

2022

WISCONSIN

FIRE WEATHER OPERATING PLAN

AGENCIES PARTICIPATING IN THIS PLAN INCLUDE:

NATIONAL WEATHER SERVICE,
WISCONSIN DEPARTMENT OF NATURAL RESOURCES,
DEPARTMENT OF THE INTERIOR'S BUREAU OF INDIAN AFFAIRS,
FISH & WILDLIFE SERVICE, AND
NATIONAL PARK SERVICE, AND
DEPARTMENT OF AGRICULTURE, FOREST SERVICE.

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I. INTRODUCTION

The National Weather Service (NWS) is legally mandated to provide a Fire Weather Program and there is a requirement from the customers for the NWS to supply the fire weather services. This annual operating plan describes the policies, procedures and relationship the NWS will have with the federal wildland fire management agencies, as well as with the state of Wisconsin wildland fire management agencies. This operating plan complies with and complements the Interagency Agreement for Meteorological Services. Those involved in the interagency agreement with the Department of Commerce, National Oceanic Atmospheric Administration-NWS are the Department of the Interior's Bureau of Land Management, Bureau of Indian Affairs, Fish & Wildlife Service and National Park Service, and the Department of Agriculture, Forest Service.

The Operating Plan is updated annually and is reviewed by representatives of the NWS and each user agency prior to the onset of the spring fire season. All parties should have a copy of this plan available for reference purposes. Each fire management agency receiving this plan will be responsible for duplicating and distributing this plan to its field offices, which require NWS forecasts.

A. SUMMARY OF CHANGES FOR 2022

1. Information about the National Weather Service DSS Packet for Fire Weather Watch coordination was added to page 23.
2. Website links and contact information were updated throughout this document.

II. ORGANIZATIONAL DIRECTORY

A. NWS OFFICES AND POINTS OF CONTACT

1. WFO Milwaukee/Sullivan

Backup Office: WFO Green Bay

National Weather Service
N3533 Hardscrabble Road.
Dousman, WI 53118
Phone Number...262-965-2197
Internet Address: <http://www.weather.gov/mkx/fire>

Meteorologist-in-Charge: Kevin Lynott
Fire Weather Focal Point: J. J. Wood
Assistant Fire Weather FP: Jaclyn Anderson

kevin.lynott@noaa.gov
james.wood@noaa.gov
jaclyn.anderson@noaa.gov

2. WFO La Crosse

Backup Office: WFO Des Moines

National Weather Service
N2788 County Road FA
La Crosse, WI 54601
Phone Number...608-784-8292
Internet Address: <http://www.weather.gov/arl/fire>

Meteorologist-in-Charge: Todd Shea
Fire Weather Focal Point: Michael Kurz

todd.shea@noaa.gov
michael.kurz@noaa.gov

3. WFO Green Bay

Backup Office: WFO Milwaukee/Sullivan

National Weather Service
2485 South Point Road
Green Bay, WI 54313-5522
Phone Number...920-497-8771
Internet Address: <http://www.weather.gov/grb/fire>

Meteorologist-in-Charge: Matt Lorentson
Fire Weather Focal Point: Tim Kieckbusch
Assistant Fire Weather FP: Keith Cooley

matthew.lorentson@noaa.gov
tim.kieckbusch@noaa.gov
keith.cooley@noaa.gov

4. WFO Twin Cities/Chanhassen

Backup Office: WFO Duluth

National Weather Service
1733 Lake Drive West
Chanhassen, MN 55317
Phone Number...952-361-6671
Internet Address: <http://www.weather.gov/mpx/fire>

Meteorologist-in-Charge: Dan Hawblitzel
Fire Weather Focal Point: Mike Griesinger

daniel.hawblitzel@noaa.gov
michael.griesinger@noaa.gov

5. WFO Duluth

Backup Office: WFO Twin Cities/Chanhassen

National Weather Service
5027 Miller Trunk Highway
Duluth, MN 55811
Phone Number...218-729-0653

Internet Address: <http://www.weather.gov/dlh/fire>
Fire Weather Dashboard: <https://www.weather.gov/dlh/fwd>

Meteorologist-in-Charge: Chris Gitro christopher.gitro@noaa.gov
Fire Weather Focal Point: Jonathan Wolfe jonathan.wolfe@noaa.gov
Assistant Fire Weather FP: Woody Unruh woodrow.unruh@noaa.gov

6. WFO Des Moines

Backup Office: WFO La Crosse

National Weather Service
9607 NW Beaver Drive
Johnston, IA 50131
Internet Address: <http://www.weather.gov/dmx/fire>

Meteorologist-in-Charge: Donna Dubberke donna.dubberke@noaa.gov
Fire Weather Focal Point (Acting): Mike Fowle michael.fowle@noaa.gov

7. Other Important Contacts

Larry Van Bussum, Operations Section Chief – National Weather Service Fire Weather
National Interagency Fire Center (NIFC)
3833 South Development Avenue, Bldg 3807
Boise, ID 83705-5354
E-mail: Larry.Vanbussum@noaa.gov
National Fire Weather website: <https://www.weather.gov/fire/>

Chris Foltz, Fire Weather Program Manager
National Weather Service,
Central Region Headquarters
7220 NW 101st Terrace
Kansas City, MO 64153
Email: Christopher.Foltz@noaa.gov
Central Region website: <http://www.weather.gov/crh/>

Heath Hockenberry
National Fire Weather Program Leader
National Weather Service
3833 South Development Ave.
Boise, ID 83705
E-mail: Heath.Hockenberry@noaa.gov

B. PARTICIPATING AGENCIES

1. U.S. Forest Service (USFS)
 - a. Chequamegon-Nicolet National Forests in northern Wisconsin
2. U.S. Fish and Wildlife Service (USFWS)
 - a. Necedah National Wildlife Refuge in Juneau County
 - b. Horicon National Wildlife Refuge in Dodge County
 - c. Leopold Wetland Management District in Columbia County
3. Bureau of Indian Affairs (BIA)
4. National Park Service (NPS)
5. Wisconsin Department of Natural Resources (WDNR)

CONTACTS FOR THESE AGENCIES ARE LOCATED IN THE APPENDIX.

III. SERVICES PROVIDED BY THE NWS

A. Basic Services

This section describes the fire weather products and services provided by the NWS as described in National Weather Service Directive NWSI 10-401. Since there are no full-time forecasters devoted solely to fire weather, fire weather duties are scheduled among other warning and forecast responsibilities. **However, spot forecasts for wildfires are treated with a high priority.**

Fire weather forecasts will be prepared by the NWS for various fire control agencies in Wisconsin on a seasonal time schedule from early spring to late fall. Start-up and termination of the fire weather season is mainly dictated by snow coverage across Wisconsin and will be requested by the fire control agencies. The fire control agencies (i.e. WDNR, USFS) shall provide the NWS at least one week of advanced notice prior to the start-up of the fire season.

History indicates spring to be the most active season for fire weather, since dead fuels are abundant, and the relative humidity is sometimes quite low. Fall is another peak time for fire weather, due to a new source of fuel from dead vegetation as a result of freeze damage.

Here are the general time periods for each season:

Spring season March 15 to June 15
 Summer season June 15 to September 1
 Fall season September 1 through Thanksgiving weekend

The NWS is responsible for routine and non-routine forecasts, which include the Fire Weather Planning Forecast (FWF), NFDRS point forecasts (FWM), Spot Forecasts (FWS) for prescribed burning and wildfires, Fire Weather Watches (RWF), and Red Flag Warnings (RWF). Most of these products will be available on the Weather Information Management System (WIMS) and/or the internet web sites of the NWS and Eastern Area Coordination Center (EACC). The NWS websites are listed in the Organizational Directory.

The website for the EACC in the Great Lakes region is:

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

Some additional fire weather forecasts that can be obtained on this website are the weekly, monthly and seasonal **fire potential outlooks**. Fire weather agencies are encouraged to remain informed on these outlooks.

Table 1 below outlines the responsibilities of each NWS office and their respective geographic area. Figure 1 also indicates area of responsibility.

Table 1. Forecast times, product identifiers and area responsibility of NWS offices

Office	7:00 AM LT 3:00 PM LT	Point forecast 3:30 PM CDT	Spot forecast on request	Watch/Warning	Fire district
Duluth	MSPFWFDLH	MSPFWMDLH	phone, web-based MSPFWSDLH	MSPRFWDLH	955 956 957
Chanhasen	MSPFWFMPX	MSPFWMMPX	phone, web-based MSPFWSMPX	MSPRFWMPX	961
La Crosse	MKEFWFARX	MKEFWMARX	phone, web-based MKEFWSARX	MKERFWARX	962 963 964
Milwaukee/ Sullivan	MKEFWFMKX	MKEFWMMKX	phone, web-based MKEFWSMKX	MKERFWMKX	965 966 967

Green Bay	MKEFWFGRB	MKEFWMGRB	phone, web-based MKEFWSGRB	MKERFWGRB	958, 959 960 965
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Note: The fire weather responsibility of fire weather zone 965 is shared by WFO Milwaukee/Sullivan and WFO Green Bay. WFO Milwaukee/Sullivan has fire weather responsibility for Marquette and Green Lake counties of zone 965, while WFO Green Bay has fire weather responsibility for Waushara County of zone 965.

