

# 2024 North Dakota Fire Weather Operating Plan

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## I. Introduction

This Annual Operating Plan (AOP) is a procedural guide, based on the National Interagency Agreement for Meteorological Services, which describes fire meteorological services provided within North Dakota. The AOP is updated annually after review by representatives of the National Weather Service (NWS) and each user agency in North Dakota.

## II. Service Area and Organizational Directory

Fire meteorological services in North Dakota are provided by the National Oceanic and Atmospheric (NOAA) National Weather Service (NWS) offices in Bismarck and Grand Forks. The NWS weather forecast office (WFO) in Bismarck is responsible for the fire weather program in western and central North Dakota, while the NWS WFO in Grand Forks is responsible for eastern North Dakota. See Figure 1 for specific areas. The normal fire weather season begins in early April and continues to around the end of October. The season will vary according to the actual weather conditions. Fire weather forecasts and other fire weather related information can be found on the Bismarck and Grand Forks Internet web pages:

<https://www.weather.gov/bis/> or <https://www.weather.gov/fgf/>

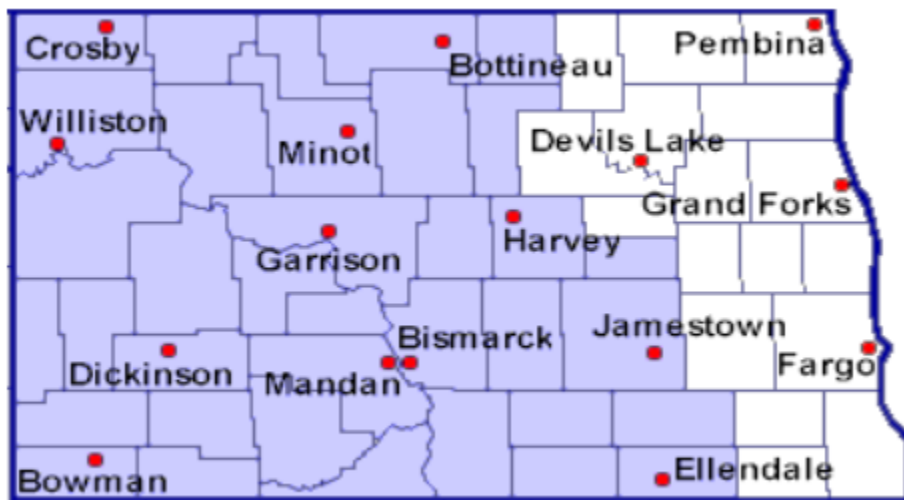


Figure 1: The NWS-Bismarck area of responsibility is shaded. The area of responsibility for NWS-Grand Forks is not shaded.

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### III. Fire Danger Rating for North Dakota

The most commonly accepted definition of Fire Danger is: **“The resultant descriptor of the combination of both constant and variable factors which affect the initiation, spread and difficulty of control of wildfires on an area.”** The various factors of fuels, weather, topography and risk are combined to assess the daily fire potential on an area. Fire Danger is usually expressed in numeric or adjective terms.


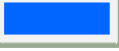

The North Dakota Fire Danger Rating Map (see Appendix A) is produced each day by the North Dakota Department of Emergency Services around 7:00 AM Central time using information from the Experimental Fire Weather Matrix produced by the National Weather Service (see Section IV.A.3 for details on the Experimental Fire Weather Matrix, and Appendix B.1 for an example). It is a forecast of the **potential** for non-agricultural grasslands to **carry** fire. It is based on weather and grassland conditions. The highest threat period for grassland fire danger is usually before the Spring green-up (when grasslands are still in dormancy coming out of the winter season); and again in the late Summer into Fall (when the curing of grasslands leads to critical dryness in the moisture content of the various warm-season and cool-season grasses).



The five fire danger ratings are:

Low    Moderate    High    Very High    Extreme

These ratings may be useful to local fire management officials for daily planning and preparedness purposes.

The following description of Fire Danger Rating is a description of what **may** happen should a fire ignite. It does **not** describe whether or not a fire will ignite.

