Service Assessment

Northern Idaho and Western Montana Summer 2000 Wildfires

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Weather Service
Silver Spring, Maryland

Cover: The photograph was taken on August 6, 2000, on the East Fork of the Bitterroot River on the Sula Fire Complex. (Courtesy of John McColgan, Alaskan Type I Incident Management Team, Bureau of Land Management, Alaska Fire Service)

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February 2001

U.S. DEPARTMENT OF COMMERCE
Donald L. Evans, Secretary

National Oceanic and Atmospheric Administration
Scott B. Gudes, Administrator (Acting)

National Weather Service
John J. Kelly, Jr., Assistant Administrator

Preface

Federal and state land management organizations recognized the wildfires of 2000 as historic in both extent and duration. Due to the impact of these wildfires, a Service Assessment Team examined the warning and forecast services provided by the National Weather Service (NWS) to fire control agencies, emergency managers and the public in northern Idaho and western Montana. For the purpose of this document, Northern Rockies will be used interchangeably with northern Idaho and western Montana. While the wildfires threatened many parts of the country, the Service Assessment centered on the Northern Rockies due to the unprecedented magnitude of the suppression effort, the extraordinary level of weather services provided and the critical role timely and consistent weather information played in fire fighter and public safety and suppression activities.

Service assessments provide a valuable contribution to our ongoing efforts to improve the quality and timeliness of our products and services for the protection of life and property. Findings and recommendations from this assessment will help to improve techniques, products and services.

John J. Kelly, Jr.
Assistant Administrator
for Weather Services

February 2001

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Service Assessment Team

On September 22, 2000, the Assistant Administrator for Weather Services, John J. Kelly, Jr., activated a Service Assessment Team to review NWS performance in supporting wildfire operations in the Northern Rockies. (See Appendix A for Team Charge.) The Team assembled in Boise, Idaho, on September 24 and met with wildfire resource managers located at the National Interagency Fire Center (NIFC) and the Boise Weather Forecast Office (WFO) personnel. The Team traveled to Missoula, Montana, and met with personnel involved in the wildfire suppression effort in northern Idaho and western Montana. Interviews were conducted with the Montana State Forester, the Montana State Director for Fire and Aviation, the Western Montana Department of Emergency Services Coordinator, Forest Service Region 1 Deputy Regional Forester, members of the Multi-Agency Coordination (MAC) group for the Northern Rockies, Incident Commanders, NWS Meteorologists in Charge (MICs) and Incident Meteorologists (IMETs) at WFOs Missoula, Great Falls, Billings, Montana; Spokane, Washington; and Pocatello, Idaho. The team also surveyed all the IMETs who supported the Northern Rockies wildfire suppression efforts.

The Team was comprised of the following individuals:

D. Gregory Harmon	Team Leader, Meteorologist in Charge, Weather Forecast Office Sioux Falls, South Dakota
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Nancy A. Dean	Meteorologist in Charge, WFO Eureka, California
Todd A. Heitkamp	Warning Coordination Meteorologist (WCM), WFO Sioux Falls, South Dakota
Vince Kolar	Emergency Manager, Cascade County, Montana
Patrick J. Slattery	Central Region Headquarters, Public Affairs, Kansas City, Missouri

Other contributors:

Donald Artley	Montana State Forester and Chairman of the National Wildfire Coordinating Group, Missoula, Montana
David Goens	Meteorologist in Charge, WFO Missoula, Montana
Linda Kremkau	NWS Headquarters, Office of Climate, Water and Weather Services, Silver Spring, Maryland
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Kathy McAllister	U.S. Forest Service (USFS) Region 1 Deputy Regional Forester, Missoula, Montana
Tim Murphy	Montana State Director for Fire and Aviation, Missoula, Montana
Rick Ochoa	Staff Meteorologist to NIFC, Boise, Idaho
Bill Thomas	District One Representative for the Montana Disaster and Emergency Services, Missoula, Montana

The Service Assessment Team also acknowledges the NIFC staff and the many others who took time to provide the Team with valuable information contained in this Report.

Upper Nine Mile Complex in the Lolo National Forest, Montana. (Courtesy of NIFC)

Acronyms

ATMU	Advanced Technology Meteorological Unit
CJIN	Criminal Justice Information Network
CPC	Climate Prediction Center
HPC	Hydrometeorological Prediction Center
ICS	Incident Command System
IMET	Incident Meteorologist
LETS	Law Enforcement Teletype System
MAC	Multi-Agency Coordination
MAR	Modernization and Associated Restructuring
MIC	Meteorologist in Charge
NAWAS	National Warning System
NCEP	National Centers for Environmental Prediction
NIFC	National Interagency Fire Center
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
RAWS	Remote Automated Weather Station
SPC	Storm Prediction Center
USFS	U.S. Forest Service
WCM	Warning Coordination Meteorologist
WFO	Weather Forecast Office

Service Assessment Report

Introduction

Federal and state land management organizations recognized the wildfires of 2000 as historic in both extent and duration. Through late September, more than 79,700 wildfires scorched over 6.8 million acres of public and private land. This exceeds the 10-year average of 66,120 wildfires and 3.1 million acres burned annually. The number, size and intensity of these wildfires stretched land management suppression resources to the limit, threatened entire communities and caught the attention of the public and media throughout the world. The suppression effort was likely the largest peacetime mobilization of resources in our Nation's history. The U.S. military provided valuable resources to the suppression effort.

The wildfire season started in the early spring in the southeast United States and progressed west and north as hot, dry, summer weather settled over the western half of the country. The first IMET of the season was dispatched to a wildfire in Louisiana on March 9, 2000. IMETs are meteorologists who, in addition to their regular forecasting duties, are specially trained to provide onsite weather support to fire fighting teams. IMETs were deployed onsite in 16 states from March through September. This involved a record 64 IMETs dispatched 246 times for a record 1,772 IMET days. Routine and specific fire weather services were provided nationwide for an extended period.

The focus of this Service Assessment Report is limited to NWS services provided to the wildfire suppression effort in northern Idaho and western Montana from mid-July to mid-September. The Northern Rockies was chosen due to the unprecedented duration and magnitude of the suppression effort, the extraordinary level of services provided and the critical role timely and consistent weather information played in fire fighter and public safety and suppression activities.

In the Northern Rockies, a 3-year period of dry weather and above normal temperatures created tinder dry forests that led to this prolonged wildfire season. A mid-summer series of lightning storms and strong winds caused an unusually large number of wildfire starts with swift wildfire spread. Initial relief to the critical wildfire situation came in the form of cooler temperatures and rain over the Labor Day weekend. More than one million acres burned and fire danger forced federal and state officials to close millions of acres of public land for extended periods. Interstate commerce was impacted and the interstate freeway was closed at times. Thick smoke filled valleys for extended periods, disrupting the lives of residents and visitors. A record 40 to 50 Incident Management Teams were in the Northern Rockies at one time. Some of these teams came from Australia, Canada and New Zealand. All were provided quality weather information and services from the NWS.

Fire Weather Services

Fire weather services date back to the 1910s. The growth and changes in the NWS Fire Weather Program have been linked to the evolving needs of land management agencies coupled with the inclusion of new technologies and forecasting concepts. Prior to the NWS modernization and associated restructuring (MAR), only the Missoula and Billings offices provided fire weather services in Montana and northern Idaho. Two fire weather forecasters in Missoula and one fire weather forecaster with part-time help from the MIC at Billings provided for 8- to 12-hour support during the fire season. With the MAR completion, fire weather services are now provided around the clock by trained meteorologists at all four offices in the area: Missoula, Great Falls, Billings and Spokane.

In the late 1980s and 1990s, the NWS began upgrading IMET support. Deployment of IMETs onsite to wildfires changed from slow and restrictive trucks and campers to an air mobile system. Air Transportable Mobile Units renamed Advanced Technology Meteorological Units (ATMUs) include a Communications Module (satellite dish) and a Field Support Module (pilot balloon). The number of stored ATMUs has increased from 22 to 25 across the continental United States, with three other units in Alaska. There are also 15 ATMU Lites (satellite dish only) assigned to selected NWS offices. More remains to be done. Some fire weather laptop computers used by IMETs do not have the connections needed for the ATMU satellite equipment. Remote weather data can be obtained from 26 portable Remote Automated Weather Station (RAWS) weather observing platforms owned by land management agencies and deployed to wildfires as needed. RAWS provides valuable real-time weather information to WFO forecasters, IMETs and fire management officials. However, not all IMETs in the Northern Rockies had access to these systems due to the lack of sufficient RAWS units, and not all units are configured the same. For example, some RAWS do not have satellite interrogation capability, limiting access to weather data.

