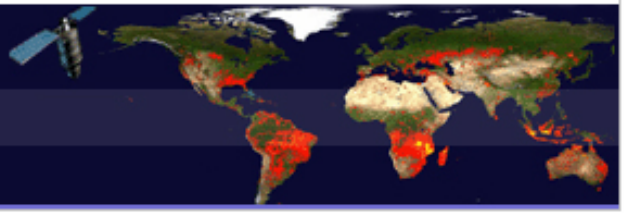
FIRMS

FIRE INFORMATION FOR RESOURCE MANAGEMENT SYSTEM



Fire Information for Resource Management System (FIRMS)

Diane Davies[1], Chris Justice[1], Jacques Descloitres[2], John Latham[3] John Musinsky [4]

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

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MODIS

CONSERVATION INTERNATIONAL

Overview of Presentation

1. Background

2. Introduction to FIRMS

3. Examples of how the data are being used to improve decision support systems

4. Next Steps

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MODIS

CONSERVATION INTERNATIONAL

Overview of Presentation

1. Background – why the interest in fire?

2. Introduction to FIRMS

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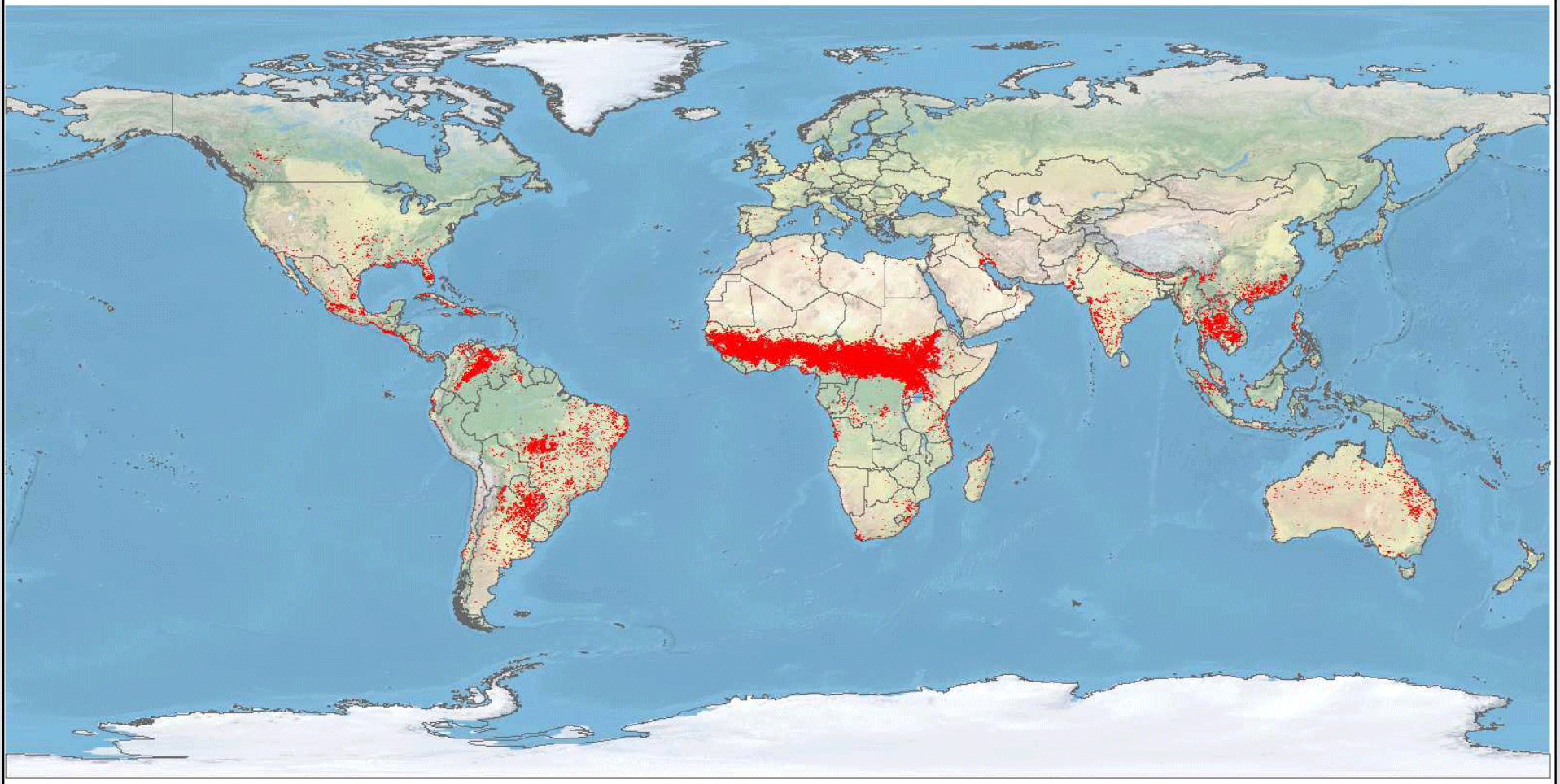
Burning Issues

- Fire is an established ecosystem process
- Fire - an effective land management tool
- The widespread use of fire has associated risks
- Uncontrolled fires can damage natural resources, diminish the range and diversity of species and erode forests
- Information on fire incidence can be used for strategic fire management, ecological studies and to inform policy

MODIS Rapid Response Active Fire Detections for 2006



January February March April May June July August September October November December

Active fires, shown in red, are detected using MODIS data from the Terra Satellite.
Source: MODIS Rapid Response http://rapidfire.sci.gsfc.nasa.gov/
Fire Information for Resource Management System (FIRMS)
http://maps.geog.umd.edu

2. Introduction to FIRMS-

FIRMS integrates remote sensing and GIS technologies to deliver MODIS fire data to natural resource managers around the world with a specific focus on protected areas

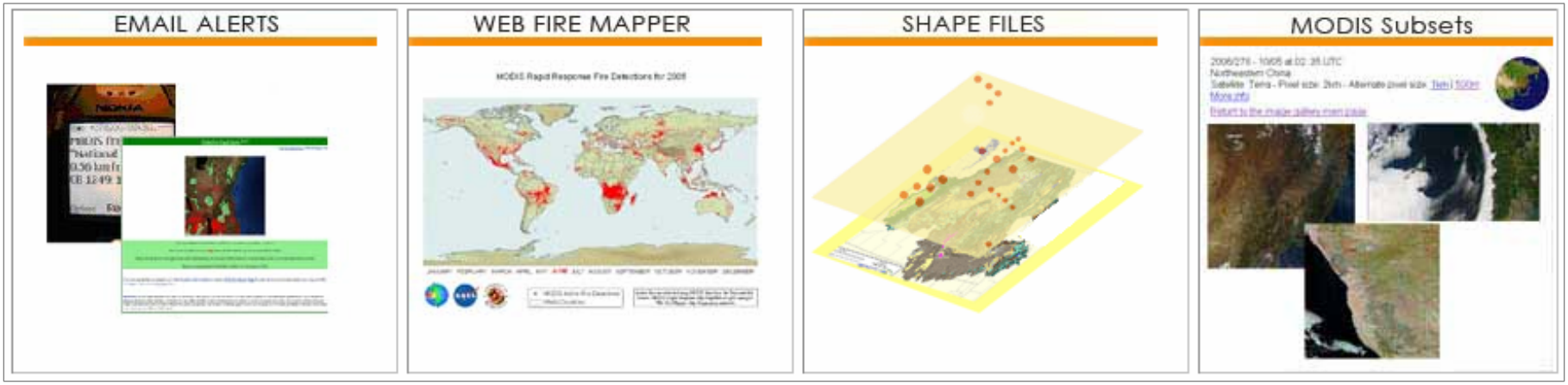
FIRMS is building on and enhancing Web Fire Mapper

The goal … to transition FIRMS to operational partners with a global monitoring mandate

- UN FAO in the Dept of Sustainable Development and Natural Resources
- Conservation International in Washington DC
- UNEP (Ashbindu Singh)

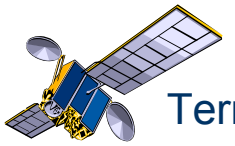
Overview of FIRMS Products

FIRMS delivers MODIS active fire locations in 4 ways:



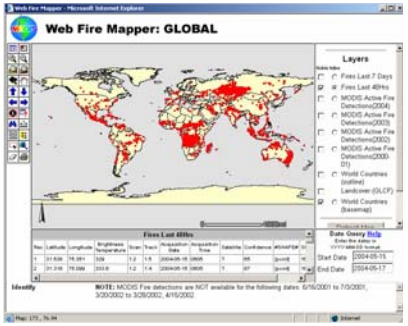
All of which are delivered in near real time (approx 2 hours after satellite overpass), with relatively small file sizes and in easily accessible formats

