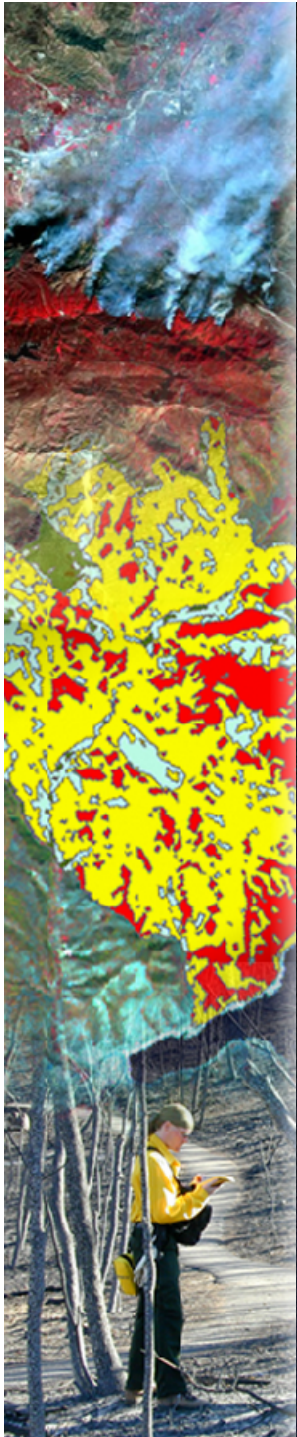
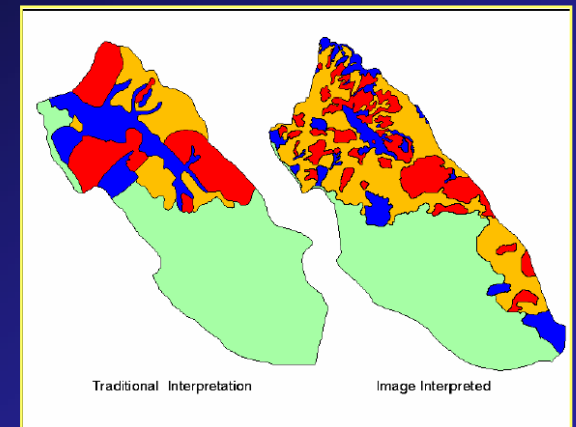
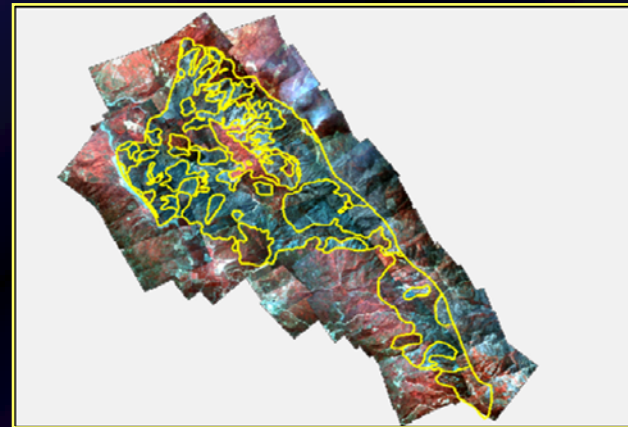


# RSAC and BAER Fire Mapping Support



# History—1996

- RSAC and Region 5 evaluated the use of airborne color infrared digital imagery to map burn severity
  - Kodak DCS420
- One 25,000 acre fire (Fork Fire, Mendocino NF) was evaluated
  - Results:
    - An effective tool for mapping burn severity
    - Image acquisition costs vary substantially
    - Difficult to provide data in a timely manner



# History—2001

- Steering committee project
- Objective: Develop techniques for mapping burned vegetation and soil conditions with multi-spectral satellite data
- Requirements: Image data and derived products need to be provided to BAER teams as soon as possible after fire containment (1 to 1  $\frac{1}{2}$  days)
- Results:
  - Coordination with vendors to acquire cost-effective, timely image data
  - Developed & implemented methodologies to create preliminary burn severity data
  - Provided timely support to 15 BAER teams and mapped 311,000 acres
- Sensors Used: LANDSAT 5 & 7, SPOT 1, 2 & 4 and IKONOS