NWS offices have traditionally developed new capabilities to enhance weather services to land managers. One recent example is the development of a Web-based Spot Forecast service (see WFO Products and Services for an explanation of the Spot Forecast Program). Pioneered at WFO Missoula, it is an interactive graphic request-reply program, providing site-specific weather information to land managers up to 20 percent faster than manual methods. This efficiency is especially important for initial wildfire suppression. Another example is the Web-based current weather map available from the WFO Great Falls Fire Weather Home Page. This map, developed for the 2000 fire season, displays color contoured relative humidity, wind and temperature and is automatically updated every 20 minutes using fire weather RAWS, aviation weather observations and data from the Montana Department of Transportation. The map provides a one-stop, near-real-time source for the latest weather conditions.

Preconditions and Significant Weather Events

As mentioned before, a 3-year period of dry weather and above normal temperatures created tinder dry forests that led to this prolonged wildfire season across northern Idaho and western Montana. During the winter of 1999-2000, there was less snow and rain than usual. The snowpack was at or below 70 percent of normal (Figure 1). Warm spring temperatures caused what snow there was to melt early. Rainfall in May and June was below normal and by summer forests became tinder dry. See Figure 2 for precipitation deficits across the area. The moisture remaining in trees and vegetation (i.e., fuel moisture) reached record low values by mid-July. At many locations in the Northern Rockies, fuel moisture fell below 10 percent of normal.

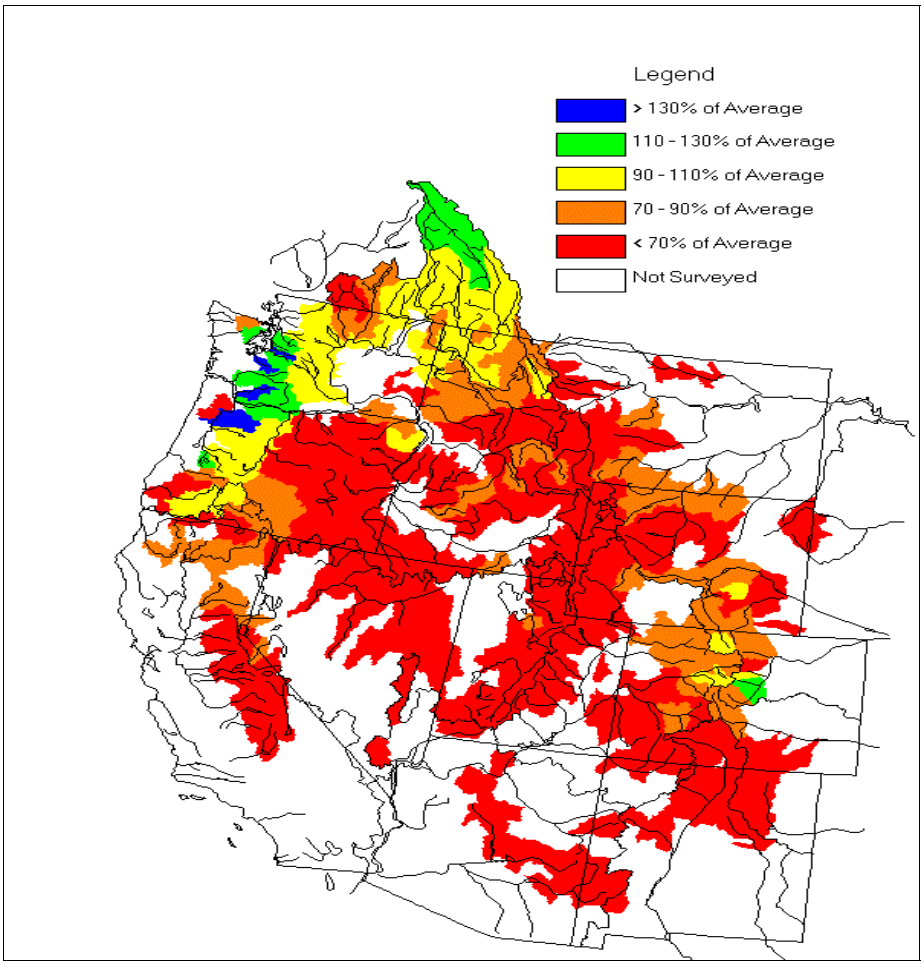


Figure 1. Snowpack in the western United States as of May 1, 2000. (Courtesy of U.S. Department of Agriculture, Natural Resource Conservation Service)

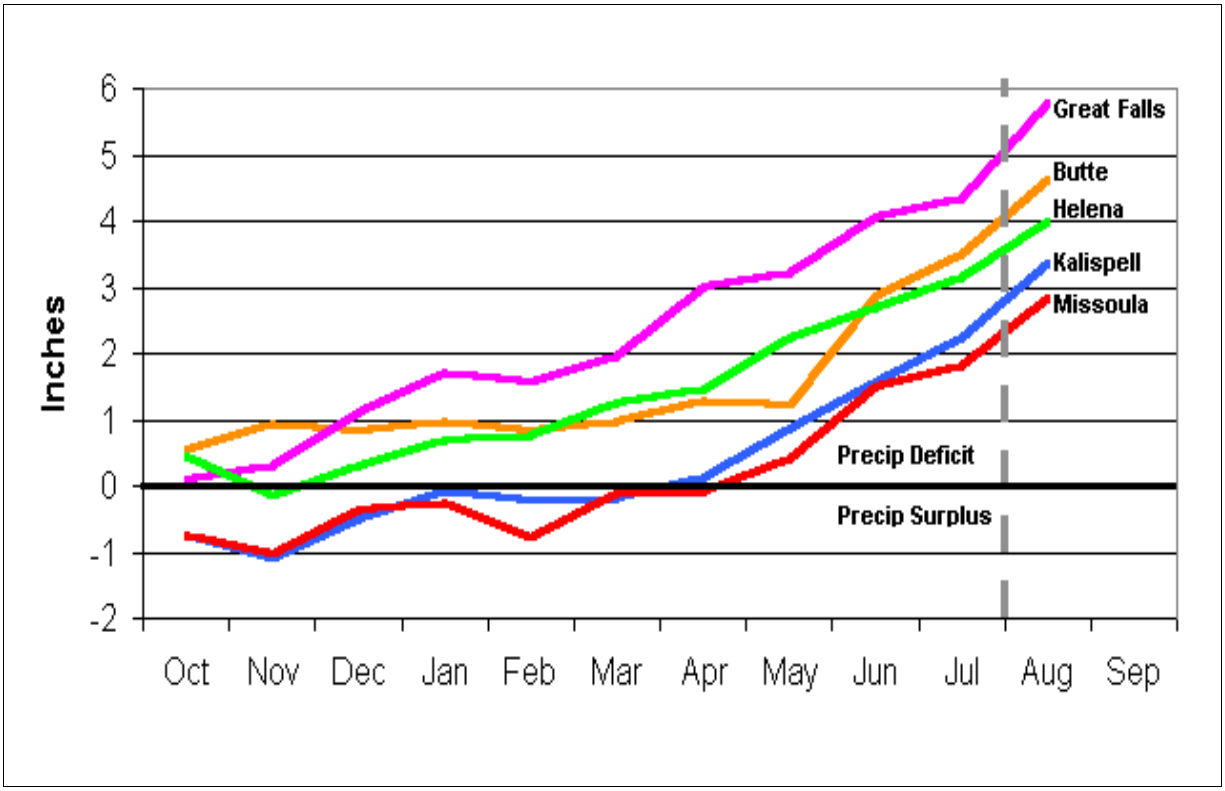


Figure 2. Monthly Accumulated Precipitation Deficits, October 1999 to August 2000, for Idaho and Montana. (Courtesy of Larry Bradshaw of the USFS Intermountain Fire Sciences Laboratory)

A period of widespread rain occurred the first week of July but provided only temporary relief. A persistent area of high pressure in the upper levels of the atmosphere developed over the western United States and remained in place through August. This produced daytime sunny skies, hot temperatures and low relative humidity that further dried the fuels. While nighttime temperatures cooled in the valleys, higher elevations remained warm with continued low humidity. This helped keep the forests at dangerously dry levels. The spark that ignited the explosive fire development came on July 13 in the form of dry thunderstorms (dry thunderstorms are storms that produce less than a tenth of an inch of rain).

The July 13 lightning event was the first of several significant lightning or wind events that occurred over the next 6 weeks across the Northern Rockies. Conditions were so dry across the region that one land manager stated he had never seen such efficient wildfire producing lightning during his 30-year career.

Figure 3 shows the number of new fire starts each day in the Northern Rockies from July to mid-September. Nearly 3,900 fires were ignited; all but 10 were caused by lightning. Once the fires started, periodic strong winds and low relative humidity caused widespread containment

and suppression problems. The most critical weather days for wildfire starts or spreads were July 13, and August 9, 10 and 19.

