

Overview of Remote Sensing Support To Wildland Fire Applications



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Remote Sensing for Wildland Fire Applications

- Pre-Fire Fuels/Vegetation Mapping
 - National Scale Fire Danger Rating System
 - Fire Regime Condition Class
 - Predictive Services
- Active-Fire Suppression Mapping
 - National Scale Active Fire Mapping
 - Tactical Scale Fire Mapping – Incident Command support
- Post-Fire Rehabilitation Mapping
 - Burn Area Emergency Response (BAER)
 - **R**apid **A**ssessment of **V**egetation Condition after Wildfire (RAVG)
 - **M**onitoring **T**rends in **B**urn **S**everity (MTBS)



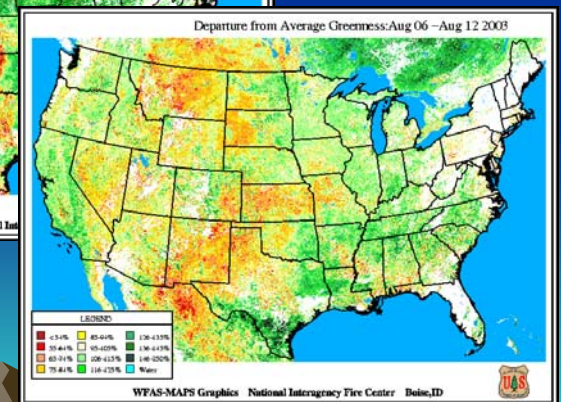
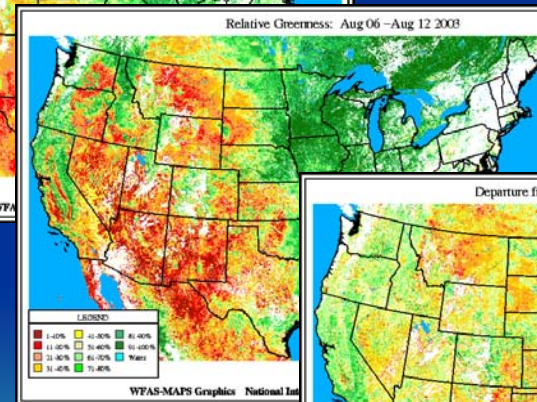
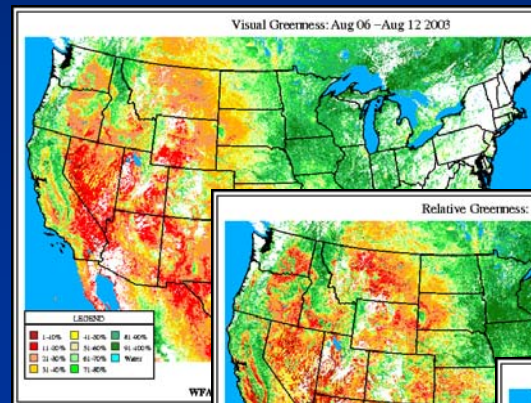
Pre-Fire Fuels/Vegetation Mapping

- National Fire Danger Rating System (NFDRS)
 - Data analysis system that provides a nationwide estimate of the current fire danger
 - US Geological Survey provides remote sensing component
 - Weekly “Greenness” maps to assess vegetation condition



Weekly AVHRR
Composite Data

<http://edc.usgs.gov/greenness/>



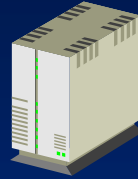
Weekly AVHRR
Derived Greenness
Maps

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
 - National Infrared Operations (NIROP)
 - Wildfire Research Application Partnership (WRAP) NASA & Forest Service – Unmanned Aerial Systems
 - Other commercial and agency sources



