

Geospatial Multi-Agency Coordination (GeoMAC) Wildland Fire Perimeters, 2008



Data Series 612

FRONT COVER: Smoke rising from the King County Creek Fire, Alaska within the boundaries of the Kenai National Wildlife Refuge. (Source: U.S. Fish and Wildlife Service National Digital Library, http://www.fws.gov/digitalmedia/cdm4/item_viewer.php?CISOROOT=/natdiglib&CISOPTR=5439&CISOBX=1&REC=19.)

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By Sandra P. Walters, Norma J. Schneider, and John D. Guthrie

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**U.S. Department of the Interior
U.S. Geological Survey**

U.S. Department of the Interior
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U.S. Geological Survey, Reston, Virginia: 2011

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Suggested citation:

Walters, S.P., Schneider, N.J., and Guthrie, J.D., 2011, Geospatial Multi-Agency Coordination (GeoMAC) wildland fire perimeters, 2008: U.S. Geological Survey Data Series 612, 6 p.

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Acknowledgments

GeoMAC is a multiagency effort supported by The National Interagency Fire Center (NIFC) and its member agencies:

- Bureau of Land Management (BLM)
- Bureau of Indian Affairs (BIA)
- U.S. Fish and Wildlife Service (USFWS)
- National Park Service (NPS)
- U.S. Department of Agriculture, Forest Service (USDA-FS)
- U.S. Geological Survey (USGS)

Abbreviations and Acronyms

GeoMAC	Geospatial Multi-Agency Coordination
GIS	Geographic Information System
GISS	Geographic Information System Specialist
GPS	Global Positioning System
GSTOP	Geographic Information System Standard Operating Procedures
HTTP	Hypertext Transfer Protocol
IR	Infrared
NWCG	National Wildfire Coordinating Group
RMGSC	Rocky Mountain Geographic Science Center
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey

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Abstract

The Geospatial Multi-Agency Coordination (GeoMAC) has been collecting and storing data on wildland fire perimeters since August 2000. The dataset presented via this U.S. Geological Survey Data Series product contains the GeoMAC wildland fire perimeter data for the calendar year 2008, which are based upon input from incident intelligence sources, Global Positioning System (GPS) data, and infrared (IR) imagery. Wildland fire perimeter data are obtained from the incidents, evaluated for completeness and accuracy, and processed to reflect consistent field names and attributes. After a quality check, the perimeters are loaded to GeoMAC databases, which support the GeoMAC Web application for access by wildland fire managers and the public. The wildland fire perimeters are viewed through the Web application. The data are subsequently archived according to year and state and are made available for downloading through the Internet in shapefile and Keyhole Markup Language (KML) format. These wildland fire perimeter data are also retained for historical, planning, and research purposes.

Introduction

As of September 22, 2000, more than 79,000 fires had burned an estimated 6,838,748 acres during the 2000 fire season, along with hundreds of structures and valuable natural resources throughout the western United States. Over 25,000 firefighters, 900 fire engines, 200 helicopters, and all available air tankers had been deployed; many of those resources had been fighting fires since early May. Long-term weather forecasts indicated that the hot, dry conditions throughout the west would continue until fall weather brought rain.

Across the west, geographic fire coordination centers set priorities for deployment of firefighting resources on the basis of human safety and protection of property and natural-resource values. Determining these priorities required more information than printed maps and situation reports provided. Fire managers requested a real-time application that would give them geospatial information on the status, location, and proximity of wildfires to life, property, and infrastructure. An Internet-based visual representation of the

active fires, resulting from the development of Geospatial Multi-Agency Coordination (GeoMAC), gave managers a better idea of where to focus resources. GeoMAC partnering agencies were the National Interagency Fire Center (NIFC), the Bureau of Land Management (BLM), the Bureau of Indian Affairs (BIA), the U.S. Fish and Wildlife Service (USFWS), the National Park Service (NPS), the U.S. Department of Agriculture, Forest Service (USDA-FS), and the U.S. Geological Survey (USGS).