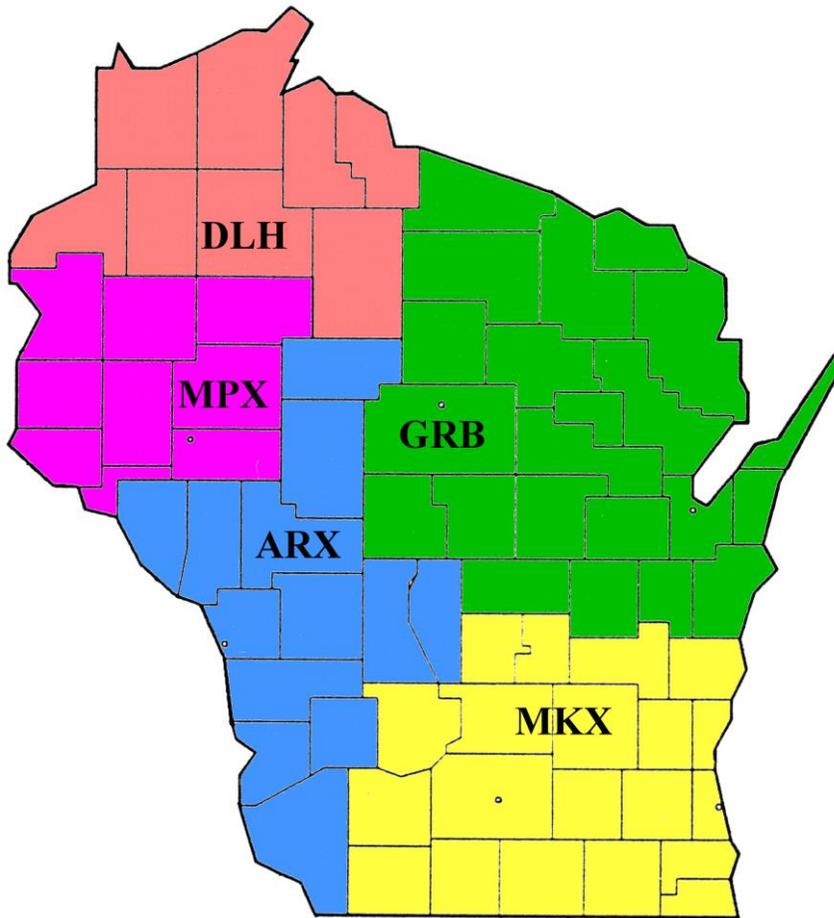


Figure 1. Forecast Areas

Products Issued:

1. Planning Forecasts
2. NFDRS Forecasts
3. Spot Forecasts
4. Fire Weather Watch
5. Red Flag Warning

1. Routine Fire Weather Planning Forecasts

The Fire Weather Planning Forecast is a zone-type product used by land management personnel. It is primarily for input in decision-making related to pre-suppression and other planning. The decisions impact firefighter safety, protection of the public and property, and resource allocation.

The morning and afternoon Fire Weather Planning Forecast (AWIPS/WIMS product **MKEFWFMKX, MKEFWFGRB, MKEFWFARX, MSPFWFMPX** or **MSPFWFDLH**) will be broken down into 74 zones with a zone number assigned to each Wisconsin county (**Figure 2**). Many zones will usually be combined to form one forecast group. The morning and afternoon forecast will be entered into the NWS AWIPS computer system by 700 AM LT and 3-330 PM LT respectively. They are then available to users via WIMS, NWS office web sites, or Predictive Services web sites at the GACCs.

The elements in the narrative forecast are:

Headline (Required for Red Flag Warnings and Fire Weather Watches)

- may also headline other significant weather concerns or changes.

Discussion

- written with enough detail to give users knowledge of weather causes during the forecast period. Brief enough to make radio dissemination as efficient as possible.
- provides frontal positions, movements and timing.
- serves as a vehicle to discuss reasoning for headlines or expected changes in critical parameters such as temperature, humidity, and wind.
- A note will be used, in this section, to alert for YouTube video briefings, or other special briefings, for the more critical fire weather days.

Sky/Weather

- sky and general weather conditions (Appendix F) including trends.
- as specific as possible on timing, duration and coverage of precipitation.
- as specific as possible on cloud coverage, type, and trends.

High and low temperature

- temperature ranges should be kept as small as possible, around 5 degrees or less.

Relative humidity

- forecast daytime minimum and nighttime maximum.
- humidity ranges of 5 percent when RH is 40 percent or less; a maximum range of 10% can be used for RH greater than 40 percent.

20-foot wind speed (mph) and direction

- as specific as possible on timing of significant speed and directional changes
- given in ranges of 5 mph or less and includes gusts
- forecast direction to nearest 8 cardinal compass points (northwest, north, southeast)

Other elements included:

Haines Index

- low level determined from the 950 - 850 MB level (about 1,000 ft to 5,000 ft.)
- attached to “DAY” periods
- provided by all NWS offices year-round (use Point-And-Click option to get Hourly Weather Graph. Select Haines Index option from Fire Weather parameters and select Submit).

Smoke Management parameters

- depth of the mixing layer. The average mixing height from 12 to 18 hours local time.
- attached to “DAY” periods
- transport winds (speed and direction) in the mixing layer dispersion index consisting of a number and a text ranking of poor, fair, good, or excellent (Appendix B explains the terms used in smoke management)
- provided by all NWS offices year-round (use Point-And-Click option to get Hourly Weather Graph. Select Mixing Height, Transport Winds and Ventilation Rate options from Fire Weather parameters and select Submit).

Hours of sunshine

- important for assessing probability of ignition of fine fuels (strong insolation can make them more likely to ignite)

Precipitation amount

- coverage and expected amount

Extended forecasts

- added after each forecast group providing forecasts for the Day 3-7 period.
- Includes the following: sky/weather, temperature, with a wind forecast thru Day 7.

**Optional elements in narrative forecasts may vary slightly between NWS offices

Examples of the morning and afternoon Fire Weather Planning Forecast are located on pages 13-16. The morning format includes the first three forecast periods, while the afternoon forecast will include an additional 4th period.

Morning Planning Forecast Example:

FNUS53 KMKX 070925
FWFMKX

Fire Weather Planning Forecast for Southern Wisconsin
National Weather Service Milwaukee/Sullivan WI
325 AM CST Tue Mar 7 2017

.DISCUSSION...

Strong low pressure north of Lake Superior will move toward Hudson Bay Canada. In the wake of the cold front that has exited eastern Wisconsin, very strong gradient winds, coupled with deep mixing and low dew points, will quickly dry things out.

Very windy conditions will continue into Wednesday, with cooler temperatures expected on northwest winds. The remainder of the week will be cool.

WIZ046-047-056-057-080015-
Marquette-Green Lake-Sauk-Columbia-
Including the cities of Montello, Westfield, Oxford, Neshkoro,
Endeavor, Berlin, Princeton, Markesan, Baraboo, Reedsburg,
Prairie Du Sac, Sauk City, Portage, Columbus, Lake Wisconsin,
and Lodi
325 AM CST Tue Mar 7 2017

.TODAY...

Sky/weather.....Partly sunny. Slight chance of rain showers
after 1700. Chance of showers 20 percent.
Max temperature.....46-51.
Min humidity.....30-35 percent.
20-foot winds.....Southwest winds 18 to 23 mph with gusts to
around 45 mph.
Haines Index.....5 or moderate.
Hours of Sun.....7 Hours.
Precipitation.....Isolated trace to 0.05 inch amounts.
Mixing Height.....Around 9100 ft AGL (Ave 12-6 PM).
Transport winds....West around 39 mph (Ave 12-6 pm).
Smoke dispersal.....Around 313000 or excellent (Ave 12-6 PM).

.TONIGHT...

Sky/weather.....Partly cloudy. Chance of rain showers until
1900, then slight chance of rain showers until
2400. Chance of showers 30 percent.
Min temperature.....27-32.
Max humidity.....65-70 percent.
20-foot winds.....West winds 15 to 20 mph. Gusts up to 35 mph
increasing to 45 mph early in the morning.
Precipitation.....Isolated Trace to 0.05 inch amounts.

.WEDNESDAY...

Sky/weather.....Mostly sunny.
Max temperature.....38-43.
Min humidity.....27-32 percent.
20-foot winds.....West winds 19 to 24 mph with gusts to around 45
mph.
Haines Index.....5 or moderate.
Hours of Sun.....10 Hours.
Precipitation.....None.
Mixing Height.....Around 5500 ft AGL (Ave 12-6 PM).
Transport winds.....West around 40 mph (Ave 12-6 pm).

Smoke dispersal.....Around 195000 or excellent (Ave 12-6 PM).

.FORECAST DAYS 3 THROUGH 7...
.WEDNESDAY NIGHT...Partly cloudy. Lows 20 TO 25. Northwest winds 11 to 16 mph with gusts to around 30 mph.
.THURSDAY...Mostly cloudy. Highs 35 TO 40. Northwest winds 5 to 8 mph.
.THURSDAY NIGHT...Partly cloudy. Lows 15 TO 20. Northwest winds 5 to 10 mph.
.FRIDAY...Partly sunny. Highs 25 TO 30. North winds 6 to 11 mph.
.FRIDAY NIGHT...Partly cloudy. Lows 10 TO 15. North winds 5 to 7 mph.
.SATURDAY...Mostly cloudy. Slight chance of snow. Highs 25 TO 30. Northeast winds 5 to 7 mph. Chance of snow 20 percent.
.SATURDAY NIGHT...Partly cloudy. Lows 15 TO 20. Northeast winds 5 to 6 mph.
.SUNDAY...Partly sunny. Chance of snow. Highs 30 TO 35. Southwest winds 5 to 7 mph. Chance of snow 40 percent.
.SUNDAY NIGHT...Mostly cloudy. Chance of snow. Lows 20 TO 25. South winds 5 to 7 mph. Chance of snow 50 percent.
.MONDAY...Snow and rain likely. Highs 35 TO 40. Southeast winds 5 to 7 mph. Chance of precipitation 70 percent.

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. . . (other zone groups and forecasts from the remainder of the NWS office's county area of responsibility).

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The Afternoon Planning Forecast:

The afternoon planning forecast includes the same bulleted weather parameters as the morning planning forecast. The difference is a detailed, bulleted forecast is provided for the first four periods TONIGHT, TOMORROW, TOMORROW NIGHT and the NEXT DAY.

