# Exploring U.S Cropland – A Web Service based Cropland Data Layer Dissemination, Visualization and Querying System

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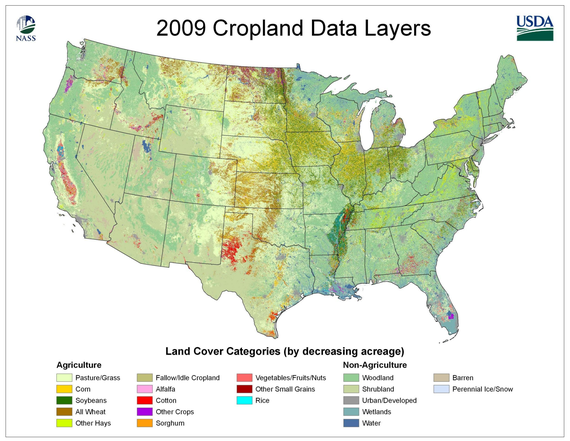
## INTRODUCTION

The National Agricultural Statistics Service (NASS) of the USDA produces the Cropland Data Layer (CDL) product, which is a raster-formatted, geo-referenced, U.S. crop specific land cover classification. This digital data layer is widely used in climate change research, environmental ecosystem studies, bioenergy production & transportation planning, environmental health research and agricultural production decision making, etc. It is also being used internally by NASS statistics analysts for crop acreage and yield estimation. It provides a "census by satellite" for major field crops. However, the dissemination channels for this product is only available via NASS marketing channel and online bulk downloading. There are no interactive map, no online visualization and exploring, no online geospatial query and analytics capabilities. Therefore, an interactive mapping application is needed.




## OBJECTIVE

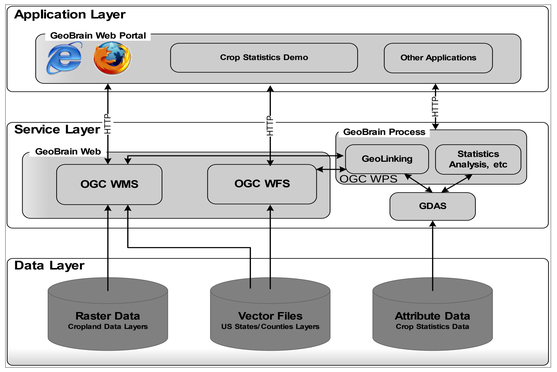
An online application provides capabilities of on-line geospatial crop information access, geospatial query and on-line analytics via interactive maps, disseminates all data to the decision makers and users via real time retrieval, processing and publishing over the web through standards-based geospatial web services

## REQUIREMENTS

Reasonable performance with no user burden
- •No client software development &installation.
- •No special software tools needed.
- •No specialized knowledge and training needed.

## ARCHITECTURE – Service Oriented (SOA)

- ▪Integrates data through interoperable services into decision support information (reports, tables, views, charts, maps etc.)
- ▪Open Architecture
- ▪Interoperable at organizational levels
- ▪Comprehensive Standard API
- ▪Accessible through HTTP
- ▪Scalable, Robust, and Reusable




## TECHNOLOGIES

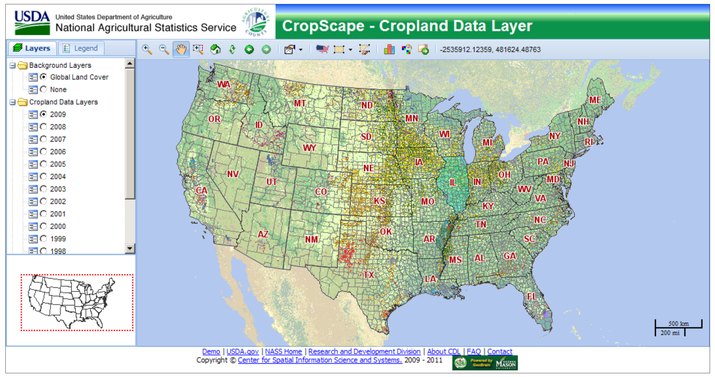
- •OGC specifications and standards: WFS, WMS, WPS, WCS etc.
- •Web service based service oriented architecture
- •Service workflow integration - BPEL, BPEL execution engine
- •GeoBrain technology(GMU developed)

