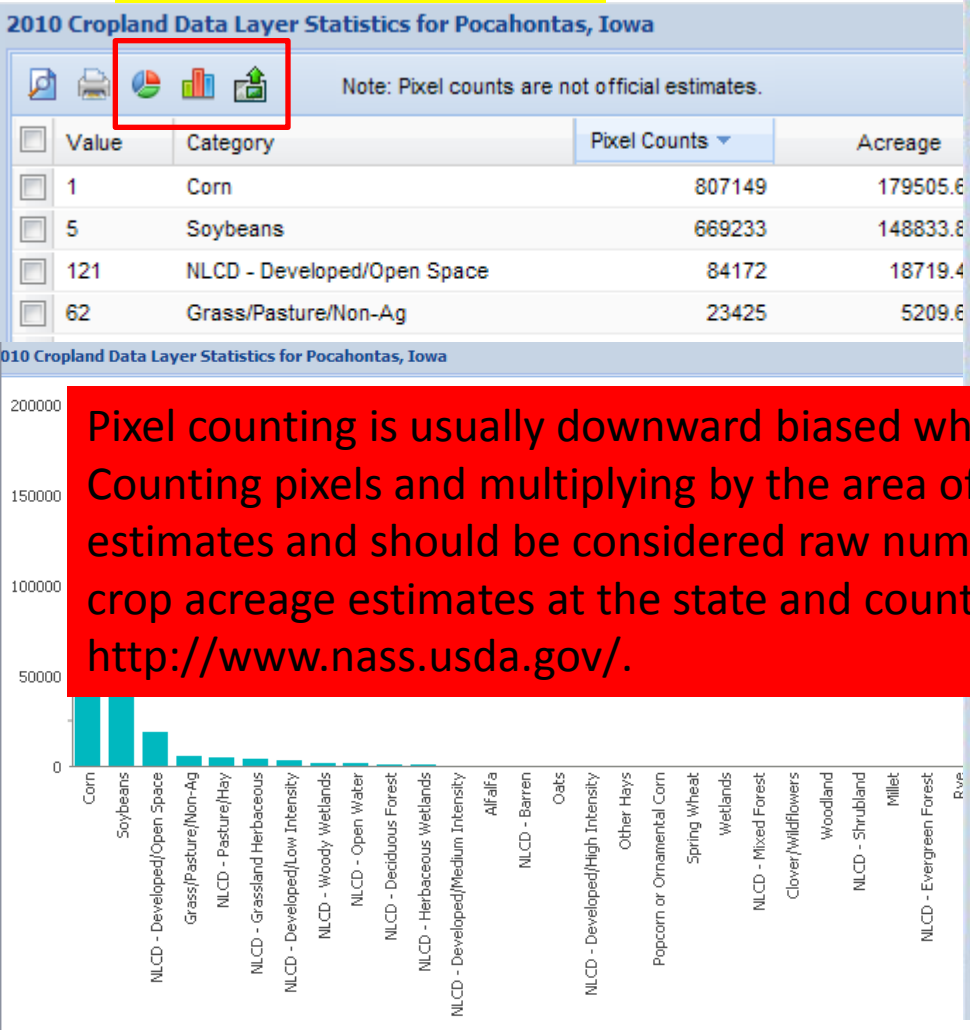
CropScape Stats

Pie/Histogram/Graphic



Pixel counting is usually downward biased when compared to official estimates. Counting pixels and multiplying by the area of each pixel will result in biased area estimates and should be considered raw numbers needing bias correction. Official crop acreage estimates at the state and county level are available at http://www.nass.usda.gov/.