Overview of FIRMS data processing



Terra and Aqua

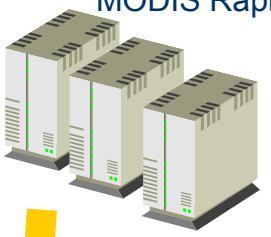
EOS Data Operations System

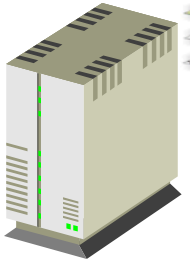


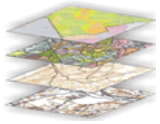
Interactive Web GIS Maps

Email Alerts
Cell phone Text messages

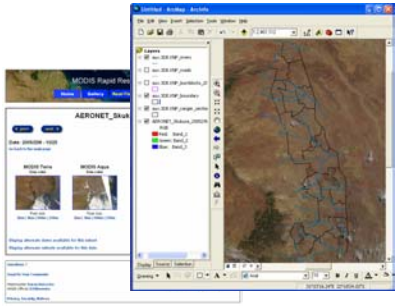
MODIS Rapid Response





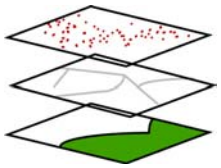


FIRMS



MODIS subset color composite images

Active Fire Locations
Burned Area Product

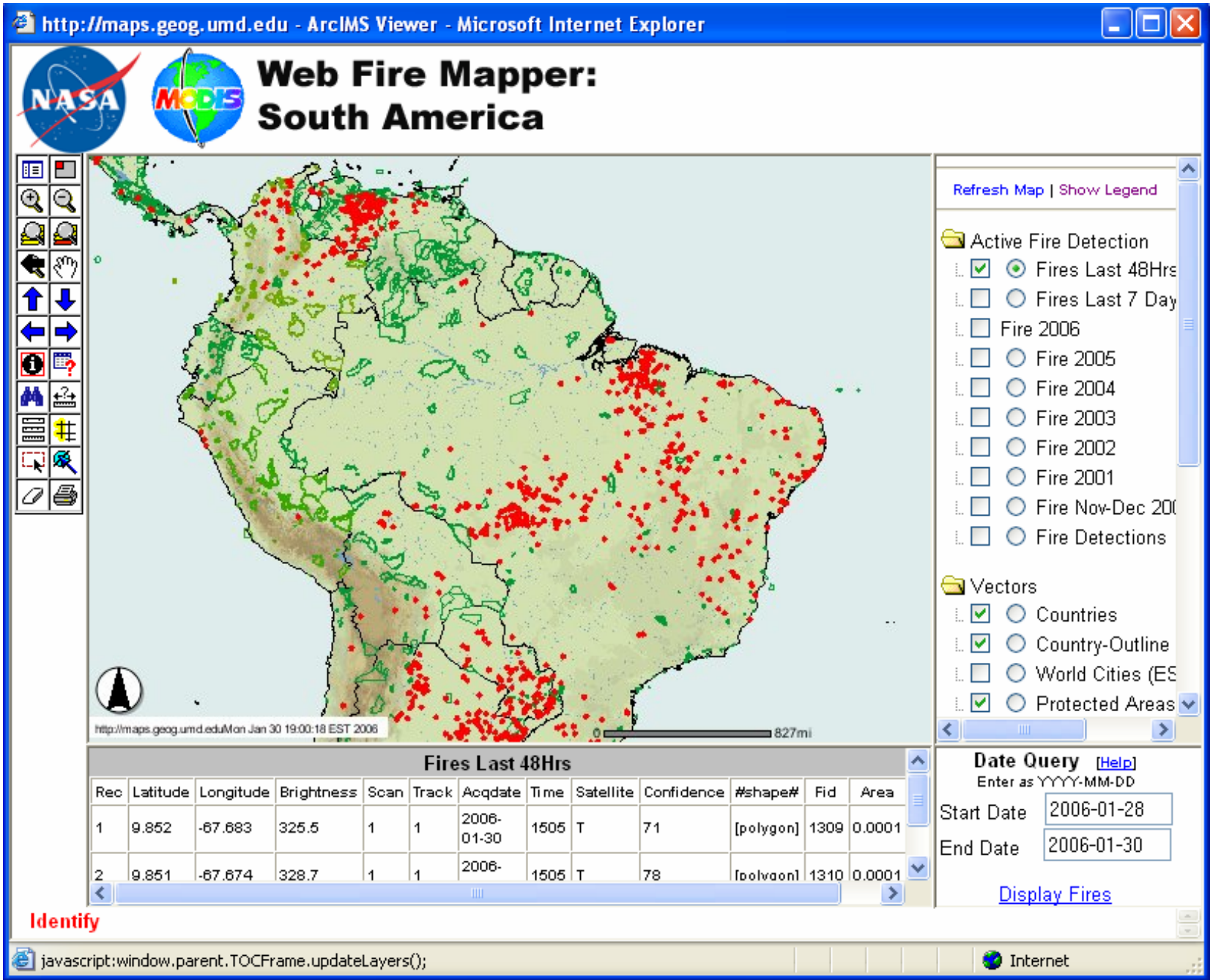


Downloadable shape files and text files

Supporting Protected Area Management

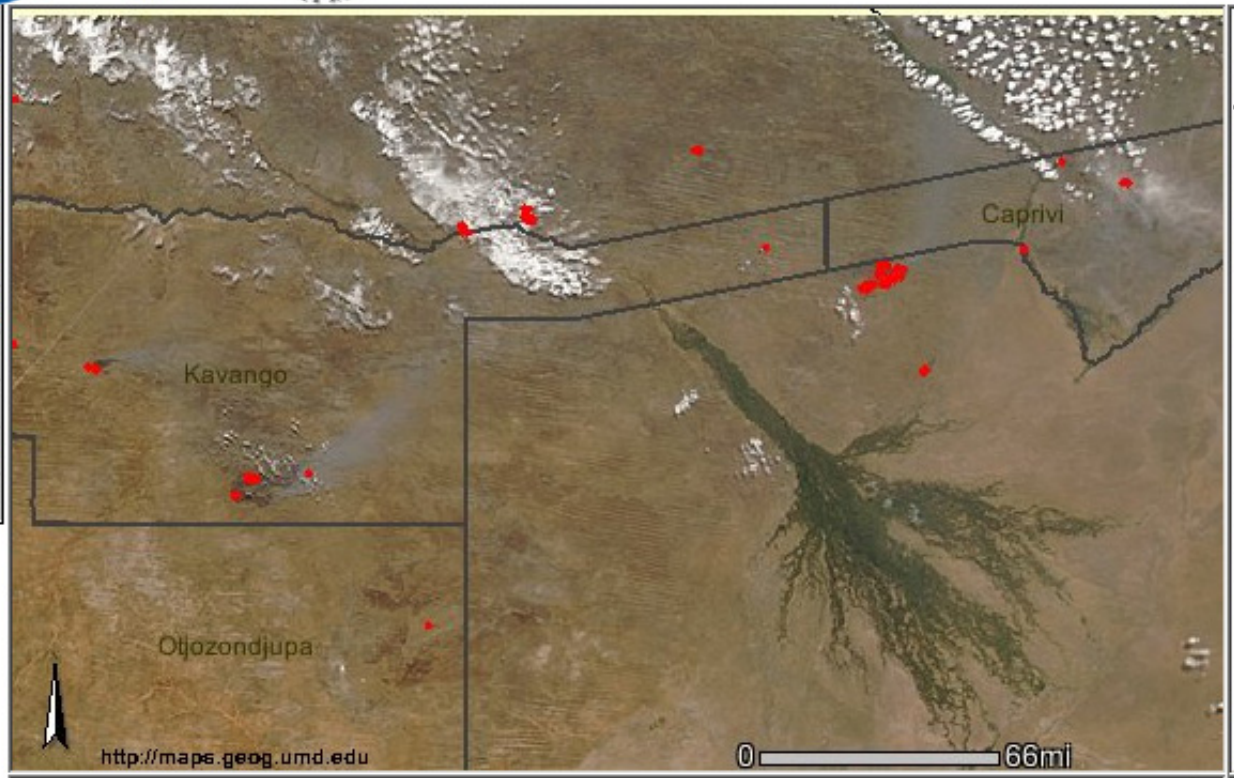
Strategic Fire Management: to control or suppress fires
Establish fire record to help formulate fire policy
Early Warning Disaster Management
Ecological Monitoring
Validating fire risk maps
Prioritization of resources Analyze fire responses & staffing levels
Modeling fire emissions
Identify poaching activity

Overview of FIRMS Products: Web GIS



Web Fire Mapper - Microsoft Internet Explorer

Web Fire Mapper: Namibia



Layers

Visible Active

- [x] (•) Fires Last 48Hrs
- [ ] ( ) Fires Last 7 Days
- [ ] ( ) MODIS Active Fire Detections(2004)
- [ ] ( ) MODIS Active Fire Detections (Archive)
- [ ] ( ) Major Towns
- [ ] ( ) Towns
- [ ] ( ) Trunk Roads
- [ ] ( ) Roads
- [ ] ( ) Rivers
- [x] ( ) Regions
- [ ] ( ) Protected Areas
- [ ] ( ) Biomes

Fires Last 48Hrs

Rec	Latitude	Longitude	Brightness Temperature	Scan	Track	Acquisition Date	Acquisition Time	Satellite	Confidence	#SHAPE#	SI
1	-18.972	20.105	340.1	1.5	2.3	2004-09-23	0825	T	92	[polygon]	1
2	-18.975	20.126	337.2	1.5	2.2	2004-09-23	0825	T	89	[polygon]	1

Date Query Help

Enter the dates in YYYY-MM-DD format.

Start Date 2004-09-23

End Date 2004-09-25

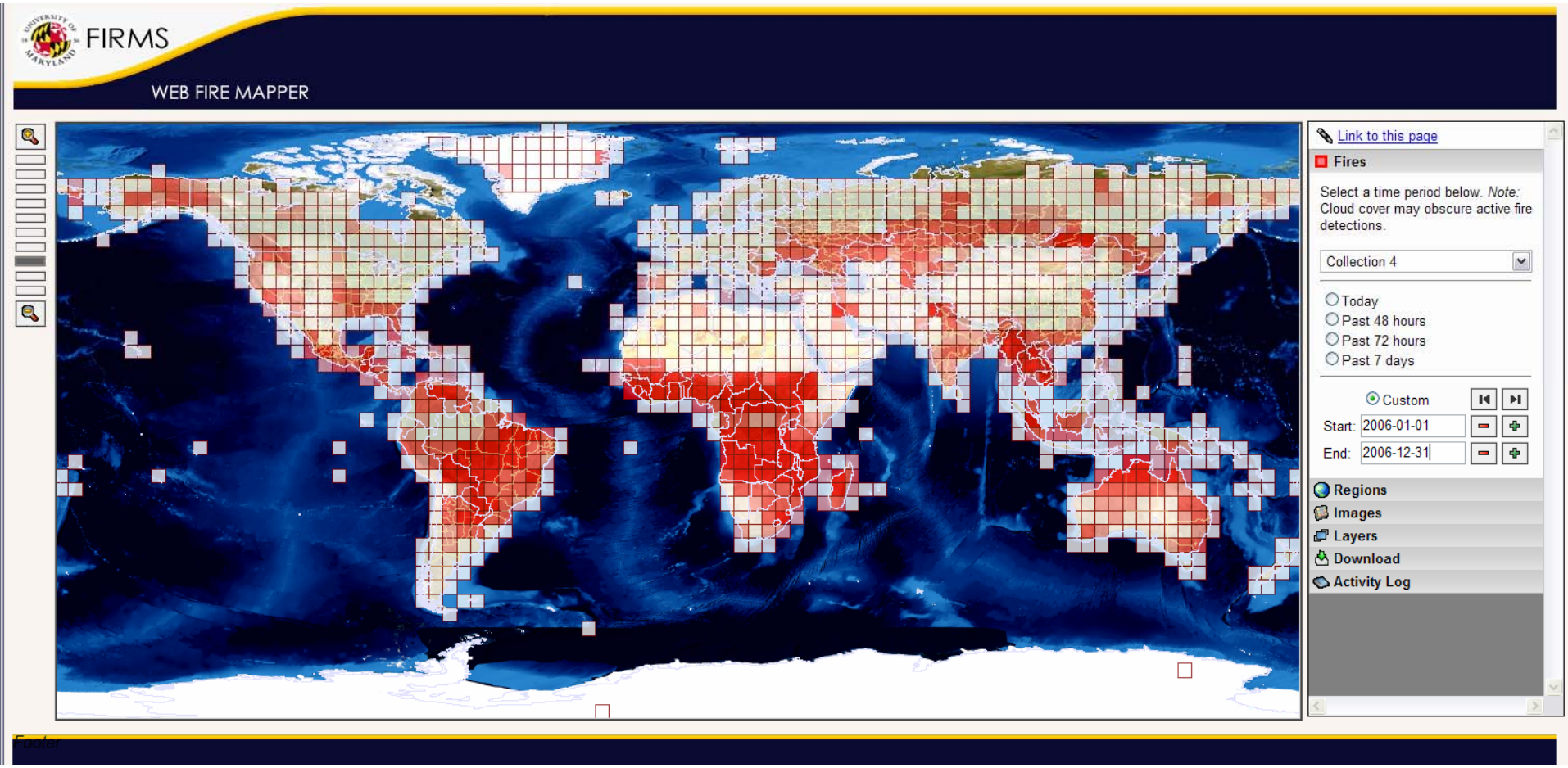
Pan

NOTE: MODIS Fire detections are NOT available for the following dates: 6/16/2001 to 7/3/2001, 3/20/2002 to 3/28/2002, 4/15/2002.

