

# The Role of Remote Sensing to Support Active Fire Mapping, Post Fire Rehabilitation, and Forest Monitoring within the USDA Forest Service

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2<sup>nd</sup> Workshop on Geostationary Fire Monitoring and  
Applications



Darmstadt, Germany  
December 4-6, 2006

# Topics

## Active Fire Mapping

- ◆ National Scale Active Fire Mapping – MODIS Rapid Response
- ◆ Tactical Scale Fire Mapping – Airborne TIR

## Post Fire Rehabilitation & Monitoring

- ◆ Burn Area Emergency Response (BAER)
- ◆ Monitoring Trends in Burn Severity (MTBS)

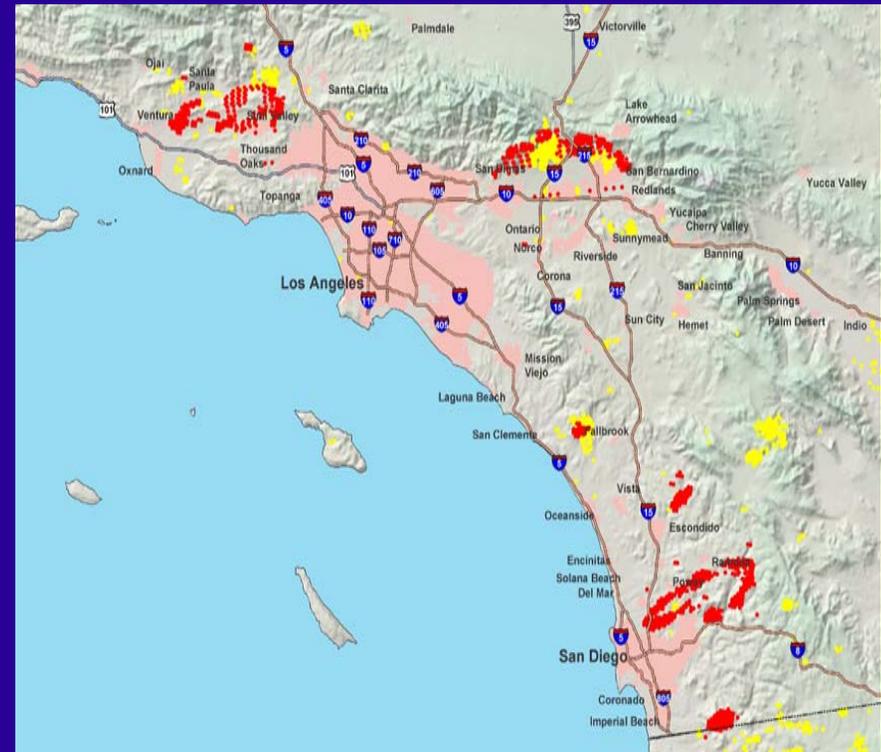
## Forest Monitoring

- ◆ Forest Health Change Detection

# Forest Service MODIS Active Fire Mapping Program

- Developed in 2001- using MODIS Rapid Response Detection
- Comprehensive coverage of CONUS, Alaska, Hawaii & Canada
- Operational near real-time (NRT) acquisition/processing of MODIS data to meet needs of fire managers

The screenshot shows the website's header with 'USDA FOREST SERVICE' and 'REMOTE SENSING APPLICATIONS CENTER'. It features navigation tabs for 'Regional Maps', 'ArcIMS Maps', 'Imagery', 'GIS Data', 'Fire Detections', and 'Other Products'. A search bar is located on the left. The main content area is titled 'MODIS Active Fire Mapping Program' and includes a legend for 'Large Incidents - October 09, 2006'. The legend identifies four types of fires: Wildland Fire - IMT1 (red), Wildland Fire - IMT2 (blue), Wildland Fire - Other (green), and WFU Fire (yellow). A map of the United States shows the location of the active fire incidents. The website footer contains logos for RSAC, USDA, NASA, MODIS, and SSEC.



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

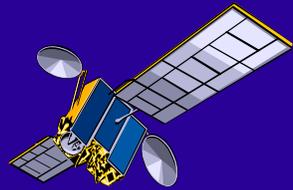
# MODIS Active Fire Mapping Program Objectives

- Generate “value added” geospatial fire products – National Interagency Fire Center (NIFC)
  - ◆ 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 conditions
- Aid wildfire strategic planning and response
  - ◆ Prioritize allocation of suppression assets
  - ◆ Focus tactical airborne reconnaissance & TIR mapping assets
- Detect and monitor fire activity in remote areas
- Support several other fire-related applications



# MODIS Direct Broadcast/Direct Readout

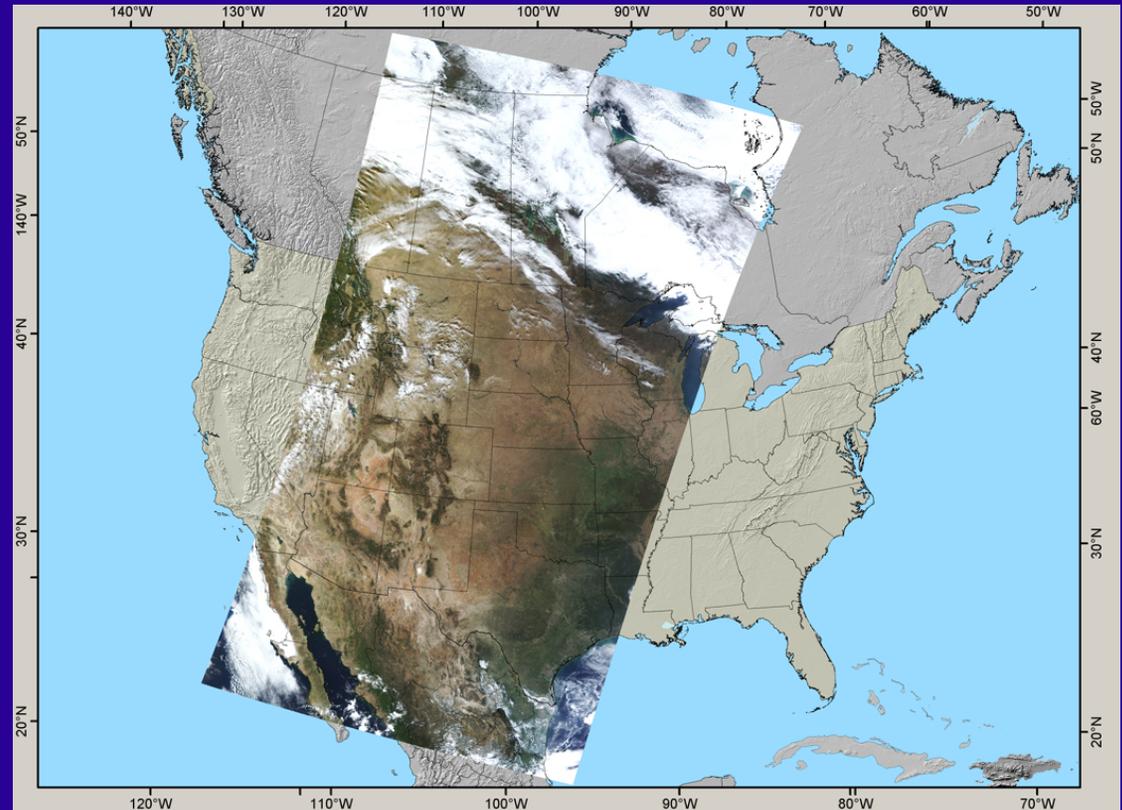
## NRT MODIS Data Acquisition...



Terra / Aqua  
Direct Broadcast



Direct Readout  
Ground Station



### Direct Broadcast (DB)

Real-time transmission of satellite data to the ground. As the Earth is being observed by the satellite, the data is formatted and transmitted to any user below in real-time.

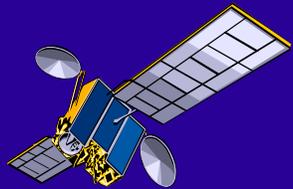
### Direct Readout (DR)

Acquisition of freely transmitted live satellite data by users with compatible ground receiving equipment and direct line of sight to the satellite.

# MODIS Ground Station Network

Primary data source for MODIS Active Fire Mapping Program...

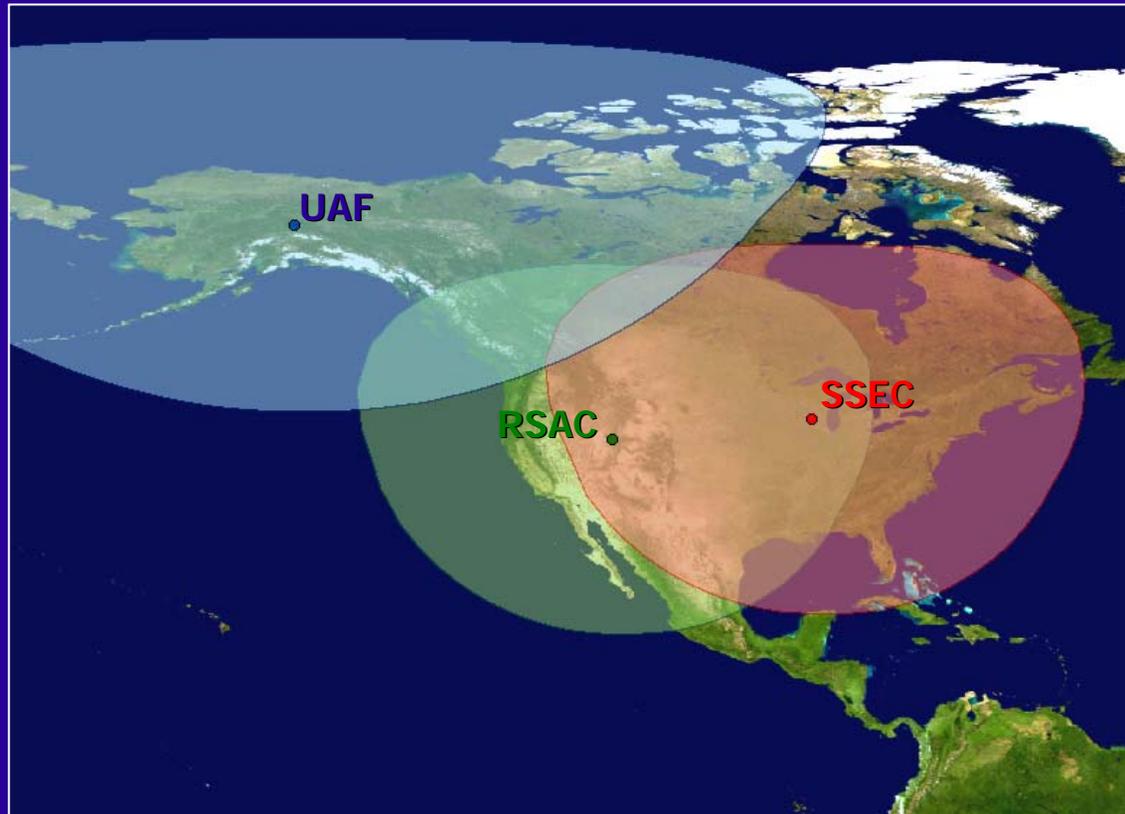
- NRT MODIS data via Direct Broadcast/Direct Readout
- North America coverage provided by RSAC, University of Wisconsin-SSEC and University of Alaska-Fairbanks-GINA
- L2 surface reflectance and fire detection data processed on site



Terra / Aqua  
Direct Broadcast



Direct Readout  
Ground Station



# MODIS Rapid Response (RR) System

## Additional data source...

- Developed in 2001 by NASA-GSFC/ University of Maryland
- Daily global MODIS coverage
- Access to MODIS data stream via NOAA MODIS Near Real Time Processing System
- Rapid generation of key MODIS products for operational objectives
  - ◆ L2 MODIS surface reflectance
  - ◆ L2 MODIS fire detections
- Available ~ 3 hours post acquisition