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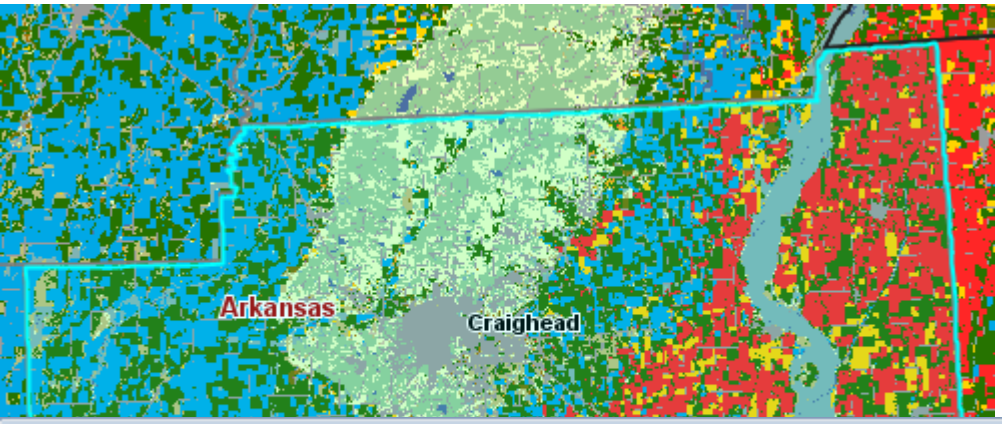
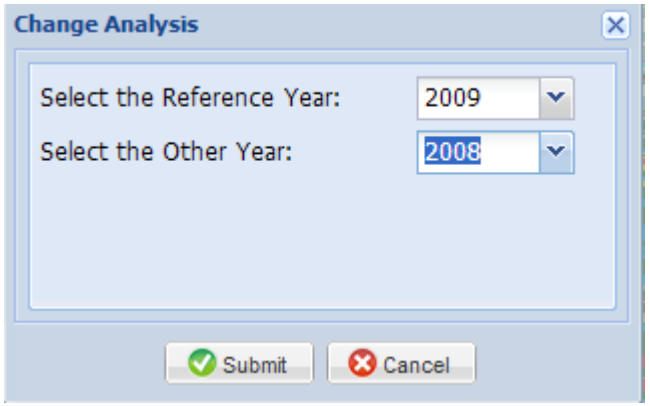
CropScape Change Analysis



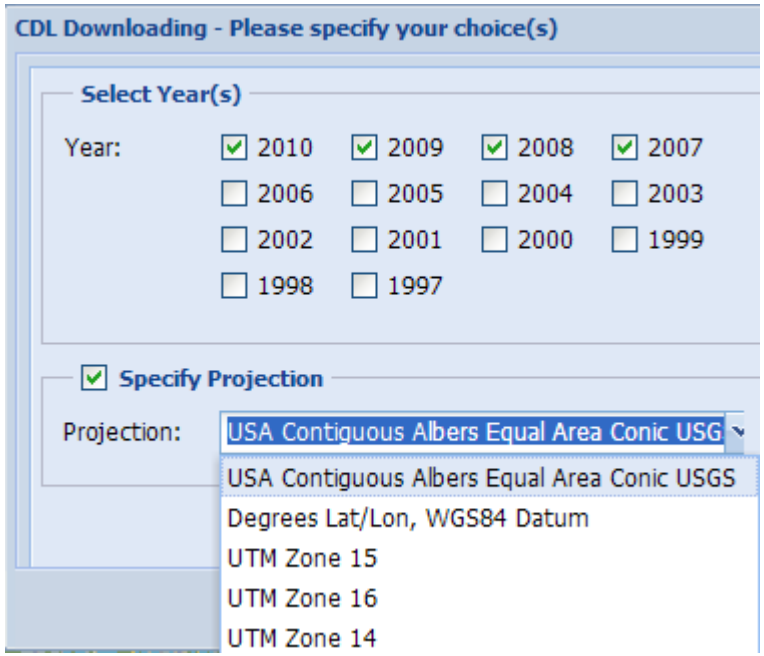


Cropland Data Layer Changes between 2009 and 2008

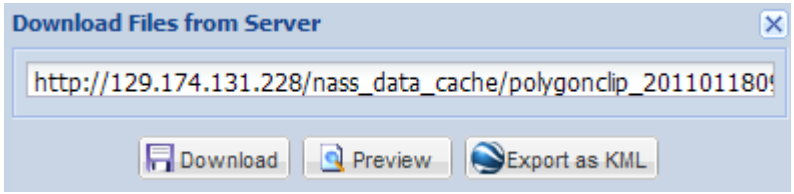
Note: Pixel counts are not official estimates.