Map: 21.04 , -18.33

Internet

Overview of FIRMS Products: Web GIS



New Web Fire Mapper prototype

Web Fire Mapper prototype – gridded hotspots

FIRMS

WEB FIRE MAPPER

Link to this page

Fires

Select a time period below. *Note:* Cloud cover may obscure active fire detections.

Collection 4

Show Fires from:

Aqua & Terra

- Today
- Past 48 hours
- Past 72 hours
- Past 7 days
- Custom

Start: 2001-01-01

End: 2001-01-31

Regions

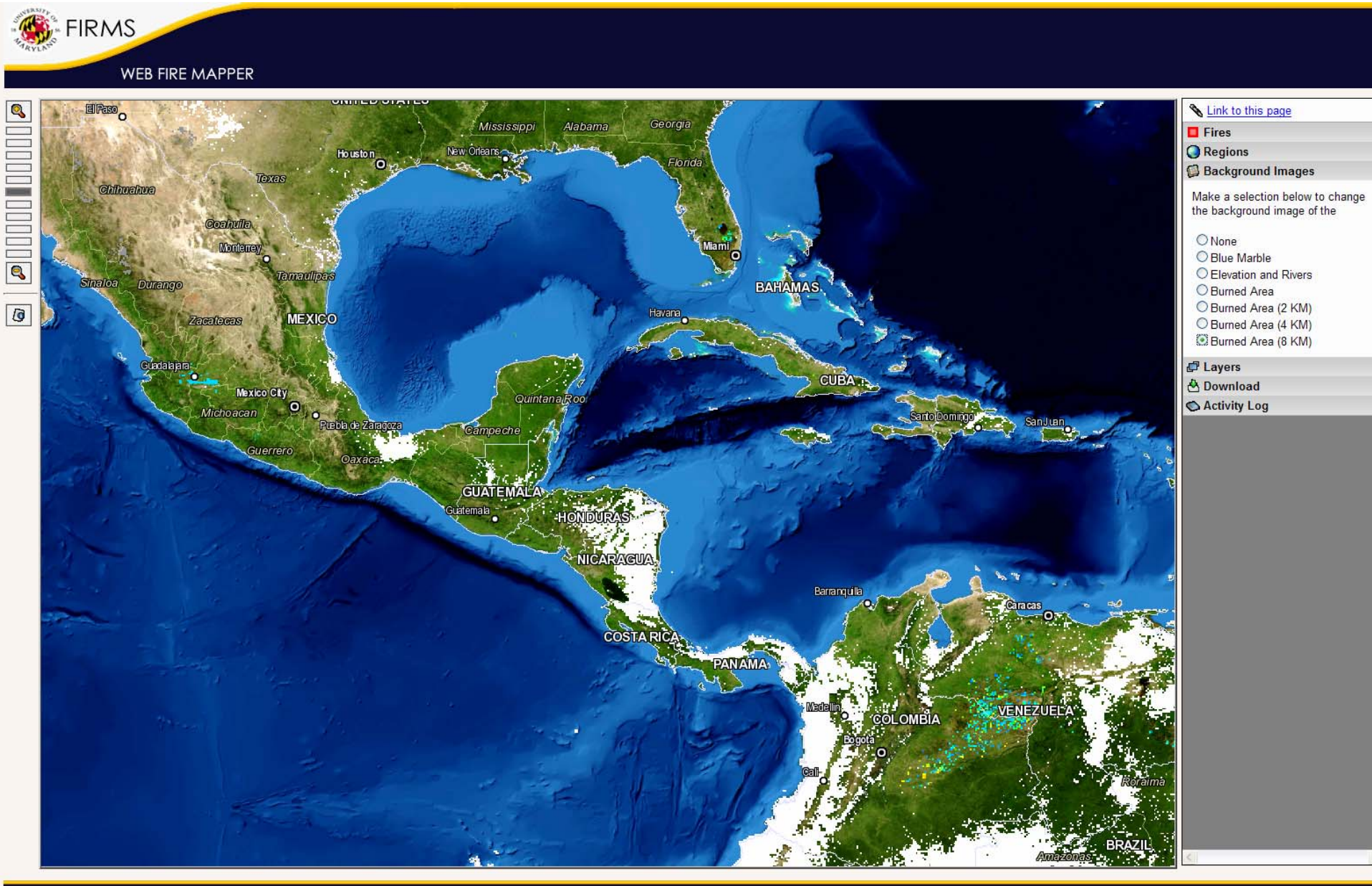
Images

Layers

Download

Activity Log

Provisional Burned Area Product



Overview of FIRMS Products: Email Alerts

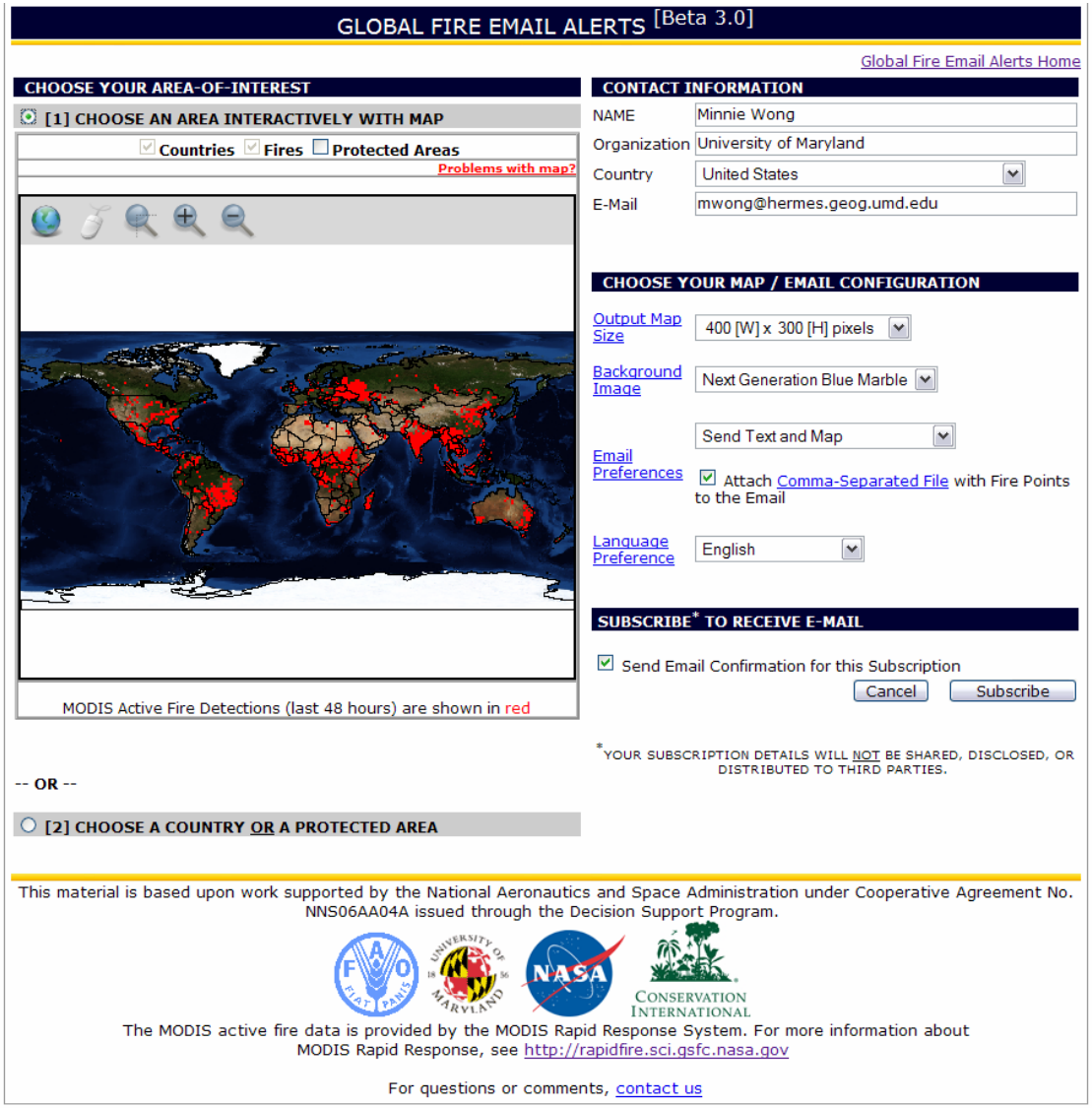
Great to be able to check the Internet for fires – but even more convenient to get a message in your inbox

3 ways to specify your area:

- Using an Interactive Map
- Select Protected Area, with buffer option
- Select by country

Options:

- JPEG image or a link to the image
- CSV file containing fire locations (easily imported in to local GIS)
- Background imagery



Sample email alert for Katavi National Park, Tanzania

FIRMS Alert: Fires in your area - Message (HTML)

File Edit View Insert Format Tools Actions Help

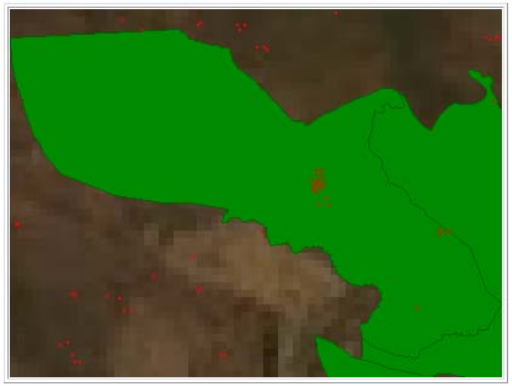
Reply | Reply to All | Forward

From: FIRMS [firms@hermes.geog.umd.edu]
To: Minnie Wong
Cc:
Subject: FIRMS Alert: Fires in your area
Sent: Mon 7/9/2007 4:49 AM

Attachments: FirePoints-070907-172.csv (1 KB)

Global Fire Alerts [Beta 3.0]

• View Your Subscriptions • FIRMS Home • FAQ



Your Area of Interest (Protected Area) : Katavi ~ (IUCN: II) (Tanzania: United Republic of), including a buffer of 0 KM

Fires detected over the past 48 hours in your area-of-interest : **24**

(NOTE: Cloud cover might obscure active fire detections. The fire points will be listed only when the total number of active fires detected is less than or equal to 50)

This email was generated on 2007-07-09 , 08:48:45 GMT.

If you have any questions or comments, go to the Frequently Asked Questions (http://maps.geog.umd.edu/firms/faq.asp) or contact the FIRMS Team. To query the full active fire database for your area, go to FIRMS Home (http://maps.geog.umd.edu/). Please read the disclaimer below.

[SATELLITE: A = Aqua; T = Terra; ACQDATE = Acquired Date.]