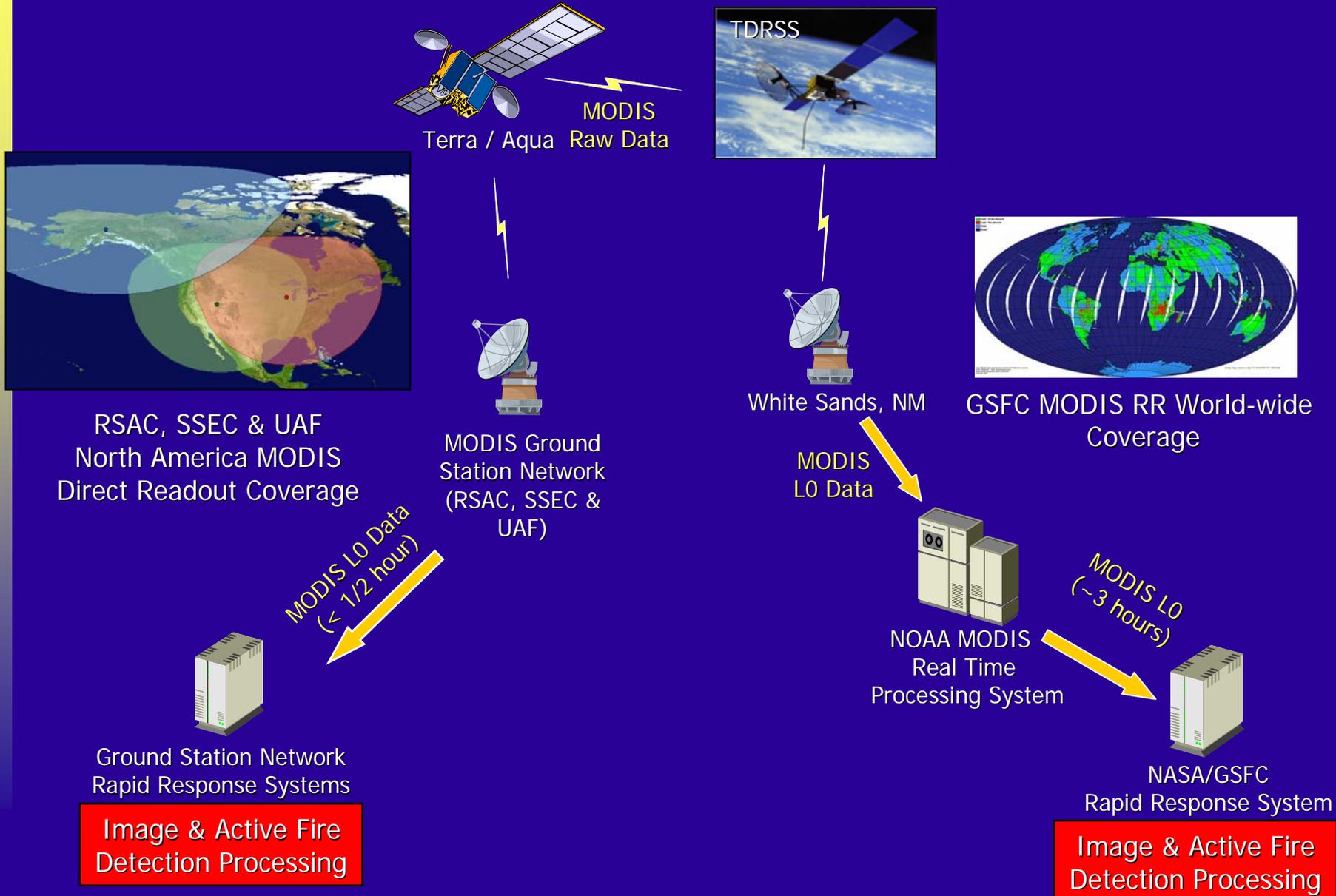
**MODIS Rapid Response System**

[Home](#) | [Gallery](#) | [Real-Time](#) | [FAQ](#) | [Status](#)

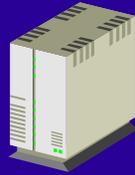
Mission	MODIS Image of the Day	
<p>The MODIS Rapid Response system has been developed to provide rapid access to MODIS data globally, with initial emphasis on 250m color composite imagery and active fire data. The experience gained during the Montana fires of 2000, when the MODIS team was asked to provide active fire information to the U.S. Forest Service (USFS), has led to the improvement and automation of several of the steps involved in MODIS rapid data provision. Imagery and data are now being provided to a number of users such as the USFS <b>Remote Sensing Applications Center (RSAC)</b>, the <b>National Interagency Fire Center (NIFC)</b>, the <b>U.N. Global Fire Monitoring Center</b>, and NASA's <b>Earth Observatory</b>. Incremental improvements are planned both for the user interface and the selection of products available from this site.</p> <p>This research and development system is a contribution to the rapid prototyping of NASA's Applications data and information systems, providing data and information in support of decision making. The system builds on the experience gained with the <b>MODIS Land 250m</b> production and distribution system. The data delivery system is also being developed as a contribution to the implementation of the international <b>Global Observation of Forest Cover/Global Observation of Landcover Dynamics (GOCF-GOLD)</b>.</p> <p>The MODIS Rapid Response imagery augment the MODIS Standard Land Products, which can be obtained from the <b>LP DAAC</b>. Availability of MODIS Standard Land Products will lag behind current satellite acquisition by a few days but all the data used to create images in the Rapid Response System are available from the GSFC DAAC (Level 1B data) or the LP DAAC (Thermal Anomalies - MOD14/MYD14).</p> <p>The MODIS Rapid Response Project is supported in part by NASA's Earth Science Applications Program, the MODIS Team Leader NASA/GSFC's Terrestrial Information Systems Branch. Start-up support provided by the USDA Forest Service's Remote Sensing Applications Center. Additional support provided by the USDA Foreign Agricultural Service.</p> <p>A press release announcing this NASA/UMd/USFS collaboration and the launch of the MODIS Rapid Response Project can be found at the <a href="#">NASA Earth Observatory</a>.</p>	<div style="text-align: center;"> <p>North-eastern China</p>  </div> <div style="text-align: center; margin-top: 10px;"> <p><b>Quick links</b></p> <ul style="list-style-type: none"> <li>+ <a href="#">Post Hurricane Katrina images (GIS compatible)</a></li> <li>+ <a href="#">Near-real-time production</a></li> <li>+ <a href="#">Near-real-time subsets</a></li> <li>+ <a href="#">Image Gallery</a></li> <li>+ <a href="#">About us</a></li> <li>+ <a href="#">Related sites</a></li> <li>+ <a href="#">Frequently Asked Questions</a></li> <li>+ <a href="#">Production status</a></li> <li>+ <a href="#">Products</a></li> <li>+ <a href="#">Web Fire Mapper</a></li> <li>+ <a href="#">USFS Active Fire Maps</a></li> </ul> </div>	
<div style="text-align: center;"> <p><b>Web Fire Mapper</b></p>  </div> <p>The Web Fire Mapper at the University of Maryland provides access to current and archived fire locations detected by the MODIS Rapid Response System through an interactive ArcIMS interface with an extensive database of region-specific layers and ancillary information.</p> <p>+ <a href="#">Read more and access data</a></p>	<div style="text-align: center;"> <p><b>Active Fire Maps</b></p>  </div> <p>The USFS's Remote Sensing Applications Center generates regional maps for the US fire managers using the active fire locations provided by the MODIS Rapid Response System, and also makes them available through an interactive ArcIMS interface over the conterminous United States, Alaska, and Canada.</p>	<div style="text-align: center;"> <p><b>Near-real-time Subsets</b></p>  </div> <p>A large number of near-real-time georectified images across the world are available in our MODIS Rapid Response Subsets page in GIS-compatible format, including most AERONET sunphotometer sites.</p> <p>+ <a href="#">Read more and download imagery</a></p>

<http://rapidfire.sci.gsfc.nasa.gov>

# Overview: MODIS Data Acquisition and Processing



# Overview: MODIS Fire Mapping and Distribution



Ground Station Network  
Rapid Response Systems

Image & Active Fire  
Detection Processing

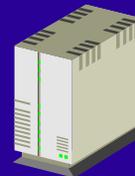


NASA/GSFC  
Rapid Response System

Image & Active Fire  
Detection Processing

Active Fire Detections  
& Imagery  
(Continental U.S.,  
Alaska, Canada)

Active Fire Detections  
& Selected Imagery  
(North America)



USFS-RSAC  
MODIS Active Fire  
Mapping System

Fire Maps  
Image Subsets  
GIS Data  
Custom Products



Forest Service MODIS Active Fire  
Maps Web Server



geography network



Other Fire Geospatial  
Applications/Data Services

Updated  
continuously

Updated  
Hourly

# MODIS Active Fire Mapping Program Products

The screenshot shows the website's header with 'USDA FOREST SERVICE' and 'REMOTE SENSING APPLICATIONS CENTER' on the left, and 'Canadian Fire Maps' and 'Mexico Fire Maps' on the right. The main title is 'MODIS Active Fire Mapping Program'. Below the title is a navigation menu with buttons for 'Regional Maps', 'ArcIMS Maps', 'Imagery', 'GIS Data', 'Fire Detections', and 'Other Products'. A search bar is located on the left side. The main content area features a map titled 'Large Incidents - October 09, 2006' showing the United States with fire indicators. A legend identifies four types of fires: Wildland Fire - IMT1 (red), Wildland Fire - IMT2 (blue), Wildland Fire - Other (black), and WFU Fire (green). Three specific incidents are labeled: UNCLAS COMPLEX, BAR COMPLEX, and PEATLAND FIRE. Below the map are links for 'View Printable Map', 'View High Res Map', and 'Definition of Map Terms'. A 'News' section is visible at the bottom, with a post from September 20, 2006, about daily georeferenced MODIS image subsets. The footer contains 'Feedback | Disclaimers | Privacy Policy' and the URL 'http://activefiremaps.fs.fed.us'.

Links to Products



Links to Canada and Mexico Fire Maps

National Interagency Fire Center (NIFC) Incident Map

Project Cooperators

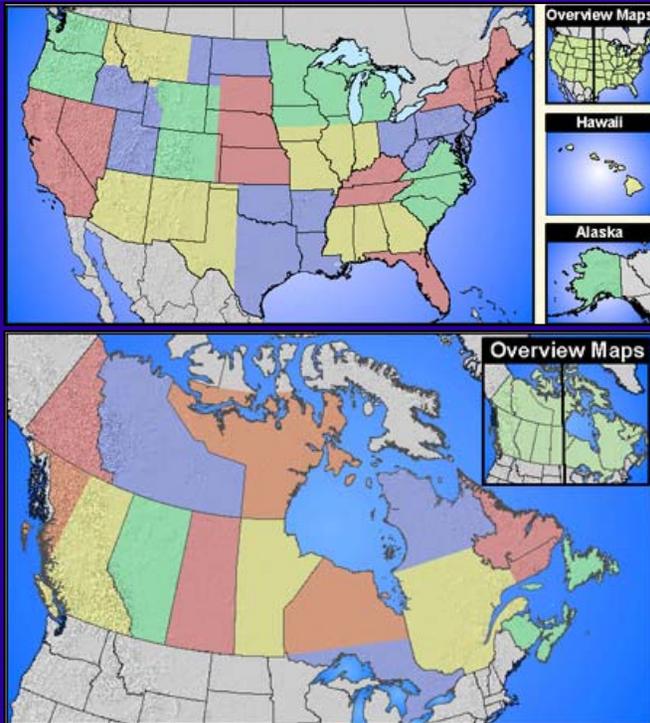


Remote Sensing Applications Center  
2222 W. 2300 South  
Salt Lake City, UT  
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voice: (801) 975-3737  
fax: (801) 975-3478