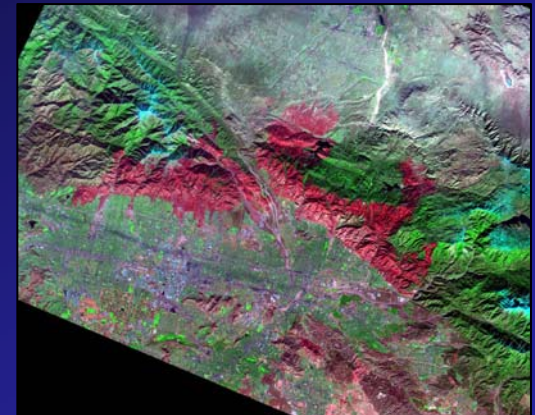
# History—2002

- RSAC “BAER Imagery Support Program” is implemented to provide operational support to all USFS BAER teams
- RSAC coordinates with USGS-EROS to support BAER teams assigned to fires with mixed DOI/USFS ownership
- 2002 fire season one of the busiest on record
- Results:
  - Provided timely support to 73 BAER teams
  - Mapped over 2.7 million acres



# History—2003 thru 2005

- RSAC investigates and implements other sensors for BAER support:
  - ASTER, MAS, MASTER, ALI, and etc.
- RSAC coordinates all available government and commercial remote sensing assets to support BAER teams responding to southern California fire event (750,000+ acres burned in seven days)
- Results:
  - Mapped 125 fires (2,843,132 acres)
  - Gathered field samples while visiting five fires: Willow, AZ; Nuttall Complex, AZ; Pot Peak, WA, School, WA; Burnt Cabin, OR



# History—2006 and 2007

- 2 busiest fire seasons in the lower 48 in 50 years
  - Fires supported: 221
  - Acres mapped: 5,979,263
  - # satellite images used: 264
  - # of BARC layers created: 275
  - # of fires greater than 100,000 acres: 16
  - Largest fire supported: Cascade Complex (302,376 acres) - 2007
  - Smallest fire supported: Grease (366 acres) - 2006
  - Fire mapped the most: Tripod (4 versions) - 2006
- Field sampling in Minnesota (Ham Lake)
- Pseudo-BAER assignment on Neola North
- Southern California firestorm part 2
- Began using the AWiFS sensor (56m resolution)



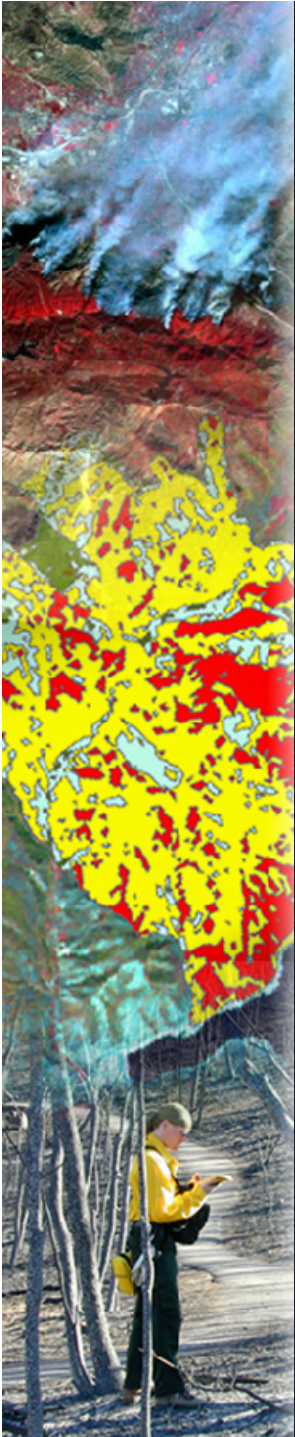
# Fire Support Statistics

Year	USGS-EROS		USFS-RSAC		Sum	
	Fires	Acres	Fires	Acres	Fires	Acres
2001	5	N/A	15	310,500	20	310,500
2002	10	500,000	73	2,710,599	83	3,210,599
2003	17	307,034	54	1,637,471	71	1,944,505
2004	24	5,000,000	25	471,102	49	5,471,102
2005	23	800,000	46	734,559	69	1,534,559
2006	61	2,532,907	115	2,470,856	176	5,003,763
2007	48	2,422,130	106	3,508,407	154	5,930,537
<b>Sum</b>	<b>188</b>	<b>11,562,071</b>	<b>434</b>	<b>11,841,324</b>	<b>622</b>	<b>23,405,565</b>