LATITUDE	LONGITUDE	CONFIDENCE	ACQDATE	TIME	SATELLITE
-6.9270	31.4500	93.0000	2007-07-07	0820	T
-6.9290	31.4590	84.0000	2007-07-07	0820	T
-6.9360	31.4490	100.000	2007-07-07	0820	T
-6.9380	31.4580	99.0000	2007-07-07	0820	T
-6.9470	31.4570	86.0000	2007-07-07	0820	T
-6.9480	31.4660	41.0000	2007-07-07	0820	T
-6.9540	31.4470	81.0000	2007-07-07	0820	T
-6.9560	31.4560	81.0000	2007-07-07	0820	T
-6.9570	31.4650	81.0000	2007-07-07	0820	T
-6.9630	31.4450	99.0000	2007-07-07	0820	T
-6.9650	31.4540	83.0000	2007-07-07	0820	T
-6.9660	31.4630	82.0000	2007-07-07	0820	T
-6.9850	31.4700	91.0000	2007-07-07	0820	T
-7.0660	31.7360	77.0000	2007-07-07	1110	A
-6.9770	31.4500	38.0000	2007-07-07	1110	A
-6.9540	31.4470	92.0000	2007-07-07	1110	A
-6.9700	31.4440	69.0000	2007-07-07	1110	A
-6.9580	31.4420	80.0000	2007-07-07	1110	A

Sample Spanish email alert for Brazil

Alerta FIRMS: Incendios en su área de interés - Message (HTML)

File Edit View Insert Format Tools Actions Help

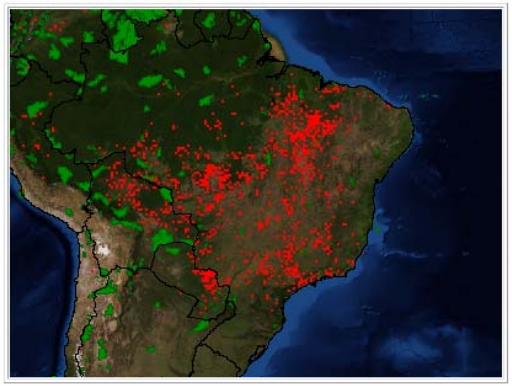
Reply | Reply to All | Forward

From: FIRMS [firms@hermes.geog.umd.edu]
To: Minnie Wong
Cc:
Subject: Alerta FIRMS: Incendios en su área de interés
Sent: Mon 7/9/2007 4:51 AM

Attachments: FirePoints-070907-988.csv (95 KB)

Alertas Globales de Incendios [Beta 3.0]

• Vea sus subscripciónes • FIRMS Home • FAQ



Su área de interés (País) : Brazil

En las últimas 48 horas, total de fuegos activos fueron detectados dentro de su área de interés : **2296**

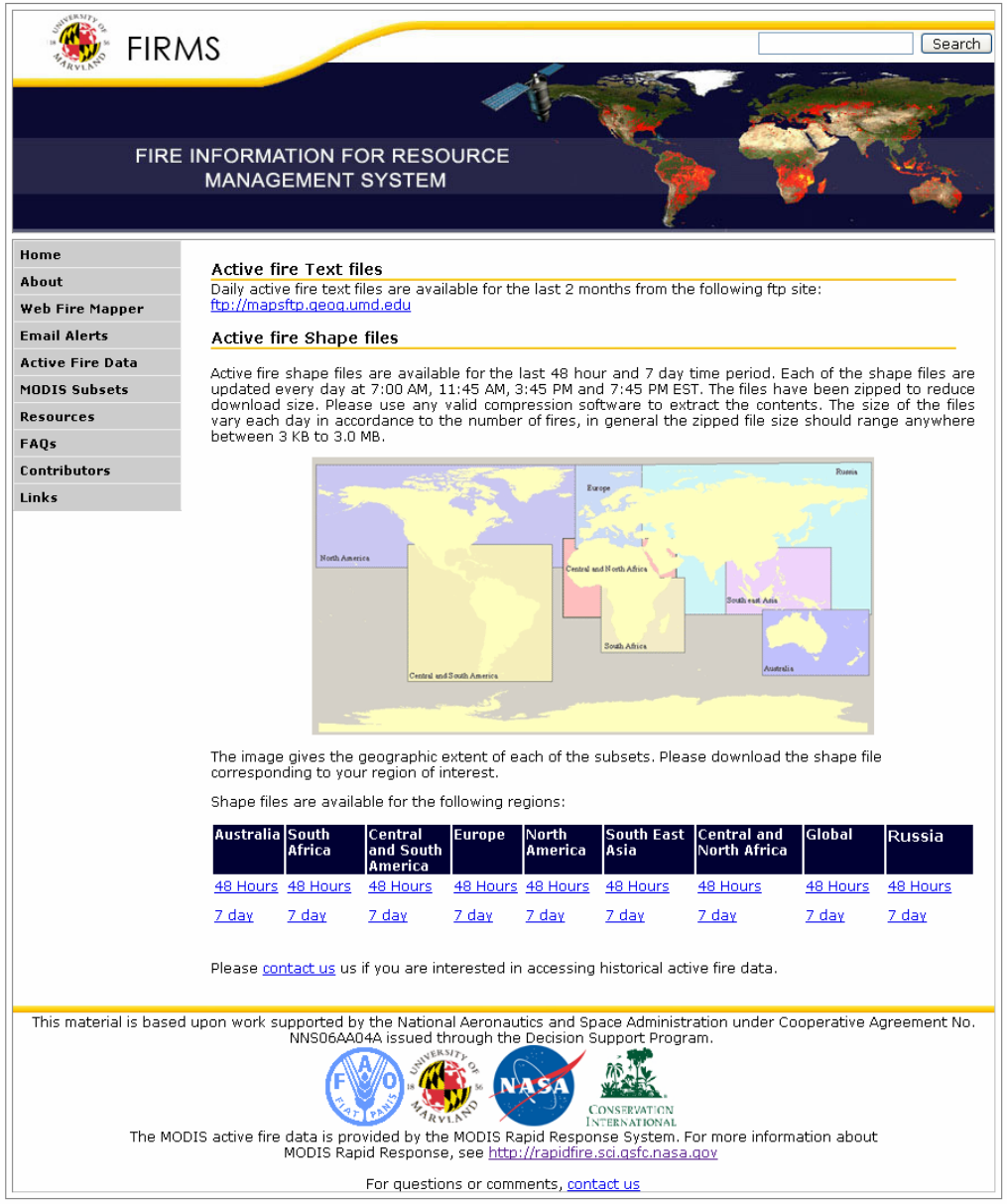
(NOTA: Cobertura nublar puede obstaculizar detección de fuegos activos. Los puntos de fuego solo serán puestos en la lista cuando el número total de fuegos activos son menor que 50)

Este correo electrónico fue generado 2007-07-09 , 08:51:04 GMT.

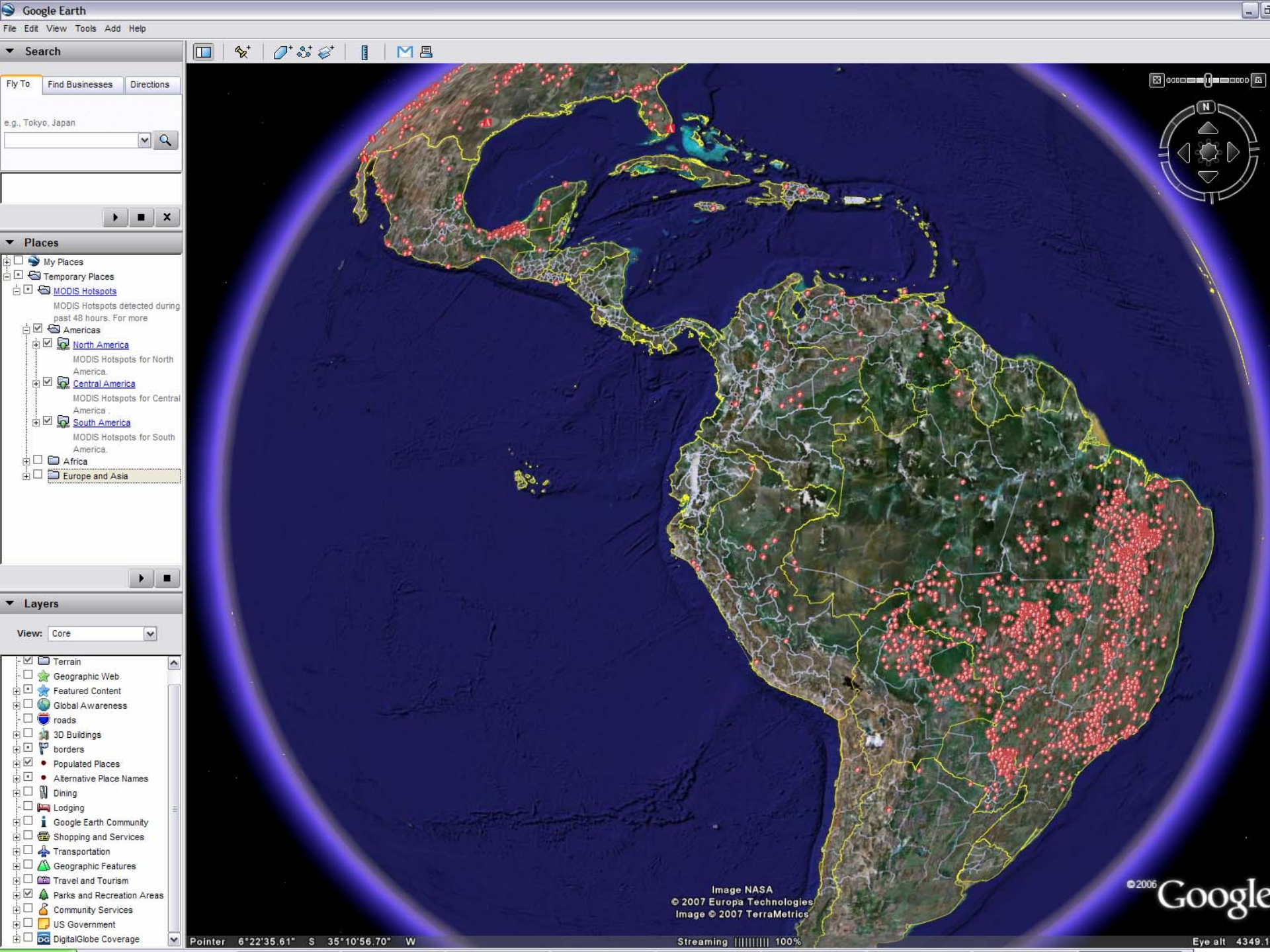
Si usted tiene alguna pregunta o comentarios, diríjase a Preguntas más Frecuentes (http://maps.geog.umd.edu/firms/faq.asp) o contacte Equipo FIRMS . Para realizar una búsqueda completo en la Base de Datos de fuegos activos en su área, diríjase a FIRMS Inicio (http://maps.geog.umd.edu/). Favor de leer el Limitación de responsabilidad en la parte inferior de esta hoja.

Limitación de Responsabilidad: Respuesta rápida de MODIS (MRR) y la Universidad de Maryland (UMD) no garantizan que los datos, base de datos, u otra información generada por el uso de los datos o de la base de datos, estén exentos de errores. Los datos son proporcionado "tal cual" y MRR y UMD no hacen representaciones ni garantías expresas o implícitas de ninguna clase, incluyendo pero no limitado a cualquier garantía tácitas de venta o de la aptitud para un propósito en particular. La institución receptora estará en acorde que no garantizará que se refiere a datos o bases de datos a terceros en nombre de MRR o de UMD.