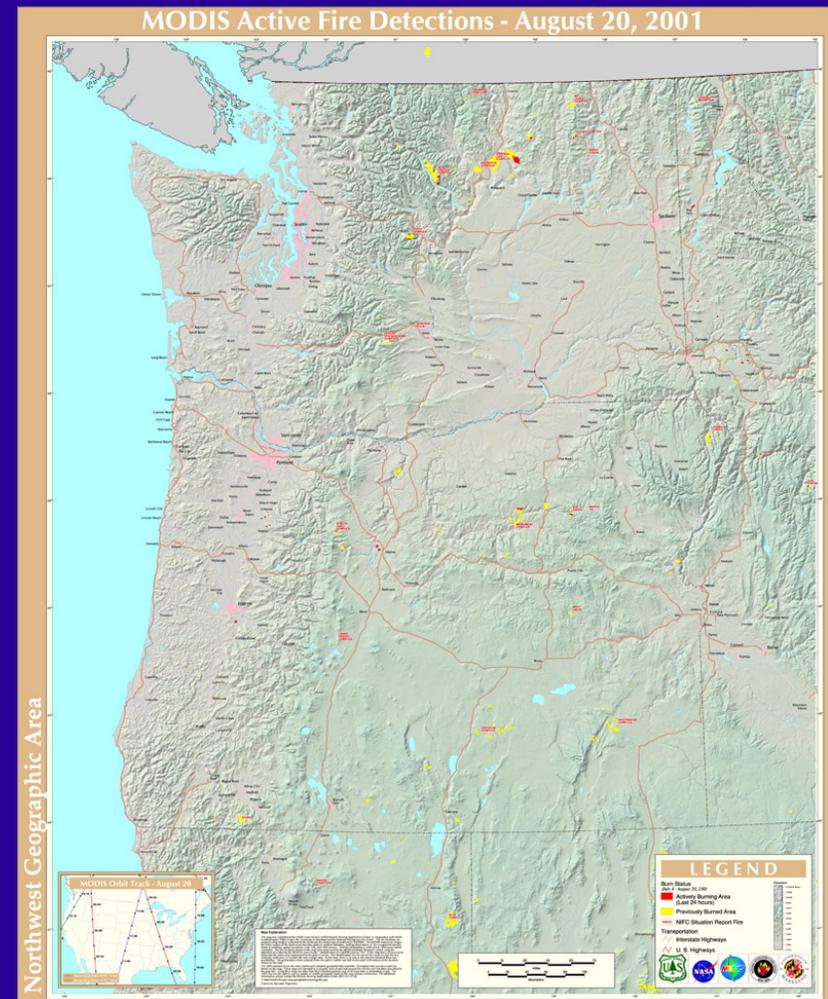
Current News Items of Interest

# Regional MODIS Active Fire Maps



- Regional and overview maps for U.S. & Canada
- Updated several times daily
- Display current and cumulative fire activity
- Provided in JPG and PDF format
- ~30,000 maps produced annually
- Map archive available

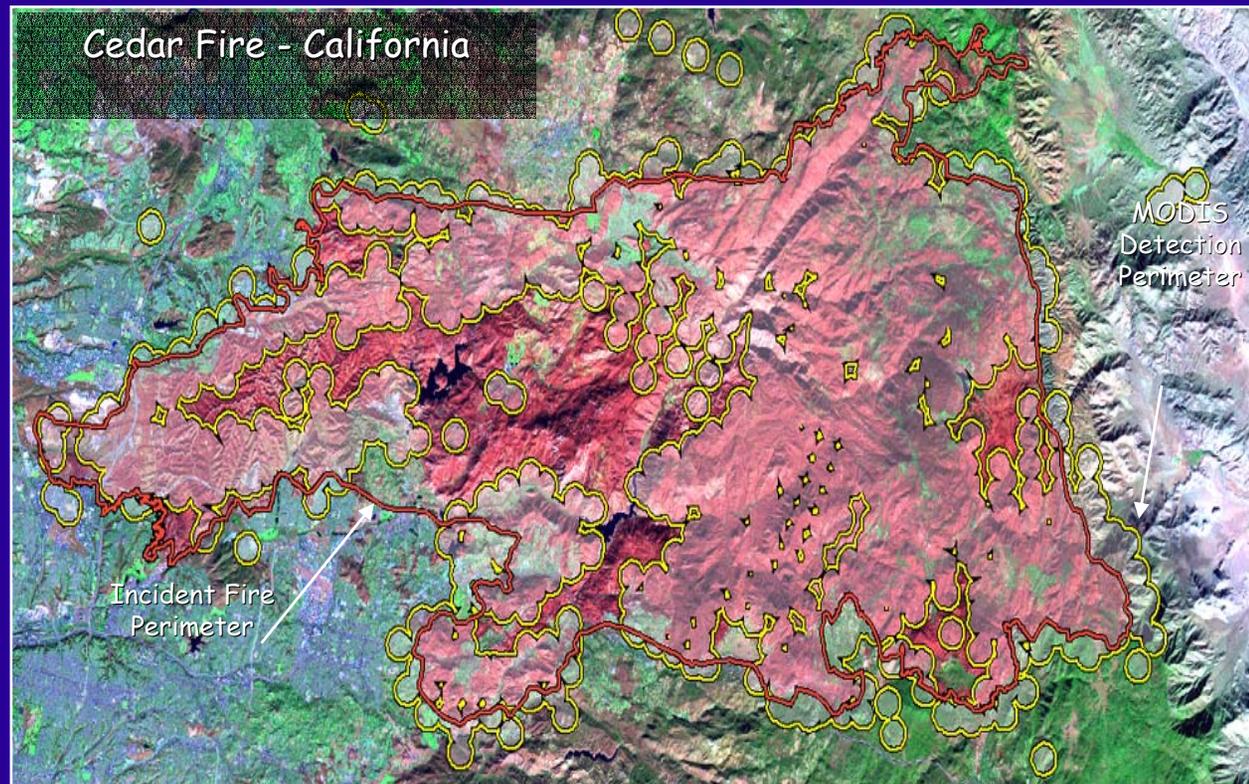
## Northwest Geographic Area





# Fire Detections $\neq$ Burned Area

- Fire detections may over and underestimate burned area



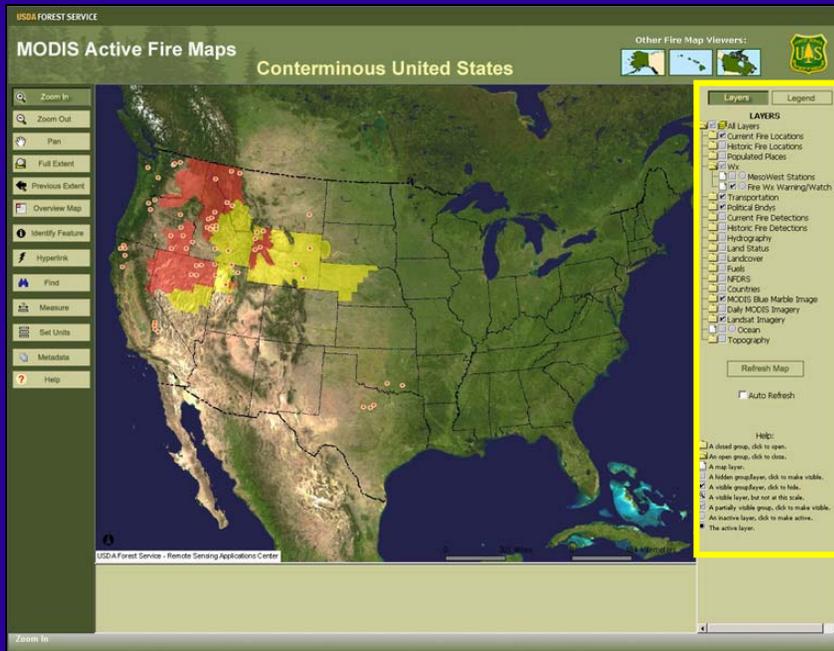
## Sources of Underestimation

- Clouds obscuring fires
- Fast moving fires
- Polar orbit of sensor (not geostationary)

## Sources of Overestimation

- Spatial resolution
- Entire pixel may not be on fire
- False detections

# Interactive MODIS Active Fire Maps Examples



## Available Layers

- MODIS, AVHRR & GOES Fire Detections
- National Fire Danger Rating System
- NWS Wx Observations
- NWS Fire Watch/Warnings
- Daily Terra/Aqua MODIS Imagery
- LANDSAT imagery
- Fire Regime/Condition Class
- Baseline Cartographic data



# MODIS Fire Image Subsets

USDA FOREST SERVICE REMOTE SENSING APPLICATIONS CENTER Canadian Fire Maps Mexico Fire Maps

## MODIS Active Fire Mapping Program

Search

RSAC Home  
About Us  
Contact Us  
Programs and Services  
BAER  
Active Fire Maps  
Regional Maps  
ARCHS Maps  
Imagery  
GIS Data  
Fire Detections  
Other Products  
Links

Select date of interest

September 2006

Sun	Mon	Tue	Wed	Thu	Fri	Sat
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

Fire Subsets

U.S. States and Canada Province/Territory Subsets

and wildfire imagery subsets. Imagery subsets are provided for states that currently have significant land and fire activity. Wildfire imagery subsets are available for fires 10,000 acres or larger. [More information about how to use MODIS image subsets](#)

Sunday August 27, 2006 Fire Subsets: Select... Go State Subsets: Select... Go

Monday August 28, 2006 Fire Subsets: Select... Go State Subsets: Select... Go

Tuesday August 29, 2006 Fire Subsets: Select... Go State Subsets: Select... Go

Wednesday August 30, 2006 Fire Subsets: Select... Go State Subsets: Select... Go

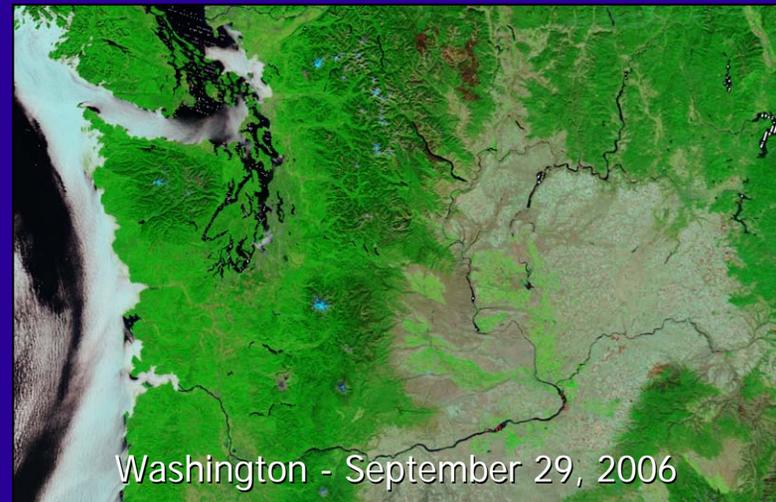
Thursday August 31, 2006 Fire Subsets: Select... Go State Subsets: Select... Go

Friday September 1, 2006 Fire Subsets: Select... Go State Subsets: Select... Go

Saturday September 2, 2006 Fire Subsets: Select... Go State Subsets: Select... Go

These fire information products are produced in cooperation with NASA Goddard Space Flight Center, the USDA Forest Service (USFS) Remote Sensing Applications Center in cooperation with NASA Goddard Space Flight Center, the University of Maryland, the National Interagency Fire Center, and the USFS Missoula Fire Sciences Laboratory.

