P1.7   **MAPPING, ANALYZING AND DELIVERING SPATIO-TEMPORAL
FIRE POTENTIAL PRODUCTS USING OPEN GEOSPATIAL
CONSORTIUM STANDARDS**

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1. INTRODUCTION

The Wildland Fire Assessment System (WFAS) consists of web-based decision support tools that summarize fuels, weather and fire danger information into maps and metrics that are useful to managers (Jolly et al. 2005). The current WFAS implementation uses ESRI-based software to generate static maps of fuel, weather and fire danger information and it would benefit from methods to dynamically display and analyze spatial data. This paper details the development of such a system.

Building a platform based on Open Geospatial Consortium (OGC) interoperability standards provided the framework for cataloging and advertising WFAS raster product availability, and for delivering maps and data.

This abstract gives an overview of our OGC-compliant installation, our rich internet web application, and it describes how network-enabled clients (browser, desktop, or automated systems) can access WFAS product maps and data.

2. SYSTEM OVERVIEW

This WFAS mapping and data platform consists of three main components(Figure 1):

1. Data management layer.

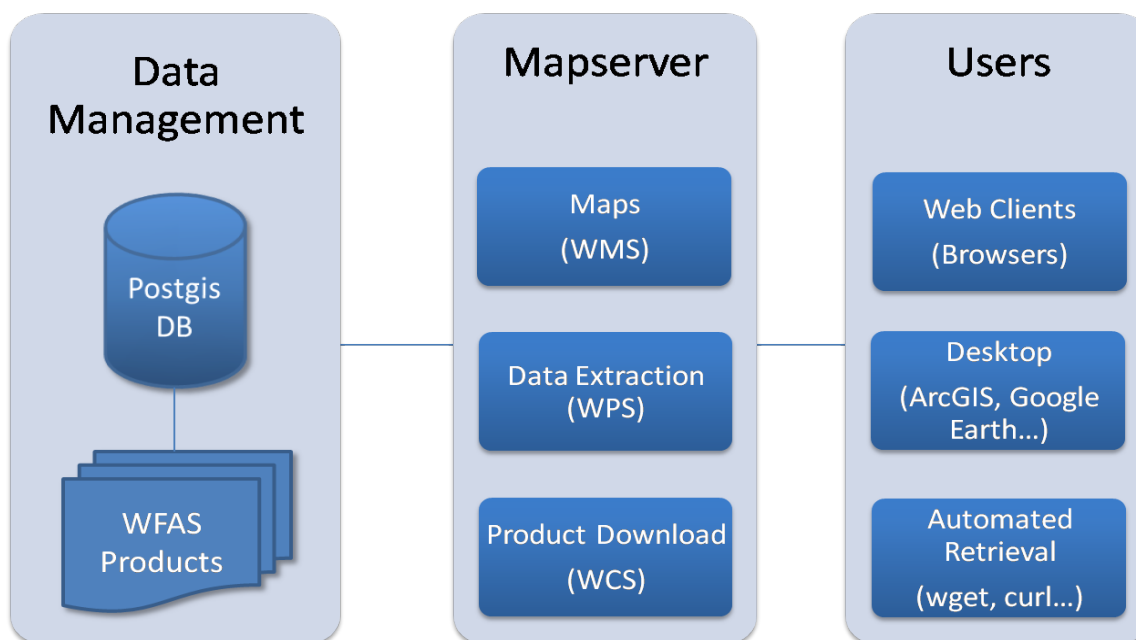2. Map and data delivery server and analysis tools.

3. Users/clients.

Figure 1: System architecture overview.

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The data management layer is responsible for updating and cataloging WFAS raster products. WFAS products are updated daily to provide latest Departure from Average (DA)(Burgan et al. 1996), Relative Greenness (RG) (Burgan and Hartford 1993) and Normalized Difference Vegetation Index (NDVI) 7-day composite raster data sets. A PostgreSQL/Postgis geospatial database catalogs all WFAS raster data to provide an up to date time-indexed inventory.

The server component advertises and provides maps and data for available WFAS products. Our MapServer installation relies on the Postgis database from the data management layer for inventory, advertises WFAS product availability (GetCapabilities request), and is the gateway for maps, data, and analytical tools to OGC-enabled clients.

The WFAS web portal is a browser-based application that allows users to select, map, and download data for available WFAS products. This interface also allows raster data search, compositing, as well as time-series point-based data extraction. In addition, users can access

WFAS raster products through other OGC-compliant clients, which can be other web GIS portals, desktop applications (ArcGIS, Google Earth, and others), and automated systems (i.e. command line scripts that use the http protocol).

