

Predictive Services: A New Tool for Proactive Wildland Fire Management

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Abstract

After the 2000 US fire season, a National Fire Plan (NFP) was implemented to better manage fire impacts and reduce the risk to communities. The NFP identified the need for a more proactive approach to anticipating fire activity and pre-positioning resources through the integration of fire weather, fire danger/fuels information and intelligence. Fire weather meteorologists were hired under the NFP to team up with intelligence officers and wildland fire analysts to form Predictive Service units at national and geographic area coordination centers.

Predictive Services helps fire managers anticipate where the fire problems will be today, tomorrow and for the next 7-10 days, including estimates on the number of large incidents per fire episode. The units produce weekly, monthly and seasonal fire weather / fire danger outlooks, daily briefings and various resource/intelligence reports. Examples of products will be discussed in the paper including success stories such as the Pacific Northwest Predictive Service unit providing four days advance warning of a major dry lightning outbreak in Washington and Oregon in August 2001. The significant pre-positioning of assets including incident management teams, engines and crews allowed for quick suppression of dozens of small fire starts. This action resulted in improved public/firefighter safety and tremendous cost savings.

Introduction

In many ways, the 2000 US fire season was a turning point in fire management. The National Fire Plan identified a number of sorely needed actions to improve firefighting, rehabilitation/restoration, community assistance and accountability. In terms of firefighting, the acquisition of more personnel, engines, and other assets provided for a quicker and greater response to wildland fire. To some degree, fire operations will usually be in a reactive mode unless one can anticipate fire activity and pre-position resources before the fires start. This proactive approach is called Predictive Services. This paper will provide an overview of the program, the information tools used, products and services provided as well as an example of a success story.

Predictive Services

In the past, there was not a holistic approach to weather, fuels, fire danger, and resource information. During severe fire seasons, a group of meteorologists, fire behavior specialists, and managers would be assembled to assess the current and projected fire activity over a region. The problems were that assessments were needed before fire activity developed and that these were usually one-time projections and were not routinely updated. Fire managers recognized these problems but tight budgets and higher priorities prevented a solution.

The National Fire Plan provided the solution by the development of the Predictive Services program to **integrate fire weather, fire danger and resource information** for strategic resource allocation and prioritization. By pre-positioning forces ahead of dry lightning or high wind events, one can:

- maximize public and firefighter safety,
- reduce losses,
- and lower costs.

Fire management is analogous to military operations in that one must anticipate the location and time of the battle and pre-position the right amount of resources to deal with the threat.

One of the key points about Predictive Services is the requirement to have a dedicated team focused on fire weather, fire danger and resources. Each Geographic Area Coordination Center (GACC), including the National Interagency Fire Center (NICC), has a Predictive Services unit staffed with one or two meteorologists and an intelligence specialist (figure 1). The NICC unit at Boise also has a wildland fire analyst and some of the GACCs bring on fire behavior specialists during the fire season.



Figure 1. Map of Geographic Areas

Information Tools

Predictive Services meteorologists utilize a variety of sources of weather information, including the two primary systems called FX-Net and ROMAN. Forecasters use PC workstations running FX-Net software (provided by the National Oceanic and Atmospheric Administration's Forecast Systems Laboratory) which allows them to quickly and easily view satellite imagery, numerical weather models, observations and radar information. The Real-Time Observation Monitor and Analysis Network (ROMAN) is a web-based application (www.met.utah.edu/roman) for displaying weather observations from a variety of observation networks, including RAWS (Remote Automatic Weather Stations).

There are a several sources of fuels and fire danger information. FireFamily Plus is a PC program that uses weather and fire occurrence data to compute and display fire danger indices. Another important tool is the Wildland Fire Assessment System which is an excellent Internet site (www.fs.fed.us/land/wfas) for weather, fire danger, "greenness" maps, etc.

Resource information is available via routine geographic area summaries and incident reports. One tool under review is a fire analysis program used to estimate the number of fires and resources needed per fire episode in various geographic areas. Preliminary results have shown this tool to be quite promising.

Products and Services

Perhaps the greatest strength of Predictive Services is the ability to distill a large amount of weather and fire danger information into short, concise documents which pinpoint problem areas (critical fire weather event, location, time, degree of potential, confidence, etc.) and which areas which will likely show improvement.

During the fire season, Predictive Service units produce weekly fire weather / fire danger outlooks. These outlooks contain a weather, fire danger and resource predictions for the next seven to ten days. Figure 2 shows an example of this weekly outlook for northeast Oregon. Some units also issue daily outlooks which summarize the forecasted weather and fire danger across the area (figure 3).

Monthly and seasonal outlooks are also issued by each GACC and incorporated into national products. An example of a monthly national outlook is along with an overlaid plot of the large fires which occurred during that period is shown in figure 4. Seasonal assessments are usually issued prior to the fire season, including a mid-season update. A seasonal assessment workshop is typically held during the spring and brings together climatologists, fire managers and Predictive Service personnel to coordinate the pre-season outlook.

