Chapter 14

Dissemination of LANDFIRE Prototype Project Data

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Introduction

The transfer of LANDFIRE data to users is the most important aspect of the Landscape Fire and Resource Management Planning Tools Project (LANDFIRE Prototype Project). The creation of an accurate, consistent, nationwide data set provides the foundation for a successful project. The final step is to make the data readily available to the user community. User capabilities and needs vary widely. Many users require LANDFIRE data to solve day-to-day wildfire management problems such as planning fuel treatments or managing active wildfires. Others use LANDFIRE data to gather information over large geographic areas for strategic planning and analyses. The diversity of users and the variety of applications of LANDFIRE data present an interesting challenge: to develop a data dissemination system that is comprehensive, user-friendly, and flexible. The system must be functional across many levels of technology, ranging from powerful computing capability to support national-scale strategic planning to field-level tactical wildfire operations support. The system must be sustainable, dependable, affordable, and adaptable to various levels of and changes in technology.

In: Rollins, M.G.; Frame, C.K., tech. eds. 2006. The LANDFIRE Prototype Project: nationally consistent and locally relevant geospatial data for wildland fire management. Gen. Tech. Rep. RMRS-GTR-175. Fort Collins: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

The Technical Problem

Most of the LANDFIRE products are developed at a 30-meter grid resolution. Because the overall volume of LANDFIRE data is expected to exceed four terabytes, an effective and efficient distribution mechanism is required to allow for seamless data download for any given polygon area.

Access to LANDFIRE data must be supported on several levels. First, users must be able to view the core deliverables produced by the LANDFIRE Project. The U.S. Geological Survey (USGS), via The National Map, uses Internet map services (IMS) as the primary mechanism for viewing geospatial data layers. With an IMS, a view of selected data layers is rendered as an image for a selected map scale and extent. The LANDFIRE data and information from The National Map are provided through an IMS (fig. 1) that is supported by fully compliant Open Geospatial Consortium (OGC) web map service (WMS) connectors and ArcIMS interfaces. The IMS can also be directly accessed through Geographic Information System (GIS) tools, such as ArcMap. Second, users must be able to download data to their own computers for local application. An interface is needed that enables users to select a segment of data for a geographic region and download the data in a timely manner and standard format. Third, users must be able to perform applications via the Internet, without having to download the data or the application. Examples include running models interactively or producing summary reports from the geospatial data.