The GeoMAC Wildland Fire Support Web viewer, an Internet-based mapping application, is supported by the National Wildland Fire Agencies and is hosted and maintained at the USGS Rocky Mountain Geographic Science Center (RMGSC) in Denver, Colorado. The original design of the viewer was intended to support fire managers by providing access to online maps of current fire information. With the growing concern over western wildland fires in 2000, the application also became available to the public within the same year. The GeoMAC viewer (figs. 1–4) allows fire managers and the public to access online maps of current and historic fire locations and perimeters throughout the United States using standard Web browsers.



Wildfire trees torching in the Tetlin National Wildlife Refuge, Alaska. (Source: U.S. Fish & Wildlife Service National Digital Library.)

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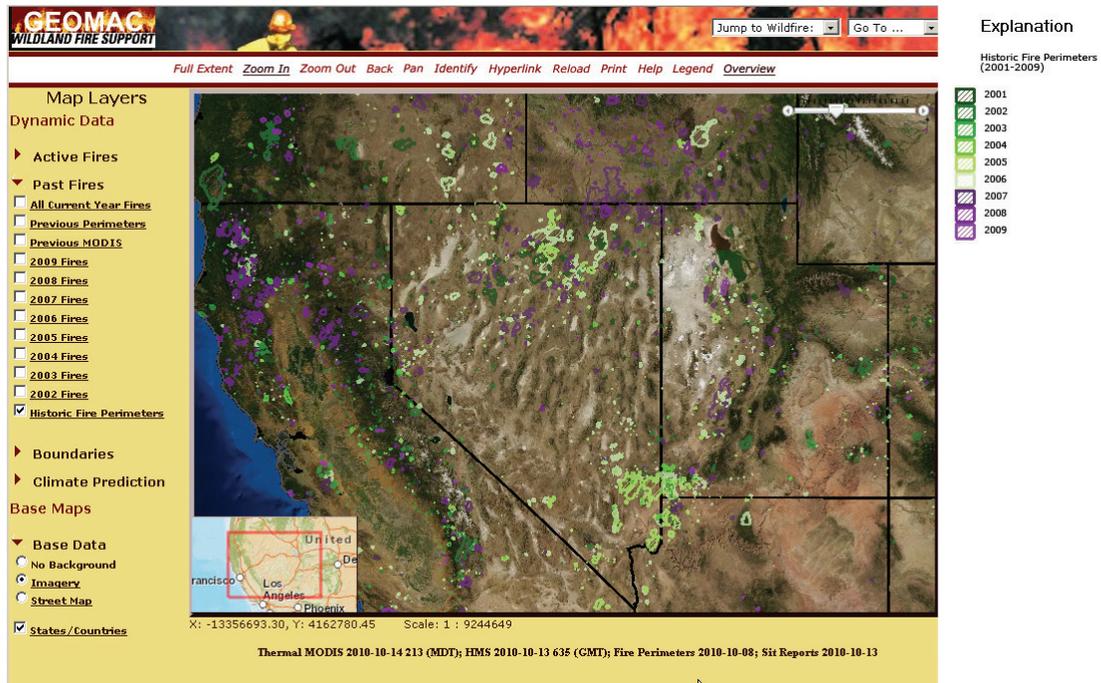


Figure 1. The GeoMAC Wildland Fire Support Web viewer integrated with the ESRI Imagery overlay showing Historic Fire Perimeters (2001–2009) in the western United States. (Source: GeoMAC Wildland Fire Support viewer; scale of original image is 1:9,244,649.)

