

# FIRE WEATHER OPERATING PLAN (updated January 2020)

FIRE WEATHER SERVICES FOR MOST OF MISSOURI AND ADJACENT COUNTIES OF EASTERN KANSAS, SOUTHERN ILLINOIS, SOUTHWEST INDIANA, AND WESTERN KENTUCKY



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## FIRE WEATHER OPERATING PLAN

# FIRE WEATHER SERVICES FOR MOST OF MISSOURI, AND ADJACENT COUNTIES OF EASTERN KANSAS, SOUTHERN ILLINOIS, SOUTHWEST INDIANA, AND WESTERN KENTUCKY

### Introduction

This local Operating Plan is within the framework of the the National Interagency Fire Weather Annual Operating Plan, detailing national-level services, products and responsibilities for both the Wildland Fire Agencies and the National Oceanic and Atmospheric Administration’s (NOAA’s) National Weather Service (NWS). The general relationship between NWS and the interagency fire management community is set forth in the National Interagency Agreement for Meteorological Services (the National Agreement). References include:

- **National Weather Service Policy Instructions (NWSI) 10-4, 401, 402, 403, 404, 405 and 407**  
(<https://www.nws.noaa.gov/directives/index.php>)
- **The National Agreement** ([https://www.weather.gov/media/fire/2018\\_Natl\\_AOP\\_FINAL.pdf](https://www.weather.gov/media/fire/2018_Natl_AOP_FINAL.pdf))
- **National Mobilization Guide** (<https://www.nifc.gov/nicc/mobguide/index.html>)

This document contains the local Operating Plan for the fire weather forecast areas for the National Weather Service Offices (WFO) at Springfield (SGF), Pleasant Hill (EAX), and St. Louis (LSX) in Missouri and Paducah (PAH), Kentucky. This plan will be reviewed as needed and will remain in effect until the next revision.

This is an interagency agreement for meteorological services between the above National Weather Service Offices and the following agencies:

<b>USDA Forest Service</b>	<p><b>Mark Twain National Forest (Missouri)</b></p> <p>Jim Cornelius, Mark Twain NF Fire Management Officer, Rolla, MO phone: 573-341-7403 email: <a href="mailto:jecornelius@usda.gov">jecornelius@usda.gov</a></p> <p><b>Shawnee National Forest (Illinois)</b></p> <p><b>Land Between the Lakes National Recreation Area (Kentucky)</b></p>
<b>The National Park Service</b>	<p>Bobby Bloodworth, NPS, Ozark Riverways Fire Management Officer Van Buren, MO</p> <p><a href="mailto:Bobby_bloodworth@nps.gov">Bobby_bloodworth@nps.gov</a> (573) 323-4236</p>

<p><b>U.S. Fish and Wildlife Service</b></p>	<p><b>Crab Orchard National Wildlife Refuge (Illinois)</b></p> <p><b>Marais des Cygnes National Wildlife Refuge (Kansas)</b></p> <p><b>Cypress Creek National Wildlife Refuge (Illinois)</b></p> <p><b>Squaw Creek National Wildlife Refuge (Missouri)</b></p> <p><b>Swan Lake National Wildlife Refuge (Missouri)</b></p>
<p><b>U.S. Department of Defense</b></p>	<p><b>Fort Campbell Public Works Business Center Environmental Division (Kentucky/Tennessee)</b></p>
<p><b>State of Missouri</b></p>	<p><b>Missouri Department of Conservation (MDC)</b></p> <p>Ben Webster, MDC Fire Program Supervisor – Jefferson City, MO  ben.webster@mdc.mo.gov  573-522-4115, ext. 3113</p> <p><b>Missouri Department of Natural Resources/Missouri State Parks</b></p> <p>Tim Turpin , Natural Resource Steward  Resource Management and Interpretation Program  Missouri State Parks  Jefferson City, MO 573-751-8664</p>

### Summary of Changes (2019-2020)

- Made various changes to NWS personnel.
- Added NWS operations email contact for SGF (contact.sgf@noaa.gov).
- Removed fax contacts. Removed fax option to request spot forecasts.
- Added table of contents.
- Added national references to the introduction
- Added a section for land management agency responsibilities

## Fire Weather Support Responsibility Areas and Contact Information for NWS Offices

National Weather Service Forecast Offices are staffed 24 hours a day 365 days a year. Service areas and contact information for each forecast office is depicted below (Figure 1):

