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VegScape: A NASS Web Service-based U.S. Crop Condition Monitoring System

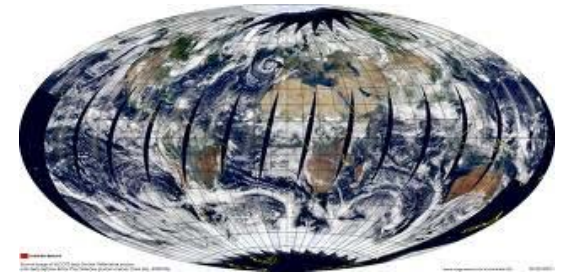
Rick Mueller

National Agricultural Statistics Service





VegScape Goals



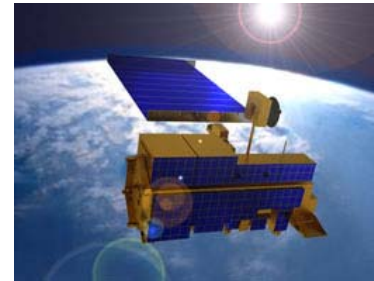
- Improve objectivity, robustness, quantification, and defensibility of nationwide crop condition monitoring program
- On-line satellite-based U.S. crop condition vegetation assessment and monitoring
- Provides tools for data exploration and visualization
- Publically disseminates geospatial vegetation 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



VegScape Components

- Moderate Resolution Imaging Spectroradiometer (MODIS)

- Daily global coverage
- 250 meter spatial resolution
- 13 year historical record
- Launched/maintained by NASA

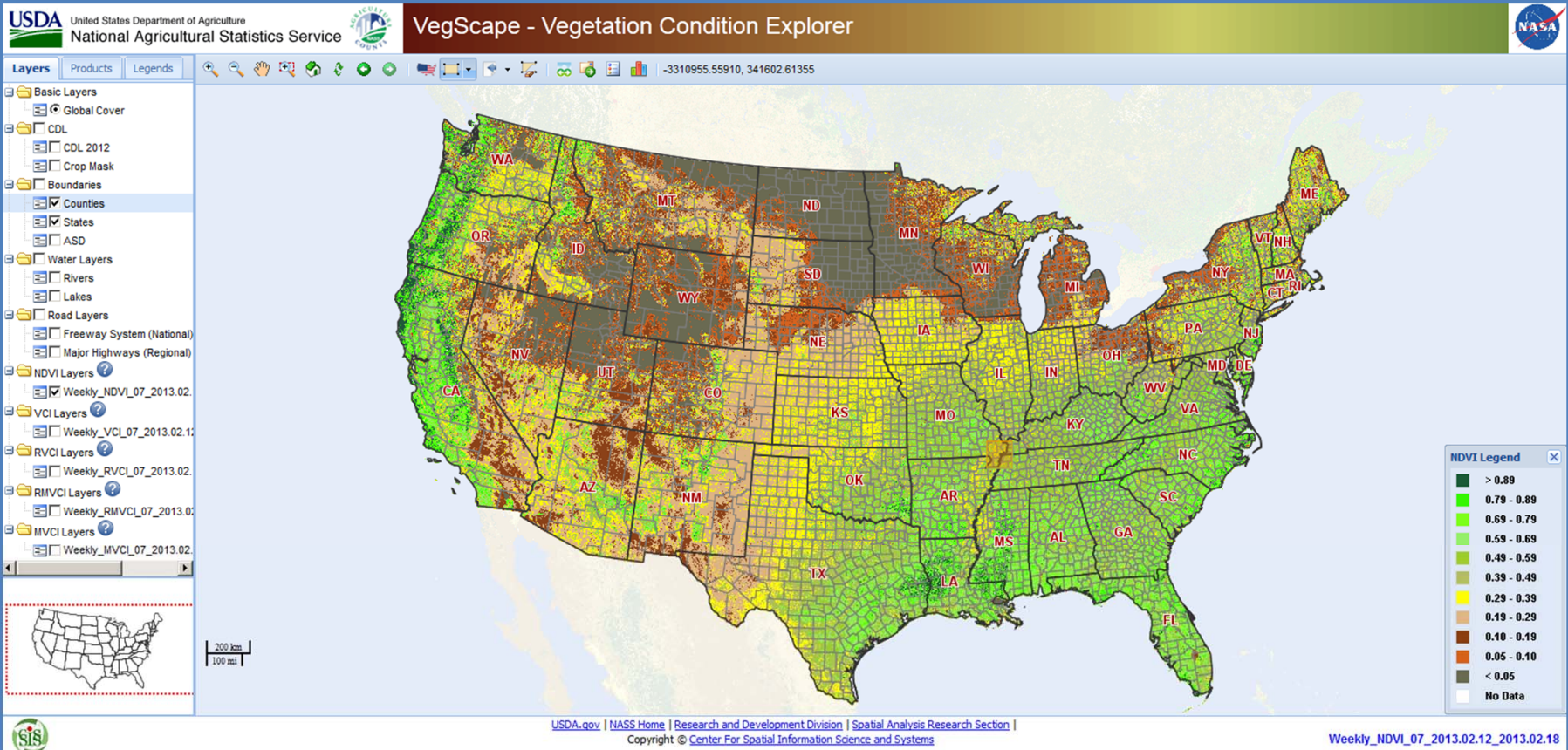


- VegScape built on CropScape framework/architecture

- 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



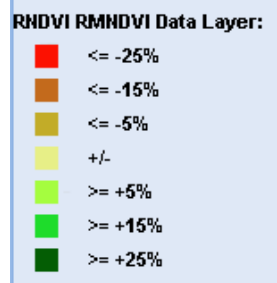
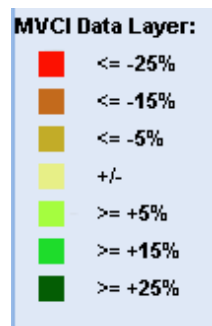
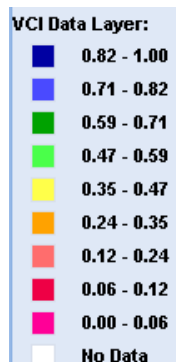
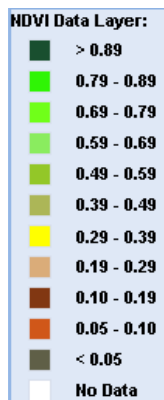
Daily/Weekly/Biweekly Automated Customized US Composites



Leverage George Mason Univ/GeoBrain technology (i.e., CropScape)