Fire Danger Rating and Color Code	Description
Low (Green) 	Fuels do not ignite readily from small firebrands although a more intense heat source, such as lightning, may start fires in duff or punky wood. Fires in open cured grasslands may burn freely a few hours after rain, but woods fires spread slowly by creeping or smoldering, and burn in irregular fingers. There is little danger of spotting.
Moderate (Blue) 	Fires can start from most accidental causes, but with the exception of lightning fires in some areas, the number of starts is generally low. Fires in open cured grasslands will burn briskly and spread rapidly on windy days. Timber fires spread slowly to moderately fast. The average fire is of moderate intensity, although heavy concentrations of fuel, especially draped fuel, may burn hot. Short-distance spotting may occur, but is not persistent. Fires are not likely to become serious and control is relatively easy.
High (Yellow) 	All fine dead fuels ignite readily and fires start easily from most causes. Unattended brush and campfires are likely to escape. Fires spread rapidly and short-distance spotting is common. High-intensity burning may develop on slopes or in concentrations of fine fuels. Fires may become serious and their control difficult unless they are attacked successfully while small.

<p>Very High (Orange)</p> 	<p>Fires start easily from all causes and, immediately after ignition, spread rapidly and increase quickly in intensity. Spot fires are a constant danger. Fires burning in light fuels may quickly develop high intensity characteristics such as long-distance spotting and fire whirlwinds when they burn into heavier fuels.</p>
<p>Extreme (Red)</p> 	<p>Fires start quickly, spread furiously, and burn intensely. All fires are potentially serious. Development into high intensity burning will usually be faster and occur from smaller fires than in the very high fire danger class. Direct attack is rarely possible and may be dangerous except immediately after ignition. Fires that develop headway in heavy slash or in conifer stands may be unmanageable while the extreme burning condition lasts. Under these conditions the only effective and safe control action is on the flanks until the weather changes or the fuel supply lessens.</p>