Overview of FIRMS Products:
Shape files, Google KML files and WMS services

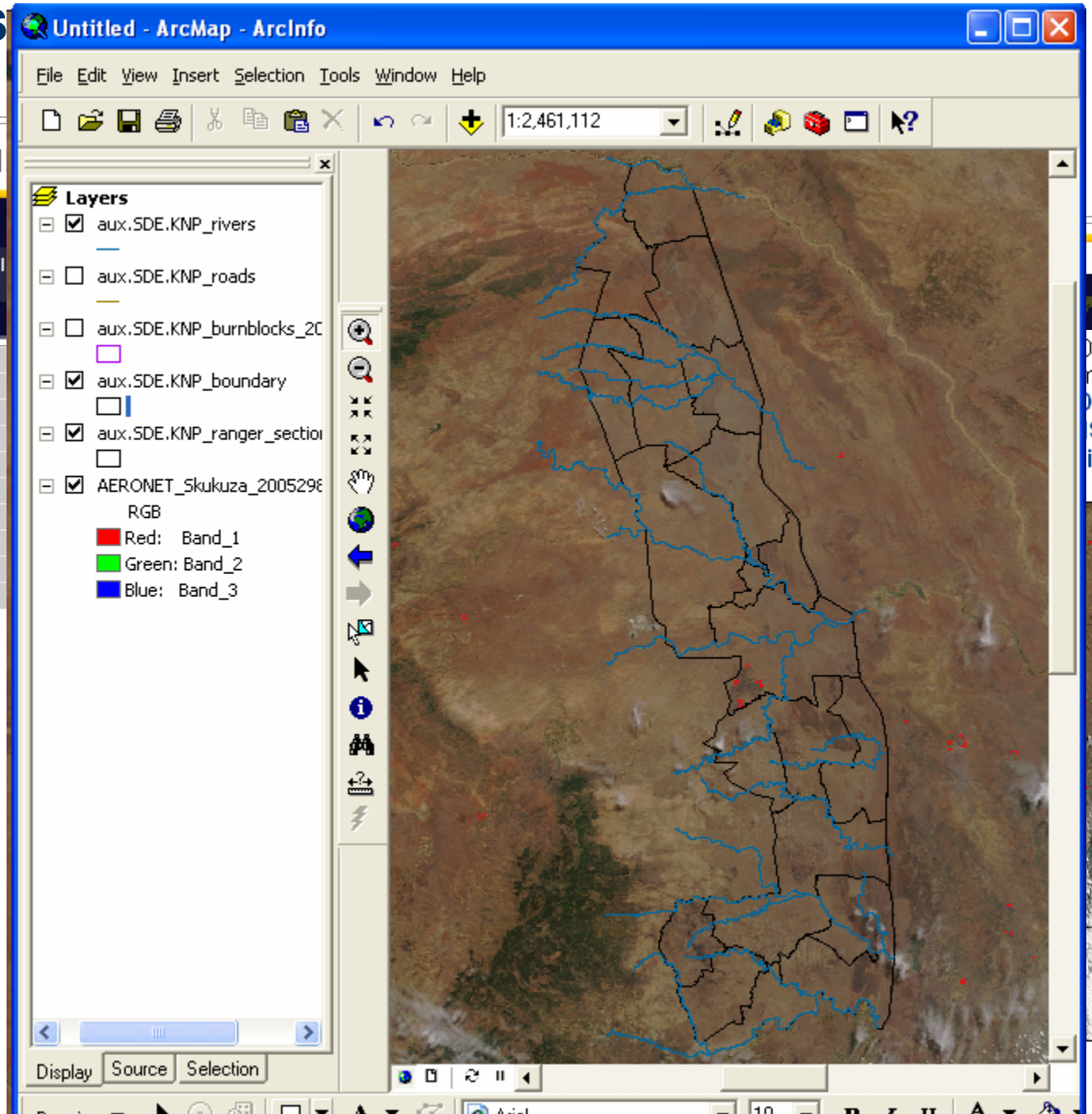


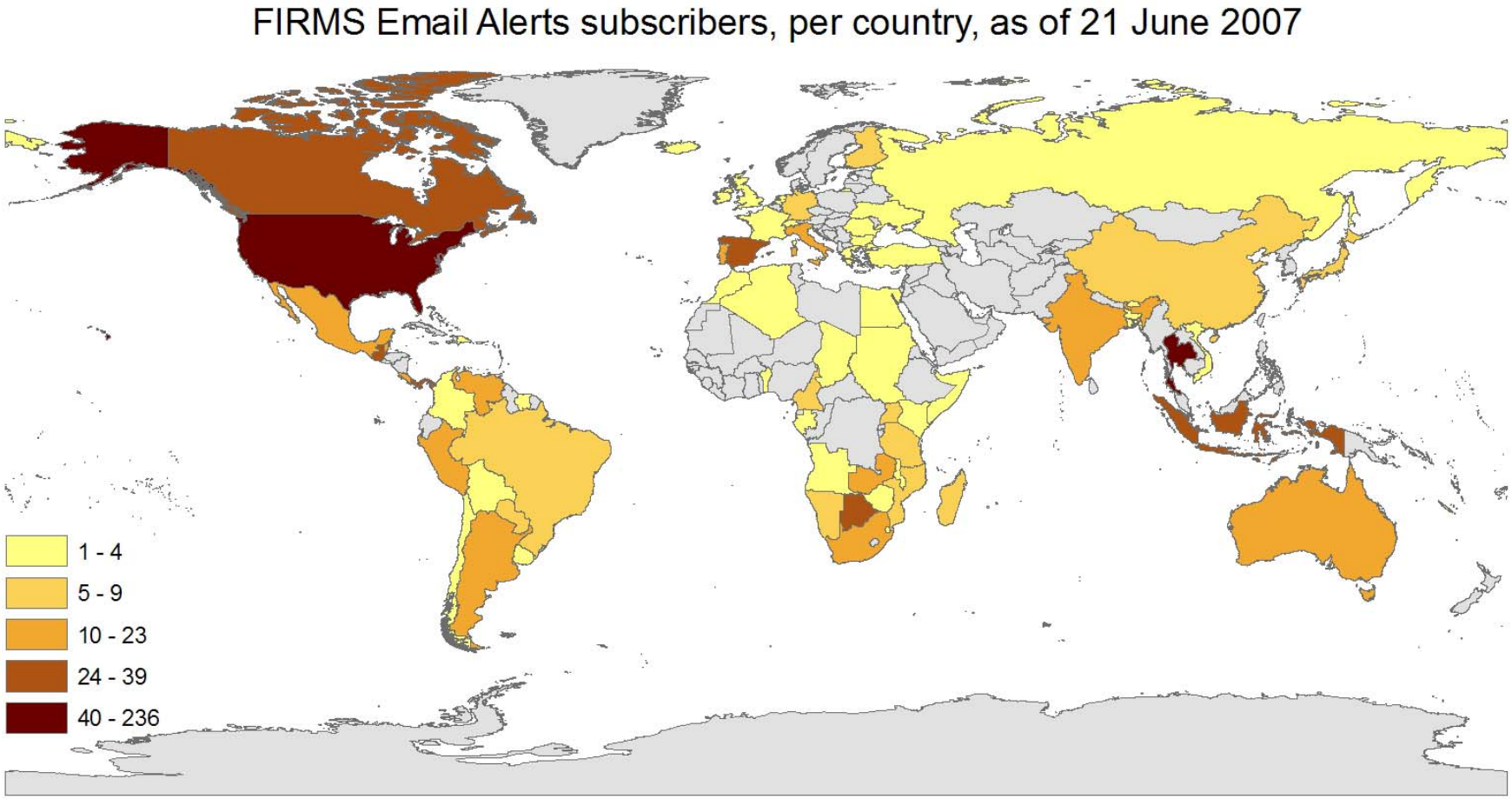
Active fire data is also available as text files via the ftp site


Google Earth
File Edit View Tools Add Help
Search
Fly To
Find Businesses
Directions
e.g., Tokyo, Japan
Places
My Places
Temporary Places
MODIS Hotspots
MODIS Hotspots detected during past 48 hours. For more
Americas
North America
MODIS Hotspots for North America.
Central America
MODIS Hotspots for Central America .
South America
MODIS Hotspots for South America.
Africa
Europe and Asia
Layers
View: Core
Terrain
Geographic Web
Featured Content
Global Awareness
roads
3D Buildings
borders
Populated Places
Alternative Place Names
Dining
Lodging
Google Earth Community
Shopping and Services
Transportation
Geographic Features
Travel and Tourism
Parks and Recreation Areas
Community Services
US Government
DigitalGlobe Coverage
N
Image NASA
© 2007 Europa Technologies
Image © 2007 TerraMetrics
©2006 Google
Pointer 6°22'35.61" S 35°10'56.70" W
Streaming 100%
Eye alt 4349.1

NASA World Wind
File Edit View Tools Plug-Ins Help
Bermuda
Gulf of California
Gulf of Mexico
Straits of Florida
The Bahamas
Mexico
Cuba
Cayman Islands
Dominican Republic
Puerto Rico
Anguilla
Jamaica
Navassa Island
Saint Kitts and Nevis
Antigua and Barbuda
Montserrat
Guadeloupe
Dominica
Martinique
Barbados
Belize
Guatemala
Honduras
El Salvador
Nicaragua
Caribbean Sea
Grenada
Aruba
Netherlands Antilles
Gulf of Venezuela
Clipperton Island
Costa Rica
Panama
Guyana
Colombia

Overview of FIRMS Products: MODIS





This map shows the number of users, by country that regularly access the MODIS fire data through FIRMS (updated 21 June 2007)