Overview: MODIS Fire Mapping Product Distribution



USFS-Remote Sensing Applications Center
MODIS Active Fire
Mapping System

Fire Maps
Imagery Subsets
GIS Data
Custom Products
& Analysis



MODIS Active Fire
Maps Web Server

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

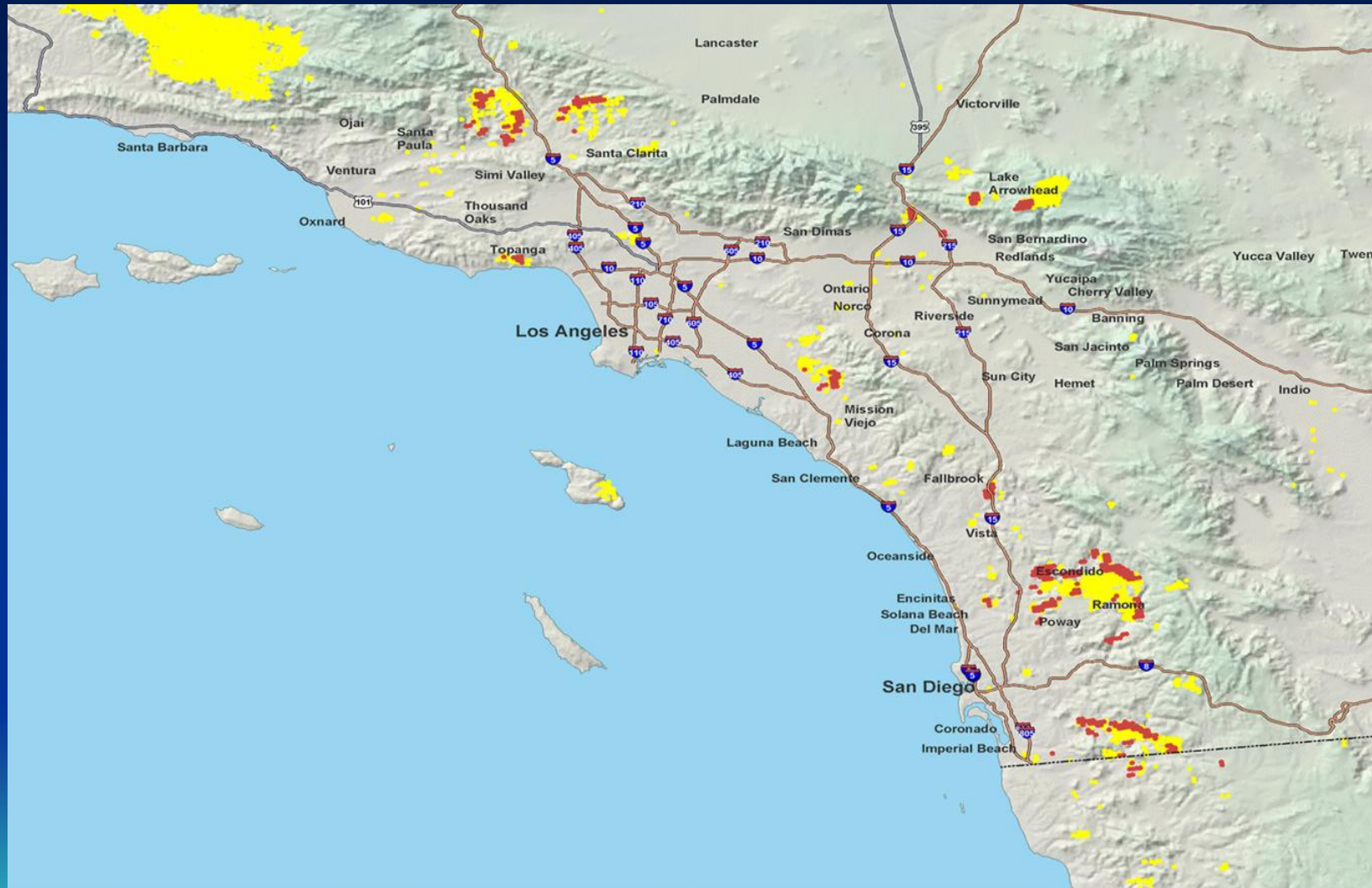


geography network



Other Fire Geospatial
Applications/Data Services

MODIS Active Fire Map & Imagery Products



National Infrared Operations (NIROP)