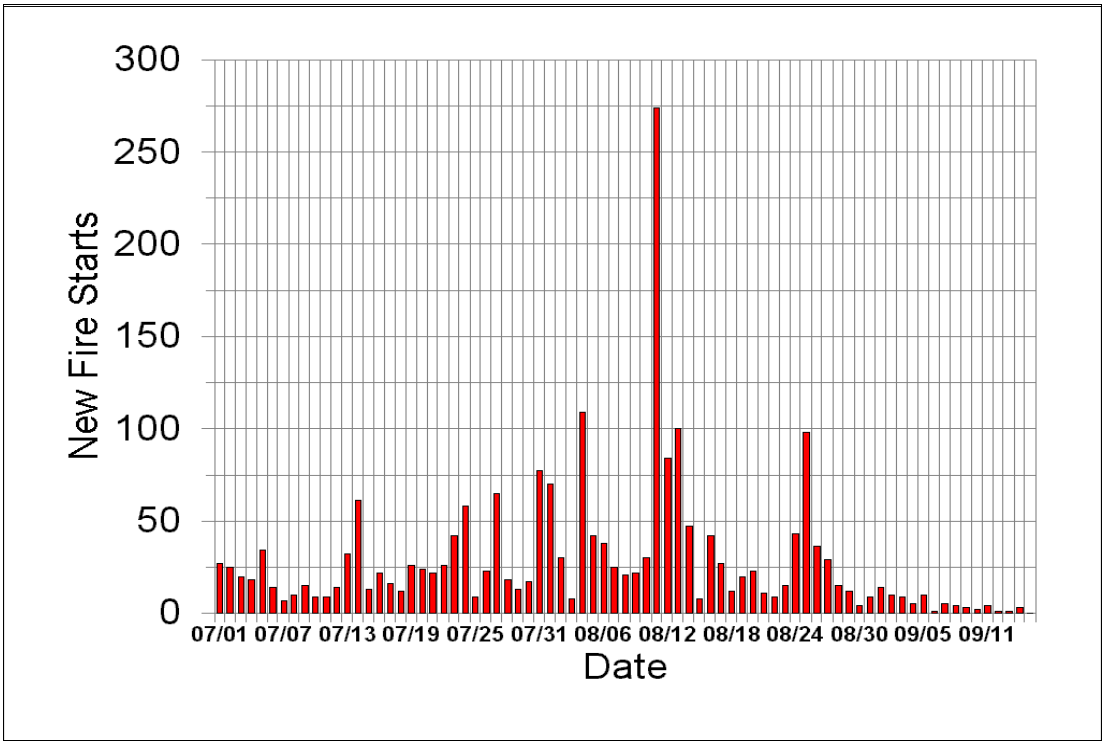


Figure 3. New fire starts in the Northern Rockies, July to mid-September 2000. Data gathered from daily NIFC Incident Reports. (Storm Prediction Center, National Oceanic and Atmospheric Administration [NOAA])

NWS Performance Overview

Fire control representatives interviewed by the Service Assessment Team unanimously stated that the unprecedented wildfire season in the Northern Rockies was matched by an equally unprecedented level of timely, accurate and consistent NWS products. These included routine weather products, as well as special products and services tailored to the needs of individual fire control managers. Extensive coordination among WFOs and IMETs resulted in a consistent weather message. Kathy McAllister, USFS Region 1 Deputy Regional Forester, indicated the Forest Service could not have achieved its wildfire suppression goals and accomplished the fire line safety it had throughout the long and tiring fire season without the outstanding cooperation, expertise and service from the NWS. Ms. McAllister concluded the relationship between USFS Region 1 and the NWS is perhaps the best in the country. (See Figure 4 for USFS Region 1 map.)

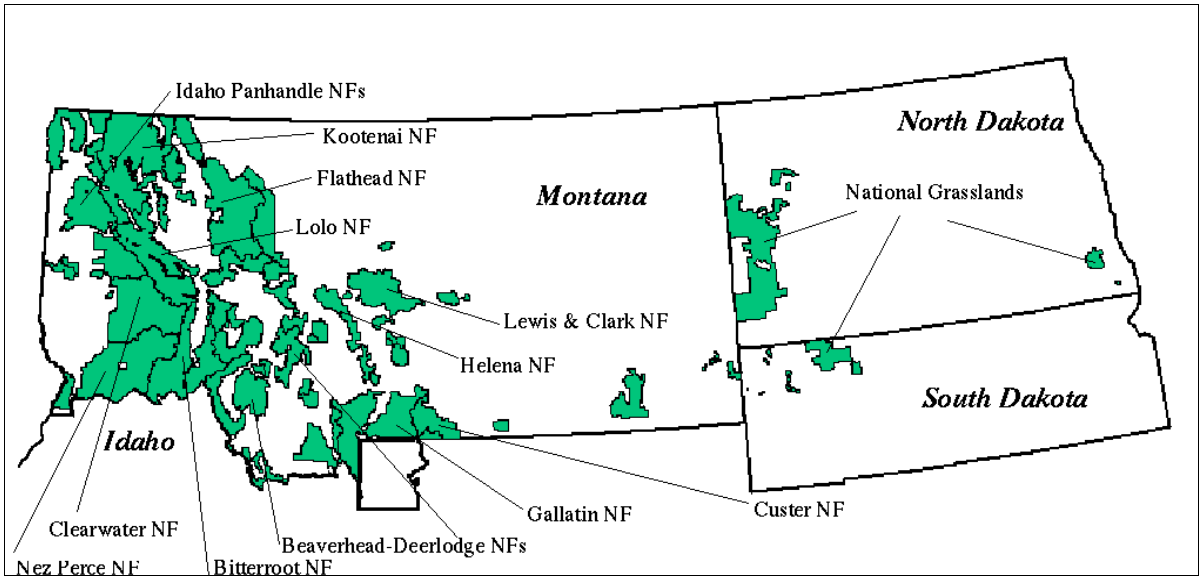


Figure 4. U.S. Forest Service Region 1. (Courtesy of USFS)

The unprecedented level and quality of NWS service was a direct result of committed and talented people working with new technological tools. Service before self was the norm among NWS employees committed to meeting the needs of the fire suppression community. Forty-one different IMETs were dispatched 105 times for a total of 915 IMET days in USFS Region 1. This was about two-thirds of all the IMETs used during the 2000 fire season. Some came from as far away as Florida and Alaska. Many of these forecasters were called more than once for duty, each time working long hours for an extended period. A typical IMET workday can extend beyond 16 hours. Prolonged IMET deployment, up to 14 days, can be exhausting. This service commitment was not limited to IMETs but included the staffs at WFOs. In several cases, NWS personnel adjusted or canceled approved annual leave to help relieve operational pressures brought about by the extreme fire season.

This fire season reaffirmed the importance of the Staff Meteorologist position to NIFC. This individual is the liaison between NWS and NIFC officials. The understanding of land managers' needs and the skill in communicating current and future weather conditions to forestry officials led to a high level of confidence and trust. The Staff Meteorologist is also responsible for the selection and deployment of IMETs to fire sites. This was accomplished efficiently despite the record number of IMETs involved.

The escalating wildfire situation and the likely need for multiple NWS on-site support services was recognized early. Assistant Administrator for Weather Services John J. Kelly, Jr., and Regional Directors ensured IMETs were available as needed. While some suppression

resources were in short supply, all requests for IMETs were satisfied not only for the Northern Rockies but across the entire country.

As mentioned before, four days were critical wildfire days. The August 9, 10 and 19 episodes were preceded by timely Fire Weather Watch and Red Flag Warning products. Fire Weather Watches were in effect in advance of the July 13 lightning event. However, the watches were canceled and Red Flag Warnings not issued. Scattered dry thunderstorms were forecast but land managers and forecasters believed moisture from recent rains would limit fire starts. The July 13 lightning triggered numerous fires and clearly indicated the forests were critically dry. On August 9, very low relative humidity, hot temperatures and strong winds caused the fires to expand, forcing hundreds of residences to be evacuated. More than 100,000 acres burned during a 2-day period ending August 9 (i.e., approximately 10 percent of total acreage destroyed during the entire season). In excess of 13,000 lightning strikes on August 10 triggered more than 500 new fires. The August 19 wind event was predicted by the NWS nearly a week in advance, allowing for significant pre-positioning of fire fighting resources.