## SYSTEM FUNCTIONALITIES

- ▪Selecting CDL by state and year
- ▪Visualizing CDL
- ▪Zooming in/out
- ▪Panning
- ▪Sub-setting data by state, county, and by area of interest (AOI)
- ▪Reprojecting data to a commonly used map projection (e.g., Lat/Long, UTM) specified by the user
- ▪Downloading the CDL AOI
- ▪Exporting a selected CDL AOI to Google Earth (in KML).
- ▪Crop acreage statistics and graphs
- ▪Change analysis for any given area between any two years
- ▪On-the-fly single crop type map generating, display and downloading
- ▪Crop type identification for individual map pixel
- ▪Web service implemented for Geospatial query statistics data delivery
- ▪Web service implemented for CDL map AOI data delivery

## CropScape - CROPLAND DATA LAYER WEB EXPLORER

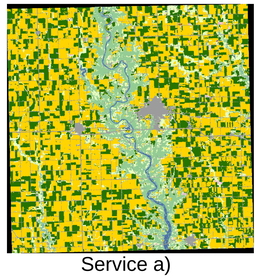
http://nassgeodata.gmu.edu/CropScape/




## WEB SERVICE FOR AUTOMATIC DATA DELIVERY

a) http://nassgeodata.gmu.edu/CropScape/GetCDL?year=2009&fips=19015

b) http://nassgeodata.gmu.edu/CropScape/GetNASSStatData?year=2008&fips=19015&commcode=11199199

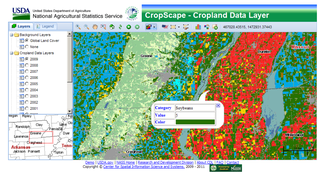


Service a)

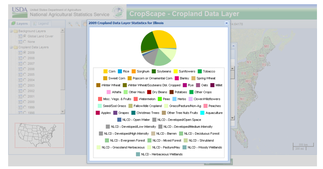
Year: 2008
State: IA
County: Boone
Commodity: Corn For Grain
Planted: 163500
Harvested: 158500
Yield: 166.0000
Production: 26300000

Service b)

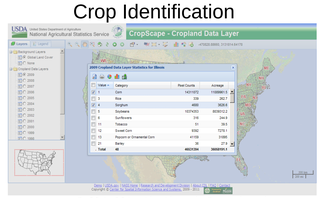
## ON-LINE VISUALIZATION, ANALYTICS & DISSEMINATION



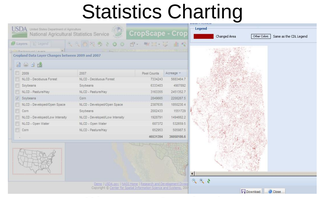

Crop Identification



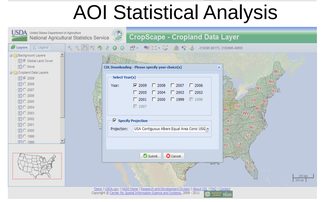

Statistics Charting



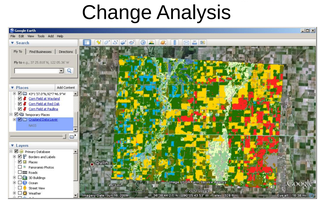

AOI Statistical Analysis




Change Analysis




Downloading



Export to Google Earth

## CONCLUSION

- ▪CropScape made online exploring US Cropland possible and facilitated an equal access to cropland information.
- ▪The service oriented architecture works well.
- ▪Web-based interactive mapping enabled geospatial data accessing, navigation, querying, visualization, and dissemination, and greatly improved user experiences.
- ▪Web services facilitate interoperability and automatic data delivery.
- ▪Reusing Geo-brain technology allows for fast prototyping and implementation.
- ▪The open GIS technology is robust and has better performance.
- ▪It greatly reduced the need of paper map and enhanced low carbon geospatial cropland information for decision support.

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