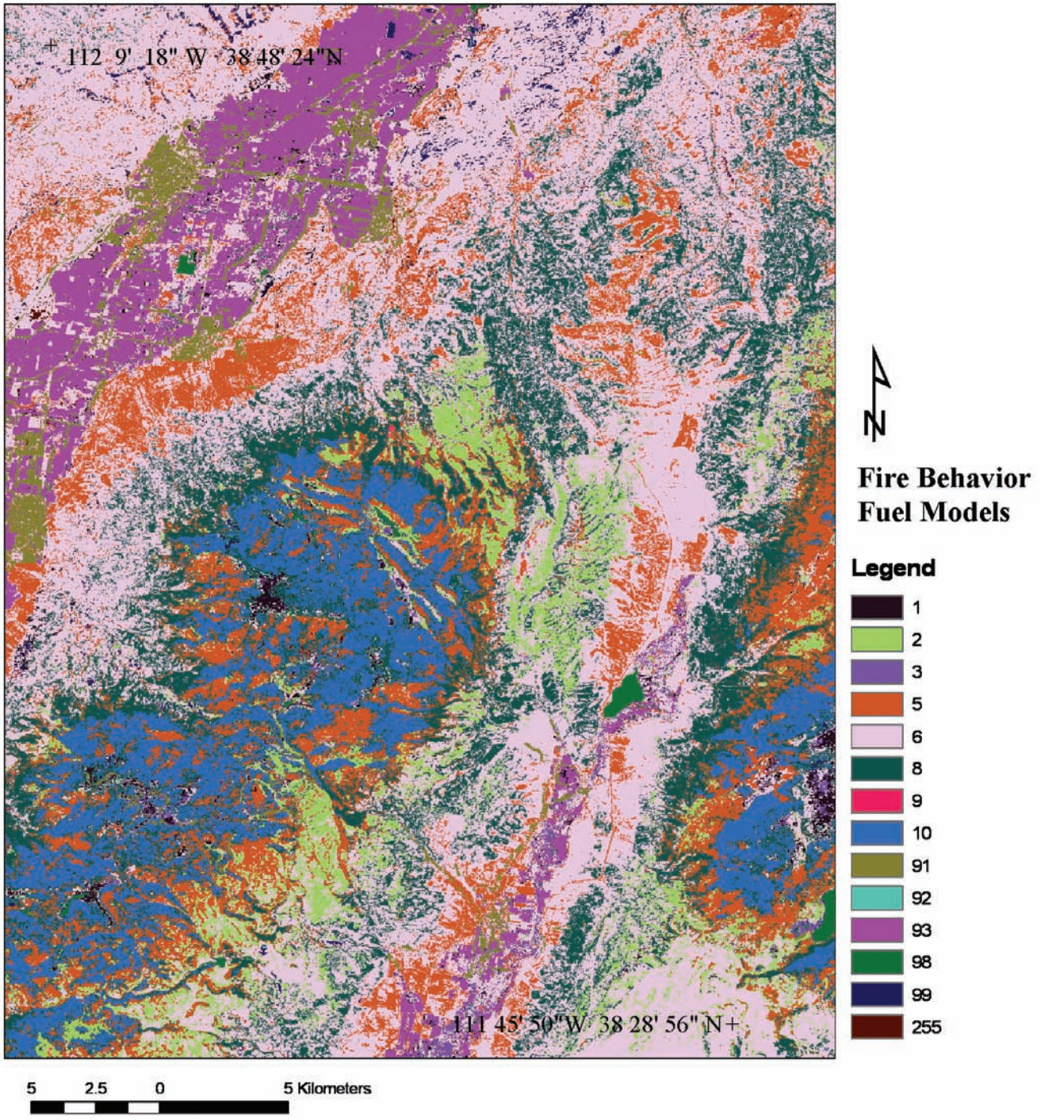

Figure 1—A portion of the LANDFIRE Zone 16 (central Utah) Fire behavior Fuel Models layer from The National Map. The colors represent different fire behavior fuel models. (Please visit the Data Products section of www.landfire.gov for details on the fire behavior fuel models.)

Objectives

The plan for distributing LANDFIRE data capitalizes on the capabilities of The National Map to provide integrated geospatial data within the context of the wildland fire community's data requirements. This approach is logical from the standpoint that the USGS has the necessary technical experience, a long history of delivering geospatial and remotely sensed data, and the required software and hardware resources.

The objectives of the LANDFIRE data distribution plan are as follows:

- to develop a LANDFIRE data access interface based on the technical capabilities of The National Map,
- to develop a document that articulates the requirements for LANDFIRE data delivery, and
- to integrate LANDFIRE products with other geospatial data.

LANDFIRE Prototype Project Data Distribution Approach

The Internet is the enabling technology that will increase the public and private sectors' and individuals' awareness and use of spatial data. Having evolved from a means to view content and deliver products, the Internet encourages the development of more holistic spatial services, stand-alone devices, specialized applications, customized spatial queries, and interactive capabilities. The USGS, via The National Map, is currently employing the Internet as the primary mechanism for improving the availability of geospatial data.

A functional prototype IMS has been developed for LANDFIRE data dissemination (see www.landfire.gov). The two LANDFIRE Prototype mapping zones are used as the foundation for the prototype IMS. As they are mapped, other zones are added to the IMS. The availability of the LANDFIRE IMS will enable users of LANDFIRE products to integrate current GIS capability with LANDFIRE data.