Afternoon Planning Forecast Example:

FNUS53 KMKX 082025
FWFMKX

Fire Weather Planning Forecast for Southern Wisconsin
National Weather Service Milwaukee/Sullivan WI
225 PM CST Wed Mar 8 2017

.DISCUSSION...The strong gusty west winds will gradually ease this evening, as high pressure builds into the state. The high will bring a lighter wind regime tonight into Thursday. A low pressure system passing to our south will bring the chance for some light snow on Thursday, mainly in the morning.

WIZ046-047-056-057-091215-
Marquette-Green Lake-Sauk-Columbia-
Including the cities of Montello, Westfield, Oxford, Neshkoro,
Endeavor, Berlin, Princeton, Markesan, Baraboo, Reedsburg,
Prairie Du Sac, Sauk City, Portage, Columbus, Lake Wisconsin,
and Lodi
225 PM CST Wed Mar 8 2017

.TONIGHT...
Sky/weather.....Partly cloudy until 0300, then mostly cloudy.

Slight chance of snow after 0300 until 0500,
then chance of snow. Chance of snow 40 percent.
Min temperature.....21-26.
Max humidity.....63-68 percent.
20-foot winds.....West winds 15 to 20 mph with gusts to around 35
mph becoming northwest 5 to 10 mph after
midnight.
Precipitation.....Scattered Trace to 0.05 inch amounts.

.THURSDAY...

Sky/weather.....Mostly cloudy. Chance of snow until 0900, then
slight chance of snow until 1100. Chance of
snow 40 percent.

Max temperature.....34-39.
Min humidity.....38-43 percent.
20-foot winds.....Northwest winds 5 to 9 mph.
Haines Index.....4 or low.
Hours of Sun.....2 Hours.
Precipitation.....Scattered Trace to 0.05 inch amounts.
Mixing Height.....Around 3100 ft AGL (Ave 12-6 PM).
Transport winds.....Northwest around 12 mph (Ave 12-6 pm).
Smoke dispersal.....Around 35000 or good (Ave 12-6 PM).

.THURSDAY NIGHT...

Sky/weather.....Mostly cloudy until 1900, then partly cloudy
until 0300, then clear.

Min temperature.....9-14.
Max humidity.....60-65 percent.
20-foot winds.....Northwest winds 8 to 13 mph. Gusts up to 30
mph.
Precipitation.....None.

.FRIDAY...

Sky/weather.....Mostly sunny.
Max temperature.....21-26.
Min humidity.....18-23 percent.
20-foot winds.....Northwest winds 10 to 15 mph with gusts to
around 25 mph.
Haines Index.....5 or moderate.
Hours of Sun.....10 Hours.
Precipitation.....None.
Mixing Height.....Around 4900 ft AGL (Ave 12-6 PM).
Transport winds.....Northwest around 19 mph (Ave 12-6 pm).
Smoke dispersal.....Around 79000 or excellent (Ave 12-6 PM).

.FORECAST DAYS 3 THROUGH 7...

.FRIDAY NIGHT...Partly cloudy. Lows zero to 10 above. North winds
5 to 9 mph.

.SATURDAY...Partly sunny. Highs 25 TO 30. North winds 5 to 7 mph.

.SATURDAY NIGHT...Partly cloudy. Lows 10 TO 15. Northwest winds
around 5 mph.

.SUNDAY...Partly sunny. Highs 30 TO 35. North winds around 5 mph.

.SUNDAY NIGHT...Mostly cloudy. Chance of snow. Lows 15 TO 20.

East winds 5 to 7 mph. Chance of snow 50 percent.

.MONDAY...Snow likely. Highs 30 TO 35. Northeast winds 5 to
9 mph. Chance of snow 70 percent.

.MONDAY NIGHT...Partly cloudy. Slight chance of snow. Lows 15 TO
20. North winds 5 to 8 mph. Chance of snow 20 percent.

.TUESDAY...Partly sunny. Highs 30 TO 35. Northwest winds 5 to
8 mph.

.TUESDAY NIGHT...Mostly clear. Lows 15 TO 20. West winds 5 to
6 mph.

.WEDNESDAY...Partly sunny. Highs 35 TO 40. Southwest winds 5 to
8 mph.

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(other zone groups and forecasts from the remainder of the NWS office's area).

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Updates to Fire Weather Planning Forecasts

Updates and a reason for an update will be provided whenever forecast conditions become unrepresentative. Fire agencies are also encouraged to call their local NWS office when the forecast is unrepresentative, or the forecasts between NWS offices are sufficiently different at the geographical NWS borders to create uncertainty among the fire weather users. Additionally, updates will be made to the morning or afternoon Fire Weather Planning Forecasts for changes in Red Flag headlines (coordination required) which include:

1. New issuance of a Fire Weather Watch or Red Flag Warning.
2. Upgrading from a Fire Weather Watch to a Red Flag Warning.
3. Change an area outline of a Fire Weather Watch or Red Flag Warning.
4. Cancellation of a Fire Weather Watch or Red Flag Warning.

Also, updates will be made when the following conditions are met during a Fire Weather Watch or Red Flag Warning:

1. Precipitation occurrence or non-occurrence if different from the forecast.
2. Wind speed differs by more than 5 mph.
3. Temperature differs by more than 5 degrees Fahrenheit.
4. Relative Humidity differs by 5% or more.

2. NFDRS point forecasts

A point forecast will be issued for a fire weather user reporting an observation for any given day and must be entered into AWIPS before 3:30 PM CDT/2:30 PM CST (2030 UTC). The point forecasts are then used to calculate output from the National Fire Danger Rating System (NFDRS). The output is used by land management agencies to determine fire danger levels, staffing, and resource needs. NWS forecasters can retrieve this data under the AWIPS identifier **NMCFDICR**. Critical fire danger situations may exist when the energy release component (ERC) is 44 or higher in the q-fuel model (Jack Pine) and/or the 10-hour fuel moisture (10 H) is less than 10%.

Up to 37 point forecasts may be issued on a particular day statewide with high fire danger levels. But during wet periods or after green-up, there is considerably less point forecasts requested with land agencies. During periods of low fire danger, point forecasts may be terminated on weekends. In addition, after green-up in early June, and with the offering of a normal or wetter than normal summer, point and narrative forecasts may be terminated for all days until late summer, or when land agencies feel that point forecasts or narratives are again necessary.

A listing of observations from 1900 UTC is obtained from two separate transmissions at 1930 UTC and 2015 UTC. The transmissions are under the AWIPS identifier **NMCFWO CR**. After the point forecasts are issued, a third transmission of NMCFWO CR, at 2030 UTC, will list the point forecasts for that day. Point forecasts for NFDRS sites can be found under the identifiers MKEFWMMKX, MKEFWMGRB, MKEFWMARX, MSPFWMMPX or MSPFWMDLH. See **figure 2** for the location of NFDRS sites and **Table 2** for the format of the NFDRS forecasts. A catalog of all the NFDRS sites for Wisconsin is located in Appendix F.

Table 2. Fire weather point forecast coding reference

The format is: (commas but NO spaces)	
FCST,SSCCNN,YYMMDD,VT,W,TT,RH,L1,L2,DD,VV,M,TM,TN,HM,HN,P1,P2,WF	
STN # code SSCCNN where SS = State (21 is MN) CC = County NN = station	
SSCCNN – 6-digit station number from above	
YYMMDD - valid day of forecast - year/month/day (The forecast made on April 10, 2007 for the 11th would be 070411)	
VT - Valid time (always a 13 for 1300 CST or 2 pm CDT)	
W - State of the weather at 1300 CST tomorrow, as shown below:	
0	= less than 1/8 clouds
1	= 1/8 to 4/8 opaque clouds
2	= 5/8 to 7/8 opaque clouds
3	= cloudy (Note: categories 5, 6, or 7 set NFDRS indices to zero)
4	= fog
5	= drizzle
6	= rain
7	= snow/sleet
8	= showers
9	= thunderstorms
TT	= temperature for 1300 CST tomorrow
RH	= relative humidity for 1300 CST tomorrow
* L1	= lightning activity level (1400 CST today until 2300 CST). Always a “1” in Wisconsin
* L2	= lightning activity level (2300 CST today until 2300 CST tomorrow). Always a “1” in WI.
DD	= wind direction at 1300 CST tomorrow (16 point compass)
VV	= 20 ft wind speed in mph at 1300 CST tomorrow
M	= 10 hr fuel moisture (input by the users and left blank by the forecaster). Two commas will be noted next to each other
TM	= maximum temperature from 1300 CST to 1300 CST
TN	= minimum temperature from 1300 CST to 1300 CST
HM	= maximum humidity in percent from 1300 CST to 1300 CST
HN	= minimum humidity in percent from 1300 CST to 1300 CST
P1	= pcpn duration in hours from 1300 CST today till 0500 CST tomorrow
P2	= pcpn duration in hours from 0500 CST tomorrow till 1300 CST tomorrow
WF	= Wet Flag. A Y or N. It is used to indicate if fuels will be wet at 1300 CST. Use with caution, a “Y” will set all NFDRS indices to ZERO! In most cases a “N” is recommended.

3. Spot forecasts

a) Criteria - Spot forecasts are site specific forecasts in support of wildfire suppression and natural resource management. Spot forecasts for a wildfire will be treated with a priority similar to that of severe weather warnings. It is the responsibility of the requestor to indicate that the request is for wildfire suppression.

By [Interagency Agreement](#) and [NWSI 10-401](#), the NWS will provide spot forecasts to any federal, state, tribal, or local official for support of a wildfire.

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

- a. Upon request of any federal official who represents that the spot forecast is required under the terms of the [Interagency Agreement for Meteorological Services](#) and [NWSI 10-401](#).
- b. Upon request of any state, tribal, or local official who represents that the spot forecast is required to carry out their wildland fire management responsibilities in coordination with a federal land management agency participating in the [Interagency Agreement for Meteorological Services](#).
- c. 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 release.