Collaborative effort between USFS-RSAC and USGS-EROS

# Additional Remote Sensing Technology Applications by RSAC to Support Wildland Fire Management within the USDA Forest Service

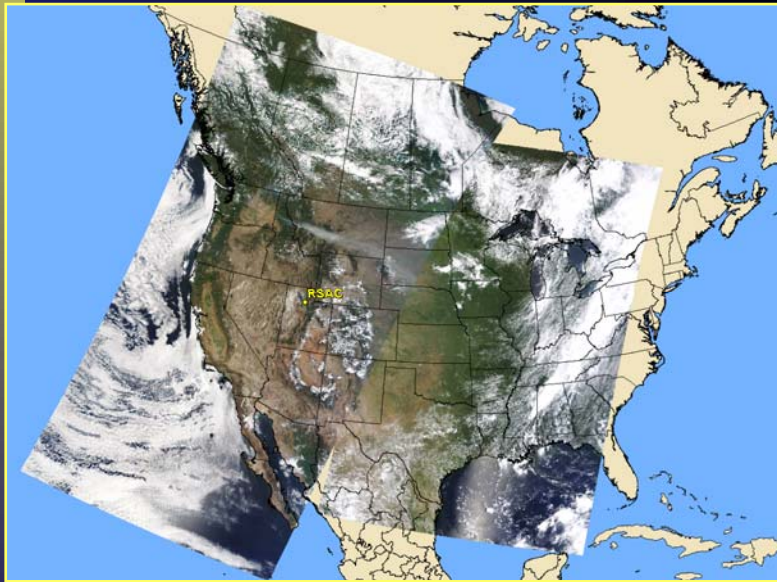




# Active Fire Suppression Mapping

- National Scale:
  - ◆ MODIS Active fire maps and associated data
  - ◆ Cooperative effort with NASA & University of Maryland
- Tactical Scale for Incident Command
  - ◆ High resolution airborne Thermal IR Mapping Systems
  - ◆ Forest Service, other agency and commercial systems used

# Active Fire Detection/Mapping: MODIS



- RSAC collects MODIS data in real time for the majority of the U.S. via its MODIS ground station in Salt Lake City, Utah
- Collected data is processed to extract fire detection locations within 1 hour of acquisition
- Additional data for other areas of the country are provided to RSAC by NASA and other MODIS ground stations

# Active Fire Detection/Mapping: MODIS



- RSAC compiles fire detection nationwide MODIS fire detection data and imagery data from all sources to provide a suite of daily fire geospatial products for fire detection and monitoring

USDA FOREST SERVICE REMOTE SENSING APPLICATIONS CENTER Canadian Fire Maps

### MODIS Active Fire Mapping Program

Search

Regional Maps ArcIMS Maps Imagery GIS Data Fire Detections Other Products

Fire locations are based on data provided by the National Interagency Fire Center and are subject to change.

