

2010 AAG Annual Meeting
April 14 - 18, 2010
Washington, DC, USA

Sharing and Exploring Cropland Data Layer through OGC Web Services

Weiguo Han, Liping Di, Peisheng Zhao

Center for Spatial Information Science and Systems, George Mason University

Zhengwei Yang

Spatial Analysis Research Section, National Agricultural Statistics Service





Cropland Data Layer (CDL)

- Released by National Agricultural Statistics Service (NASS) each year (from 1997 to 2009)
- Provide the official annual estimation of crop (i.e. corn, soybean, rice, and cotton) production in the agricultural regions like Midwestern and Mississippi Delta States
- Generated from reports of state and local field personnel and satellite pictures of the Resource Sat-1 AWiFS sensor
- Be very useful and helpful for government agencies to observe the primary crops grown and make better decisions as well as for researchers to study land use and land cover.



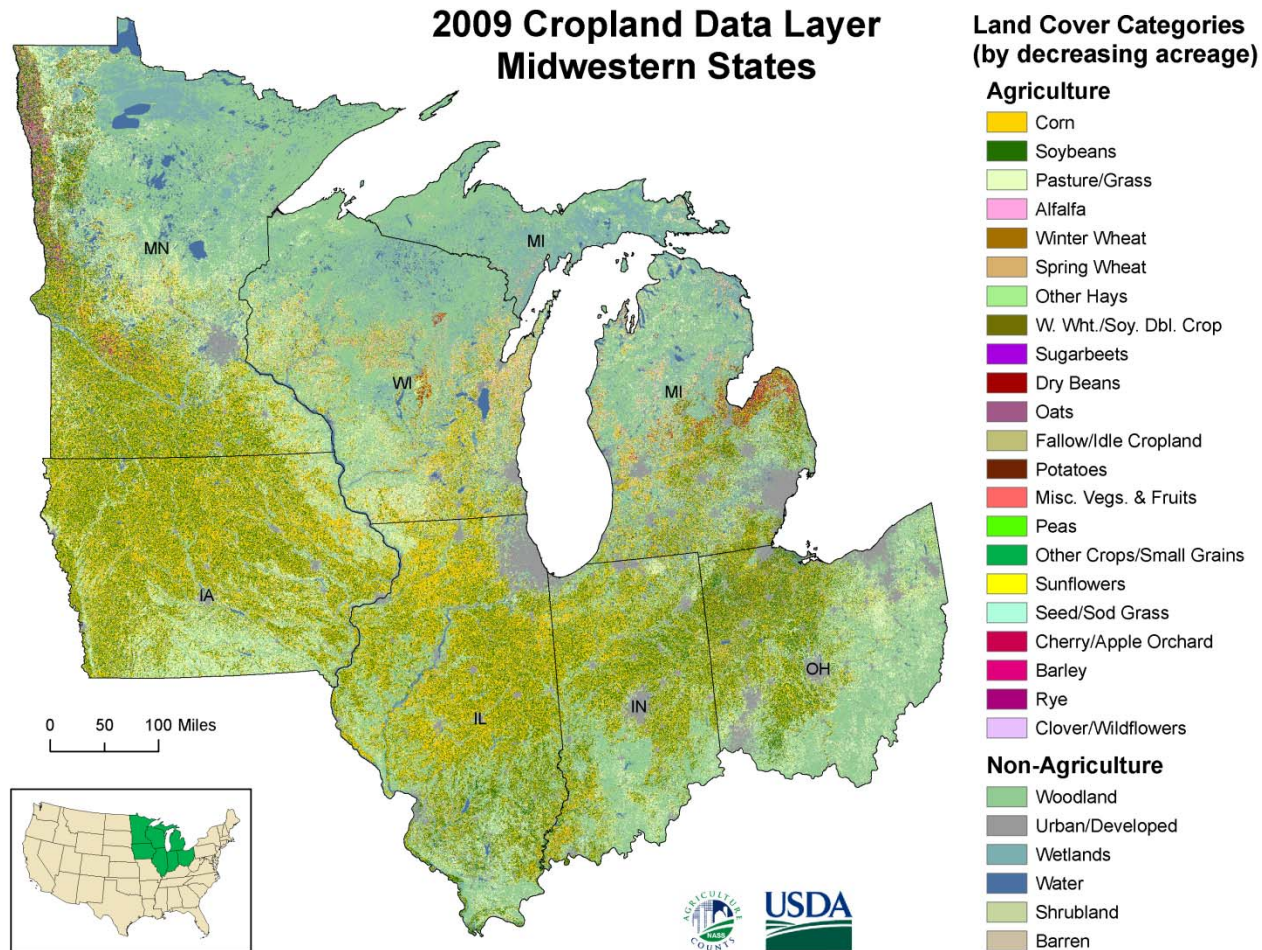
Cropland Data Layer (CDL)