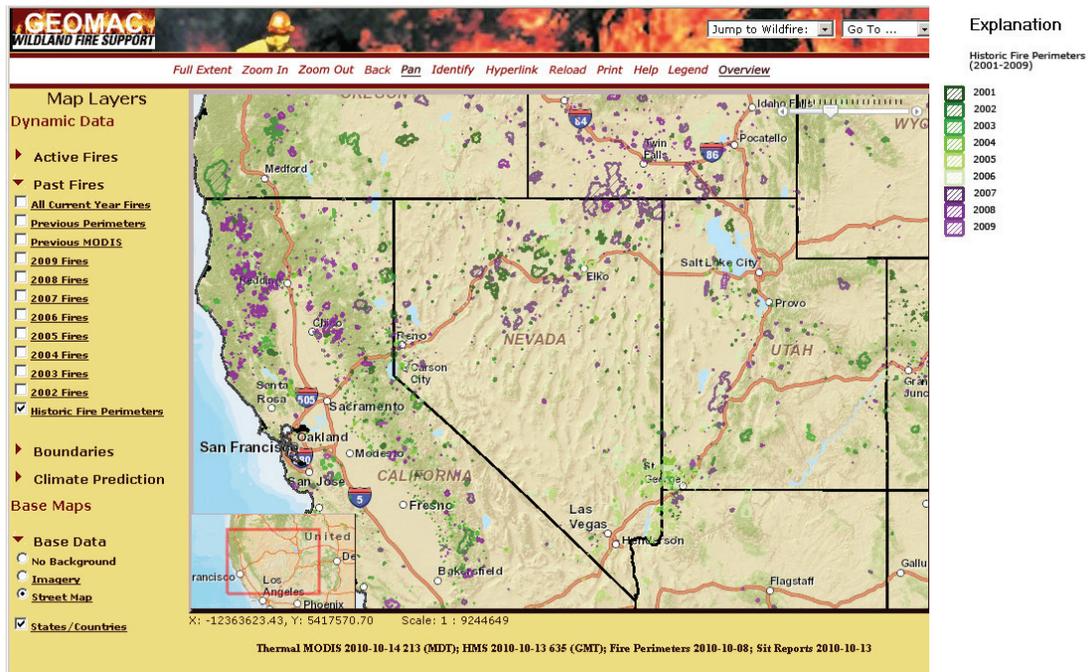


Figure 2. The GeoMAC Web viewer with the ESRI Street Map overview showing Historic Fire Perimeters (2001–2009) in the western United States. (Source: GeoMAC Wildland Fire Support viewer; scale of original image is 1:9,244,649.)