3. MAPS

Maps can be viewed via the WFAS WMS client, or any other OGC-compliant software. Access to our WMS catalog provides a detailed listing of currently-available WFAS raster products and their attributes. Below is the URL where the WMS catalog can be accessed:

http://wfas.smoke-fire.us/cgi-bin/WMSGetCapabilities

Our web-based application uses the ExtJS Javascript-based framework for building the user interface, while OpenLayers provides mapping facilities and tools for exploring time indexed WFAS products (Figure 2a). The interface features a navigational toolbar, layer selection panel, and a product search engine.
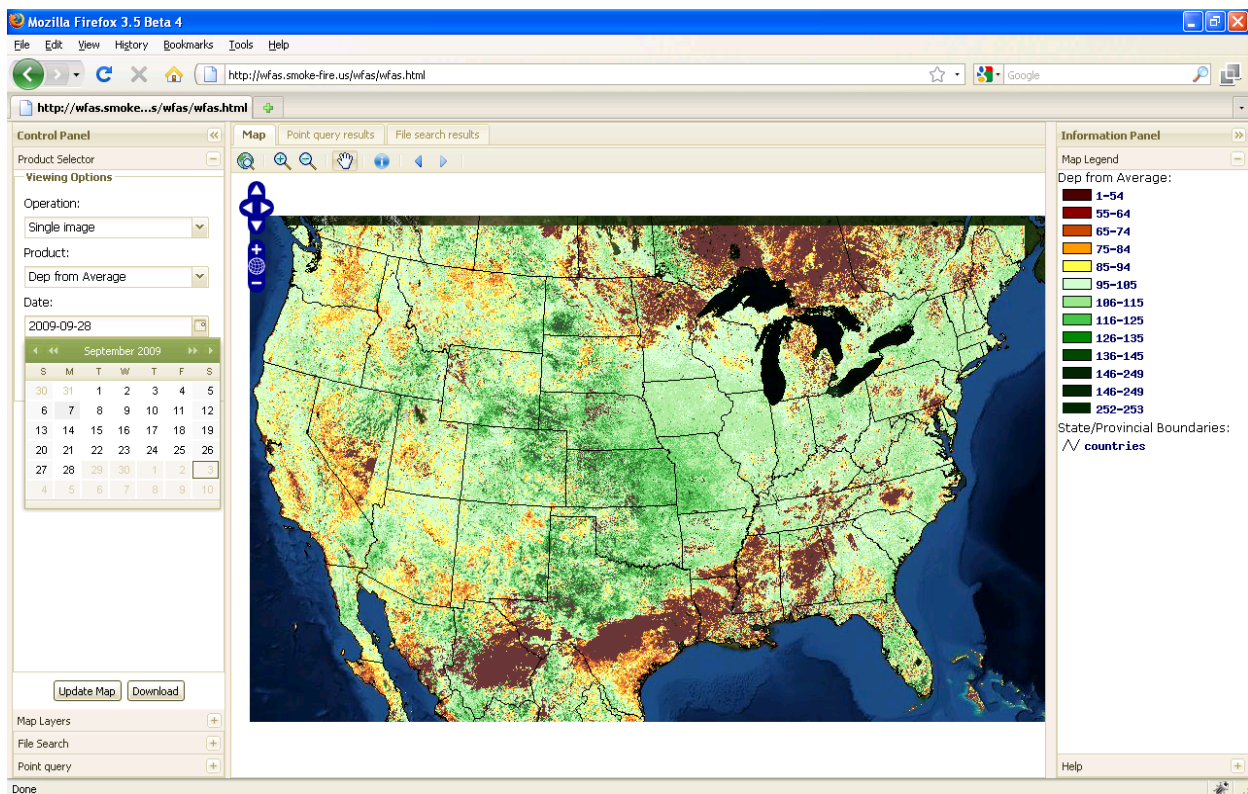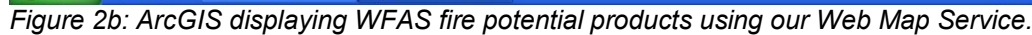

Figure 2a: Displaying WFAS product maps from OGC-compliant web-based GIS portals.

In addition, other clients (such as ArcGIS, Google Earth, QGIS and others) can access WFAS data. Figure 2b depicts an ArcGIS installation connected to the WFAS Web Mapping Service instance, where the displayed map layers are a WFAS Departure from average product and satellite imagery.

for point-based queries. Users can use raster comparison to see how individual data sets within a product differ from one another. The result is a downloadable raster map that represents the numerical comparison of the image of interest against an arbitrarily chosen base image (Figure 4).