The screenshot shows a Mozilla Firefox browser window displaying the website <http://www.nass.usda.gov/research/Cropland/SARS1a.htm>. The page header includes the U.S. Department of Agriculture National Agricultural Statistics Service Research and Development Division logo and a Google Custom Search box. Navigation links for the Census and Survey Research Branch and Geospatial Information Branch are visible. The main content area features a map of the United States and the text: "Cropland Data Layer (Now Available on CD-ROM and/or DVD)". A red announcement states: "Announcement: The Spatial Analysis Research Section released ALL 2009 Cropland Data Layer products sans Florida during the week of January 4, 2010. Florida was released for download March 5, 2010. The CDL now spans 48 States. The 2008 New Mexico CDL was also released." Below this, it mentions that products are available for free download at the Data Gateway and provides contact information for the Geospatial Information Branch. Further down, it states that the 2009 Cropland Data Layer (CDL) was released for all Continental US States, except Florida, and provides file sizes for download: Florida (13 MB) and Delta States (76 MB).

<http://www.nass.usda.gov/research/Cropland/SARS1a.htm>



Cropland Data Layer (CDL)





Why Is CDL Web Portal Needed?

- **Current dissemination channels**
 - NASS Marketing Channel (external users)
 - NRCS Geospatial Data Gateway (external users)
 - Online bulk file download (<http://datagateway.nrcs.usda.gov/>)
 - Special request & delivery
 - Printed maps
 - CD/DVD delivery
 - Email generated
- **No online geospatial information access and dissemination**
 - No direct and interactive crop data customization
 - No geospatial crop visualization & browsing
 - No geospatial query capability
 - No geospatial online analysis

