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Weather Support to the FEMA/DHS Joint Field Office Established in Response to the Devastating Southern California Wildfires of October 2007

An Incident Support Specialist Overview

Abstract: On October 24, 2007, President George W. Bush, signed a Major Disaster Declaration for the State of California for severe wildfires affecting Southern California. The Disaster Declaration put into motion federally funded and state coordinated response and recovery efforts, including establishing a FEMA/DHS Joint Field Office. Weather support for this function was provided by an Incident Support Specialist (ISS) from the National Weather Service in Los Angeles/Oxnard, California. This paper is an overview of those local efforts, including the products and services provided, and an examination of the complexities involved. It also discusses the lessons learned and the successes realized.

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Cover Photo: Courtesy of LA Times

Editor's Note: The term ISS is a prototype concept. This acronym may change in the future.

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An Incident Support Specialist Overview

By Todd Morris (WFO Los Angeles/Oxnard)

I. Introduction

Numerous devastating wind-fanned wildfires burned extensive portions of southern California in late October 2007. From Santa Barbara to San Diego – a distance of 220 miles and encompassing 21 million people – as many as 24 wildfires were burning out of control. Some of these fires were in urbanized areas and all of them threatening the inhabitants in their paths (Fig. 1). Local firefighting resources were quickly overwhelmed. On October 24, 2007, President George W. Bush signed a Major Disaster Declaration (FEMA 1731-DR-CA) for the State of California for these wildfires. The Disaster Declaration put into motion federally funded and state-coordinated response and recovery efforts. One of these efforts was to provide dedicated federal weather services by the National Weather Service (NWS) at the newly spun-up FEMA/DHS Joint Field Office (JFO) in Pasadena, California.

Figure 1 - Santiago Fire (Courtesy of LA Times)

II. Background

Every autumn, as cold air spills south out of Canada into the Great Basin following the passage of a large-scale storm system through the Pacific Northwest, strong offshore winds blow across southern California and through the passes and canyons of the surrounding mountains. These "Santa Ana" winds are a result of a tight atmospheric pressure gradient created as a result of cold high pressure over the Great Basin and relatively lower pressure along or just off the California coast. Santa Ana winds frequently reach speeds of 60-80 mph and occasionally exceed 100 mph in the strongest events. When these strong winds are combined with warm temperatures and very low relative humidities during a period of low fuel moistures, the potential for wildfires is greatest. Some historic Santa Ana wind driven wildfires of the last 50 years include:

- Oct. 2006 – Esperanza Fire
- Oct. 2003 – Southern CA Firestorm
- Dec. 2001 – Potrero Fire
- Oct. 1997 – Orange County Fire
- Oct. 1993 – Topanga, Laguna Hills, and Kinneloa fires
- Sep. 1970 – Laguna Fire
- Nov. 1961 – Bel Air Fire

An extremely strong and long-lasting Santa Ana event created wind gusts over 100 mph in the mountains as a large ridge of high pressure moved into the western part of the country following a dry cold frontal passage across southern California on Saturday, October 20, 2007. Surface high pressure then strengthened over the Great Basin and a thermal trough developed just off the California coast, creating a tight atmospheric pressure gradient over southern California. Some of the peak wind gusts occurred Saturday night (Whitaker Peak 108 mph) and early Sunday morning (Laguna Peak 111 mph) as the Santa Ana kicked off in earnest. The first wildfire (Ranch Fire near Castaic) started before 10 pm PDT Saturday night, when power lines were knocked down in the area during the onset of the strong winds (Fig. 2). During the first night, when winds gusting to near 100 mph began to blow in the mountains above Malibu, another wildfire (Canyon Fire) started which quickly engulfed numerous structures on its march to the sea. Widespread gusty winds continued each day, especially late at night into the early afternoon hours (Fremont Canyon 85 mph), through Tuesday, October 23, 2007, resulting in other significant fires such as the Santiago Fire, the Witch Fire, and the Harris Fire. The Witch Fire required that the NWS office in San Diego be evacuated for a time, requiring service backup from the Weather Forecast Office (WFO) in Oxnard.

More information on Santa Ana winds can be found at:

http://www.atmos.ucla.edu/~fovell/ASother/mm5/SantaAna/winds.html

and

http://en.wikipedia.org/wiki/Santa_Ana_wind.

Figure 2 - Ranch Fire near Santa Clarita, CA (Photo by Jeff Turner)

III. Support History

NWS support began on October 25, 2007 at the JFO in Pasadena, California. The JFO, a FEMA/DHS federal facility in operation since the 1994 Northridge earthquake, coordinates all federal, state, tribal, and local response operations during major disasters in southern California. Similar JFO's were in operation following the recent Greensburg, Kansas tornado, both the Democratic and Republican National Conventions of 2004, Hurricane Katrina, and the Columbia Space Shuttle Recovery. Weather forecasts provided to these JFO's helped planners successfully accomplish their mission and were crucial to decisions made by emergency management officials.