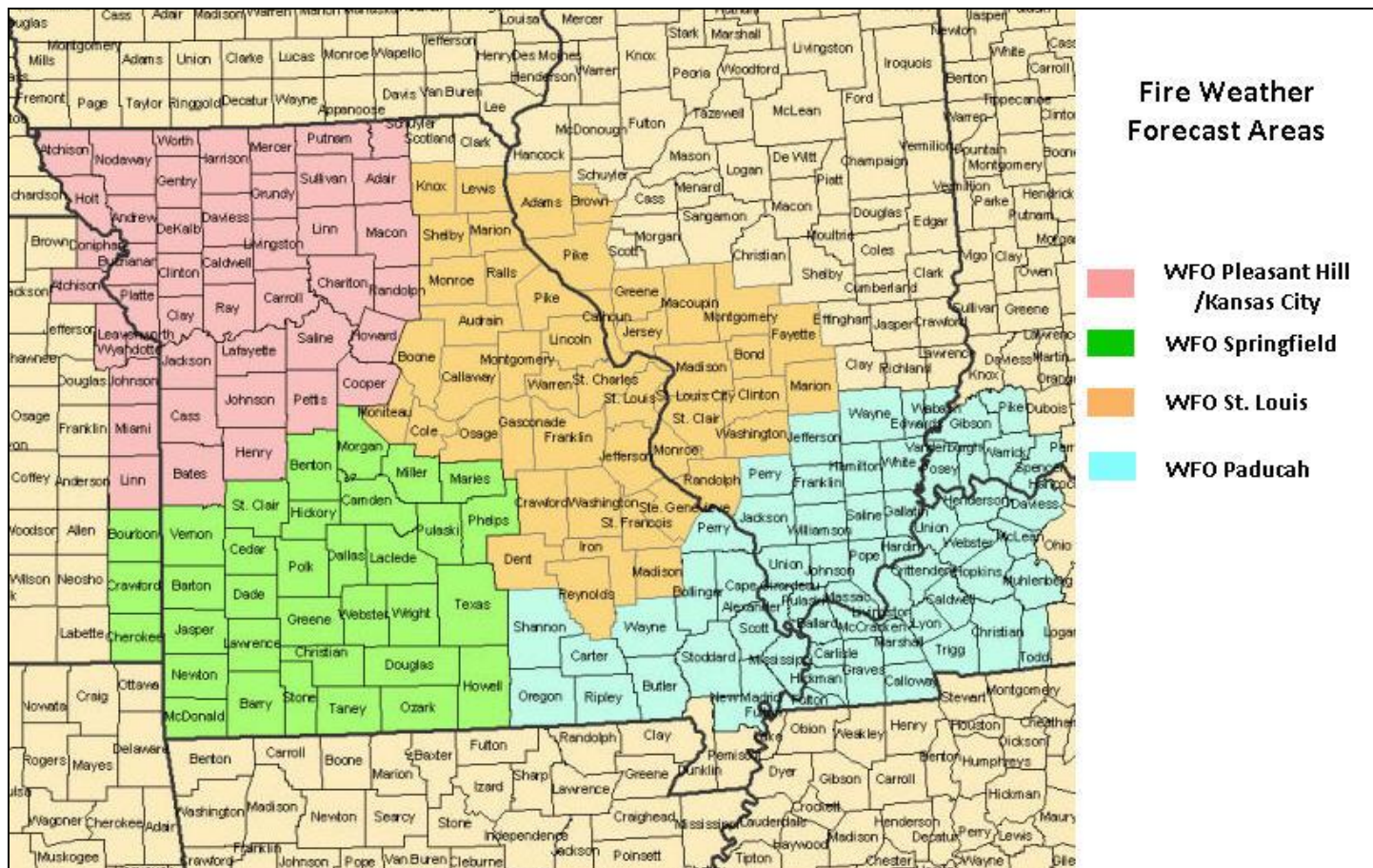


Figure 1: Fire weather forecast areas of responsibility.

### Contact Information:

<b>Contact Information: WFO Springfield, MO</b>	
Address:	5805 West Highway EE Springfield, MO 65802
Phone/Operations Email	(800) 762-4363/contact.sgf@noaa.gov
Meteorologist In Charge:	Kelsey Angle – kelsey.angle@noaa.gov
Fire Weather Program Leader:	Drew Albert – drew.albert@noaa.gov
Web Page:	<a href="http://www.crh.noaa.gov/sgf/">http://www.crh.noaa.gov/sgf/</a>

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<b>Contact Information: WFO Paducah , KY</b>	
Address:	8250 Kentucky Hwy 3520 West Paducah, KY 42086
Phone:	(800) 533-7189
Meteorologist In Charge:	Steve Eddy – steven.eddy@noaa.gov
Fire Weather Program Leader:	Greg Meffert – gregory.meffert@noaa.gov
Web Page:	<a href="http://www.crh.noaa.gov/pah/">http://www.crh.noaa.gov/pah/</a>
<b>Contact Information: WFO Pleasant Hill, MO</b>	
Address:	1803 N. 7 Hwy Pleasant Hill, MO 64080
Phone:	(800) 438-0596
Meteorologist In Charge:	Julie Adolphson – julie.adolphson@noaa.gov
Fire Weather Program Leader:	Sarah Corfidi – sarah.taylor@noaa.gov
Web Page:	<a href="http://www.crh.noaa.gov/eax/">http://www.crh.noaa.gov/eax/</a>
<b>Contact Information: WFO St. Louis, MO</b>	
Address:	12 Missouri Research Park Drive St. Charles, MO 63304
Phone:	(800) 852-7497
Meteorologist In Charge:	Sally Pavlow-Johnson – sally.pavlow@noaa.gov
Fire Weather Program Leader:	Gary Schmocker - gary.schmocker@noaa.gov
Web Page:	<a href="http://www.crh.noaa.gov/lx/">http://www.crh.noaa.gov/lx/</a>

<b>Contact Information: Eastern Area Coordination Center</b>	
Address:	Eastern Area Fire Weather Program Manager EACC - Mississippi National River and Recreation Area 111 East Kellogg Blvd, Suite 105 St Paul, MN 55101
Phone:	414-944-3811
Web Page:	<a href="http://gacc.nifc.gov/eacc/">http://gacc.nifc.gov/eacc/</a>
Meteorologist:	Steve Marien Office: 651- 293-8446 Cell: 402-250-7844 Fax: 651-290-3815 Stephen_Marien@nps.gov
<b>Contact Information: Rocky Mountain Area Coordination Center</b>	
Address:	2850 Youngfield Ave Lakewood, CO 80215
Phone:	303-445-4300/ 1-800-494-2073
Web site:	<a href="http://gacc.nifc.gov/rmcc/">http://gacc.nifc.gov/rmcc/</a>
<b>Contact Information: Southern Area Coordination Center</b>	
Address:	1200 Ashwood Parkway, Suite 230, Atlanta, GA 30338
Phone:	(678) 320-3000
Web Page:	<a href="http://gacc.nifc.gov/sacc/">http://gacc.nifc.gov/sacc/</a>

**Service Backup:**

The following NWS offices will provide service backup for fire weather products:

	<b>WFO Paducah</b>	<b>WFO Pleasant Hill</b>	<b>WFO Springfield</b>	<b>WFO St. Louis</b>
Primary	WFO Louisville	WFO Springfield	WFO St. Louis	WFO Pleasant Hill
Backup:	(502) 968-6329	(800) 762-4363	(800) 852-7497	(800) 438-0596
Secondary	WFO Springfield	WFO Topeka	WFO Paducah	WFO Central Illinois
Backup:	(800) 762-4363	(785) 232-1494	(800) 533-7189	(217) 732-3089

**Basic Services**

**Fire Weather Planning Forecast**

Fire Weather Planning Forecasts are issued twice daily. Forecast amendments will be issued any time as needed. Examples of the Fire Weather Planning Forecast are in Appendix B.

Fire Weather Planning Forecasts will be updated when a Fire Weather Watch or Red Flag Warning is issued or cancelled or when forecast elements are deemed unrepresentative.

## FIRE WEATHER OPERATING PLAN

Routine forecast content/format will vary somewhat from office to office. Fire Weather Planning Forecasts will include the following general components:

**Discussion:** The discussion should be concise, but describe the main weather features to adequately explain why the forecast weather will occur. The discussion should also highlight significant changes that will affect the fire environment. Typically the discussion will cover the next two days; however, significant changes in any forecast period should be discussed. A headline will be included for Fire Weather Watches, Red Flag Warnings, and other significant weather deemed appropriate by the fire weather meteorologist.

