



USDA Remote Sensing Programs, Priorities, and Partnerships

Glenn R. Bethel
USDA Remote Sensing Advisor



Outline

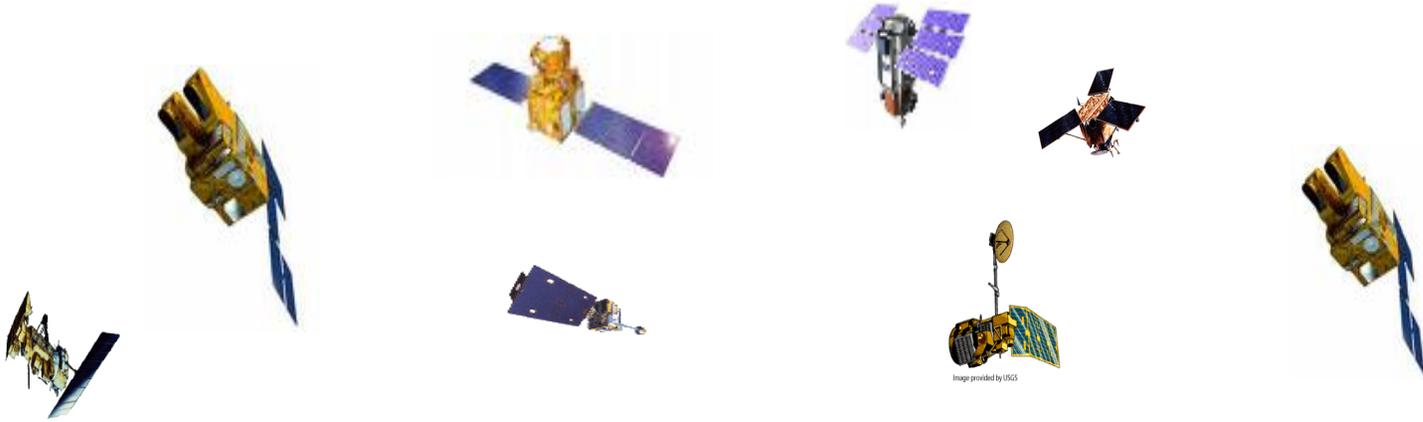
- National and Global Satellite Imagery Programs
- National Aerial Programs



Agriculture's Interrelated Policy and Program Considerations

- Commodity programs
- Conservation
- Agricultural trade
- U.S. Nutrition programs
- Rural development
- Agricultural research, education, and extension
- Forestry
- Biofuels
- Sustainable Agriculture
- Carbon Markets
- Environment
- Climate change
- Trade Policy
- Access to food by poorest consumers in poorest countries
- Dealing with longer-term scarcity concerns:
 - Land availability
 - Water
 - Food production inputs, especially energy
- Energy (total supply & demand)





Satellite Imagery

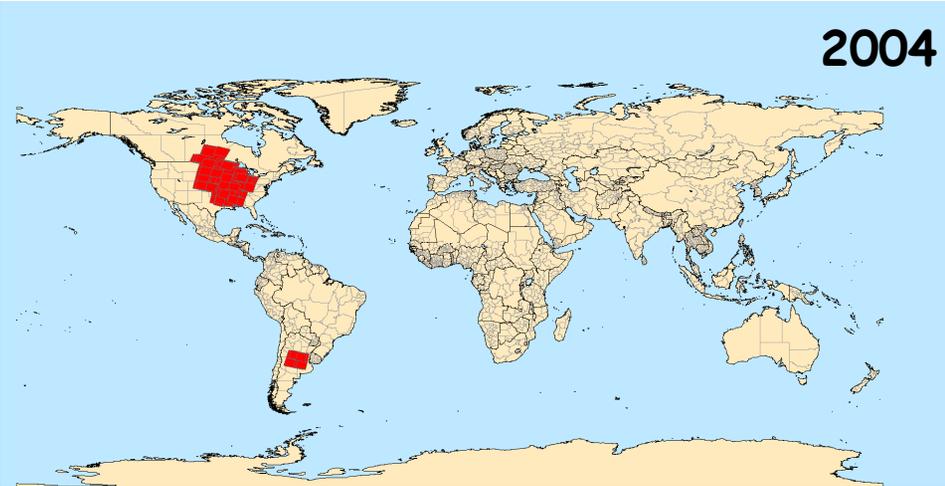
AWiFS

MODIS

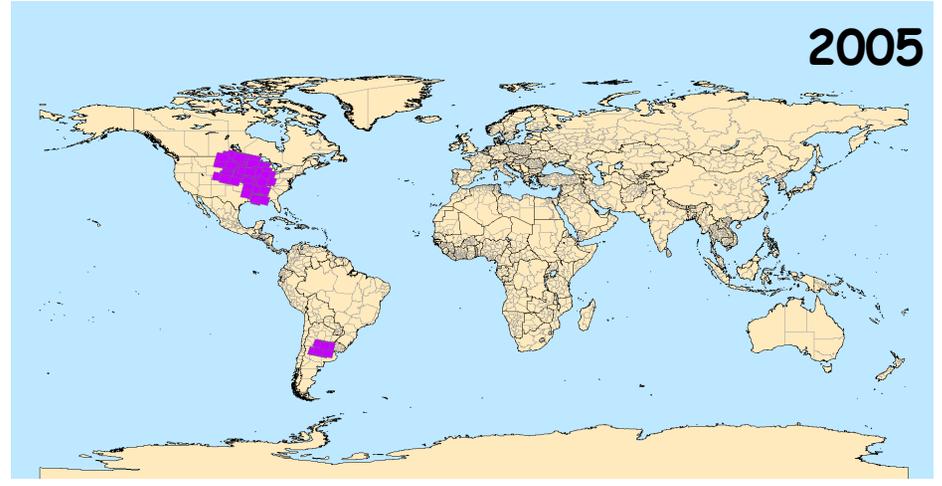
SPOT

AWiFS Areas of Collection 2004-2007

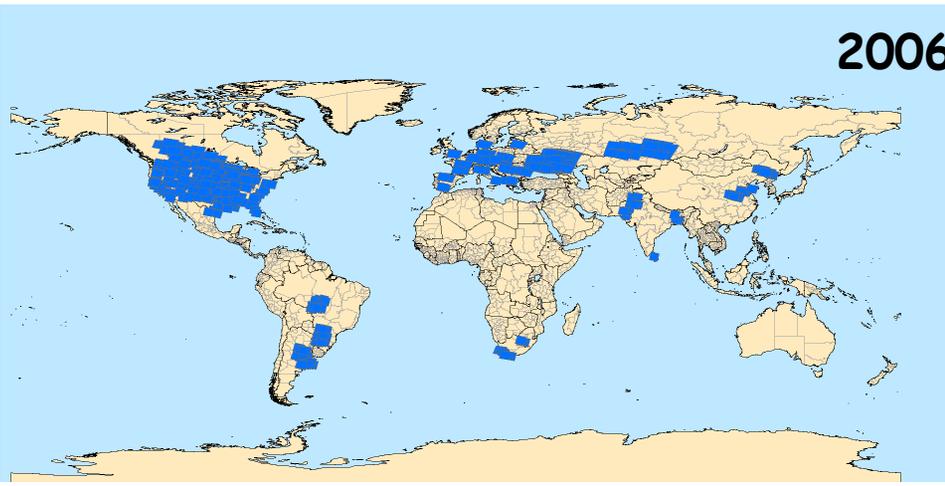
2004



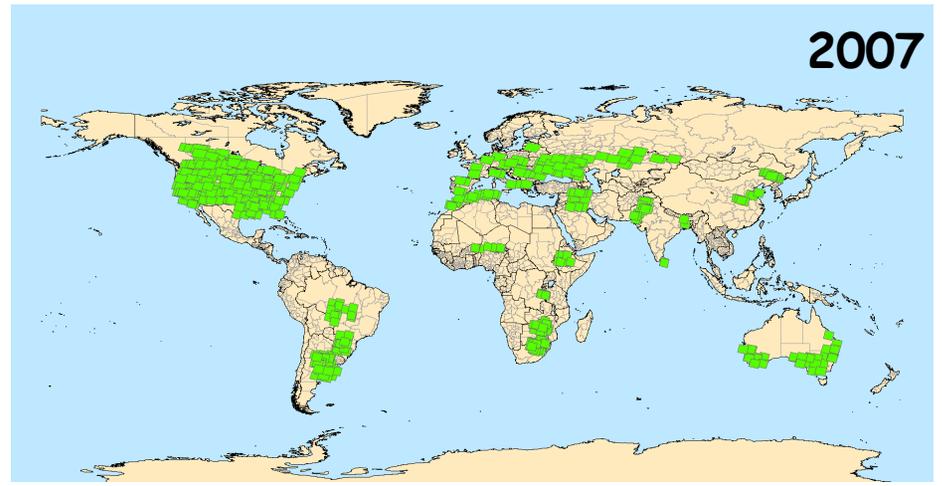
2005



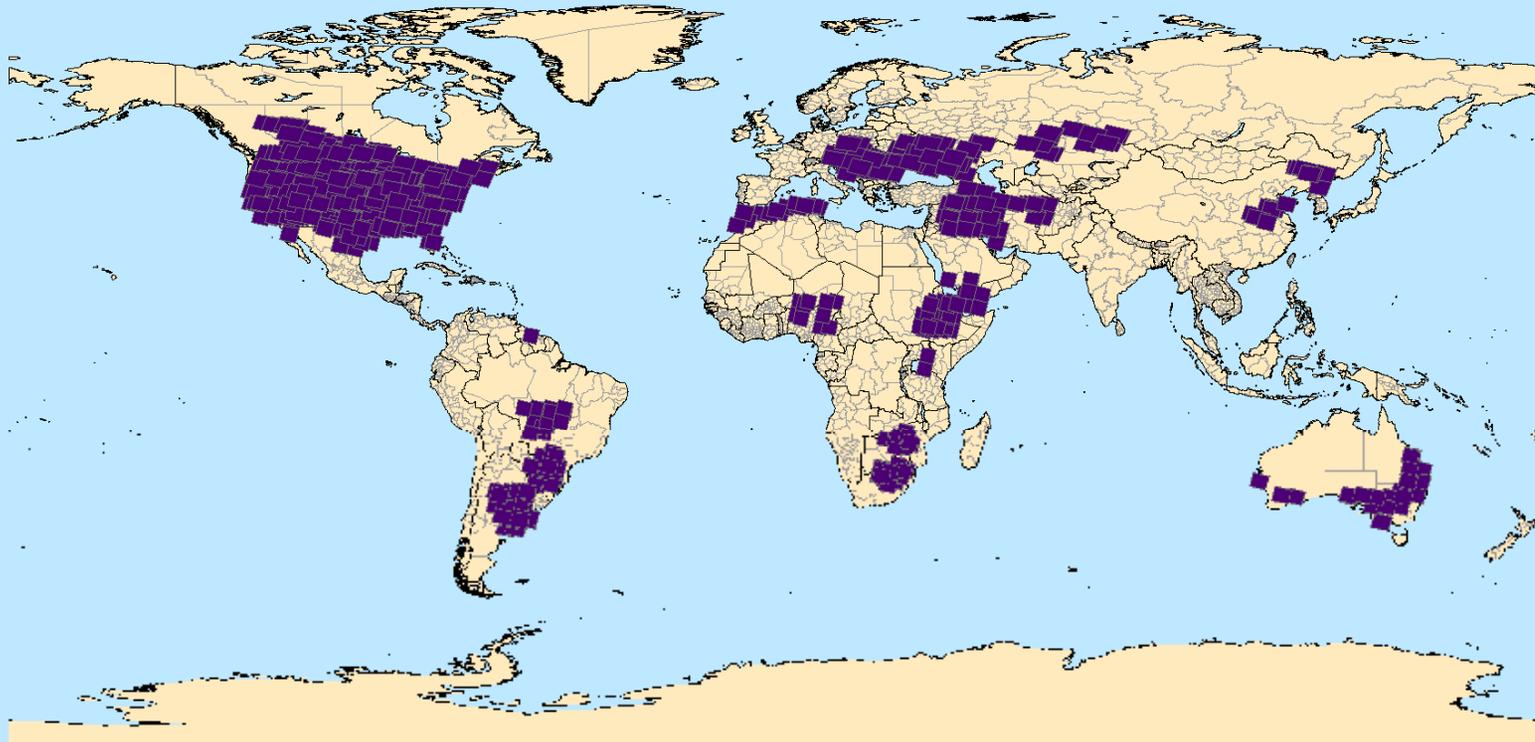
2006



2007



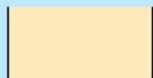
Resourcesat-1 AWiFS at USDA -- 2008



Legend



AWiFS_Collection_2008



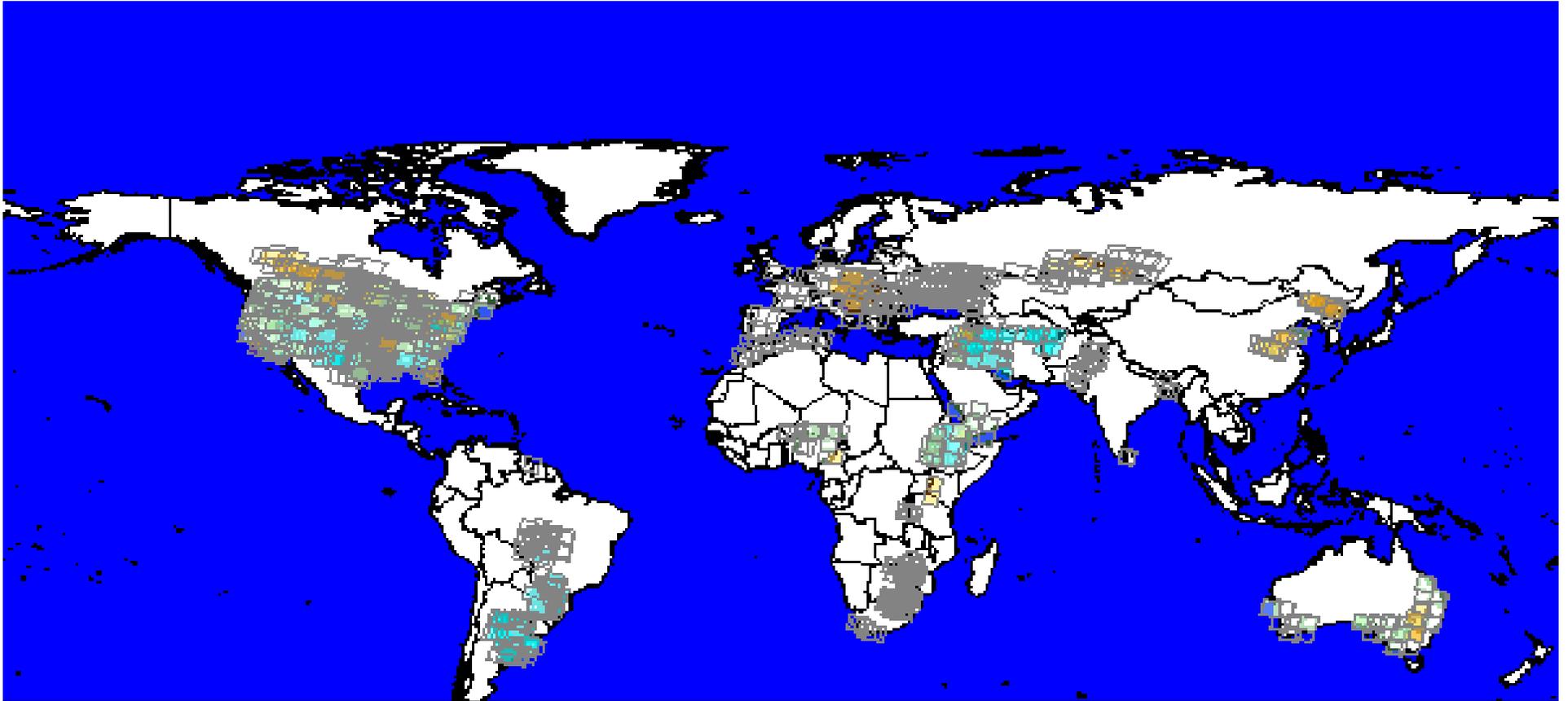
cntry00_with_lakes

Calendar Year	Total	US
2004	146	125
2005	100	84
2006	1415	888
2007	1408	798
2008	1654	1026



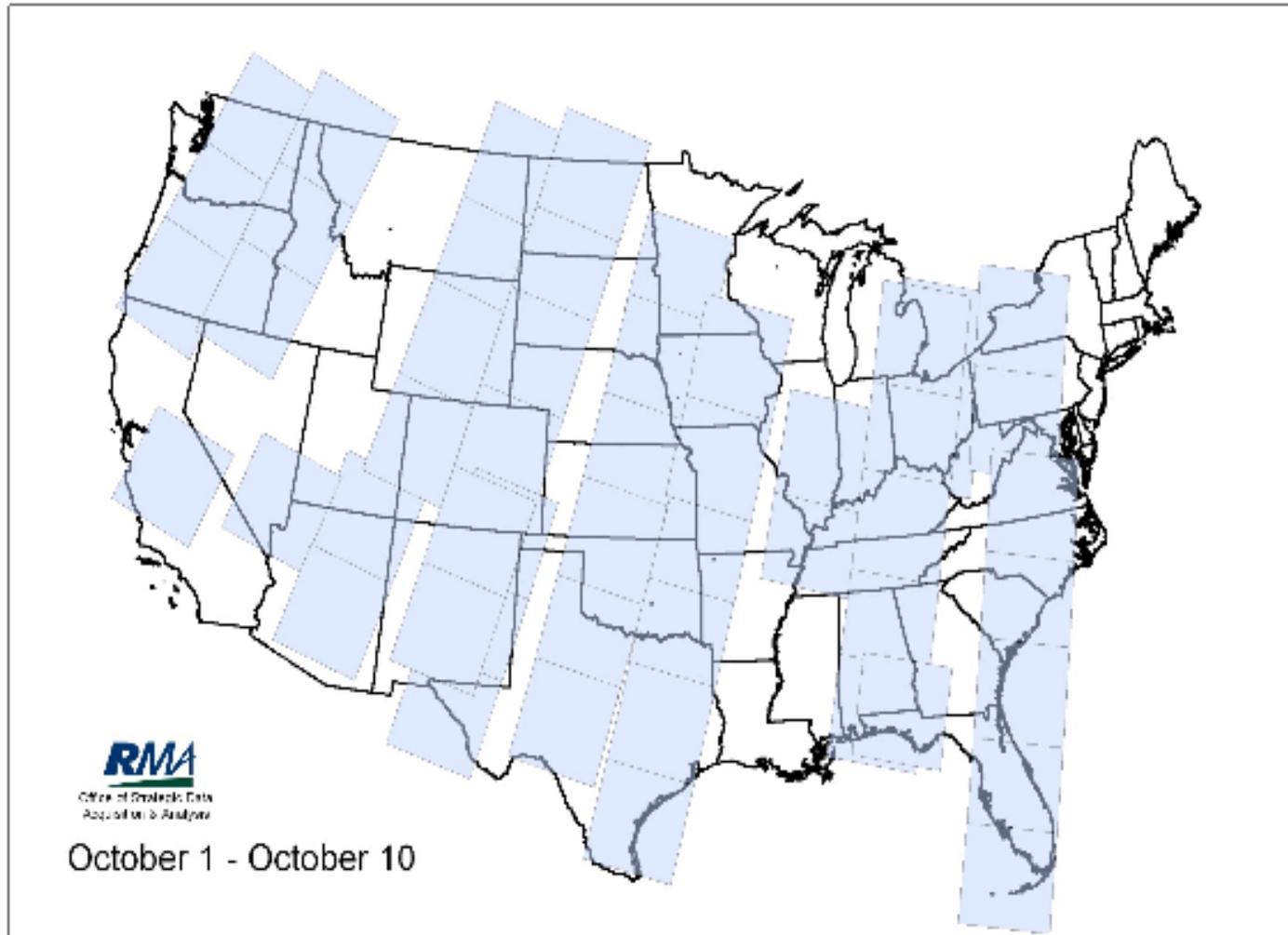
For more information, please contact
Robert Tetrault (202) 720-1071 robert.tetrault@fas.usda.gov

AWiFS Coverage



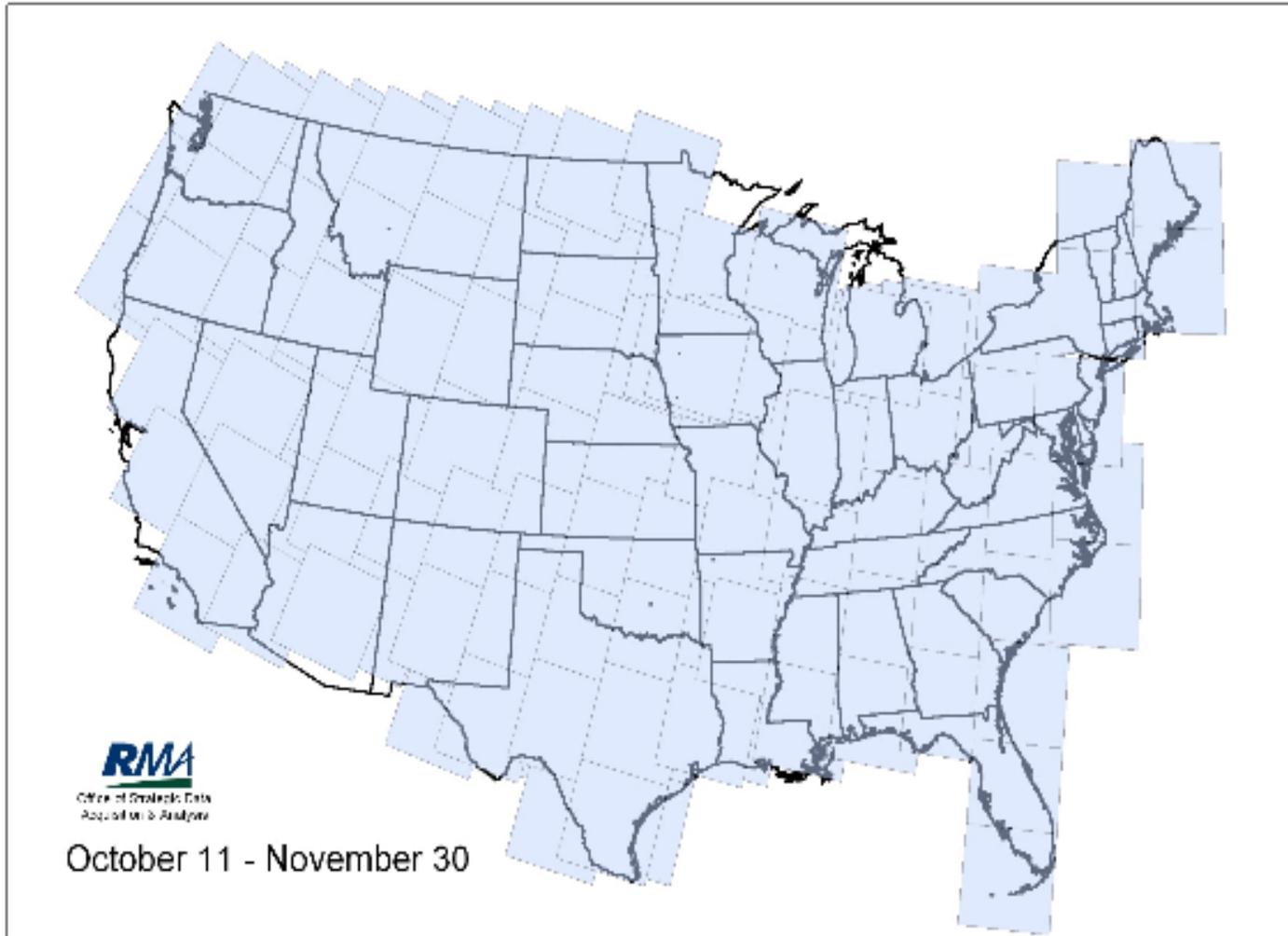
Afghanistan	Brazil	Hungary	Nigeria	Russia	Tunisia
Algeria	Bulgaria	Iraq	Pakistan	Serbia	Ukraine
Argentina	Canada	Iran	Paraguay	Slovakia	United States
Australia	China	Kazakhstan	Poland	South Africa	Zimbabwe
Bangladesh	Ethiopia	Morocco	Romania	Syria	