The allocation of limited fire fighter personnel, fire suppression resources and public safety was dependent on accurate and timely weather information. One MAC group leader stated, "All MAC group decisions are based on weather. The information from the NWS was instrumental in achieving its tactical suppression goals with no loss of life or serious injury." See Appendix B for the role of the MAC group. The cooperation and trust between NWS personnel and land managers grew as the wildfire situation worsened in the Northern Rockies. Local NWS managers and IMETs recognized the need for a coordinated "weather message" when communicating with fire control managers. Daily group coordination calls were initiated by the NWS Western Region Meteorological Services Division and involved IMETs, the NIFC Staff Meteorologist and affected WFOs. This helped facilitate consistent weather forecasts. Montana Governor Marc Racicot remarked to the Missoula MIC that he was impressed with the detail and consistent weather information he received from IMETs as he traveled from fire to fire. The Governor's remarks were echoed by several key fire control managers. The Service Assessment Team did not receive any negative comments from those interviewed. Based on the information and data gathered from this assessment, weather services exceeded the expectations of fire control managers in northern Idaho and western Montana and aided in fire fighter and public safety and suppression activities.

National Centers for Environmental Prediction (NCEP) Products and Services

Climate Prediction Center (CPC)

The CPC products most used before and during the fire season were the 6- to 10-Day, 30-Day and 90-Day Temperature and Precipitation Outlooks.

Some WFOs routinely appended 6- to 10-Day Temperature and Precipitation Outlooks to the Fire Weather Zone Forecast, providing valuable planning information for land managers. This product was also important for the MAC group. Since the MAC group makes broad strategic decisions, longer range weather forecasts were critical. On August 12, the WFO Missoula MIC briefed the MAC group on the potential for strong gusty westerly winds on or about August 19. The MAC group was sensitive to this long-range wind forecast because of public interest in the anniversary of a historical wind event for the Northern Rockies. On August 20, 1910, strong winds resulted in more than two million acres of land burned in 2 days and the deaths of almost 100 fire fighters and citizens. Based on the strong wind forecast, the MAC group decided to pre-position 75 fire engines, 15 hot shot fire fighting crews, 60 bulldozers and 6 Blackhawk helicopters. NIFC approved the resource order. Resources came from as far away as Massachusetts and Delaware. The wind event occurred on August 19, as forecast, and those pre-positioned resources were put to good use controlling new fires while they were still small.

Fire control vehicles from Massachusetts pre-positioned for the August 19 wind event. (Courtesy of WFO Missoula, MT.)

Another example of the utility of the 6- to 10-Day Outlook was the one issued on August 25 for the Labor Day weekend. This gave the first indication of a change in the prolonged hot, dry weather across the Northern Rockies. The information led to a shift in fire managers' resource planning. The graphic portion of the Outlooks proved to be an excellent NWS briefing tool for fire control managers.

WFO forecasters, land managers and emergency managers used CPC's 30- and 90-Day Temperature and Precipitation Outlooks prior to the start of the 2000 fire season. Information contained in these Outlooks enabled land managers to establish contingency plans for the upcoming fire season. The Outlooks were accurate in detailing warmer, drier weather than normal across the Northern Rockies.

Another product issued by CPC is the U.S. Threats Assessment graphic, a Web-based product covering weather conditions in the 3- to 10-day range. The Threats Assessment was not routinely used by WFO forecasters, IMETs or land managers in the Northern Rockies who thought it did not add to information available from other NWS products. The Threat Assessment was available to emergency managers and the general public through WFO Internet home pages.

Hydrometeorological Prediction Center (HPC)

HPC is responsible for basic weather forecast guidance out to 7 days and for quantitative precipitation forecasts out to 5 days. Use of the HPC guidance products varied among IMETs and WFO forecasters in the Northern Rockies. Some forecasters found the HPC narratives too broad to support the detail needed in fire weather products; others used the information as a basis for local forecasts. HPC graphics, such as location of fronts and high and low pressure systems, aided in daily briefings to fire control officials.

Storm Prediction Center (SPC)

SPC issues Fire Weather Outlooks describing areas where fire danger is high to extreme and, combined with expected thunderstorms producing at least 100 cloud-to-ground lightning strikes and less than one-tenth of an inch of rain, pose a threat of wildfires.

Many IMETs and forecasters that served in the Northern Rockies indicated Fire Weather Outlooks were too broad in detailing critical fire weather areas and provided little new information. Therefore, the product was not used by a majority of the meteorologists. Since this was the first operational year for the Fire Weather Outlook and to determine if this perception by forecasters was correct, SPC provided product verification on 10 important weather events that impacted the Northern Rockies from mid-July to September. The SPC correctly forecast 9 out of 10 events in its Day 1 Fire Weather Outlook and 7 out of 10 events in the Day 2 period.

WFO Products and Services

All WFOs with a Fire Weather Program issue a suite of fire weather products and provide a variety of services to land management agencies. Products include Fire Weather Zone Forecasts, Fire Weather Watches, Red Flag Warnings and Spot Forecasts. Appendix C shows examples.

The basic product is the twice daily Fire Weather Zone Forecast. This 5-day forecast provides weather information to fire control agencies and any IMETs assigned onsite to fires in the forecast area. These forecasts allow land management agencies to effectively marshal resources and prepare for meeting fire weather threats.

During the fire emergency for northern Idaho and western Montana, the extended 3- to 5-day portion of the Fire Weather Zone Forecast proved critical. For example, forecasters alerted fire control managers verbally and through the Zone Forecast on August 19 of a significant wind event. This forecast confirmed the 6- to 10-Day Outlook mentioned before, and validated the heightened state of readiness and marshaling of additional fire fighting resources. However, the inclusion of wind information in the extended forecast is not uniform across the country.

Fire Weather Watches are issued when there is a high potential for severe fire weather conditions in a 12- to 72-hour time frame. Information includes wind, fuel moisture, temperature, relative humidity and the likelihood of dry thunderstorms. This product provides land managers with the information to prepare for critical weather events that will impact fire behavior.

Red Flag Warnings are issued when severe fire weather conditions are expected to occur within 24 hours. Issuance criteria are established by a WFO and the local land management organizations prior to each fire season. Red Flag Warnings are normally disseminated to the land management agencies and headlined in the Fire Weather Zone Forecasts. During this wildfire emergency, these warnings were also broadcast over the National Warning System (NAWAS) to state emergency service warning points. An indicator of the severe fire weather conditions for the 2000 season was the 500 Red Flag Warnings issued for the Northern Rockies—2 ½ times the seasonal average. The importance of Red Flag Warnings is exemplified by those issued for the lightning event of August 10. With lead times of more than 18 hours, these warnings provided fire control agencies with time to react to the approaching threat.

The above three products, Fire Weather Zone Forecast, Fire Weather Watch and Red Flag Warning, all contain fire weather zone numbers but do not always include corresponding geographic references. This caused confusion for fire control officials from outside the local area.

Spot forecasts are requested by land management agencies to obtain weather information to aid the initial attack on new fires or for fires that are not staffed with an IMET. These forecasts contain highly specific information tailored for the fire area, including winds (impact of local terrain such as mountain slopes, time of wind shifts due to weather systems or terrain, etc.), temperature and humidity (times of minimum and maximum) and a 12-hour outlook. For July and August 2000, the Missoula, Great Falls, Billings and Spokane WFOs issued a total of 623 Spot Forecasts. Most of these were prepared and disseminated in less than 30 minutes. This rapid production was due to the use of a Web-based software program. This program was an efficient way for fire control agencies to use the Internet to request a Spot Forecast and for the servicing WFO to prepare and return the forecast. However, not all Western Region WFOs used this new capability in 2000 and offices outside the Western Region do not have access to the software and data base.

Many aircraft were involved in the fire suppression effort. The fires produced areas of dense smoke, hindering aircraft operations and safety. The NWS responded by providing daily aviation weather briefings. This service was well received and contributed to an accident-free aviation record throughout the fire suppression effort in the Northern Rockies.

The extensive fire activity in northern Idaho and western Montana generated the added responsibility to transmit fire weather information to emergency managers and the general public. In order to accomplish this, NWS managers added additional fire weather shifts and used overtime as needed. Several offices minimized or eliminated the use of IMETs on midnight shifts during the fire weather season. These IMETs focused on meeting the weather needs of land managers and were available to be dispatched to fires.

IMET Products and Services

The NWS IMETs go through a well-defined training and certification program. This program includes a week-long workshop, local on-station training, completion of an IMET task book and hands-on experience at an ongoing wildfire or prescribed burn. The number of certified IMETs has increased from 35 in the mid-90s to more than 60 by the end of the 2000 fire season.

IMETs deploy to a specific fire and are responsible for providing onsite weather support. Since IMETs are requested by land management agencies, not all fires have an assigned IMET. IMETs prepare forecasts, conduct crew briefings, attend planning meetings and work closely with Incident Fire Behavior Analysts to provide specific information to the Incident Commander and other support personnel for wildfire suppression planning, fire fighter safety planning and resource management. This weather information also was used by county emergency managers to decide on community evacuations and other related public safety measures. Between July 15 and September 20, 41 different IMETs furnished weather services in northern Idaho and western Montana.