**Cloud Cover:** This element describes the sky condition for the forecast period.

**Precipitation (Precip) Type :** This is a general descriptor of the precipitation type (rain, sleet, snow, showers, thunderstorms, etc).

**Chance of Precipitation (Chance Precip %):** The probability of precipitation expresses the chance that measurable rainfall will occur at any given point within a county zone group. Measurable rainfall is 0.01 inches or greater. Probability is expressed in percent.

**Maximum (Max)/Minimum (Min) Temperature:** Temperatures will be encoded in degrees Fahrenheit (deg F). The maximum temperature will be forecast for the day period, and minimum at night.

**Maximum (Max)/Minimum (Min) Humidity:** Relative humidity is expressed in percent. The minimum or lowest humidity will be forecast for the day period, and highest humidity at night.

**20 Foot Wind:** The forecast wind speed for the fire weather forecasts will reflect the 10 minute average wind that is commonly measured at fire weather sites. The wind direction will be forecast to the sixteen cardinal points of the compass and expressed in miles per hour (mph). Wind direction will indicate the direction the wind is blowing from (**i.e. SSW 15 mph**). Since most surface observation stations used for National Weather Service forecasts measure wind speed/direction at 10 meters (roughly 33 feet) with a two minute average, a reduction factor is used to arrive at the 20 foot wind forecast.

**Wind Shift:** If a shift in wind direction associated with a frontal passage is expected during the period, the new direction and wind speed will be forecast. Because a front may take several hours to move through a zone/area, the approximate time or time period (**i.e. afternoon/morning/evening/overnight**) of the wind shift will be encoded. Significant wind shifts may also be encoded in the remarks section of the forecast.

**Precipitation Amount:** The expected average rainfall for a county zone group will be expressed in decimal notation in inches (**i.e. 0.10 to 0.50 inches, 1.00 to 1.50 inches**).

**Duration:** This is the average duration in whole hours that precipitation will occur in the county zone group.

**Mixing Height:** Mixing height is the extent or depth to which smoke will be dispersed by means of turbulence and diffusion. The forecast of mixing height is expressed in feet above ground level (AGL) and is the maximum mixing height expected (generally during the afternoon).

**Transport Wind:** Transport wind is the average wind speed in meters/second in the mixing depth above the surface. These winds are good indications of the horizontal dispersion of suspended particles. The transport wind is the forecast wind at the time of maximum mixing of the atmosphere, normally during the mid afternoon. A transport wind of less than 4 meters/second may restrict some agencies from conducting prescribed burn operations.



**1700 foot (500 meter) Mixing Height Temperature:** This is the surface temperature that must be reached in order for the mixing depth to reach 1700 feet. Once the forecast temperature is reached at the burn site, it can be assumed that the mixing height above the burn site is at least 1700 feet or 500 meters.

Note: One consequence of the Clean Air Act, is that land managers must practice principles of careful smoke management. This is done by combining favorable meteorological conditions with a variety of prescribed fire techniques so that smoke will be readily dispersed. The 1700 foot/500 meter mixed layer is a common suggested minimum mixing layer depth for prescribed burning to limit the concentration of particulate matter near the ground and to limit the aerial coverage of limited visibility due to smoke. Local regulations or practices may differ.

**Haines Index:** Used to indicate the potential for wildfire growth by measuring the stability and dryness of the air over a fire. It is calculated by combining the stability and moisture content of the lower atmosphere into a number that correlates well with large fire growth. The stability term is determined by the temperature difference between two atmospheric layers; the moisture term is determined by the temperature and dew point difference. This index has been shown to be correlated with large fire growth on initiating and existing fires where surface winds do not dominate fire behavior. The Haines Index can range between 2 and 6. The drier and more unstable the lower atmosphere is, the higher the index.

**Ventilation Rate/Dispersion Index:** Ventilation Rate is a measure of the ability of the atmosphere to disperse smoke or other pollutants. Ventilation Rate/Index can be defined as the product of the mixing height of the atmosphere multiplied by the wind speed. Higher ventilation rates result in greater transport of smoke away from the source, lower ventilation indices result in reduced transport away and therefore a greater near-ground impact. It depends on two components: The depth of the mixed layer (or unstable layer) above the ground and the average wind speed or transport wind within that mixed layer. The chart below relates qualitative values with calculated values.

	Ventilation Index (kt ft) = Mixing Height (ft ) x Average Transport Winds (kts)	
Excellent	>= 150,000 kt ft	>= 23445 m*m/sec
Very Good	>= 100,000 kt ft and < 150,000 kt ft	>= 15630 m*m/sec and <23445 m*m/sec
Good	>= 60,000 kt ft and < 100,000 kt ft	>=9378 m*m/sec and <15630 m*m/sec
Fair	>= 40,000 kt ft and < 60,000 kt ft	>=6252 m*m/sec and <9378 m*m/sec
Poor	<= 40,000 kt ft	<=6252 m*m/sec

**Davis Stability Index (DSI) (WFO Paducah only):** The Davis Stability Index is a common fire stability index parameter utilized primarily in the southeast United States. The formula for the Davis Stability Index is as follows:

$$\text{Davis Stability Index (DSI)} = \text{Max Temp (deg C)} - 850\text{mb Temp (deg C)}$$

If the difference is less than 10 deg C, it is considered a Category 1 or stable.

If the difference is 10 deg C to 14 deg C, it is considered a Category 2 or conditionally unstable.

If the difference is 15 deg C to 17 deg C, it is considered a Category 3 or unstable.

If the difference is greater than 17 deg C, it is considered a Category 4 or absolutely unstable.

**Extended Forecast:** A general extended forecast will be included in the fire weather planning forecast text. This will include expected general weather conditions, high and low temperatures, and 20 foot winds. The extended forecast will cover a period out to 7 days and should be considered for general planning purposes only.

**Remarks:** This section is for appropriate remarks to add value to the forecast or mark significant weather changes.

## Fire Weather Watches and Red Flag Warnings

Fire Weather Watches and Red Flag Warnings will be issued when the combination of dry fuels and weather conditions support an extreme fire danger. These conditions alert land management agencies to the potential for widespread fire control problems.