In circumstances where bandwidth capability is limited or where in-house applications require complex data analysis, field practitioners may wish to download the data as opposed to simply viewing the data through an IMS. LANDFIRE data are distributed through the LANDFIRE IMS following the model of the USGS Seamless Data Distribution System (SDDS) (http://seamless.usgs.gov/). The SDDS includes an area of interest selection tool and online direct data downloads. Initially, these data sets can be retrieved interactively by drawing a box around the area of interest. The next level of capability will support the use of a template defining the desired area, such as a county or watershed. The template may be derived from an existing LANDFIRE geospatial layer or from The National Map. Ultimately, the data distribution system will need to accept user-defined templates such as the perimeter of an active wildfire or an administrative unit.

Recommendations for National Implementation

Scientists from the USGS Center for Earth Resources Observation and Science, The Nature Conservancy, the USDA Rock Mountain Research Station Missoula Fire Sciences Laboratory, and the National Interagency Fire Center are cooperating with field personnel to develop the IMS in addition to the data download and delivery capabilities. Recommendations for national implementation address issues affecting the integration of the IMS with GIS technology and existing models. Four main points for refinement have been identified.

"Third-party" Fire and Land Management Models

A major requirement of the LANDFIRE Prototype Project is that it must facilitate the implementation of existing models. Specifically, it must support four standardized analytical fire models: FARSITE, a fire behavior simulation model; FlamMap, a fire potential model; and FOFEM and CONSUME, both fire effects models. Each of these models uses several LANDFIRE layers combined with ancillary data. The models also produce derived layers that need to be catalogued as part of the LANDFIRE database and also made accessible for other users and applications.

The capability to perform interactive modeling using IMS is in the early stages of development. Research will determine how these models will function as part of the analytical tools provided within an IMS. The capability to execute these models through an Internet-based interface would substantially reduce the need to download a large volume of data from remote locations using slow Internet connections. Instead, model results, having a considerably smaller data volume than the input data itself, could be delivered to a field center in a timely manner. The modeling results will be enhanced using ancillary layers (such as those depicting transportation, hydrology, terrain, and/or structures) from The National Map.

Scaling of LANDFIRE Products and Geospatial Data

LANDFIRE products and geospatial data must be useable at spatial scales ranging from that of a watershed to that of the entire nation. LANDFIRE data will be used in decision support systems where emphasis could range from real-time requirements for wildland fire fighting to national planning requirements for allocation of fuel treatment resources. For effective use of LANDFIRE data, a robust scaling capability will be needed to enable land managers to scale LANDFIRE data layers from local to national applications. Users will identify the most appropriate scales for applying LANDFIRE products. Techniques for display of multi-scale data using IMS, at scales that meet the needs of decision support and modeling, are under development.

Updating LANDFIRE Geospatial Data

A LANDFIRE requirement is that data be routinely updated in order to capture varying patterns of fire and fuel in terms of both time and geographic scale. This updating process presents challenges for the LANDFIRE team, the greatest of which will be solving the administrative and technical problems regarding processes for collecting and collating updates from the field. Ideally, every fuel treatment, such as prescribed burns or the mechanical removal of fuel, and all wildfires will be mapped by a land management agency; however, the collection and collation of this information at a national scale across agencies and programs remains a difficult task. Data will be updated through GIS capabilities that integrate with the data dissemination system.

Developing the Technical Infrastructure

Implementing a national LANDFIRE data distribution system can be viewed simply as expanding the prototype effort to the national scale. The data distribution infrastructure, such as data servers, network bandwidth, and data storage, can be improved by incremental expansion of the hardware capability and through routine replacement of old technology. Meeting the technological needs of the users, however, is much more complex. Processes such as formatting data, merging data from disparate sources, and analyzing data become increasingly complex as more users find more ways to employ the data.

Conclusion

The LANDFIRE data dissemination system is built on existing and emerging Internet technology. The LANDFIRE data layers are available for viewing and download using the functional capability of Internet map services. The LANDFIRE data dissemination framework is modeled after The National Map and other geospatial data delivery systems. Unique LANDFIRE requirements will be identified through cooperation with users. The goal is to meet the needs of field-level management as well as those of national strategic planning. The technology of the LANDFIRE data dissemination system will be an effective and affordable solution to the challenge of wildfire management information delivery.

For further project information, please visit the LANDFIRE website at www.landfire.gov.

The Author

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