An Incident Support Specialist (ISS) was assigned to the Planning Section of the JFO (Fig. 3) and reported directly to the Situation Unit Leader. Not knowing what equipment would be available to a non-FEMA/DHS federal employee, the ISS arrived equipped with a laptop computer and FX-NET [1]weather display software (Madine and Wang 2002). Later a printer, mouse and keyboard were added. Internet access was available from the very first day. Dedicated weather support was provided from 0700 – 2100 hrs Local daily. This dedicated onsite-support continued through November 5, 2007, after which dedicated weather support was provided by an ISS off-site. This dedicated remote-support continued through March 25, 2008. Total support for both on and off-site was 153 days.

[1] FX-Net is a meteorological PC workstation that provides access to the basic display capability of an NWS workstation via the Internet.

Figure 3 - Joint Field Office (JFO) Planning Section

While the JFO was the primary "customer" of the ISS, there was also a secondary "customer". Beginning on November 12, 2007 and continuing through December 21, 2007, dedicated remote weather support was provided to the FEMA Multi-Agency Support Group in Colton, California. Their primary support role was flood mitigation in the burn areas.

IV. Areas of Concern

There were a total of 24 wildfires affecting 7 California counties, with 522,398 acres burned (Fig. 4). This equates to 816 square miles or nearly 4 percent of the total land area within the more populated areas of the 7 counties! As many as 321,500 persons and their animals were evacuated. Some burn areas were located in coastal regions, others in valleys, and others in mountainous terrain – some over 6000 ft MSL.

Moisture conditions at the time across Southern California were extremely dry. There was no area that was immune to the potential for additional wildfires with the region having just experienced one of the driest water years (July-June) on record. Live fuel moistures, or the amount of moisture in the vegetation to inhibit burning, were at all time, critical, low levels. The combination of warm temperatures, low humidity values, gusty winds, and low live fuel moistures (red flag conditions) was all that were needed to make conditions ripe for new fires.

This of course made for challenging forecasts and a challenging opportunity to educate the JFO workforce, many of which were non-Californians, on the climate diversity in southern California.