#### Large Incidents - January 28, 2005

View Printable Map Definition of Map Terms Select a Fire Go

Posted November 2, 2004

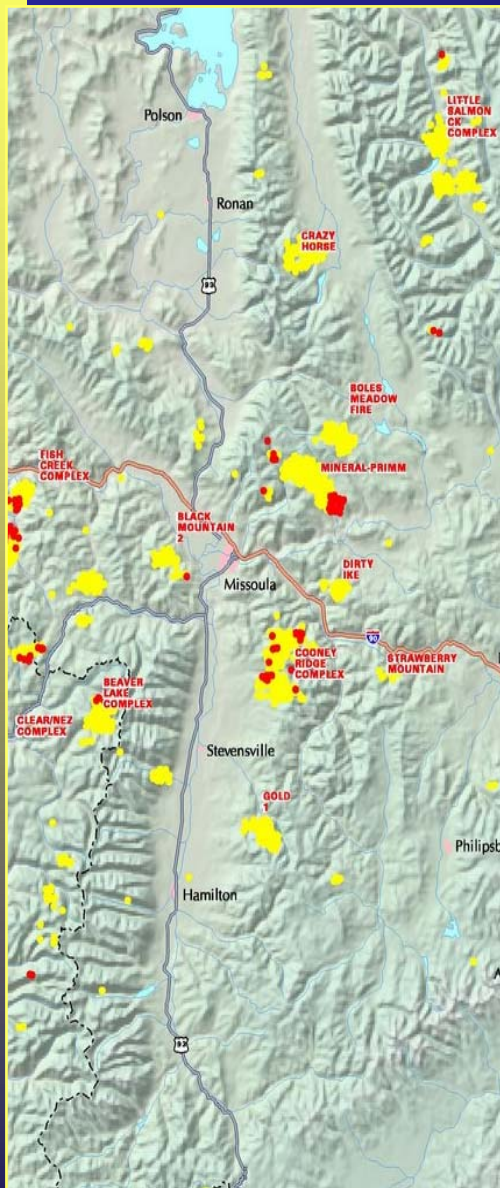
Please see the MODIS fire detection animation of the Alaskan wildfires compiled by the Remote Sensing Applications Center available under the Custom Products link. The animation displays the progression of fire activity in the Alaskan interior from June 10 to September 6, 2004.

These fire information products were compiled at 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 Lab.

- Maps
- Interactive web maps
- Image subsets
- GIS data

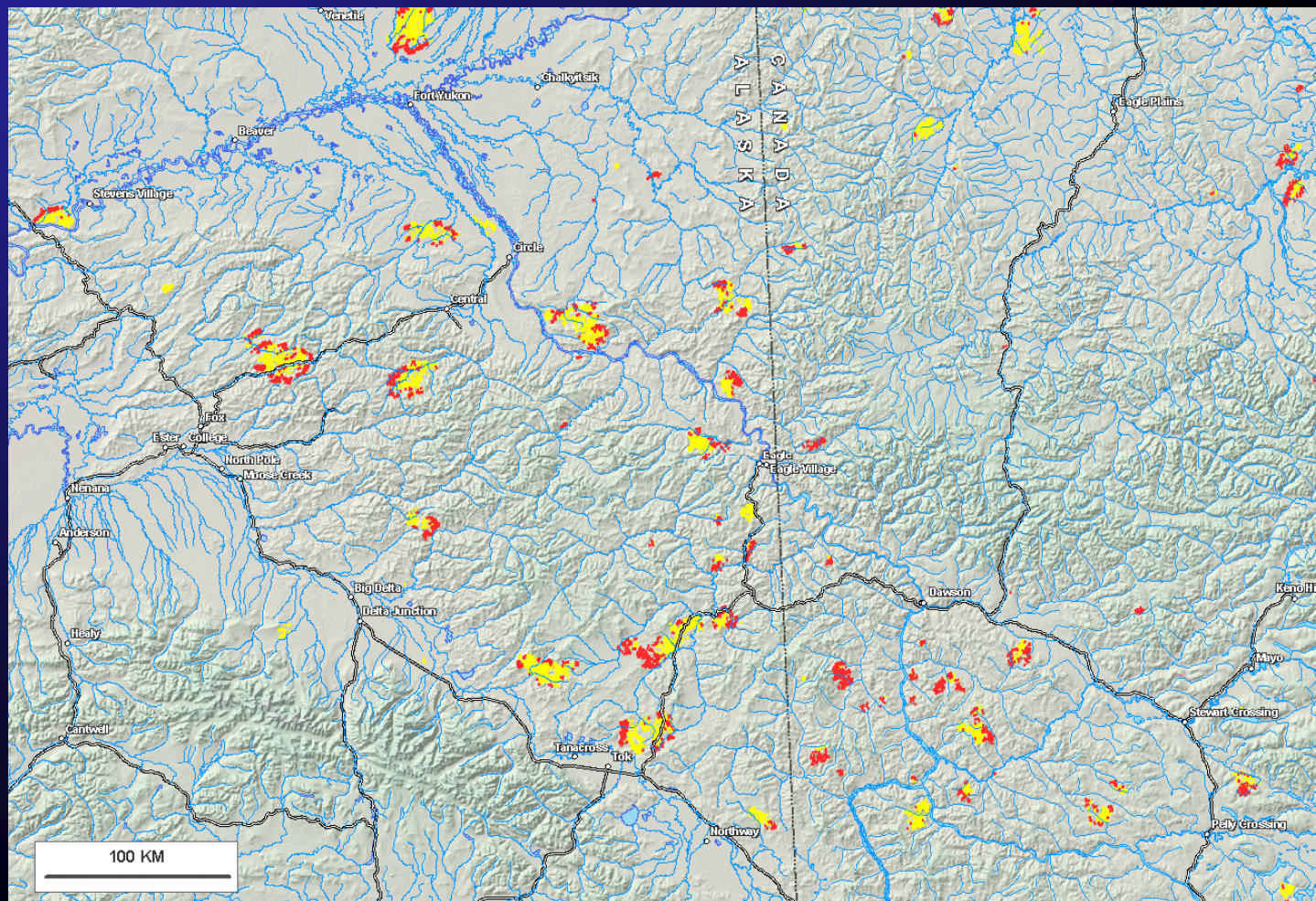
- Products are available at <http://activefiremaps.fs.fed.us>