Additional AWiFS Coverage: October 1-10, 2008

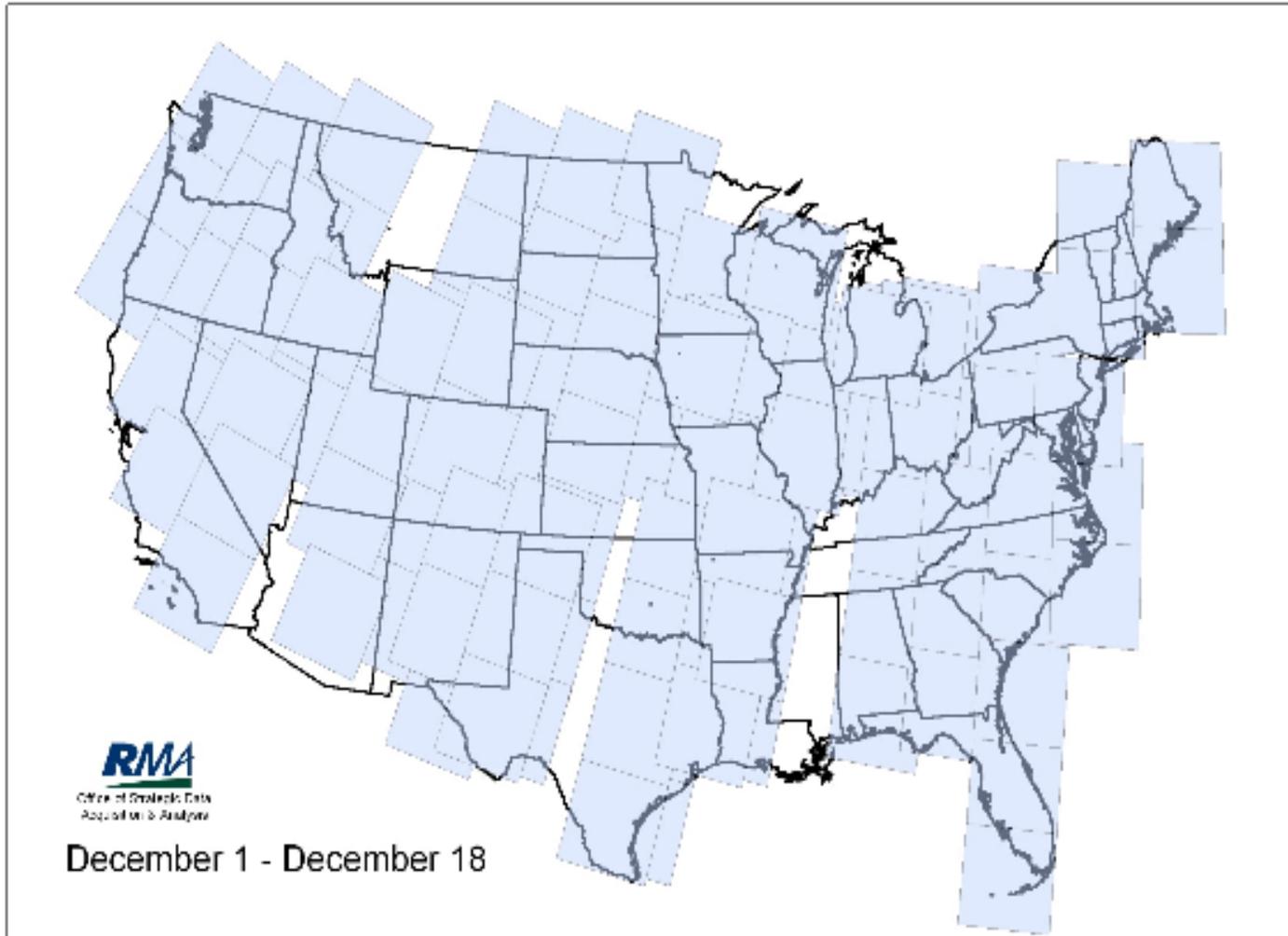


Coverage Limited by Funds

Additional AWiFS Coverage: October 11 - November 30, 2008

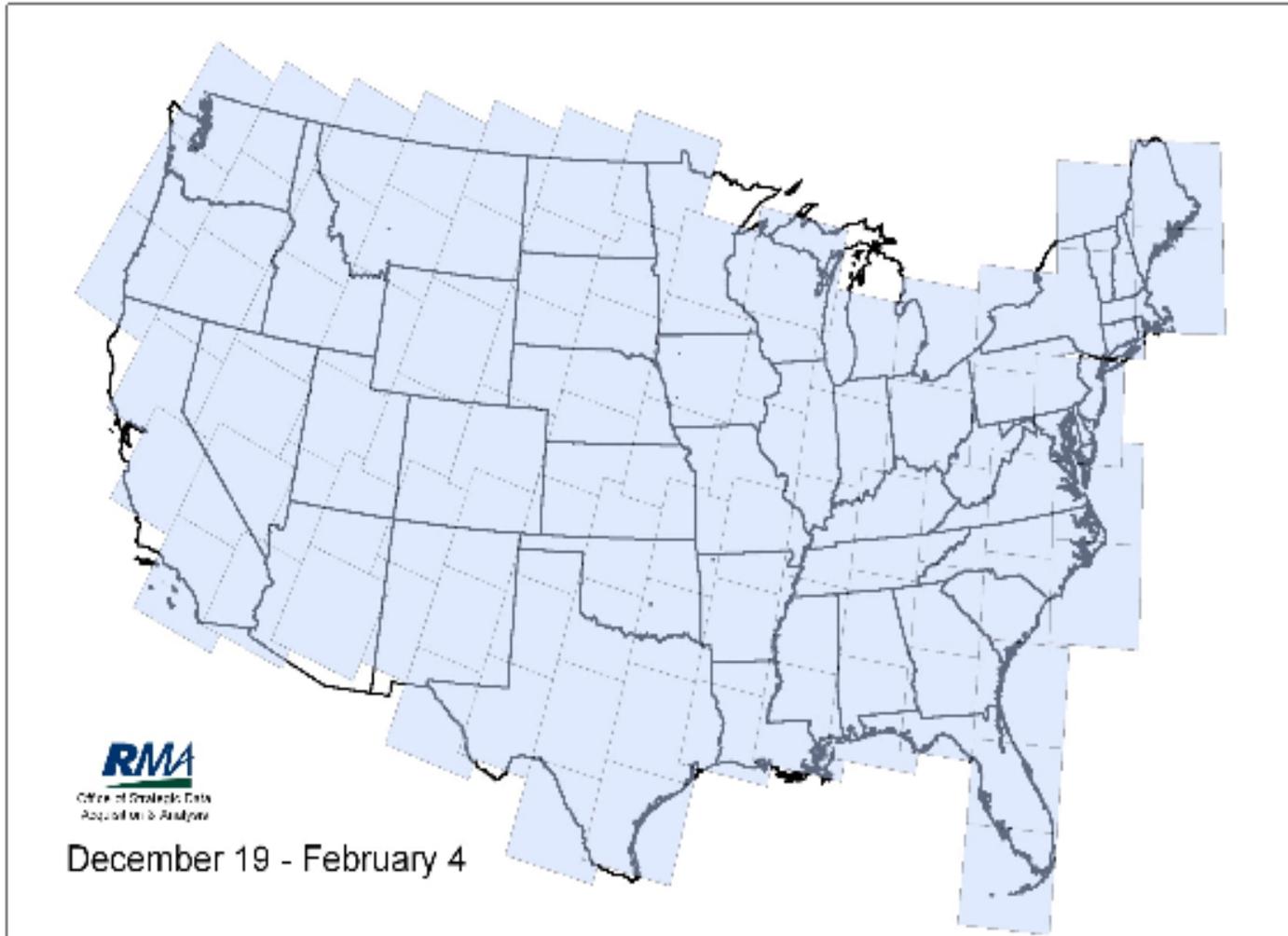


Additional AWiFS Coverage: December 1-18, 2008

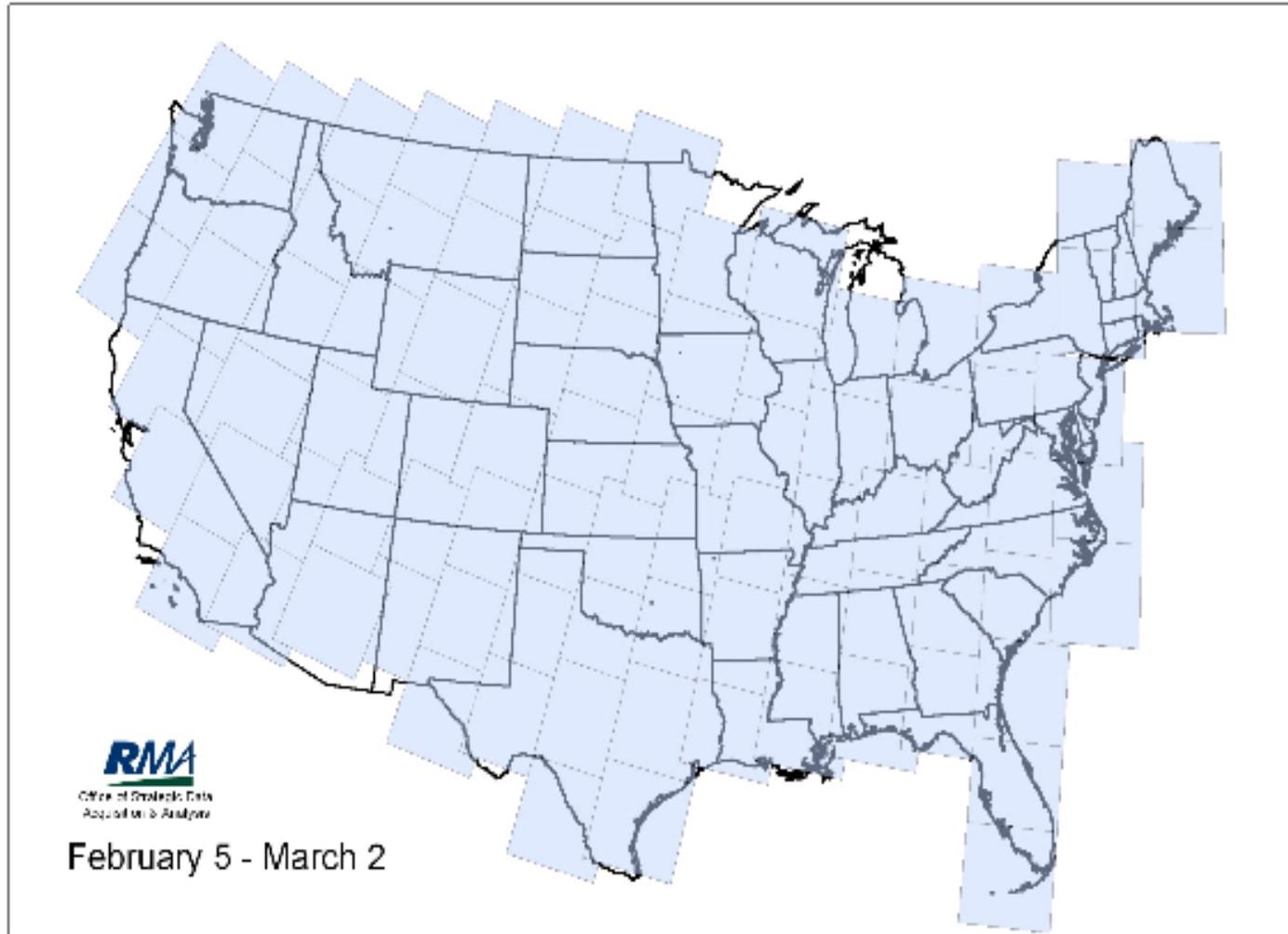


Coverage Limited by Funds

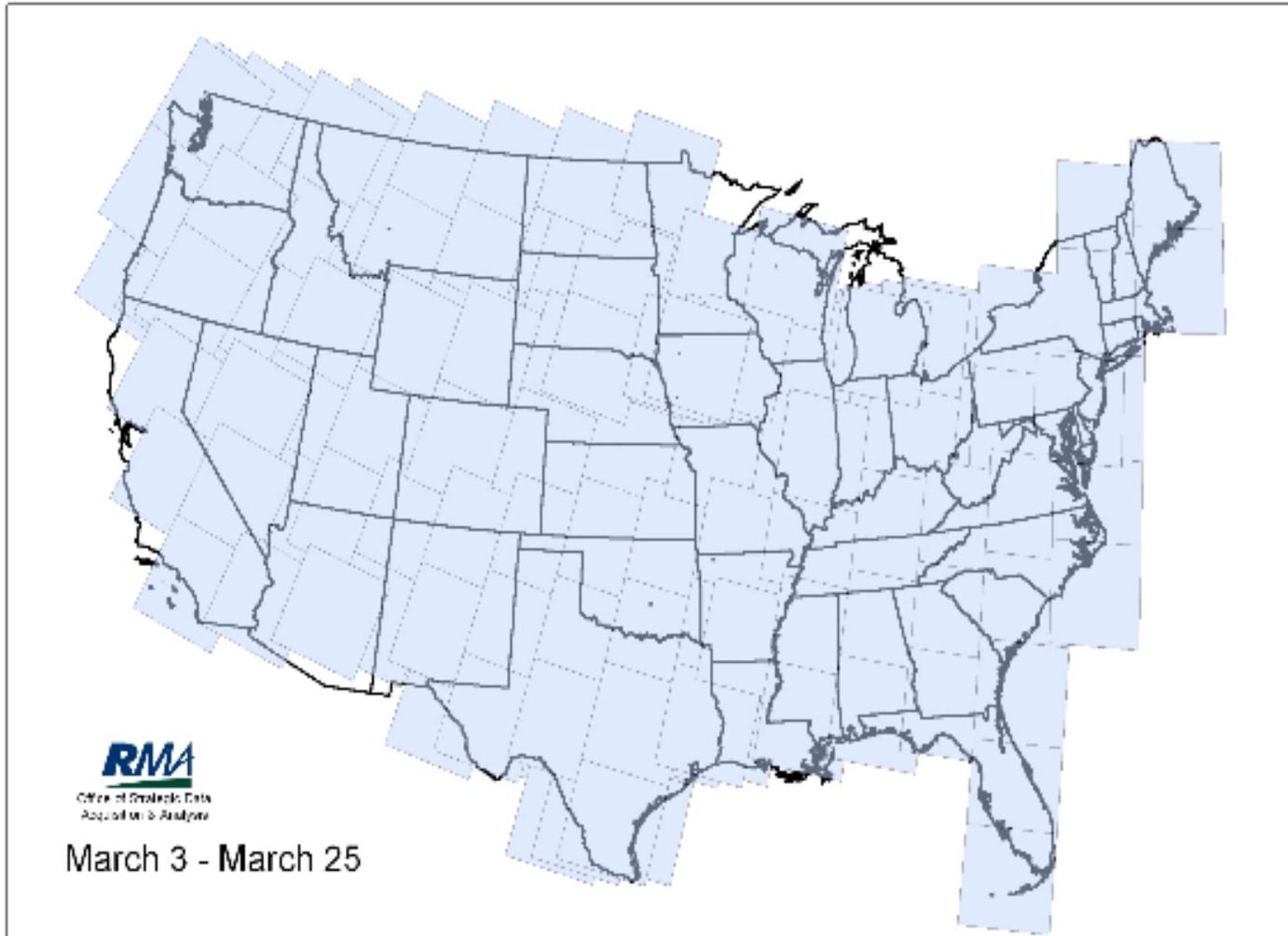
Additional AWiFS Coverage: December 19, 2008 - February 4 2009



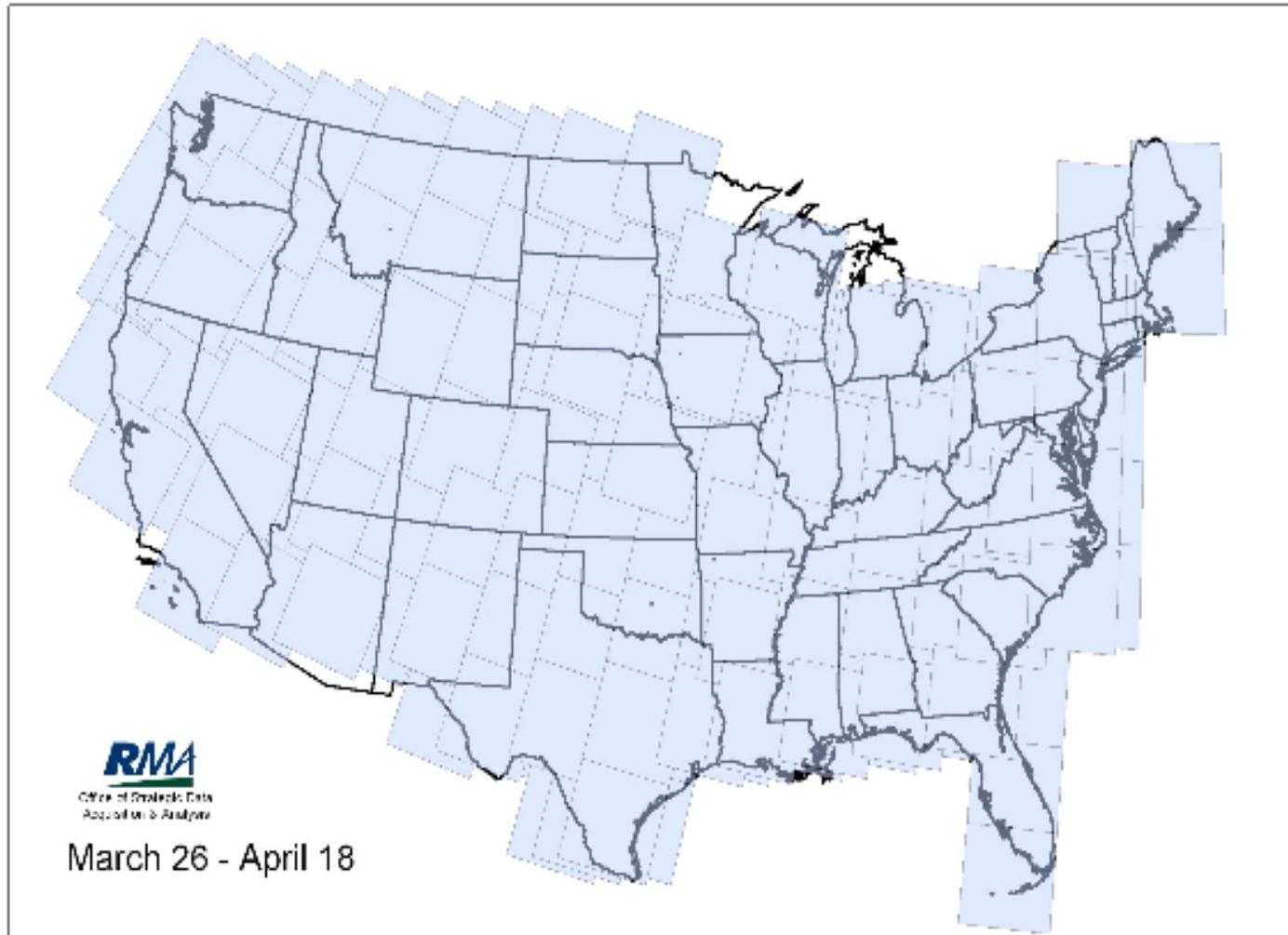
Additional AWiFS Coverage: February 4 2009 - March 2, 2009



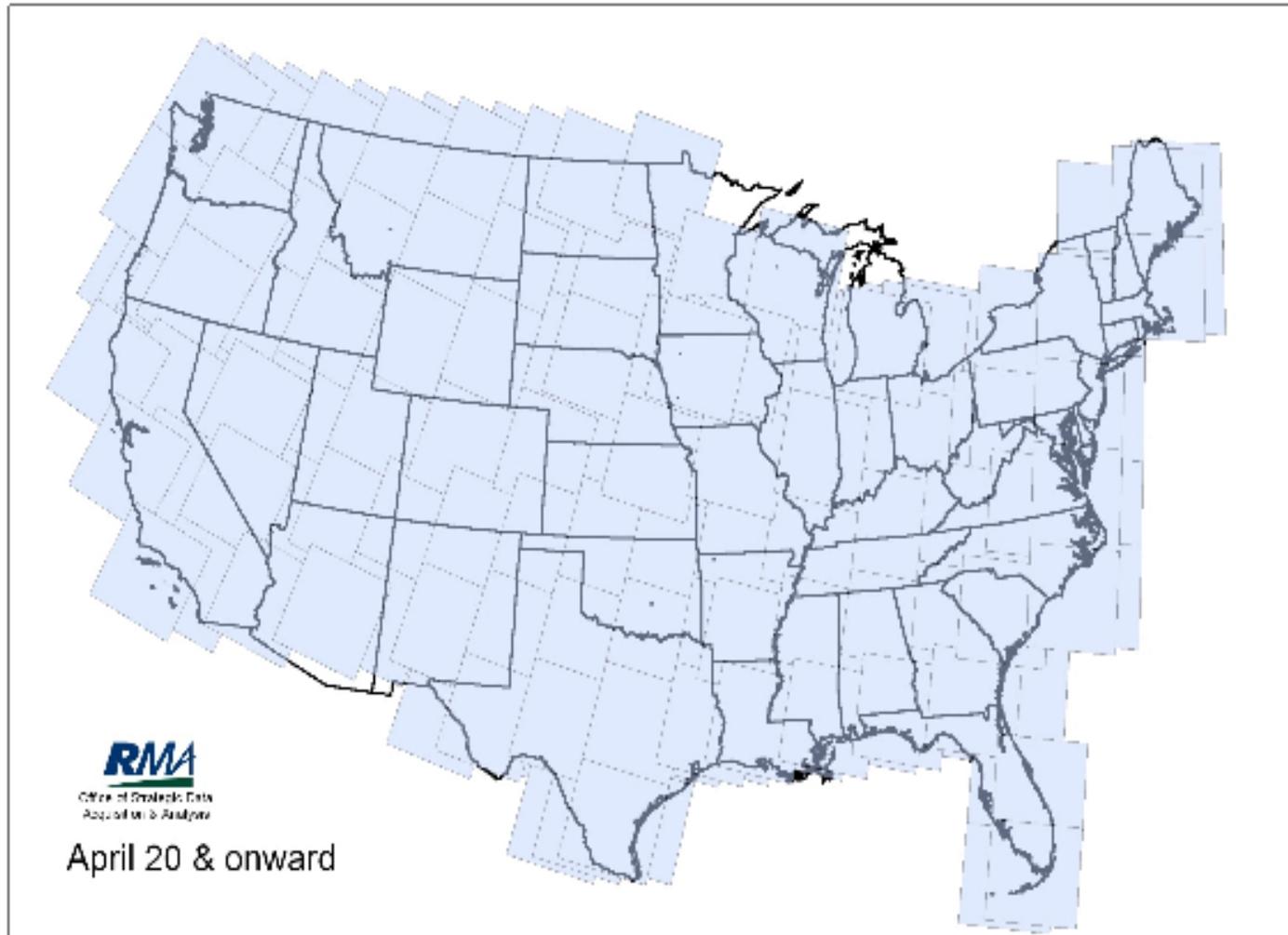
Additional AWiFS Coverage: March 3-25, 2009