Vegetation Indices

- NASS uses NASA's MODIS satellite to identify crop condition throughout the growing season
- Each pixel measures 250 sq. meters or 15 acres/6.25 hectares
- 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



about NDVI

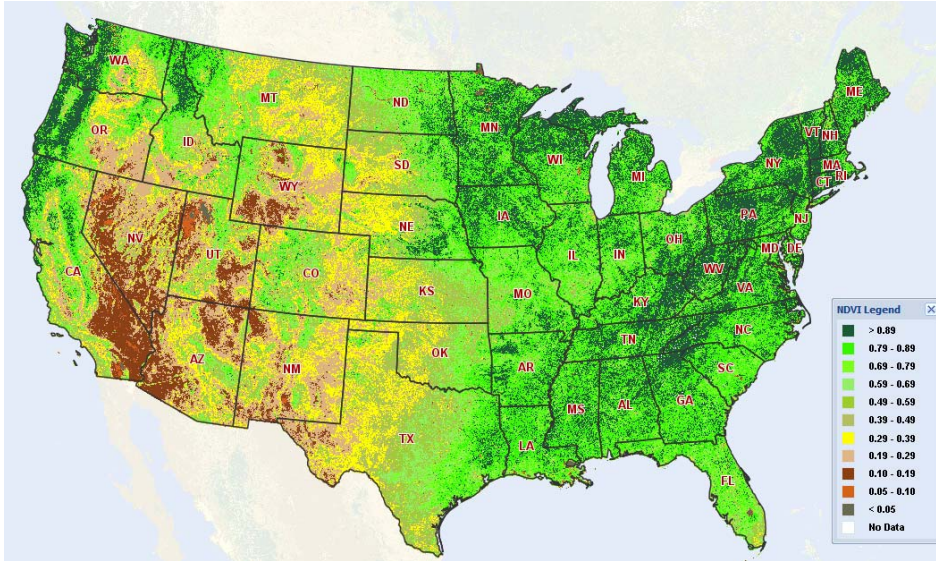
The Surface Reflectance Daily L2G Global 250m of MODIS is selected as the input for generating normalized difference vegetation index (NDVI). The L2G product has two bands – Band1 (620-670 nm) and Band2 (841-876 nm) that represent respectively red and near-infrared band. Therefore, the equation for computing daily NDVI is as follows:

$$NDVI = \frac{Band2 - Band1}{Band2 + Band1} \times 125 + 125$$

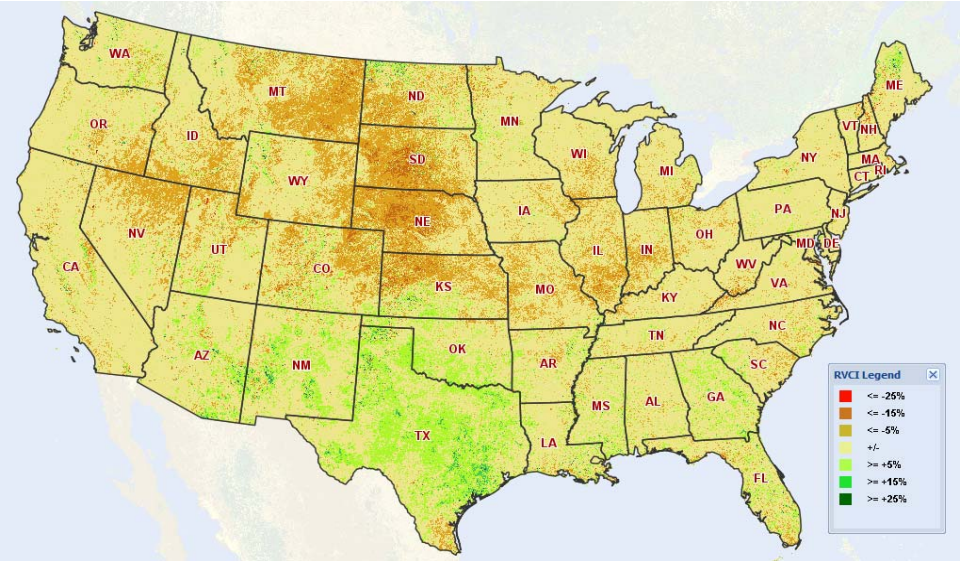
Resulted data are in the range of [0, 250].

Weekly Vegetation Indices 07/24/12 – 07/30/12

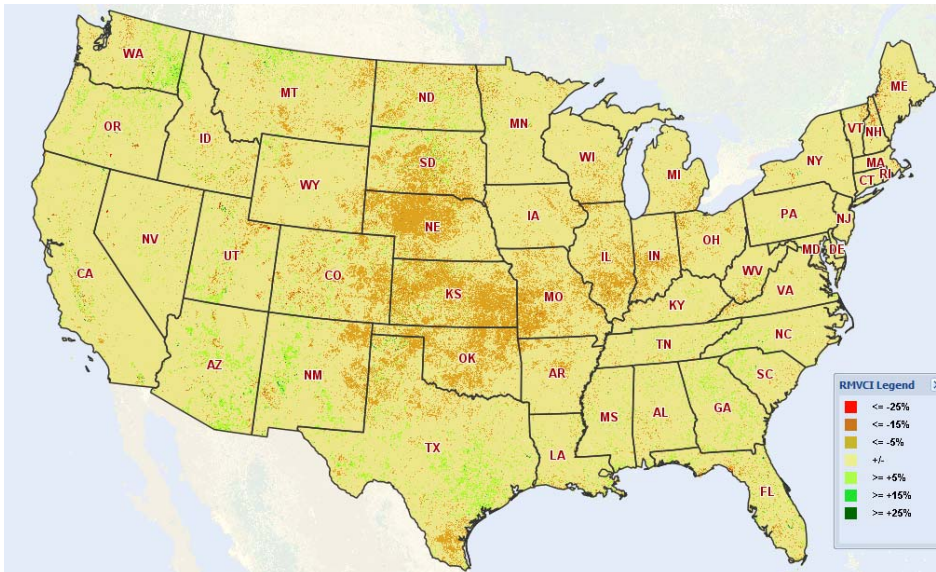
Normalized Difference Vegetation Index (NDVI)