Fire Weather Watches will be issued when there is a high potential for a Red Flag event. The watch will be issued between 12 to 96 hours before the onset of warning conditions. The watch can be issued for all or select portions of the region.

**Fire Weather Watches should not be issued, or continued, to indicate that low confidence or borderline warning conditions will take place.** In these situations, forecasters should describe the expected conditions and state the reasons for forecast uncertainty in the discussion portion of the routine planning forecast.

A Red Flag Warning is used to warn of an impending, or occurring, Red Flag event. Its issuance denotes a high degree of confidence that weather and fuel conditions consistent with local Red Flag criteria will occur within 24 hours or less. Forecaster can issue the warning for all or part of their fire weather forecast area.

National Weather Services offices and user agencies are strongly encouraged to establish local general criteria for the issuances of watches and warnings. See Appendix C for the general Red Flag criteria established by each forecast office. These criteria are general parameters and they should be considered with the whole fire weather environment in mind.

**Because of the restriction of user programs brought about by a Red Flag Warning, it is imperative that the warning be promptly cancelled when the conditions cease to exist or if the conditions are no longer expected to develop. The cancellation will be issued under the RFW product header.**

## National Fire Danger Rating System (NFDRS) Fire Weather Point Forecasts

The NFDRS is a quantitative means for evaluating the fire danger across a large area such as a forest. This complex model processes daily weather observations, fuel moisture, and forecasts as inputs. The resulting numeric output and indices suggest the severity of fire danger over a large area.

The following are NFDRS/RAWS sites covered by this Annual Operating Plan (Figure 2):

Site	County	State	WIMS Station ID	Issuing WFO
Ava	Taney	Missouri	238502	Springfield
Camdenton	Camden	Missouri	235202	Springfield
Cassville	Barry	Missouri	238201	Springfield
Wah Kon Tah	Cedar	Missouri	235901	Springfield
Mt. Vernon	Lawrence	Missouri	236902	Springfield
Mountain Grove	Wright	Missouri	237201	Springfield
Mountain View	Howell	Missouri	238802	Springfield
Roby	Texas	Missouri	237301	Springfield
Chillicothe	Livingston	Missouri	231301	Pleasant Hill
Atlanta	Macon	Missouri	231501	Pleasant Hill
Clinton	Henry	Missouri	233701	Pleasant Hill
State Line	Linn	Kansas	145801	Pleasant Hill
Farmington	St. Francois	Missouri	236601	St. Louis
Sinkin	Dent	Missouri	236403	St. Louis
Sullivan	Franklin	Missouri	234502	St. Louis
Ashland	Boone	Missouri	232401	St. Louis
Council Bluff	Iron	Missouri	236501	St. Louis
MBOT	City of St. Louis	Missouri	234801	St. Louis
Big Spring	Carter	Missouri	239004	Paducah
Doniphan	Ripley	Missouri	239102	Paducah
Piedmont	Wayne	Missouri	239204	Paducah
Greenville	Muhlenberg	Kentucky	151191	Paducah
Golden Pond	Trigg	Kentucky	159901	Paducah
Crab Orchard NWR	Williamson	Illinois	119001	Paducah
Dixon Springs	Pope	Illinois	119501	Paducah
Bean Ridge	Alexander	Illinois	119701	Paducah
Fort Campbell	Montgomery	Tennessee	400201	Paducah
Stilly Hollow	Stewart	Tennessee	400101	Paducah

NFDRS forecasts will be issued daily during designated (locally agreed upon) fire weather seasons. Daily issuance times will be made on an agency by agency basis, however, it is recommended that National Weather Service offices make forecasts available as soon as possible (after the daily 100 pm observation are available) so that land management agencies can calculate burn indices, projected staffing levels, etc. as quickly as possible.

Appendix D lists the elements of a NFDRS forecast.

## Spot Forecasts (All NWS Offices)

Website: <http://www.weather.gov/spot/>

Site specific (spot) forecasts are non-routine products issued at the request of the user. NWS offices will provide spot forecast service upon request of any federal, state, or local official required to support wildfire suppression operations.

For non-wildfire purposes, resources permitting, NWS offices will provide spot forecast service under the following circumstances and conditions:

1. Upon request of any federal official who represents that spot forecast support is required under the terms of the Interagency Agreement for Meteorological Services ([NWS Instruction 10-406](#)).
2. Upon request of any state, local, or tribal official who represents that the spot forecast is required to carry out their wildland fire management responsibilities in coordination with any federal land management agency participating in the Interagency Agreement for Meteorological Services ([NWS Instruction 10-406](#)).
3. Upon request of any public safety official who represents that the spot forecast is essential to public safety. A “public safety official” is an employee or contract agent of a government agency at any level (federal, state, local, tribal, etc.) charged with protecting the public from hazards including wildland fires of whatever origin and/or other hazards influenced by weather conditions such as hazardous material releases.

**NWS offices will not provide spot forecasts to private citizens or commercial entities not acting as an agent of a government agency.**

Requests for a spot forecast will normally be transmitted to the WFO via the Internet Spot Forecast Request Program (NWS Spot), telephone, or fax.

Spot forecasts for active fires should be updated when the forecaster becomes aware of any significant unanticipated weather changes that may have an impact on fire suppression or controlled burning operations and/or safety of personnel. Updates can consist of a telephone/verbal update in lieu of a written product. Land management personnel should contact the WFO if forecast conditions become unrepresentative of the observed weather.

Unless otherwise stated by the requesting agency, the forecast parameters of sky condition, weather, temperature, relative humidity, 20 foot wind, significant/sudden changes in wind speed or direction, along with mixing heights, transport winds, and stability, if available, shall be provided.

Site forecast for ongoing wildfires are crucial to fighting fires and personnel safety. Of paramount importance are forecasts of wind velocity and humidity. For an ongoing wildfire, an attempt should be made to provide a current observation at the time a forecast is requested. The observation will aid the forecaster in preparing a more accurate site specific forecast.

### Spot Forecasts Requests via the NWS Spot Forecast Program

Spot forecasts via the Internet can be accessed from the appropriate National Weather Service office’s fire weather page. Websites: <https://www.weather.gov/spot/monitor/> (map of current spot forecasts) and <https://www.weather.gov/spot/request/> (for spot forecast requests)

**Spot Forecasts Requests via Telephone**

Spot requests via telephone should be reserved for occasions where a quick forecast update is needed and time restraints and/or available resources prohibit the use of the Internet or fax. Both the requesting agency and the WFO are highly encouraged to document as thoroughly as possible any information communicated during a phone/verbal spot forecast briefing.