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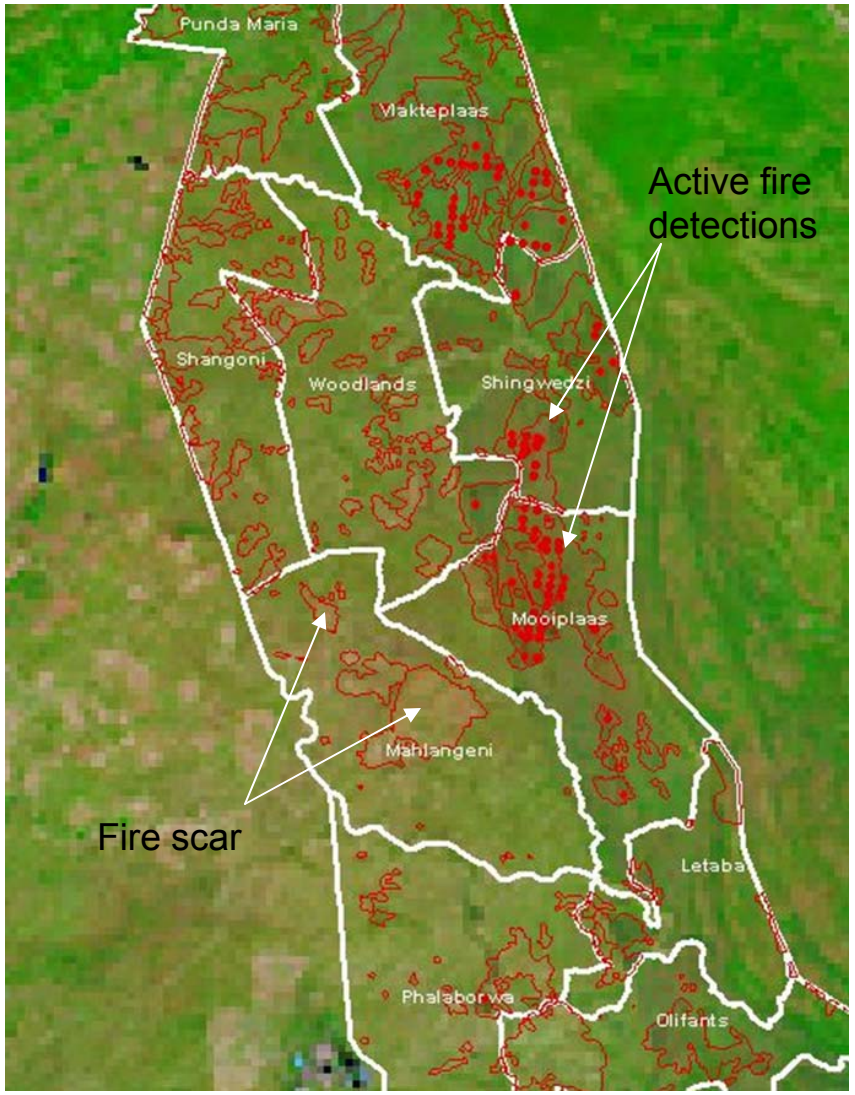
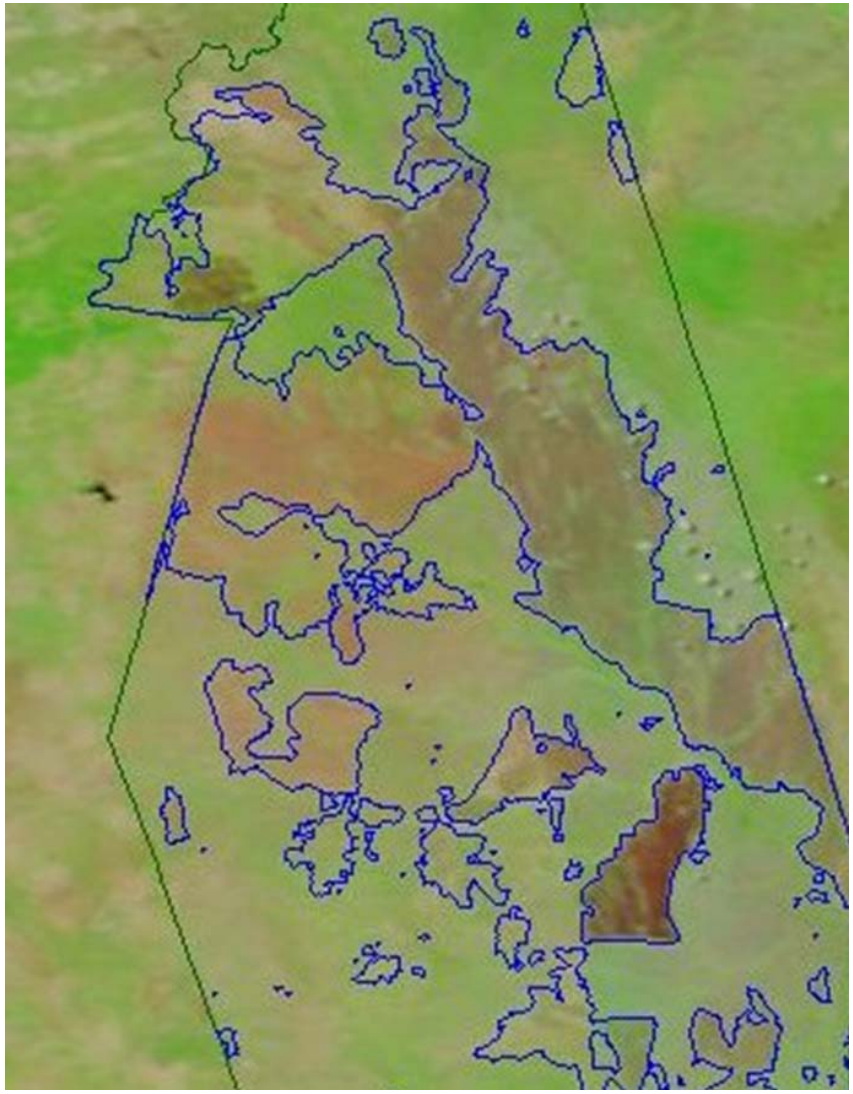
CONSERVATION INTERNATIONAL

Kruger National Park, South Africa

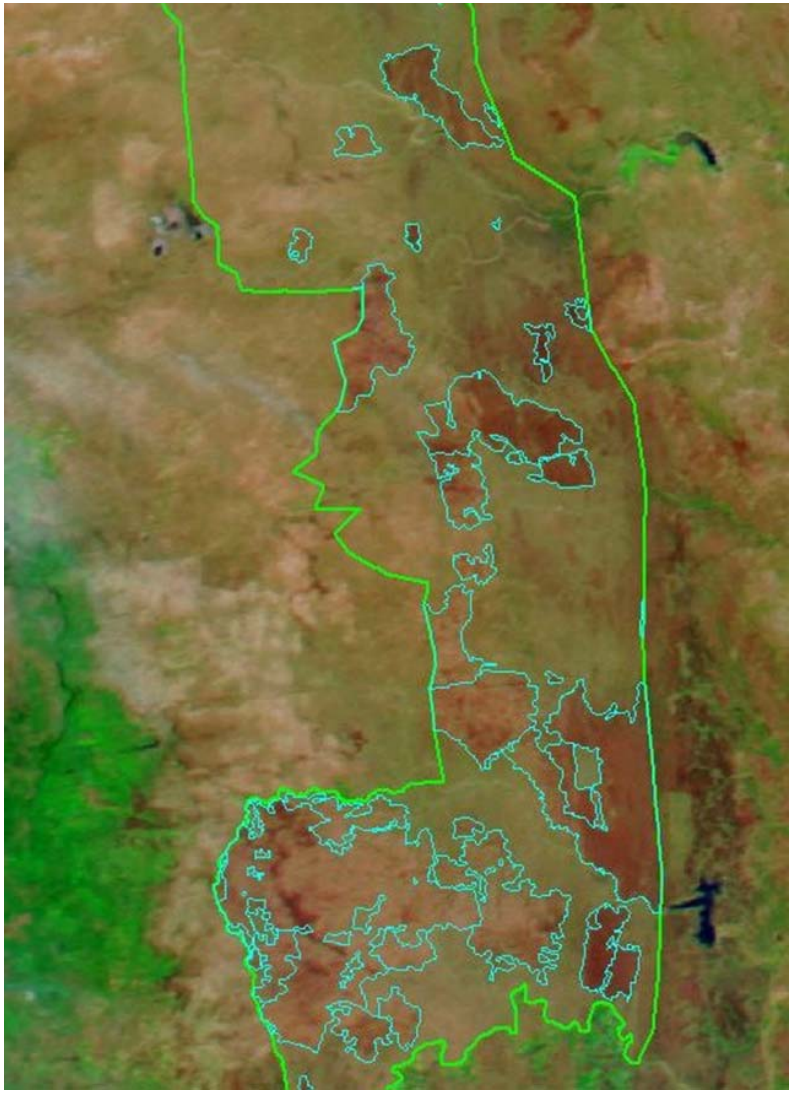
- Savanna ecosystem- fire important in maintenance and conservation of the savannas
- MODIS image subsets and MODIS active fire detections provided by FIRMS are used to drive a burnt area detection algorithm in Kruger National Park to derive burnt area
- Allows rangers and park managers to visualize areas that have burned and areas that still need to burn



2006 Burn Scars in Kruger National Park
(Source: Navashni Govender)



2004 Burn Scars in Kruger National Park
(Source: Navashni Govender)



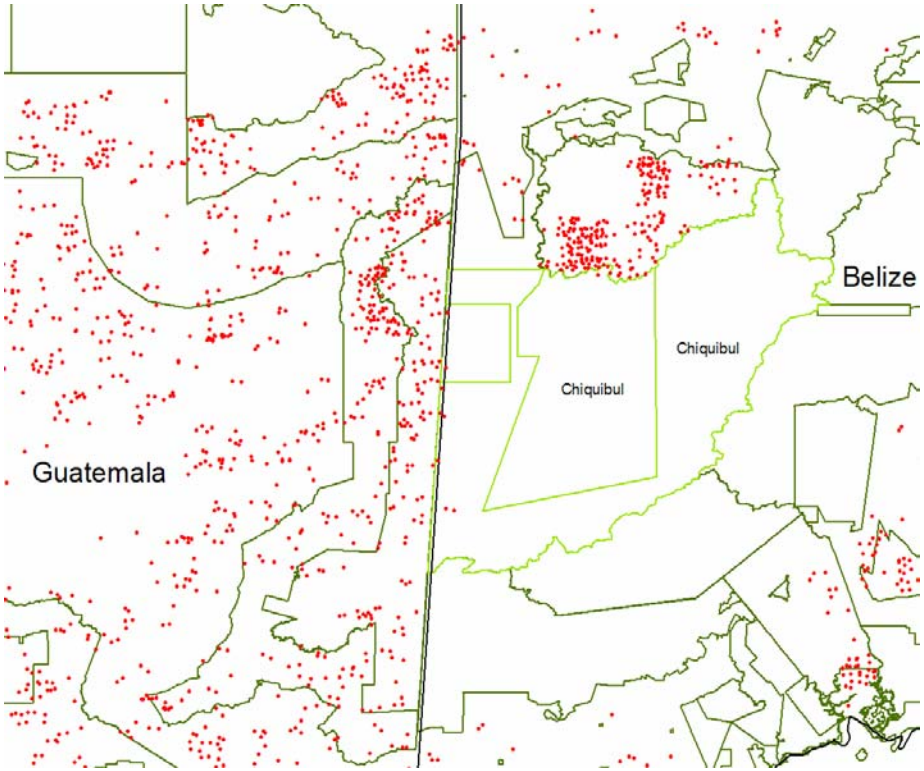
2005 Burn Scars in Kruger National Park
(Source: Navashni Govender)

From: Mr. Rafael Manzanero, CMM Program Director, Belize. May 22, 2007

Fire Alerts in the Chiquibul National Park

"Over the last few days we have been receiving your fire alerts and even though I am a new user – I can see your level of professionalism in ensuring that these arrive to managers on the ground in an effective and efficient manner.

Last two weeks your information gave us an insight on fires occurring on the southern portion of the Chiquibul National Park; this was later confirmed by the wings of Conservation, Lighthawk. A ground reconnaissance mission confirmed the worse. Unknown to anyone there have been large incursions in the park from Guatemalan farmers as far as four kilometers inside the national territory.



More than 100 acres of forest have been cleared for farming and the burning detected by FIRMS showed that more forest was being burnt this year. This has enabled us to put measures now in place to better secure that tropical forest from destruction.

I want to thank you and your FIRMS team for this new management tool that serves as an eye for us in the Chiquibul National Park and the Greater Chiquibul-Maya Mountain Massif."