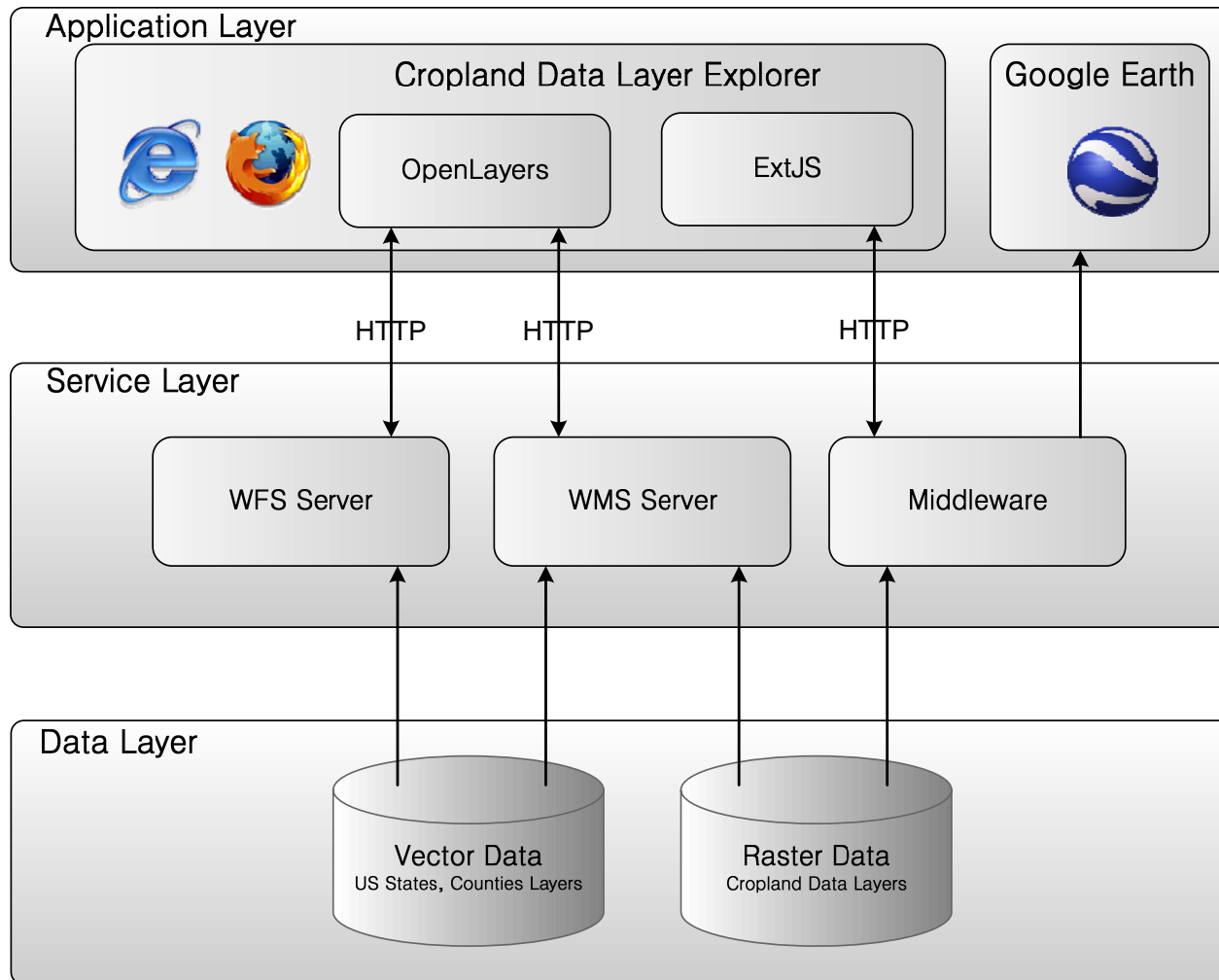


CDL Web Portal Requirement

- **Disseminate CDL data via online publishing, access, and retrieval**
- **Deliver CDL data via industry standard compliant geospatial web services**
- **No burden for users**
 - No client software development & installation
 - No special software tools needed for CDL data visualization, geospatial queries and online analytics



System Architecture





Data Layer

- Vector data files (in PostgreSQL DB)
 - ❑ US state, county, ASD or other boundaries
- Raster data
 - ❑ Global Land Cover and CDL (2006 – 2008)