Figure 2b: ArcGIS displaying WFAS fire potential products using our Web Map Service.

4. WFAS PRODUCT DATA

The Web Coverage Service (WCS) specification outlines the standard for downloading grid coverage (raster) data. Using MapServer's WCS component, clients can download WFAS products for any time step, as well as specify desired geospatial extent and resolution. Our web application enables users to select the geographic extent and download WFAS products in GeoTiff format (Figure 3).

5. ANALYSIS OF WFAS PRODUCTS

The Web Processing Service (WPS) specification provides the standard for advertising and using predetermined analytical functions. At the time of this writing the WFAS web application provides analytical tools for raster comparison and
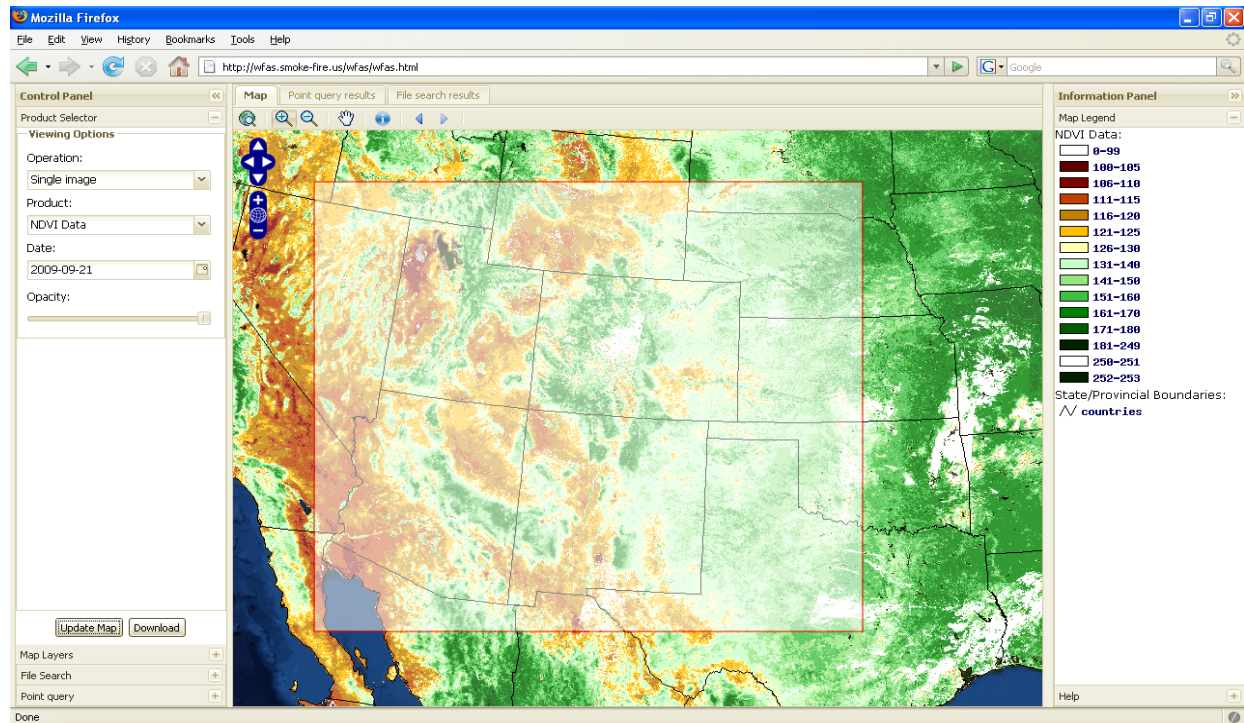
The point-based graphing and extraction routine allows users to customize window size (in pixels), and to specify geographic point coordinates for extracting time-series (Figures 5a,b). When window sizes greater than one are selected, the program samples the central and surrounding points and displays the median value of all points within the window. Time series results are displayed either within the web mapping window or can be extracted into a MS Excel format. The length of the time series can be varied to examine trends over weeks, months or years.