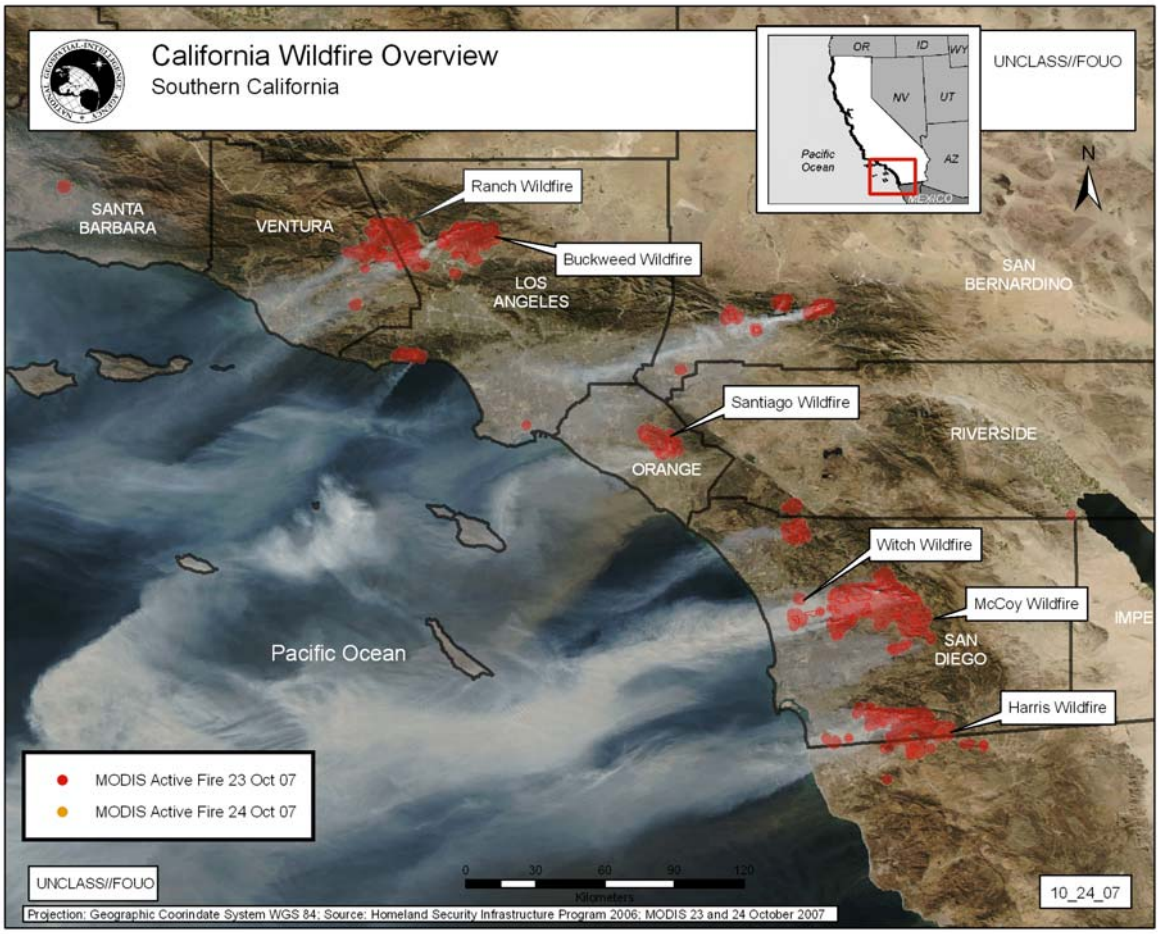


Figure 4 - October 24, 2007 - Satellite Photo with Fire Boundaries Overlaid

V. Coordination Complexities

The most populated portions of southern California are served by two WFO's with the dividing line along the densely populated Orange and Los Angeles county line – a split of a major metropolitan area. This can make for challenging forecast and coordination situations since both offices issue their own unique forecasts, warnings, and advisories. In addition, there were as many as 8 Incident Meteorologists (IMETS's) on the fires providing their own unique, tailored, forecast products. To make matters even more complicated, there were several NWS National and Regional Centers issuing guidance products for southern California. This included the Climate Prediction Center, the Storm Prediction Center, the Hydrologic Prediction Center, and the California River Forecast Center. Center guidance products were available on the internet as well and despite being labeled as "guidance", most users consider their products as forecasts (Fig. 5).