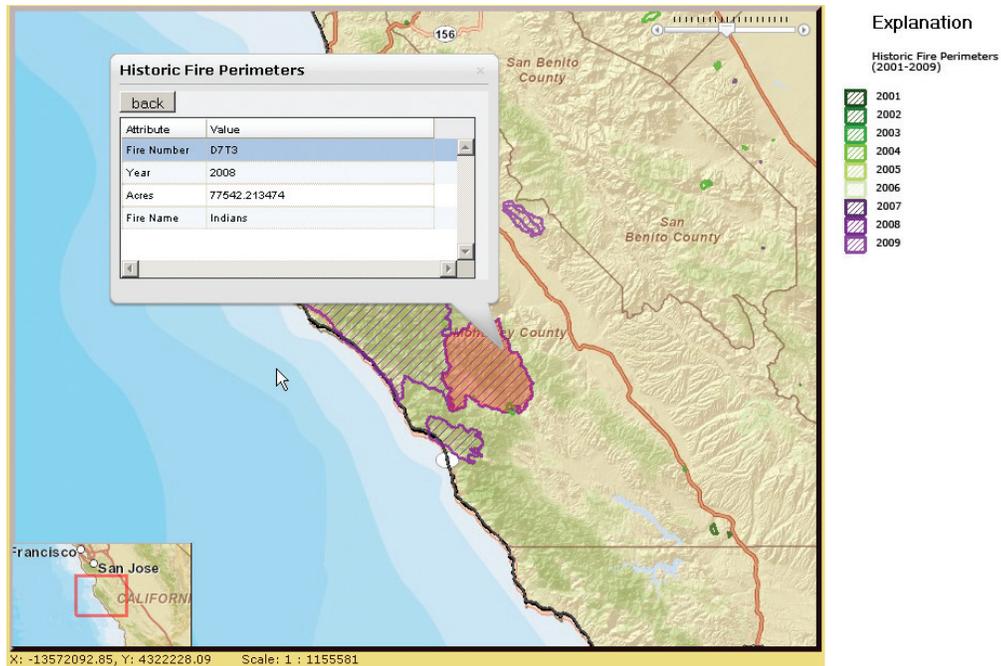


Figure 3. Indians Fire, 2008 fire perimeter (highlighted) in the Los Padres National Forest, California, on ESRI Street Map overview. The view is zoomed in to display the Historic Fire Perimeters, and the Identify tool shows the Fire Number, Year, Acres, and Fire Name in the dialog box. The 2008 fire perimeters near the Indians fire include the Basin Complex and the Chalk Fire. (Source: GeoMAC Wildland Fire Support viewer; scale of original image is 1:1,155,581.)

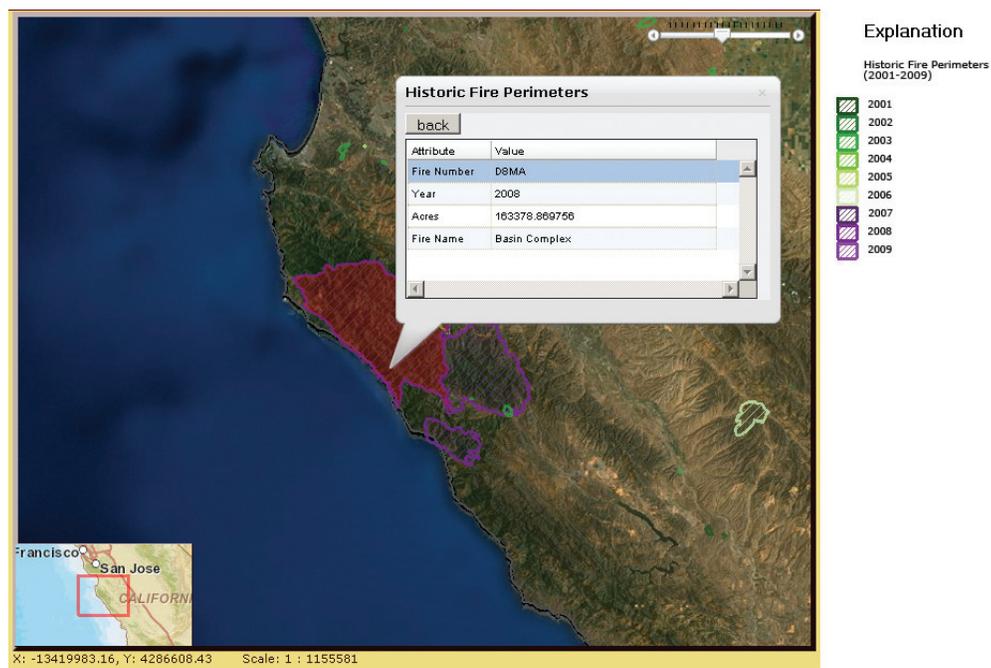


Figure 4. Basin Complex, 2008 fire perimeter (highlighted) in the Los Padres National Forest, California, on ESRI Imagery overlay while zoomed into the Historic Fire Perimeters. The Identify tool shows the Fire Number, Year, Acres, and Fire Name in the dialog box. The 2008 fire perimeters near the Basin Complex include the Indians Fire and the Chalk Fire. (Source: GeoMAC Wildland Fire Support viewer; scale of original image is 1:1,155,581.)

Purpose and Scope

This USGS Data Series product encompasses only the 2008 GeoMAC fire perimeters. GeoMAC wildland fire perimeter data are also available from the years 2000 through the present at http://rmgsc.cr.usgs.gov/outgoing/geomac/historic_fire_data/. Perimeter processing procedures described herein are applicable to the 2008 perimeters, as well as to 2009 and 2010 perimeters.