2009	2008	Pixel Counts	Acreage
Rice	Soybeans	133502	103453.6
Soybeans	Rice	129916	100674.7
Cotton	Cotton	120872	93666.3
Soybeans	Soybeans	106428	82473.4
NLCD - Developed/Open Space	NLCD - Developed/Open Space	85414	66189.2
NLCD - Woody Wetlands	NLCD - Woody Wetlands	83660	64830
NLCD - Deciduous Forest	NLCD - Deciduous Forest	73312	56811.1
Other Hays	Other Hays	61496	47654.6
Rice	Rice	39116	30311.8
		1177212	**912239.6**

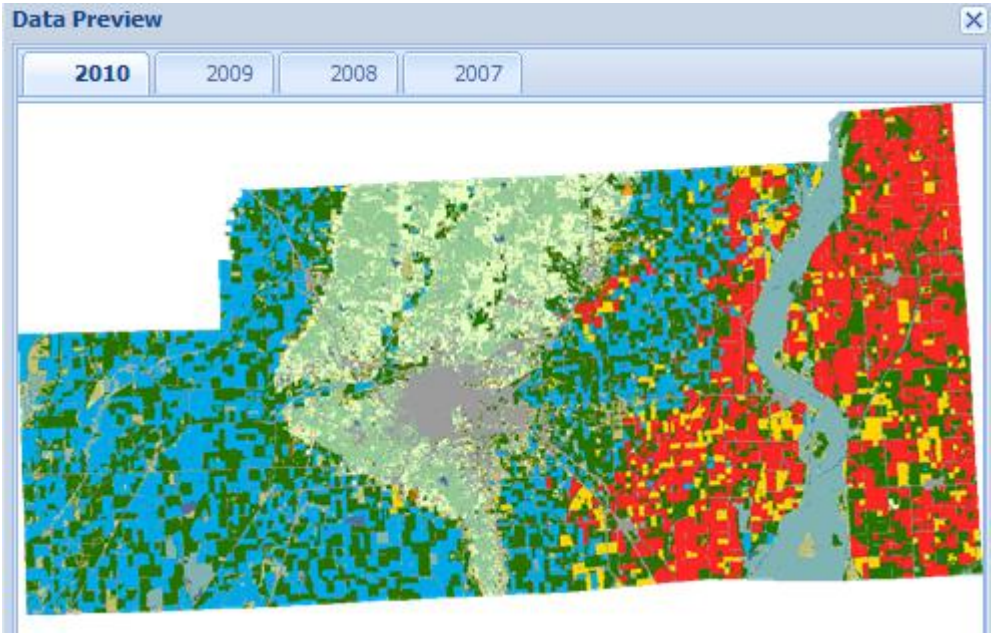