Communication and data acquisition while onsite at wildfires is one of the greatest challenges for IMETs. The current main data delivery method is through the Internet but satellite communication capability provided by ATMUs is also used. Approximately 4 percent of the time during the 2000 fire season, satellite data was old or unavailable due to periodic problems with the Western Region data server, the onsite setup and/or the contract data delivery system. Though infrequent, these data gaps impacted the service capability of IMETs.

In addition to routine products and services, IMETs provided to the Incident Commanders and crews special alert statements for developing thunderstorm activity that could impact the fire control operation and fire fighter safety. On the Wilderness Fire, south of Missoula, Montana, an IMET alert of impending thunderstorm winds allowed fire crews to be pulled from the fire line well before the winds hit. In the words of the Incident Commander, this timely weather information saved lives. This level of service was provided on a 24-hour basis. At the Boulder Creek Fire, near Boulder, Montana, on August 10, an IMET issued three special alert statements at 12:30 p.m., 5 p.m. and 1 a.m., with lead times ranging from 10 minutes to 1 ½ hours. This heightened awareness of impending critical weather resulted in the Incident Commander taking action. Updates to routine forecasts and verbal briefings to key support personnel were provided anytime IMETs thought significant weather was possible. This free flow of weather information created an effective communication link between IMETs and Incident Commanders and helped build credibility. When requested by fire control officials, IMETs assisted in community briefings as frequently as once a day. IMETs also conducted media interviews.

There are only four interagency Incident Command System (ICS) Area Command Teams in the United States (Appendix B). All four were active in western Montana at the same time, an unprecedented occurrence. Due to the large number of fires, many management teams were forced to oversee fires much more complex than they had previously experienced. It was the opinion of at least two Area Commanders that these teams were able to handle the more complex fires because of the high-level IMET support and excellent forecast services they provided.

Weather support to the MAC group was initially provided by WFO Missoula. During the initial stages around July 20, the MAC group met at the Missoula WFO, reflecting well on the interagency cooperation between the NWS and the fire control organizations in western Montana. By mid-August, a separate IMET provided weather support to the MAC group. The MAC group makes broad strategic decisions. This IMET focused on those parts of the NWS product suite that were most important, namely longer range weather information.

On Friday, August 25, the CPC issued a 6- to 10-Day Outlook calling for above normal precipitation and below normal temperatures. This was the first indication of a possible change in the hot, dry weather since the Northern Rockies' fires began in mid-July. This information was first conveyed to the MAC group on August 26. This extended forecast led the MAC group to shift its strategic resource planning strategy, even before the rain started. At subsequent MAC group meetings, a consistent message of cooler, wetter weather continued to be conveyed. The rains came as forecast over the Labor Day weekend, substantially reducing the fire activity across

northern Idaho and western Montana and eventually eliminating any further need for MAC group resource management.

Coordination

Coordination played a major role in the successful delivery of products and services from the NWS to land managers during the 2000 fire season. Intensive coordination efforts took place between WFOs and IMETs and their local fire weather customers. This increased level of coordination was unprecedented due to the length of the fire season and scope of the wildfire emergency. All WFOs serving northern Idaho and Montana conducted preseason workshops. These meetings were well attended and set a positive tone with customers. For the purpose of this Assessment, the Team focused on three levels of NWS coordination: WFO to WFO; WFO to IMET; and IMET to the MAC group, Area Command or Incident Commander.

WFO to WFO: As the fire season approached, the WFOs serving USFS Region 1 discussed the threat of a very active fire season. These discussions took on added importance because the Great Falls and Pocatello offices would be providing fire weather services for the first time. Preseason coordination laid the foundation for the summer 2000 success by establishing an early consistent message to customers. Coordination among WFOs increased as the wildfire threat materialized, especially when issuing Fire Weather Watches or Red Flag Warnings.

Twice-daily coordination calls are standard procedure for Western Region WFOs. They routinely include the discussion of models, temperatures, etc. During the fire season, there was an added focus on radar information. This radar information was passed on to IMETs, resulting in 2- to 3-hour lead times when thunderstorms moved toward a fire. In more than one case, this lead time allowed fire crews to be pulled off the line for safety or repositioned to better fight the fire.

WFO to IMET: In a survey of IMETs dispatched into northern Idaho or western Montana (see Appendix D), a majority of IMETs rated the level of supporting WFO coordination as a five on a scale of six. IMETs were especially complimentary toward the support provided by WFO Missoula. The IMETs suggested daily coordination calls be conducted when three or more IMETs are onsite within a WFO forecast area. However, not all IMETs immediately made contact with the supporting WFO, delaying this coordination effort.

IMET to MAC Group, Area Command or Incident Commander: Rick Haffenfeld, who served as the Operations Chief for the western Montana MAC group, stated, "All MAC group decisions were made based on a lot of information, beginning with the weather." Twice daily weather briefings were provided to the MAC group and Incident Commanders to help with fire suppression, tactical and strategic planning and fire fighter safety. Earlier coordination with WFOs allowed IMETs to relay a unified message to their Incident Commanders. This resulted in a high level of confidence with the forecasts. Besides "scheduled" briefings, IMETs kept the fire

control managers well informed as weather conditions changed. These one-to-one interfaces allowed many resource and safety decisions to be made by the MAC group, Area Command or Incident Commander. Paul Hefner, who served as an Incident Commander at three separate incidents, stated, "The success of the fire fight and many of the decisions that were made was due in part to excellent weather information provided by IMETs in a timely manner."

IMET Chuck Redman conducting a daily briefing at the Upper Nine Mile Complex, Lolo National Forest. (Courtesy of WFO Missoula, MT.)

IMET Dave Schmidt conducting a daily briefing at the Ryan Gulch Fire. (Courtesy of WFO Missoula, MT.)

Emergency Management Response

State and county emergency management throughout Montana and Idaho were unanimous in their praise for the NWS. This was due to the strong partnership between local offices and emergency management officials. When the Service Assessment Team interviewed emergency management personnel, the emergency managers cited coordination meetings initiated by each WFO as one indicator of the high-level NWS service they received. As the fire season unfolded, emergency managers began working closely with fire control agencies but remained in contact with the local WFO through phone calls or the WFO Internet home page. Several emergency managers stated the NWS home pages were critical to their operation. Lacy Marks, Emergency Manager for Ravalli County in western Montana, stated, "The WFO Missoula Home Page was critical to my operation. I used the information from the Web as a tool to help me brief the

residents within my county." She also used this information during the evacuation process. Ravalli County experienced an extreme level of fire activity and at one point, up to 1,500 people were evacuated from their homes.

Forecasts and information from the IMETs were helpful in planning and prioritizing community evacuations. If emergency managers had any weather questions, they would go directly to the NWS for further clarification or additional information. Paul Spengler, Emergency Manager for Lewis and Clark County in western Montana, stated, "The NWS did an excellent job of fire weather forecasting. I called the Great Falls office many times this summer during the three major fires in Lewis and Clark County and always received the latest data. They were very responsive and I'm a satisfied customer!"

Red Flag Warnings were disseminated through direct contact with the emergency managers, on WFO home pages, broadcast over NAWAS and transmitted through the State Law Enforcement Teletype System (LETS). In Montana, the State LETS is the Criminal Justice Information Network (CJIN). CJIN would pass all Red Flag Warnings to the affected counties and if the emergency manager had any questions, they would contact the issuing WFO. Cindy Mullaney, Emergency Manager for Pondera County in northern Montana, stated, "I found the NWS to be very responsive to my needs during the fire season. In addition to the information that was available over the Emergency Managers Weather Information Network and on the Internet, at my request I was called whenever the weather was expected to meet certain parameters the NWS and I agreed too. I really liked the personal touch and appreciated the heads up, particularly during a time which must have been extremely busy for the Great Falls office."

Bill Thomas, District One Representative for the Montana Disaster and Emergency Services, summarized the general feelings of the emergency management community. He stated, "Nothing negative was ever said concerning the NWS. The level of service was fantastic for an unprecedented disaster such as this was."

Media Response

NOAA and NWS Offices of Public and Constituent Affairs instituted new practices to keep the media and public well informed. Regional public affairs officers, especially those in Western and Central Regions, coordinated closely with the NOAA Webmaster to establish and maintain new Internet avenues for collecting and disseminating timely information via the NOAA Home Page. Frequent Web site updates ensured media and public access to the latest information. Local, regional and national media contacts commented to the NOAA Webmaster that the summaries and links were quickly assimilated to assist them in guiding their daily search for wildfire news. The Internet proved to be a valuable communication tool.

Information on the Internet to some degree reduced media contact with WFOs and IMETs. However, the sense of urgency in covering such a large number of wildfires still drew

intense media focus. For example, the local Missoula newspaper, ***Missoulian***, had wildfire in its headlines for 40 straight days.