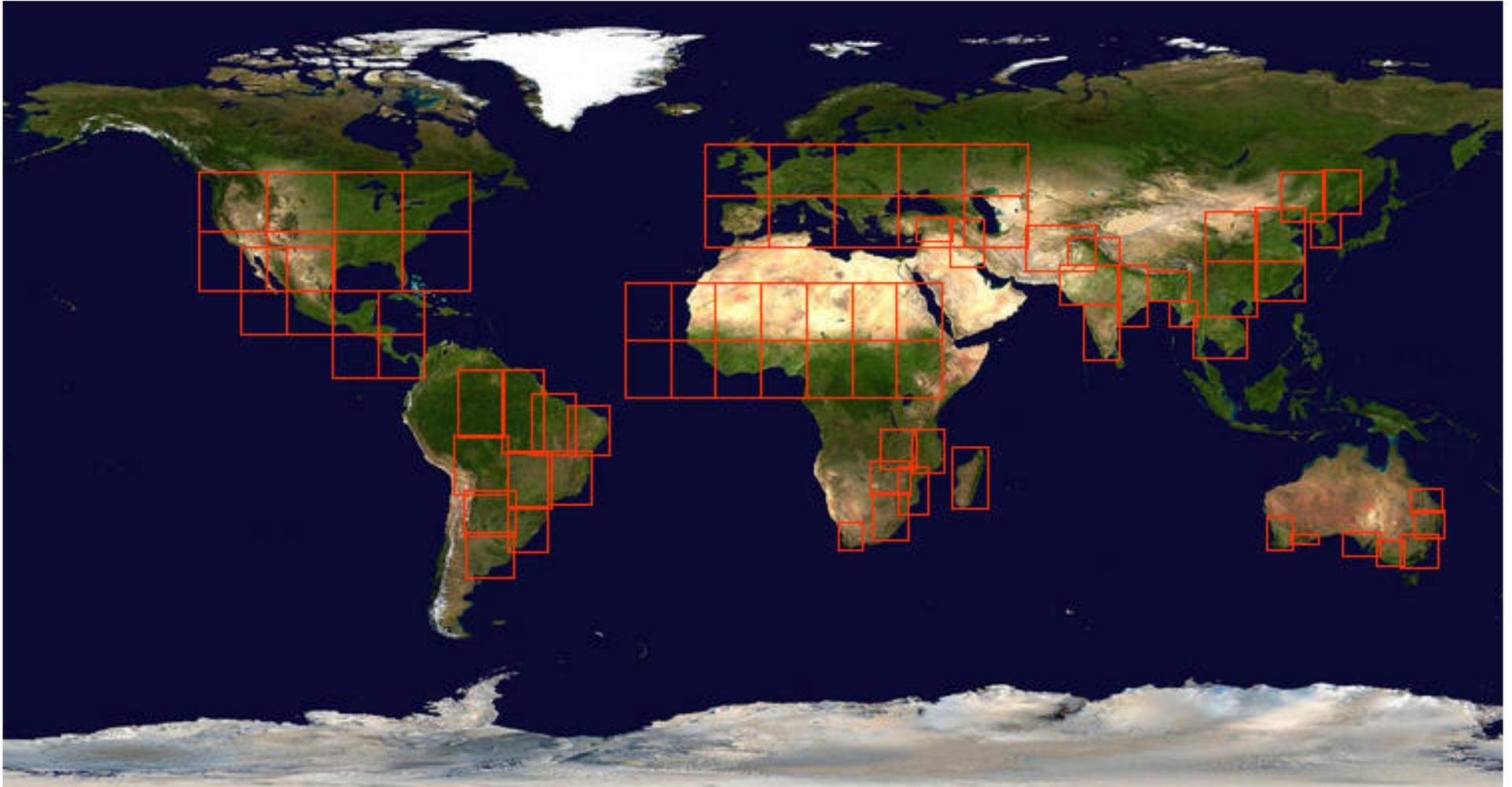
Additional AWiFS Coverage: March 26, 2009 - April 18, 2009



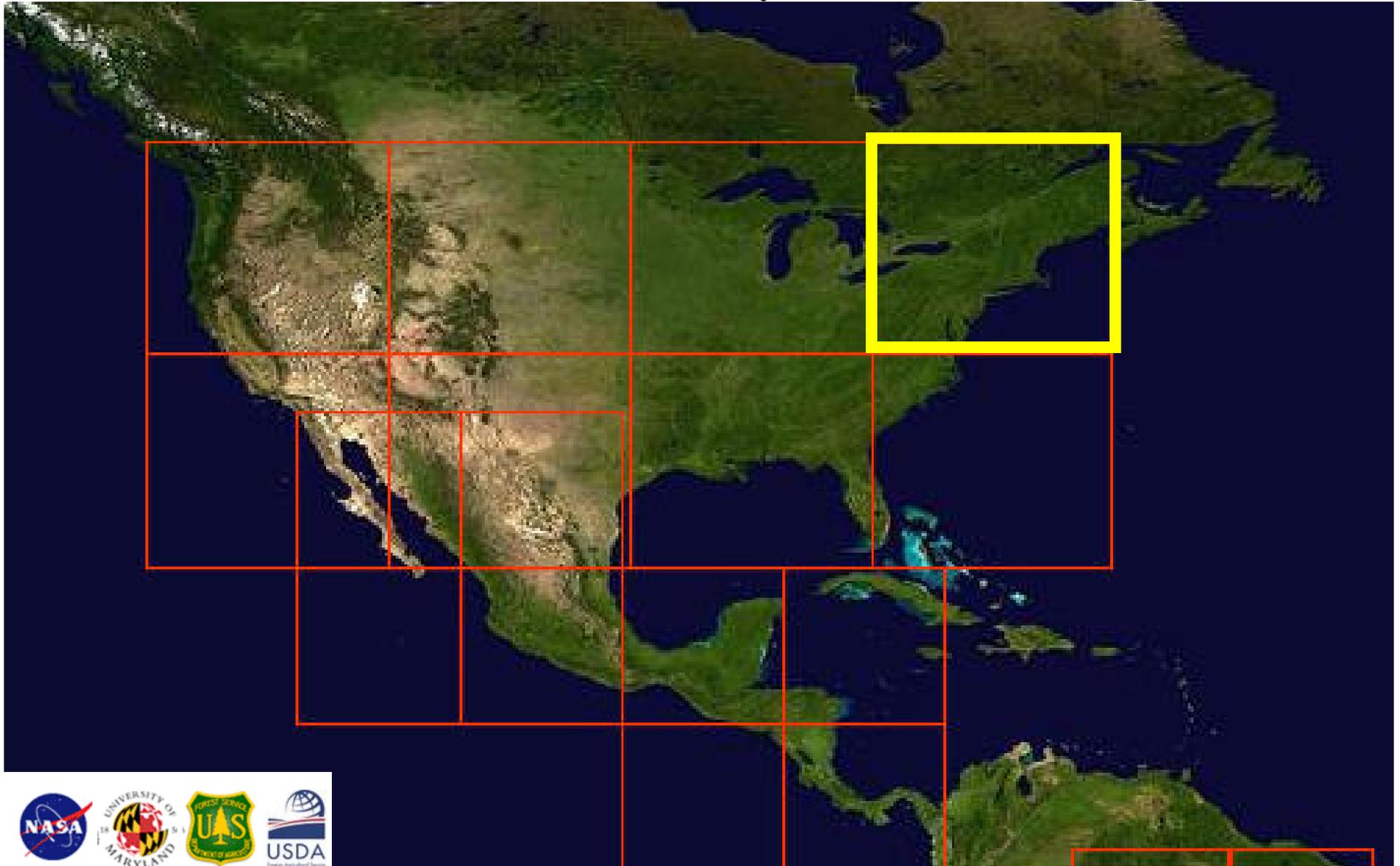
US Areas Collected for Remainder of Growing Season (≥ 5 day Repeat Cycle)

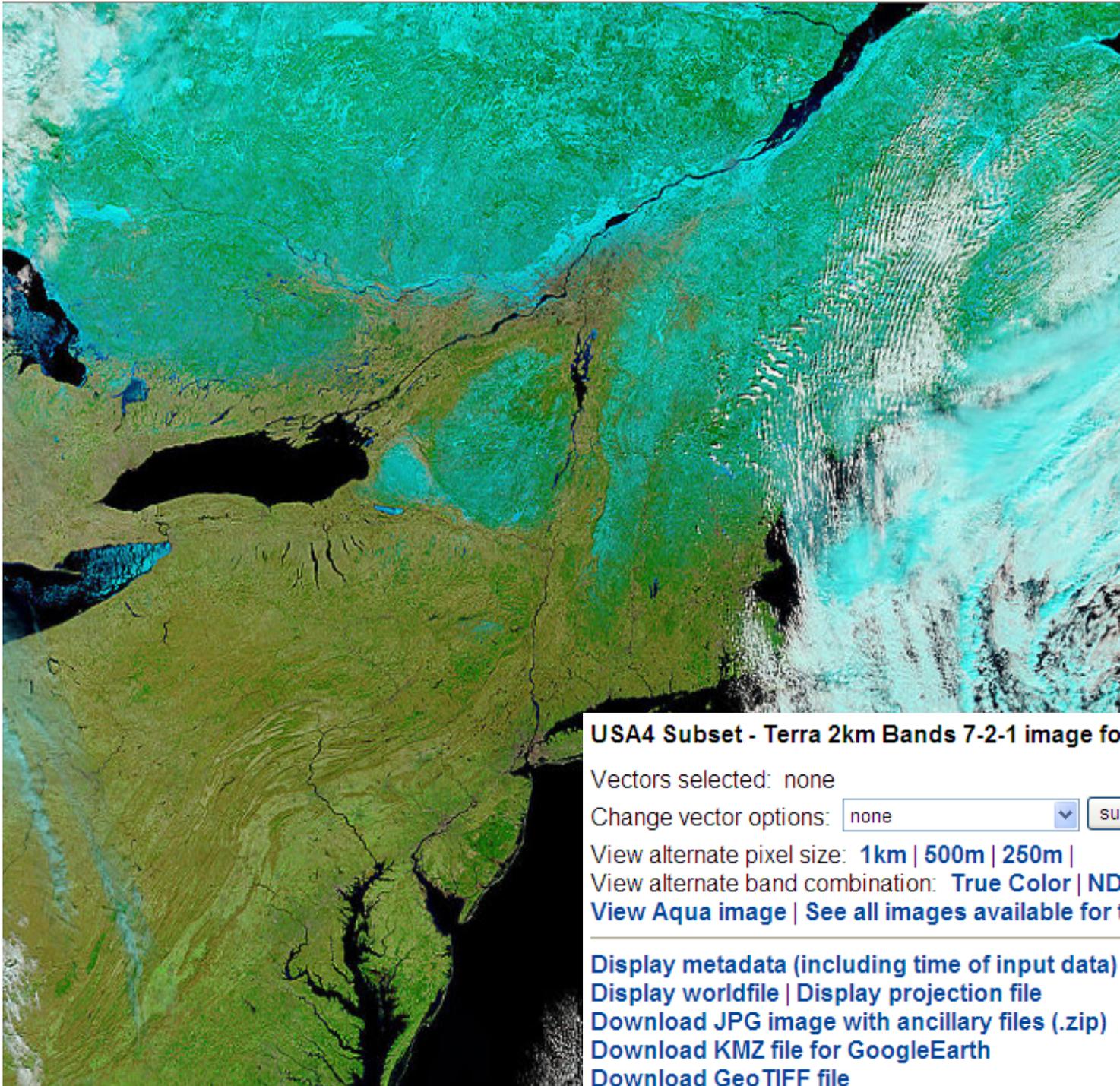


Foreign Agriculture Service MODIS Subsets for Crop Monitoring



Foreign Agriculture Service MODIS Subsets for Crop Monitoring





USA4 Subset - Terra 2km Bands 7-2-1 image for 2009/083 (03/24/09)

Vectors selected: none

Change vector options:

View alternate pixel size: [1km](#) | [500m](#) | [250m](#) |

View alternate band combination: [True Color](#) | [NDVI](#) |

[View Aqua image](#) | [See all images available for this area this day](#) |

[Display metadata \(including time of input data\)](#)

[Display worldfile](#) | [Display projection file](#)

[Download JPG image with ancillary files \(.zip\)](#)

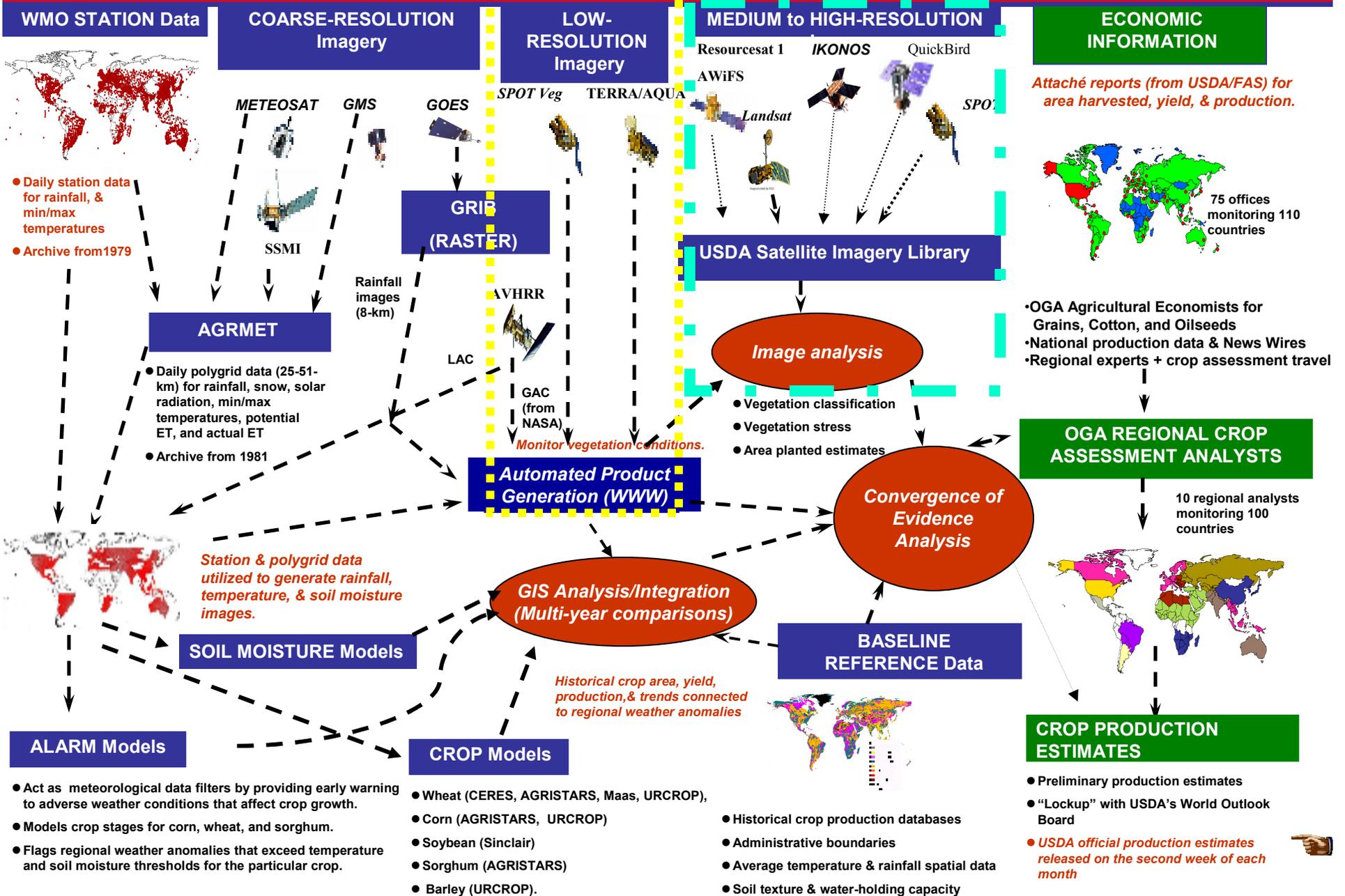
[Download KMZ file for GoogleEarth](#)

[Download GeoTIFF file](#)



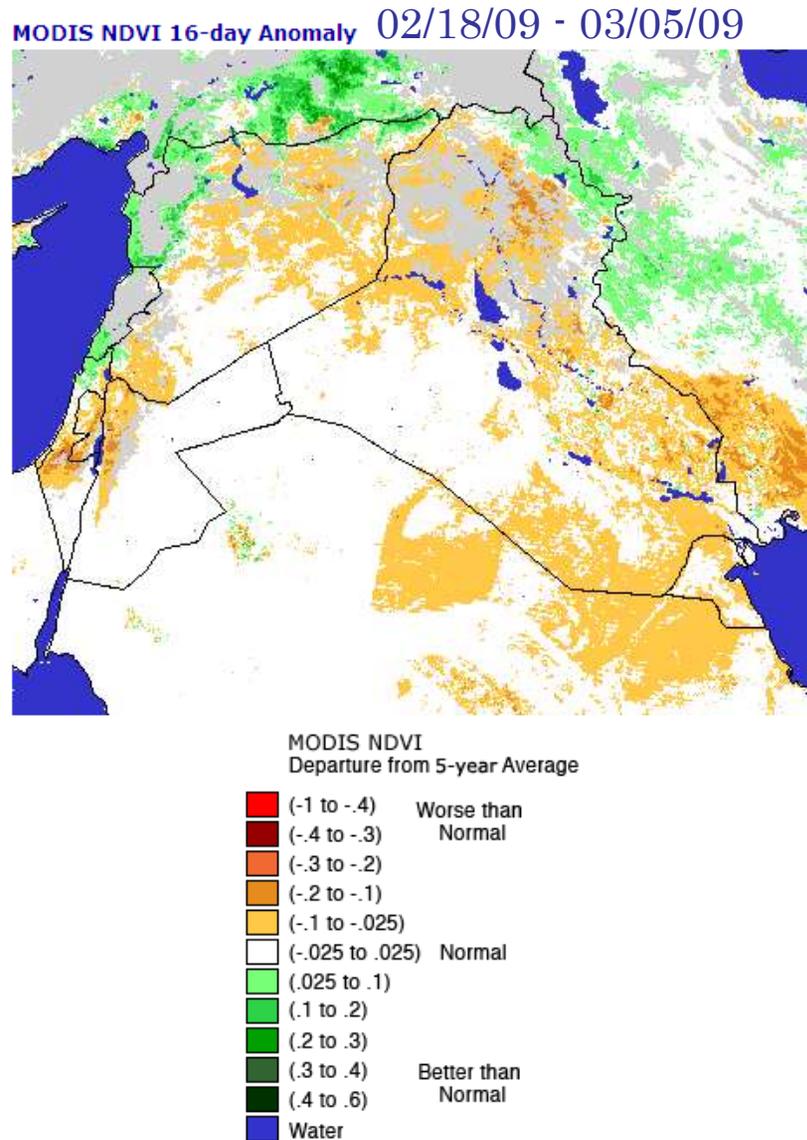
Global Monitoring Data Sources for Estimating Crop Production

FAS/Office of Global Analysis

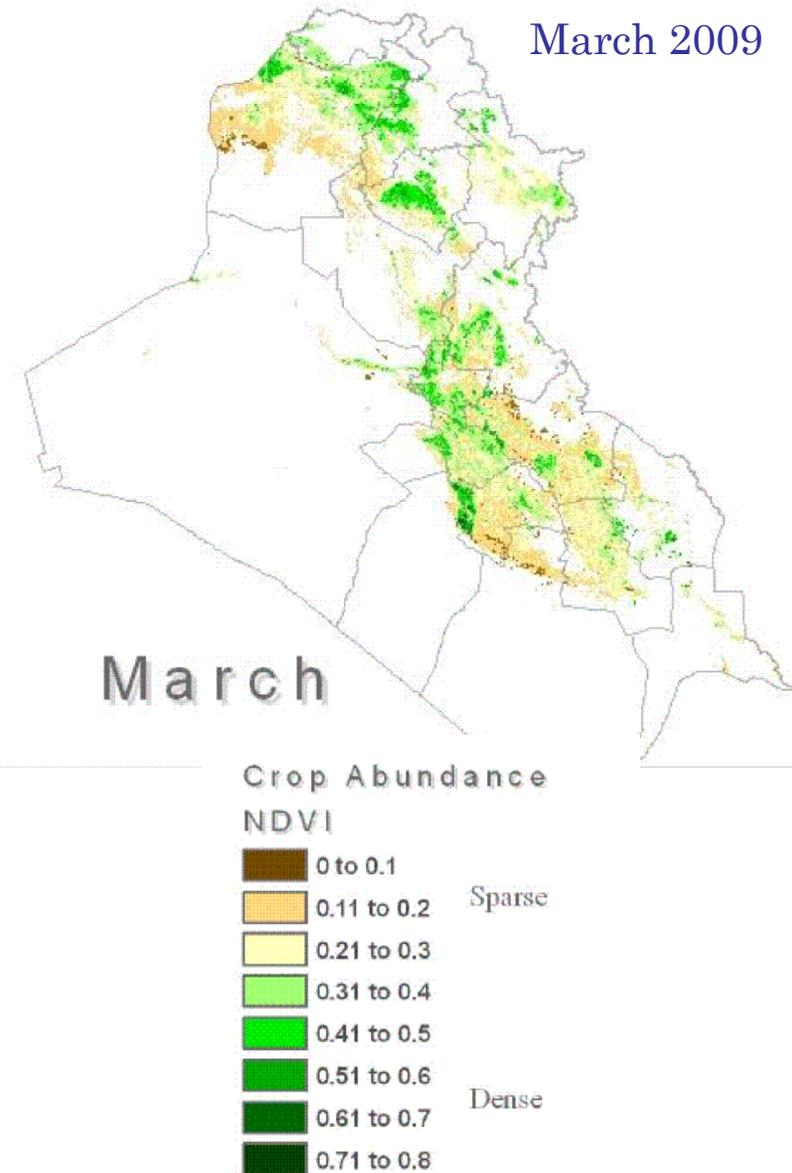


MODIS Processed Data

NDVIs related to 5-Year Average



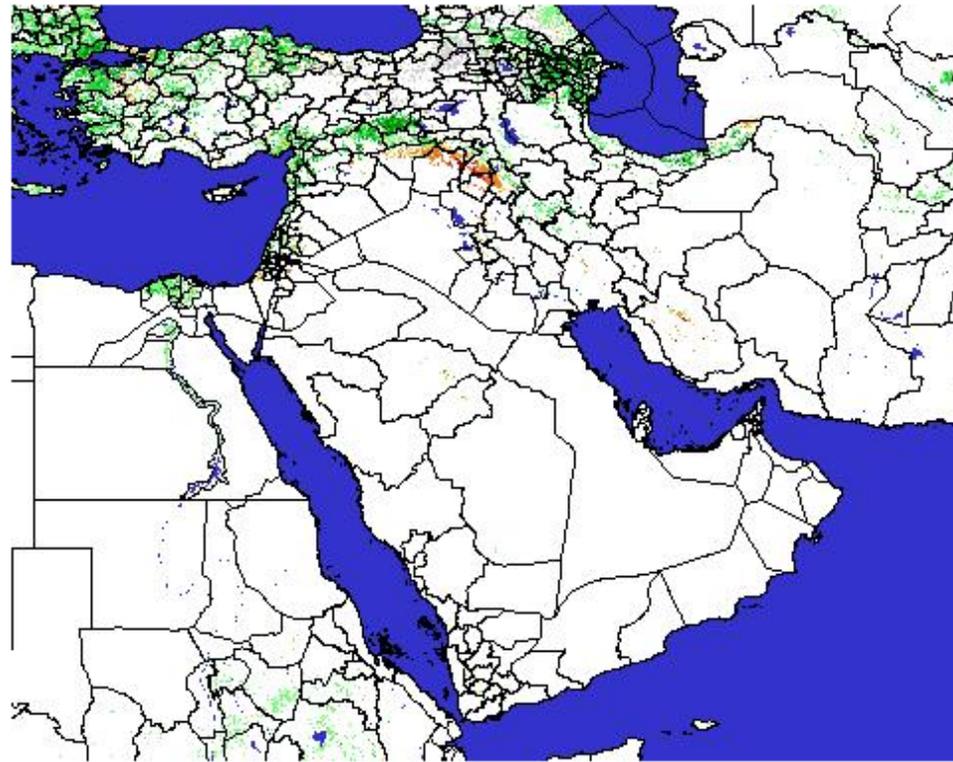
NDVIs related to Cropland



Processing Global SPOT Vegetation NDVI

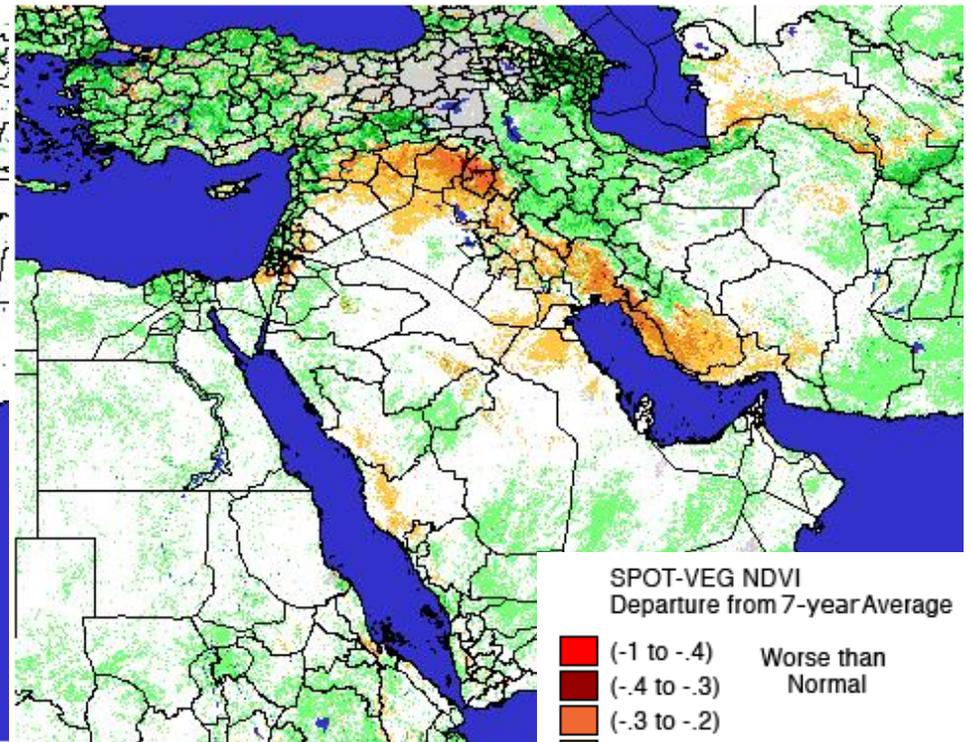
Crop-masked SPOT-VEG Departure from Short-term Average