## IV. Services Provided by the NOAA National Weather Service

### A. Basic Services

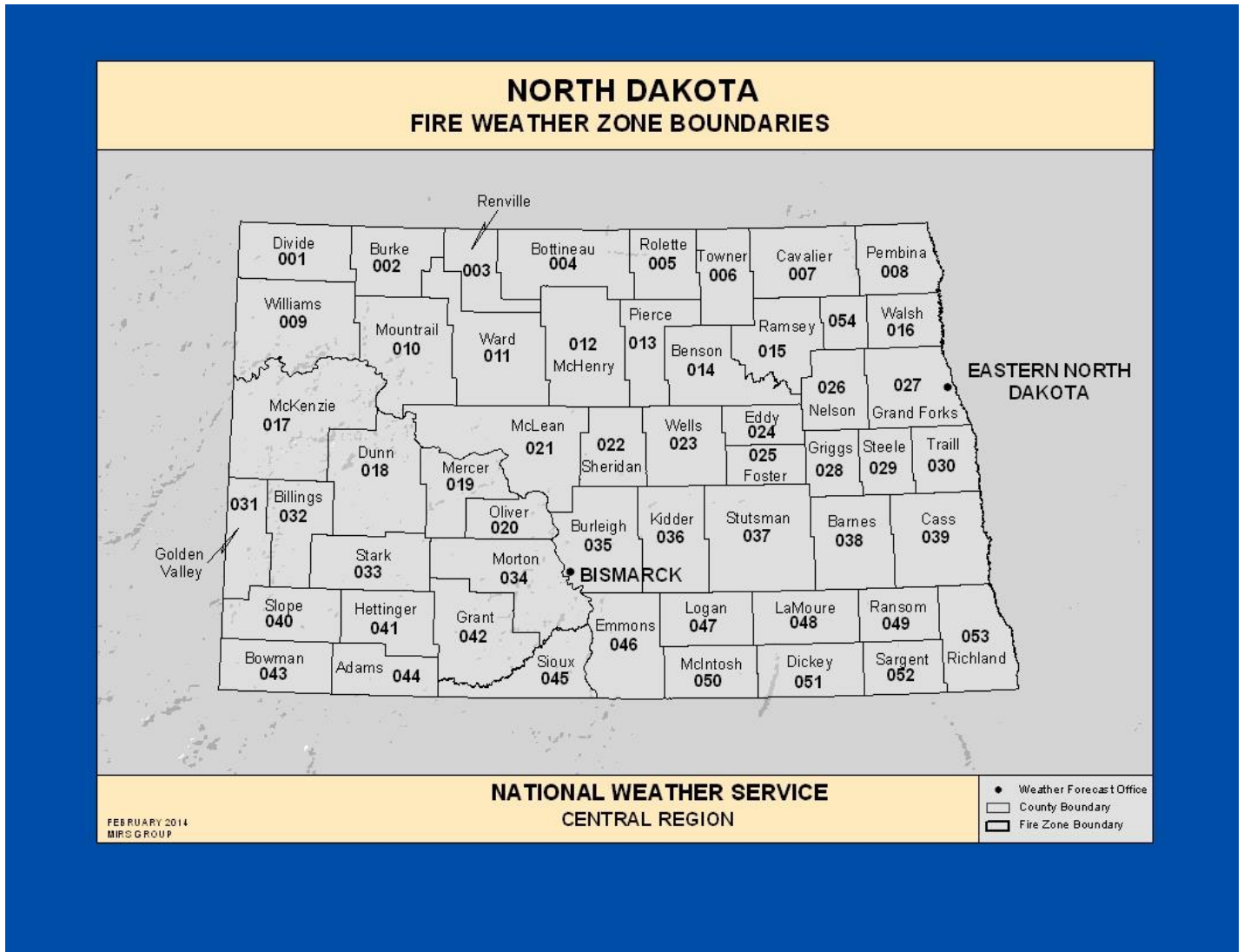


Figure 2: North Dakota Fire Weather Zones used for Fire Weather Watches, Red Flag Warnings, and Fire Weather Planning Forecasts.

#### 1. Fire Weather Planning Forecast (routine issuance)

This forecast product is issued at a minimum of twice daily during the fire weather season at approximately 4 a.m. and 4 p.m. Central Time, and updated as needed. For the Grand Forks NWS Office, the morning issuance will be updated to include the observed Haines index.

The morning forecast contains a brief weather discussion, forecasts for today, tonight and tomorrow, and a general 3 to 7-day forecast. The afternoon forecast covers the periods of tonight, tomorrow, tomorrow night, the following day, and a general 3 to 7-day forecast. The product will be updated as needed. The “Discussion” should be tailored to address items of importance to the fire weather forecast. Persistent errors or biases in the



forecast should be brought to the attention of the National Weather Service. The local optional elements may vary from office to office.

The Bismarck planning forecast optional local elements will be the mid-level Haines index (Appendix D), LAL (Appendix E), Chance of Wetting Rain (CWR >0.10 inches), transport wind, mixing height and smoke dispersal (Appendix F). See Appendix A.2 for examples of these products.

The Grand Forks optional local elements will be the mid-level Haines index, LAL, Precipitation amount, hours of sunshine, transport wind, mixing height, and smoke dispersal.

## 2. National Fire Danger Rating System Forecasts – Fire Weather Matrix (FWM) (routine issuance)

The National Fire Danger Rating System (NFDRS) is designed to represent the fire potential at peak burning conditions over a large area, generally in excess of 100,000 acres. The NWS offices in Bismarck and Grand Forks provide a point forecast, or Fire Weather Matrix (FWM) for RAWS stations utilized in the forecast NFDRS program. The point forecast is used in the Weather Information Management System (WIMS) forecast NFDRS calculations.

The following RAWS sites will receive point forecasts daily during the fire season:

### NWS Bismarck

Crosby	320101	Watford City	321703
Painted Canyon	322503	Sand Creek	323804
Lostwood	320220	Knife River	322701
J. Clark Salyer	320401	Long Lake	322901
Arrowwood	323536	Turtle Mountain	320501
Tatanka Prairie	328501	Williams Lookout	324101

### NWS Grand Forks

Devils Lake	321401		
Hampden	320701	Sheyenne	324605

The point forecasts (FWM) should be sent by 1545 LDT. Forecasted NFDRS indices are valid 24 hours from the current day's 1400 LDT observation. The forecasts should be available in WIMS by 1615 LDT.

The Following is an explanation of codes used in NFDRS Forecasts. See Appendix A.3 for an example.

FCST, STATION#, YYMMDD, 13, WX, TEMP, RH, LAL1, LAL2, WDIR, WSPD, , TX, TN, RHx, RHn, PD1, PD2, WETF

FCST: Indicates individual site forecasts.