[Feedback](#) | [Disclaimers](#) | [Privacy Policy](#)



- Daily georeferenced image subsets
- Compiled from RSAC swath data
- MODIS "land bands"
- 3 band true and false color JPGs, GeoTiffs
- 7 band generic binary (BSQ)

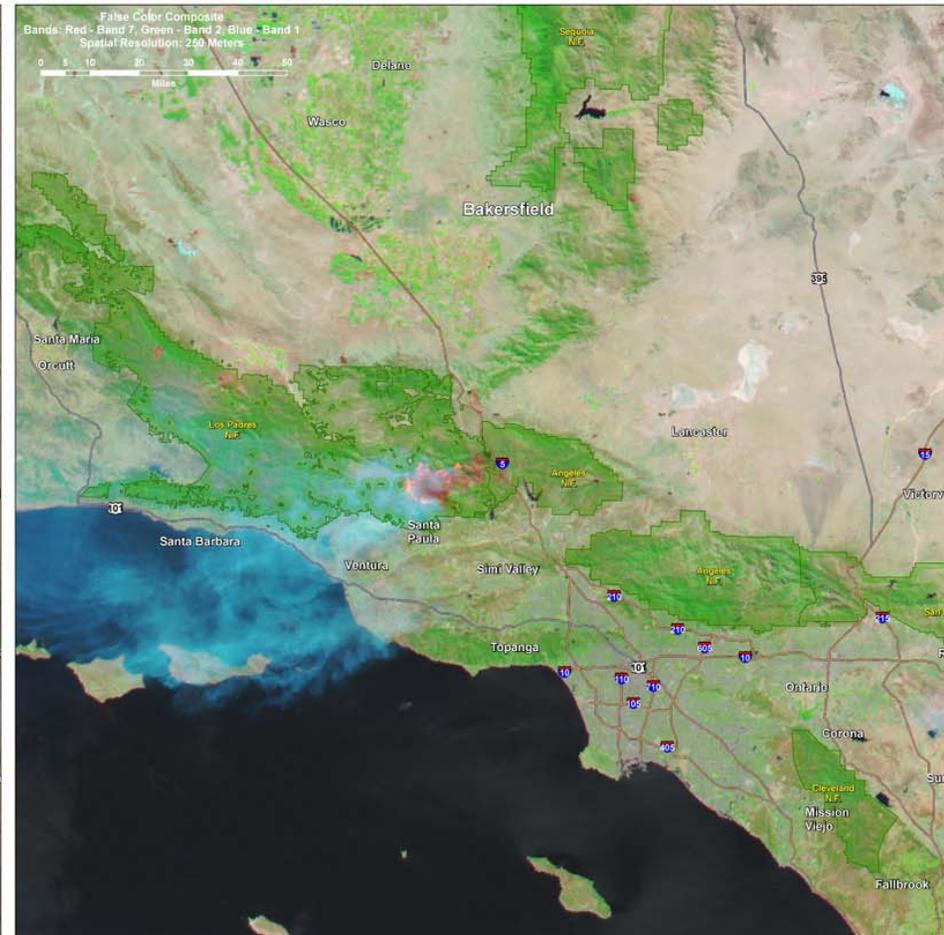
# MODIS Fire Image Subset Examples



**DAY FIRE**  
*As Viewed By Aqua MODIS*  
**September 17, 2006; 20:55 UTC**



Produced by the USFS Remote Sensing Applications Center (RSAC)



# MODIS Fire Detection GIS Data

USDA FOREST SERVICE REMOTE SENSING APPLICATIONS CENTER Canadian Fire Maps Mexico Fire Maps

## MODIS Active Fire Mapping Program

Annual cumulative datasets

Web Map Service

These data depict MODIS active fire detections for North America and were collected and compiled by the USDA Forest Service Remote Sensing Applications Center. Fire detection data are derived from Terra and Aqua MODIS data collected and processed in cooperation between RSAC, NASA-Goddard Space Flight Center, and the University of Maryland.

**ERSI Compatible Data**  
- Updated Hourly -

Download the annual cumulative fire detection data in an ESRI compatible format (Coverage or ShapeFile) for:

Download fire detection data for the last 7 days [here](#).

**Web Map Service Layers**  
- Updated Hourly -

WMS of annual cumulative fire detection data for years 2001-2006.

**Connection String:**

- <http://activefiremaps.fs.fed.us/cgi-bin/map.exe?Request=GetMap&Version=1.1.1&>

**Get Capabilities String:**

- <http://activefiremaps.fs.fed.us/cgi-bin/map.exe?REQUEST=GetCapabilities&Service=wms>

ESRI users should read about the [interoperability Add-Ons](#) for WMS support in their products.

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USDA, NASA, MODIS, SSEC, CONABIO

Feedback | Disclaimers | Privacy Policy

- Terra & Aqua MODIS fire detection GIS data for North America
- Compiled from GSFC, RSAC, SSEC & UAF MODIS Rapid Response
- Available for 2001 - 2006
- Updated hourly
- ESRI coverage & shapefile format
- FGDC Metadata
- Web Map Service (WMS)

## MODIS Active Fire Detections for North America (2006) - Through 10/11/2006 1700 MDT

Metadata also available as

### Metadata:

- Identification Information
- Data Quality Information
- Spatial Data Organization Information
- Spatial Reference Information
- Content and Attribute Information
- Distribution Information
- Metadata Reference Information

## Metadata

### Identification Information:

#### Citation:

**Citation Information:**  
Originator: USDA Forest Service, Remote Sensing Applications Center  
Publication Date: 20061011

**Title:**  
MODIS Active Fire Detections for North America (2006) - Through 10/11/2006 1700 MDT

**Geospatial Data Presentation Form:** vector digital data

**Publication Information:**  
Publication Place: Salt Lake City

**Online Linkage:**  
[http://activefiremaps.fs.fed.us/files/data/modis\\_fire\\_2006\\_204.r00.gzip](http://activefiremaps.fs.fed.us/files/data/modis_fire_2006_204.r00.gzip)  
[http://activefiremaps.fs.fed.us/files/data/modis\\_fire\\_2006\\_204\\_shapefile.zip](http://activefiremaps.fs.fed.us/files/data/modis_fire_2006_204_shapefile.zip)

#### Description:

**Abstract:**  
This coverage represents year 2006 MODIS fire detections for the geographic area covering the conterminous United States, Alaska, Hawaii, Canada and northern Mexico. The detections are obtained using both TERRA MODIS and AQUA MODIS data are collected and processed as a cooperative effort between the USDA Forest Service Remote Sensing Applications Center, NASA-Goddard Space Flight Center and the University of Maryland.

**Purpose:**  
These fire detection data are collected for the USDA Forest Service MODIS Active Fire Mapping Program (<http://activefiremaps.fs.fed.us>). These data are intended to provide a synoptic view of active fires for the past and present over the specified time period. These data are collected at a spatial resolution of 1 kilometer and therefore are only intended for geographic display and analysis at the national and regional levels. No responsibility is assumed by the USDA Forest Service in the use of these data.

#### Time Period of Contents:

**Time Period Information:**

**Range of Dates/Times:**

Beginning Date: 20060101

Ending Date: 20061011

Currentness Reference: publication date

#### Status:

**Progress:** In work

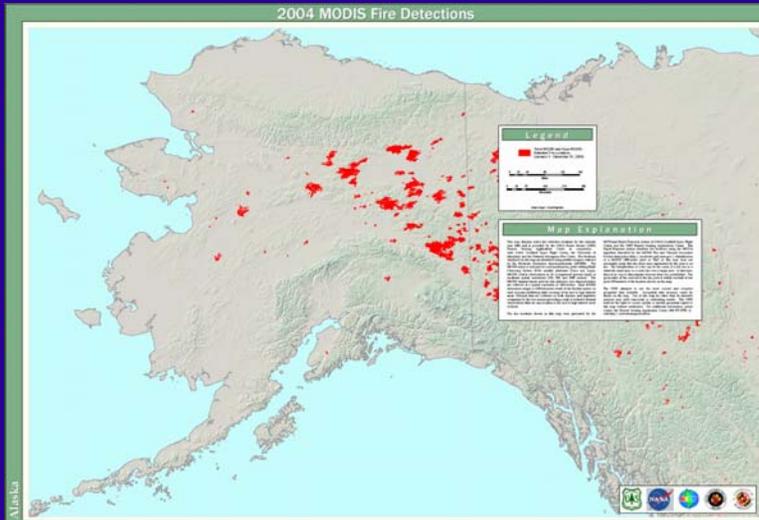
**Maintenance and Update Frequency:** Daily

#### Spatial Domain:

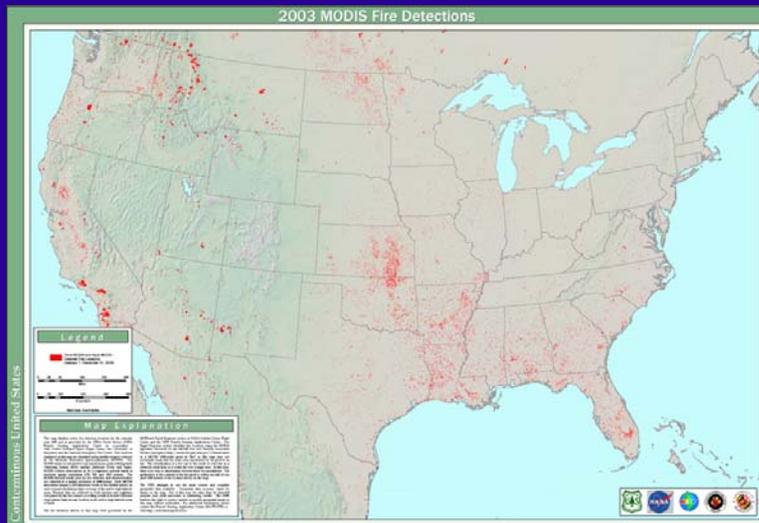
**Bounding Coordinates:**

West Bounding Coordinate: -167 971

# MODIS Fire Detection GIS Data



Alaska Cumulative Fire Detections 2004



CONUS Cumulative Fire Detections 2004

## Fire Detection Attributes

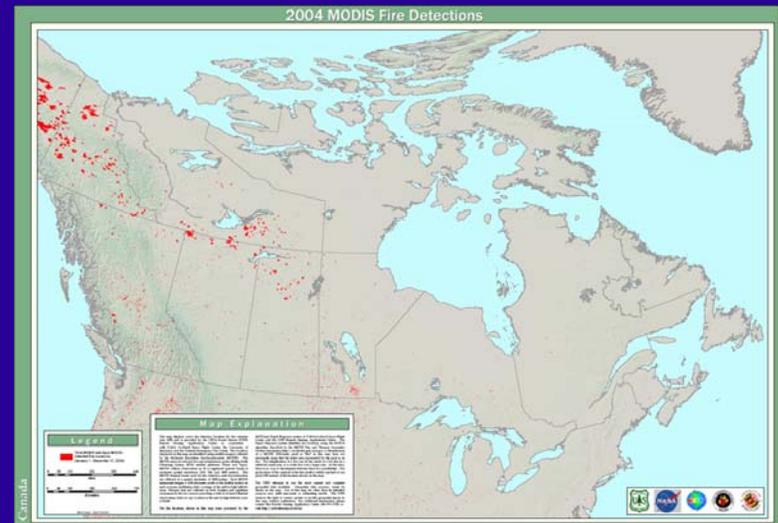
Acquisition date

Acquisition time

Pixel size (IFOV)