03/11/09 - 03/20/09

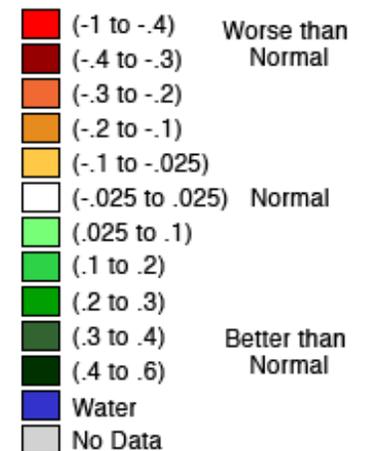


SPOT-VEG Departure from Short-term Average

03/11/09 - 03/20/09



SPOT-VEG NDVI
Departure from 7-year Average





Time Series of Mississippi Flooding June 2008 MODIS Imagery from MODIS Rapid Response System

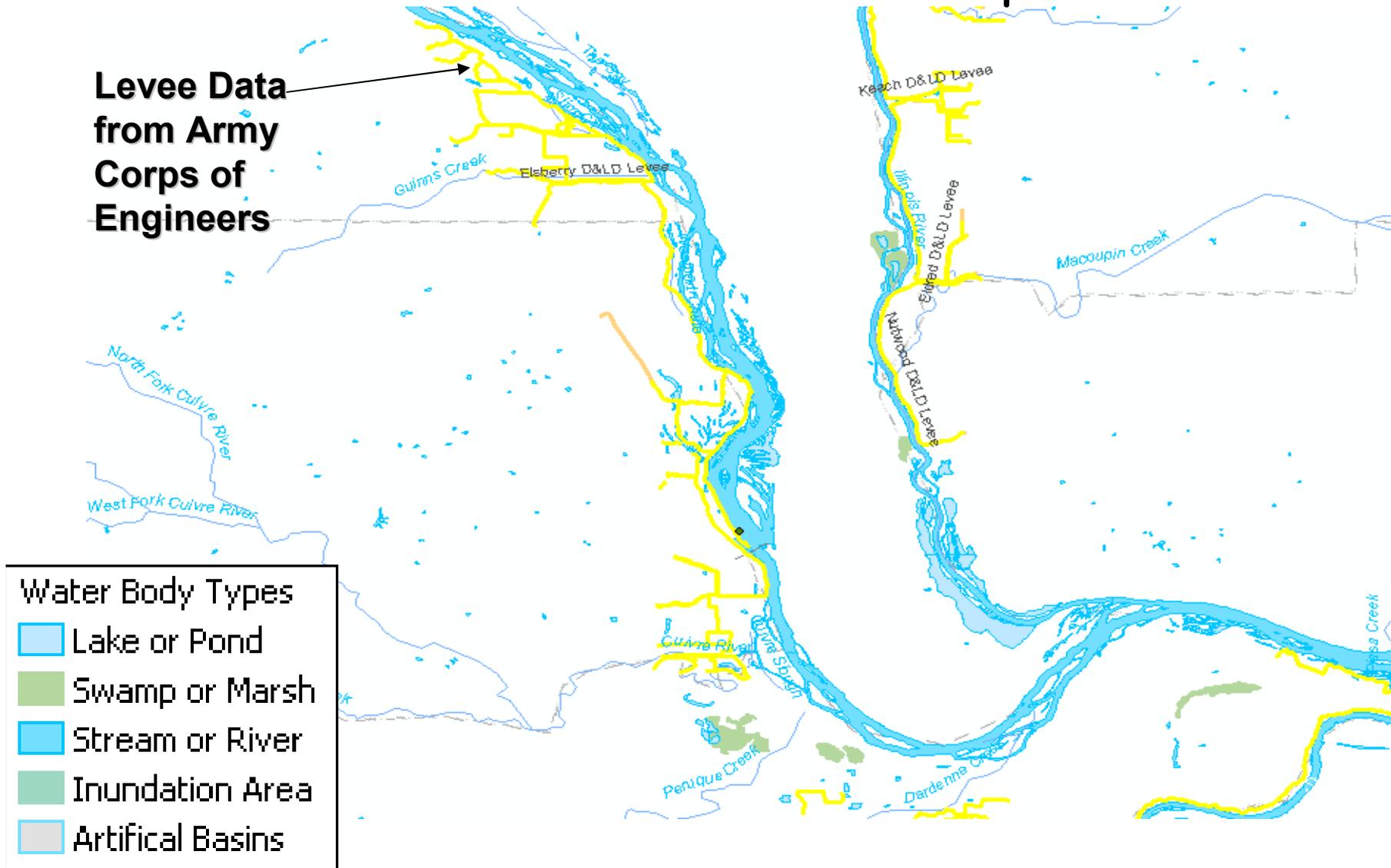
Imagery downloaded from:

<http://rapidfire.sci.gsfc.nasa.gov/subsets/?subset=USA3.2008080>

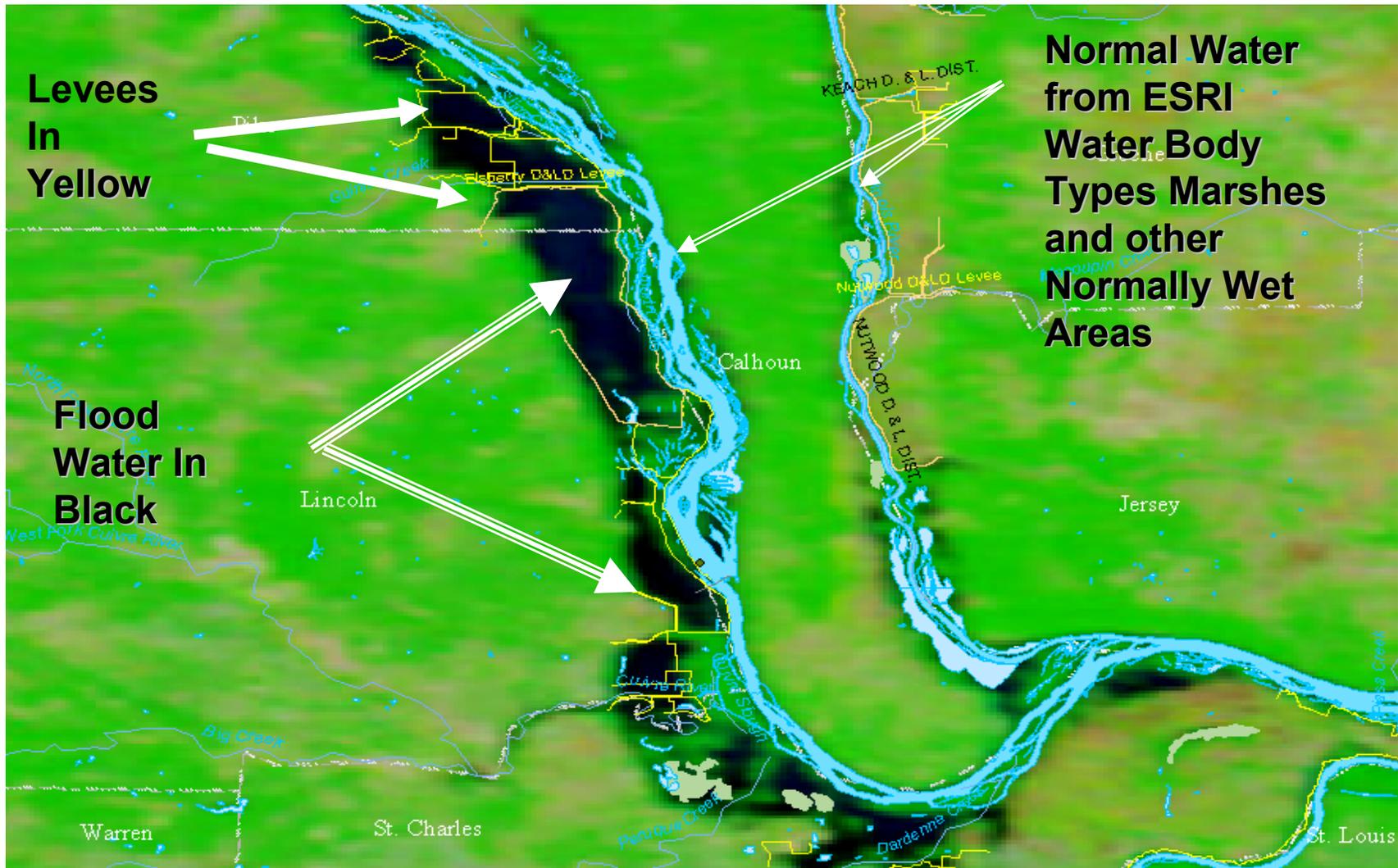


ESRI Water Body Types Used to Display Normal Water and Swaps...