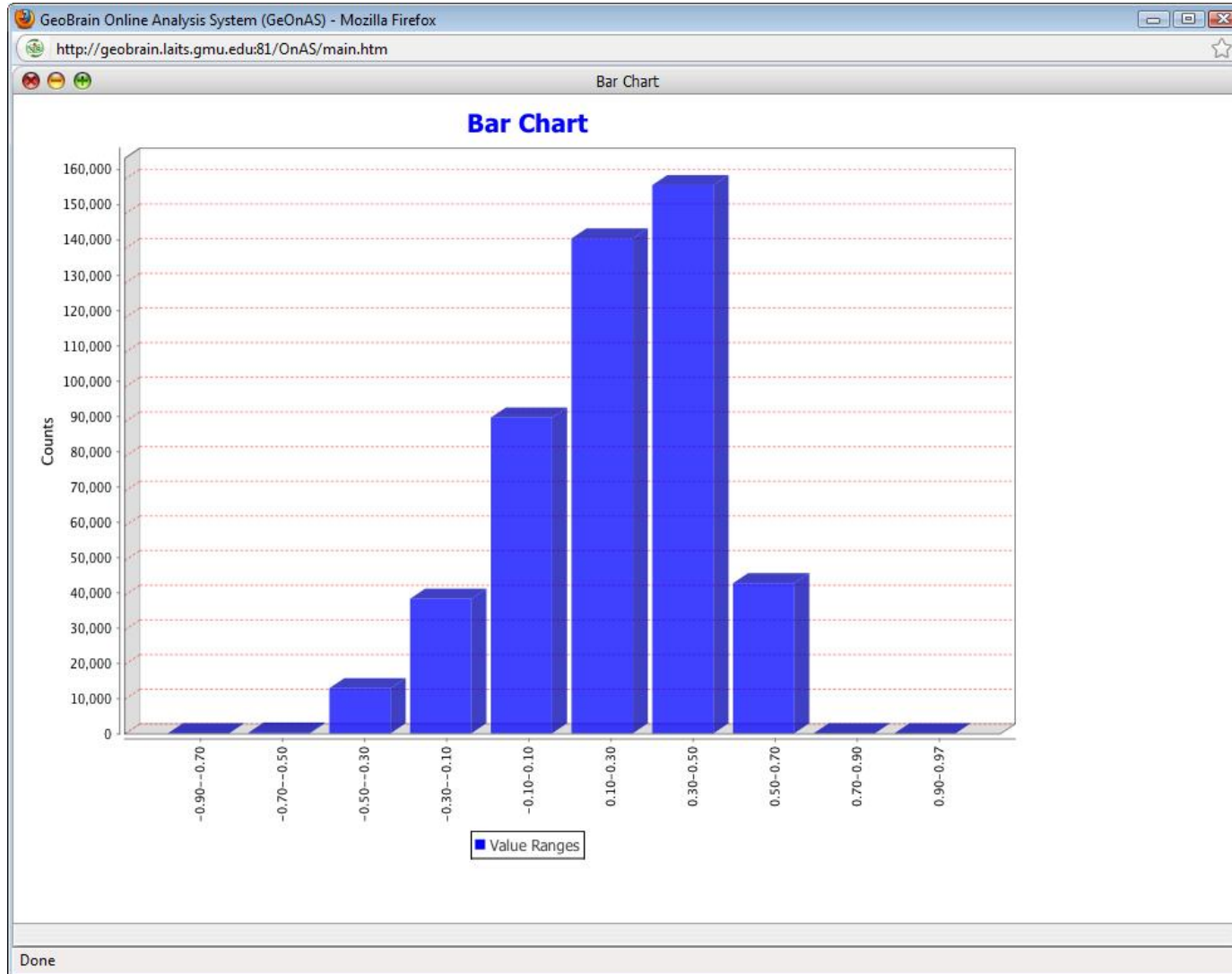


Service Layer

- WFS
 - Vector files - boundaries and their attributes are retrieved and encoded in GML when WFS *GetFeature* request is processed.
- WMS
 - GetMap* - Retrieve geo-registered map images from one or more distributed geospatial databases.
 - GetFeatureInfo* - Provide feature information by identifying a point on a map based on its pixel location.
- WCS
 - GetCoverage* - Retrieve coverage with specified parameters.
- WPS
 - GeoBrain Web Statistics Services
 - GeoBrain Map Algebra Services
 -