**Grassland Fire Danger Index (Experimental Forecast Product WFO Springfield and WFO Kansas City/Pleasant Hill only)**

The Grassland Fire Danger Index (GFDI) values correspond to the likelihood that grassland fires will become uncontrolled. The index was developed in Australia and adapted for use in United States. The GFDI forecast is used as a fire weather planning aid for predictive service meteorologists, land management personnel, and can potentially be used by emergency management and county fire personnel to decide when to issue burn permits. The index values for days 2 through 6 are intended to be used as a planning guideline.

GFDI numeric output is based on expected relative humidity, temperature, 20 ft wind speed, and a grassland “curing index” from direct field observations. It does not account for precipitation that occurs within the hour preceding any given forecast hour or any snow on the ground at the forecast hour and appropriate adjustments in fuel condition.

The GFDI adjectives and numeric values are summarized below.

Grassland Fire Danger Adjective	GFDI Numeric Value
Low (L)	0 to 2
Moderate (M)	3 to 7
High (H)	8 to 19
Very High (V)	20 to 49
Extreme (E)	50+

GFDI values are calculated on a county basis as depicted below. Daily 24 hour index values are based on hourly data. Three hourly data is calculated for each day.

```

KSZ073-220415-
BOURBON-
INCLUDING THE CITY OF...FORT SCOTT
405 AM CST MON DEC 21 2009

                                (ALL TIME REFERENCES ARE IN CST)

DAY/DATE      24HR INDEX  *  MID  3AM  6AM  9AM  NOON  3PM  6PM  9PM
MON DEC 21    MODERATE   4  *   L   L   L   L   L   M   M   L
TUE DEC 22    LOW          2  *   L   L   L   L   L   L   L   L
WED DEC 23    MODERATE   4  *   L   L   L   L   L   M   M   M
THU DEC 24    HIGH         15 *   M   M   M   M   H   H   H   H
FRI DEC 25    HIGH          9  *   M   M   M   M   H   M   M   M
SAT DEC 26    MODERATE   5  *   M   M   M   M   M   M   M   L
    
```

## Hazardous Weather Outlooks (All NWS Offices)

Hazardous Weather Outlooks are issued by weather forecast offices to alert the general public to potentially dangerous weather situations. When a combination of meteorological conditions leads to an increased fire danger but falls short of Fire Weather Watch or Red Flag Warning criteria, this product is issued to the general public. This statement is issued to make the public aware of a heightened fire danger and to discourage open burning and careless use of smoking materials. Approval of the user agencies is not necessary to issue this statement. (See Appendix B for an example).

Fire Weather Watches and Red Flag Warnings will also be mentioned in the form of a general text message to the general public using the Hazardous Weather Outlook.

### Special Services

Special meteorological services meet the needs of agencies that often have unique requirements for weather support, and may best be performed by the fire weather meteorologist away from the home forecast office. These services usually must be initiated by the requesting agency, and costs such as travel and per diem will be charged to a reimbursable task number assigned for the project.

Special services may include fire weather station visits, familiarization trips to the forest, observer training sessions, and S-290, S-390, S-490, and other courses. The fire weather meteorologist may be asked to attend a prescribed burn when available. If the trip involves an overnight stay, the letter should state that the requesting agency will pay travel expenses. A one day trip will not incur any costs to the requesting agency. When the land management agency wishes for a fire weather forecaster to attend a course, the same procedure for requesting a forecaster to a station visitation should be followed, except that specific dates should be given in the letter. The letter will be forwarded to NWS Central Region Headquarters so that a reimbursable task code can be assigned for the trip.

#### 1. Fire Weather Stations

Supplies, equipment, and maintenance of the fire weather station are the responsibility of the land management agency (station owner). If a new station is being established, or an old station is moved to another location, a station number will be assigned by the fire weather program leader for the National Weather Service Central Region Headquarters located in Kansas City. The land management agency should provide the latitude and longitude of the new station, and the elevation when requesting a station number.

#### 2. Fire Weather Services – On Site Support

On-site forecast service is a non-routine service available from National Weather Service Offices with designated Incident Meteorologists (IMETs). The NWS will provide IMET services upon request of federal, state, tribal, or local government fire agencies in support of wildfires. This support typically includes dispatches to Incident Command Posts, but may also include dispatches to land management coordination and dispatch centers, and Area Commands.

IMET support will also be considered for non-wildfire situations if resources permit. Such uses will be limited to requests of federal fire agencies participating in the Interagency Agreement ([see NWS Instruction 10-406](#)), and requests by a public safety official who represents such support as essential to public safety ([see section 4 of National Weather Service Instruction 10-401](#)).

Procedures to request the services of an IMET are detailed in [NWS Instruction 10-402](#).

## Land Management Agency Services and Responsibilities

Operational Support and Predictive Services - The Eastern Area Fire Weather Program Manager/Meteorologist (currently Steve Marien), working remotely for the Eastern Area Coordination Center (EACC) in St. Paul, Minnesota, combines forecast information from NWS offices and other sources into area-wide summaries and briefings. This meteorologist, along with Fire Intelligence, forms the Predictive Services group which produces fire weather/fire danger assessments for Iowa. These value added products enhance short and long range forecasts issued by the NWS to assist land managers in allocating fire-fighting resources. Products issued by the EACC are available online at:

<http://gacc.nifc.gov/eacc/predictive/predictive.htm>

**Agency Computer Systems** - The communication system used to link the NWS with its users is the Weather Information and Management System (WIMS). The NWS receives user agency observations entered into WIMS via its AWIPS computer system. The principal method of dissemination of the observations and forecasts is through WIMS. Observations that are entered into WIMS at the Kansas City Computer Center are transmitted to the NWS Telecommunications Gateway Facility in Washington D.C. The observations are collected in bulletins that are transmitted to the National Weather Service Forecast Offices where they are compiled into various fire weather products and then transmitted via the NWS Telecommunications Gateway Facility to WIMS.

National Fire Danger Rating System (NFDRS) forecasts and narrative forecasts are also sent to WIMS via this system. Observations and forecasts are exchanged between WIMS and AWIPS in the USFS Kansas City Computer Center.

**Fire Weather Observations** - Station inspection, instrument maintenance, and quality control of fire weather observation systems are the responsibility of land management agencies. NWS forecasters may monitor data quality from observation sites.