STATION#: NFDRS site number

YYMMDD: Date

13: Valid Forecast Time (Always 13 to indicate 1300 LST)

WX: Weather valid at 1300 LST tomorrow. Valid entries are:

- 0 clear
- 1 scattered clouds (1/8 to 4/8)
- 2 broken clouds (5/8 to 7/8)

3 overcast clouds (more than 7/8)  
4 foggy  
5 drizzle  
6 raining  
7 snowing or sleet  
8 showers (in sight or at the station)  
9 thunderstorm  
(Categories 5, 6, 7 sets most NFDRS indices to 0. ERC is the exception)

TEMP: Temperature in degrees F valid at 1300 LST

RH: Relative humidity in percent valid at 1300 LST

LAL1: Lightning Activity Level 1400 LST to 2300 LST

LAL2: Lightning Activity Level 2300 LST to 2300 LST

WDIR: Wind direction valid at 1300 LST

WSPD: Wind speed in mph valid at 1300 LST

TX: Maximum temperature from 1300 LST to 1300 LST tomorrow

TN: Minimum temperature from 1300 LST to 1300 LST tomorrow

RHx: Maximum relative humidity from 1300 LST to 1300 LST tomorrow

RHn: Minimum relative humidity from 1300 LST to 1300 LST tomorrow

PD1: Precipitation duration in hours 1300 LST to 0500 LST

PD2: Precipitation duration in hours 0500 LST to 1300 LST

WETF Y or N: Wet flag, yes or no. This indicates whether or not fuels will be wet at 1300 LST.

### **3. Experimental Fire Weather Matrix (routine issuance)**

This forecast product is produced twice daily and issued around 4 a.m. and 4 p.m. Central Time. It is available online and through NWS dissemination sources with the product identifier BISOPUBIS. The Experimental Fire Weather matrix provides a county-based value that describes the potential for wildfires to ignite, spread, and be difficult to control in non-agricultural grasslands based on weather conditions, fuel state, and topography. A single value is provided for each of the 53 counties in North Dakota and is provided on a scale of 1 (lowest potential) to 5 (highest potential). A daily forecast for each of the next seven days is provided in the matrix. Weather inputs to the matrix are provided from both the NWS Bismarck and NWS Grand Forks offices, while fuel state information is provided by a calculated Growing Season Index that is supplemented by NFDRS-provided Energy Release Component values. The weather forecast and fuel state information is combined in a model that provides a scale-based value of the potential for non-agricultural grasslands to carry fire based on combinations of critical weather and fuel states, including computation of NFDRS-based Ignition Components and Burning Index values.

See Appendix B.1 for an example of the Experimental Fire Weather Matrix.

#### 4. Fire Weather Watch/Red Flag Warning (non-routine issuance)

These products are essential to the safety of the fire crews. Coordination with surrounding offices and land management agencies is essential. Red flag warnings should be issued any time of the day if conditions warrant.

- 1) A Fire Weather Watch will be issued when the potential for Red Flag conditions are expected in the next 12 to 72 hours.
- 2) A Red Flag Warning will be issued if the Red Flag criteria, given below, are expected to be met within the next 24 hours, are imminent or are occurring.

The Red Flag information will be included as a “headline” in the daily planning forecast. It will also be disseminated as a special product that is available on the Internet and NOAA Weather Wire. In addition, the Miles City Dispatch Center will be notified by phone at 406-233-2900. If one of these products are issued during the overnight hours, delay notification until 8:00 AM CT.

See Appendix B for Red Flag Criteria. An example of the fire weather watch and red flag warning product is provided in Appendix A.4.

#### 5. Spot Forecasts (non-routine issuance)

##### a. Policy

- Spot Forecasts will be issued upon request of any federal, state, tribal, or local official in support of a **wildfire**.
- Upon request of any **federal official** as required under the Interagency Agreement
- Upon request of any state, tribal, or local official **in coordination with any federal land management agency**.
- Upon request of any public safety official when **essential to public safety**
- Will **not** provide to private citizens or commercial entities not acting as an agent of a government agency.

##### b. Procedure for Requesting Spot Forecasts

The preferred method to request a spot forecast is via the national spot web page at <http://www.weather.gov/spot>. The spot forecast will be posted to the web page. Our goal is to provide a forecast within 30 minutes of the request; however, higher priority duties may occasionally delay the spot forecast. An updated spot forecast may be requested if it appears conditions are significantly different than those forecast. User feedback on the spot forecasts is strongly encouraged.

Should the national spot web page be unavailable, requests for spot forecasts to WFO Bismarck may be e-mailed to [nws.bismarck@noaa.gov](mailto:nws.bismarck@noaa.gov) after calling 701-250-4494 to coordinate. Please use WS Form D-1 or equivalent (Figure 5b) to produce the request if possible. For spot forecast service in eastern North Dakota when the national spot webpage is unavailable, call WFO Grand Forks at 701-795-5127. The requesting agency should provide the appropriate fax number or email address for this spot forecast.

