Fire Information for Resource Management (FIRMS)

Diane Davies¹, Chris Justice¹, Jacques Descloitres², John Latham³ John Musinsky ⁴

¹Department of Geography, University of Maryland
²SSAI / NASA Goddard Space Flight Center
³United Nations Food and Agricultural Organization
⁴Conservation International
Overview of Presentation

1. Introduction to FIRMS – a new project funded by NASA to deliver satellite derived fire information to protected area managers in easy to use formats

2. Introduction to the MODIS sensor

3. FIRMS products – what they look like and how to access them

4. Next steps
1. Introduction to FIRMS

FIRMS provides fire information derived from satellite to natural resource managers in easy to use formats.

Specifically FIRMS provides active fire information derived from the MODIS sensor onboard NASA’s Aqua and Terra satellites.

FIRMS is currently served out of the University of Maryland, USA. In future it will become operational at the UN FAO.
Overview of FIRMS data processing

**Supporting Protected Area Management**

- Strategic Fire Management: to control or suppress fires
- Early Warning Disaster Management
- Ecological Monitoring
- Prioritization of resources
- Analyze fire responses & staffing levels
- Modeling fire emissions
- Identify poaching activity

**FIRMS**

- Active Fire Locations
- Burned Area Product

**Cell phone Text messages**

**Email Alerts**

**Interactive Web GIS Maps**

**MODIS subset color composite images**

**Terra and Aqua**

**EDOS**

**MODIS Rapid Response**

**DAAC**

**MODAPS**

**Overview of FIRMS data processing**
2. Introduction to MODIS

MODIS, the Moderate Resolution Imaging Spectroradiometer is an instrument on board NASA’s Terra and Aqua satellites.

MODIS launched December 1999 on NASA’s Terra Earth Observing System (EOS) satellite, providing morning and night time high quality observations since November 2000.

MODIS launched again on NASA’s Aqua EOS satellite in 2002.
Daily coverage from MODIS (Moderate Imaging Spectroradiometer) instrument
3. FIRMS Products

FIRMS provides active fire for protected areas in 4 ways:

<table>
<thead>
<tr>
<th>Email Alerts</th>
<th>Web Fire Mapper</th>
<th>Shape Files</th>
<th>MODIS Subsets</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Email Alerts" /></td>
<td><img src="image2" alt="Web Fire Mapper" /></td>
<td><img src="image3" alt="Shape Files" /></td>
<td><img src="image4" alt="MODIS Subsets" /></td>
</tr>
</tbody>
</table>

1. Email Alerts – notifying you of a fire in your area of interest
2. Interactive Web GIS
3. Downloadable shape files
4. MODIS subset images showing active fires
3. FIRMS Products
- What they look like

1. Email Alerts – notifying you of a fire in your area of interest
2. Interactive Web GIS
3. Downloadable shape files
4. MODIS subset images showing active fires
Email Alerts

Global Fire Email Alerts program - a beta version of our new email alert service that will notify you of fires in your area-of-interest.

There are 3 ways to specify your area-of-interest:

- Protected Area, with buffer option
- Using an Interactive Map
- Specifying lat long coordinates
Email Alerts

You can customize your email alert by choosing to receive:

- An image with fires and text of detected fire locations
- Just the fire locations text, with a link to the image

Further, you can also choose to receive a Comma-Separated Text File (CSV) containing all the detected fire points.

You can import this file into your desktop GIS for further analyses.

All email alerts include the geographic coordinates of pixels flagged as containing one or more fires, the time and date of data satellite acquisition and a confidence value.
3. FIRMS Products

1. Email Alerts – notifying you of a fire in your area of interest
2. Interactive Web GIS
3. Downloadable shape files
4. MODIS subset images showing active fires
Web Fire Mapper

- A WebGIS that displays near-real time active fire data from the MODIS Rapid Response System

- developed to serve the broader natural resource management community for whom accessing and processing satellite data is costly and time consuming

- displays active fire data approx 2 hours after satellite acquisition
3. FIRMS Products

1. Email Alerts – notifying you of a fire in your area of interest
2. Interactive Web GIS
3. Downloadable shape files
4. MODIS subset images showing active fires
Download active fire
Shape files for:
- the last 48 hours
- the last 7 days or
- the last month

Active fire data is also available as text files via the ftp site

Or of course you can get them as part of your email alert!
3. FIRMS Products

1. Email Alerts – notifying you of a fire in your area of interest
2. Interactive Web GIS
3. Downloadable shape files
4. MODIS subset images showing active fires
Subsets of MODIS images

Until recently, protected area managers have faced considerable challenges in obtaining timely satellite-derived information on vegetation fires that are burning within and around their management area.

To be of most value, protected area managers require fire information to be delivered in near real-time, with minimal file sizes and in easy-to-use formats.

MODIS Rapid Response and FIRMS are meeting these requirements by making daily JPEG images available for end users.

Example of a subset of a MODIS image for Kruger National Park – ingested in to ArcMap
The Fire Information for Resource Management System (FIRMS) integrates remote sensing and GIS technologies to deliver MODIS active fire locations to natural resource managers around the world.

Until recently, protected area managers have faced considerable challenges in obtaining timely satellite-derived information on vegetation fires that are burning within and around their management area. To be of most value, protected area managers require fire information to be delivered while fires are still burning, with minimal file sizes and in easy-to-use formats.

FIRMS will meet these requirements in four main ways: by delivering fire alerts through e-mail and cell phone text messages; by providing active fire information via an interactive Web Mapping interface; by providing shape files containing the locations of the latest fires that have been detected; and by providing subsets of MODIS images.