CropScape Download & Export



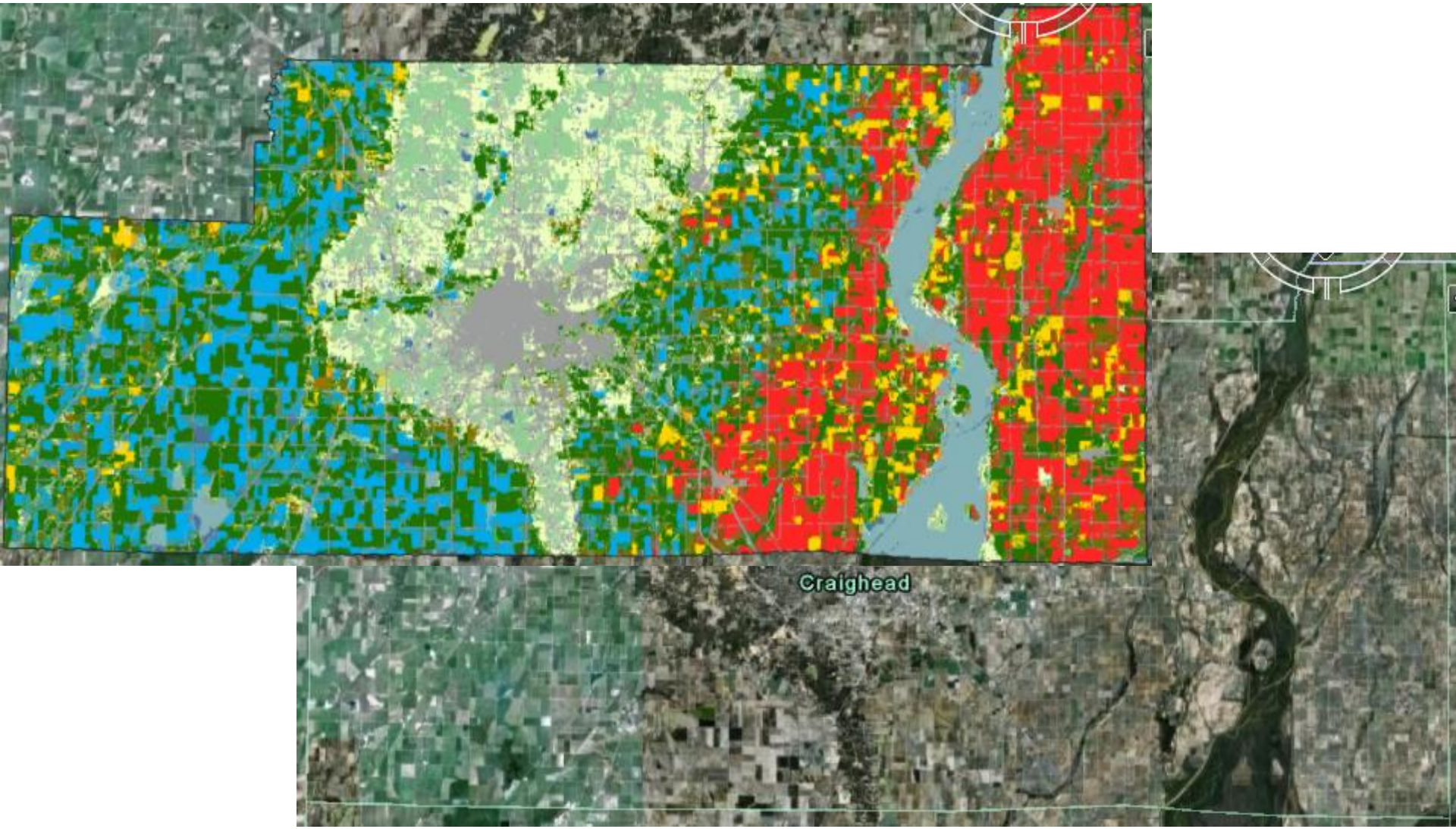
Specify Years and Projection



Preview and Download



CropScape w/ Google Earth



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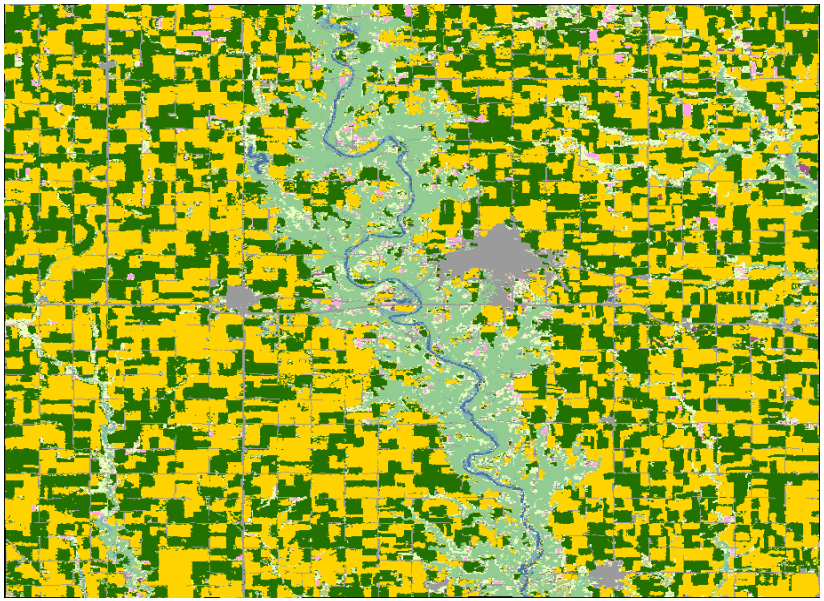
Web Service Examples

1)http://nassgeodata.gmu.edu/CropScape/GetCDL?year=2009&fips=19015
2)http://nassgeodata.gmu.edu/CropScape/GetNASSStatData?year=2008&fips=19015&commcode=11199199