- Two channel thermal IR line scanner
 - 3-5 micron band for fire
 - 8-12 micron band for background terrain
- 1.25 milliradian IFOV – 3.5 meter pixel at NADIR, 10,000 feet AGL
- 120 degree FOV – 6 mile swath at 10,000 feet AGL
- 256 gray scale (255th pixel is colored red)
- 1676 pixels per scan line
- 200 scan lines per second



High productivity rate – imaging over 500,000 acres an hour
Can reliably detect a six inch hot spot and provide background terrain

WRAP Ikhana Fire Missions

- 2007 Fire Missions
 - 8 missions
 - 35+ fires mapped
 - Traversed 8 western states
 - Over 90 hours operational hours in the National Airspace
- 2008 California Fire Support
 - First use of system for emergency response
 - 4 missions
 - 11 Wildfires mapped
 - 94 images and over 20 hot-spot perimeters



Post-Fire Rehabilitation Mapping

- **Burn Severity”** has different meanings...
- **Burn Area Emergency Response (BAER)**
 - Focus on soil and water quality effects
- **Rapid Assessment of Vegetation Condition after Wildfire (RAVG)**
 - Focus on reforestation needs
- **Monitoring Trends in Burn Severity (MTBS)**
 - Focus on long term vegetation



Burn Area Emergency Response (BAER) Support

- Objective is to prepare Burn Area Emergency Response plan within 7 days of fire containment
- Remotely sensed imagery - use best available
 - Landsat 5,7
 - AWiFS
 - ASTER
 - SPOT 4,5
 - Ikonos, OrbView, GeoEye
 - Airborne MS scanners
 - Airborne CIR Digital cameras
- Critical factors:
 - Acquisition timing
 - Delivery from provider
 - Spectral properties – SWIR band
- Burned Area Reflectance Classification (BARC)
 - Thematic raster image thresholded into 4 discrete classes (unburned, low, moderate, high).
 - Continuous raster image with values between 0-255, colored like the BARC4. Meant to be adjusted to using local information.



RAVG Requirements

- **R**apid **A**ssessment of **V**egetation Condition after Wildfire (RAVG)
 - Post-fire damage assessment due to wildfire
 - Focus on vegetation – forestry silviculture perspective
 - Calculate acres of land suitable for reforestation
 - Spatially represent forested vs. deforested areas following wildfire
 - Data delivered to Regional Silviculturists to help determine reforestation needs
 - All within 30 calendar days of fire containment



RAVG Procedure

- Map all Forest Service fires that burned $> 1,000$ acres of forested land
 - Uses relative version of the dNBR (RdNBR) – an algorithm more sensitive to vegetation than the dNBR used for BAER support
- Summarizes vegetation mortality information by:
 - Vegetation Group (LANDFIRE EVT)
 - Ownership and Land Status
 - Slope
- GIS data, Map and Tabular products provided



MTBS (Monitoring Trends in Burn Severity)

- USFS RSAC and USGS Center for EROS
- Map *every* fire > 1,000 acres (in West) and > 500 acres (in East) between 1984 – present
 - Historical fires
 - Current year fires
- Mapped with extended assessment protocol
 - Post-fire imagery acquired during next growing season
- Severity classifications focused on vegetation and ecological effects



MTBS Deliverables

- Prefire Image (full scene)
- Postfire Image (full scene)
- Continuous value dNBR / RdNBR (full scene)
- Thematic 5-class severity layer
- Vector shapefile fire perimeter
- Nationwide fire occurrence database
- Trends analyses
 - Acres of severity by vegetation, ownership, etc., over time