## Appendices

### Appendix A - Product Identification List

Product/WMO Header	Typical Issuance Times	AWIPS PIL WFO Paducah	AWIPS PIL WFO Pleasant Hill	AWIPS PIL WFO Springfield	AWIPS PIL WFO St. Louis
Fire Weather Forecast/ FNUS53	At least twice daily 4am/4pm Other times as needed	SDFFWPAH	STLFWFEAX	STLFWFSGF	STLFWFLSX
Fire Weather NFDRS Point Forecast/ FNUS83	Once daily 2-3 pm	SDFFWMPAH	STLFWMEAX	STLFWMSGF	STLFWMLSX
Fire Weather Watch/ Red Flag Warning/ WWUS83	As needed	SDFRFWPAH	STLRFWEAX	STLRFWSGF	STLRFWLSX
Spot Forecast Requests/ BMBB91	As needed	SDFSTQPAH	STLSTQEAX	STLSTQSGF	STLSTQLSX
Spot Forecasts/ FNUS73	As needed	SDFFWSPA	STLFWSEAX	STLFWSSGF	STLFWLSX
Hazardous Weather Outlook/ FLUS43	Varies by office	SDFHWOPA	STLHWOEAX	STLHWOSGF	STLHWOLSX
Grassland Fire Danger Index (GFDI)/ FNUS63	At least twice daily 4am/4pm	NA	STLRFDEAX	STLRFDSGF	NA



## Appendix B - Fire Weather Product Examples (products will vary somewhat)

### 1. Fire Weather Planning Forecast

FIRE WEATHER PLANNING FORECAST

NATIONAL WEATHER SERVICE CITY STATE

TIME-DATE (example: 300 PM EST TUE JAN 1 2001)

...HEADLINE... (REQUIRED for Red Flag Warnings and Fire Weather Watches...significant fire weather feature(s) at other times recommended...does not include public warnings/advisories)

.DISCUSSION...(concise, clear, non-technical explanation of the current/forecasted fire weather)

SSZXXX-XXX>XXX-DDHHMM- (UGC/FIPS coding)

GEOGRAPHIC DESCRIPTORS (such as land management units, political boundaries, geographic features, and/or fire weather zones)

TIME-DATE (repeated)

...RED FLAG WARNING/FIRE WEATHER WATCH HEADLINE (as needed in each appropriate zone grouping) ...

PARAMETER	TONIGHT	TOMORROW NIGHT	TOMORROW	FOLLOWING
CLOUD COVER	(CLOUDY, MCLDY, PCLDY, CLEAR)			
CHANCE PRECIP (%)	(Percent chance precip 0-100 or areal coverage)			
PRECIP TYPE	(NONE, DRIZL, FRZ RAIN, SNOW/RAIN, RAIN, TSHWR)			
TEMP (24H TREND)	(Max/min temps as zone avg or extremes, trend not included in 3 <sup>rd</sup> or 4 <sup>th</sup> period PM forecasts)			
RH % (24H TREND)	(Max/min relative humidity as zone avg or extremes, trend not included in 3 <sup>rd</sup> or 4 <sup>th</sup> period PM forecasts)			
20FT WND MPH(VALLEY/AM)	(8 pt compass or upslope/downslope and MPH w gusts, can be VALLEY or AM wind)			
20FT WND MPH(RIDGE/PM)	(8 pt compass and MPH w/gusts, can be PM or ridge top winds)			
PRECIP DURATION	(Hours of precip in period)			
PRECIP BEGIN	(Onset of precip probability)			
PRECIP END	(Cessation of precip probability)			
PRECIP AMOUNT	(Zone avg QPF inches)			
LAL	(Lightning Activity Level)			
HAINES INDEX (LOW)	(As applicable)			
HAINES INDEX (MID)	(As applicable)			
MIXING HGT (AGL/MSL)	(Feet or meters)			
TRANSPORT WIND(KTS)	(8 pt compass)			
VENT RATE (KT-FT)	(Mixing height times transport wind)			
DISPERSION	(Locally defined category, e.g. GOOD)			
OTHER LCL OPTIONS				

REMARKS...APPROPRIATE REMARKS TO ADD VALUE AND MARK SIGNIFICANT WEATHER CHANGES.

(.FORECAST DAYS 3 THROUGH 7 may optionally be provided for each zone segment)

\$\$

[forecast for next geographical descriptor and fire weather zone group]

\$\$

.FORECAST FOR DAYS 3 THROUGH 7... (wind required days 3-5, days 6 and 7 if appropriate; other elements per locally-established policy; days 3-7 may be grouped in any combination; may be in each zone segment versus this location)

**2. Fire Weather Watch/Red Flag Warning**

URGENT – FIRE WEATHER MESSAGE

NATIONAL WEATHER SERVICE SPRINGFIELD MO

1100 AM CDT TUE APR 1 2011

...FIRE WEATHER WATCH IN EFFECT FROM WEDNESDAY AFTERNOON THROUGH EARLY WEDNESDAY EVENING FOR STRONG SOUTHWEST WINDS AND LOW RELATIVE HUMIDITY FOR EXTREME SOUTHEAST KANSAS AND PARTS OF WEST CENTRAL AND SOUTHWEST MISSOURI...

THE NATIONAL WEATHER SERVICE IN SPRINGFIELD HAS ISSUED A FIRE WEATHER WATCH. FOR HIGH AND LOW RELATIVE HUMIDITY...WHICH IS IN EFFECT FROM WEDNESDAY AFTERNOON THROUGH 8PM WEDNESDAY EVENING.

\* AFFECTED AREA...THIS WATCH INCLUDES COUNTIES ALONG AND WEST OF A LINE FROM NEVADA TO ANDERSON.

\* TIMING...STRONG SOUTHWEST WINDS ARE EXPECTED TO DEVELOP BEFORE NOON WEDNESDAY. CRITICALLY DRY HUMIDITY LEVELS ARE EXPECTED BY NOON.

\* WINDS...SOUTHWEST WINDS OF 20 TO 25 MPH WITH GUSTS TO 40 MPH.

\* RELATIVE HUMIDITY...HUMIDITIES BETWEEN 20 TO 25 PERCENT.