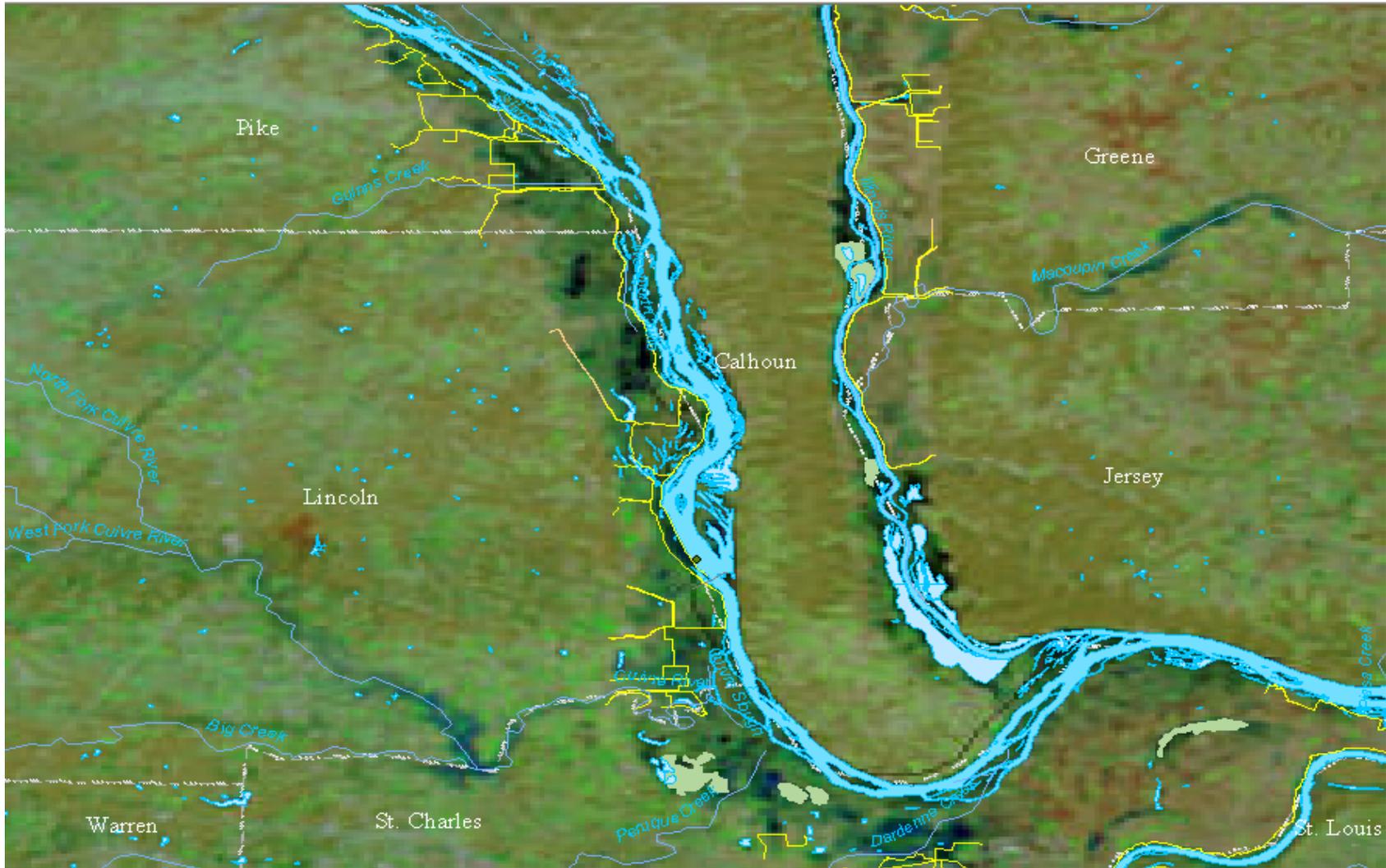
Levee Data
from Army
Corps of
Engineers



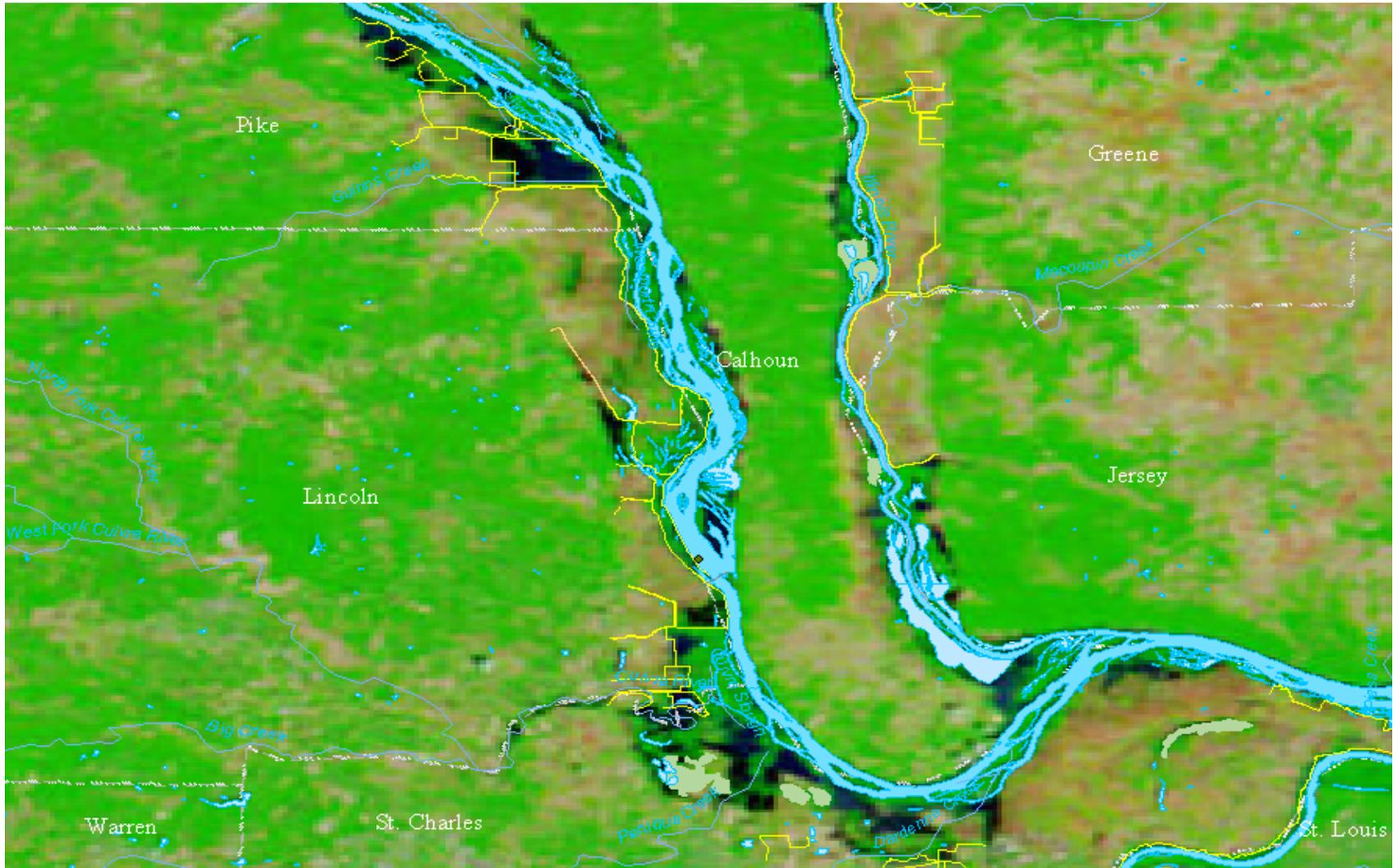
About the Slides



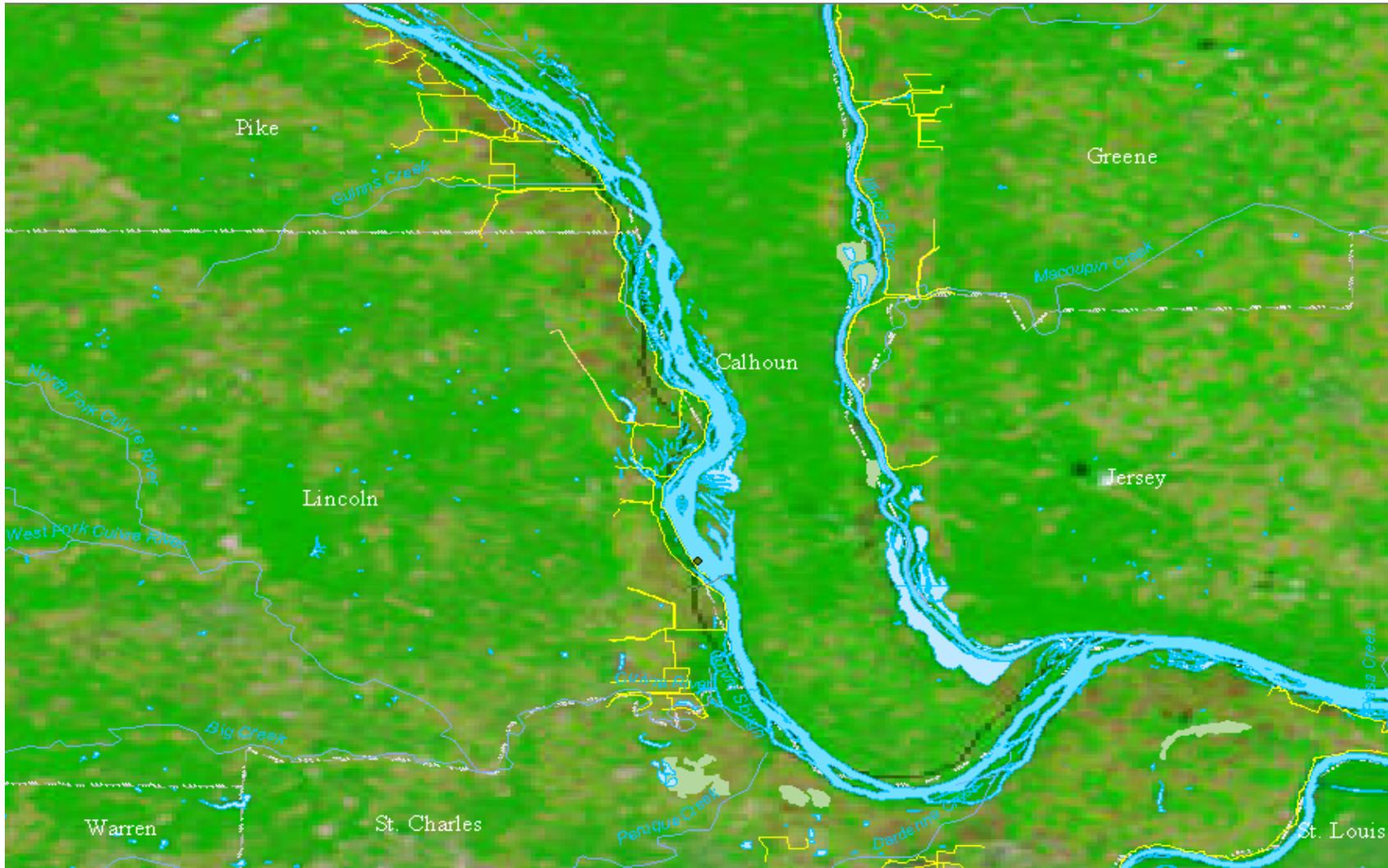
March 20, 2008



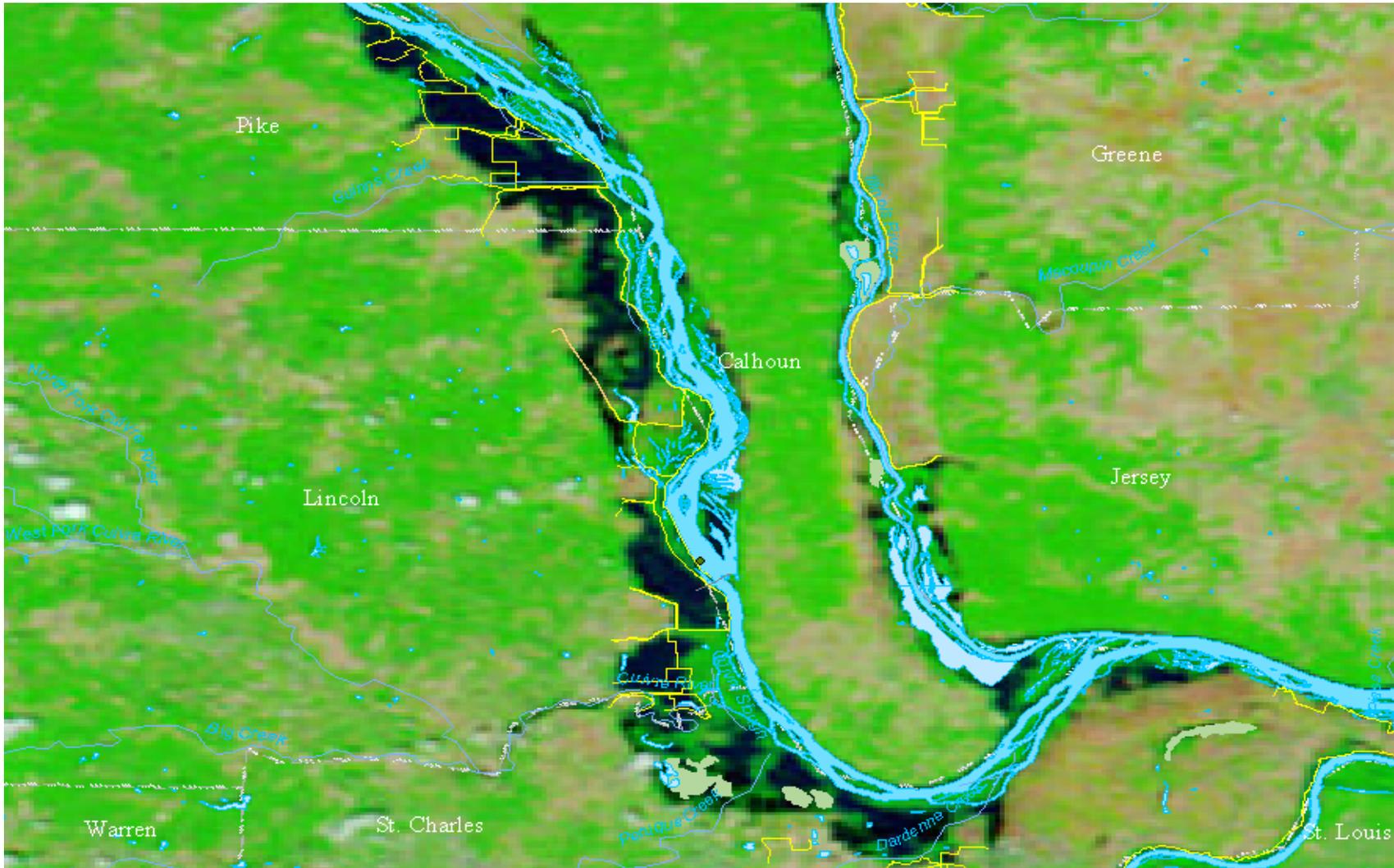
June 17, 2008



June 12, 2007

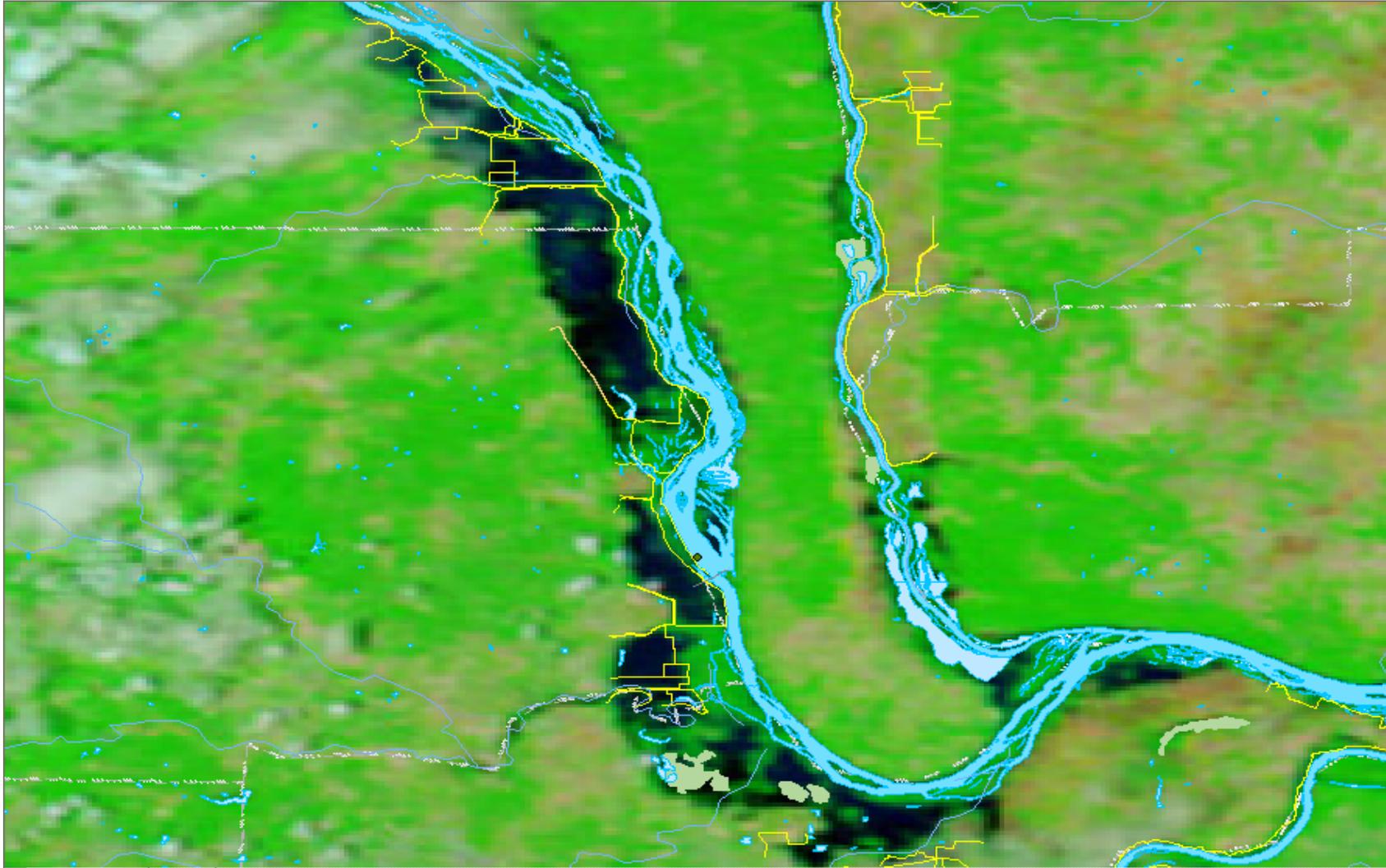


June 19, 2008

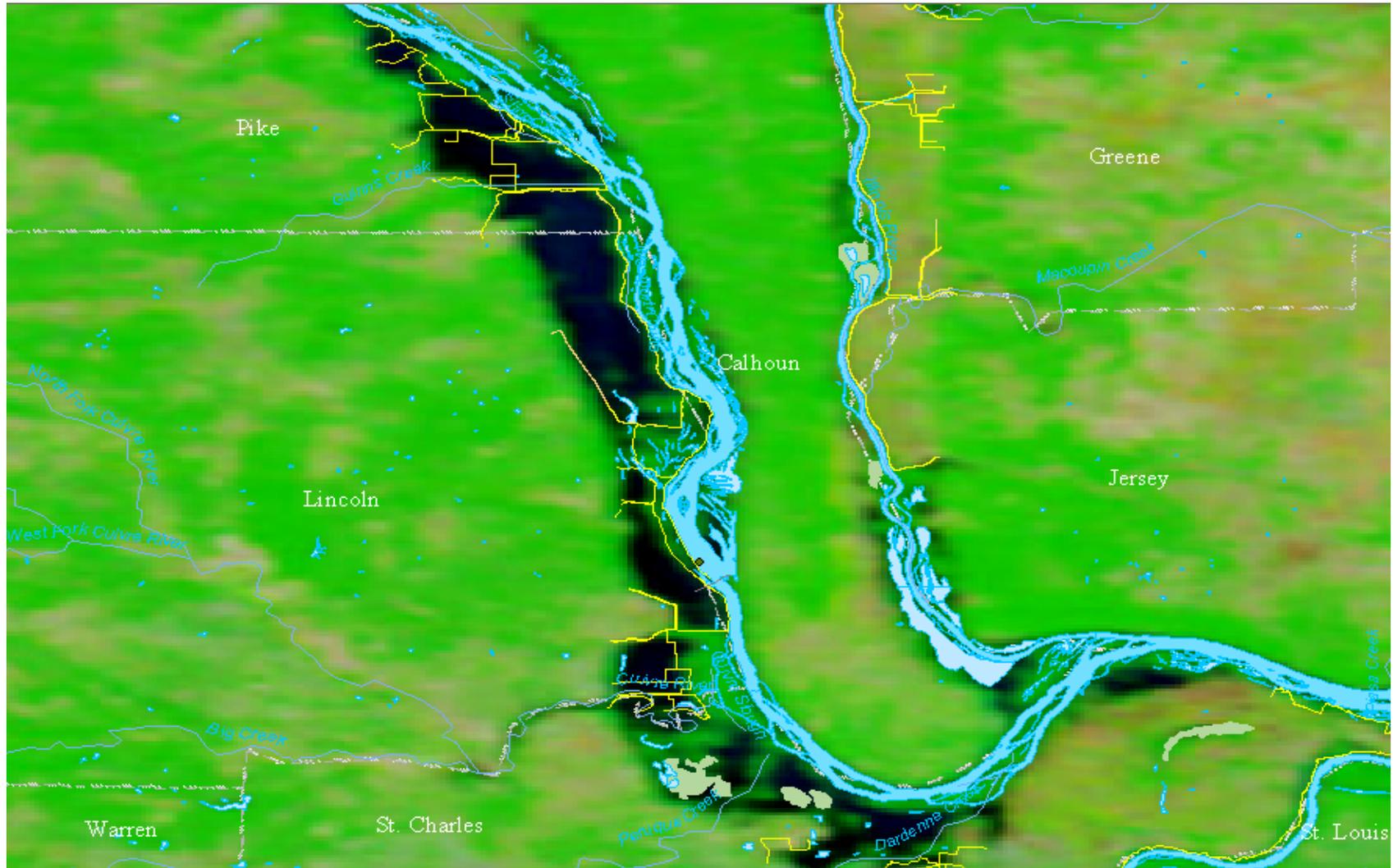


MODIS Rapid Response Team

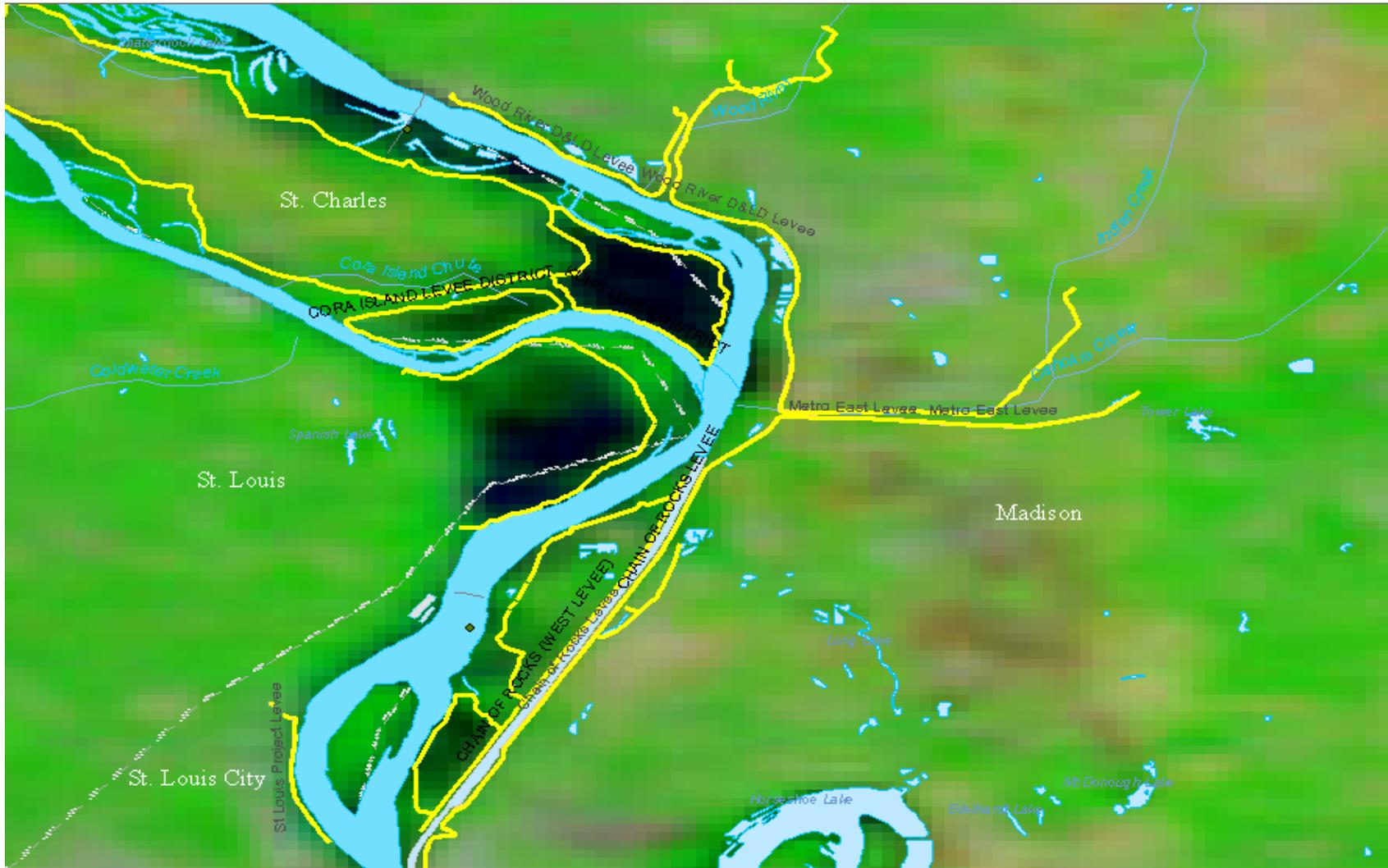
June 21, 2008



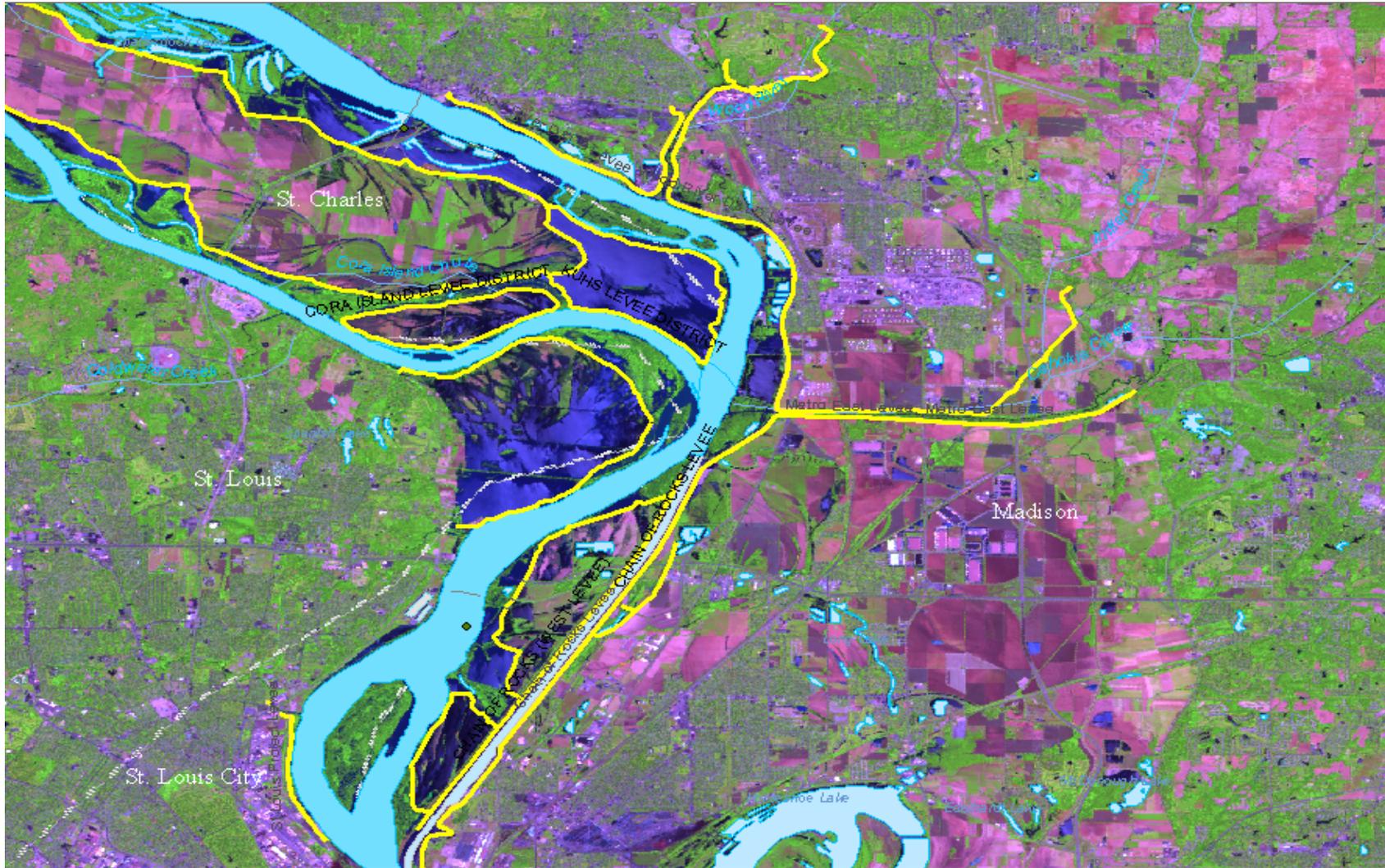
June 23, 2008



June 23, 2008 MODIS



June 23, 2008 SPOT



The additional Spatial Resolution of Spot 5.



MODIS Active Fire Mapping Program

- Generate “value added” geospatial fire products
 - ◆ Current, synoptic view of the wildfire situation in a geospatial context
 - ◆ Accurate and current information on fire locations, fire intensity, burned area extent and smoke
 - ◆ Aid strategic planning and asset allocation at regional/national level
 - Prioritize allocation of suppression assets
 - Focus tactical airborne reconnaissance assets
 - ◆ Monitor fire activity in remote areas



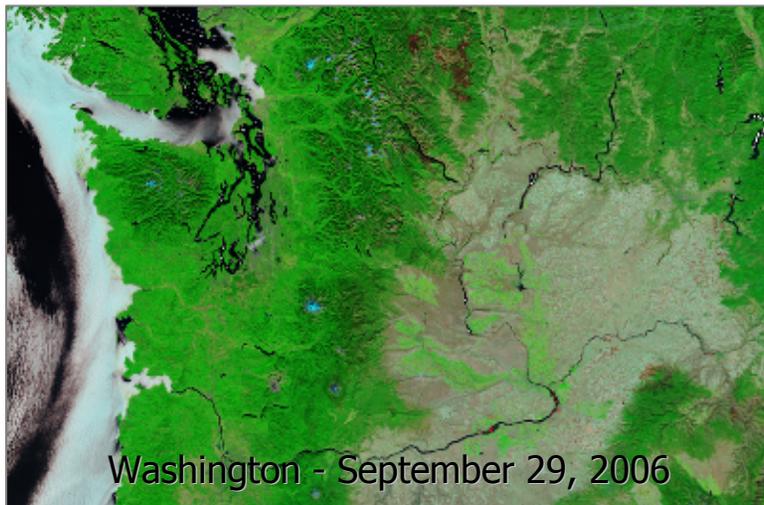


MODIS Active-Fire Products

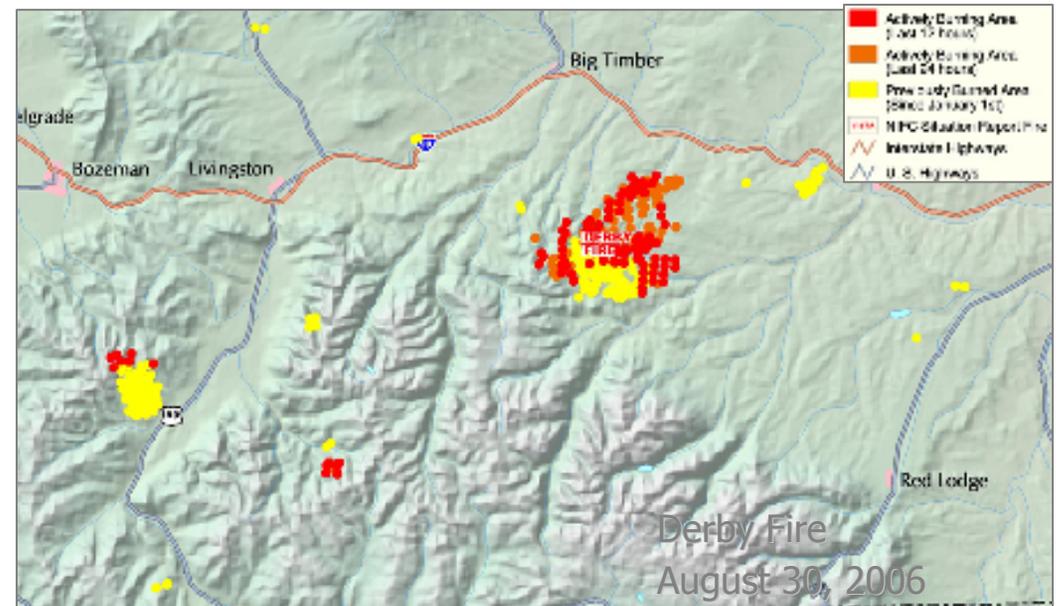


Utah - June 23, 2006

- Products to assist **strategic** planning
 - Fire detection maps, imagery and geospatial data
 - Not a replacement for airborne thermal infrared mapping systems
- Available for United States & Canada



Washington - September 29, 2006



NIROPS Aircraft

Main function: Wildfire mapping from **April-November**



144Z: Cessna Citation Bravo



149Z Beechcraft 200 Super King Air



PHOENIX

FS Phoenix sensor is the primary tactical fire sensor.

IR Analysts Interpret Orthorectified Imagery to create Fire Boundary Shapefiles.