# MODIS Active Fire Products



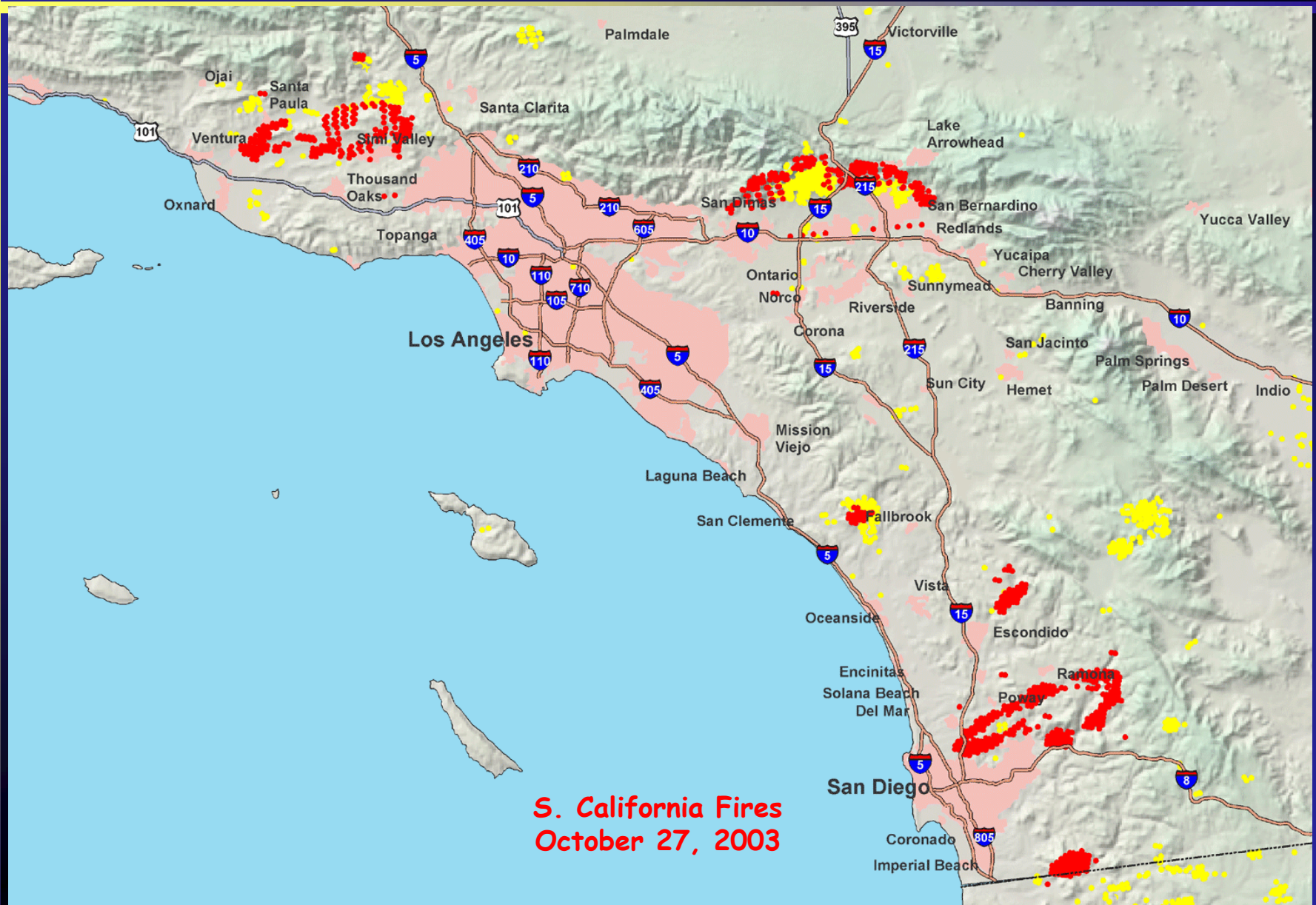
- National scale maps, geospatial data and imagery used to assist in strategic planning - 1 km spatial resolution
  - Not a replacement for airborne thermal infrared mapping systems
- Available for United States & Canada
- Maps and images produced several times daily (as fire conditions warrant)
- Display active and previously burned areas with baseline cartographic data
- Maps, geospatial data, and imagery made available through website:  
<http://activefiremaps.fs.fed.us>