Services include daily briefings of weather and fire danger as well as close weather watch. Coordination center personnel are kept fully apprised of weather conditions which might impact wildfires. In addition, Predictive Services personnel participate in training and research during the off-season.

**Pacific Northwest Fire Weather / Fire Danger Outlook
 Northeast Oregon - Predictive Service Area E4
 Friday August 8 to Sunday August 17, 2003**

Weather Discussion

Warming and drying.... Chance of lightning through this weekend and again next Wednesday... The weather pattern over NE Oregon will change little through the first part of next week. An upper level low will remain off the Coast with high pressure to the east over the Rockies. This will maintain a southwesterly flow of air over the area with isolated thunderstorms. The upper low is finally forecast to move inland next Wednesday. As it does, there will be a chance of thunderstorms along with strong gusty, shifting winds. High pressure will rebuild over NE Oregon the later part of next week with warm, dry weather.

* Large Fire Risk (table below) refers to wildland fire (95th percentile) 200 acres or larger. (Table reduced to only 4 days for publication purposes)

Day	Date	ERC	100 FM	Large Fire Risk ¹	Weather
Friday	8/8	72	8	Mod	Mostly sunny. Isolated afternoon/evening thunderstorms. Highs in the 80s. Lowest RH in the sub-teens.
Saturday	8/9	75	7	High	Mostly sunny. Isolated afternoon/evening thunderstorms. Highs in the 80s to lower 90s. Lowest RH in the single digits.
Sunday	8/10	75	6	High	Mostly sunny. Isolated afternoon/evening thunderstorms. Highs in the 80s to lower 90s. Lowest RH in the single digits.
Monday	8/11	75	6	High	Sunny, warm and dry. Highs in the 80s. Lowest RH in the teens.

100 Hour Fuel Moisture Outlook 8/8 - 8/17 Fuel Model G

Predictive Service Area	Weighted Avg. value for August (Climatology)	Current Obs from WIMS	Predicted 10 Day Value Range
Northeast Oregon	8%	8%	5-8%

ERC Outlook 8/8 - 8/17 Fuel Model G

Predictive Service Area	Weighted Avg. value for August (Climatology)	Current Obs from WIMS	Predicted 10 Day Value Range
Northeast Oregon	61	69	72-80

Fire Danger Assessment: Isolated lightning this weekend with a better chance next Wednesday. A return to warmer and drier weather will likely result in “hold-over” fires as fuels dry. The potential for large fires will climb into the **high risk** category this weekend and continue through the remainder of the 10-day period. **Gusty, shifting winds could cause control problems on new lightning starts next Wednesday.**