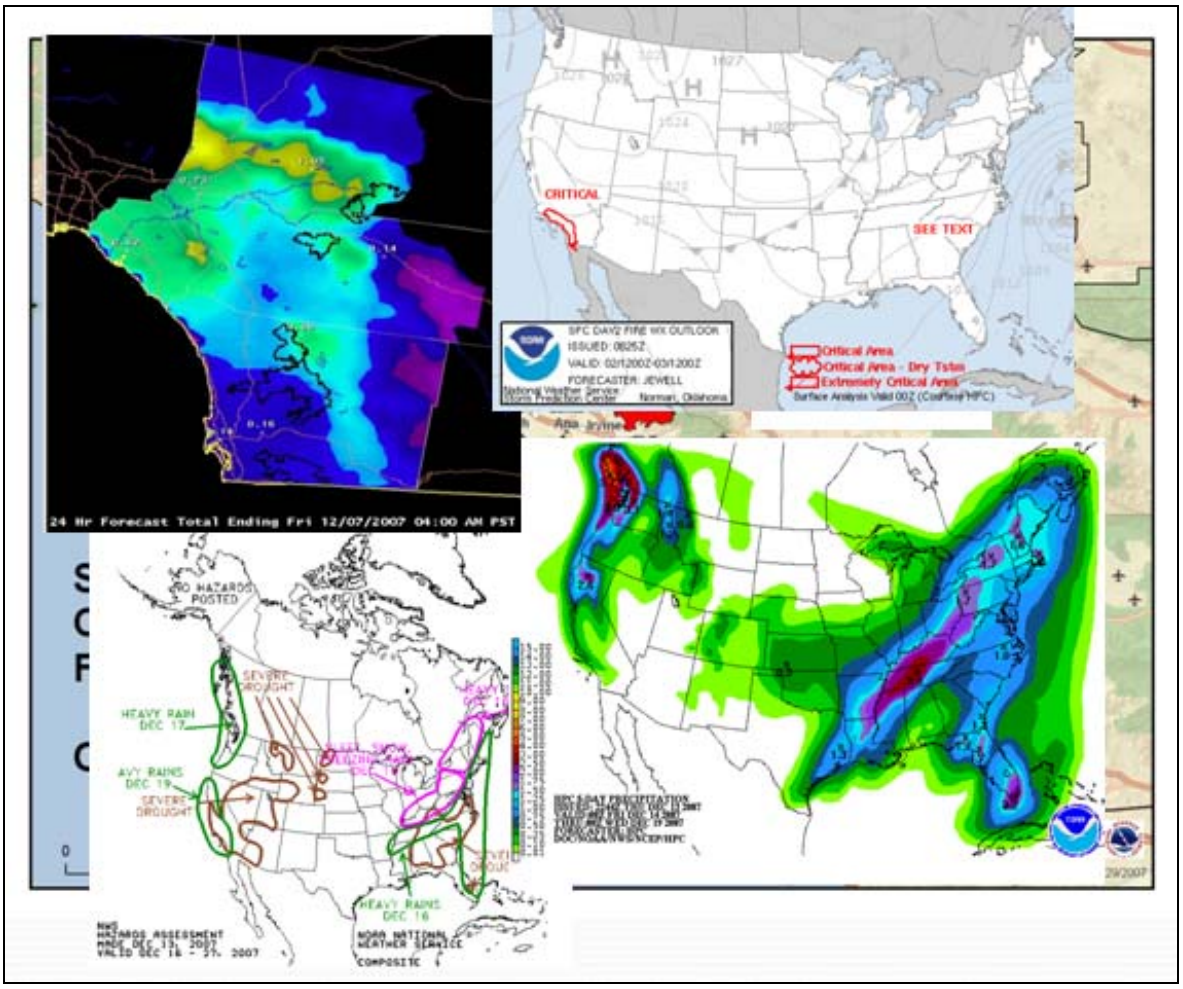


Figure 5 - "Guidance" From Various Centers – both National and Regional

All together this required a substantial amount of coordination by the ISS to be certain that the NWS spoke with one voice and provided the customer, in this case the entire disaster response community, with the best, consistent forecast - a forecast that many used to make life and death decisions; a forecast that many used to make substantial financial and human resource decisions.

At the same time, private vendor forecasts were available on the Internet and proliferated within the disaster response community as analysts, not used to having an on-site meteorologist, searched for information. This required additional coordination by the ISS to dispel rumored weather changes that were not in the official forecast.

VI. Support Focus

Initially, weather support was directed toward fire suppression, containment, and the safety of the utility infrastructure. This focus continued for the first four to six weeks, and then thereafter only occasionally when strong offshore winds along with low humidity values were forecast. Once containment was accomplished and the utility infrastructure was secure, the focus of the weather support turned to rain and the potential for flooding as southern California entered into its climatological rainy season. This included the potential for dangerous mud and debris flows often

observed with intense rainfall following a fire. Once in the heart of the winter, another focus became the cold and snow. Low snow levels impacted transportation routes to and from several of the higher elevation fire locations. The cold and snow also became a concern for the equipment and personnel still mopping up after the fires.

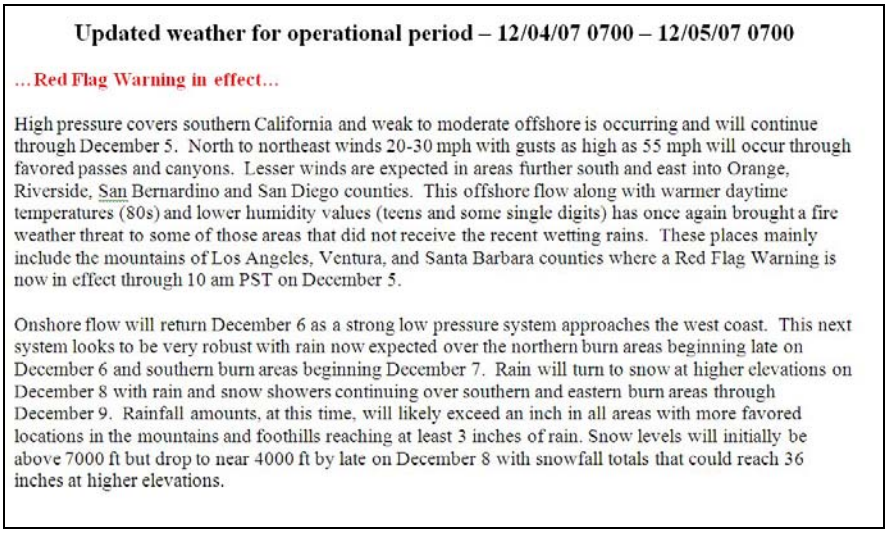
VII. Products and Services

The exact services provided evolved and morphed with increasing JFO staff and ever-evolving FEMA/DHS support requirements. While there were numerous coordination calls and meetings and countless questions from support staff, the majority of weather support provided over the 153 days was in the form of written weather forecasts, weather summaries, and stand-up briefings.