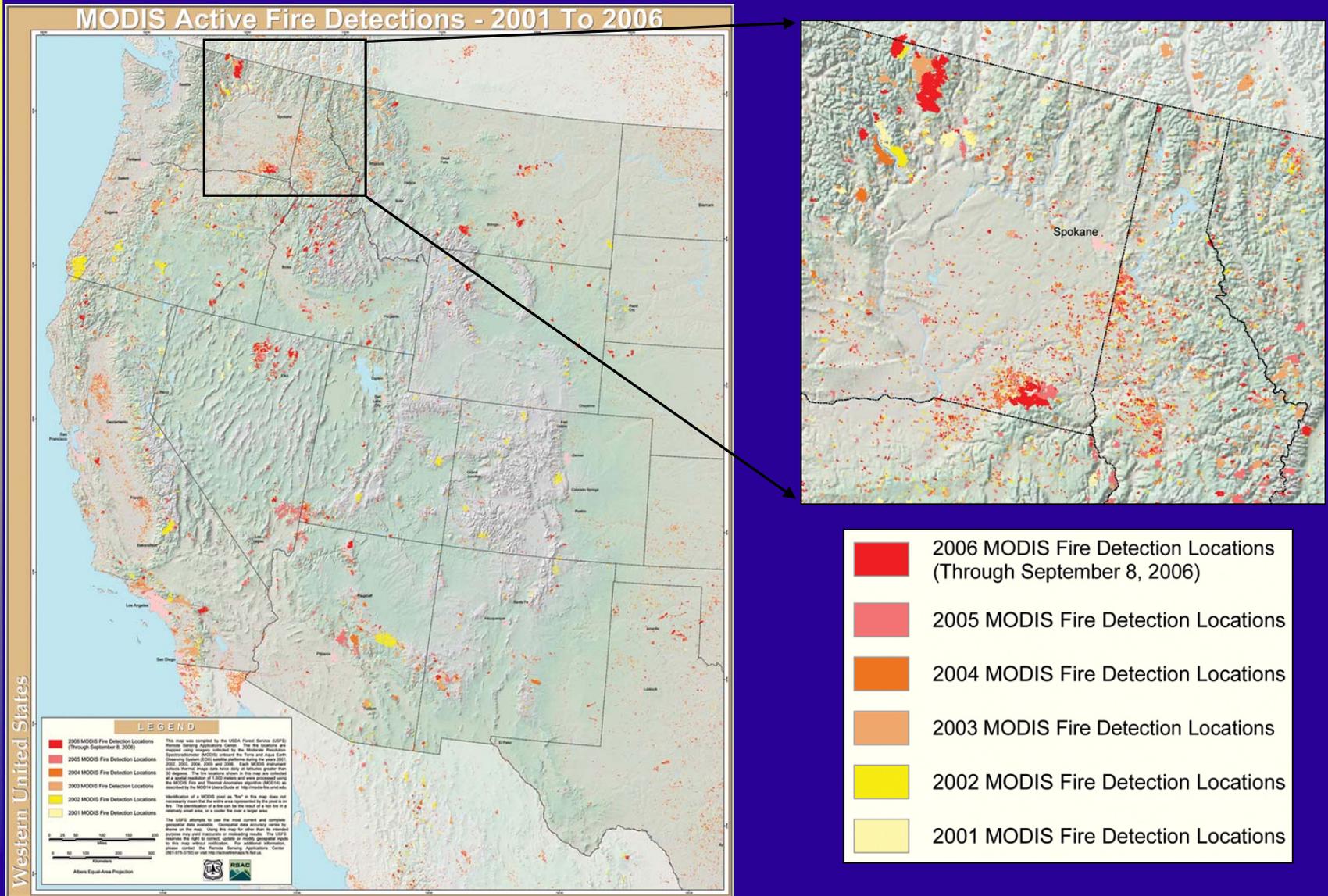
Observed brightness temperature

Ground station source



Canada Cumulative Fire Detections 2004

# MODIS Fire Detection GIS Data



Annual Western U.S. MODIS Fire Detections (2001-2006)

# User Community Depends On MODIS Active Fire Data

Usage of MODIS active fire data and products provided by Forest Service via USDA MODIS Active Fire Mapping Program website

	2001*	2002	2003	2004	2005	2006#
Hits	1.5 Million	3.3 Million	24.9 Million	18.7 Million	25.8 Million	32.6 Million
Users	42,000	502,000	1.5 Million	817,200	960,000	1.3 Million
Data Volume Transferred	12 GB	215 GB	750 GB+	1 TB+	4 TB	1.9 TB

\* - complete statistics not available for entire year

# - through October 9, 2006

Critical source of timely wildfire data...

*Data provided by MODIS Active Fire Mapping Program is also relayed to other fire support websites and data portals*

# Tactical Scale Active-Fire Mapping



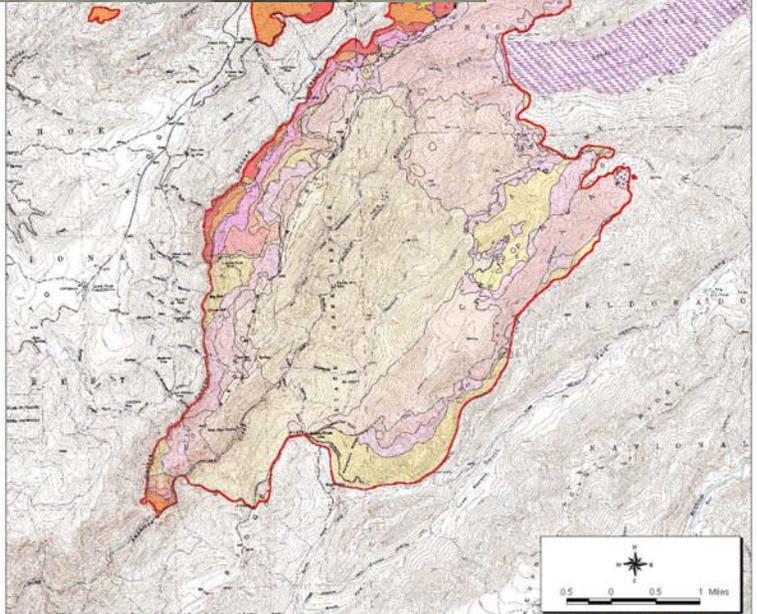
High resolution fire map products needed for daily 6:00 AM Incident Command briefing

Delineate fire perimeter and active fire fronts

Determine line of containment

Identify problem areas - hot spots inside & outside containment line

Identify hot spots during the mop-up phase



**Eldorado National Forest -- Tahoe National Forest**  
Star Fire Progression -- August 27 00:26 AM to September 10 8:15 PM

August 27 00:26 AM	August 30 7:21 PM	September 3 7:44 PM	September 7 7:58 PM
August 27 9:40 PM	August 31 9:20 PM	September 4 7:35 PM	September 8 8:54 PM
August 28 7:00 PM	September 1 9:07 PM	September 5 7:24 PM	September 9 9:50 PM
August 29 7:15 PM	September 2 7:47 PM	September 6 7:34 PM	September 10 9:15 PM

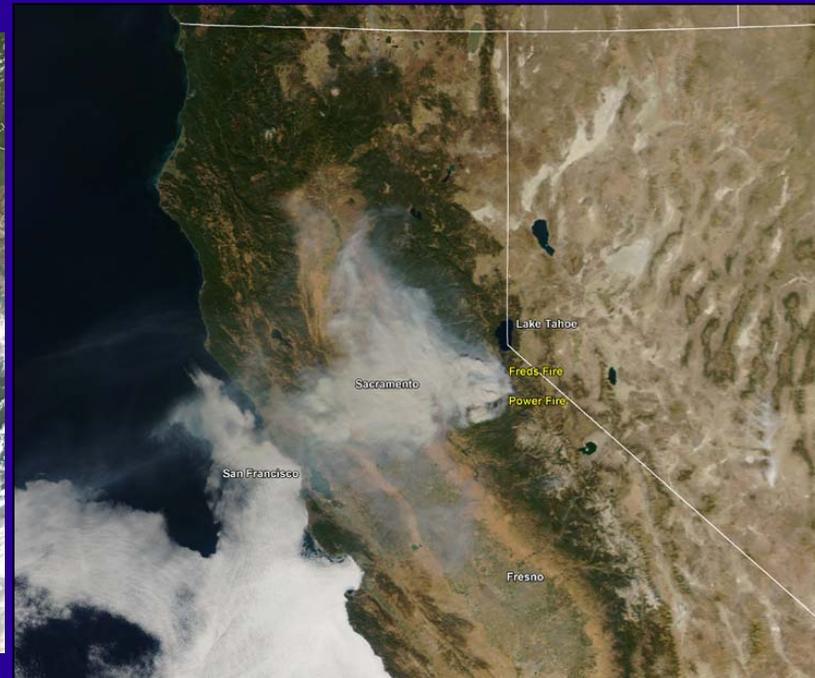
The fire perimeter used here is based on Infrared Interpretation. Please see the official Star Fire web page for more information on how the data was collected and turned into maps.

<http://www.r5.fs.fed.us/eldorado/incident/star/>



# Other Applications of MODIS Data

## Monitoring smoke transport



- Regional air quality managers monitor smoke from prescribed and wildfire activity

# MODIS Active Fire Mapping Summary

- MODIS Active Fire Mapping Program supports strategic fire management in North America
  - ◆ Direct broadcast/direct readout technologies are critical
  - ◆ “Value added” geospatial products
  - ◆ Operational; 24/7 year round
- Supports several additional fire mission objectives
- Looking forward
  - ◆ Continued program development and enhancement
  - ◆ Integration of future satellite sensors (VIIRS, etc.)
- Collaborative effort:



USDA Forest Service  
Remote Sensing  
Applications Center



National  
Interagency  
Fire Center



NASA  
Goddard  
Space Flight  
Center



University of  
Maryland –  
Dept of  
Geography



NOAA



University of  
Alaska-  
Fairbanks



University of  
Wisconsin  
Space Science  
& Engineering  
Center

# Post-Fire Rehabilitation & Monitoring

- Burn Area Emergency Response (BAER)
  - ◆ Satellite and airborne remote sensing systems used to support Burn Severity Mapping
- Monitoring Trends in Burn Severity (MTBS)
  - ◆ For wildland fires – 1984 to present

# Burn Area Emergency Response (BAER) Support

- Objective is to prepare Burn Area Emergency Response plan within 10 days of fire containment
- Remotely sensed imagery - use best available
  - MODIS
  - AWiFS
  - Landsat 5,7
  - ASTER
  - SPOT 2,4,5
  - Ikonos, Quickbird, Digital Globe
  - Airborne MS scanners
  - Airborne CIR Digital cameras
- Critical factors:
  - Acquisition timing
  - Delivery from provider
  - Spectral properties - SWIR band