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

Requestor Identification - The requestor for each spot forecast must provide the following information before a spot forecast can be issued.

- a. Name
- b. Government agency
- c. Address and phone number
- d. Representation as to the reason for the spot forecast, which must be one of the reasons indicated above.

A current on-site weather observation should accompany the forecast request. The requestor should specify how the wind measurement was obtained (20-foot or eye-level). In the case of a wildfire or prolonged prescribed burn, updated observations should be provided during the course of the event. Land management personnel should contact the servicing NWS office if forecast conditions appear unrepresentative of actual weather conditions. Spot forecasts should be considered one-time requests and are not routinely updated unless representative observations are available to the forecaster. Feedback from land management personnel is also encouraged during or after the burn.

Users are asked to read the Fire Weather Planning Forecast before making a spot forecast request. To hold the number of spot forecasts to a manageable level, internal coordination and planning should be done by user agencies making forecast requests.

b) Content and Format - The standard format for wildfire spots includes the following: headlines (Red Flag Warning or Fire Weather Watch) explaining what, when, where and why; discussion, sky/weather, temperature, relative humidity, and wind. Other optional elements may also be provided. See example below.

The content of non-wildfire spots should conform to the standard format for wildfire spots, though the content and number of forecast periods may be different, as determined by the requestor. Users should be as specific as possible when making a forecast request.

To aid in making smoke management decisions, requestors may now request HYSPLIT trajectory data as part of their Spot Forecast request. More detailed information and instructions can be found in Appendix B, HYSPLIT Requests.

c) Procedures - The [NWS Spot Forecast Request website](#) is the national standard for requesting, issuing, and retrieving spot forecasts. This website will be used for all spot forecast information across the country. Spot forecasts can also be requested by phone or fax, as a backup to the Spot Forecast website. A phone call must accompany the fax request, so the forecaster is aware of the request.

The requesting agency should provide information about the location, topography, fuel type(s), size, ignition time, and a contact and telephone number of the responsible land management official. When possible, a representative weather observation should accompany the request. As indicated above in section 3a, requestor information justifying the spot forecast request must also be provided for the forecast request to be honored.

Feedback to the NWS office providing the spot forecast is highly encouraged, and can be submitted via the feedback option on the [NWS Spot Forecast Monitor website](#).

MIXING HEIGHT.....Decreasing to 300-800 ft AGL in the late evening
and overnight.
TRANSPORT WINDS.....West 12 to 20 mph shifting to the northwest 8
to 9 mph after midnight.
SMOKE DISPERSAL.....Poor to good (2100-52000 knot-ft).

TIME (CST)	6 PM	8 PM	10 PM	MIDNGT	2 AM	4 AM
SKY (%).....	12	14	17	20	35	49
WEATHER COV.....						
WEATHER TYPE....	NONE	NONE	NONE	NONE	NONE	NONE
TSTM COV.....						
CWR.....	0	0	0	0	0	0
TEMP.....	60	53	48	46	43	40
RH.....	58	71	83	83	89	92
20 FT WIND.....	W 5	W 5	W 5	W 6	NW 5	NW 5
20 FT WIND GUST.	10	10	10	10		

\$\$
Forecaster...DS
Requested by...Nate Fayram
Type of request...PRESCRIBED
.TAG 1702626.0/ARX
.EMAIL Nathan.Fayram@wisconsin.gov

Figure 3. Example of a standardized spot weather forecast for a prescribed burn or wildfire.

4. Fire Weather Watches and Red Flag Warnings

NWS offices will issue Fire Weather Watches and Red Flag Warnings when the combination of dry fuels and weather conditions support extreme fire danger. The WDNR and USFS are responsible for keeping the NWS aware of fuel conditions that could lead to extreme fire danger. The NWS will coordinate with these primary user agencies prior to issuing Fire Weather Watches and Red Flag Warnings. See the call list under section 4. C. – Procedures.

User agencies will handle all public and media questions about fire potential and danger. The NWS will answer questions only about weather conditions and will not comment on fire conditions.

The issuance of these products is typically a two-stage process.

A. Fire Weather Watch

A Fire Weather Watch is issued when there is a reasonable level of confidence for the development of a red flag event. A watch will be issued 18 to 72 hours in advance of the expected onset of criteria. Red flag criteria are listed below. All four of the following weather conditions, including the dryness of the fuels, should be met for a watch to be issued. These criteria are subjective guidelines, so watches and warnings may be issued by the NWS offices for lesser criteria, assuming the WDNR and the USFS agree that critical

fire weather conditions will occur. See the highlighted text below:

1. Sustained ten-minute winds at the 20-foot level are at or above 15 mph.
2. Minimum relative humidity at or less than 25 percent.
3. Temperatures at or greater than 75 degrees F.
4. The dryness of the fuels will be determined by analyzing the Fine Fuel Moisture Code (FFMC) of the Canadian Forest Fire Danger Rating System (CFFDRS). Fire season 2022 will be another year in using FFMC. When the FFMC reaches 92, this will be the trigger point for agencies to collaborate to determine if a Red Flag should be issued. A FFMC of 94 or higher has been identified as the predictable level that would commonly represent a Red Flag warning.

NOTE: Basic fuels thresholds for use during summertime (after green-up) Red Flag events have been determined. The CFFDRS Build-Up Index (BUI) has shown the best correlation with summertime fuels and fires. Similar to the ERC, two fuel thresholds will be used: One that will be used to determine if Red Flag coordination needs to occur, and another that represents critically dry conditions. These may be changed in the future, if the WDNR and USFS feel that these values are not representative.

CFFDRS BUI of 100+ = Coordination guideline (if values are less than 100, fuels are probably too moist for a summertime project fire).

CFFDRS BUI of 110+ = Fuels are critically dry and conducive to project fires.

Other factors which may be considered if any of the above are marginal:

- A dry slot will affect the area.
- NFDRS Energy Release Component (ERC) of 44 or higher in Q-fuel model.
- NFDRS values are in the high to extreme categories.
- The surface dew point depression (best indicator of high fire danger) is more than 40 F.
- The 850 mb dew point depression is greater than 18F (10C).
- It is before spring green-up (usually by June 1st).
- It is after the fall color change or a killing frost.
- The area has been in a dry spell for a week or more.
- Dry lightning is anticipated (rare, except during periods of drought).
- Frequent wind gusts in excess of 25 mph are expected.
- Gusty winds in excess of 35 mph (low end threshold), or in excess of 45 mph (high end threshold), are expected. This can result in trees falling on power lines, causing power lines to break and sparking fires.
- 10-hour fuel moisture is less than 10%.
- Extreme behavior on prescribed burns in the area the past several days.
- Haines Index values are in the moderate to high category (5 or 6).

The most common red flag or near red flag synoptic weather situations:

- Strong low pressure moving from the north or central U.S. Rockies to Lake Superior, or a strong Alberta Low tracking to near Lake Superior. Both situations require a windy dry slot associated with a low level jet.
- A departing Hudson Bay High Pressure replaced by the strong low pressure scenario. The high pressure area provides Wisconsin with dry easterly winds and subsiding air. This will effectively dry out the fuels.

Fire Weather Watch coordination and issuance:

- NWS offices will coordinate the issuance, change, and cancellation of Fire Weather Watches with the WDNR and USFS.
- **All NWS offices will coordinate weather conditions internally via the shared DSS Packet for Fire Weather Watch Coordination.** Chat software or telephone can be used in addition to the DSS Packet. If critical weather conditions are expected, one NWS contact person will email the DSS Packet to the WDNR (usually) and USFS, and then contact them via telephone for fuel conditions using the phone list provided herein.
- If fuel coordination between the WDNR and USFS has not taken place prior to this call, a **collaboration period** before the official “go-ahead” to issue a watch will be granted. During this period, the WDNR and USFS will coordinate fuel conditions, and the overall need for a watch. A spokesperson from the WDNR (usually) or USFS will call the NWS contact person to relay their decision.
- **There will be 5 AM (morning) and 2 PM (afternoon) fuel and headline coordination deadlines for Fire Weather Watch and Red Flag Warning situations. Initial phone calls to Eric Martin (WDNR) and Lee Jensen (USFS) need to occur by 3 AM (morning) and 12 PM (afternoon).**
- **As part of the National Weather Service Impact-based Decision Support Services, heads-up e-mail messages will be sent by NWS offices to user agencies as early as possible (as soon as a couple of days in advance), alerting to the possibility of upcoming Fire Weather Watch and Red Flag Warning conditions. This will facilitate earlier fuel coordination. These e-mail messages will continue through the event and contain information on expected fire weather conditions and impacts.**
- The NWS contact person shall be responsible for disseminating this information back to the other affected NWS offices via chat software or telephone.
- During situations of borderline criteria (no Fire Weather Watch/Red Flag Warning in

effect), the NWS and land management agencies have agreed to use “near-critical” or “elevated” wording when describing fire weather conditions in their respective public information products. Land management agencies may use other wording in these situations, provided the NWS is not mentioned in their public information products.

- During situations when Fire Weather Watches or Red Flag Warnings are in effect, the NWS and land management agencies have agreed to use “severe”, “critical” or “extreme” wording when describing fire weather conditions in their respective public information products.

- To avoid confusion, the term “red flag” will only be used in a Red Flag Warning. A Fire Weather Watch **will be** disseminated on NOAA All Hazards Radio.

- A Fire Weather Watch will be headlined in the Fire Weather Planning Forecast. The headline will include what, when, where and why. Headlines belong before the discussion and before each zone grouping of the Fire Weather Planning Forecast.