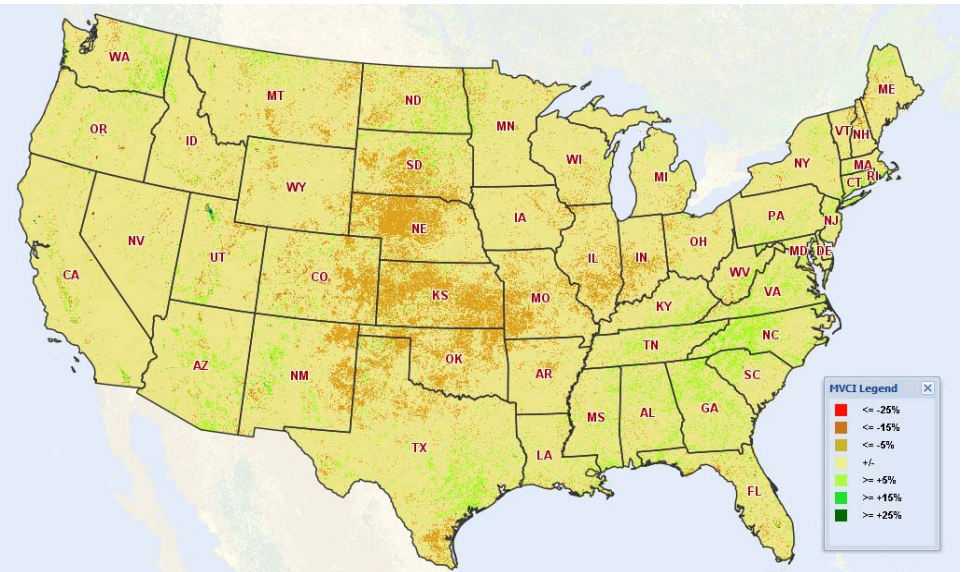
Ratio NDVI or RNCI



Ratio Median NDVI or RMNCI



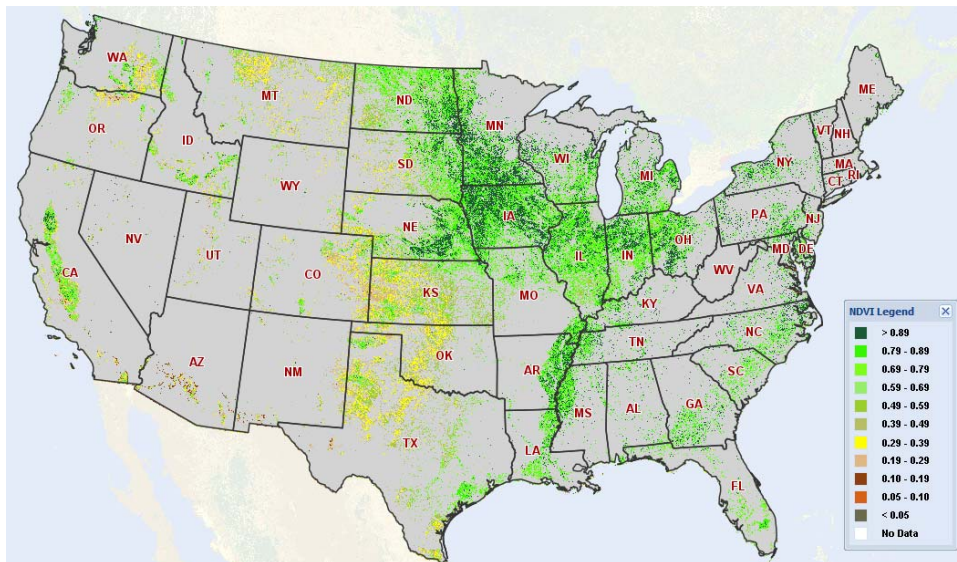
Mean NDVI or MNCI



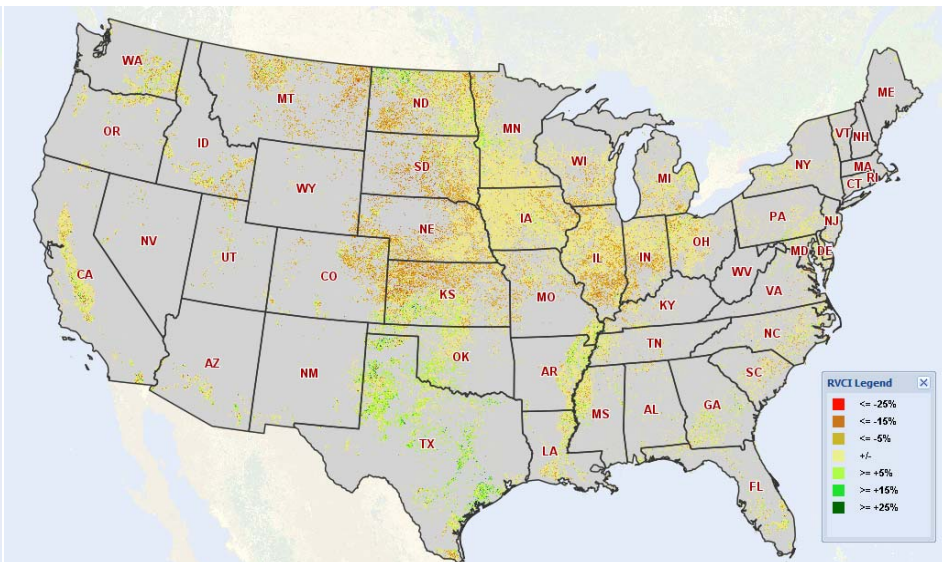
Weekly Vegetation Indices 07/24/12 – 07/30/12

Crop Mask Applied

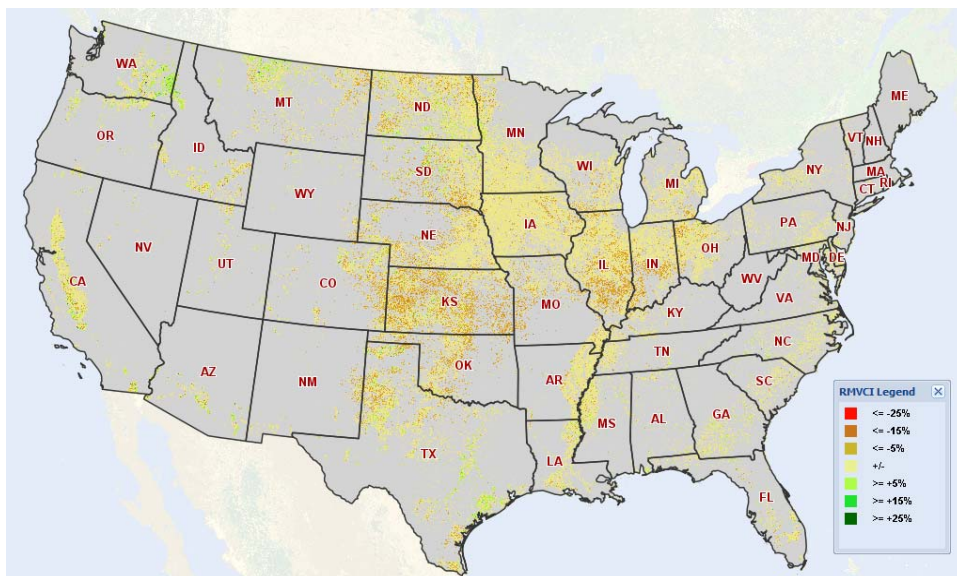
Normalized Difference Vegetation Index (NDVI)