In total there were:

- 180 Written Forecasts; focused on the weather for the next operational period (1-14 days)
- 49 Weather Summaries; highlighting the weather in the last operational period
- 44 Stand-up Briefings; focused on major weather impacts expected in the upcoming operational period

All forecasts and summaries were created using Microsoft Word and transmitted to designated FEMA/DHS staff responsible for the routine Incident Action Plans (IAP) and Situation Reports using Email (Fig. 6). Stand-up briefings were provided to the entire command staff on a daily basis while the ISS was on-site, but done via the telephone (and previously provided graphics) when the ISS was off-site.



Updated weather for operational period – 12/04/07 0700 – 12/05/07 0700

…Red Flag Warning in effect…

High pressure covers southern California and weak to moderate offshore is occurring and will continue through December 5. North to northeast winds 20-30 mph with gusts as high as 55 mph will occur through favored passes and canyons. Lesser winds are expected in areas further south and east into Orange, Riverside, San Bernardino and San Diego counties. This offshore flow along with warmer daytime temperatures (80s) and lower humidity values (teens and some single digits) has once again brought a fire weather threat to some of those areas that did not receive the recent wetting rains. These places mainly include the mountains of Los Angeles, Ventura, and Santa Barbara counties where a Red Flag Warning is now in effect through 10 am PST on December 5.

Onshore flow will return December 6 as a strong low pressure system approaches the west coast. This next system looks to be very robust with rain now expected over the northern burn areas beginning late on December 6 and southern burn areas beginning December 7. Rain will turn to snow at higher elevations on December 8 with rain and snow showers continuing over southern and eastern burn areas through December 9. Rainfall amounts, at this time, will likely exceed an inch in all areas with more favored locations in the mountains and foothills reaching at least 3 inches of rain. Snow levels will initially be above 7000 ft but drop to near 4000 ft by late on December 8 with snowfall totals that could reach 36 inches at higher elevations.

Figure 6 - Example Written Forecast

In addition to the routine forecasts and summaries, the ISS took the opportunity to introduce some of the new products and services available from the NWS. These included Geographic Information System (GIS) compatible digital forecast data graphics and the Southern California Weather and Hazards Data Viewer (Fig. 7 and Fig. 8).

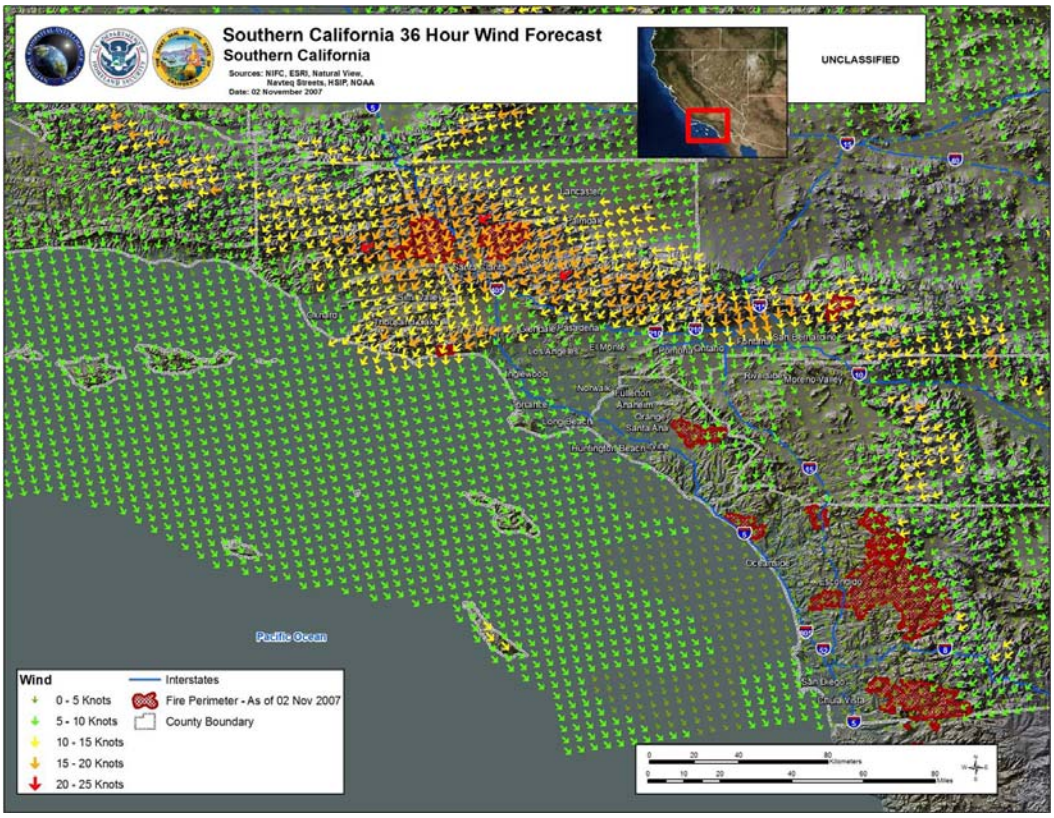


Figure 7 - GIS Compatible Digital Forecast Data Graphic (created at the JFO)