The NWS will strive to provide as much detail as possible in the wind forecast. This includes specific wind shift times, wind gusts, etc.

### c. Weather Elements Included in Spot Forecasts

Discussion - A brief synopsis of weather features affecting the area

Sky/Weather, Maximum/Minimum temperature, Maximum/Minimum relative humidity, and 20 foot Winds (including shifts and gusts)

Optional Elements (Bismarck) – Mid-level Haines index, transport wind, mixing depth, LAL, and Chance of wetting rain (>.10 inches).

Optional Elements (Grand Forks) - Mid-level Haines index, LAL, Precipitation amount, hours of sunshine, transport wind, mixing height, and smoke dispersal.

See Appendix A.5 for an example of a Spot Forecast.

## **B. Special Services**

### **1. Incident Meteorologist (IMET) Service**

If a wildfire is, or is expected to be, uncontrollable, and loss of life and/or considerable property damage is a possibility, the land management agency may request an on-site deployment of a trained and certified NWS Incident Meteorologist (IMET). An IMET may be requested to a wildland fire at the request of a land management agency through the Miles City Dispatch Center. Per NWSI 10-402, “All requests for IMET support will be requested through the NFWOC (National Fire Weather Operations Coordinator).” If a request to the Bismarck Weather Forecast Office for an IMET is made from anyone other than the NFWOC, then contact the Bismarck MIC (Meteorologist in Charge). The MIC will contact the NFWOC on duty, who will facilitate finding an IMET at the regional or national level. The NFWOC 24 hour Duty Number is 877-323-IMET (4638).

## **V. Wildland Fire Agency Services and Responsibilities**

### **A. RAWS Station Identification Numbers: Procedures for a New RAWS Station**

The following steps are necessary in order to correctly provide a new RAWS station with its identification number:

The land management agency responsible for the new site will provide preliminary information on the plans for a new station. This information will be provided to the NWS Central Region Fire Weather Program Manager (Christopher Foltz, available at [Christopher.foltz@noaa.gov](mailto:Christopher.foltz@noaa.gov) or via phone at 816-268-3143). The preliminary information should also be shared with the local NWS office. The NWS will provide input on siting criteria of the site if requested by the land management agency.

A formal request for the six-digit RAWS identification number will be provided to the responsible NWS office, or directly to the Central Region Headquarters Operational Service Meteorologist.

The regional Operational Services Meteorologist will coordinate with the local NWS office, appropriate land management personnel, and the WIMS staff in order to determine the proper RAWS identification number. Note that the first two digits of the identification number denote the state (in ND, the number is 32), the second pair of digits denotes the county, and the last pair of digits denotes the particular station in that county. In each county, once a station is given a number, that identification number can no longer be used, even if that station becomes inactive.

The regional Operational Services Meteorologist will provide the RAWS identification number to the requesting land management agency and the appropriate NWS office.

The land management agency will notify WIMS in order to assure that the observations are received and sent from the system.

## VI. Appendices

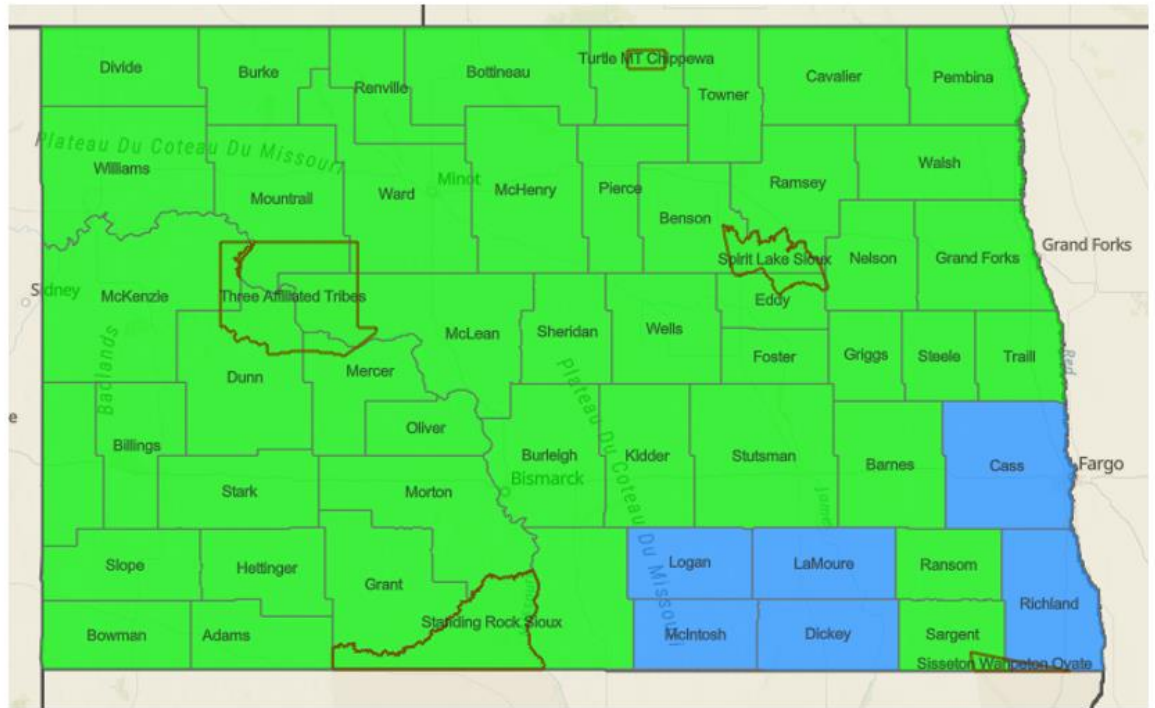
### A. North Dakota Fire Danger Rating Map