Click on the graphics below to access the different services:

<table>
<thead>
<tr>
<th>Email Alerts</th>
<th>Web Fire Mapper</th>
<th>Shape Files</th>
<th>MODIS Subsets</th>
</tr>
</thead>
</table>

**Background**

FIRMS is transitioning NASA-finned research results and observations to operational partners to support decision making for management of Protected Areas (PAs) worldwide. Specifically, FIRMS builds on Web Fire Mapper, a Web GIS developed by researchers at the University of Maryland (UMD). FIRMS will provide active fire locations, burned area data, and NASA imagery to protected area managers around the World. The fire data will be delivered in easy-to-use formats suitable for decision making.

**FIRMS Partners**

The operational partners in this project are the United Nations Food and Agriculture Organisation (FAO) and the United Nations Environment Programme (UNEP). At FAO, FIRMS will be housed in the Department of Sustainable Development and Natural Resources (DSDNRM) and will complement their existing suite of projects that deliver near-real-time information to ongoing monitoring and emergency projects, as well as providing information to the general public.
4. Next Steps

Coming next year

- MODIS Burned Area product
- Improved version of the Web GIS – online maps
  - faster
  - better date query
  - more MODIS images
- Easier access to moderate resolution (Landsat and Aster) satellite data for protected areas

We are interested to get your feedback and comments, so please let us know what you like and don’t like about FIRMS and what you would like to see improved.
Thank you!

For more information on FIRMS
http://maps.geog.umd.edu/firms/
Email: webfiremapper@hermes.geog.umd.edu

Acknowledgements

The MODIS active fire data is provided by the MODIS Rapid Response System. For more information about MODIS Rapid Response see http://rapidfire.sci.gsfc.nasa.gov

This material is based upon work supported by the National Aeronautics and Space Administration under Cooperative Agreement No. NNS06AA04A issued through the Decision Support Program.
Additional Slides
# Users of Web Fire Mapper

... include natural resource managers, scientists and policy makers from at least 30 countries

<table>
<thead>
<tr>
<th>Use</th>
<th>Country</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategic fire management: to control or suppress fires</td>
<td>Namibia, Tanzania, Alaska, China, Canada, Zimbabwe, India, Madagascar, Paraguay, South Africa,</td>
<td>Mobilization of resources to suppress or control the fire</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prioritization of resources</td>
</tr>
<tr>
<td>Establishing fire record to help formulate fire policy.</td>
<td>Mozambique, South Africa Swaziland, China, Central Africa Bolivia, Namibia</td>
<td>Better understanding of the frequency and extent of fires for improved information for fire policy and for more effective zoning for forest management</td>
</tr>
<tr>
<td>Analyze fire responses and staffing levels</td>
<td>Alaska</td>
<td>Prioritization of resources</td>
</tr>
<tr>
<td>Raising awareness of fires</td>
<td>Namibia, Bolivia, Democratic Republic of Congo</td>
<td>Policy makers and the general public are more informed Information is passed on to Ministers (Namibia) and PA managers (C Africa). In Bolivia fire maps are printed 3 days a week in <em>El Deber</em> newspaper during the fire season</td>
</tr>
<tr>
<td>Estimating burned areas (using MODIS subset imagery)</td>
<td>South Africa, Namibia, Tanzania, New Caledonia</td>
<td>Feeds in to fire management decision support system (Kruger NP, Etosha NP)</td>
</tr>
<tr>
<td>Identify poaching activities</td>
<td>Tanzania</td>
<td>The national parks agency (TANAPA) is using the alerts to identify poaching activities in savanna areas where poachers use bushfire to frighten and chase wildlife for capture or hunting</td>
</tr>
<tr>
<td>Ecological / Forest Monitoring</td>
<td>Tanzania, Congo, South Africa, Botswana, Brazil, Namibia Mozambique, Senegal, Peru, Zimbabwe, USA, Thailand, Japan, Swaziland, Russia,</td>
<td>Improved understanding of the role of fire Botswana: effect of fire on Wild Dogs. Tanzania: Long Term Ecological Monitoring Mozambique, Senegal, Peru: Forest monitoring</td>
</tr>
<tr>
<td>Early warning / Disaster Management</td>
<td>USA, South Africa, Indonesia, Ukraine</td>
<td>Disaster early warning Prepare maps for emergency managers</td>
</tr>
<tr>
<td>Validating Fire Risk maps</td>
<td>South Africa</td>
<td>Improve fire risk maps (South African regional weather forecasting)</td>
</tr>
<tr>
<td>Modeling Fire Emissions</td>
<td>USA, Taiwan, Germany, Brazil, France, Israel, Namibia</td>
<td>Improving emissions modelling</td>
</tr>
</tbody>
</table>
## Relative Download Times from the DAAC and Web Fire Mapper

<table>
<thead>
<tr>
<th>Parameter</th>
<th>DAAC</th>
<th>Web Fire Mapper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>MOD14A1</td>
<td>ESRI shape files</td>
</tr>
<tr>
<td>Size of area over which fires are detected</td>
<td>1.44 million km²</td>
<td>148.94 million km²</td>
</tr>
<tr>
<td></td>
<td>(approx 1 MODIS tile)</td>
<td>(global land coverage)</td>
</tr>
<tr>
<td>File Size</td>
<td>53,200 kb</td>
<td>500 kb</td>
</tr>
<tr>
<td>Download time for a bandwidth of 56k modem</td>
<td>2 hours 3 minutes 41 secs</td>
<td>1 minute 9 seconds</td>
</tr>
<tr>
<td>Time from satellite overpass to availability of data online</td>
<td>Minimum of 48 hours</td>
<td>Approx 2 hours</td>
</tr>
</tbody>
</table>