Several people noted how IMETs and WFO forecasters avoided what could have been a confusing situation by focusing their information only in their area of expertise: weather elements. Several fire control officials praised the IMETs and other forecasters for sticking with what they knew during media interviews and public presentations. For example, the NWS forecasters gave information about the weather and didn't venture into unfamiliar areas like fire behavior. The consistent reports helped fire management agencies gain the confidence of local residents, which was vital to public safety.

Valley Complex in the Bitterroot National Forest, Montana.
(Courtesy of Karen Wattenmaker)

Facts

FACT: Federal and state land management organizations recognized the wildfires of 2000 as historic in both extent and duration. In the Northern Rockies, more than one million acres burned. The fire threat forced federal and state officials to close millions of acres of public land for extended periods. Interstate commerce was impacted and the interstate freeway was closed at times. Thick smoke filled valleys for extended periods, disrupting the lives of residents and visitors.

FACT: A record 40 to 50 Incident Management Teams were in the Northern Rockies at one time. Some of these teams came from Australia, Canada and New Zealand. All were provided quality weather information and services from the NWS.

FACT: Remote Automated Weather Stations (RAWS) provided valuable real-time weather information to WFO forecasters, IMETs and fire management officials.

Portable Remote Automated Weather Station. (Courtesy of WFO Missoula, MT.)

FACT: Kathy McAllister, USFS Region 1 Deputy Regional Forester, indicated the Forest Service could not have achieved its wildfire suppression goals without the outstanding cooperation, expertise and service from the NWS.

FACT: 41 different IMETs were dispatched 105 times for a total of 915 IMET days in USFS Region 1.

FACT: This fire season reaffirmed the importance of the Staff Meteorologist position to NIFC.

FACT: Nearly all of the fires within USFS Region 1 were caused by lightning. In one case on August 10, lightning caused more than 500 new fire starts (see Figure 5).

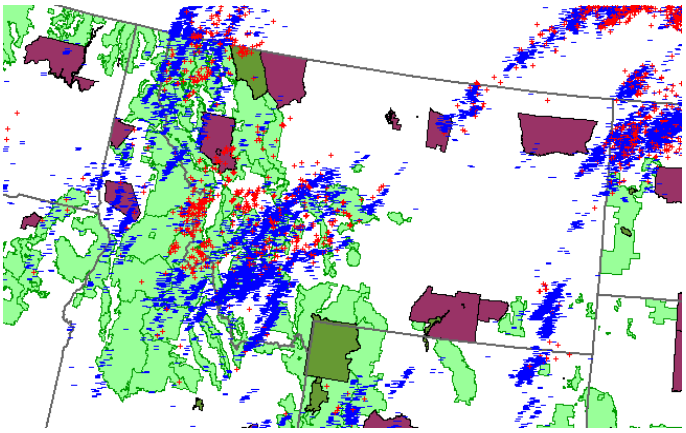


Figure 5. Lightning activity in the Northern Rockies on August 10, 2000. (Courtesy of Global Atmospherics, Inc.)

FACT: All requests for IMETs were satisfied.

FACT: There were no wildfire-related loss of life or serious injury within USFS Region 1.

FACT: The Internet proved to be a valuable communication tool.

FACT: The local Missoula newspaper, ***Missoulian***, had wildfire in its headlines for 40 straight days.

Flags of cooperating countries at the Nine Mile Complex, Montana. (Courtesy of WFO Missoula, MT.)

Valley Complex in Bitterroot National Forest, Montana. (Courtesy of Karen Wattenmaker)

Helicopter water drop over Burgdorf Fire in Payette National Forest, Idaho. (Courtesy of NIFC)

Bomber dropping fire retardant over Blodgett Fire in Bitterroot National Forest, Montana. (Courtesy of NIFC)

Trail Creek Fire in Idaho. (Courtesy of Ric Holmes, Atlanta resident)

Findings and Recommendations

Fire Weather Services

Finding 1: Some fire weather laptop computers used by IMETs do not have the connections needed for the ATMU satellite equipment.

Recommendation 1: NWS should ensure that all fire weather laptops have standard connections needed for the ATMU satellite equipment.

Finding 2: The 26 portable RAWS provides valuable real-time weather information. Not all IMETs had access to these fire control agency systems due to their limited number. Some RAWS do not have a satellite interrogation capability, limiting access to weather data.

Recommendation 2: The NWS should recommend to land management agencies to increase the number of portable RAWS units to match the 40 ATMUs available and equip all RAWS with satellite interrogation capability.

NWS Performance Overview

Finding 3: The USFS Region 1 Deputy Regional Forester indicated the Forest Service could not have achieved its wildfire suppression goals and accomplished the fire line safety it had throughout the long and tiring fire season without the outstanding cooperation, expertise and service from the NWS.

Recommendation 3: Formally recognize the contributions of the NIFC Staff Meteorologist, the IMETs that served in the Northern Rockies and the staffs at WFOs Billings, Great Falls, Missoula, Pocatello and Spokane.

Finding 4: A typical IMET workday can extend beyond 16 hours. Prolonged IMET deployment, up to 14 days, can be exhausting.

Recommendation 4: The NWS should establish national guidelines for IMET dispatch by August 1, 2001.

NCEP Products and Services

Finding 5: The SPC Fire Weather Outlook product was not used by a majority of meteorologists in the Northern Rockies.

Recommendation 5: The Regions should instruct forecasters to use the Fire Weather Outlook as they would any other guidance product.

WFO Products and Services

Finding 6: Providing wind information in the 3- to 5-day extended portion of a Fire Weather Zone Forecast proved critical. Inclusion of wind information in the 3- to 5-day forecast period is not uniform across the country.

Recommendation 6: Include wind information in the 3- to 5-day portion of all Fire Weather Zone Forecast products by August 1, 2001.

Finding 7: Fire weather products that used only zone numbers confused customers from outside the local area.

Recommendation 7: Geographic names, similar to those used in the public zone forecast products, should be used with the zone numbers in fire weather products by August 1, 2001.

Finding 8: The Web-based Spot Forecast program was an efficient way for fire control agencies to use the Internet to request a Spot Forecast and for the servicing WFO to prepare and return the forecast. However, not all Western Region WFOs used this new capability in 2000 and offices outside the Western Region do not have access to the software and data base.

Recommendation 8a: Western Region should implement the Web-based Spot Forecast service regionwide by August 1, 2001.

Recommendation 8b: NWS should determine whether to implement the Web-based Spot Forecast service nationwide.

IMET Products and Services

Finding 9: Approximately 4 percent of the time during the 2000 fire season, satellite data was old or unavailable due to periodic problems with the Western Region data server, the onsite setup and/or the contract data delivery system. Though infrequent, these data gaps impacted the service capability of IMETs.

Recommendation 9a: NWS should ensure a server and data reliability standard of 98 percent.

Recommendation 9b: NWS should develop a methodology of limiting data loss to a maximum of 30 minutes upon notification of interruption.

Recommendation 9c: ATMU setup and problem diagnosis instructions should be kept current and emphasized in all IMET training.

Coordination

Finding 10: Not all IMETs immediately made contact with the supporting WFO upon arrival at a fire incident.

Recommendation 10: Implement policy by August 1, 2001, requiring IMETs to notify the supporting WFO and the NIFC Staff Meteorologist upon their arrival and departure from an incident.

Clear Creek Fire in Salmon-Challis National Forest in Idaho.
(Courtesy of NIFC)

Best Practices

1. Preseason Coordination Workshops

WFOs providing fire weather services to northern Idaho and Montana all hosted preseason coordination meetings with land management officials. These workshops were well attended and helped establish a baseline understanding between the WFO staff and the fire weather customer. Several land managers commented about the trust and confidence that comes from knowing who is providing the weather information. These preseason customer workshops went a long way to establish the communication and a working relationship for these offices to be successful during the prolonged wildfire emergency. This was especially true at WFOs Pocatello and Great Falls because these offices assumed full fire weather responsibility for the first time this year.

2. Post-season Customer Feedback

WFO Great Falls conducted a post-season customer feedback meeting with all fire weather customers. This is an excellent way to ensure NWS products and services meet customer needs in preparation for the next fire season.

3. WFO/IMET Coordination Conference Calls

A daily conference call was conducted between supporting WFOs and IMETs in northern Idaho and western Montana during the height of the fire emergency. These calls proved successful in detailing the "meteorology of the day" and coordinating watch/warning requirements. These calls helped establish a common weather message among WFOs and IMETs, enhancing the confidence of both the forecasters and the customers receiving the final forecast product.

4. MIC Visits to IMETs

MIC involvement during a fire weather emergency is crucial to the success of the services provided by the NWS. The WFO Missoula MIC made a point of personally visiting as many IMETs deployed into the Missoula fire weather district as possible. This interest and personal touch from the MIC helped connect the IMETs to the WFO, making them feel valued and enhancing their motivation and effectiveness.