- If issued, a Fire Weather Watch (RFW) will describe the affected area, valid time of the watch, and reasons for the watch. A RFW shall have a UGC coding line followed by a Valid Time Event Code (VTEC). Identifiers for each office are MKERFWMKX, MKERFWGRB, MKERFWARX, MSPRFWMPX AND MSPRFWDLH.

B. Red Flag Warnings

A Red Flag Warning is issued when there is a high probability that all four weather criteria listed under the Fire Weather Watch section of this plan are imminent or will be met within 24 hours. However, a Red Flag Warning can be issued any time at the request of fire management personnel during times of critically dry fuels.

The WDNR and the USFS will monitor the FFMC to help them determine the dryness of the fuels before green-up. The Canadian Forest Fire Danger Rating System (CFFDRS) Build-Up Index (BUI) will be used during the summertime (after green-up) period. A Red Flag Warning will be issued immediately when red flag conditions are occurring but will be coordinated prior to issuance with WDNR and USFS. The NWS may also monitor the NFDRS and CFFDRS values by going to the WDNR or Eastern Area Coordination Center (EACC) Internet sites. These sites will help the NWS monitor the dryness of the fuels in the state.

Red Flag Warning coordination and issuance:

- NWS offices will coordinate the issuance, change and cancellation for Red Flag Warnings with the WDNR and USFS. If **no** Fire Weather Watch is in effect, full

coordination of fuels with the WDNR and USFS must be made prior to the issuance of a Red Flag Warning (using the same procedure as described above for the watch process). If the WDNR and USFS observe wet fuels and do not believe a warning should be issued, then do not issue the warning.

- If a Fire Weather Watch has already been issued for the affected area (i.e. fuel coordination has already taken place), and if forecast offices agree that critical fire weather conditions will be met, a Red Flag Warning can be issued **without any additional coordination** with the fire management agencies (i.e. WDNR and USFS).

- For **high confidence** Red Flag Warning events, the Red Flag Warning may be issued **the afternoon before** instead of the morning of the event. This would allow extra lead time for the fire management agencies to plan for these events.

- Any Red Flag Warning issuance requires a call or fax to Brenden Neylan at the Eastern Area Coordination Center in Milwaukee, Wisconsin:

Main Office Phone: Fax:

- A Red Flag Warning **will be** disseminated on NOAA All Hazards Radio and also NAWAS.

- A Red Flag Warning will be headlined in the routine Fire Weather Planning Forecast (FWF). The headline will include what, when, where and why. Headlines belong before the discussion and before each zone grouping of the Fire Weather Planning Forecast.

- If issued, a Red Flag Warning (RFW) will describe the affected area, valid time of the warning, and reasons for warning. A RFW shall have a UGC coding line followed by a Valid Time Event Code (VTEC). Identifiers for each office are MKERFWMKX, MKERFWGRB, MKERFWARX, MSPRFWMPX AND MSPRFWDLH.

Cancellation of Fire Weather Watches and Red Flag Warnings:

When conditions warrant that a Fire Weather Watch or Red Flag Warning is no longer needed, it should be cancelled by the NWS as soon as possible. **Note: A cancellation statement is not needed if upgrading from a watch to a warning, or for a Red Flag Warning that is being allowed to expire.**

- The cancellation will be coordinated with the users.
- The cancellation will be headlined in the Fire Weather Planning Forecast.
- A cancellation statement under the RFW message shall be issued. A RFW shall have a UGC coding line followed by a Valid Time Event Code (VTEC).

Updates to fire weather planning forecasts when red flag conditions are present:

Updates will be made to the morning or afternoon forecasts for changes in Red Flag headlines (coordination required with land management agencies) which include:

- New issuance of a Fire Weather Watch or Red Flag Warning.
- Upgrading from a Fire Weather Watch to a Red Flag Warning.
- Change an area outline of a Fire Weather Watch or Red Flag Warning.
- Cancellation of a Fire Weather Watch or Red Flag Warning.

In addition, updates will be made when the following conditions are met when a Fire Weather Watch or Red Flag Warning has been issued:

- Precipitation occurrence or non-occurrence if different from the forecast.
- Wind speed differs by more than 5 mph from the forecast.
- Temperature differs by more than 5 degrees Fahrenheit from the forecast.
- Relative Humidity differs by 5 % or more from the forecast.

C. Procedures for calling the WDNR and USFS during potential RFW situations.

Outlook Period (More than 48 hours prior to event):

- The NWS will attempt to provide fire control agencies (i.e. WDNR, USFS, etc.) a “heads-up” of potentially critical fire weather conditions several days in advance if possible. Initial communication may occur via email, during the weekly fire weather conference call, or a courtesy call to the land management agencies.

Watch Period (18 - 72 hours prior to event):

- After coordinating weather conditions via the DSS Packet, as well as chat software or telephone, **one** NWS contact person will email the DSS Packet to the WDNR (usually) and USFS and contact them via telephone, using the phone list provided below. The WDNR and USFS will coordinate fuel conditions, and the overall need for a watch. A spokesperson from the WDNR or USFS will call the NWS contact person to relay their decision. The NWS contact person shall be responsible for disseminating this information back to the other affected NWS offices via chat software or telephone.

Warning Period (less than 24 hours prior to the event):

- If no Fire Weather Watch is in effect, full coordination of fuels with the WDNR and USFS must be made prior to the issuance of a Red Flag Warning (same procedure as described above for the watch process).

- If a Fire Weather Watch has already been issued for affected areas (i.e. fuel coordination has already taken place), and the NWS forecast offices agree that critical fire weather conditions will be met, a Red Flag Warning can be issued without any additional coordination with the WDNR and USFS.

<u>First Call Made To WDNR:</u> Eric Martin	<u>First Call Made To USFS:</u> Lee Jensen	<u>Call To EACC As Alternate To WDNR And/Or USFS:</u> Stephen Marien
<u>Second Call Made To WDNR:</u> Jim Barnier	<u>Second Call Made To USFS:</u> Steve Radaj	
<u>Third Call Made To WDNR:</u> Chad Gottbeheut	<u>Third Call Made To USFS:</u> Bill Bollfrass	

WWUS83 KMKX 202030
RFWMKX

URGENT - FIRE WEATHER MESSAGE
National Weather Service Milwaukee/Sullivan WI
330 PM CDT Tue Mar 8 2012

...CRITICAL FIRE WEATHER CONDITIONS EXPECTED WEDNESDAY AFTERNOON...

.A strong warm front will move north through the area Wednesday morning. Gusty southwest winds behind the front during the afternoon will combine with very warm temperatures and low relative humidity values to bring critical fire weather conditions to locations mainly northwest of Madison.

WIZ046-047-056-057-220000-
/O.NEW.KMKX.FW.W.0001.120321T1800Z-120322T0000Z/
Marquette-Green Lake-Sauk-Columbia-
330 PM CDT TUE MAR 20 2012

...RED FLAG WARNING IN EFFECT FROM NOON TO 6 PM CDT WEDNESDAY FOR VERY WARM
TEMPERATURES...GUSTY SOUTHWEST WINDS AND LOW RELATIVE HUMIDITY VALUES FOR
MARQUETTE...GREEN LAKE...SAUK AND COLUMBIA COUNTIES...

The National Weather Service in Milwaukee/Sullivan has issued a Red Flag Warning for very warm temperatures, gusty southwest winds and low relative humidity values, which is in effect from noon to 6 PM CST Wednesday.

* AFFECTED AREA...Marquette...Green Lake...Sauk and Columbia Counties.

* TIMING...Noon until 6 PM CST Wednesday.

* WINDS...Southwest 15 to 25 mph, with gusts to 35 mph.

* RELATIVE HUMIDITY...20 to 25 percent.

* TEMPERATURES...75 to 80 degrees.

* IMPACTS...These conditions will bring critical fire weather conditions to these areas Wednesday afternoon.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

A Red Flag Warning means that critical fire weather conditions are either occurring now or will shortly. A combination of strong winds, low relative humidity, and warm temperatures will create critical fire weather conditions.

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Figure 4. Example of a Bulleted Red Flag Warning. Fire Weather Watches would follow the same format. The exact content of the bullets and call to action statements may vary slightly from office to office.

NOTE: DO NOT USE THE PHRASE "RED FLAG" IN A FIRE WEATHER WATCH PRODUCT. INSTEAD, USE PHRASES SUCH AS "CRITICAL FIRE WEATHER CONDITIONS" OR "EXTREME FIRE WEATHER CONDITIONS" TO DESCRIBE THE SITUATION.

5. Verification and Participation in Interagency Groups

a) Verification

Fire weather program leaders will verify the red flag program. Results will be distributed to the NWS regional fire weather program managers as well as the appropriate State and Federal user groups in Wisconsin. Red Flag Warnings will be verified based on the Probability of Detection, False Alarm Rate, Critical Success Index, and Lead Time.

b) Participation in Interagency Groups

NWS offices providing fire weather services for Wisconsin are expected to participate in the annual state fire meeting. This meeting serves as a forum for interaction between NWS program leaders and their interagency users. It also provides an effective vehicle for discussions pertaining to changes to the Annual Operating Plan.

6. Special Services

FIRE WEATHER ON-SITE SUPPORT (IMET) - [NWSI 10-402](#)

a) INCIDENT SUPPORT

On-site forecast service is available from NWS offices with designated Incident Meteorologists (IMETs).

- Only certified Type 1 IMETs may be dispatched to support on-site service for fire. The NWS is responsible for maintaining proficiency of designated IMETs.
- Request and dispatch of IMETs and equipment is accomplished through the National Resource Coordination System. See [NWSI 10-402](#) for contact information.

In addition to wildfires, IMETs may be dispatched to support:

- Critical resource value prescribed burns.
- Land management coordination and dispatch centers.
- Hazardous substance release.
- Any special projects or incidents, which fall under the mandate of the NWS.