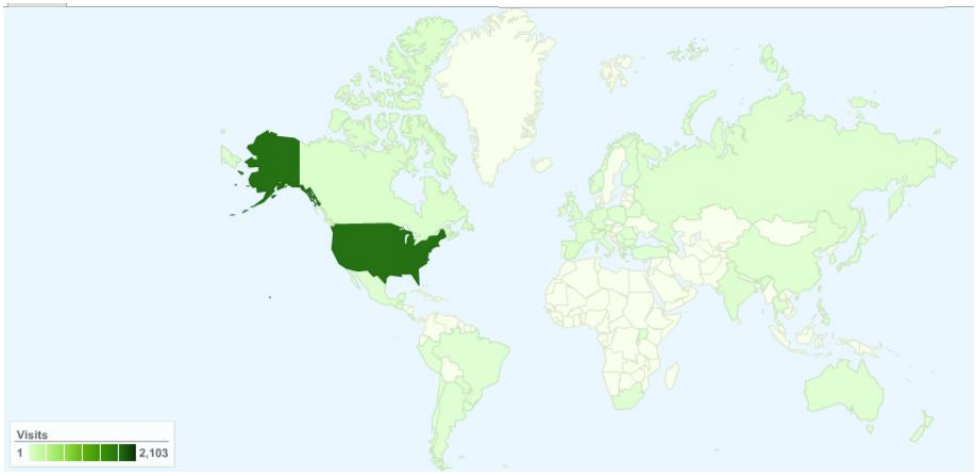


Service a)

Year: 2008
State: IA
County: Boone
Commodity: Corn For Grain
Planted: 163500
Harvested: 158500
Yield: 166.0000
Production: 26300000

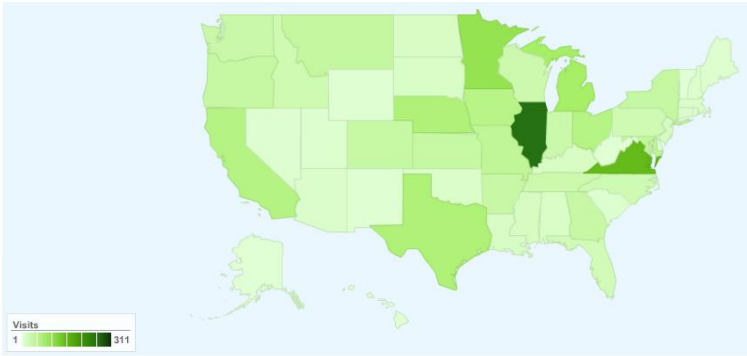
Service b)

CropScape Metrics

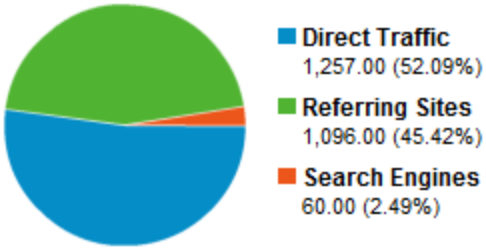


2,413 visits came from 44 countries/territories

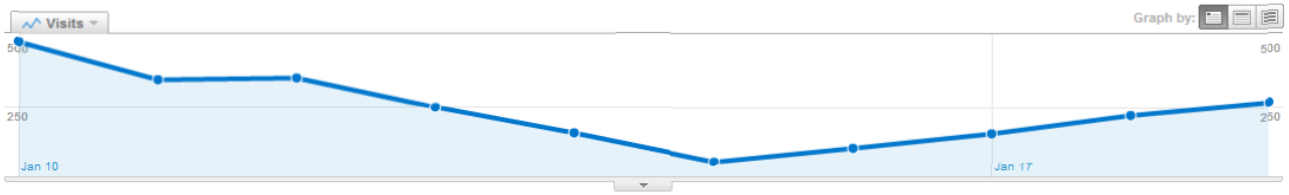
Detail Level: City | Country/Territory | Sub Continent Region | Continent Dimension: None



This country/territory sent 2,103 visits via 52 regions



- **Direct Traffic**
  1,257.00 (52.09%)
- **Referring Sites**
  1,096.00 (45.42%)
- **Search Engines**
  60.00 (2.49%)



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CropScape Future Improvements

- Additional GIS layers
  - watershed, congressional districts, roads
- Multi-year crop acreage statistical change graphics for state, county, or area
- Change analysis mapping
- Map production/printing services
- More analysis functions

CropScape Summary

- State of the art CDL visualization, querying and dissemination tool
- Interactive geospatial statistical analysis tools
  - Online/interactive analytics, charting and mapping
  - Geospatial information access, navigation
  - CDL map and statistical result retrieval and dissemination web services
- Open geospatial standards compliant

Thank you!

Spatial Analysis Research Section
USDA/NASS R&D Division

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