Methods

The wildland fire perimeter datasets require manual processing for use in the GeoMAC application. GeoMAC perimeter data are provided by geographic information system (GIS) specialists (GISS) working at their respective wildland fire incidents. (For more information on the GIS Standard Operating Procedures used, see http://gis.nwccg.gov/gstop_sop.html.) Specialists at the RMGSC compile, analyze, and evaluate the data for attribute and spatial integrity and completeness, and they provide the resources for processing, attributing, and distributing the data via the GeoMAC Web site and data download sites. Perimeter processing can be divided into five major steps:

1. Identification and downloading of potential datasets.
2. Evaluation for completeness, attribution, acreage calculation, and reprojection.
3. Uploading to GeoMAC databases and serving via the Web application.
4. Posting to the GeoMAC outgoing Web site for access via Hypertext Transfer Protocol (HTTP).
5. Archival for historical purposes.



Llamas in a field watch as a wildfire comes close to home on the Deer Creek Ranch outside of Selma, Oregon. (Photograph by Thomas Iraci, USDA, Forest Service, Region 6, Oregon. Source: USDA, Forest Service, Fire & Aviation Management, "Fire Management Today.")

The identification of potential perimeter datasets involves finding and transferring the needed GIS data from various File Transfer Protocol (FTP), HTTP, and Web sites. The wildland fire perimeter data are collected daily during the fire season, evaluated for attribute and spatial integrity and completeness, and then processed in accordance with established standards that include quality checking the perimeter polygons and the geospatial information and relationships (projection and topology). Attributes are added in accordance with the National Wildfire Coordination Group (NWCG) Daily Fire Perimeter Standard (http://www.nwccg.gov/pmu/pmo-archive/products/stds/gdl_fire_perimeter/cover.htm) and FireCode System (<https://www.firecode.gov>). Issues concerning whether a particular fire is a fire complex—defined as two or more individual incidents located in the same general area that are assigned to a single incident team or unified command (<http://www.nwccg.gov/pms/pubs/glossary/c.htm>)—or a single incident are then resolved. Next, extraneous attributes (those not required according to the NWCG Daily Fire Perimeter Standard) are removed.

After the wildland fire perimeters have been processed, the perimeters are uploaded to ArcSDE (Arc Spatial Database Engine, part of the ArcGIS platform) databases on SQL (Structured Query Language) Server databases. The data are then served by the GeoMAC application via an ArcGIS Server Representational State Transfer (REST) service. Vector polygons of the perimeter data are stored in an ESRI shapefile format, as well as Keyhole Markup Language (KML) and compressed Keyhole Markup Language (KMZ) files, then posted to the GeoMAC Web site and archived.

All GeoMAC wildland fire perimeter data for large fire incidents can then be downloaded by the public from the HTTP outgoing dataset site: http://rmgsc.cr.usgs.gov/outgoing/GeoMAC/historic_fire_data/.

Metadata for the GeoMAC wildland fire perimeter data are available at http://rmgsc.cr.usgs.gov/outgoing/GeoMAC/historic_fire_data/2008_perimeters_dd83_METADATA.htm.

Download procedures and data descriptions are also available in a Microsoft archived Web page format (.mht) or Acrobat Portable Document Format (.pdf): http://rmgsc.cr.usgs.gov/outgoing/GeoMAC/geomac_download_procedures.mht or http://rmgsc.cr.usgs.gov/outgoing/GeoMAC/geomac_download_procedures.pdf.

The data layers available on the HTTP site contain all wildland fire perimeters that were collected during the active fire season by means of the methods previously described. Additional perimeters may be submitted to GeoMAC at the end of the active fire season or as resources permit. Wildland fire perimeters are collected in the field by various methods, including infrared (IR) flights and use of Global Positioning System (GPS) units to map the perimeters via foot, land-based vehicle, or aircraft.