# Post-Fire Rehabilitation

## BAER Team prepares Response Plan

- Identifies priority areas to be treated



**Installing soil erosion barriers**

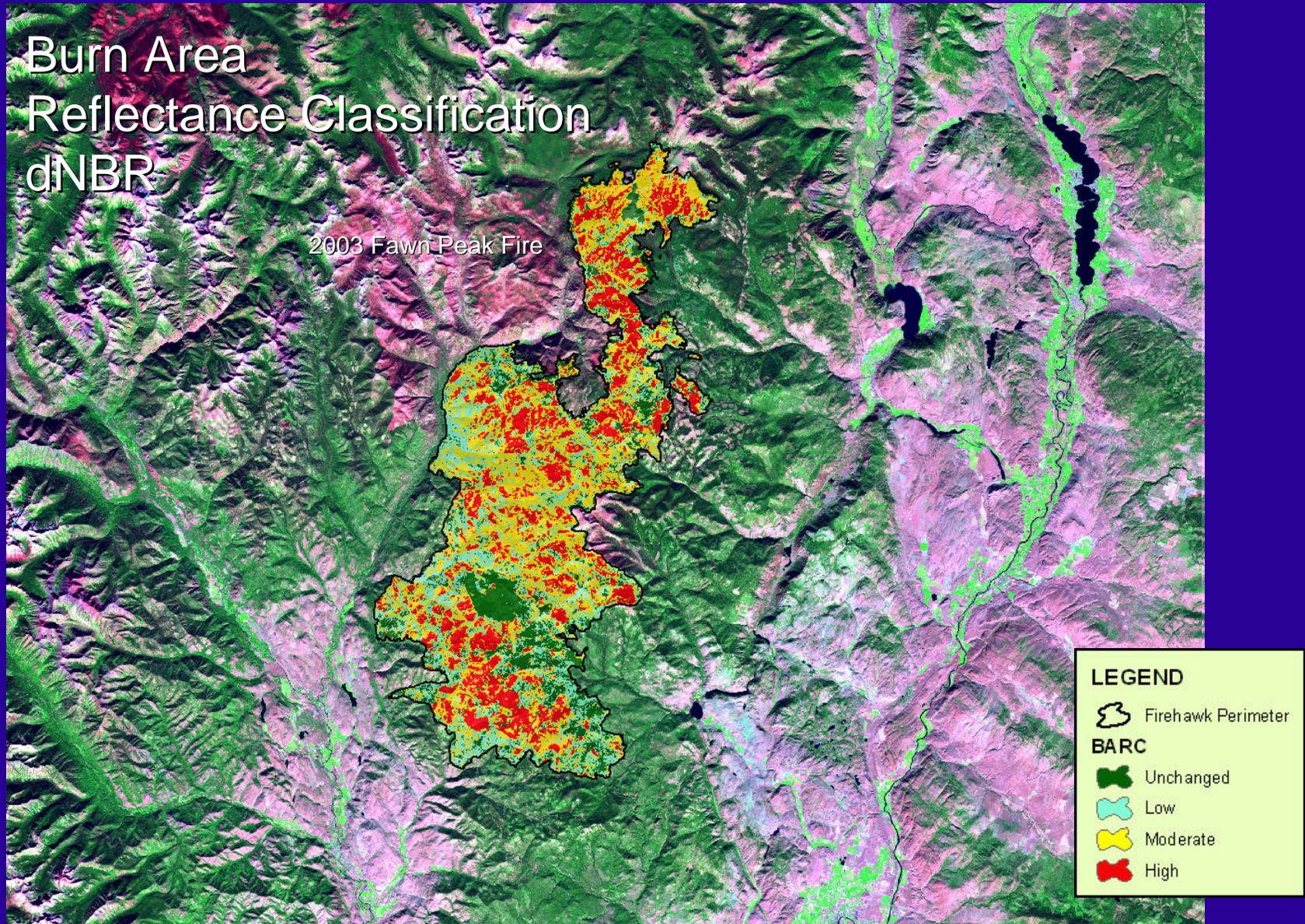


**Aerial mulching and grass seeding**

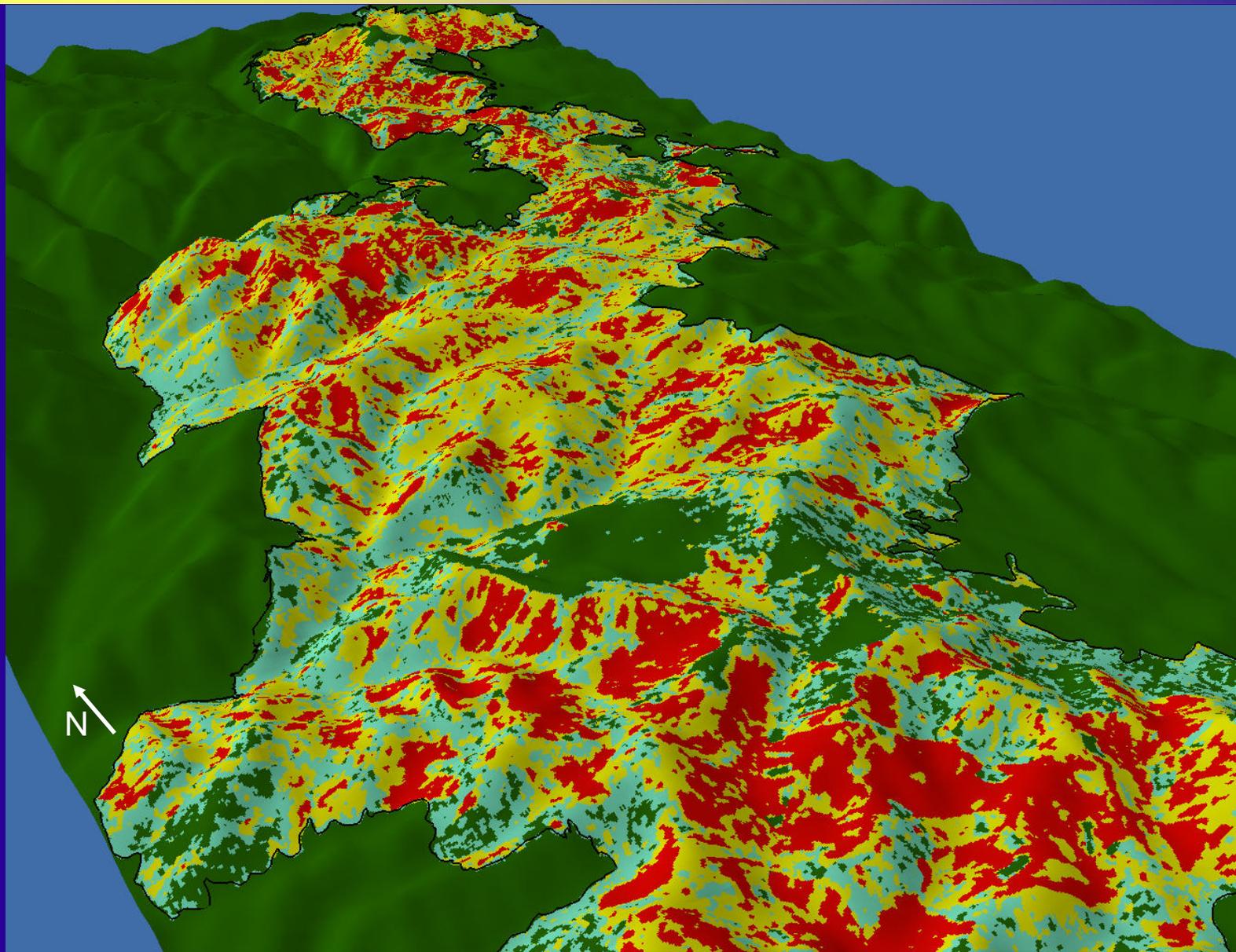
# Burn Area Emergency Response (BAER) Support

- Imagery and Burn Area Reflectance Classification (BARC) used to:
  - Derive **preliminary** estimates of burn severity - **rapidly**
  - Identify areas of greatest concern
  - Predict runoff response in hydrologic models
  - Create 3-D models of the burned area
  - Prepare graphics for BAER team and public meetings
  - Since 2001 mapped 7.9 million acres on 281 BAER fires

# Tripod Complex – Burn Area Reflectance Classification



# Tripod Complex – Burn Area Reflectance Classification



# Monitoring Trends in Burn Severity (MTBS)

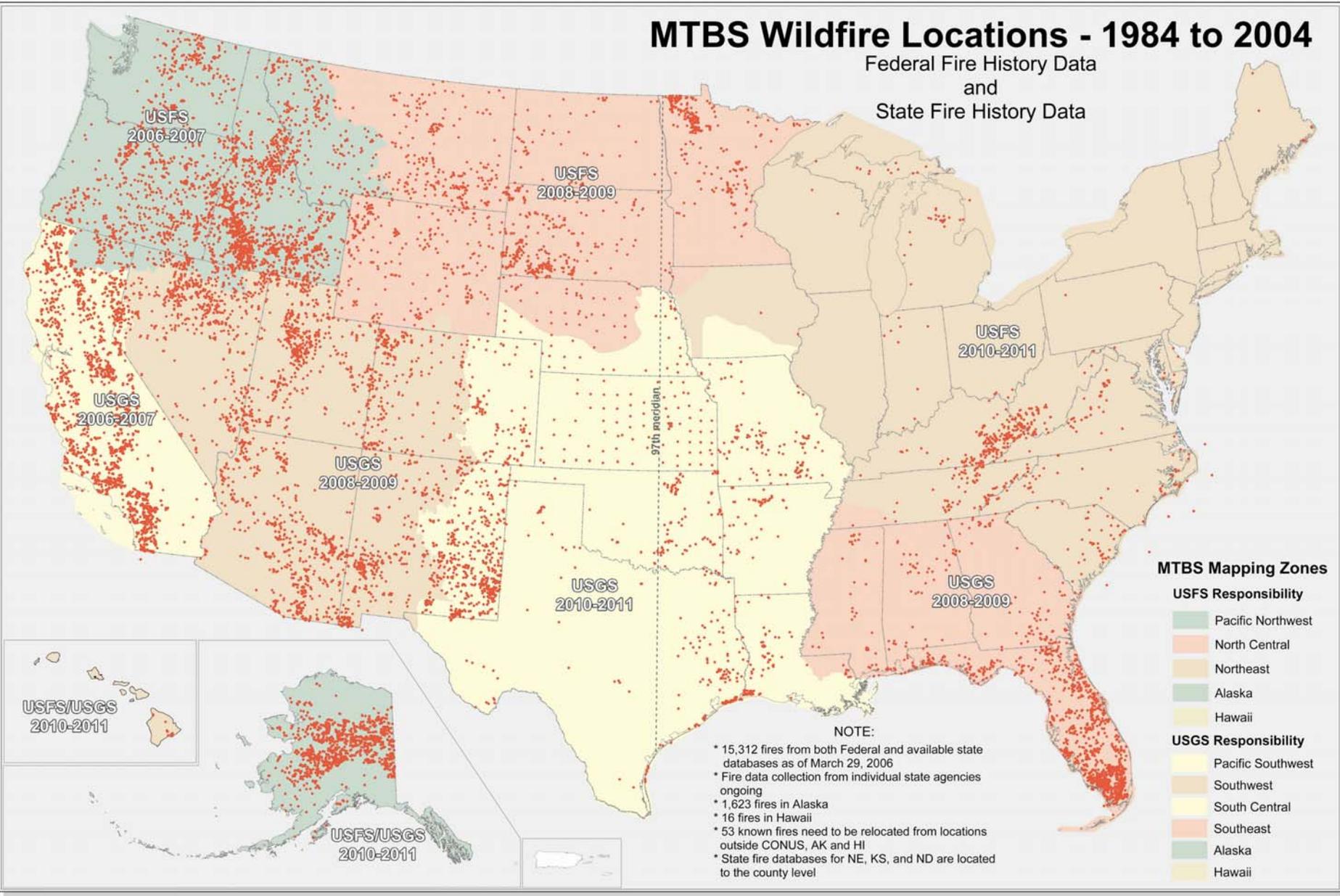
- Primary objective: Provide for a national analysis of trends in burn severity for the National Fire Plan
- Secondary objective: Provide consistent and comprehensive information about wildfire effects to land managers and the scientific community

# MTBS Products

- Burn severity data on all fires >1000 ac (385 ha) west of the 97th meridian and >500 ac (192 ha) east
  - ◆ Thematic and continuous Landsat TM, ETM 30m raster layers
- Fire perimeters
  - ◆ Shape files
- Tabular data summarizing burn severity acres by class
  - ◆ Additional stratification by vegetation type, treatment zones, condition classes, etc.
- Metadata
- Analysis performed by US Forest Service RSAC, and the US Geological Survey, EROS Data Center

# MTBS Wildfire Locations - 1984 to 2004

Federal Fire History Data  
and  
State Fire History Data



### MTBS Mapping Zones

#### USFS Responsibility

- Pacific Northwest
- North Central
- Northeast
- Alaska
- Hawaii

#### USGS Responsibility

- Pacific Southwest
- Southwest
- South Central
- Southeast
- Alaska
- Hawaii

**NOTE:**

- \* 15,312 fires from both Federal and available state databases as of March 29, 2006
- \* Fire data collection from individual state agencies ongoing
- \* 1,623 fires in Alaska
- \* 16 fires in Hawaii
- \* 53 known fires need to be relocated from locations outside CONUS, AK and HI
- \* State fire databases for NE, KS, and ND are located to the county level