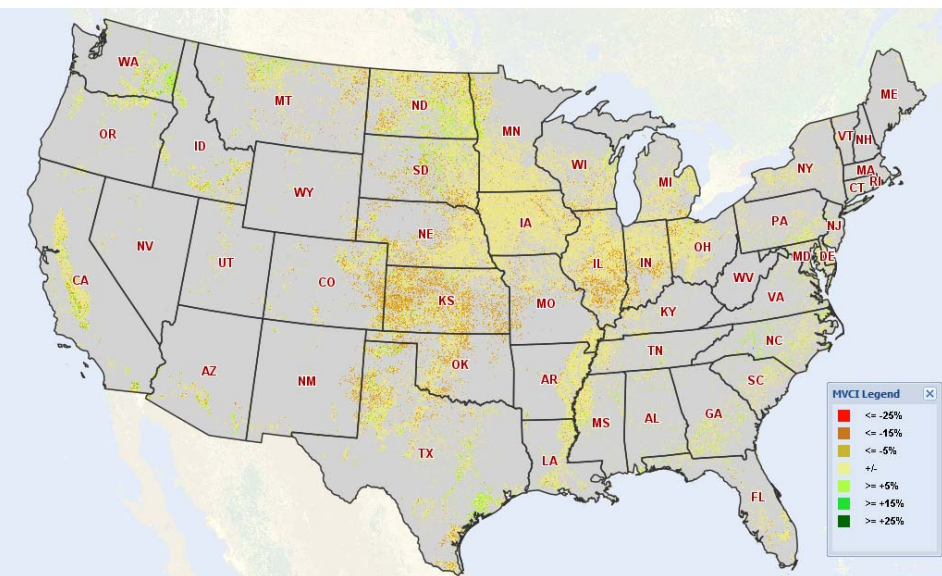
Ratio NDVI or RNCI



Ratio Median NDVI or RMNCI

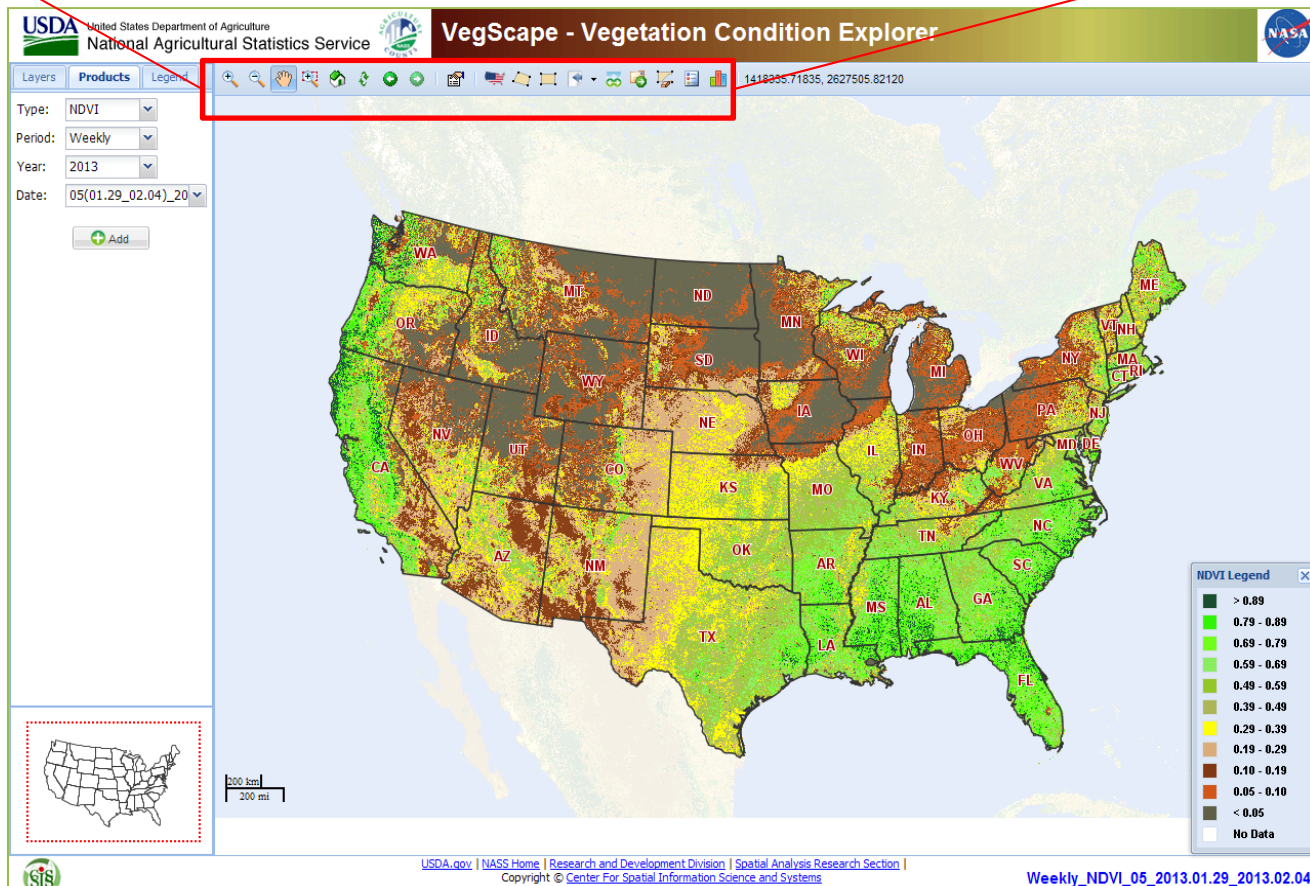


Mean NDVI or MNCI



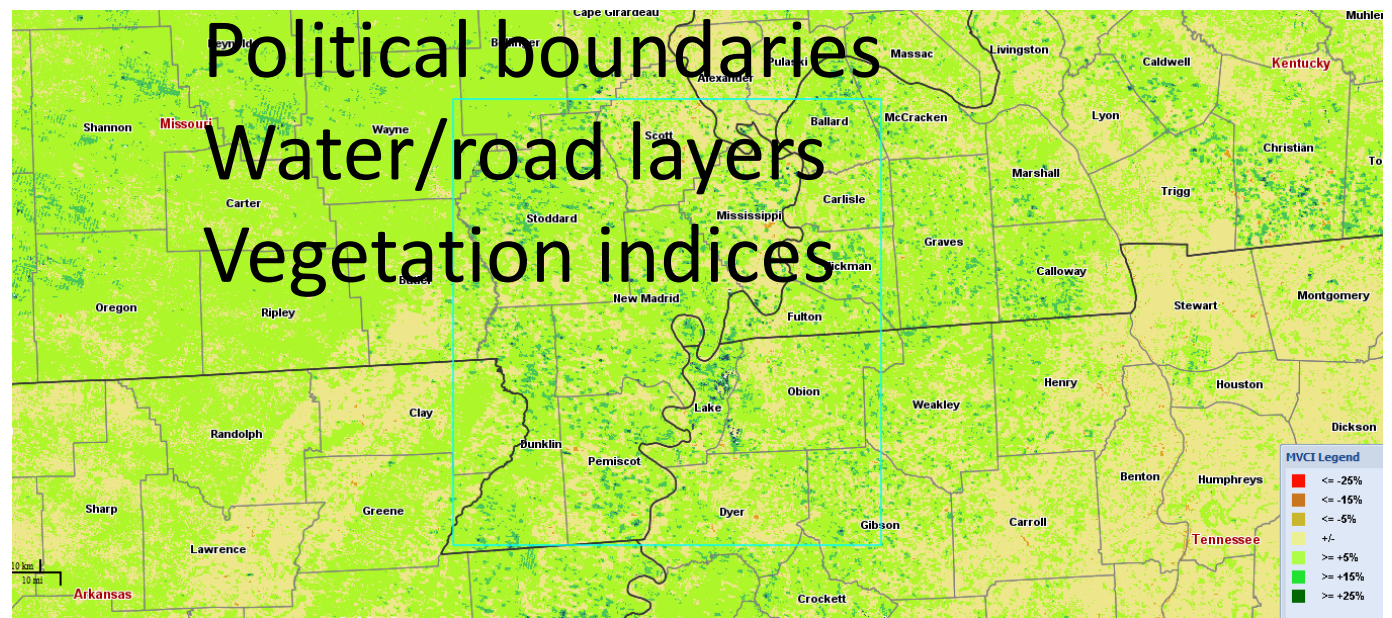
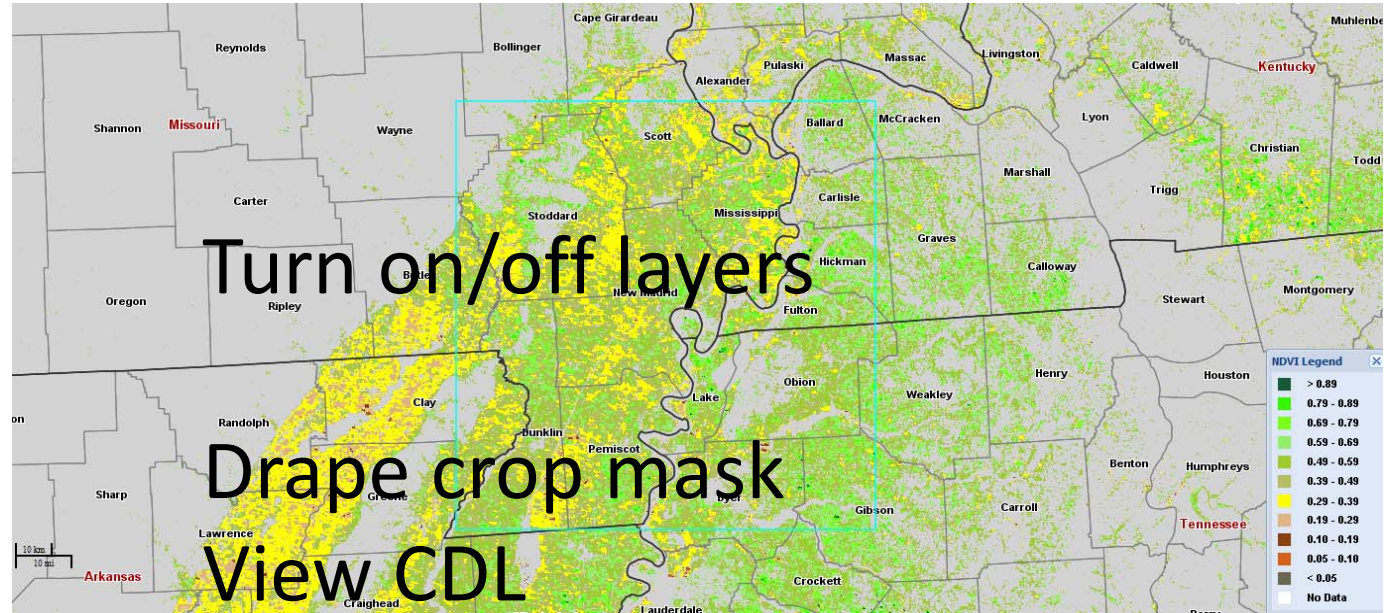


VegScape GUI



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 layer has a checkbox to toggle its visibility. The 'Global Cover' layer is selected. The 'CDL' folder contains 'CDL 2012' and 'Crop Mask'. The 'Boundaries' folder contains 'Counties' and 'States'. The 'Water Layers' folder contains 'Rivers' and 'Lakes'. The 'Road Layers' folder contains 'Freeway System (National)' and 'Major Highways (Regional)'. The 'NDVI Layers' folder contains 'Weekly_NDVI_07_2013.02.'. The 'VCI Layers' folder contains 'Weekly_VCI_07_2013.02.1:'. The 'RVCI Layers' folder contains 'Weekly_RVCI_07_2013.02.'. The 'RMVCI Layers' folder contains 'Weekly_RMVCI_07_2013.0:'. The 'MVCI Layers' folder contains 'Weekly_MVCI_07_2013.02.'. A scroll bar is visible at the bottom of the panel.