GeoMAC displays only wildland fire perimeter data layers that are submitted as described above. Perimeter data provided by the GeoMAC site are derived from data produced by GIS specialists working on each incident. Perimeter data



Rocky Mountain Geographic Science Center (RMGSC) Outgoing Datasets

Name	Last modified	Size
Parent Directory		-
!METADATA_README.rtf	03-Dec-2010 11:26	32K
!README!.rtf	27-Aug-2008 11:28	285
2000_perimeters_dd83.zip	01-Mar-2011 16:24	12M
2001_perimeters_dd83.zip	01-Mar-2011 16:24	27K
2002_perimeters_dd83.zip	01-Mar-2011 16:24	12M
2002_sit_rep_pts_dd83.zip	30-Dec-2008 14:56	234K
2003_perimeters_dd83.zip	01-Mar-2011 16:24	7.9M
2003_sit_rep_pts_dd83.zip	30-Dec-2008 14:56	165K
2004_perimeters_dd83.zip	01-Mar-2011 16:24	9.2M
2004_sit_rep_pts_dd83.zip	11-Jul-2007 16:40	120K
2005_perimeters_dd83.zip	01-Mar-2011 16:25	12M
2005_sit_rep_pts_dd83.zip	11-Jul-2007 16:47	145K
2006_perimeters_dd83.zip	01-Mar-2011 16:25	18M
2006_sit_rep_pts_dd83.zip	11-Jul-2007 16:50	231K
2007_perimeters_dd83.zip	01-Mar-2011 16:25	47M
2007_sit_rep_pts_dd83.zip	28-Dec-2007 15:17	194K
2008_perimeters_dd83.zip	08-Mar-2011 16:08	48M
2008_perimeters_dd83_METADATA.htm	28-Jan-2011 15:08	18K
2008_sit_rep_pts_dd83.zip	19-Dec-2008 09:48	172K
2009_perimeters_dd83.zip	01-Mar-2011 16:25	13M
2009_sit_rep_pts_dd83.zip	31-Dec-2009 10:04	155K
2010_perimeters_dd83.zip	01-Mar-2011 16:25	7.4M
2010_sit_rep_pts_dd83.zip	30-Dec-2010 09:46	155K
nifc_large_fires_dd83_METADATA.htm	21-Jan-2011 11:18	15K
perimeters_dd83_METADATA.htm	21-Jan-2011 13:34	18K
us_hist_fire_perimeters_dd83.zip	10-Jan-2011 15:20	49M
us_hist_fire_perimeters_dd83_METADATA.htm	21-Jan-2011 14:15	16K

Figure 5. Screen shot of RMGSC outgoing datasets, Rocky Mountain Geographic Science Center. (Source: Rocky Mountain Geographic Science Center Outgoing Datasets Web site, http://rmgsc.cr.usgs.gov/outgoing/Geomac/historic_fire_data/)

displayed in and delivered by the GeoMAC application are not the final or official perimeters for any incident and are provided for informational purposes only. One should obtain the final official wildland fire perimeter from the unit on which the fire occurred. The host unit can be located by using the unit ID for any specific fire. This unit is responsible for producing the official and final wildland fire perimeters for all incidents in its jurisdiction.

Summary

During active wildland fires, fire managers need near-real-time information about the extent of the fire area. These perimeter data are updated daily in GeoMAC and are based upon input from GISS sources, GPS data, and IR imagery from fixed-wing and satellite platforms. The GeoMAC Web site allows users to manipulate the map information displayed in the application by zooming in and out to display fire information at various scales and detail. Hardcopy maps can be printed for use in fire-information and media briefings, dispatch offices, and coordination centers. These data are also valuable for land managers, researchers, and the public after fires are extinguished. There are many uses for historic fire perimeters including fire planning, resource assessment, and research purposes. The wildland fire information is integrated with data stored in relational databases and served from ArcIMS and ArcGIS Server viewers, from which the user can display individual fire perimeter information such as fire name, date, time, acreage,

agency, and unit ID. The availability of GeoMAC 2008 perimeter data improves wildland fire information in the following ways:

- Sharing 2008 perimeter data with wildland fire managers, the public, researchers, scientists, and the media.
- Providing interactive, online maps of the 2008 wildland fire perimeters.
- Displaying detailed information about the areas where 2008 wildland fires had burned.
- Improving wildland-fire decisionmaking for the future.



Silhouette. (Source: U.S. Fish & Wildlife Service National Digital Library.)