Using Web GIS and Satellite Technology to Deliver Timely Data to Assist Fire Management in Protected Areas

Diane Davies[1], Minnie Wong[1]
John Musinsky[2], Leanne Miller[2]

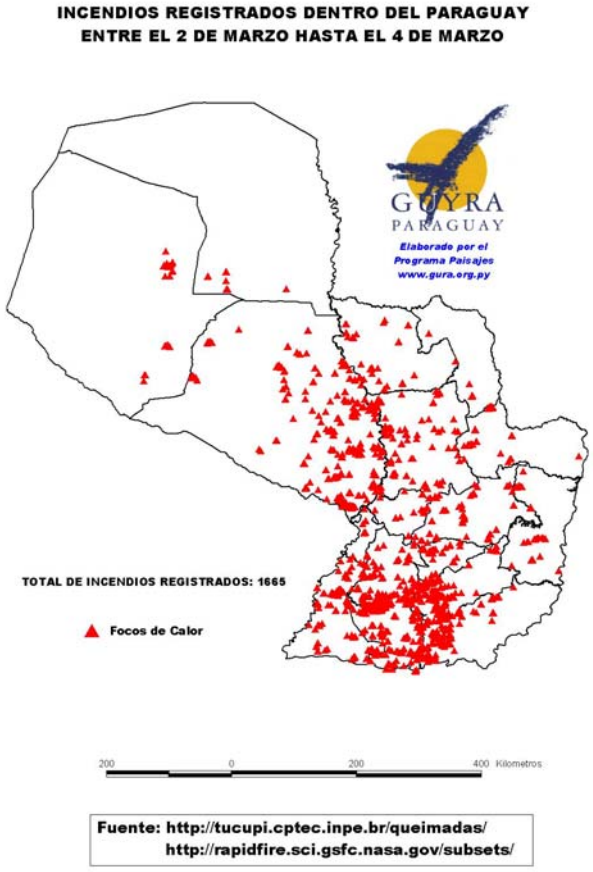
[1]Department of Geography, University of Maryland
[2]Conservation International

Fire Alert System for Protected Areas

- In collaboration with UMD & the MODIS Rapid Response System, Conservation International built a prototype email alert for protected areas in August 2003. The first phase began sending daily to seven countries (Brazil, Paraguay, Bolivia, Madagascar, Namibia, South Africa and Tanzania) using the active fire data produced by UMD and NASA (this continues to the present, though users have been encouraged to transition to FIRMS).
- The current system has over 200 recipients, associated with international and local conservation institutions and government agencies
  - Regional and central offices of many national park agencies (e.g., ANGAP in Madagascar, TANAPA in Tanzania)
    - Forestry research
    - Rapid wildfire response
    - Environmental law enforcement
    - Monitoring of poaching in savanna areas
- CI is also using FIRMS data for monitoring illegal forest activity in Indonesia

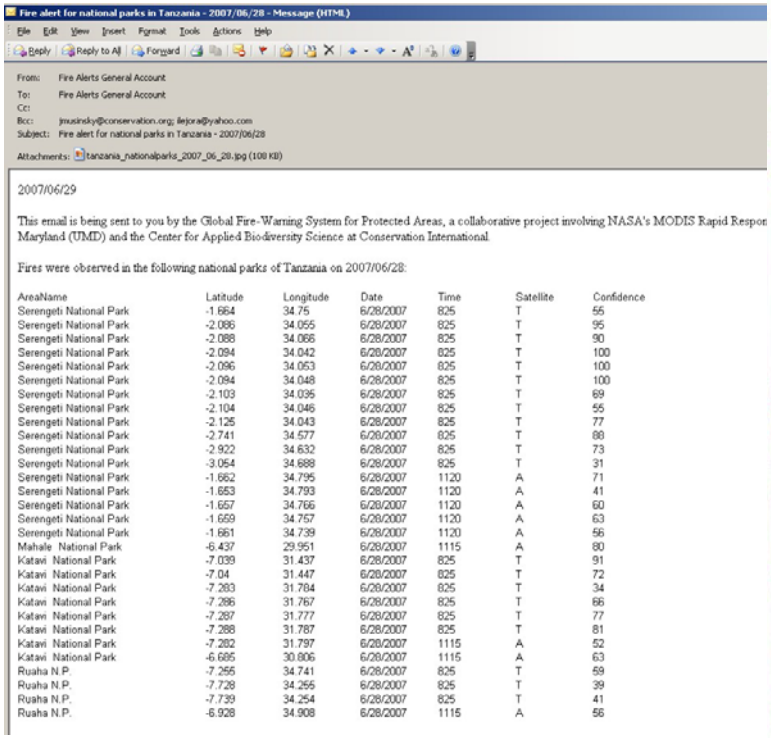
Examples from Paraguay

- Paraguay uses fire alerts from multiple systems (FIRMS, INPE) for monitoring protected areas, and used rapid fire data for fighting fires in San Rafael Nature Reserve. Alerts were first indicator of fires, and subsequently used to ID locations.



Examples from Tanzania

The regional and central offices of the national park agencies in Tanzania (TANAPA) are using the daily fire alerts from the current system to guide local fire brigades responding to wildfires threatening the countries' national parks, as well as a early warning tool to identify poaching activities in savanna areas, where poachers use fire to scare and chase wildlife for capture or hunting.



Fire alert for national parks in Tanzania - 2007/06/28 - Message (HTML)

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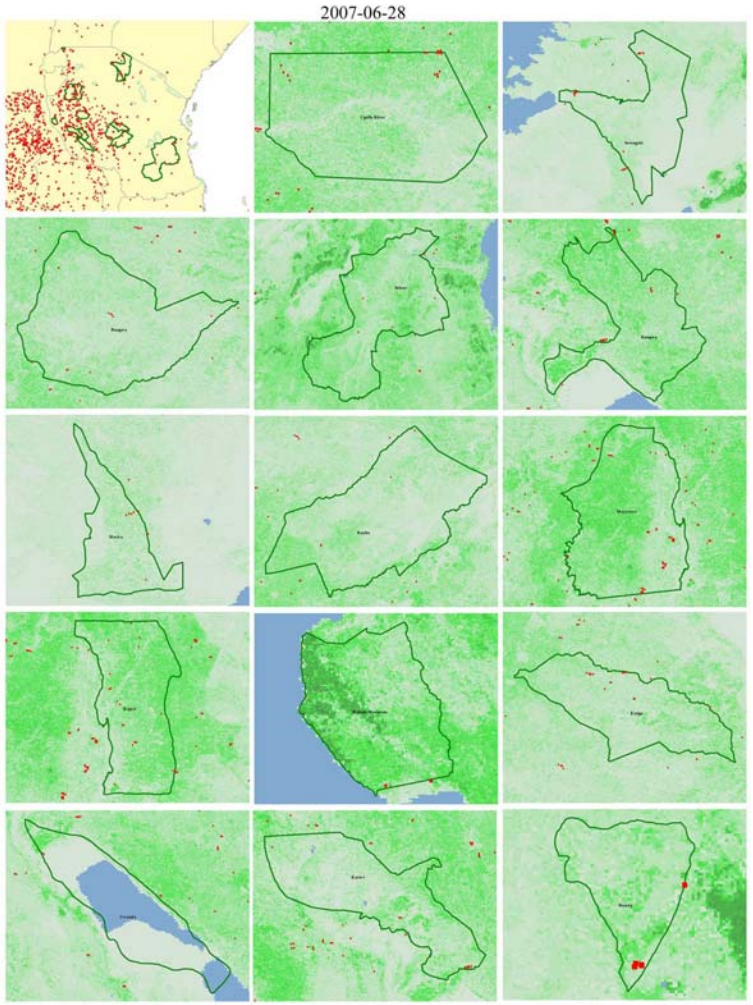
From: Fire Alerts General Account
To: Fire Alerts General Account
Cc:
Bcc: jmusinsky@conservation.org; iejora@yahoo.com
Subject: Fire alert for national parks in Tanzania - 2007/06/28
Attachments: tanzania_nationalparks_2007_06_28.jpg (108 KB)

2007/06/29

This email is being sent to you by the Global Fire-Warning System for Protected Areas, a collaborative project involving NASA's MODIS Rapid Respon
Maryland (UMD) and the Center for Applied Biodiversity Science at Conservation International.

Fires were observed in the following national parks of Tanzania on 2007/06/28:

AreaName	Latitude	Longitude	Date	Time	Satellite	Confidence
Serengeti National Park	-1.664	34.75	6/28/2007	825	T	55
Serengeti National Park	-2.086	34.055	6/28/2007	825	T	95
Serengeti National Park	-2.088	34.066	6/28/2007	825	T	90
Serengeti National Park	-2.094	34.042	6/28/2007	825	T	100
Serengeti National Park	-2.096	34.053	6/28/2007	825	T	100
Serengeti National Park	-2.094	34.048	6/28/2007	825	T	100
Serengeti National Park	-2.103	34.036	6/28/2007	825	T	69
Serengeti National Park	-2.104	34.046	6/28/2007	825	T	55
Serengeti National Park	-2.125	34.043	6/28/2007	825	T	77
Serengeti National Park	-2.741	34.577	6/28/2007	825	T	88
Serengeti National Park	-2.922	34.632	6/28/2007	825	T	73
Serengeti National Park	-3.054	34.688	6/28/2007	825	T	31
Serengeti National Park	-1.662	34.795	6/28/2007	1120	A	71
Serengeti National Park	-1.653	34.793	6/28/2007	1120	A	41
Serengeti National Park	-1.657	34.766	6/28/2007	1120	A	60
Serengeti National Park	-1.659	34.757	6/28/2007	1120	A	63
Serengeti National Park	-1.661	34.739	6/28/2007	1120	A	56
Mahale National Park	-6.437	29.951	6/28/2007	1115	A	80
Katavi National Park	-7.039	31.437	6/28/2007	825	T	91
Katavi National Park	-7.04	31.447	6/28/2007	825	T	72
Katavi National Park	-7.283	31.764	6/28/2007	825	T	34
Katavi National Park	-7.286	31.767	6/28/2007	825	T	66
Katavi National Park	-7.287	31.777	6/28/2007	825	T	77
Katavi National Park	-7.288	31.787	6/28/2007	825	T	81
Katavi National Park	-7.282	31.797	6/28/2007	1115	A	52
Katavi National Park	-6.685	30.806	6/28/2007	1115	A	63
Ruaha N.P.	-7.255	34.741	6/28/2007	825	T	59
Ruaha N.P.	-7.728	34.255	6/28/2007	825	T	39
Ruaha N.P.	-7.739	34.254	6/28/2007	825	T	41
Ruaha N.P.	-6.928	34.908	6/28/2007	1115	A	56



Examples from Madagascar

• The Center for Applied Biodiversity (CABS) at Conservation International, International Resources Group (IRG), Ministere de L'Environnment des Eaux et Forets (MinEnvEF), and US Agency for International Development (USAID) have teamed up with the MODIS Rapid Response System and the University of Maryland (UMD) Geography Department to develop an automated e-mail based alert system warning of fires in or around protected areas and areas of high biological importance within Madagascar. This system will build on the FIRMS & Web Fire Mapper projects by incorporating more region specific data layers.

•Presented historical statistics of over 5 years of fire data provided by UMD at National Workshops held in Madagascar in 2005 & 2007. Participation included over 50 representatives from national & regional government and NGO organizations.