Load VegScape Indices

1) Select vegetative index

Products

- MVCI
- NDVI
- VCI
- RVC
- RMVCI
- MVCI

2) Time period

Type: NDVI

Period: Weekly

Year: Daily

Date: Weekly

Biweekly

Layers Products Legend

Type: NDVI

Period: Weekly

Year: 2013

Date: 05(01.29_02.04)_20

+ Add

Follow these five steps to add products for analysis

5) Add

+ Add

3) Year

Type: NDVI

Period: Weekly

Year: 2013

Date: 2000

2001

2002

2003

4) Date

Type: NDVI

Period: Weekly

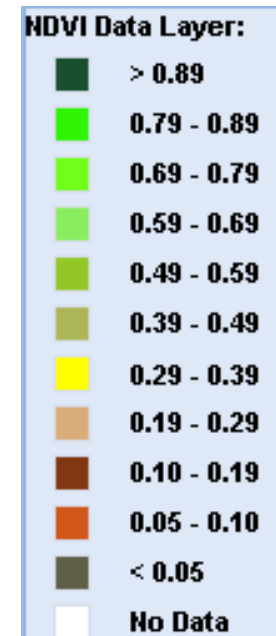
Year: 2013

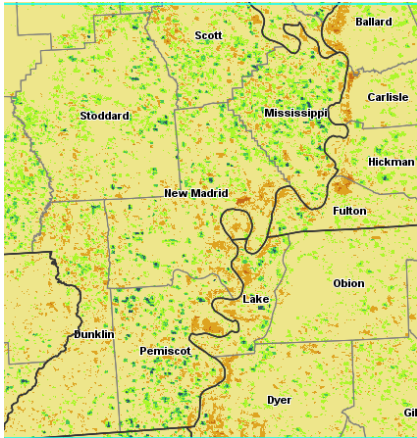
Date: 05(01.29_02.04)_20

01(01.01_01.07)_2013

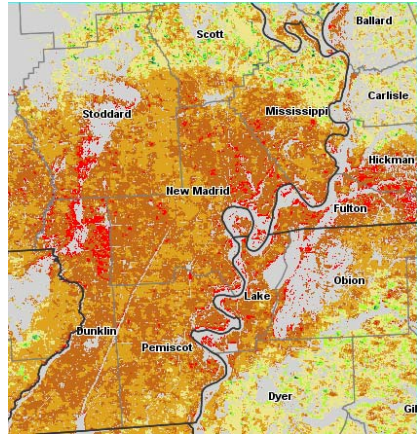
02(01.08_01.14)_2013

03(01.15_01.21)_2013

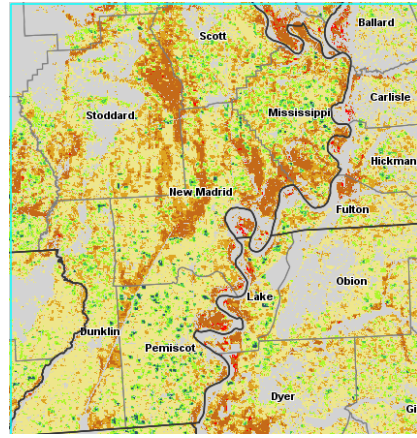




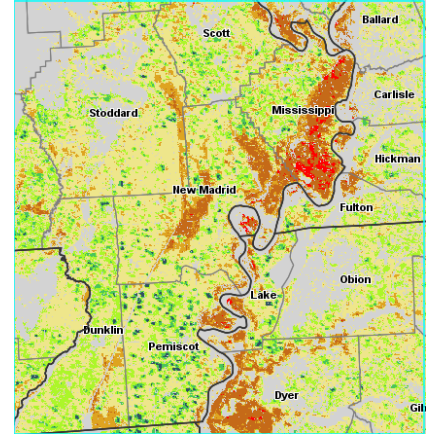
04/12-04/18/11



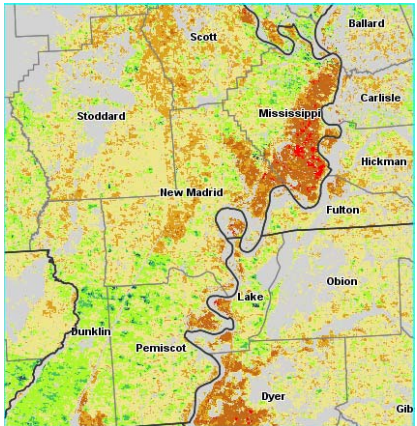
04/19-04/25/11



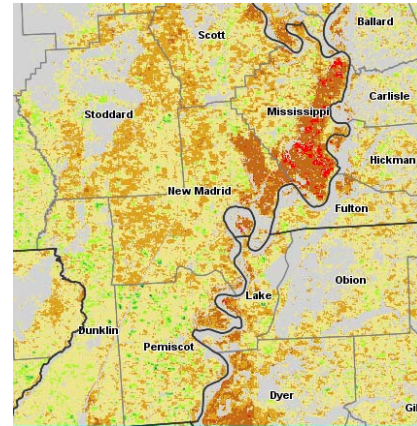
04/26-05/02/11



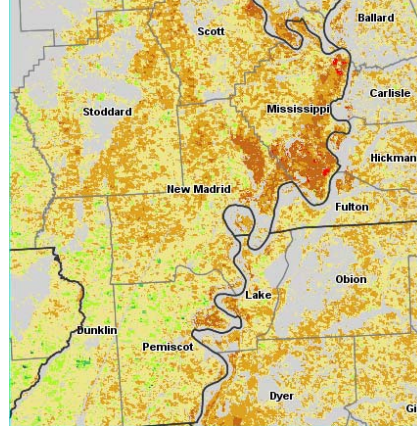