USFS  
2006-2007

USFS  
2008-2009

USFS  
2010-2011

USGS  
2006-2007

USGS  
2008-2009

USGS  
2010-2011

USGS  
2008-2009

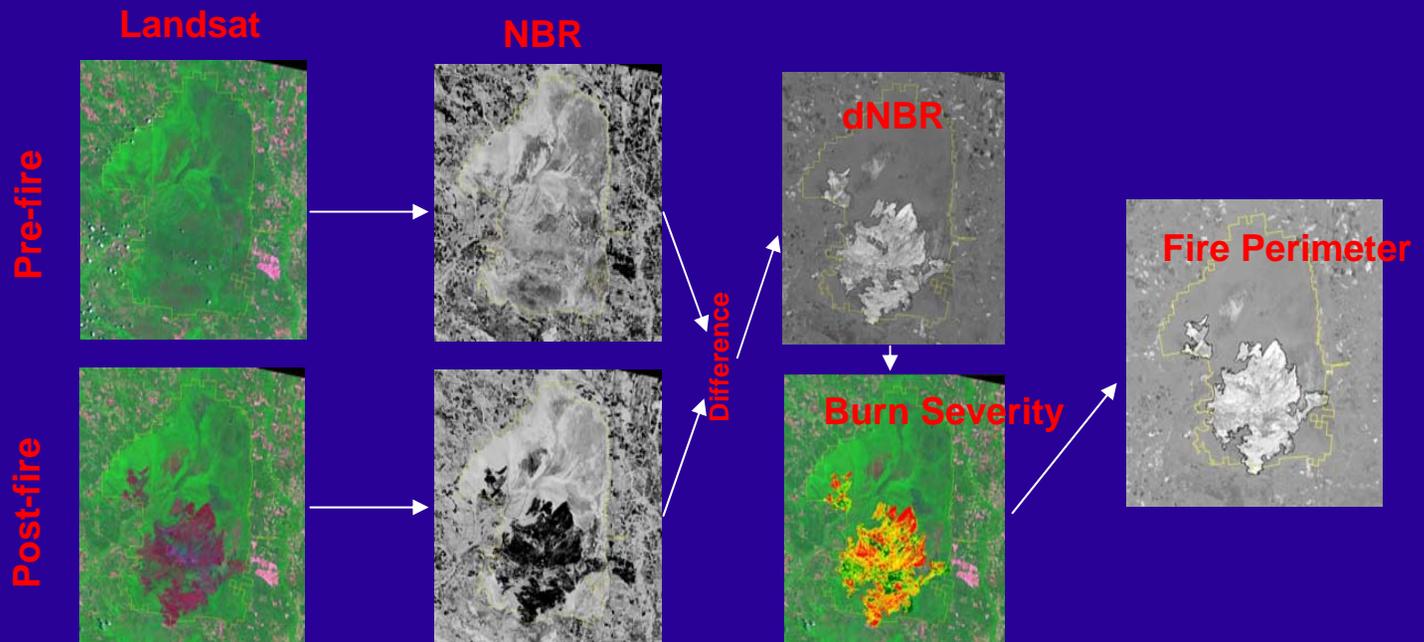
USFS/USGS  
2010-2011

USFS/USGS  
2010-2011

97th meridian

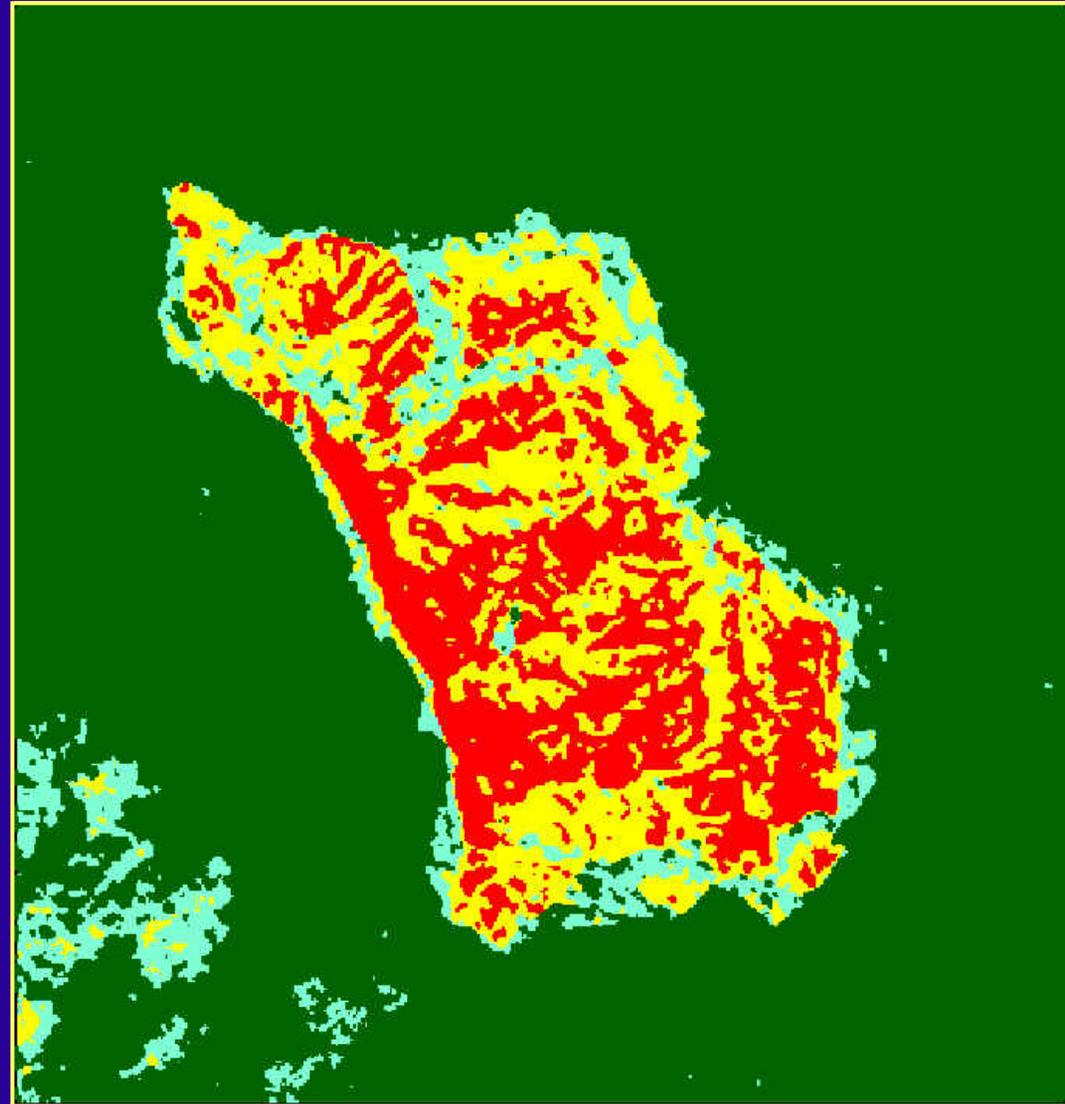
# MTBS Method Outline

- Compile a single MTBS fire occurrence database from existing sources
- Based on fire occurrence database, select pre and post-fire LANDSAT TM, ETM scenes
- Data processed at EROS-terrain correction through NBR calculations
- EROS and RSAC analysts perform differencing and threshold dNBR images into burn severity classes
- Data summary and trends analysis



# MTBS Methods - Burn Severity Map Development

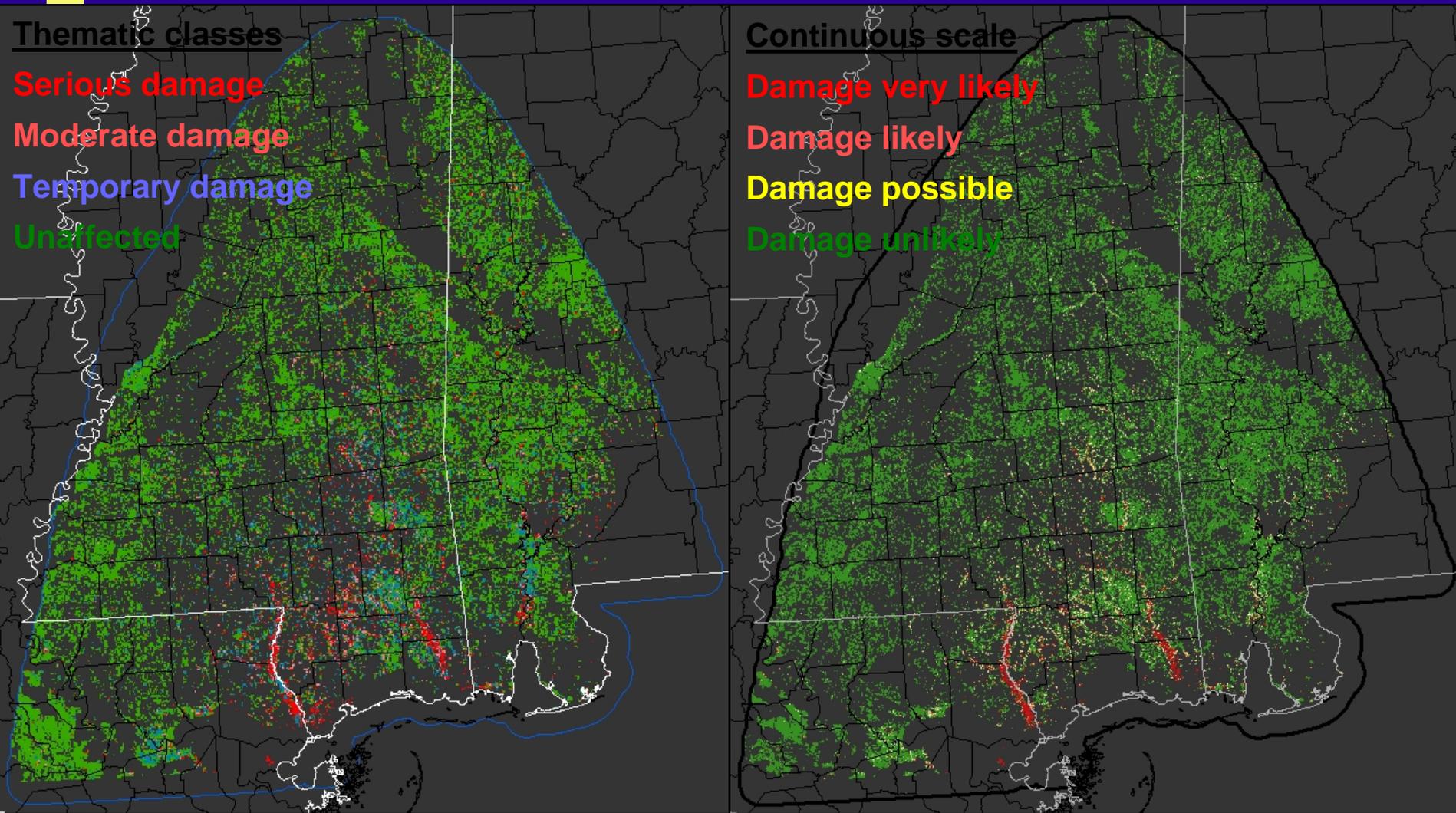
- Differenced NBR images are interpreted to derive 4 severity classes (unburned, low, moderate, high)
- Analysts use existing Composite Burn Index (CBI) thresholds (Key, 2001) as guidance for choosing severity thresholds