# MODIS Active Fire Map & Imagery Products

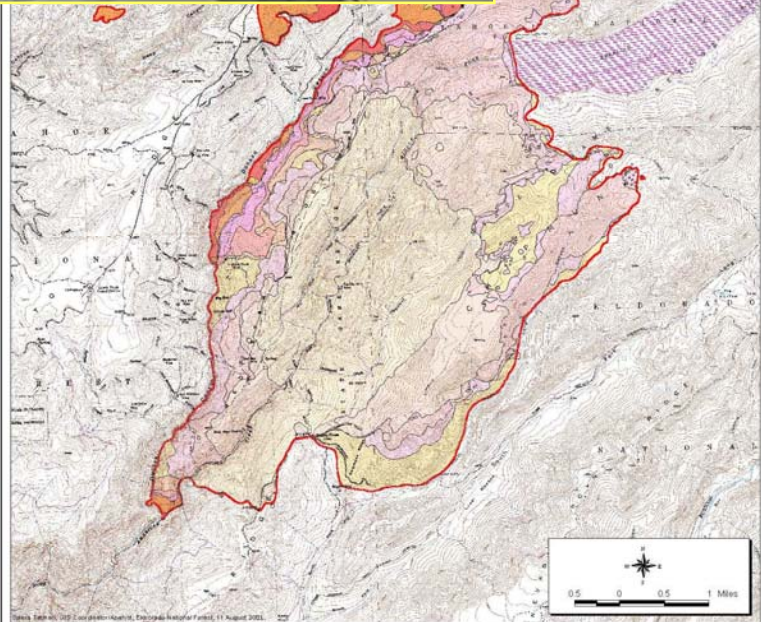


Alaska Fires  
June 29, 2004

# MODIS Active Fire Map & Imagery Products



# Tactical Scale Active Fire Mapping



**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 8:50 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/>

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

# Airborne Thermal Infrared System Typing

Components	Multiple Incident/Large Fires		Single Incident
	Type 1	Type 2	Type 3 (FLIR)
Mount	Nadir	Nadir	Gimbaled
Geocorrected products	Yes	Yes	Optional
TIR Spectral Bands	2 or more	1	1
Production rate acres/hr	100,000	10,000	500 - 1,000