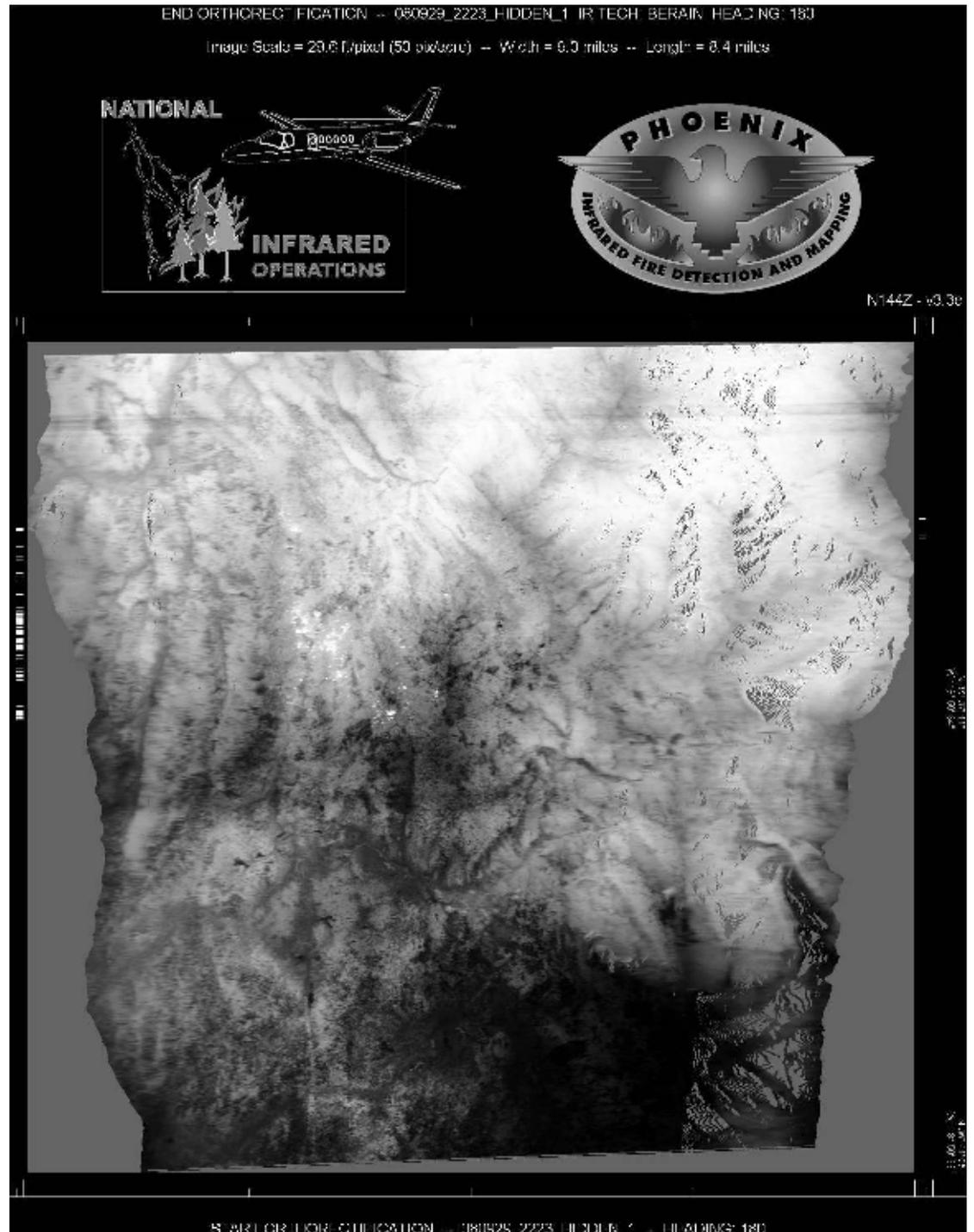
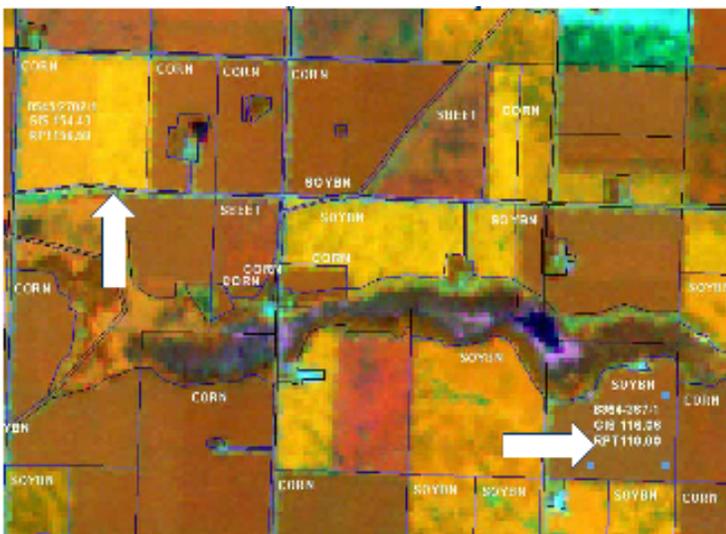
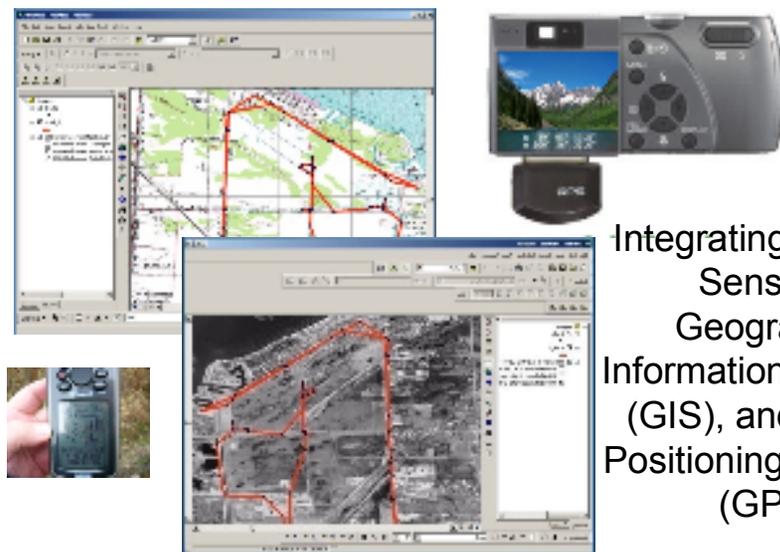


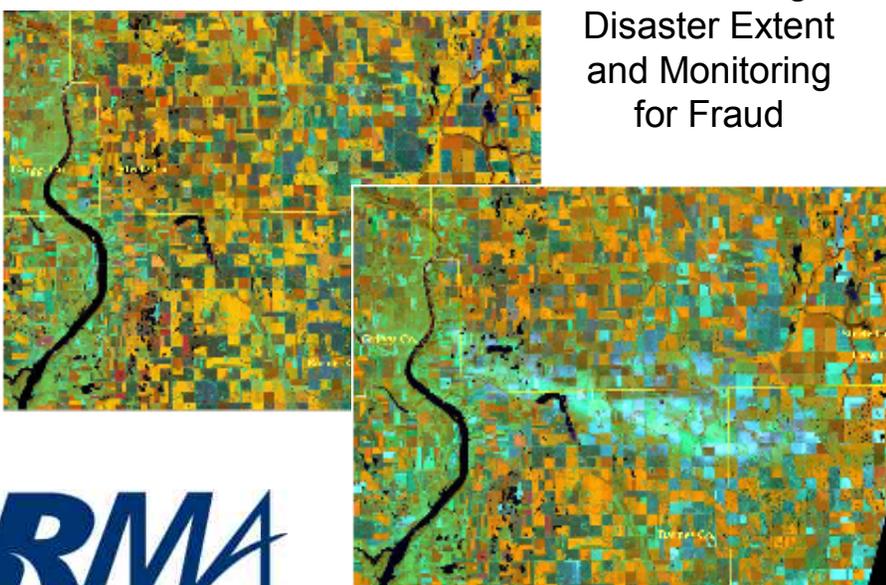
Image Processing / Information Extraction



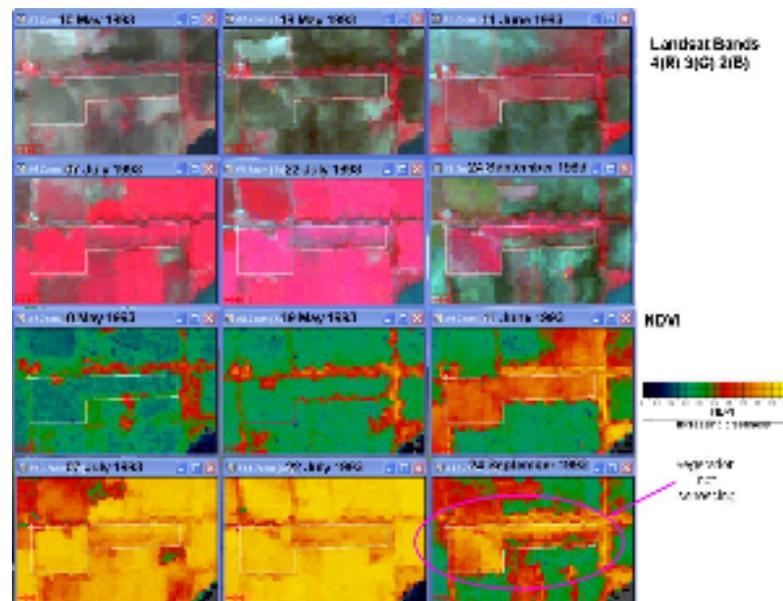
Tracking Reported Crops & Monitoring for Discrepancies



Integrating Remote Sensing, Geographic Information Systems (GIS), and Global Positioning Systems (GPS)



Determining Disaster Extent and Monitoring for Fraud

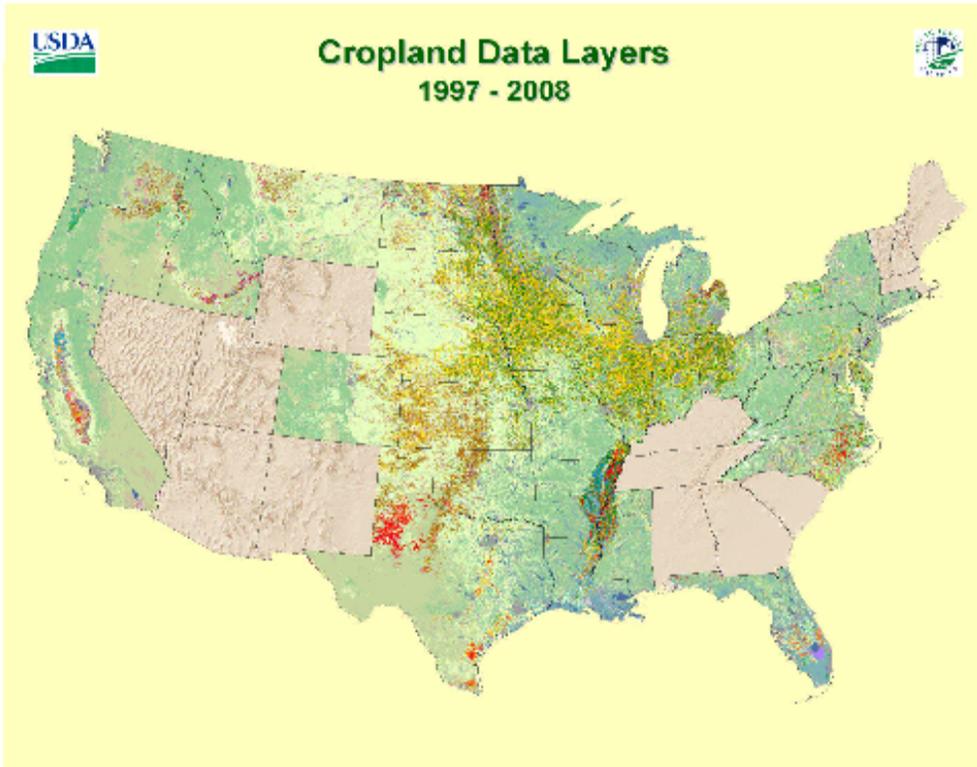


Forensic Reconstruction and Analysis of Crop Histories





AWiFS Imagery has allowed for Increased Cropland Data Layer production.



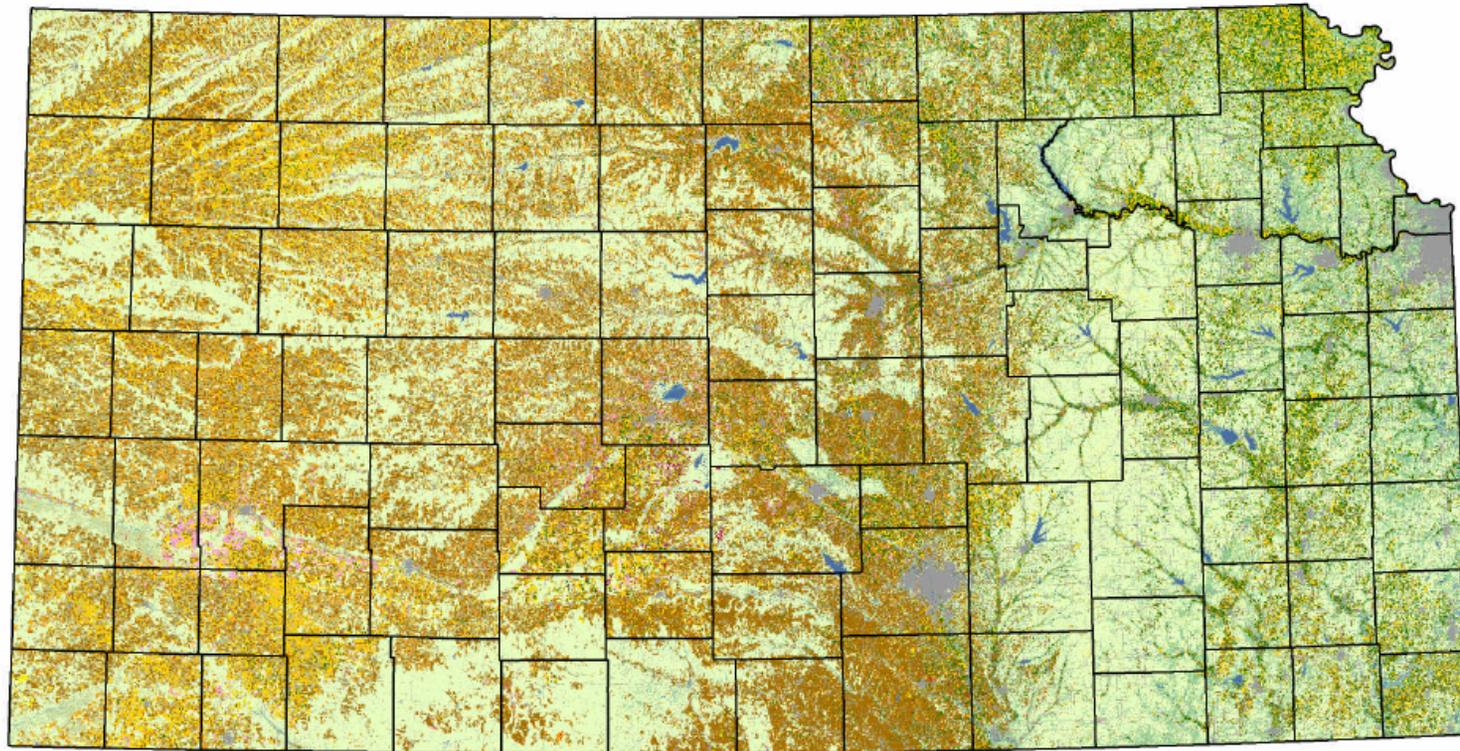
Traditional (1997-2003)	Expansion (2004-2008)	Additions for 2009
North Dakota	Louisiana ('04)	California
Arkansas	South Dakota ('06)	Washington
Mississippi	Ohio ('06)	Montana
Illinois	Minnesota ('06)	Kentucky
Iowa	Kansas ('06)	North Carolina
Indiana	Oklahoma ('06)	Georgia
Missouri	Michigan ('07)	
Nebraska	Colorado ('08)	
Wisconsin	Texas ('08)	

Expansion of NASS Cropland Data Layer

1. Increased amount of imagery for same cost.
2. Improved commercial software.
3. Increased amount of ground truth data.



Kansas 2008 Cropland Data Layer



Land Cover Categories

(Ordered by Decreasing Acreage)

Agricultural

- Winter Wheat
- Corn
- Sorghum
- Soybeans
- Alfalfa
- W. Wht./Soy. Dbl. Crop.
- Sunflowers
- Rye

- Cotton
- Other Small Grains
- Clover/Wildflowers
- Oats
- Potatoes
- Seed/Sod Grass
- Canola
- Millet

- Other Crops
- Barley
- Other Tree Nuts
- Peas
- Apples
- Misc. Vegs. & Fruits

Non-Agricultural

- Grass/Pasture/Non-Ag
- Urban/Developed
- Woodland
- Fallow/Idle Cropland
- Water
- Wetlands
- Shrubland
- Barren

Aerial





Date: 24MAR09
TOT: 1447Z
Location: Abercrombie, ND
Latitude: N 46° 26.56' / Longitude: W 096° 43.70'
Object: Broadway Abercrombie



USDA Aerial Programs

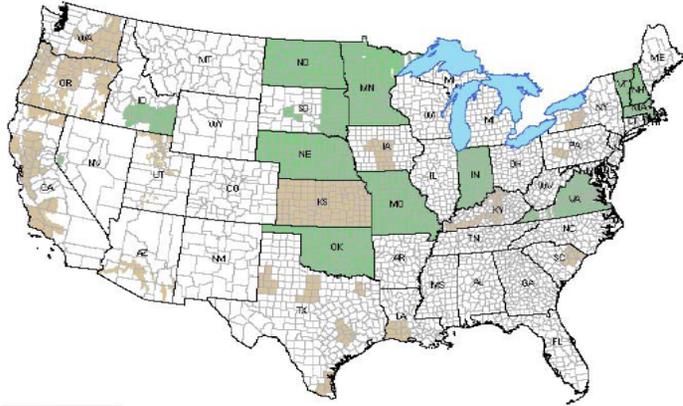
Farm Service Agency

Forest Service

Natural Resources Conservation
Service

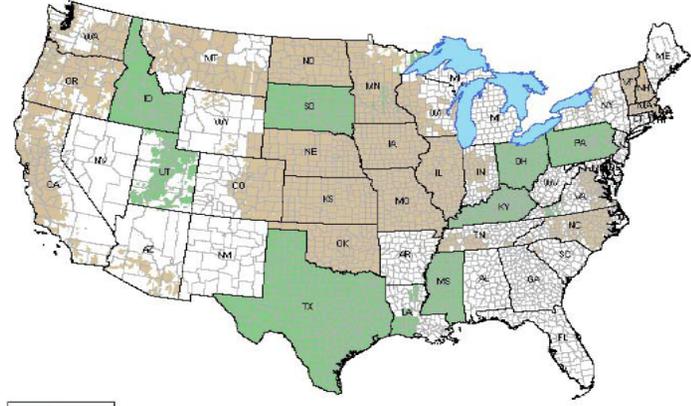


2003 NAIP COVERAGE



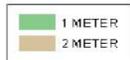
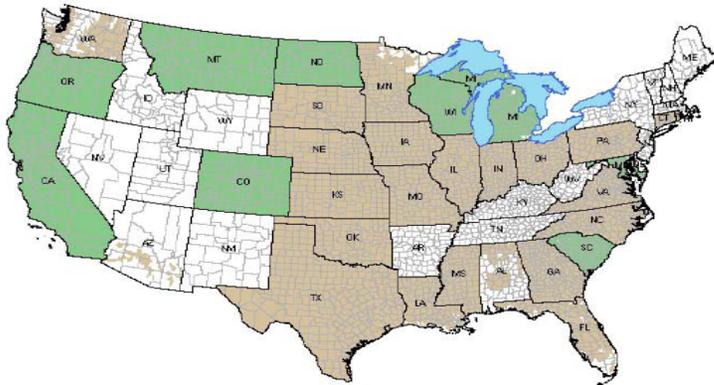
USD A-FSA-APFO

2004 NAIP COVERAGE



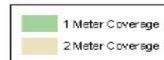
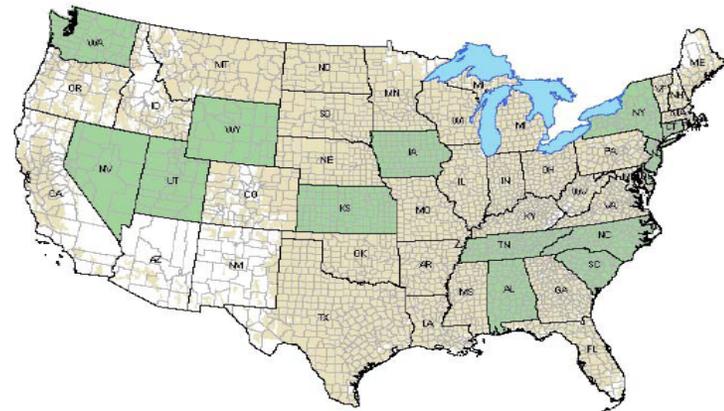
USD A-FSA-APFO