# Forest Monitoring

- Storm Damage Assessment
- Forest Health Monitoring – Change Detection

# MODIS 250 m Rapid Assessment Test - Katrina



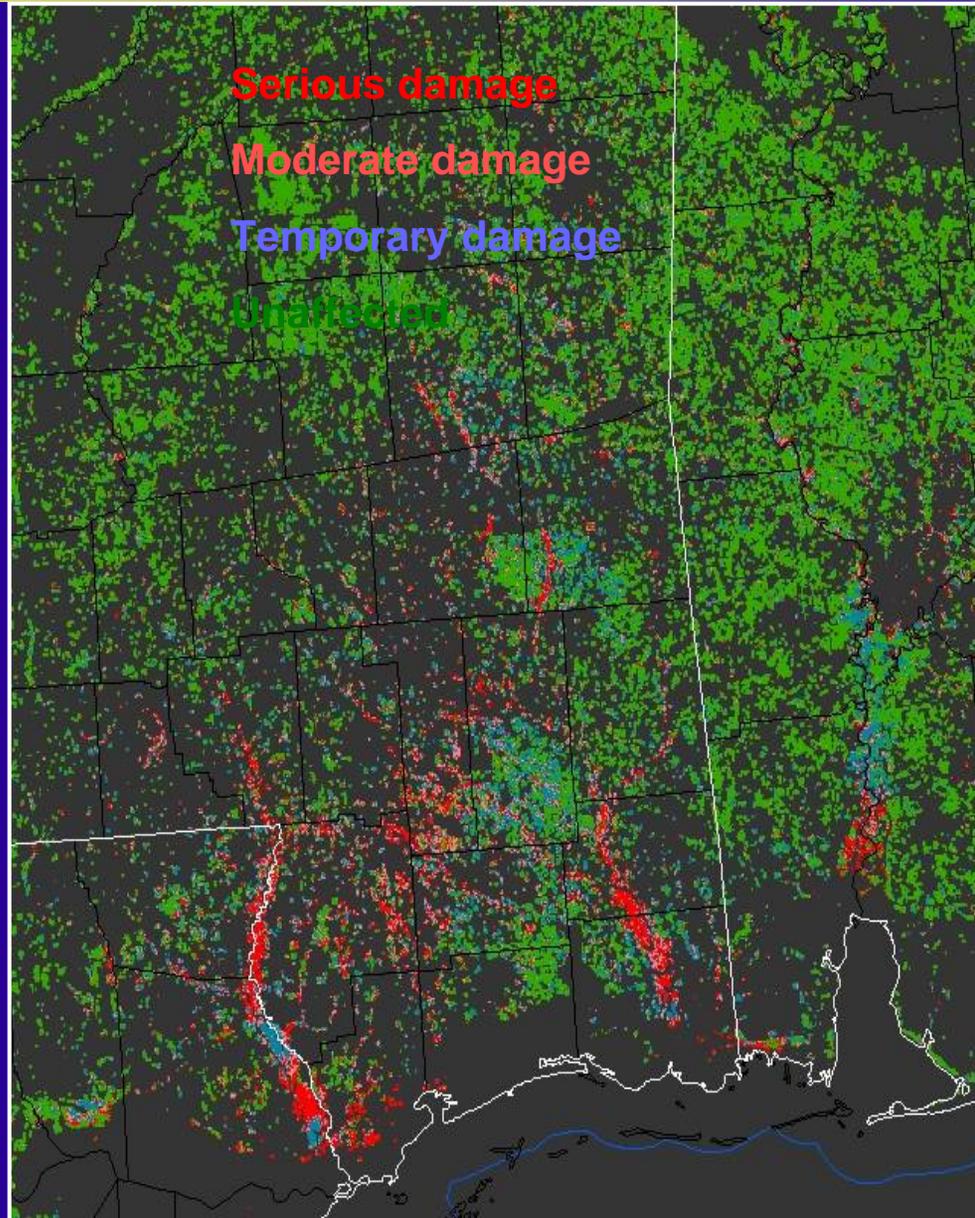
● Damage map produced using time-series data through 2.5 months after hurricane.

● Damage likelihood produced using data available 3 days after hurricane.

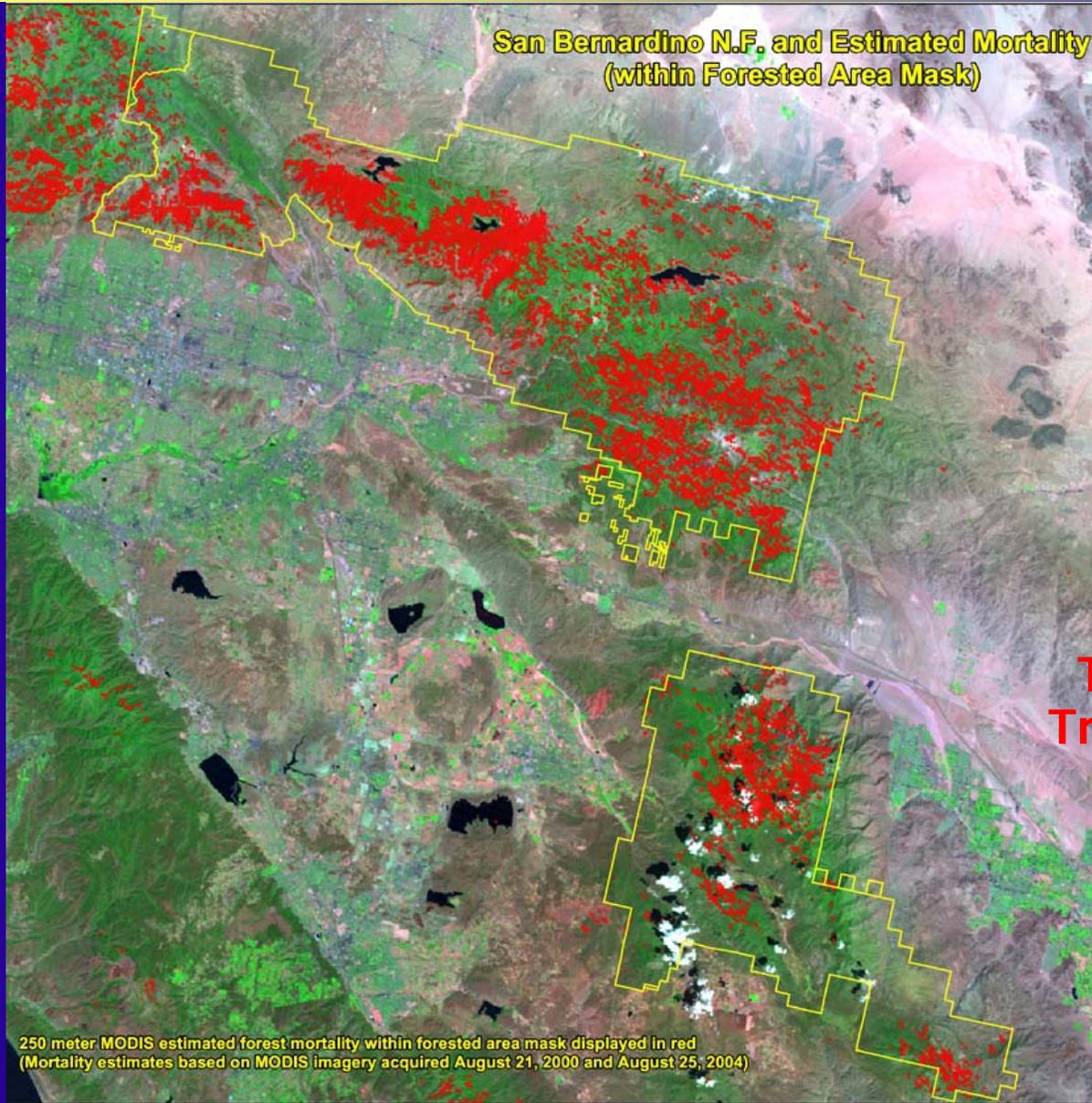
# MODIS 250 m Rapid Assessment Test - Katrina

Closeup of heavily damaged coastal region.

Damage map produced using NDVI time-series data from before Katrina until 2.5 months after.

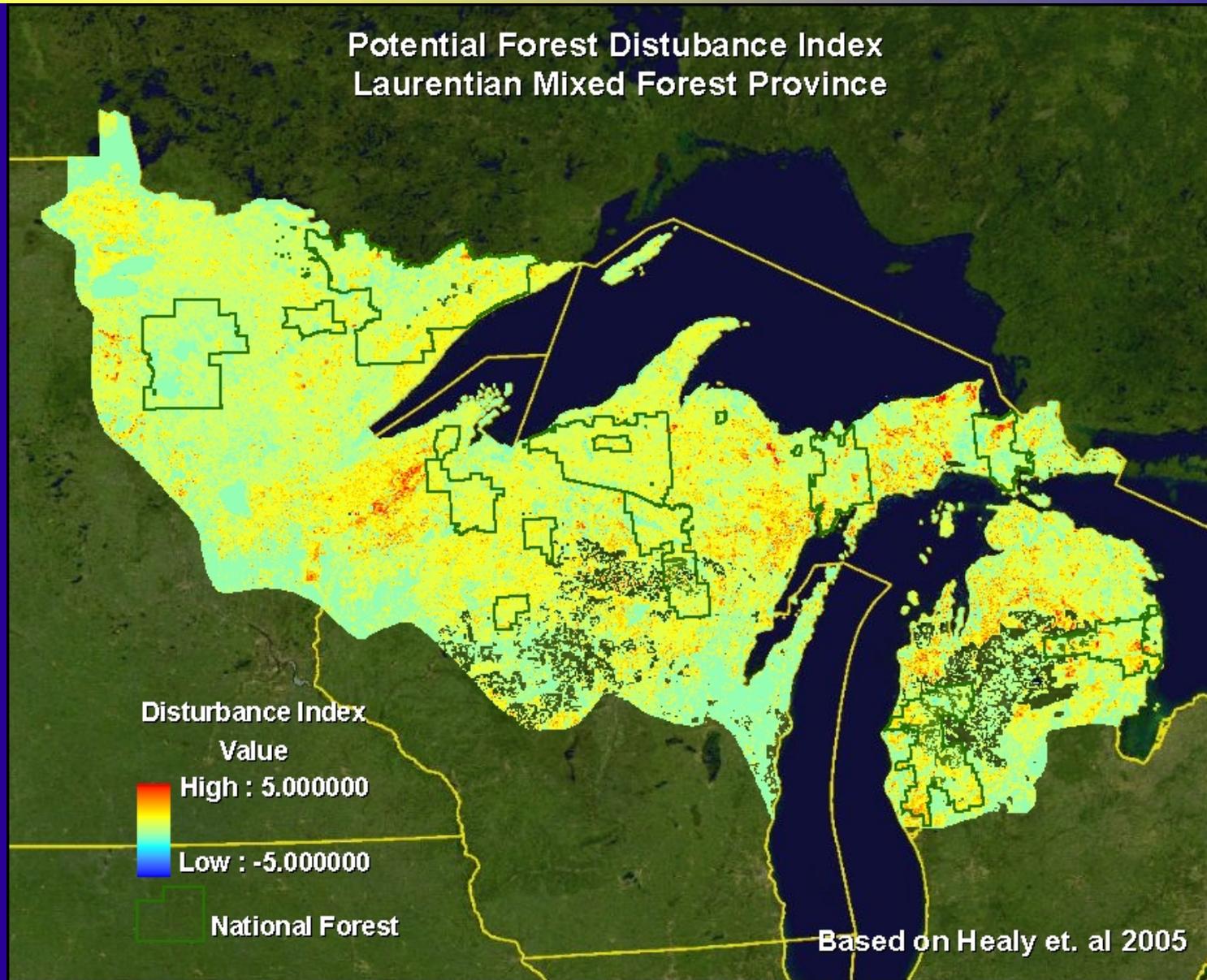


# MODIS Derived Forest Mortality Mask



Tasseled Cap  
Transformation  
– 500 m

# MODIS Derived Forest Disturbance Index



# Additional Information

USDA Forest Service Remote Sensing Applications Center

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

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