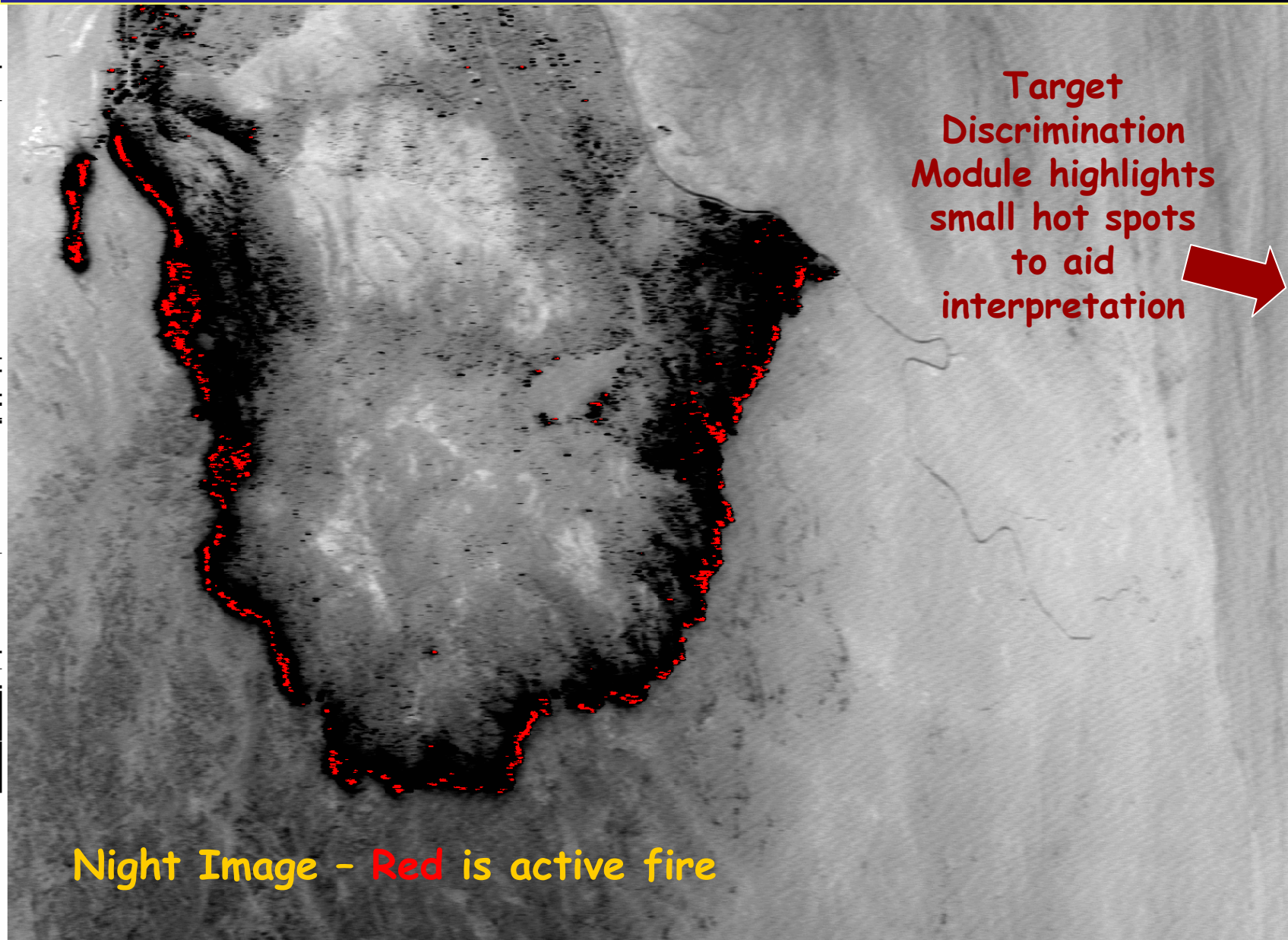


# Forest Service Type 1 Phoenix System

- High Resolution Thermal Infrared Line Scanner
  - 3-5 and 8-12 micron spectral bands
  - 120 degree FOV, 1.25 milliradian IFOV, 200 scans/second
  - 9,900 m swath width at 3,100 m AGL
  - GPS and Applanix 3500 IMU
  - Terrain corrected Geotiff file
  - Continuous strip imagery with hotspots delineated
  - Primarily used for night time missions



# Forest Service Type 1 Phoenix System



Target  
Discrimination  
Module highlights  
small hot spots  
to aid  
interpretation

Night Image - Red is active fire

Hdg 20  
Alt 18376 (MSL)  
Scale 22.5 fppix

N 32° 25' 06"  
W 110° 45' 58"  
Line 115552

AT  
SC



# The End