2005 NAIP COVERAGE



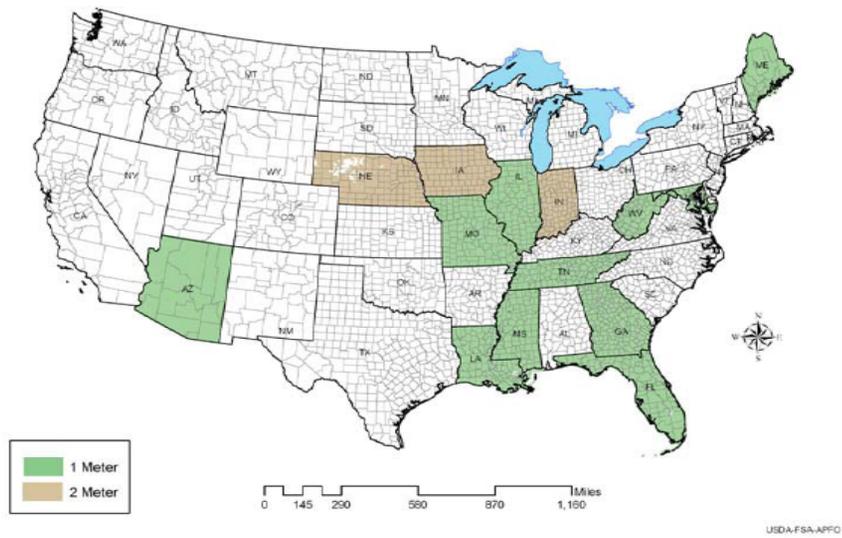
USD A-FSA-APFO

2006 NAIP COVERAGE

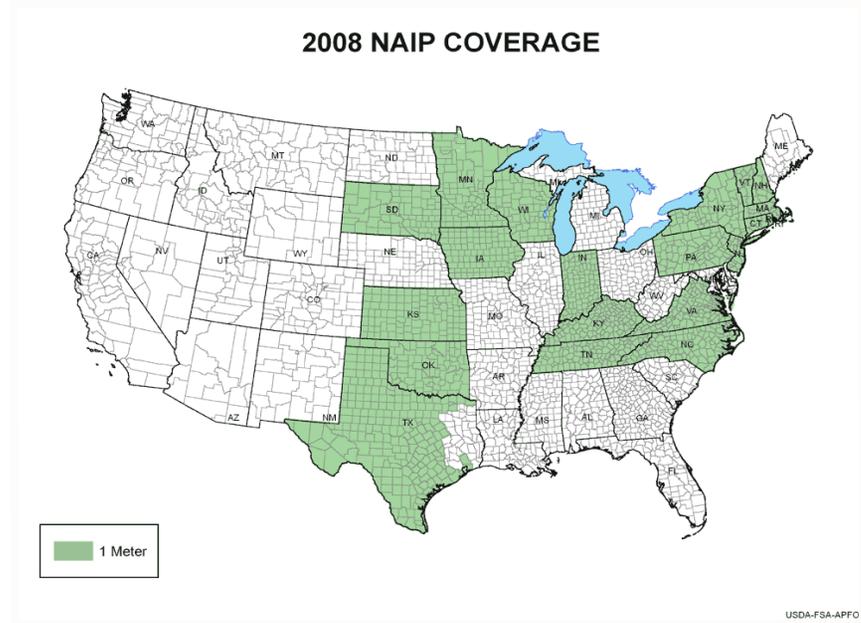


USD A-FSA-APFO

2007 NAIP Coverage

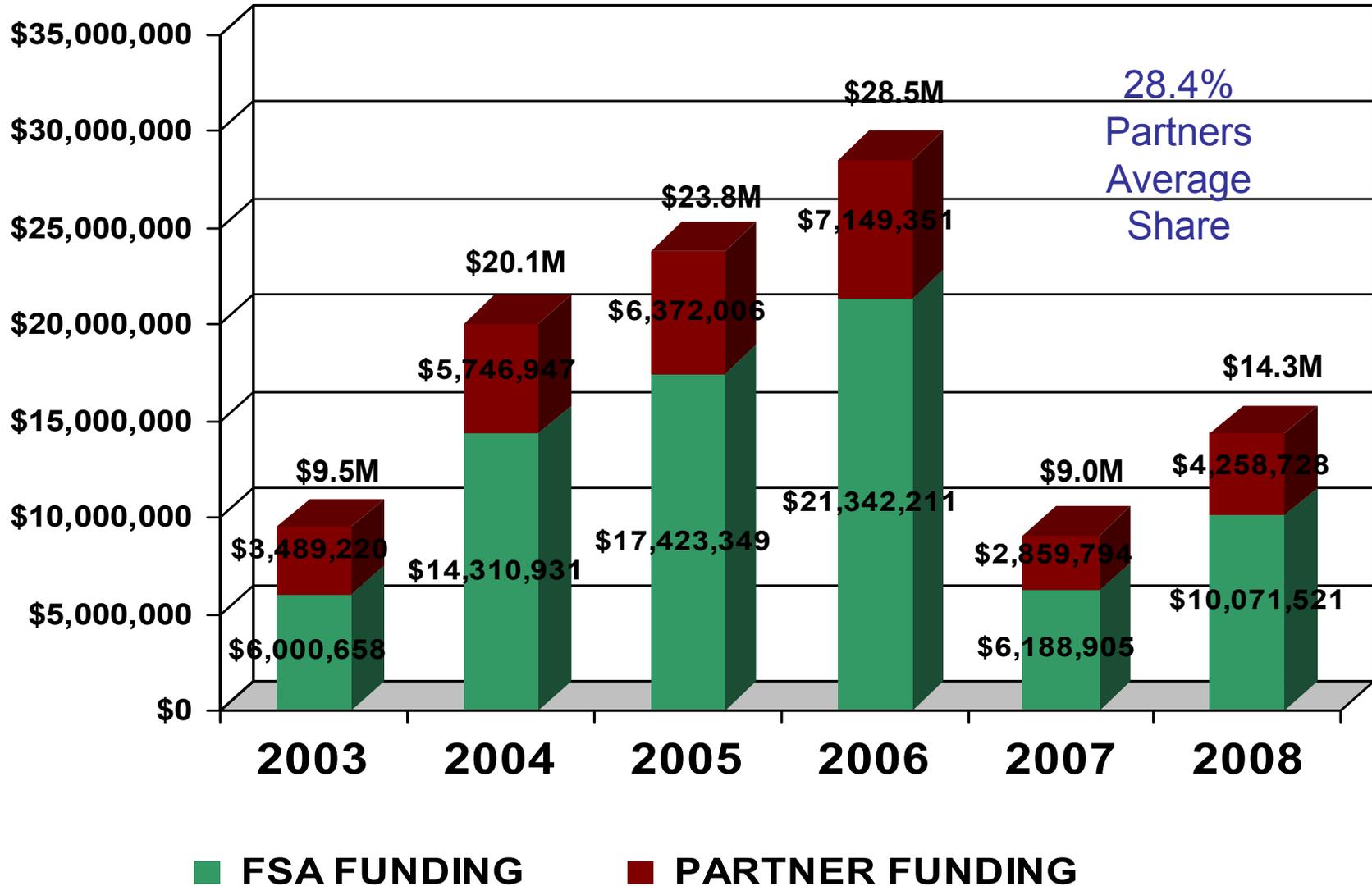


2008 NAIP Coverage



NAIP Funding History

2003 - 2008 USDA NAIP Contracts

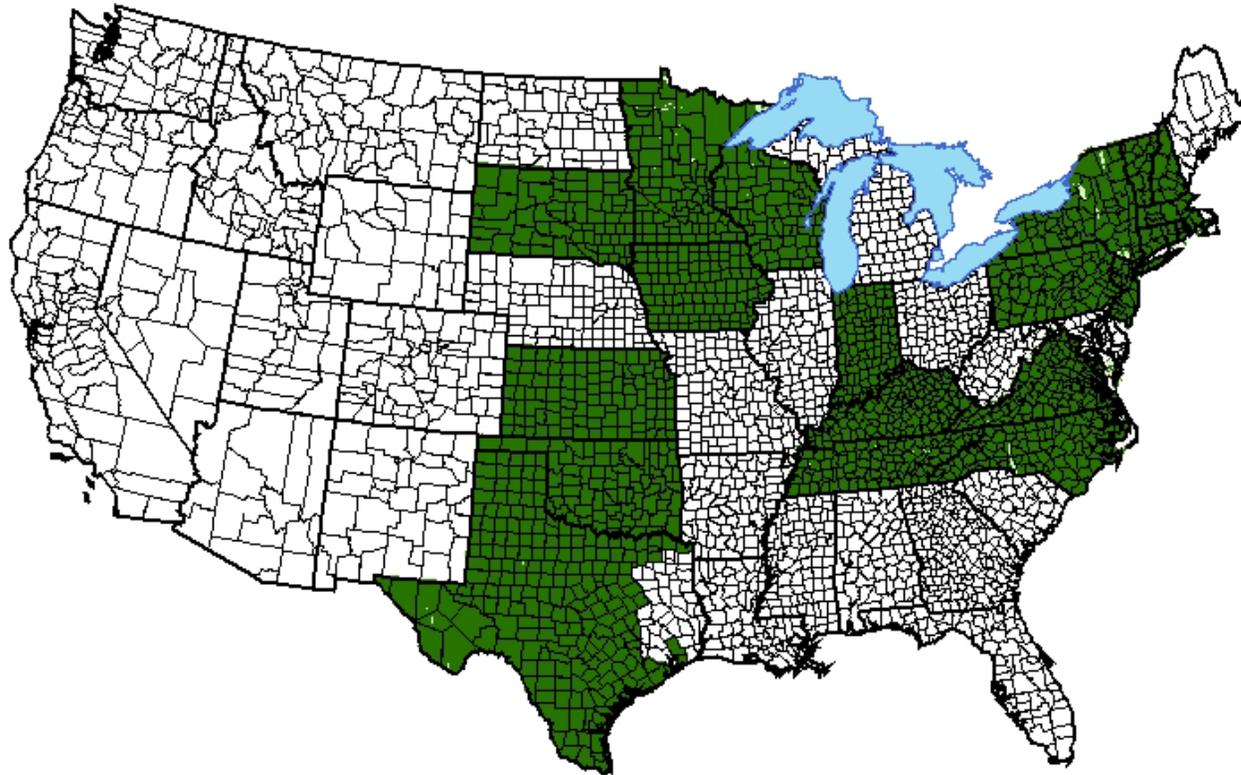


2008 NAIP Funding Sources

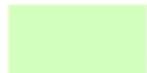
U.S. Forest Service	\$1,140,000
Natural Resource Consvr. Service	\$500,000
U.S. Geological Survey	\$150,000
FSA RMA (Coop with WVU)	\$50,000
State Governments (12 states)	<u>\$2,418,728</u>
Total 2008 Cost Shares:	\$4,258,728
FSA Funding Amount	<u>\$10,071,521</u>
<i>2008 NAIP Funding Total:</i>	<i>\$14,330,249</i>



2008 NAIP IMAGERY STATUS



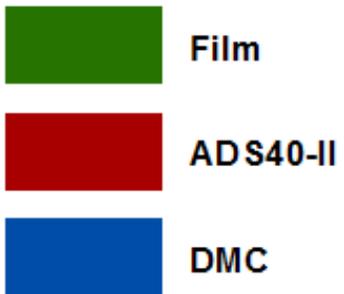
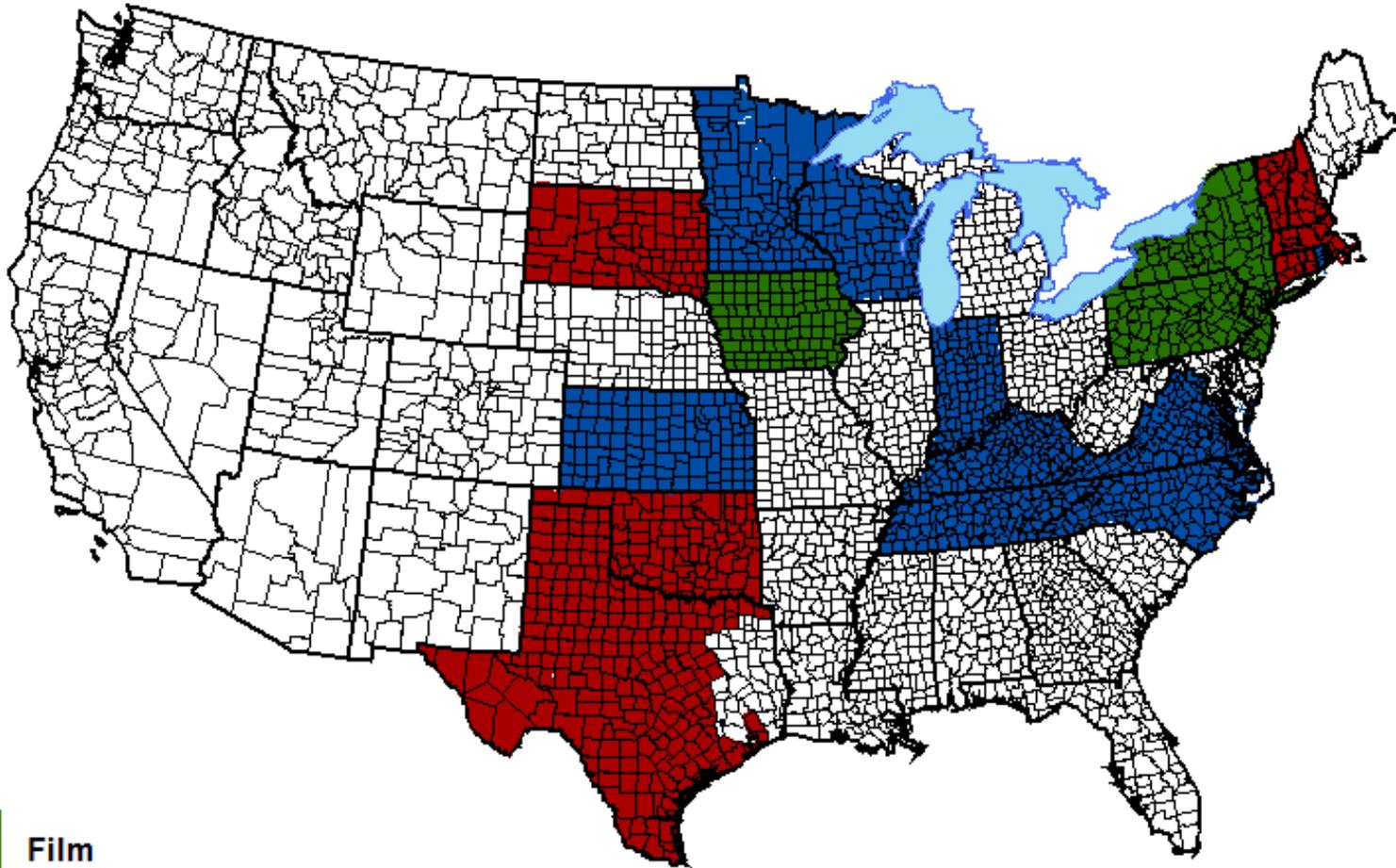
AREAS FLOWN