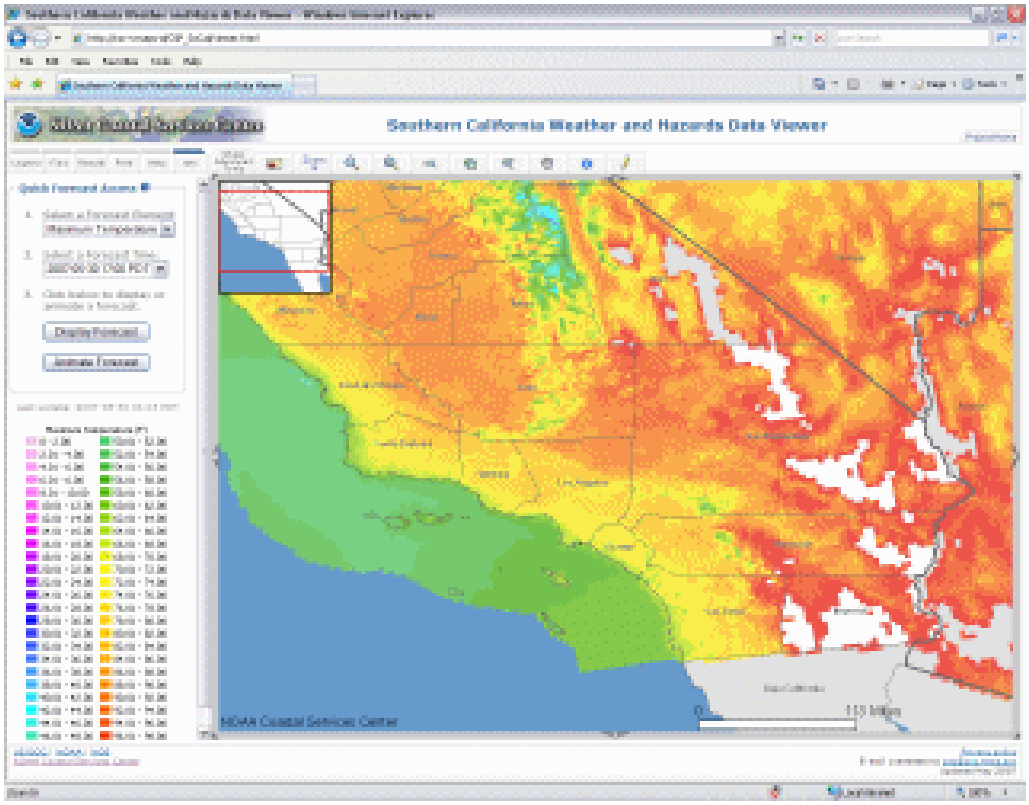


Figure 8 - Southern California Weather and Hazards Data Viewer

Both utilize the NWS National Digital Forecast Database and GIS technology to display sensible weather elements, providing very detailed forecasts which then can be used by decision makers in incident action planning.

VIII. Lessons Learned

This was the first time the Los Angeles/Oxnard WFO activated an ISS at a JFO. An IMET has been deployed to incidents on several occasions but never before to a JFO. Thus it was unclear what to expect, what to take, and what to do once there. Questions existed like:

- What value will the ISS have?
- How long will they need ISS support?
- Where will the ISS fit in the National Incident Management System (NIMS)/Incident Command System (ICS) structure?

Training – Without question an ISS can benefit from NIMS training, including gaining an understanding of the ICS prior to ever stepping into a JFO. With training, the ISS knows his or her place in the myriad of personnel (as many as 600) at the JFO, and who to report to. The JFO also benefits because they do not have to explain the structure, especially since time is a rare commodity in the spin-up phase of a JFO.

Area/Data Familiarity – It cannot be emphasized enough how important both area familiarity and local data familiarity are to the ISS and its success at the JFO. Initially, activity at the JFO is chaotic at best as the unit spins-up and staff gets "connected". At the same time, the disaster that brought the ISS to the JFO in the first place warrants immediate attention and action. Forecast support requests are coming fast and furious from all directions and from other newly assigned JFO staff members moving at hyper speed. In order to do the best job and provide the best service, the ISS must know the area and know where to get data to support the forecast requests. The best situation would be for a full-time 24/7 operational meteorological component to exist at the JFO. Time is clearly of the essence and familiarity with both data and the area may very well save lives and property.