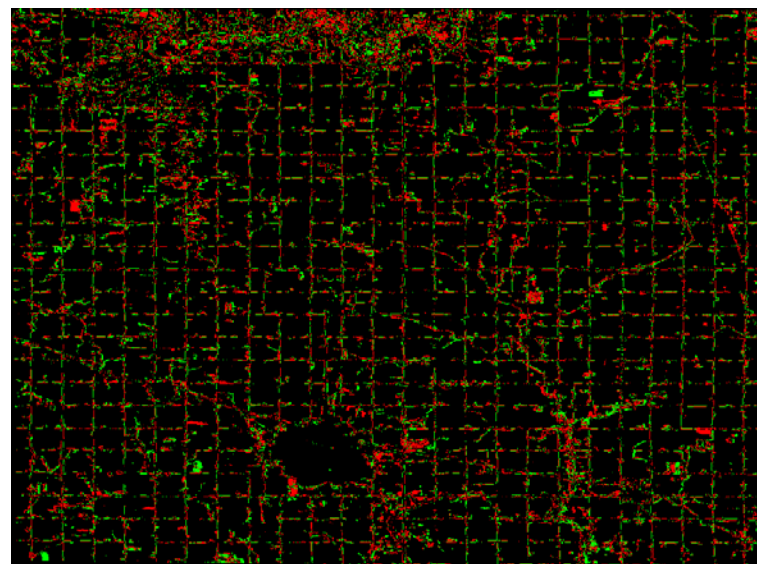
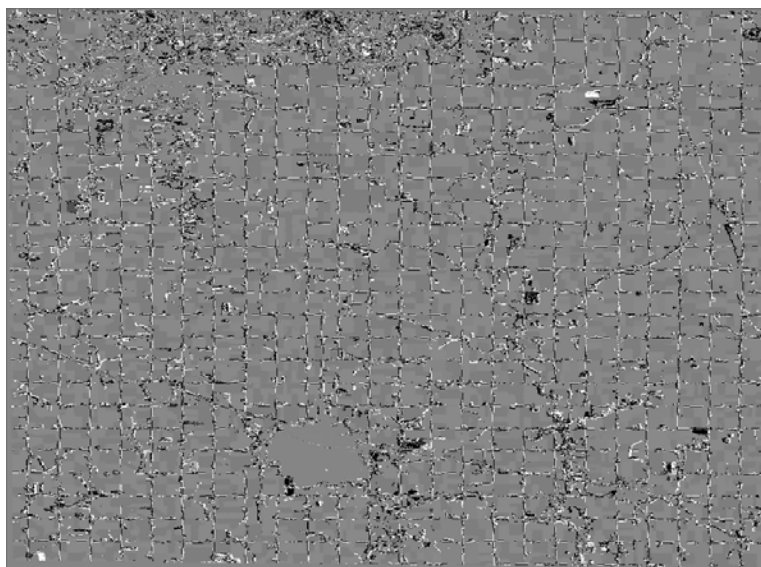


Web Statistics Services





Change Detection





Client Layer

- Openlayers
 - AJAX-enabled open source Web mapping framework
- ExtJS
 - Open source Javascript Framework
- Google Earth
 - KML with CDL display



CDL Explorer Features

- Ajax Enabled Web Application
- Accessible from any common browser
- OGC and other standards (WFS, WMS, WCS, WPS, GML, JSON) compliant
- Provide customization and download of CDL
- Help users obtain CDL effectively and efficiently
- Drive increased flexibility of CDL related application
- Work best for CDL data exploration and delivery



CDL Web Portal - Prototyped Functionalities

- Select CDL by state and year
- Visualize CDL
- Zoom in/out
- Pan
- Search the data by county and year
- Subset the data by state, county, and year
- Subset the data for any area of interest by polygon
- Reproject data to map projection specified by the user
Support common map projections (e.g., Lat/Long, UTM)
- Download the CDL subset in the original projection and GeoTiff format
- Export a selected CDL subset to Google Earth (in KML)



CDL Explorer Demo Links

- CDL Explorer Demo:

<http://129.174.131.228/NASSDownloadDemo/>

- CDL Web Service Example:

<http://129.174.131.228/NASSDownloadDemo/GetCDL>

for example:

<http://129.174.131.228/NASSDownloadDemo/GetCDL?year=2006&fips=19015>





Demo – Main User Interface

Layer Control

Map View

Legend

Overview



Demo – State/County Selection

State/County List

Define Area By State/County

State: Iowa

County:

- Adair (County)
- Adams (County)
- Allamakee (County)
- Appanoose (County)
- Audubon (County)
- Benton (County)
- Black Hawk (County)
- Boone (County)
- Bremer (County)
- Buchanan (County)
- Buena Vista (County)
- Butler (County)
- Calhoun (County)
- Carroll (County)
- Cass (County)



Demo - Query

USDA United States Department of Agriculture
National Agricultural Statistics Service

Cropland Explorer - NASS CDL Program

Map Layers

- Basic Layers
 - Global Cover
- Cropland Data Layers
 - 2008
 - 2007
 - 2006
- Boundaries
 - Counties
 - States

County Name	Butler
State Name	Iowa
FIPS Code	19023
Population(2000)	15305
Population(2005)	14620

Legend

Worth	Mitchell	Howard	
Huth	Hancock	Floyd	Fay
Wright	Franklin	Butler	Bremer
Jester	Harrison	IOWA	Benton
Boone	Story	Marshall	Tama

Demo | [USDA.gov](#) | [NASS Home](#) | [Research and Development Division](#) | [Spatial Analysis Research Section](#) | [About CDL](#) | [FAQ](#) | [Contact](#)

Copyright © General Science and Technology Solution Inc. 2009 - 2010



Demo - Customization

Year, Projection

Specify other information

Select Year: 2006 2007 2008

Specify Projection

Projection:

- UTM Zone 14
- UTM Zone 15
- UTM Zone 16
- UTM Zone 17
- WTM83

Map Layers

- Basic Layers
- Global Cover
- Cropland Data Layers
 - 2008
 - 2007
 - 2006
- Boundaries
 - Counties
 - States

Legend

	Worth	Mitchell	Howard	
Huth	Hancock	Floyd	Fay	
Wright	Franklin	Butler	Bremer	
Jester	Marshall	Tama	Benton	
Boone	Story	Marshall	Tama	Benton

Demo | [USDA.gov](#) | [NASS Home](#) | [Research and Development Division](#) | [Spatial Analysis Research Section](#) | [About CDL](#) | [FAQ](#) | [Contact](#)

Copyright © General Science and Technology Solution Inc., 2009 - 2010



Demo – Preview

Cropland Explorer Demo - NASS CDL Program - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://129.174.131.228/NASSDownloadDemo/

USDA United States Department of Agriculture
National Agricultural Statistics Service

Cropland Explorer - NASS CDL Program

Map Layers

- Basic Layers
- Global Cover
- Cropland Data Layers
 - 2008
 - 2007
 - 2006
- Boundaries
- Counties
- States

Data Preview

2006 2007 2008

Close

Legend

Worth Mitchell Howard
Hancock Floyd
Franklin Butler Bremer Fayette
Harrison Iowa
Boone Story Marshall Tama Benton

Copyright © General Science and Technology Solution Inc. 2009 - 2010

http://129.174.131.228/NASSDownloadDemo/#



Demo – Google Earth





Demo – AOI Definition



Demo – AOI Preview



Future Works

- Resample to specified spatial resolution (WCS)
- Reformat to format specified by the user (WCS)
 - ❑ Support all common raster formats offered by Geospatial Data Abstraction Library (GDAL)
- Overlay CDL data with other GIS layers (e.g. NASS Statistics Data)
- Online pixel count based crop acreage for state, county, or any AOI
- Online crop acreage statistics graphing/charting for state, county, or any AOI
- Multi-year crop acreage change statistics and graphs for state, county, or any AOI
- Maps showing the change of crop types for state, county, or any AOI between any two years



Conclusion

- NASS CDL data access, querying, visualization, and dissemination could be offered in an effective and efficient way through Web services
- SOA works well and the web-based interactive mapping enabled capabilities greatly enhance geospatially data access, navigation, query, visualization, and dissemination.
- OGC compliant Web services facilitate interoperability and automatic data delivery, and the open GIS technology is robust and has better performance.
- Online interactive mapping system/capabilities greatly improve user experiences and NASS data dissemination.



Thank you!