05/03-05/09/11



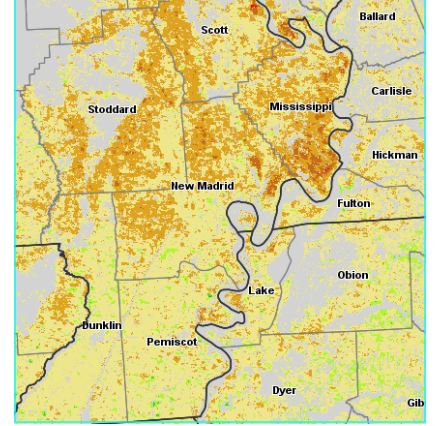
05/10-05/16/11



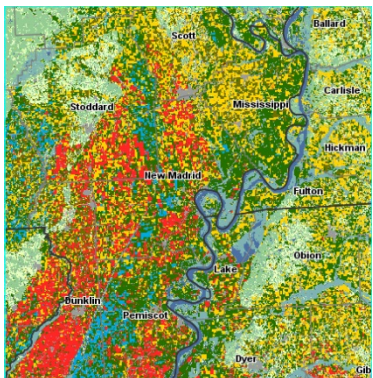
05/17-05/23/11



05/24-05/30/11

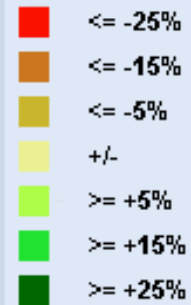


05/31-06/06/11



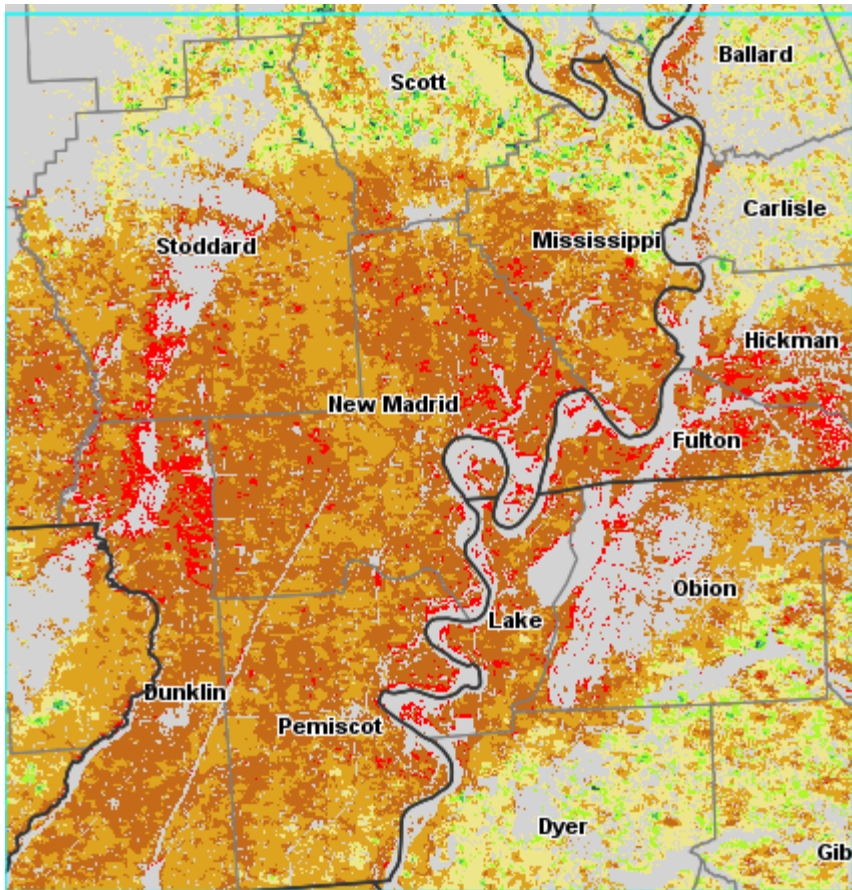
Cropland
Data
Layer

RMVCI Legend



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

RatioMedian VCI- Area of Interest Statistics



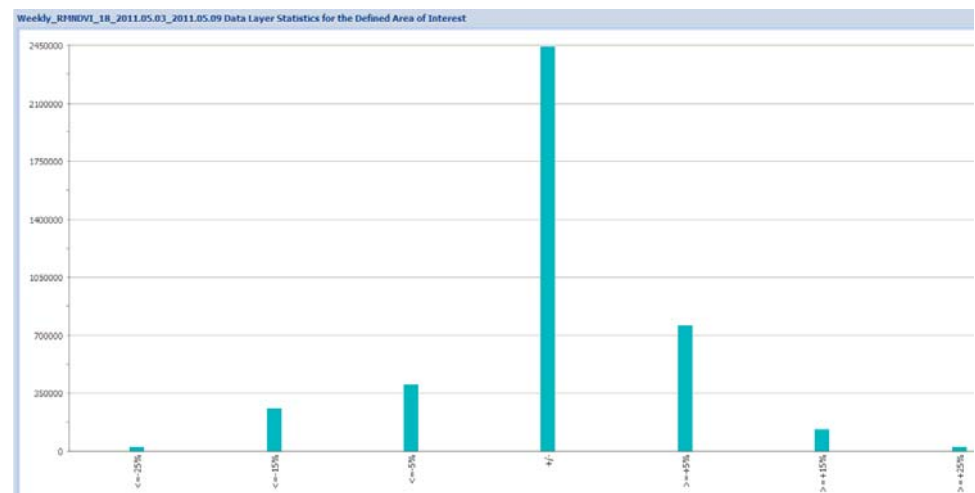
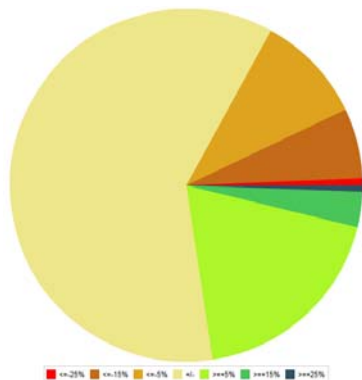
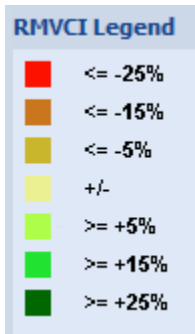
Weekly_RMNDVI_18_2011.05.03_2011.05.09 Data Layer Statistics for the Defined Area of Interest

Note: Pixel and acreage counts are not official estimates.

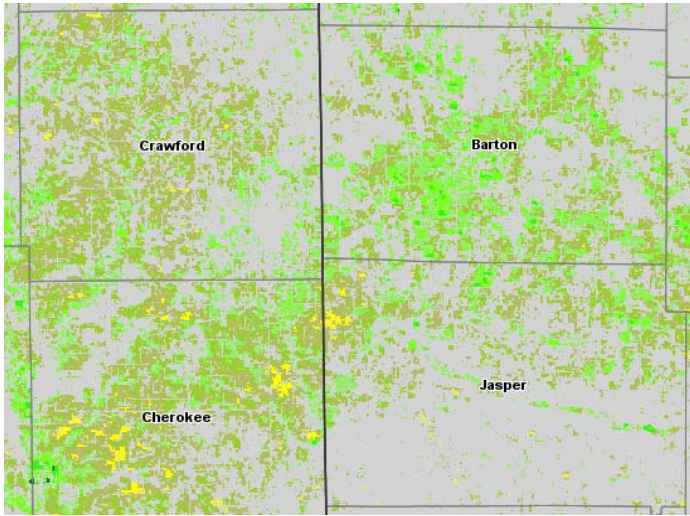
Value	Category	Pixel Counts	Acreage
0	<=-25%	1931	25606.6
1	<=-15%	19647	260535.3
2	<=-5%	30411	403274.7
3	+/-	184180	2442377.2
4	>=+5%	57280	759579.6
5	>=+15%	9910	131414.7
6	>=+25%	1765	23405.3
Total	7	305124	4046193.4