Figure 3: Users can download WFAS product via the web interface for the currently-selected geospatial extent.
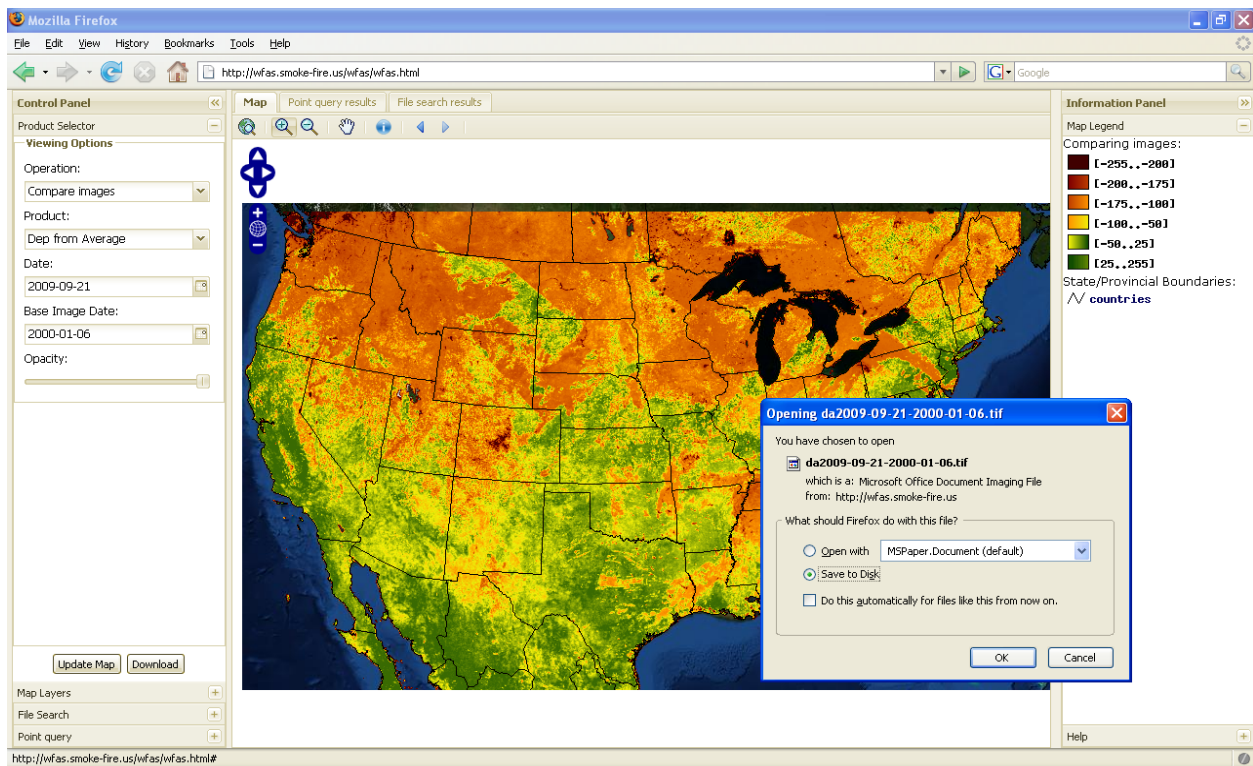

Figure 4: Raster comparison example for WFAS products.

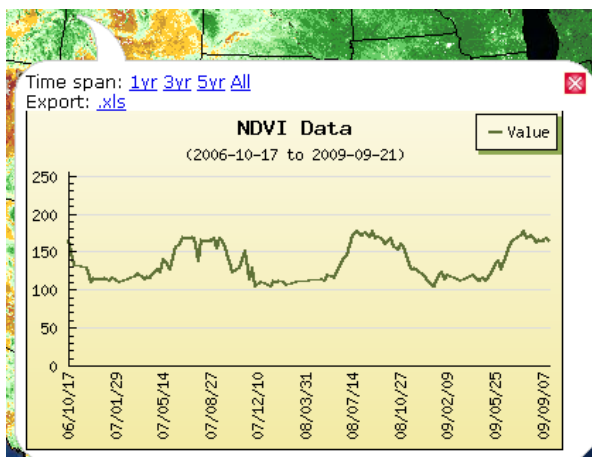*Figure 5a: Point-based data extraction.*

Figure 5b: Time-series plot for user-specified geographic coordinates. The results can be exported in Excel format for further analysis.

6. SUMMARY

Here we have described the development of a flexible and integrated web mapping system to display, analyze and distribute raster data for the Wildland Fire Assessment System. We describe how our OGC-compliant system not only exposes WFAS products via our web application but enables interoperability between remote clients and our WFAS product map and data server.

The system enables users to map WFAS products via the web application, as well as familiar, industry-standard desktop GIS applications which comply with the OGC standards. Furthermore, web coverage and processing OGC services enable product download and analysis.

7. ACKNOWLEDGMENTS

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