Equipment/Software – If an existing full-time weather monitoring network is not available, at a minimum a dedicated laptop, printer, mouse, and keyboard with wireless Internet capability is needed. The equipment and software used at this deployment was minimal and is shown in Figure 9. A large external monitor or display capability is useful when briefing large numbers of people. One cannot always be certain that the JFO will have such equipment and have it accessible when it is needed. Whatever computer system is used, the system needs to have sufficient RAM to support the memory needs of FX-NET and some of the newer GIS compatible programs such as GoogleEarth and ArcGIS Viewer.

Figure 9 - ISS Equipment at the JFO

Data/Forecast Transmission Method – Data, including graphics and forecasts, were transmitted using MS Word then attached to Email or hand-carried on a memory stick to a computer system within the FEMA/DHS network. A more reliable and less circuitous method of providing the data and forecasts would help streamline the process of getting the product to the customer – saving both time and energy. Ultimately, a system whereby briefings, including graphics and forecasts, are provided via the Internet on an overhead

display with briefing recording capability would be most desirable and make best use of current technologies.

Tailored Briefings – Initially, weather briefings are going on all the time to various different JFO staff members. Eventually the frequency of briefings lessens and the format becomes more standardized. Throughout the length of a deployment it is critical to tailor briefings to the audience. There will be times when the audience has just a minute to get just the facts and there will be other times when there is room filled with people wanting to know the most intricate details about the weather. The ISS needs to be flexible on the fly with the briefing format and gauge the audience/format before taking the stage.

Emergency Support Function (ESF) Appreciation – In order to do the best job possible it is important to quickly grasp an appreciation for the needs and concerns of the ESF's (Fig. 10). These support staff coordinate resources and programmatic support to states, tribes, local, and other federal agencies or other jurisdictions and entities during Incidents of National Significance[2] and are located in the heart of the JFO. Their needs and concerns are all different from one another and change throughout the course of a disaster. By knowing their needs and concerns, then a particular change in a forecast or weather condition will have a greater or lesser impact on a particular ESF. This can then be conveyed in time to take a critical action to ultimately save a life or protect property.

Figure 10 - Emergency Support Functions

Situational Awareness - Keeping aware of not only what is going on weather-wise, but also what is happening in the news and the response/recovery arenas, is critical to providing the best weather services possible. Knowing that the media is passing incorrect weather information to the public helps prepare for questions from Public Affairs (PA). For instance, knowing that drizzle falling on ash-covered live electrical wires is a threat to massive power outages allows the ISS to focus on specific locations

[2] A term coined within the National Response Framework as large-scale domestic emergencies.

where drizzle might be expected. Knowing there are flooding problems in other states (but still within the same FEMA region) allows the ISS to be prepared should there be questions regarding the forecast for the outside area by the Governor on a weather conference call. Remaining situationally aware will allow the ISS to do the best job possible.

There were numerous lessons learned related to this assignment with these lessons sure to pay valuable dividends for future deployments.

IX. Successes

There were numerous successes related to this assignment. These successes demonstrated the value of the ISS and greatly raised the visibility and value of the NWS in Incidents of National Significance.

ISS Emulation – This is only the second time nationally in which an ISS was assigned to a formal JFO in the wake of a disaster. The first time occurred in the wake of the Greensburg, Kansas tornado in May, 2007. JFO personnel were not accustomed to having dedicated weather support and were surprised but very pleased with its availability. Staff in the planning section could focus on other duties, leaving all the weather to the ISS. Several individuals, some with 20 years of experience, including command staff, commented on the quality of the service, including the stand-up briefings, and how they had never received such detailed forecasts and briefings at previous JFO assignments. Kim Hazel, FEMA Office of General Counsel commented that *"In all my years with FEMA I have never seen such weather expertise and quality given in a weather briefing at a JFO"*. This could become a customary situation if the ISS function is more fully utilized in the future.

Improved Coordination – The ISS was instrumental in communicating the threatening weather to the ESF's and the JFO Command Staff through direct face-to-face communication and stand-up briefings. There were several instances where information coordinated between the ESF's and the ISS led the ESF's to take certain precautionary measures not possible had the coordination not occurred. On several occasions' stand-up briefings to the Command Staff led to the development and/or prioritizing of incident objectives for the IAP.

Coordination between the Los Angeles/Oxnard and San Diego Forecast Offices existed before the ISS was deployed, although the JFO's presence highly amplified the critical need for coordination. What the ISS did was bring together the thinking of the two offices, along with the thinking of the National Centers and the field IMET's through periodic individual telephone calls and group coordination calls. This brought the forecast thinking into better focus and ensured the NWS was sending out one "unified" message. This also allowed the ISS to convey this unified message to ESF's, planners, and JFO Command Staff sooner.