AREAS CONTRACTED

73,236 - DOQQ'S FLOWN

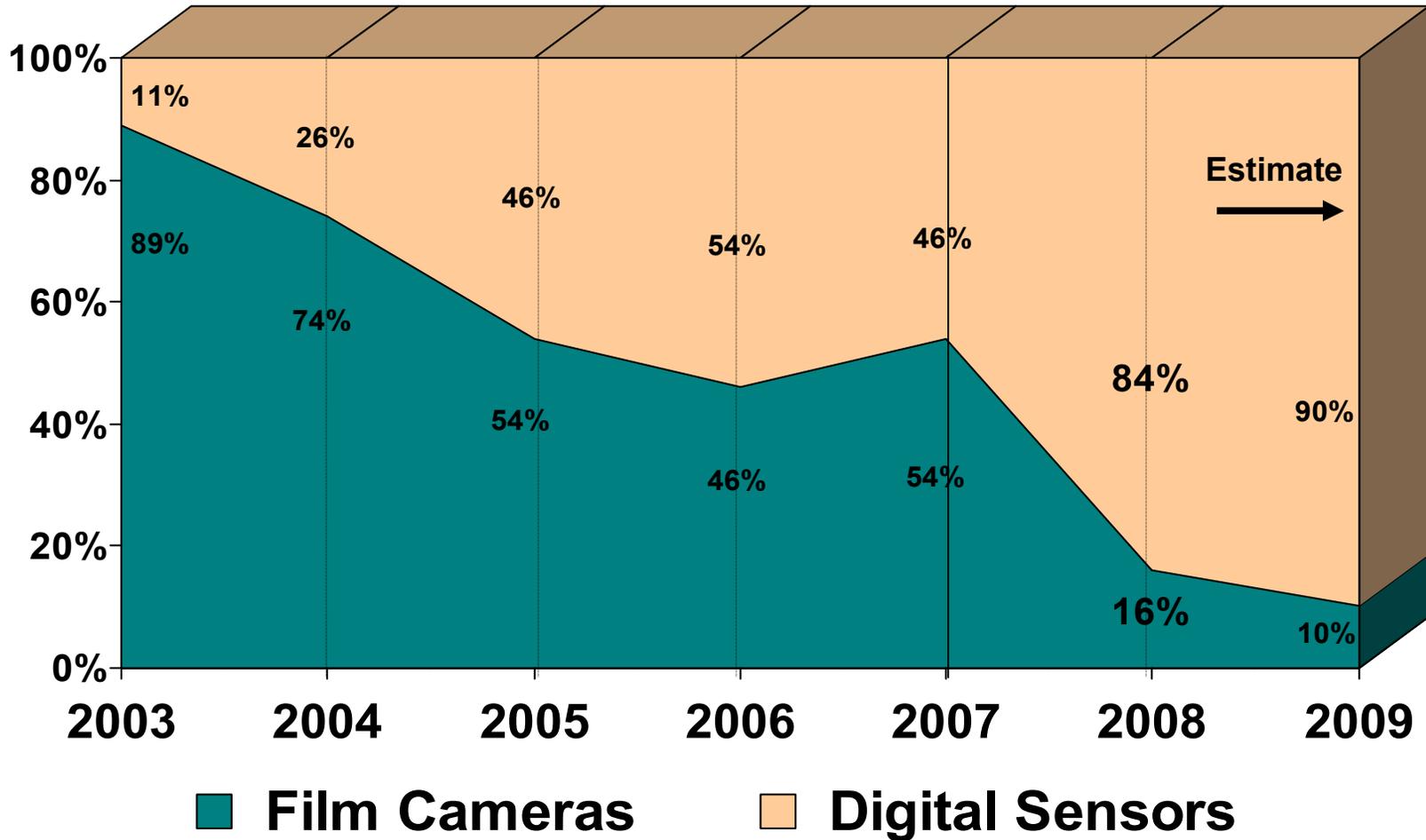
2008 NAIP CAMERA TYPES



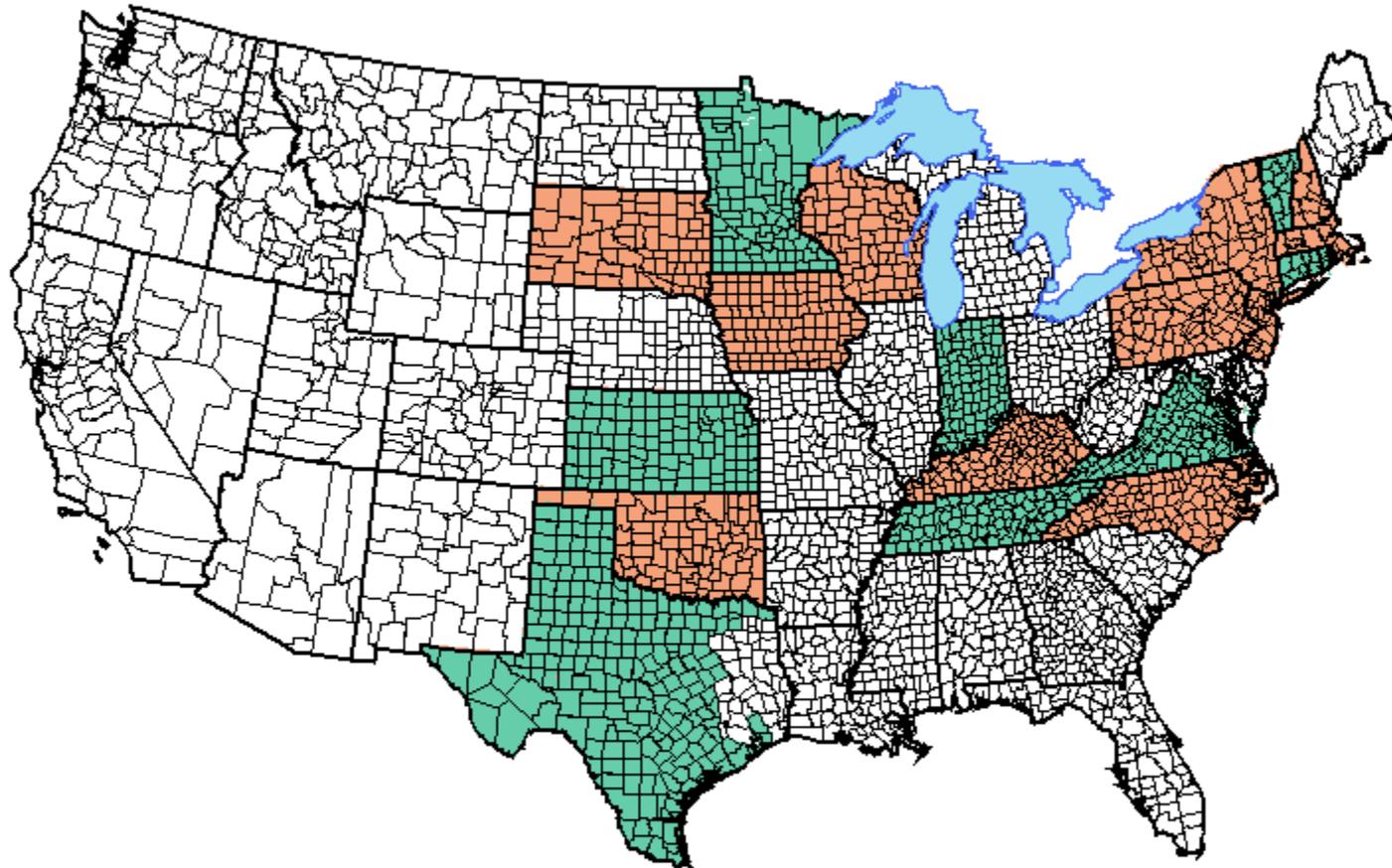


NAIP Camera Trends

Film Cameras vs. Digital Sensors

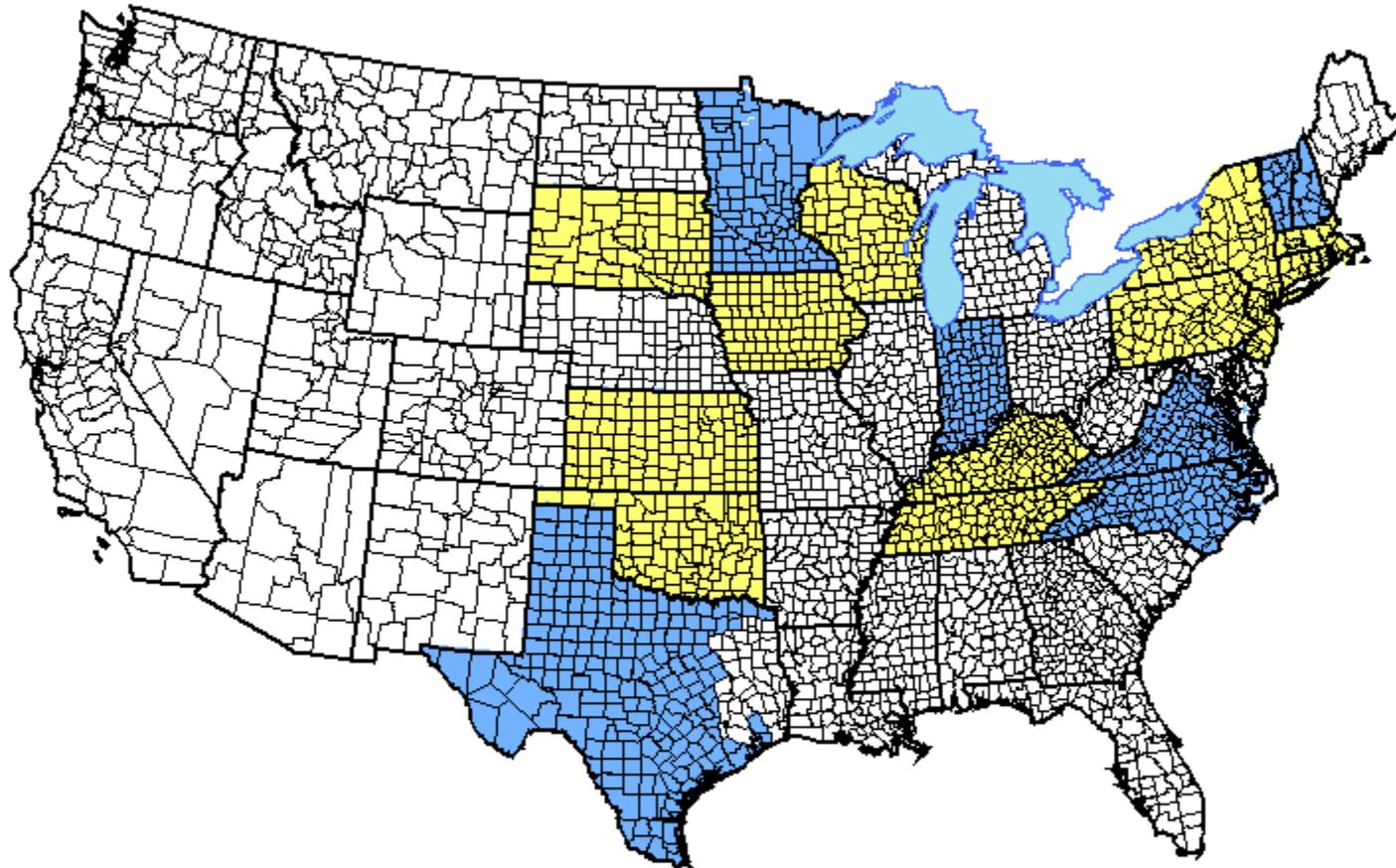


2008 NAIP 3 BAND VS 4 BAND





2008 NAIP ABSOLUTE VS RELATIVE CONTROL



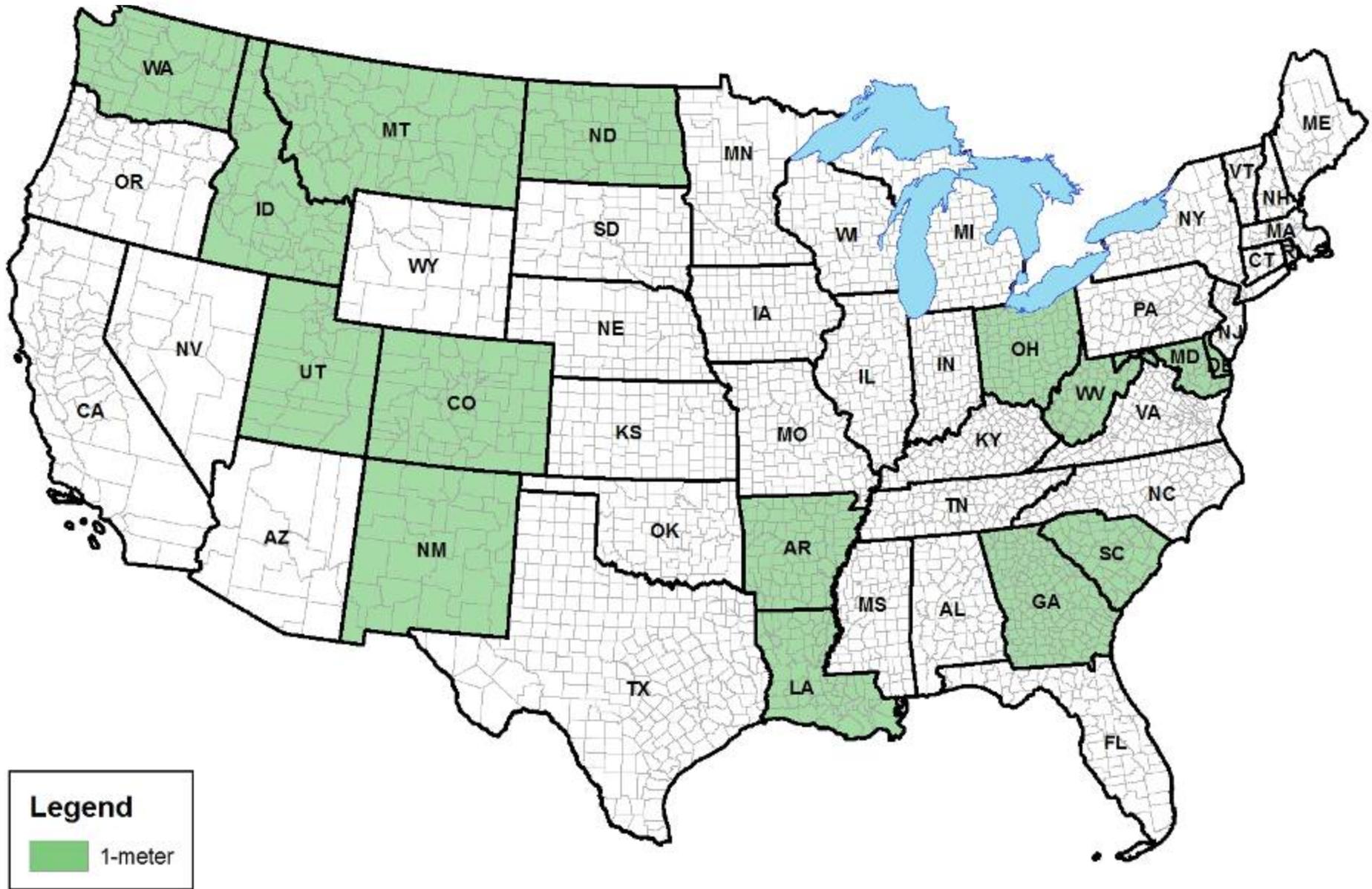
ABSOLUTE CONTROL 45%



RELATIVE CONTROL

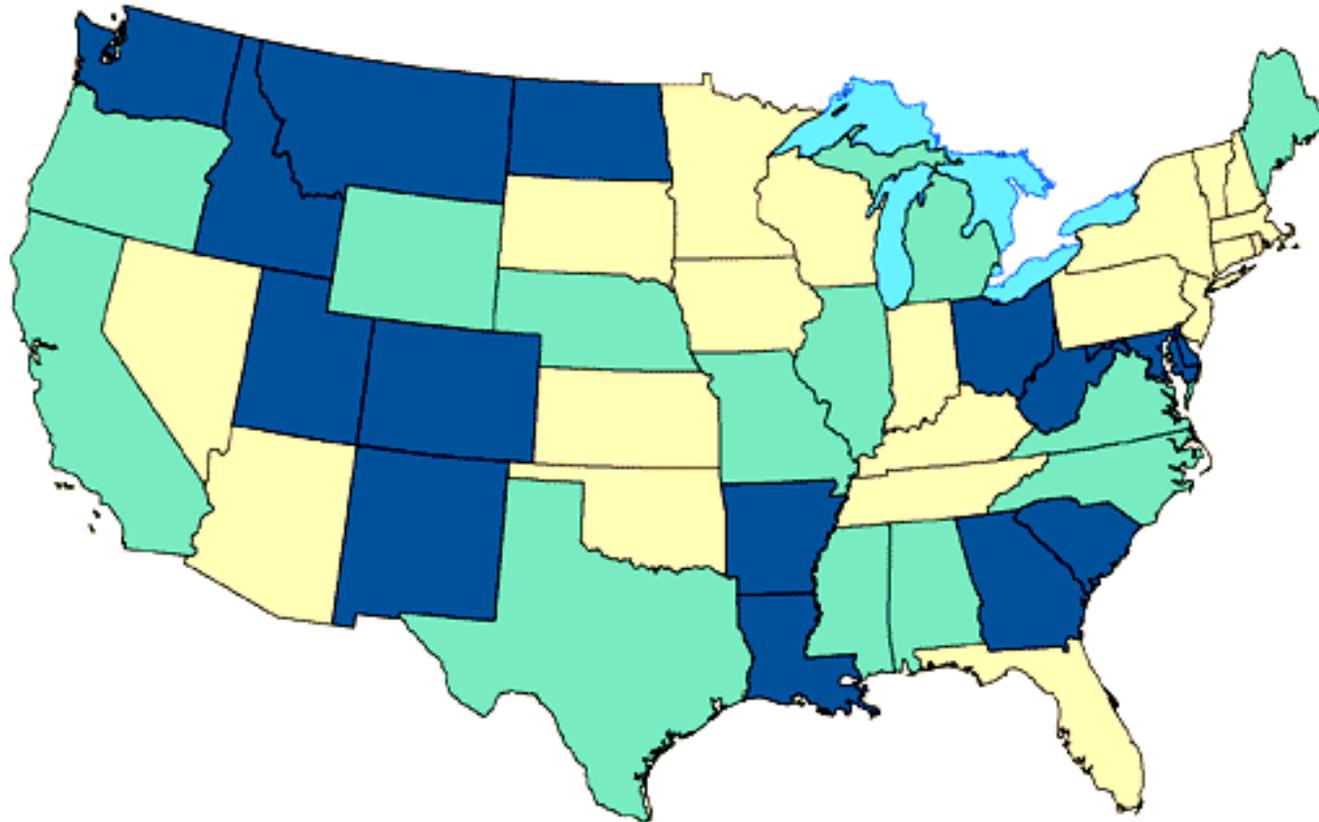


Proposed 2009 NAIP Coverage





Proposed NAIP Acquisition Cycle



Cycle Dates

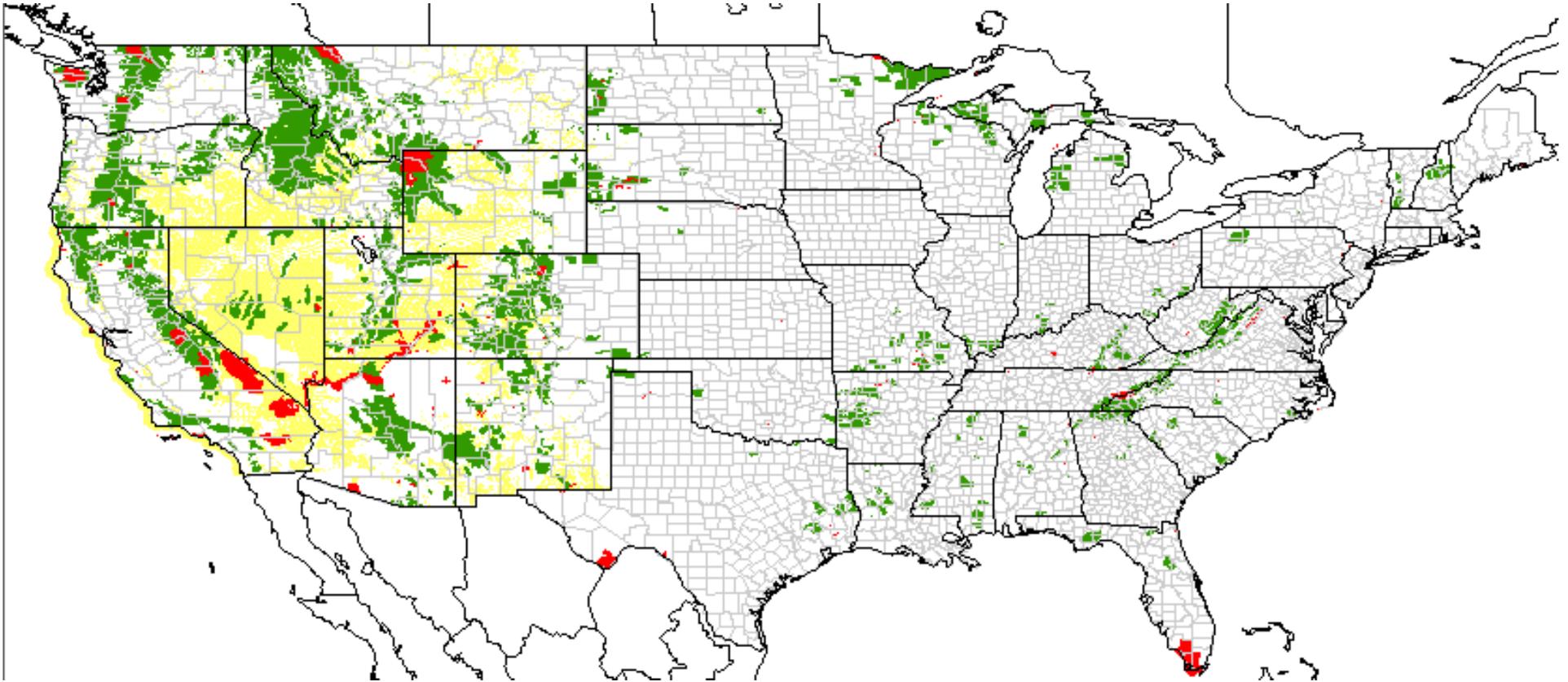
- 2009
- 2010
- 2011

CRISIS ON PUBLIC LANDS

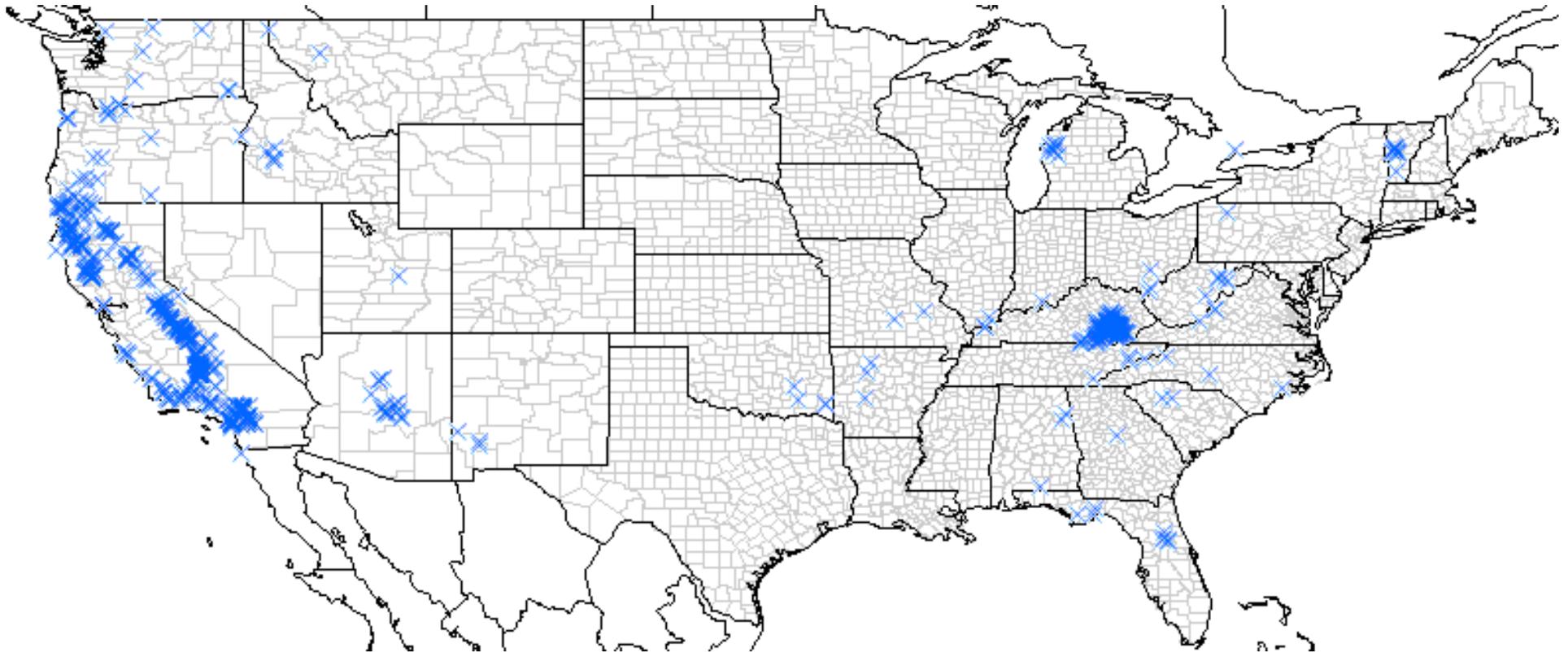
Illegal Occupation of Public Lands
By
Drug Trafficking Organizations



FS, BLM and NPS Land

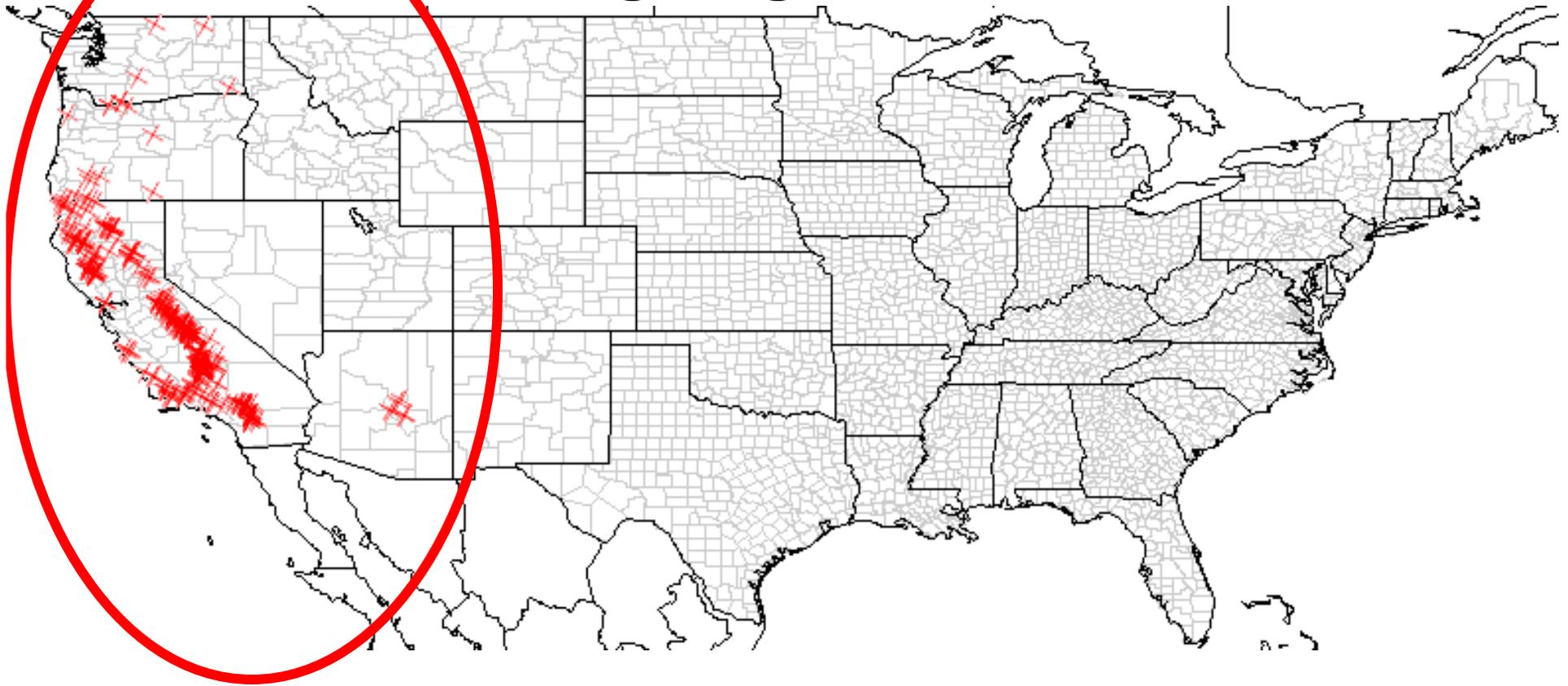


2007 Locations of Cannabis Gardens on National Forests.

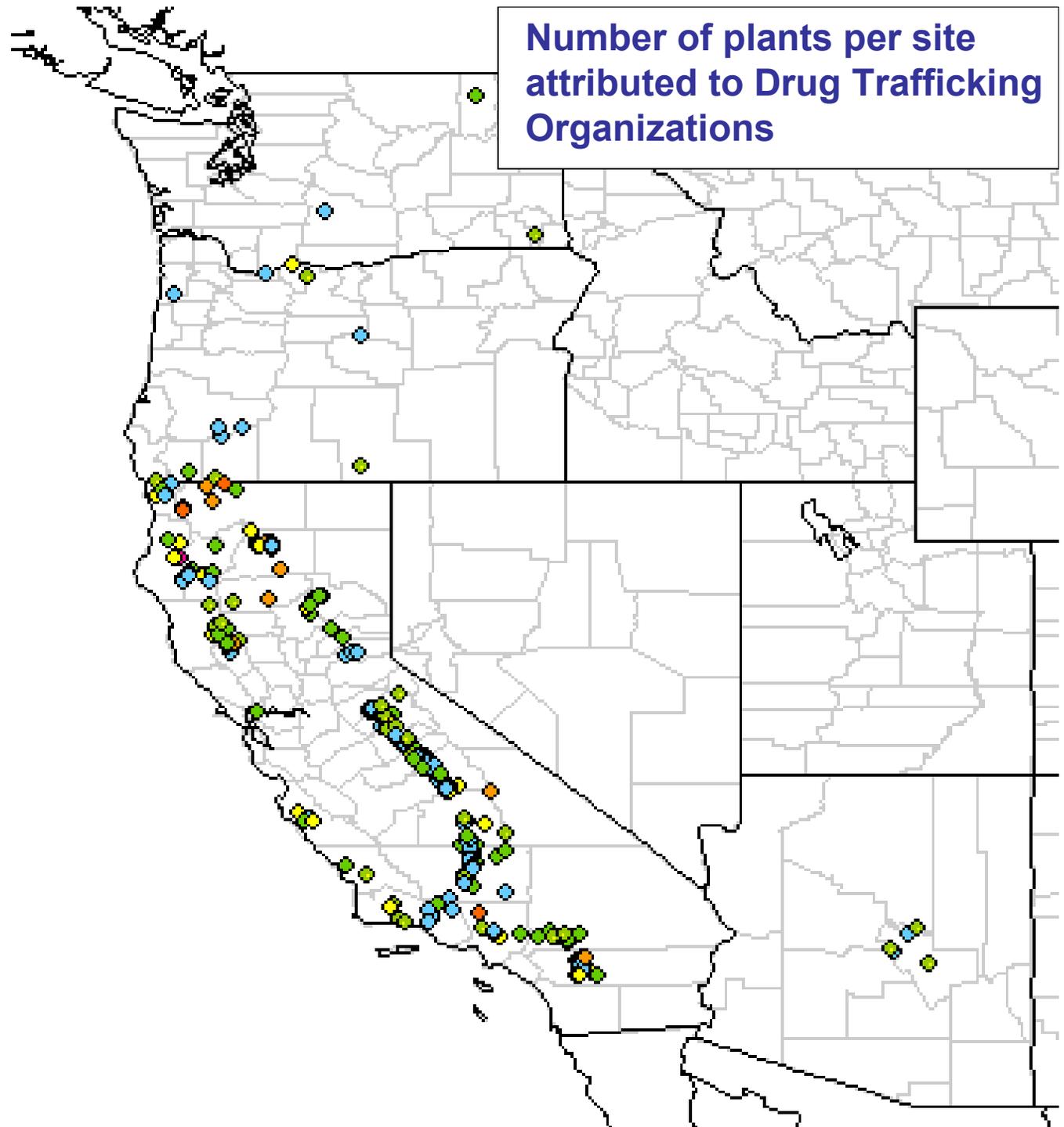


Source: FS Law Enforcement and Investigations

2007 Cannabis Gardens Linked to Drug Trafficking Organizations



**Number of plants per site
attributed to Drug Trafficking
Organizations**



2007 Plants Reported

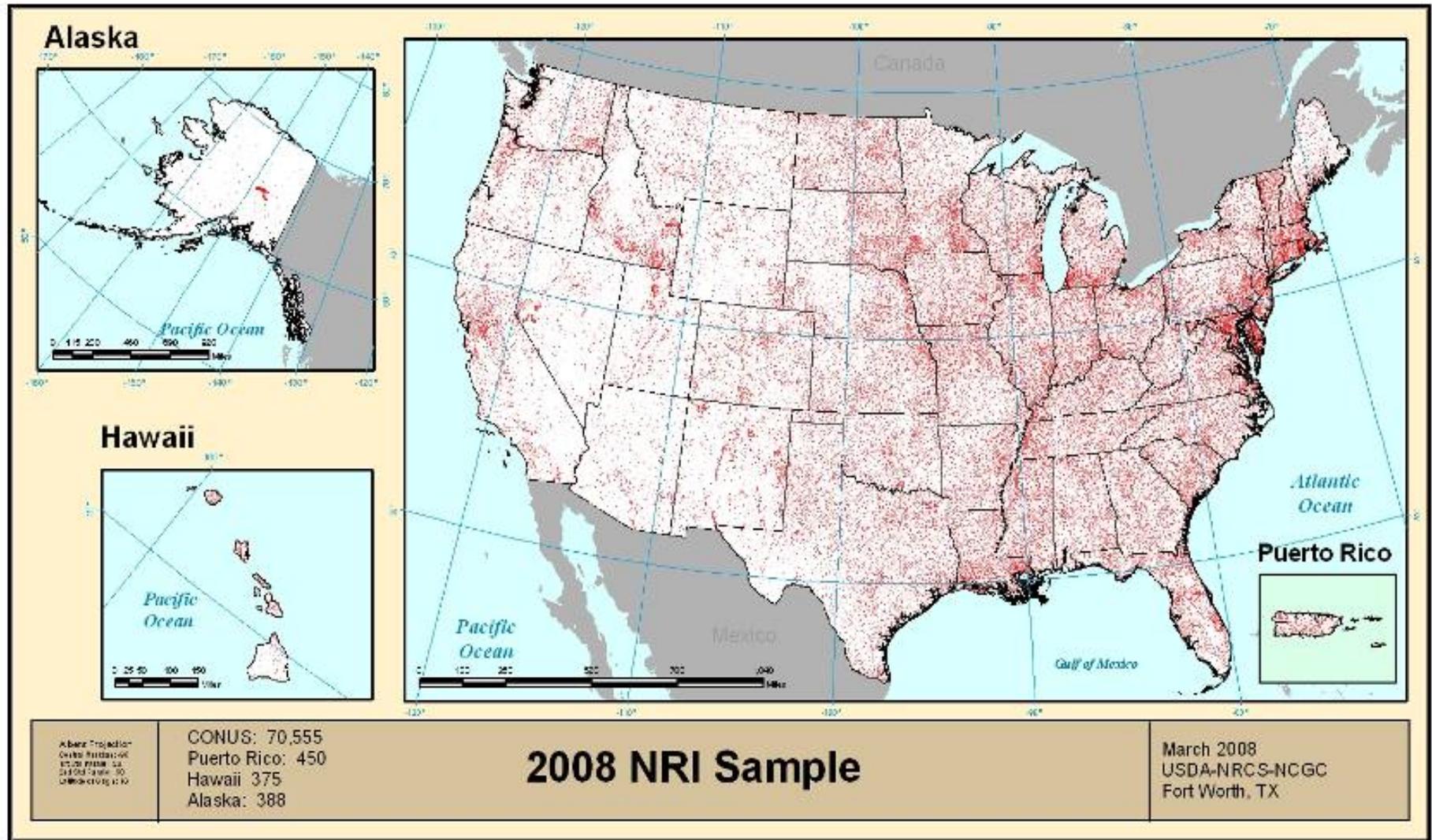
- ◆ 5.- 2661
- ◆ 2661.1 - 5612
- ◆ 5612.1 - 9566
- ◆ 9566.1 - 19580
- ◆ 19580.1 - 35821
- ◆ 35821.1 - 70158
- ◆ 70158.1 - 132000







NRCS, Natural Resources Inventory Imagery



1:7,920

Wetland Reserve Program, Program Integrity Acquisitions



Four Band Imagery Increases Applications



UltraCamX – Color and CIR – 8” GSD

The Return to Stereo Acquisitions

- The Forest Service and The Natural Resource Conservation Service were significant users of contact prints for stereo applications.
- These agencies are experimenting with the use of direct digital, 4-band stereo imagery and soft-copy exploitation software.





10,000+ USDA personnel on the landscape every day, using GPS to provide program assistance, service, and technical support to USDA customers and partners

- Safety-of-Life operations –Fire, Snow Survey
- Administration of the Farm Bill
- Conservation Planning and Application
- Natural and Cultural Resource Data Collection, Inventorying and Monitoring
- Landscape Characterization & Engineering Applications
- Soil Mapping



Questions?



Date: 27MAY09
TOT: 15122
Location: Peeps, ND
Latitude: N 46° 41.54' / Longitude: W 099° 47.24'
Object: Other



Links

- CropExplorer:
 - <http://www.pecad.fas.usda.gov/cropexplorer/>
- MODIS Rapid Response System:
 - <http://rapidfire.sci.gsfc.nasa.gov/>
- CropLand Data Layer
 - <http://www.nass.usda.gov/research/Cropland/SARS1a.htm>
- USDA Data Gateway
 - <http://datagateway.nrcs.usda.gov/>
- APFO NAIP
 - <http://www.apfo.usda.gov>

Forest Service Wildland Fire Support Websites

MODIS Active Fire Mapping

- <http://activefiremaps.fs.fed.us>

Forest Service's Remote Sensing Applications Center (RSAC)

<http://www.fs.fed.us/eng/rsac/>

National Infrared Operations

- <http://nirops.fs.fed.us/>

UAS's for Active Fire Mapping and Communications

- <http://nirops.fs.fed.us/UASDemo/>
- <http://geo.arc.nasa.gov/sge/WRAP/>

Burned Area Emergency Response Imagery Support

- <http://www.fs.fed.us/eng/rsac/baer>

Monitoring Trends in Burn Severity

- <http://svinetfc4.fs.fed.us/mtbs>