For more details and reimbursable information, refer to NWS Instruction 10-402:

<http://www.nws.noaa.gov/directives/sym/pd01004002curr.pdf>

NWS IMET Google Site: <https://sites.google.com/a/noaa.gov/imet/?pli=1>

By [Interagency Agreement](#), the NWS will support land management agencies with on-site meteorological support to wildland fires upon request through the Type 1 IMET program.

Other events listed above may be supported if resources permit. Such uses will be limited to requests of federal fire agencies participating in the Interagency Agreement and requests by public safety officials who represent such requests as essential to public safety.

7. Training

a) Forecaster training - NWS forecasters producing fire weather forecasts shall be trained. Forecasters must fulfill the following requirements as set forth in [NWSI 10-405](#):

- Complete the National Wildfire Coordinating Group's course S-290 ("Intermediate Wildland Fire Behavior").
- Complete courses IS-100.b ("Introduction to the Incident Command System (ICS), ICS-100) and IS-700.a ("National Incident Management System (NIMS), An Introduction") from the Federal Emergency Management Agency (FEMA).
- Local training generally consists of review of the Wisconsin Fire Weather Annual Operating Plan, other local station instructions, as well as training established by the Fire Weather Program Leader.
- Forecasters must also be familiar with all NWS fire weather products and services and become proficient in the preparation and dissemination of these products.

b) IMET Training and Certification requirements:

IMET CERTIFICATION AND RECERTIFICATION - NWSI [10-402](#) and [10-405](#)

The NWS Analyze, Forecast and Support Office – the Severe, Public and Fire Weather Services Branch, through the National Fire Weather Operations Coordinator (NFWOC) and the Regional Headquarters, will ensure IMETs are properly trained and certified to work within an ICS. The NFWOC and Regional Fire Weather Program Managers will ensure IMET meteorological support equipment familiarization is scheduled annually and designated IMETs in their regions remain certified.

See [NWSI 10-402](#), section 1.4, and [NWSI 10-405](#), sections 4, 5 and 6, for certification and re-certification requirements for Type 1 and Type 2 IMETs.

c) NWS provided training to land management agencies - when NWS staff provides training to land management personnel, costs above planned salary and operating costs may be borne by the benefiting agency(s). See the following guidelines for NWS Instructors Teaching Interagency courses from Appendix A of [NWSI 10-403](#):

[NWSI 10-403](#) Appendix A – Guidelines for Teaching Interagency Courses

1) The request for an NWS instructor for fire agency courses comes through the requesting

agency. As with any other non-emergency, out-of-office training assignment, sufficient lead time of several months is needed for scheduling purposes and the request is coordinated through the local WFO's MIC. If the office or Region supplying the NWS instructor expects or requires reimbursement, several options are available in gaining reimbursement.

- a) The preferred method for Federal training assignments is requesting an invitational travel order from the requesting Agency. Invitational travel requires the traveler to fill out a travel voucher in the format required by the requesting Agency. When possible, accommodation, flights and/or other expenses may be paid by the requesting Agency in advance.
- b) If an invitational travel order is not possible, an Agreement can be established with the land management unit paying for the training. For the United States Forest Service (USFS), this Agreement is usually established using the United States Department of Agriculture (USDA) AD-672 form. For the Department of Interior, the requesting Agency supplies an Interagency Agreement (IAA) in the local unit's appropriate format. Once the requesting agency initiates and completes their official request form or IAA for training, it is the responsibility of the requested NWS instructor's Region to complete and establish coding for reimbursement. It is important to note that the Interagency National Agreement for Fire Weather Services does not provide the legal or financial exchange mechanism to execute training. More detailed instruction on training agreements, including sample templates, are available either on the IMET Reimbursable Expense Report (RER) instructions or within the National AOP (both found in the "Admin" section of the national fire weather webpage <http://www.weather.gov/fire/>).

In addition, a Gifts and Bequests process can be completed, utilizing guidance found in NOAA's Personal Properties Policies, Chapter 4; sections 4-08 and 4-09. This procedure applies only for travel requested by a Federal source. Non-Federal travel is governed by the Federal Travel Regulations, 41 CFR Part 304.

The document governing Gifts and Bequests to NOAA can be found here:

http://www.corporateservices.noaa.gov/finance/docs/Policy/Chapter4_20151201.pdf

This process requires preparation of a CD-210 form, record of Gift or Bequest. If the amount requested is over \$500, advance approval from NOAA CFO is required.

2) The course should have a local, state, or federal land management instructor paid by that agency to team teach with the NWS instructor. The co-instructor cannot be from a private vendor or academic institution.

If 1 and 2 above are satisfied, then an instructor can be provided with all overtime and travel costs borne by the requesting agency once an AD-673 or IAA is completed. If 1 and 2 cannot be satisfied or it is unclear whether a local, state, or federal land management instructor has been provided, then follow step 3 below.

3) The following questions are asked by the WFO to determine whether an NWS instructor can be approved for the course in question:

a) Is the NWS instructor unique or can this course be taught by anyone else? Are other fire weather instructors (non-NWS) ready, willing and able to teach the course? Contact the Geographic Area Predictive Services meteorologist(s) for information concerning the availability of non-NWS fire weather instructors.

b) If it is determined through coordination with the Geographic Area Predictive Services meteorologist(s) that non-NWS instructors are not ready, willing and able to teach the course, can the NWS be reimbursed for overtime and travel costs?

If it is determined by answers to questions 3a and 3b that an NWS instructor is appropriate and can be reimbursed, then the NWS instructor may teach the course.

IV. WILDLAND FIRE AGENCY SERVICES AND RESPONSIBILITIES

A. OPERATIONAL SUPPORT AND PREDICTIVE SERVICES - the Eastern Area Fire Weather Program Manager/meteorologist (currently Steve Marien), working remotely for the 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 Wisconsin. 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_services/outlooks/outlooks.htm

Stephen Marien Mailing Address: EACC Physical Address:

B. 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. Point 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.

C. FIRE WEATHER OBSERVATIONS - All fire weather observations in Wisconsin are from automated sites and all have GOES antennas installed for data transmission. Station inspection and instrument maintenance are the responsibility of land management agencies. NWS forecasters may monitor data quality from observation sites. Any NWS travel expenses for equipment maintenance or station visitation will be reimbursed by the Wildland Fire Agency making the request.

The following steps are procedures for implementing a new RAWS:

- 1) The federal land management agencies (USFS, NPS, USFWS, BLM, BIA, etc.) and the state agencies (Department of Natural Resources (DNR) and a few misc. personnel (Nature Conservatory, etc.) begin the process by deciding to install a RAWS. Land management agencies sometimes request input from NWS personnel as to siting criteria. NWS offices are required (by the Interagency Agreement) to provide it if requested from the land management agencies. Also, notify Chris Foltz at Central Region Headquarters and keep him informed throughout the process of RAWS implementation.
- 2) Land management agencies will request a 6-digit code/ID for the new RAWS station. NWS personnel shall forward the request for a new 6-digit ID to the Regional Fire Weather Program Manager (currently Chris Foltz).
- 3) The Regional Fire Weather Program Manager will coordinate with the NWS office involved, the appropriate land management personnel, and the WIMS personnel to determine an identification number.
- 4) Once a 6-digit ID number is coordinated/determined, the Regional Fire Weather Program Manager will provide it to the requestor, and cc: the NWS office and the appropriate USFS personnel.
- 5) It is the responsibility of the requestor/land management person to notify WIMS in order for the observations to be received/sent from the WIMS.

D. REIMBURSEMENT FOR NWS PROVIDED ON-SITE SUPPORT AND TRAINING -- Agencies will reimburse the NWS for all costs incurred for IMET support as well as for training assistance or station visitation. Procedures are detailed in the [Interagency National Agreement](#).

V. JOINT RESPONSIBILITIES

- A.** Meteorological training can be provided either by NWS or the EACC meteorologist. Each NWS office has a Fire Weather Program Leader or IMET, who is qualified to teach courses up through Intermediate Fire Behavior (S-290). Requests for NWS training should be directed to that office's Fire Weather Program Leader or MIC. Sufficient advance notice should be given to allow for preparation as well as scheduling. Costs incurred by the NWS will be reimbursed by the requesting agency.

- B.** NWS Fire Weather Program Leaders or other NWS forecasters will participate in coordination conference calls, primarily in the spring fire season. This duty will be shared by the program leaders. The NWS representative should be prepared to provide a statewide briefing highlighting significant weather trends as well as possible critical fire weather situations.

VI. EFFECTIVE DATES ON THE AOP

This document will be effective approximately from March 15, 2022 to March 15, 2023.

VII. AGENCY SIGNATURES

Kevin Lynott, MIC NWS Milwaukee/Sullivan
Signing for all NWS offices representing Wisconsin

Date

Forestry Division Administrator Heather Berklund
Signing for the WDNR

Date

Chequamegon-Nicolet NF, Paul Strong, Forest Supervisor
Signing for the USDA Forest Service

Date

Dan Laber, Zone Fire Management Officer
Signing for USFWS

Date

VIII. APPENDICES

- A. Haines Index
- B. Smoke Management/HYSPLIT Requests
- C. Address and Phone Directory
- D. FTS Stations
- E. NFDRS RAWs Site Catalog and Contact list
- F. Precipitation and sky terminology and NOAA All Hazards Radio
- G. Interagency Agreement for Meteorological Services

APPENDIX A

HAINES INDEX

What is the Haines Index?

The Haines Index combines the effects of dry air and instability to determine the potential for large fire growth. Its purpose is to identify weather conditions that may allow an existing fire to spread rapidly or exhibit extreme fire behavior. It should NOT be used to predict the potential or probability for wildfires to ignite. No such danger or wording will be conveyed in any NWS products. The Haines Index is most applicable to plume-dominated fires. The Haines Index does not account for wind.