04/19-04/25/11

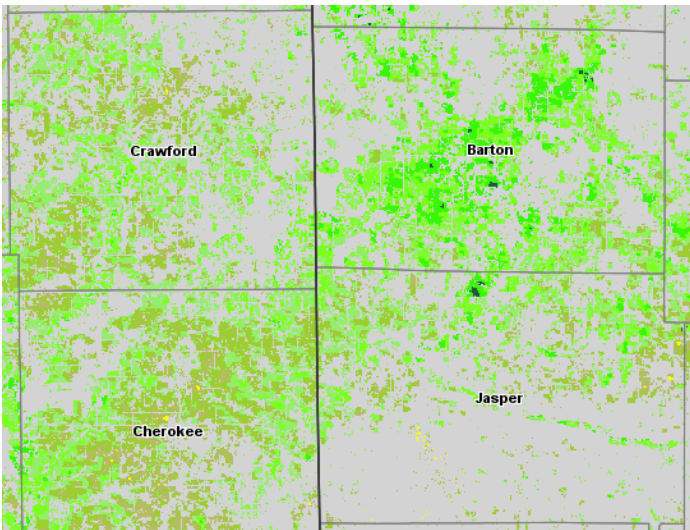
Quantify vegetative area condition



VegScape Swipe Function



NDVI 07/24/12 – 07/30/12 Crop Mask



NDVI 07/26/11 – 08/01/11 Crop Mask

Swipe Current View

Front Layer: ▾

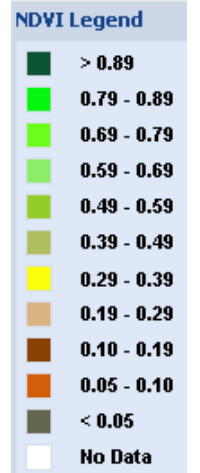
Back Layer: ▾

Swipe Position

0 100

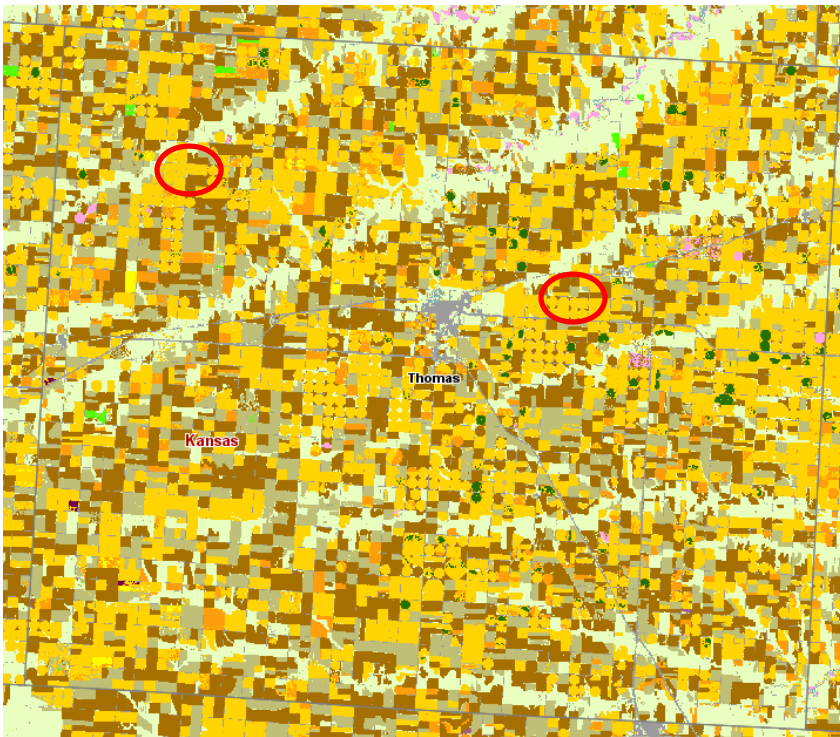
Direction: ▾

Swipe/fade widget back & forth
Vertical or horizontal motion

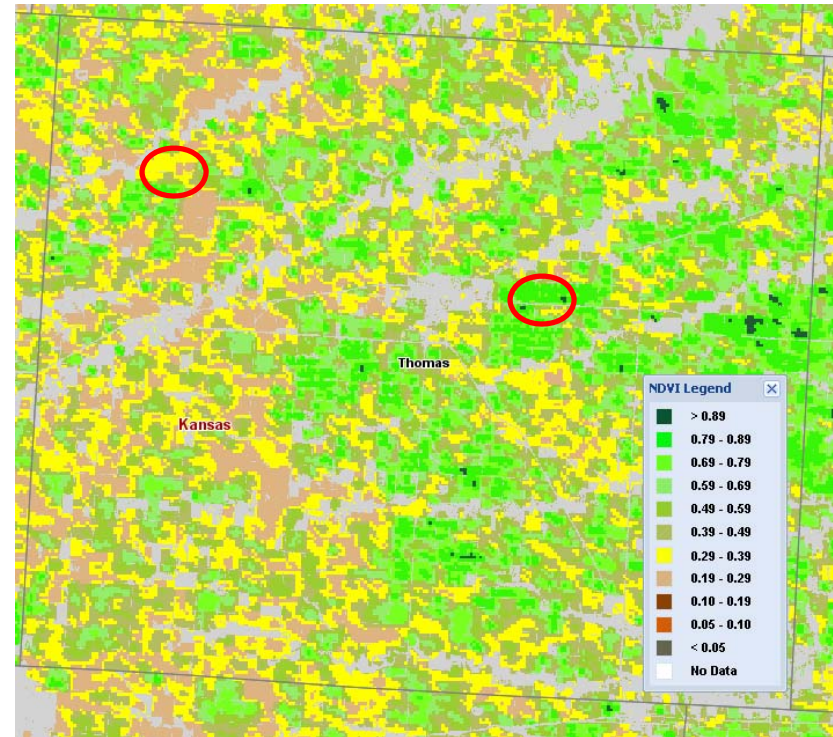


CropScape/VegScape Integration

VegScape also serves the latest 2012 CDL product

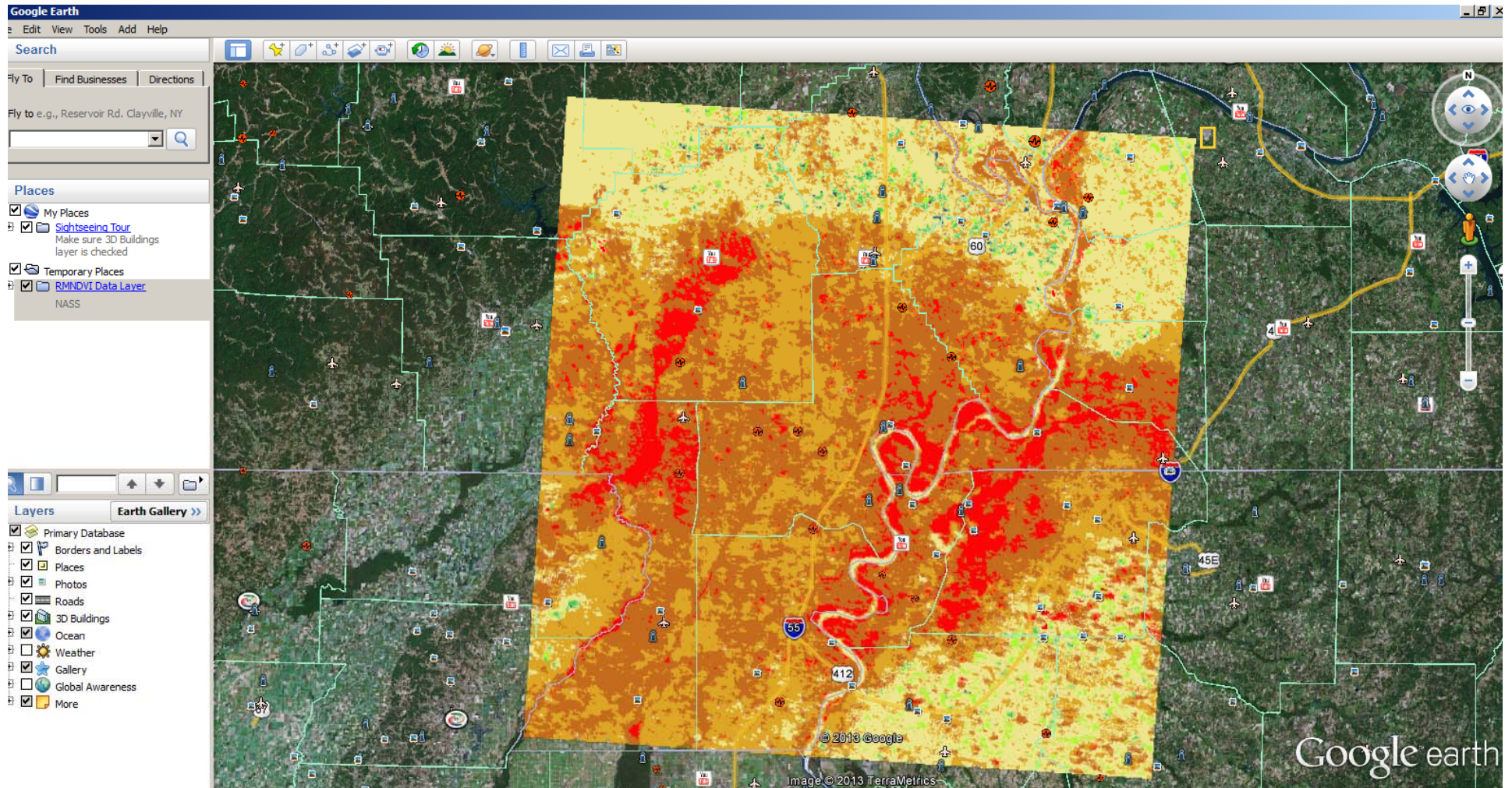


2012 Cropland Data Layer
The 2012 Cropland Data Layer
(CDL) product depicts land cover



7/24/12 – 7/30/12 NDVI
Vegetative condition indicates crops under
stress from the 2012 drought

Web Mashup



Download any selected index data directly into Google Earth



VegScape Conclusion

- 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
 - NDVI, VCI, MVCI, RMVCI, RVCi
- 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!
- Future enhancements such as soil moisture...



Just bing it!

The Bing logo, featuring the word "bing" in a blue, lowercase, sans-serif font with a small orange dot above the letter "i".

[VegScape - Vegetation Condition Explorer](http://nassgeodata.gmu.edu/VegScape)

nassgeodata.gmu.edu/VegScape ▼

VegScape - Vegetation Condition Explorer USDA.gov | NASS Home | Research and Development Division | Spatial Analysis Research Section | ...

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