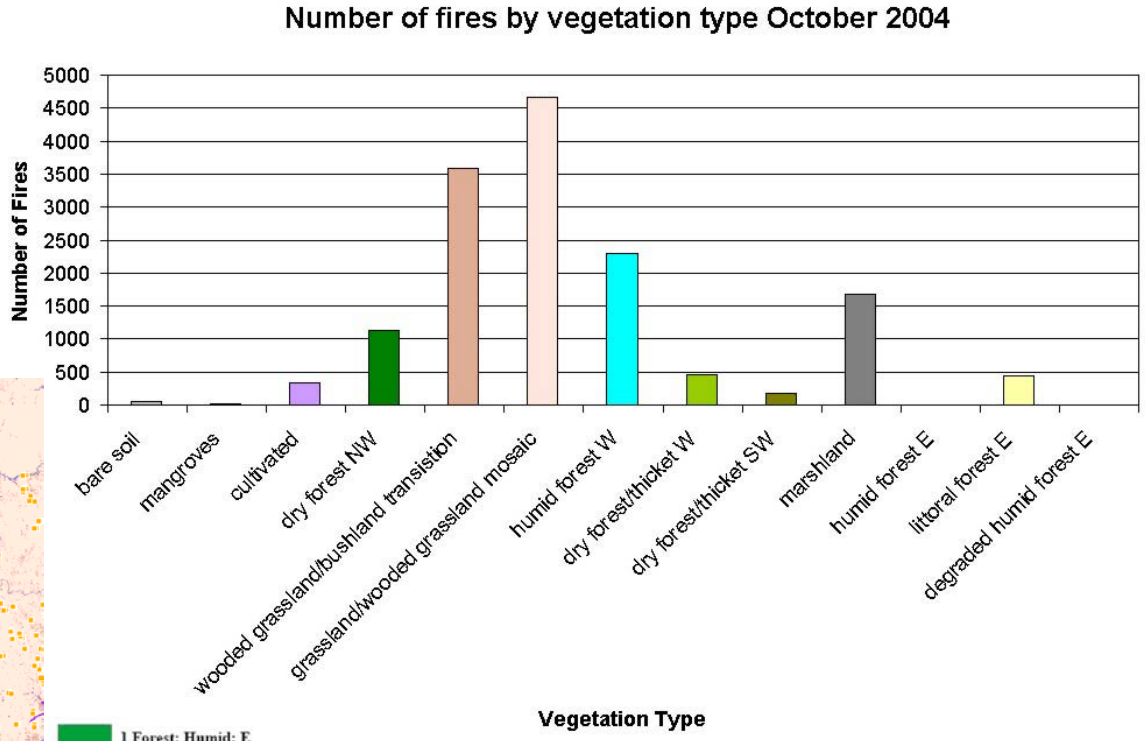
Statistics of fire incident by region

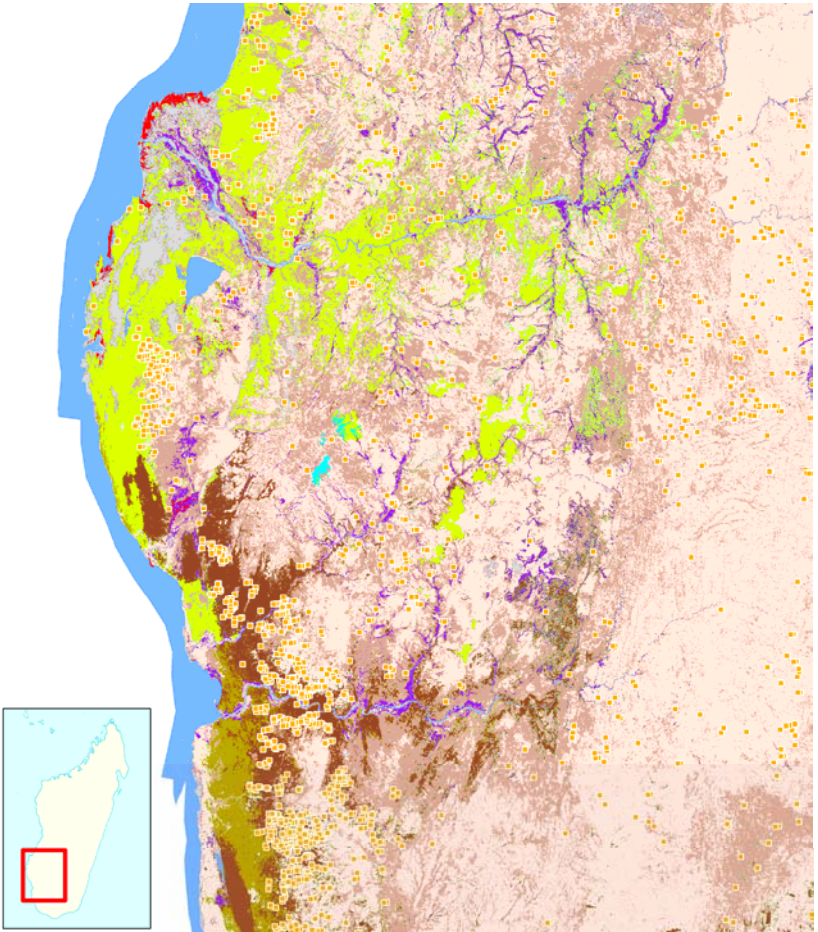
Examples of Fire Incident Per Region during August-October, 2004 & 2005

Region/Date	Aug-04	Sep-04	Oct-04	Aug-05	Sep-05	Oct-05
Alaotra Mangoro	99	248	313	182	219	481
Amoron'i Mania	220	149	80	353	203	246
Analamanga	108	239	125	569	623	378
Analanjirofo	0	2	5	2	0	66
Androy	24	79	107	13	61	132
Anosy	284	374	201	701	735	558
Antsinanana	1	30	271	3	19	277
Atsimo Andrefana	915	695	1576	1152	1070	2200
Atsimo Atsinanana	65	155	88	124	270	474
Betsiboka	620	458	461	955	789	1329
Boeni	639	538	448	588	678	581
Bongolava	615	526	103	1203	585	241
Diana	122	182	291	124	213	548
Haute Matsiatra	236	184	155	420	389	511
Ihorombe	267	491	531	814	959	752
Itasy	12	26	9	89	112	117
Melaky	1359	711	362	1715	1062	479
Menabe	1080	646	714	1696	1194	905
Sava	0	7	21	8	9	203
Sofia	492	761	876	951	1414	2547
Vakinakaratra	133	73	29	347	176	246
Vatovavy Fitovinany	16	41	156	8	35	290
Total	7307	6615	6922	12017	10815	13561

Fire Detection and Analysis

Another use of the Madagascar vegetation map by the JariAla Project is a base for reporting fire data from the global fire-warning system. This will enable us to identify which vegetation types are affected by fires, both anthropogenic and natural.





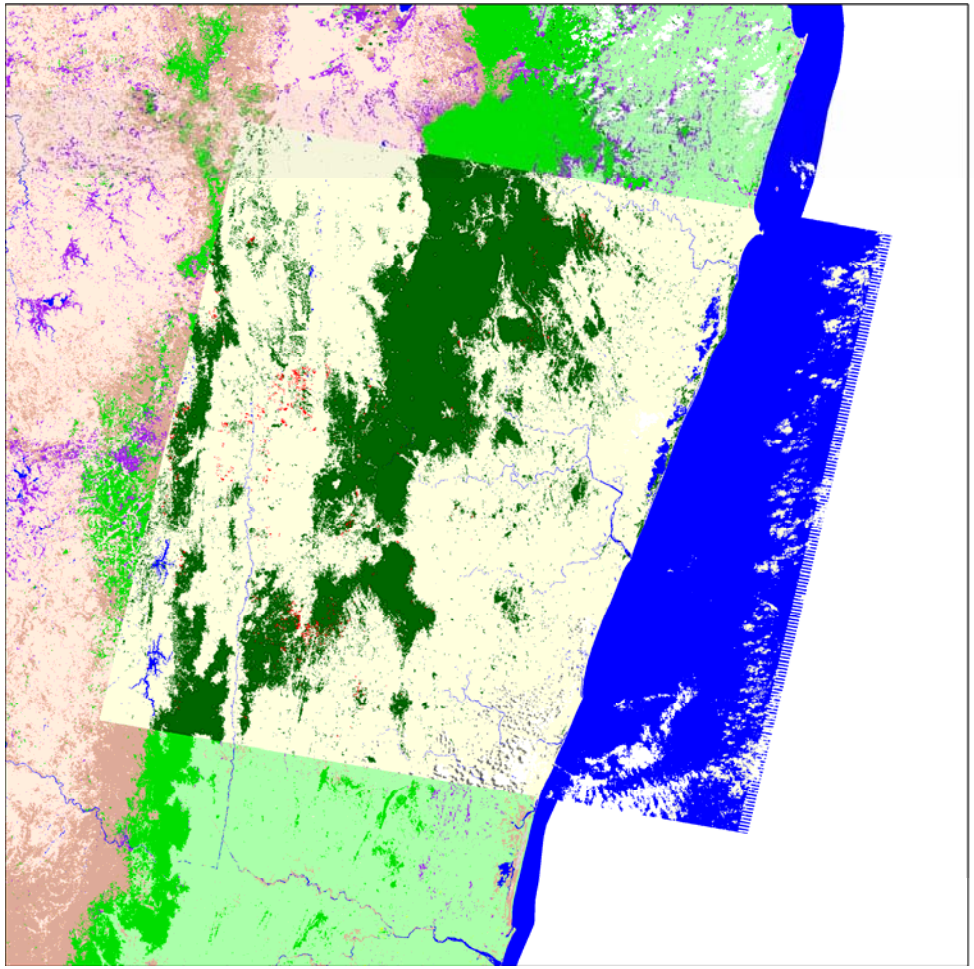
Total number of fires detected by MODIS Terra and Aqua in the month of October 2004 overlayed with the Madagascar Vegetation Map.

Deforestation Rates by Forest Type

The JariAla project is producing a 2000-2005 forest change map that, in combination with the Madagascar Vegetation Map, will be used to assess deforestation rates for specific forest types. When available, this map will be used to generate fire statistics for forest areas.

The extensive field database established in the Madagascar Vegetation Mapping project will also contribute to the validation of the forest change analysis.

Forest Cover change map 2000 to 2005 overlayed on the Madagascar Vegetation Map. Forest change estimated from Landsat 5 imagery from 2000 and 2005. Image shows deforestation in Humid Forest on the eastern coast of Madagascar.



Overview of Presentation

1. Background

2. Introduction to FIRMS

3. Examples of how the data are being used to improve decision support systems

4. Next Steps

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Next Steps

1.Enhance FIRMS for protected areas
- Summary statistics (fire and burned area)
- Links to access moderate and high resolution imagery

2. Enhance Web Fire Mapper
- Incorporate the MODIS Fire Affected Area product
- Open source software
- Improved data handling techniques

3. Transition FIRMS to an operational domain at FAO and CI. Assist UNEP to integrate FIRMS in their current fire decision support system.

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Collaborators: Ashbindu Singh (UNEP), Dan Irwin (NASA SERVIR)

FIRMS Team:

Shriram Ilavajhala and Minnie Wong from the Geography Department, UMD
Mike McGann UMIACS, UMD

http://maps.geog.umd.edu/firms/