5. Weather Support to the MAC Group

The Missoula MAC group was supported first by WFO Missoula, although an IMET was eventually detailed to this duty. IMET support to the Missoula MAC group proved very beneficial to their strategic planning and resource management.

6. Pre-positioning IMETs

Based on long-range forecasts and the threat of a major wind event in the extended period, several IMETs were pre-positioned into Missoula, Montana, for rapid deployment. This action helped minimize the NWS response time to a number of IMET requests.

7. Internet Delivery of Event-Specific Weather Information

WFOs supporting the wildfire suppression effort in northern Idaho and Montana made a high priority of providing as much information as possible through their office Web pages. This suite of Web-based weather information met the need of fire control public relations officials, emergency managers, state officials and the general public. Local and national media were directed to these Internet sources for fire and weather information. Spot Forecast services were provided over the Internet via a unique program developed at WFO Missoula. Internet access to NWS products and information reduced the number of direct calls and personal contact with the WFO.

8. Using NAWAS

NAWAS was used to communicate Red Flag Warnings to state emergency warning points.

Appendix A

Team Charge
September 22, 2000

The Service Assessment Team is charged with evaluating NWS products and services provided to the land management agencies and the emergency management communities affected by the wildfires in northern Idaho and western Montana from mid-July to mid-September 2000. This includes products and services from Incident Meteorologists as well as from Weather Forecast Offices. The team will evaluate (1) services to the Area Commands and the Multi-Agency Coordination group for the Northern Rockies Coordination Area in Missoula, Montana, (2) coordination of products and services between IMETs and WFOs and (3) forecast coordination between WFOs in and adjacent to the Northern Rockies during this period.

Road closures near Clear Creek Fire.
(Courtesy of NIFC)

Helicopter with water bucket over the Crooked Fire in Clearwater National Forest, Idaho. (Courtesy of NIFC)

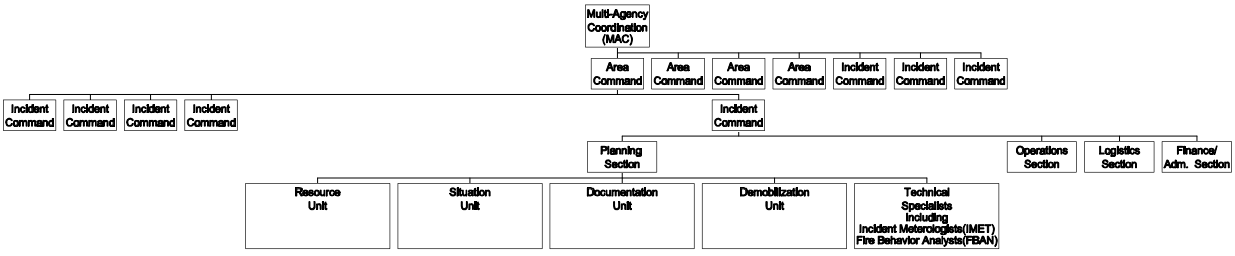
Appendix B

Incident Command System (ICS) Overview

Wildfire control agencies use the ICS for command and control of an incident. This provides a means to coordinate the efforts of individual agencies as they work toward the common goal of stabilizing the incident and protecting life, property and the environment. ICS is designed to allow its users to adopt an integrated organizational structure equal to the complexity and demands of single or multiple incidents, without being hindered by jurisdictional boundaries. The Incident Commander is the individual responsible for the management of all operations at the incident. The Incident Commander is supported by general and command staff, if required by the incident. The general staff consists of the plans, operations, logistics and finance section chiefs and their staff. The planning section's function includes the collection, evaluation, dissemination and use of information about the development of the incident and status of resources. The IMET is part of the planning staff as a technical specialist.

A manageable span of control is defined as the number of individuals one supervisor can manage effectively. In ICS, the span of control for any supervisor falls within a range of three to seven resources, with five being the optimum. When there are an extremely large number of incidents which will exceed the optimum five as occurred in western Montana, Area Commands are established. Area Commands have the responsibility to set overall strategy and priorities, allocate critical resources based on priorities, ensure that incidents are properly managed and ensure that objectives are met and strategies followed.

When there are incidents which involve a number of jurisdictions and where resources are limited, representatives of the involved agencies come together to make decisions regarding the prioritizing of incidents and the sharing and use of critical resources. This MAC group sets the overall objectives and strategies of the various Area Commands under their jurisdiction.



Appendix C

Product Examples

Fire Weather Zone Forecast

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FNUS55 KMSO 182219
FWFMSO
MISSOULA FIRE WEATHER OFFICE
AFTERNOON FIRE WEATHER FORECAST
350 PM MDT FRI AUG 18 2000.....

..RED FLAG WARNING FOR ISOLATED THUNDERSTORMS AND GUSTY WINDS UNTIL
9 PM MDT THIS EVENING FOR ZONES 110...AND 111...

   RED FLAG WARNING FOR ALL ZONES FOR STRONG WINDS ON SATURDAY...

DISCUSSION...
    STRONG SOUTHWEST WINDS AND ISOLATED THUNDERSTORMS ARE OCCURRING
ACROSS SOUTHWEST MONTANA ZONES THIS AFTERNOON... THESE CONDITIONS
ARE A PRECURSOR OF A MORE ACTIVE WEATHER SYSTEM THAT WILL MOVE
ACROSS THE ENTIRE DISTRICT ON SATURDAY AND BRING GUSTY WINDS THAT
WILL FINALLY SCOUR SMOKE OUT OF ALL VALLEYS.  SATURDAYS SYSTEM WILL
BRING CLOUDS AND SHOWERS INTO NORTHWEST MONTANA AND ISOLATED
THUNDERSTORMS ALONG THE CANADIAN BORDER.  THERE COULD ALSO BE SOME
ISOLATED THUNDERSTORMS IN SW MONTANA ZONES.

AS THE SYSTEM MOVES ACROSS THE DISTRICT THE TEMPERATURES WILL DROP
AROUND TEN DEGREES AND THERE WILL BE A CHANCE OF SHOWERS ALL ZONES
THROUGH SATURDAY NIGHT.  SUNDAY WILL BRING CLEARING BUT BREEZY
CONDITIONS AGAIN.  HIGH PRESSURE WILL BEGIN TO REBUILD ON MONDAY WITH
A RETURN TO SOUTHWESTERLY FLOW AND WARMING TEMPERATURES THROUGH THE
WEEK.


ZONES: 102 103 108 109

THIS INCLUDES: PALOUSE/HELLS CANYON.  CLEARWATER/NEZ PERCE.
EAST LOLO...BITTERROOT

 TONIGHT...
 WEATHER.............PARTLY CLOUDY.
 CWR.................NONE
 LAL.................1
 MIN TEMPS...........42 TO 52...52-60 LOWER ELEVATIONS ZONES
                     102/103
 MAX RH..............65-85% VALLEYS...40-50% MID SLOPES AND ABOVE
 SLOPE/VALLEY WIND...WEST TO NORTHWEST 10 TO 15 MPH
 RIDGETOP WIND.......SOUTHWEST TO NORTHWEST 15 TO 25
```

```
SATURDAY...
..RED FLAG WARNING FOR STRONG WINDS...
 WEATHER.............PARTLY CLOUDY AND WINDY WITH A SLIGHT CHANCE
                     OF AFTERNOON SHOWERS.
CWR.................10%
LAL.................1
MAX TEMPS...........70-80
MIN RH..............15-25%
SLOPE/VALLEY WIND...WEST 15 TO 25 MPH...LOCAL GUSTS TO 35 MPH
RIDGETOP WIND.......WEST TO NORTHWEST 15 TO 25 MPH...GUSTS TO
                     35 MPH
SATURDAY NIGHT...
WEATHER...........   PARTLY CLOUDY WITH A SLIGHT CHANCE OF SHOWERS.
CWR...............   10%
LAL...............   2
MIN TEMPS.........   40-50
MAX RH............   ABOVE 60% RIDGES..ABOVE 80% VALLEYS
SLOPE/VALLEY WIND.   VARIABLE 8-15MPH..BECOMING LIGHT DOWNSLOPE AFTER
                      MIDNIGHT.
RIDGETOP WIND.       WEST TO NORTHWEST 15 MPH