Figure 2. Example of Weekly Fire Weather / Fire Danger Outlook

Southwest Area Fire Weather Outlook

Outlook for Tuesday - April 22, 2003

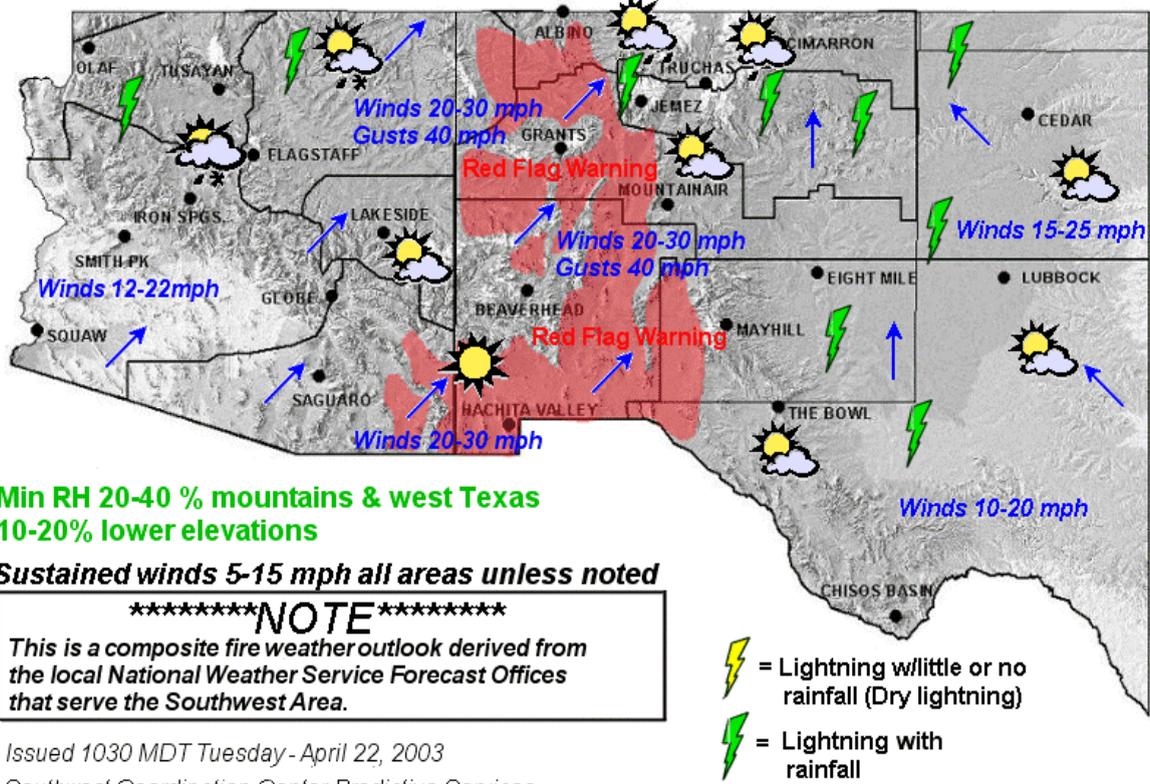


Figure 3. Example of Daily Fire Weather / Fire Danger Outlook

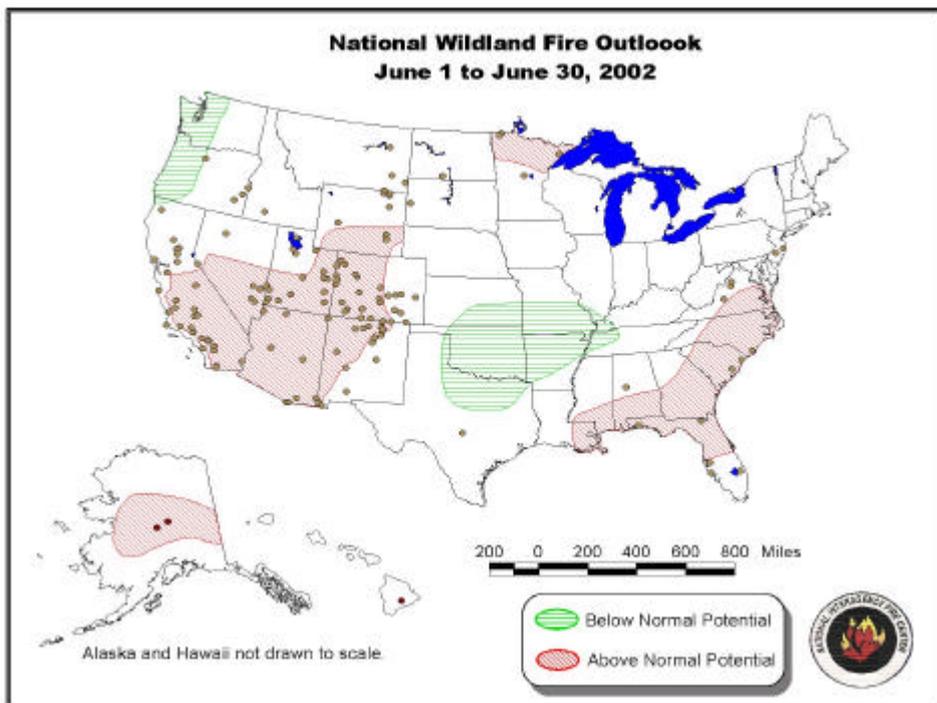


Figure 4. Example of Monthly Outlook overlaid with large fire occurrence (dots).

Success Story

One event that demonstrates the strength of Predictive Services occurred in the Pacific Northwest during the dry lightning outbreak of August 12, 2001. Four days prior to the lightning event, the Northwest Area Predictive Service Unit warned fire managers about the potential for dry lightning in areas already experiencing extreme fire danger. The unit provided fire managers with their best assessment of the situation, including various scenarios and confidence levels. The long-lead time provided by Predictive Services allowed **managers to pre-position the following resources:**

- Air tankers
- Contract crews and engines
- 5 task forces each comprised of 2 crews, 5 dozers & water tender
- Staging of two Type 2 Incident Management Teams

The dry lightning materialized as forecast and resulted in over 200 fires and by August 15, there were 18 fire complexes scattered throughout Washington and Oregon. Fire suppression costs for the Northwest in 2001 were approximately \$170 million. By pre-positioning fire fighting resources, fire managers were able to suppress a large number of small fires and thus prevent them from becoming large project-sized fires

Summary

Predictive Services is the integration of fire weather, fire danger and resource information to:

- Assess fuels and fire danger
- Generate daily, weekly, monthly, seasonal fire weather/fire danger outlooks
- Provide long-lead times for critical fire weather events
- Identify fire threat areas.

This allows fire managers to make sound decisions for both short and long range strategies for resource allocation and prioritization. As was shown in the Pacific Northwest example, Predictive Services helps improve safety, reduce losses and lower suppression costs.