The Haines Index contains two components, one to assess the dry air, and the other to measure the instability. Dry air affects fire behavior by lowering fuel moisture, which increases the amount of fuel available to the fire and enhances the probability of spotting. Instability is caused by warming the lower levels of the atmosphere, cooling the higher levels, or by a combination of the two processes. An unstable air mass promotes the formation of rising currents of air and thus increases the vertical extent of a smoke column. Wildfires that burn in a dry, unstable environment can become plume-dominated and are often able to generate their own strong surface winds. Ground elevation will determine which of three levels in the atmosphere will be used to compute the Haines Index. In Wisconsin, the low-level layer between 950 mb and 850 mb will be used.

Computing the Haines Index

Haines Index = Stability + Moisture = A + B

Stability Term = 950 MB Temperature - 850 MB Temperature

Let A equal the following values according to the temperature differences

A = 1 when stability term is 3 degrees C or less

A = 2 when stability term is 4 to 7 degrees C

A = 3 when stability term is 8 degrees C or more

Large positive values of the stability term indicate an unstable layer of the atmosphere near the earth's surface. Negative values indicate a temperature inversion.

Moisture Term = 850 MB Temperature - 850 MB Dew Point Temperature

B = 1 when moisture term is 5 degrees C or less

B = 2 when moisture term is 6 to 9 degrees C

B = 3 when moisture term is 10 degrees C or more

The value of the moisture term will always be positive. The greater the value of this term, the drier the air is.

Significance of the Haines Index values

2 or 3 Very Low (moist, stable air)

4 Low

5 Moderate

6 High (dry, unstable air)

An example calculation:

950 MB Temperature = 27 degrees C

850 MB Temperature = 18 degrees C

850 MB Dew Point = 14 degrees C

Haines Index = Stability (A) + Moisture (B)

From the tables above:

950 MB Temp - 850 MB Temp = 27-18 = 9. A Stability term of 9, so let A = 3.

850 MB Temp - 850 MB Dew point = 18 - 14 = 4. A Moisture term of 4, so let B = 1.

A + B = 3 + 1 = 4.

An Index value of 4 corresponds to a "Low" category. The conclusion is that extreme fire behavior would not be expected on this day.

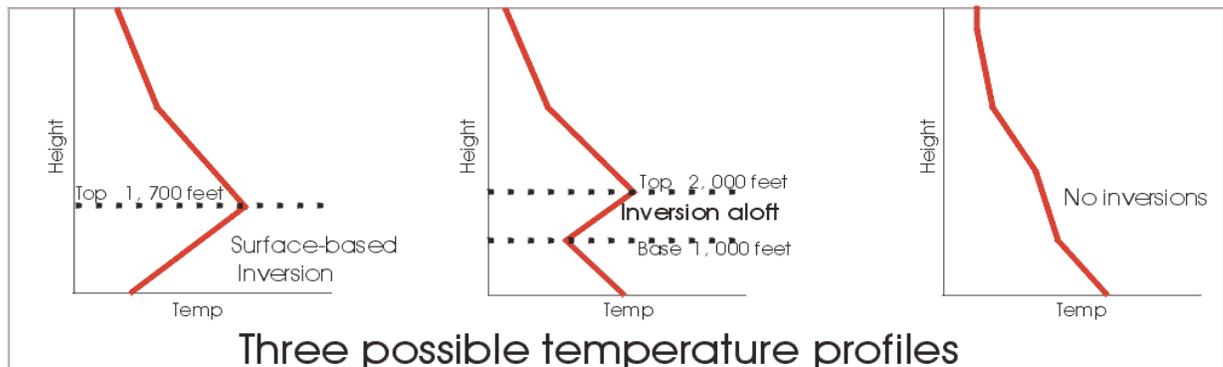
APPENDIX B

SMOKE MANAGEMENT/HYSPLIT REQUESTS

The Clean Air Act requires land management agencies to address the issue of smoke management in its prescribed burns. The goal is to burn in atmospheric conditions that would encourage smoke to rise to such a level that the smoke is dispersed as much as possible to reduce a number of health and safety risks near the fire.

The National Weather Service will support the smoke management efforts of federal, state, and local agencies as well as organizations involved in such burning. **The NWS will provide the mixing height, transport wind and dispersion index year-round in the “daytime” portions of the fire weather planning forecast. These values will represent the average values from noon to 6 pm.** The NWS will also include the mixing height, transport wind and dispersion index, upon request of the land agency, in spot forecasts.

The three weather parameters of smoke management forecasts are mixing layer (or height), transport winds, and dispersion index. For smoke management purposes, the mixing layer is usually considered the lowest layers of the atmosphere bounded by the earth’s surface and the bottom of any temperature inversion which may exist aloft. If a temperature inversion is based at the surface, then there is no mixing layer. A temperature inversion would serve to trap smoke at low levels or would prevent sufficient lofting of smoke to a level where winds would dilute or transport it away from the area. See the figure below:



Three upper air temperature profiles which affect smoke dispersal differently:

a) a surface-based inversion is an absolutely stable condition that traps smoke and prevents lofting.

b) An elevated inversion is unstable or neutral and allows limited smoke rise, but the smoke will stop rising at the base of the inversion aloft.

c) When no inversions are present, smoke is free to rise. However, the existing (ambient) lapse rate will determine the rate of rise and the plume characteristics.

The transport wind (knots) is defined as the average wind speed and direction through the mixing layer. The transport wind may suggest the need for surveillance or resource location at downstream areas for the purpose of minimizing the danger posed by spotting due to firebrands and to determine the impacts of smoke on a sensitive area.

The Dispersion Index is intended to serve as a single adjective index which describes how smoke will disperse on that day. The Dispersion Rate is given by the following formula:

$$\text{Dispersion Rate} = (\text{Mixing Height in feet}) \times (\text{Transport Wind in knots})$$

The Minnesota Smoke Management Plan (SMP) suggests the following interpretation of the values:

<u>Dispersion Index</u>	<u>Dispersion Rate</u>
< 13,000	Poor
13,000 - 29,999	Fair
30,000 - 59,999	Good
60,000 or greater	Excellent

These values are also applicable in Wisconsin.

The SMP contains guidelines for using the index and should be consulted for those details. Most smoke management inputs to software programs and nomograms are in metric units. A table for conversion among various units is provided on the next page.

Smoke management models require input of parameters in metric units. The National Weather Service uses a variety of units of measure for wind and height. To minimize confusion and to make the conversion of units easier, the following conversion factors will prove helpful:

<u>Multiply</u>	<u>By</u>	<u>To Get</u>
Feet	0.308	Meters
Feet	0.0152	Chains
Statute Miles	1609.34	Meters
Statute Miles	1.60934	Kilometers
Statute Miles	0.8684	Nautical Miles
Statute Miles	80	Chains
Nautical Miles	0.6080	Feet
Nautical Miles	1.152	Statute Miles
Nautical Miles	1853.25	Meters
Nautical Miles	1.85325	Kilometers
Chains	66	Feet
Chains	20.12	Meters
Chains	0.0125	Statute Miles
Meters	3.281	Feet
Meters	0.0497	Chains
Meters	0.00062	Statute Miles
Meters	0.00054	Nautical Miles
Kilometers	3280.84	Feet
Kilometers	0.6214	Statute Miles
Kilometers	0.5396	Nautical Miles
Knots	1	Nautical Miles Per Hour
Knots	1.152	Statute MPH
Knots	1.689	Feet Per Second
Knots	0.515	Meters Per Second
Knots	1.853	Kilometers Per Hour
Statute MPH	0.868	Knots
Statute MPH	1.467	Feet Per Second
Statute MPH	0.447	Meters Per Second
Statute MPH	1.609	Kilometers Per Hour
Statute MPH	88	Feet Per Minute
Kilometers Per Hour	0.278	Meters Per Second
Kilometers Per Hour	0.540	Knots
Kilometers Per Hour	0.621	Miles Per Hour
Kilometers Per Hour	0.911	Feet Per Second
Meters Per Second	3.6	Kilometers Per Hour
Meters Per Second	1.943	Knots
Meters Per Second	2.237	Miles Per Hour
Meters Per Second	3.281	Feet Per Second
Meters Per Second	196.85	Feet Per Minute

HYSPLIT REQUESTS

APPENDIX C

ADDRESS AND PHONE DIRECTORY

Unlisted phone numbers and addresses

APPENDIX D

Unlisted station locations and phone numbers

APPENDIX E

NFDRS RAWS SITE CATALOG AND CONTACT LIST

IF WEATHER OBSERVATIONS APPEAR TO BE INACCURATE, PLEASE CONTACT THE APPROPRIATE DISPATCHER SO THAT THE WEATHER STATION CAN BE SERVICED.