\* IMPACTS...STRONG WINDS AND LOW HUMIDITY ON WEDNESDAY WILL COMBINE TO RESULT IN SEVERE FIRE WEATHER CONDITIONS IN AREAS WHERE FUELS ARE DRY...ESPECIALLY IN WIND EXPOSED GRASSLAND AREAS AND DRIER SOUTH AND WEST FACING SLOPES.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

A FIRE WEATHER WATCH MEANS THAT CRITICAL FIRE WEATHER CONDITIONS ARE FORECAST TO OCCUR. LISTEN FOR LATER FORECASTS AND POSSIBLE RED FLAG WARNINGS.

&&  
\$\$

**3. Hazardous Weather Outlook**

HAZARDOUS WEATHER OUTLOOK  
NATIONAL WEATHER SERVICE SPRINGFIELD MO  
100 PM CST WED NOV 20 2002

THIS HAZARDOUS WEATHER OUTLOOK IS FOR THE MISSOURI OZARKS AND EXTREME  
SOUTHEAST KANSAS.

DAY ONE...

SOUTHWEST WINDS INCREASING TO 10 TO 20 MPH WITH HIGHER GUSTS ALONG WITH AFTERNOON RELATIVE HUMIDITY  
READINGS DROPPING TO 25 TO 30 PERCENT WILL COMBINE TO PRODUCE AN INCREASED GRASS FIRE DANGER OVER THE  
REGION TODAY. THE STRONGEST WINDS WILL OCCUR IN COUNTIES ALONG THE WESTERN MISSOURI STATE LINE WHERE  
WINDS ARE EXPECTED TO BE SOMEWHAT HIGHER.

SPOTTER CALL TO ACTION STATEMENT...

SPOTTER ACTIVATION IS NOT EXPECTED THROUGH TONIGHT.

DAYS TWO THROUGH SEVEN...

NO HAZARDOUS WEATHER IS EXPECTED.

\$\$

FIRE WEATHER OPERATING PLAN

4. Spot Forecast (from NWS Spot Internet Program—parameters will vary depending upon information requested)

```
SPOT FORECAST FOR DELL BRIDGE...USDA FOREST SERVICE
NATIONAL WEATHER SERVICE SPRINGFIELD MO
1159 AM CST MON NOV 30 2009

FORECAST IS BASED ON IGNITION TIME OF 1130 CST ON NOVEMBER 30.
IF CONDITIONS BECOME UNREPRESENTATIVE...CONTACT THE NATIONAL WEATHER
SERVICE.

.DISCUSSION...

SURFACE HIGH PRESSURE WILL GRADUALLY SHIFT EAST ACROSS THE OZARKS
TODAY. SURFACE WINDS WILL BE LIGHT AND VARIABLE THROUGH MOST OF
THE DAY WITH A SOUTHERLY DIRECTION BECOMING DOMINANT TONIGHT.

.TODAY...

SKY/WEATHER.....SUNNY.
MAX TEMPERATURE.....43 AT IGNITION...MAX 46.
MIN HUMIDITY.....60 PERCENT AT IGNITION...MIN 50 PERCENT.
20-FOOT WINDS.....WINDS NORTHWEST AT 6 MPH AT
                    IGNITION...OTHERWISE WEST WINDS 5 TO 8 MPH
                    BECOMING LIGHT.
WIND SHIFT.....NONE.
CHANCE OF PRECIP....0 PERCENT.
HAINES INDEX.....4 OR LOW POTENTIAL FOR LARGE PLUME DOMINATED
                    FIRE GROWTH AT IGNITION...MAX 4.
MIXING HEIGHT.....2500 FT AGL AT IGNITION...MAXIMUM 2000 FT AGL
                    INCREASING TO 2500 FT AGL AT IGNITION...MAXIMUM
                    2600 FT AGL IN THE AFTERNOON.
TRANSPORT WINDS....NORTHWEST 16 TO 25 MPH SHIFTING TO THE WEST 15
                    TO 17 MPH IN THE AFTERNOON.

TIME (CST)      11 AM  1 PM   3 PM   5 PM
SKY (%).....MCLEAR MCLEAR MCLEAR CLEAR
WEATHER COV.....
WEATHER TYPE...NONE   NONE   NONE   NONE
TEMP.....41     44     46     43
RH.....60     54     50     54
20 FT WIND.....NW 5   NW 5   W 5   W 3
20 FT WIND GUST.10    10    10    5
MIX HGT (FT)...2000  2600  2200  1400
TRANSPORT WIND..NW 16  NW 15  NW 15  W 17
CHC OF PCPN (%) .0    0     0     0
HAINES INDEX...4     4     4     4
```

## Appendix C - Red Flag Warning Criteria

### 1. WFO Springfield, MO

20 Ft wind $\geq$ 20 mph

RH $\leq$ 25 pct

10hr Fuel derived from RAWS site < 9%

Fire Weather Watches and Red Flag Warnings can be issued at fire weather forecaster discretion in coordination with federal and/or state wildland fire agencies.

Other notes concerning warning criteria:

There is no criterion for the duration of these parameters.

Generally WFO Springfield will issue Red Flag Warnings only when vegetation is dormant or emerging, basically after the first killing frost in October until mid-late April. In general the window would be Oct 15-Apr 30. There may be cases during unusual drought, heat, and wind where a warning might issue outside of this time period, but that would be rare. Light fuels/grasses would need to dry out and go dormant and larger 100 hour, 1000 hour, 10000 hour fuels would need to be unusually dry.

Fuel Moisture Issues: WFO Springfield will also not to issue warnings too soon after a snow melt or widespread heavy rain, especially in winter months when it takes a long time for leaf litter to dry out, especially on north facing slopes.

Borderline criteria: WFO Springfield may deviate from the stated criteria for Red Flag Warnings based on recent fire behavior and weather conditions, especially in areas of exposed one hour fuels (grassland areas) which are very wind/humidity sensitive. This would most often be the northwest half of the forecast area, especially in southeast KS and the Osage Plains region of west central Missouri. Periods of very high winds (> 30 mph) and moderate humidity (25-35%) can lead to an extreme fire danger. In general, we will issue more Red Flag Warnings over southeast Kansas and western/central Missouri counties versus the more densely forested eastern Missouri Ozarks.

Red Flag Warnings may be issued at the request of federal and/or state land management. The request must come from the Missouri-Iowa Interagency Coordination Center (<http://www.fs.fed.us/r9/forests/marktwain/fire/momoc/>) which is located at the Mark Twain National Forest Headquarters in Rolla, MO (Phone: 866-800-8595/573-341-7484 or 7455 Fax: 573-426-6800).