Rumor Control/Misinformation – In any given disaster or emergency, information is flowing, and flowing fast. This happens just by the nature of the event and the nature of a JFO spinning-up. Misinformation can also be flowing. This misinformation can be very detrimental to effective planning and operations. Thus having an ISS on-site at the JFO allowed the NWS to dispel many weather rumors and weather misinformation before they escalated.

Media Subject Expert – There is a PA section at every JFO. In fact, there is a PA representative for nearly every agency present at the JFO. At the same time, not every public affairs section has a weather subject matter expert on staff. The ISS becomes the weather subject matter expert and provides

information for the interviewee or does the interview themselves on behalf of the JFO. Whether it is about air pollution or strong winds or flooding, it is an opportunity to get the NWS's best capabilities and message out to the public. This includes not only the forecast but also details about the new services provided by the agency.

Support/Services Brokering – An unexpected but successful aspect of the ISS at the JFO was the opportunity to bring together emergency support individuals who are in need of help solving a problem with someone, an expert within the NWS, who can lend their expertise to solving the problem. This occurred on several occasions, but the best example was when it was mentioned by a FEMA Infrastructure Program Manager at an evening briefing that a storm survey was planned for the next day to survey wind damage to federal facilities. Upon further discussion with this manager it was determined that he could benefit from the accompaniment of an NWS employee on the survey. The ISS subsequently put him in touch with an expert from the San Diego NWS office. This type of brokering of services occured on several occasions over the 5 months and truly made a difference to the success of the entire operation.

New Products - Throughout the assignment, the ISS worked closely with on-site GIS staff to provide several useful GIS-based graphics and maps for use by decision makers. These daily maps were then used to brief the on-site command staff. In addition, staff at the National Geospatial-Intelligence Agency (NGIA) considered the application of GIS very useful for the deployment and positioning of resources. The NGIA in turn briefed their supervisors (3 star Generals – heads of the 5 intelligence agencies in the U.S.) who in turn used the graphics in a briefing to the 4 star Generals at the Pentagon. This was an excellent use of new technology and services from the NWS in a national disaster and presented to the highest levels of government.

Dedicated Support to another Federal Agency – The NWS has the responsibility to support other federal agencies in Incidents of National Significance as outlined in the National Response Framework[3] (NRF; DHS 2008). The role of the ISS at the JFO clearly falls within this mandate and is an excellent example of dedicated support to another federal agency. "Working together to Save Lives" is the theme of the NWS Strategic Plan for 2005-2010[4] (NWS 2005). Without question, the ISS efforts at the JFO served this theme.

X. IMETs vs. ISSs

The clear distinction between responsibilities of the IMETs and the ISS needs to be emphasized. For this event, the role of the IMETs was to provide dedicated weather support to the particular incident they were assigned. Usually this support was provided at a field incident command post. The role of the ISS was to provide dedicated weather support to the various agencies (federal, state, tribal, local) who were coordinating the response and recovery efforts. Often times this involved providing the bigger picture over all the individual incidents. While the IMET usually briefed the Incident Commander, the ISS briefed the Federal or State Coordinating Officer or even the State Governor.

[3] The National Response Framework (NRF) presents the guiding principles that enable all response partners to prepare for and provide a unified national response to disasters and emergencies.

[4] The NWS Strategic Plan for 2005-2010 lays out the path the agency will take to accomplish their mission, advance their vision, and integrate their core values throughout NWS.

XI. Conclusion

The NWS clearly played a vital role at the FEMA/DHS JFO by providing dedicated on-site weather support to emergency responders involved with response and recovery efforts in support of the October 2007 southern California wildfires. In addition to this support, the NWS presence at the JFO ensured that local and national weather products and forecasts, as complex as they were, were well coordinated and properly conveyed to key decision makers. There were many lessons learned and successes realized. Numerous positive comments were received from FEMA, State Office of Emergency Services, and Department of Defense staff regarding the support given, thus resulting in excellent visibility for the NWS and the agency.

The importance of the ISS is not limited to natural disasters. The ISS is critical in non-natural disasters (such as terrorist attacks) as well. It is well known that there are three primary controlling elements of conflict and battle: enemy, terrain, and weather. An ISS provides one-third of what's needed to succeed in that arena.

Finally, this role played by the NWS directly fulfills its mandated responsibilities and functions as defined in the NRF. A coordinated and networked effort to mobilize this capability, in concert with existing emergency response structures, should be undertaken not only in disaster-prone or terrorist threatened southern California but throughout the United States.

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