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- Geospatial Multi-Agency Coordination Group (GeoMAC), 2010, GeoMAC Wildland Fire Support: Interagency Web site, accessed April 20, 2010, at <http://www.geomac.gov/index.shtml>.
Description: Wildland fire support real-time Web application. From 2000 to present. Last updated Dec. 8, 2010.
- National Wildfire Coordinating Group (NWCG), 2010, National Fire and Aviation Management Web Applications, 1999 through 2008 SIT report and SIT data: Interagency Web site, accessed April 20, 2010, at <http://fam.nwcg.gov/fam-web/>.
Description: This layer displays point data for large active fire incidents that have been entered into the National Interagency Fire Center (NIFC) 209 Situation Report database maintained in Kansas City, Missouri, by the U.S. Department of Agriculture, Forest Service. The Interagency Situation (SIT) Report Program captures incident activity and resource status information in summary form intended for use by managers. Once the information has been submitted via the Web site, it can be accessed and utilized at local Dispatch Offices, Geographic Area Coordination Centers (GACCs) and the National Interagency Coordination Center (NICC) to produce summary reports to be used by agency managers as a decisionmaking tool. Agency information officers also use the reports to disseminate incident activity to the media and public. GACCs have edit access to all of the Dispatch Offices within their area. Additionally, NICC has edit access to all Dispatch Offices and GACCs. The SIT Report is prepared on a daily basis at National Preparedness Level 2 and above, or when significant activity occurs.
- U.S. Department of Agriculture, Forest Service, Fire & Aviation Management, 2010, Fire management today: Agency Web site, accessed June 24, 2010, at <http://www.fs.fed.us/fire/fmt/>.
Description: “Fire Management Today 2003” photo contest winners. Founded in 1936, “Fire Management Today” has served the wildland fire community for more than 70 years as a clearinghouse for new techniques, technologies, and ideas. It has provided a forum open to anyone with anything useful to share with other wildland fire professionals. In the process, the journal has not only facilitated information exchange but also helped build a common history and culture in the wildland fire community. Until 1961, the journal kept the same simple design under its original name, “Fire Control Notes.” Changes in wildland fire management policy in the 1970s led the journal to adopt a new name, “Fire Management Notes,” which was changed to “Fire Management Today” in 2000.
- U.S. Department of Agriculture, Forest Service, 2010, Interagency Management Situation Report (IMSR) 209: Interagency Web site, accessed November 15, 2010, at <http://fam.nwcg.gov/fam-web/>.
Description: This layer displays point data for large active fire incidents that have been entered into the National Interagency Fire Center (NIFC) 209 Situation Report database maintained in Kansas City, Missouri, by the U.S. Department of Agriculture, Forest Service. The Interagency Situation (SIT) Report Program captures incident activity and resource status information in summary form intended for use by managers. Once the information has been submitted via the Web site, it can be accessed and utilized at local Dispatch Offices, Geographic Area Coordination Centers (GACCs) and the National Interagency Coordination Center (NICC) to produce summary reports to be used by agency managers as a decisionmaking tool. Agency information officers also use the reports to disseminate incident activity to the media and public. GACCs have edit access to all of the Dispatch Offices within their area. Additionally, NICC has edit access to all Dispatch Offices and GACCs. The SIT Report is prepared on a daily basis at National Preparedness Level 2 and above, or when significant activity occurs.
- U.S. Department of Agriculture and U.S. Department of the Interior, 2010, FireCode system: Interagency Web site, accessed April 20, 2010, at <https://www.firecode.gov/>.
Description: FireCode provides access to information about wildfires in the United States from 2003 through the present. Spread sheets in various formats can be downloaded. Updating is ongoing.
- U.S. Fish and Wildlife Service, 2008, National Digital Library: Agency Web site, accessed June 24, 2010, at <http://www.fws.gov/digitalmedia/>.
Description: The U.S. Fish and Wildlife Service’s National Digital Library is a searchable collection of selected images, historical artifacts, audio clips, publications, and video and that are in the public domain. They are free to be used as one wishes—no permission is necessary.

Publishing support provided by:
 Denver Publishing Service Center, Denver, Colorado

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