### 2. WFO Pleasant Hill, MO

20 Ft wind $\geq$ 20 mph

RH $\leq$ 25 pct

10hr Fuel derived from RAWS site < 9%

Fire Weather Watches and Red Flag Warnings can be issued at fire weather forecaster discretion in coordination with wildland fire agencies.

Other notes concerning warning criteria:

## FIRE WEATHER OPERATING PLAN

There is no criterion for the duration of these parameters.

Generally WFO Pleasant Hill will issue Red Flag Warnings only when vegetation is dormant or emerging, basically after the first killing frost in October until mid-late April. In general the window would be Oct 15-Apr 30. There may be cases during unusual drought, heat, and wind where we might issue outside of this time period, but that would be extremely rare. Light fuels/grasses would really need to dry out and go dormant and larger 100 hour, 1000 hour, 10000 hour fuels would need to be dryer than normal.

Fuel Moisture Issues: WFO Pleasant Hill will not issue Red Flag Warnings too soon after a snow melt or widespread heavy rain, especially in winter months when it takes a long time for leaf litter to dry out.

### **3. WFO Paducah, KY**

20ft 10 min winds >15 mph

RH < 25%

10 hr fuels < 9%

Fire Weather Watches and Red Flag Warnings can be issued at fire weather forecaster discretion in coordination with wildland fire agencies.

### **4. WFO St. Louis, MO**

20 ft 10 min winds > 15 mph

RH < 25%

10 hr fuels < 9%

Fire Weather Watches and Red Flag Warnings can be issued at fire weather forecaster discretion in coordination with wildland fire agencies.

## Appendix D. National Fire Danger Rating System (NFDRS) Point Forecasts

Example of a NFDRS forecast (raw comma delimited text):

FCST,238602,990503,13,2,72,65,1,1,S,15,M,72,54,95,35,0,0,N

ID	DATE	VT	WX	TT	RH	L1	L2	DD	VV	M	TX	TN	HX	HN	D1	D2	Y/N
1	2	3	4	5	6	7	8	9	10	1	12	13	14	15	16	17	18
238602	990503	13	2	71	60	1	1	S	14	M	77	52	95	30	0	1	N

FCST...must always precede the forecast and each entry must be separated by a comma.

### 1. Station I.D. (ID)

Each station forecast point has an identification number assigned to it.

### 2. Date (DATE)

The date in the YYMMDD format. This is the valid date for the point forecast. A forecast valid March 1 1997 would be coded as 970301. (Today's product would have tomorrow's date).

### 3. Valid Time (VT)

This is the valid time for the forecast...1300 CST tomorrow (1pm).

### 4. State of Weather (WX)

Forecasters will select the highest code for state of weather which will describe the weather at the basic observation time the next day. It is important to distinguish between codes 5, 6, 7 (long duration stratiform precipitation) and code 8 and 9 (showers, thunderstorms). A forecast of code 5, 6, 7 will zero out the indices in the NFDRS. This is essentially like setting the wet flag to y (yes). Unless there is overwhelming meteorological support to justify codes 5, 6, or 7, use code 8 or 9 where applicable.

Weather codes: 0=Clear 1=Scattered 2=Broken 3=Overcast 4=Fog 5=Drizzle 6=Rain 7=Snow/Sleet 8=Showers 9=Thunderstorm

### 5. Temperature (TT)

This is the valid time for the forecast...1300 CST tomorrow (1pm). Units are in degrees Fahrenheit (deg F).

### 6. Relative Humidity (RH)

Relative humidity at basic observation time of 1300 CST tomorrow (1 pm).

### 7 and 8. Lightning Activity Level (L1) and (L2)

## FIRE WEATHER OPERATING PLAN

This is the predicted lightning activity level. **Some NWS offices do not forecast this parameter and in these cases a default value of 1 (no thunderstorms) is always entered.**

L1 is the lightning activity level predicted from 1:00 PM to midnight. L2 is the lightning activity level from midnight to the next midnight. A single digit (1 through 6) will be used.

1 - No thunderstorms (default value)

2 - Few building cumulus with isolated thunderstorms.

3 - Much building cumulus with scattered thunderstorms, with light to moderate rain.

4 - Thunderstorms common, not obscuring the sky, with moderate rain.

5 - Thunderstorms common, occasionally obscuring the sky, with moderate to heavy rain.

6 - Much building cumulus with scattered thunderstorms, dry/no rain. (Same as 3, but dry, no rain.)

### **9. Wind Direction (DD)**

Wind direction by compass points (i.e. N, NE, E, SE, S, SW, W, NW).

### **10. Wind Speed (VV)**

This is the forecast 10-minute average 20 foot wind speed in miles per hour at 1:00 PM tomorrow. Since most surface observation stations used for National Weather Service forecasts measure wind speed/direction at 10 meters (roughly 33 feet) with a two minute average, a reduction factor is used to arrive at the 20 foot wind forecast.

### **11. 10 Hour Time Lag Fuel Moisture (M)**

The 10-hour time lag fuel moisture is entered as M for missing or left blank.

### **12. Maximum Temperature (TX)**

The maximum temperature (deg F) expected during the 24-hour period from basic observation time today to basic observation time tomorrow. The maximum value cannot be lower than what was observed today or forecast at basic observation time tomorrow.

### **13. Minimum Temperature (TN)**

The minimum temperature (deg F) expected during the 24-hour period from basic observation time today to basic observation time tomorrow. The forecast minimum cannot be higher than the temperature observed or forecast at the basic observation time.

### **14. Maximum Relative Humidity (HX)**

Forecast maximum humidity over the 24-hour period between basic observation times.

### **15. Minimum Relative Humidity (HN)**



## FIRE WEATHER OPERATING PLAN

Forecast minimum humidity (deg F) over the 24-hour period between basic observation times. The minimum value forecast cannot be higher than the observed or forecast values at basic observation times.

### **16. Precipitation Duration 1:00 PM to 5:00 AM (D1)**

The expected duration in whole hours that precipitation will fall at the site for the first 16 hours during the 24-hour period between observation times.

### **17. Precipitation Duration 5:00 AM to 1:00 PM (D2)**

The expected duration in whole hours that precipitation will fall at the site for the last 8 hours during the 24-hour period between observation times.

### **18. Wet Fuels Conditions (Y/N)**

By default, this parameter should be set to no (N). One exception to the default will be if snow cover exists at the forecast point.