SUNDAY..
WEATHER.............PARTLY CLOUDY WITH A SLIGHT CHANCE OF
                    SHOWERS..MOSTLY IN THE MORNING.
CWR.................LESS THAN 10%
LAL.................1
MAX TEMPS...........70-80
MIN RH..............20-30%
SLOPE/VALLEY WIND...MAINLY UPSLOPE/UPVALLEY 8-15 MPH
RIDGETOP WIND.......WEST TO NORTHWEST 15-20 MPH
*********************************************************************
HAINES INDEX: POTENTIAL FOR LARGE FIRE GROWTH
TODAY..........4 TO 5 LOW TO MODERATE
SATURDAY.......3       VERY LOW
SUNDAY.........2       VERY LOW
*********************************************************************
```

Fire Weather Watch

GTFRFWGTF
TTAA00 KGTF DDHHMM

FIRE WEATHER WATCH
NATIONAL WEATHER SERVICE GREAT FALLS MT
200 PM MDT TUE AUG 22 2000

MTZ012-014-015-230300-

...FIRE WEATHER WATCH FOR DRY THUNDERSTORMS SOUTHWEST MONTANA WEDNESDAY AFTERNOON AND EVENING...

FIRE WEATHER ZONE INCLUDED IN THE WATCH IS: 118
THIS INCLUDES: TOWNSEND RANGER DISTRICT OF THE HELENA NATIONAL FOREST

DISCUSSION: MONSOONAL MOISTURE FROM THE SOUTHWESTERN UNITED STATES WILL BE DRAWN INTO THE AREA LATE WEDNESDAY AFTERNOON. THUS...THE POSSIBILITY OF DRY THUNDERSTORMS WITH GUSTY WINDS WILL EXIST FOR ZONE 118 LATE WEDNESDAY AFTERNOON THROUGH EVENING.

PLEASE ADVISE THE APPROPRIATE OFFICIALS OR FIRE CREWS IN THE FIELD OF THIS FIRE WEATHER WATCH.

Red Flag Warning

ZCZC GTFRFWMSO
FXUS70 KMSO 102122

RED FLAG WARNING
NATIONAL WEATHER SERVICE MISSOULA MT
320 PM MDT THU AUG 10 2000

IDC035-049-057-061-069-MTC001-023-029-035-039-043-047-
049-053-057-061-063-077-081-089-093-111500-

...RED FLAG WARNING FOR THUNDERSTORMS...SOUTHWEST TO WEST WINDS..
LOW RELATIVE HUMIDITES FOR TONIGHT...ZONES 102...103... 104...105
106...107...108...109 ...110...AND 111...

...RED FLAG WARNING FOR INCREASING WESTERLY WINDS AND LOW RELATIVE
HUMIDITIES FOR FRIDAY...ZONES 102...103... 104...105...106...
107...108...109 ...110...AND 111...

THIS INCLUDES: PALOUSE/HELLS CANYON...CLEARWATER/NEZ PERCE...
KOOTENAI...FLATHEAD/GLACIER PARK...WEST LOLO...SALISH AND
KOOTENAI RESERVATION...EAST LOLO...BITTERROOT...DEERLODGE/WEST
BEAVERHEAD...EAST BEAVERHEAD

****

CRITICAL WEATHER PATTERN CONTINUES OVER THE DISTRICT TONIGHT AND
FRIDAY. THE UPPER RIDGE CONTINUES TO SHIFT EAST TONIGHT AS AN UPPER
LEVEL DISTURBANCE AND ASSOCIATED COLD FRONT MOVE INTO THE DISTRICT
LATER THIS EVENING. SCATTERED THUNDERSTORMS WILL OCCUR AHEAD OF THE
FRONT WITH WIND GUSTS TO 50 MPH ASSOCIATED WITH THESE STORMS. THE
COLD FRONT PUSHES THROUGH THE AREA THIS EVENING WITH WESTERLY WINDS
INCREASING TO 15 TO 25 MPH BEHIND THE FRONT. DRIER AIR MOVES INTO
THE DISTRICT ON FRIDAY...HOWEVER...STRONG WESTERLY FLOW 15-30 MPH AT
VALLEY AND RIDGETOP LOCATIONS WILL DEVELOP.

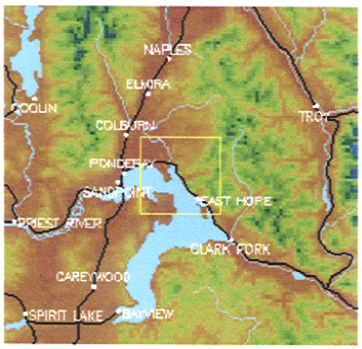
****

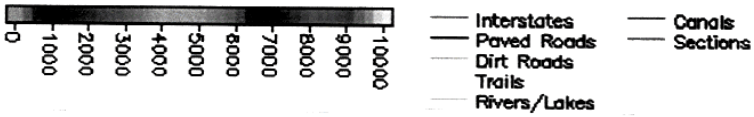
Spot Forecast (Using Web-based Program)

Kirby's 16 (WILDFIRE) (Requested:1126 8/10/00)

Forecast complete at 1148 8/10/00

Requested by:USFS





Elevation:2800Drainage:Trestle Creek Aspect:West Size:0.75

Fuel Type:logging slash (Partially Sheltered)

Observations:

Place	Elev	Time	Wind	Temp	Wetbulb	RH	Dewpt	Remarks
Fire	2800	1040	upslope 5	80	67	52		40% could cover
					Calculated:	53	61	

Requested Parameters	Remarks
... Clouds / Weather	fire on lower 1/3 of slope
... Chance of Wetting Rain	
... Temperature	
XX. Relative Humidity	
XX. Eye Level Wind	
... Smoke Dispersion	

FORECAST:

DISCUSSION...AN UPPER LEVEL DISTURBANCE WILL HEAD NORTHEAST TOWARD THE AREA AND BRING THUNDERSTORMS. THE STORMS WONT DEVELOP UNTIL LATE THIS AFTERNOON. THE STORMS WILL PERSIST INTO MUCH OF THE NIGHT. THE STORMS COULD PRODUCE LOCALLY STRONG WIND GUSTS LATE THIS AFTERNOON AND EVENING.

NOTE:
THE RELATIVE HUMIDITY REPORTED ON THE OBSERVATION AT 10:40 WAS EXTREMELY HIGH COMPARED TO OBSERVATIONS AT THE SANDPOINT AIRPORT AND SURROUNDING LOCATIONS. THIS FORECAST WILL RELY MORE ON RELATIVE HUMIDITY OBSERVATIONS AROUND THE AREA.

FOR TODAY
- WEATHER.....BECOMING MOSTLY CLOUDY. ISOLATED THUNDERSTORMS DEVELOPING THIS AFTERNOON.
- CWR.....0%
- TEMPERATURE.....MAX 87
- HUMIDITY.....MIN 22%
- WIND...EYE LEVEL...SOUTHWEST WIND 7-14 MPH...GUSTS TO 15 MPH POSSIBLE LATE THIS AFTERNOON.

FOR TONIGHT
- WEATHER.....MOSTLY CLOUDY WITH SCATTERED THUNDERSTORMS.
- CWR.....10%
- TEMPERATURE.....MIN 57
- HUMIDITY.....MAX 65%
- WIND...EYE LEVEL...SOUTHWEST 8-16 MPH...GUST TO 20 MPH POSSIBLE.

OUTLOOK FOR TOMORROW
- WEATHER.....PARTLY CLOUDY.
- CWR.....0%
- TEMPERATURE.....MAX 78
- HUMIDITY.....MIN 28%
- WIND...EYE LEVEL...SOUTHWEST 10-15 MPH

Appendix D

IMET Survey

Note: Responses are provided to the questions where data can be tabulated. Some responses have been kept deliberately vague to protect the confidentiality of the IMETs as promised. Thirty-five of 41 IMETs responded to the survey.

1. How many total days were you deployed as an IMET into Region 1?

   Shortest time: 4 days
   Longest time: 40 days

2. On average, how many briefings and forecasts did you provide per day?

   Answer: 2 regular scheduled briefings per day but also on an as-needed basis (weather dependent)

3. Was the data available to you adequate? If not, what else was needed?

   The majority responded YES

4. Was the data timely and reliable? If not, why not?

   YES, except for occasional interruptions with satellite packet data

5. What WFO did you coordinate with?

	# of IMETs
WFO Missoula, MT	*30*
WFO Pocatello, ID	*15*
WFO Great Falls, MT	*12*
WFO Boise, ID	*8*
WFO Billings, MT	*3*

For each of the offices in question five, please answer questions six through eight.

6. On a scale from one to six (one being poor and six being excellent), how would you rate the coordination between you and the WFO?

   Answers ranged from 3 to 6

7. On a scale from one to six (one being poor and six being excellent), how would you rate the service you received from the WFO? Please provide examples:

   Answers ranged from 3 to 6

8. Did you ever receive a phone call or other contact from a WFO to advise you of a significant change in their forecast products or rapidly changing weather situation that would impact your incident? If so, please provide the details.

   30 IMETs responded YES

9. Are you aware of any success stories? (For example, where your forecast saved property, lives or resources)

10. Did you use the SPC Fire Weather Outlook product while at an incident? If yes, how?

    30 IMETs responded NO
    5 IMETs responded YES; graphic was used during briefings

11. Please feel free to provide any additional comments you feel would aid the Assessment Team.