NWS GREEN BAY CWA

PHELPS 470502 USFS LAT: 46.04N LONG: 89.096W ELEV: 1770 FT.
AREA DISPATCHER: STEVE RADAJ (USFS-RHINELANDER)
SOIL TYPE: SAND LOAM/PEAT

WOODRUFF 471002 WDNR LAT: 45.89N LONG: 89.65W ELEV: 1600 FT.
AREA DISPATCHER: MARK CONKEY (WDNR-WOODRUFF)
SOIL TYPE: SAND LOAM

LAONA 471101 USFS LAT: 45.46N LONG: 88.68W ELEV: 1560 FT.
AREA DISPATCHER: STEVE RADAJ (USFS-RHINELANDER)
SOIL TYPE: SILT LOAM

WAUSAUKEE 471301 WDNR LAT: 45.39N LONG: 87.97W ELEV: 763 FT.
AREA DISPATCHER: JOHN GOLDSCHMIDT (WDNR-PESHTIGO)
SOIL TYPE: SAND LOAM

TOMAHAWK 471801 WDNR LAT: 45.594N LONG: 89.723W ELEV: 1510 FT.
AREA DISPATCHER: MARK CONKEY (WDNR-WOODRUFF)
SOIL TYPE: SAND

ANTIGO 471901 WDNR LAT: 45.16N LONG: 89.12W ELEV: 1520 FT.
AREA DISPATCHER: JOHN GOLDSCHMIDT (WDNR-PESHTIGO)
SOIL TYPE: SILT LOAM AND PEAT

KESHENA 472002 BIA/WDNR/MTE LAT: 44.89N LONG: 88.66W ELEV: 870 FT.
AREA DISPATCHER: JOHN GOLDSCHMIDT (WDNR-PESHTIGO)
SOIL TYPE: SAND LOAM

MOUNTAIN 472003 USFS LAT: 45.124N LONG: 88.372W ELEV: 910 FT.
AREA DISPATCHER: STEVE RADAJ (USFS-RHINELANDER)
SOIL TYPE: SAND

MEAD 472603 WDNR LAT: 44.70N LONG: 89.87W ELEV: 1156 FT.
AREA DISPATCHER: DENISE KRENTZ (WDNR-WOODRUFF)
SOIL TYPE: STREAMBOTTOM/MAJOR WETLANDS

ROME 473501 WDNR LAT: 44.26N LONG: 89.81W ELEV: 1025 FT.
AREA DISPATCHER: DENISE KRENTZ (WDNR-WIS RAPIDS)
SOIL TYPE: SAND

WAUTOMA 474201 WDNR LAT: 44.06N LONG: 89.30W ELEV: 982 FT.
AREA DISPATCHER: DENISE KRENTZ (WDNR-WIS RAPIDS)
SOIL TYPE: SAND

APPLETON 473402 WDNR LAT: 44.29N LONG: 88.46W ELEV: 830 FT.
AREA DISPATCHER: DENISE KRENTZ (WDNR-WIS RAPIDS)
SOIL TYPE: LOAM

NWS SULLIVAN/MILWAUKEE CWA

DODGEVILLE 476001 WDNR LAT: 43.02N LONG: 90.14W ELEV: 1260 FT.
AREA DISPATCHER: CHRISSY SHAW (WDNR-DODGEVILLE)
SOIL TYPE: FORESTED AND PRAIRIE SILTY SOILS.

PARDEEVILLE 475701 WDNR LAT: 43.54N LONG: 89.30W ELEV: 820 FT.
AREA DISPATCHER: CHRISSY SHAW (WDNR-DODGEVILLE)
SOIL TYPE: PRAIRIE WITH SILTY SOILS. SOME MARSH LAND NEARBY, ISOLATED SANDY REGIONS.

HORICON 475601 U.S. FISH & WILDLIFE LAT: 43.57N LONG: 88.60W ELEV: 850 FT.
REFUGE MANAGER: STEVE LENZ
FIRE TECHNICIAN: SEAN SALLMANN
SOIL TYPE: FORESTED AND SILTY SOILS. EXTENSIVE MARSH LAND IN AREA.

BROOKLYN 476201 WDNR LAT: 42.78N LONG: 89.50 ELEV: 800 FT.
AREA DISPATCHER: CHRISSY SHAW (WDNR-DODGEVILLE)
SOIL TYPE:

EAGLE 476401 WDNR LAT: 42.86N LONG: 88.52 ELEV: 938 FT.
AREA DISPATCHER: CHRISSY SHAW (WDNR-DODGEVILLE)
SOIL TYPE:

NWS LA CROSSE CWA

DIAMOND LAKE 471703 WDNR LAT: 45.11N LONG: 90.69W ELEV: 1317 FT.
AREA DISPATCHER: MARK CONKEY (WDNR-WOODRUFF)
SOIL TYPE: SILTY TO LOAMY

LANCASTER 476003 WDNR LAT: 42.83N LONG: 90.69W ELEV: 1085 FT.
AREA DISPATCHER: CHRISSY SHAW (WDNR-DODGEVILLE)
SOIL TYPE:

LA CROSSE 474601 WDNR LAT: 43.82N LONG: 91.19W ELEV: 1200 FT.
AREA DISPATCHER: RACHEL HAUSER (WDNR-BLACK RIVER FALLS)
SOIL TYPE:

STAR PRAIRIE 472201 WDNR LAT: 45.19N LONG: 92.65W ELEV: 980 FT.
AREA DISPATCHER: RACHEL HAUSER (WDNR-BLACK RIVER FALLS)
SOIL TYPE:

BLACK RIVER FALLS 473901 WDNR LAT: 44.30N LONG: 90.83W ELEV: 838 FT.
AREA DISPATCHER: RACHEL HAUSER (WDNR-BLACK RIVER FALLS)
SOIL TYPE: GENERALLY FORESTED SOILS OVER SANDSTONES.

NECEDAH 474301 WDNR AND US FISH & WILDLIFE LAT: 44.02N LONG: 90.08W ELEV: 950 FT.
AREA DISPATCHER: RACHEL HAUSER (WDNR-BLACK RIVER FALLS)
SOIL TYPE: WETLAND/MARCH SOILS IN BOTTOM LANDS, OTHERWISE SANDY.

BOSCOBEL 476002 WDNR LAT: 43.1492N LONG: 90.6842W ELEV: 673 FT.
AREA DISPATCHER: CHRISSY SHAW (WDNR-DODGEVILLE)
SOIL TYPE: SANDY

NWS CHANHASSEN/MINNEAPOLIS CWA

AUGUSTA 472801 WDNR LAT: 44.43N LONG: 91.04W ELEV: 1000 FT.
AREA DISPATCHER: RACHEL HAUSER (WDNR-BLACK RIVER FALLS)
SOIL TYPE: FOREST OVER SANDSTONE.

GANOE HILL 472901 WDNR LAT: 44.58N LONG: 92.07W ELEV: 1160 FT.
AREA DISPATCHER: RACHEL HAUSER (WDNR-BLACK RIVER FALLS)
SOIL TYPE:

LADYSMITH 471601 WDNR LAT: 45.43N LONG: 91.11W ELEV: 1147 FT.
CONTACT: JOHN KELTO (WDNR-PARK FALLS)
SOIL TYPE: SILTY TO LOAMY

NWS DULUTH CWA

HAYWARD 470803 WDNR LAT: 46.03N LONG: 91.45W ELEV: 1215 FT.
AREA DISPATCHER: JOHN KELTO (WDNR-PARK FALLS)

PARK FALLS 470901 WDNR LAT: 45.90N LONG: 90.40W ELEV: 1491 FT.
AREA DISPATCHER: JOHN KELTO (WDNR-PARK FALLS)

GLIDDEN 470302 USFS LAT: 46.13N LONG: 90.55W ELEV: 1568 FT.
AREA DISPATCHER: STEVE RADAJ (USFS-RHINELANDER)

LIND 470603 WDNR LAT: 45.74N LONG: 92.80W ELEV: 813 FT.
AREA DISPATCHER: KRISTINE BUCHHOLTZ (WDNR-SPOONER)

MINONG 470703 WDNR LAT: 46.80N LONG: 91.59W ELEV: 1060 FT.
AREA DISPATCHER: KRISTINE BUCHHOLTZ (WDNR-SPOONER)

BARNES 470202 WDNR LAT: 46.20N LONG: 91.32W ELEV: 1190 FT.
AREA DISPATCHER: JOHN KELTO (WDNR-PARK FALLS)

WASHBURN 470207 USFS LAT: 46.571N LONG: 91.25W ELEV: 1260 FT.
AREA DISPATCHER: STEVE RADAJ (USFS-RHINELANDER)

APOSTLE ISLANDS 470303 NPS LAT: 46.92N LONG: 90.75W ELEV: 651 FT.
FMO: SCOTT BRESSLER DISPATCH:

CLAM LAKE 470304 USFS LAT: 46.198N LONG: 90.97W ELEV: 1500 FT.
AREA DISPATCHER: STEVE RADAJ (USFS-RHINELANDER)

SMITH RAPIDS 470902 USFS LAT: 45.932N LONG: 90.181W ELEV: 1568 FT.
AREA DISPATCHER: STEVE RADAJ (USFS-RHINELANDER)

APPENDIX F

PRECIPITATION AND SKY TERMINOLOGY AND NOAA ALL HAZARDS RADIO

PROBABILITY OF PRECIPITATION TERMS (POP)

Terminology	POP
NONE OR SLIGHT CHANCE	10%
SLIGHT CHANCE	20%
CHANCE	30 TO 50%
LIKELY	60 TO 70%
NO MODIFIER	80 TO 100%

SHOWER AND THUNDERSTORM TERMINOLOGY

(assumes 100% probability that showers and thunderstorms will occur)

	POP
ISOLATED OR NONE	10%
ISOLATED OR WIDELY SCATTERED	20%
SCATTERED	30-50%
NUMEROUS	60-70%
NO MODIFIER	80-100%

CLOUD COVER will be subject to some variability in amount or location.

SUNNY/CLEAR...no clouds. 0/8 of opaque clouds.

MOSTLY SUNNY/MOSTLY CLEAR...the prevailing condition is sunny or clear but some clouds may be present either over a portion of the area or for a short period of time over the entire area. 1/8 to 2/8 of opaque clouds.

PARTLY CLOUDY/PARTLY SUNNY...3/8 to 5/8 of the sky will be covered by opaque clouds.

MOSTLY CLOUDY OR CONSIDERABLE CLOUDINESS...6/8 to 7/8 of the sky will be covered by opaque clouds.

CLOUDY...the sky is completely covered with clouds (8/8).

NOAA ALL HAZARDS RADIO

Fire Weather Watches and Red Flag Warnings will be broadcast on NOAA All Hazards Radio. Use this internet link for NOAA All Hazards Radio coverage and frequencies across Wisconsin:

<http://www.weather.gov/mkx/nwr-table>

APPENDIX G

Please go to the address below to view the
Interagency Agreement for Meteorological and other Technical Services:

https://www.weather.gov/media/fire/2017_National_Agreement.pdf