## North Dakota Fire Danger Ratings

### Fire Danger Rating

-  Low
-  Moderate
-  High
-  Very High
-  Extreme



## B. NWS Product Examples

### 1. Experimental Fire Weather Matrix

EXPERIMENTAL FIRE WEATHER MATRIX  
NATIONAL WEATHER SERVICE BISMARCK ND  
415 AM CDT THU OCT 28 2021

THIS DEVELOPMENTAL PRODUCT CONTAINS EXPERIMENTAL FIRE WEATHER  
MATRIX OUTPUT FOR NORTH DAKOTA. THIS IS AN EXPERIMENTAL PRODUCT.  
FOR OFFICIAL WEATHER FORECASTS, REFER TO WEATHER.GOV. FOR NORTH  
DAKOTA FIRE DANGER INFORMATION, REFER TO THE NORTH DAKOTA  
DEPARTMENT OF EMERGENCY SERVICES AT NDRESPONSE.GOV/FIRE-DANGER.

NDC023-282200-  
DIVIDE-  
415 AM CDT THU OCT 28 2021

	TODAY	FRI	SAT	SUN	MON	TUE	WED
L CLASS 3		3	2	2	2	2	1

\$\$

NDC013-282200-  
BURKE-  
415 AM CDT THU OCT 28 2021

	TODAY	FRI	SAT	SUN	MON	TUE	WED
L CLASS 2		3	2	2	1	2	1

\$\$

(Continues for the remainder of counties in North Dakota)



## 2. Fire Weather Planning Forecast

FIRE WEATHER PLANNING FORECAST (MORNING)

NATIONAL WEATHER SERVICE

TIME-DATE

...HEADLINE... (REQUIRED FOR RED FLAG WARNINGS AND FIRE WEATHER WATCHES...RECOMMENDED FOR SIGNIFICANT FEATURES AT OTHER TIMES)

.DISCUSSION...

NDZXXX-XXX>XXX-DDHHMM-

GEOGRAPHICAL DESCRIPTORS

...RED FLAG WARNING/FIRE WEATHER WATCH HEADLINE... (AS NEEDED)

.TODAY...

SKY/WEATHER.....

MAX TEMPERATURE.....

24 HR TREND.....

MIN HUMIDITY.....

24 HR TREND.....

WIND (20 FT)...../.....

OPTIONAL ELEMENTS...

.TONIGHT...

SKY/WEATHER.....

MIN TEMPERATURE...

24 HR TREND.....

MAX HUMIDITY.....

24 HR TREND.....

WIND (20 FT).....

OPTIONAL ELEMENTS...

.TOMORROW...

SKY/WEATHER.....

MAX TEMPERATURE...

MIN HUMIDITY.....

WIND (20 FT).....

OPTIONAL ELEMENTS....

.FORECAST DAYS 3 THROUGH 7... (WINDS MUST BE INCLUDED DAYS 3-5, MAY BE INCLUDED DAYS 6 & 7)

.DAY3... (DAYS CAN BE COMBINED)

.DAY4...

.DAY5...

.DAY6...

.DAY7...

\$\$

[FORECAST FOR NEXT GEOGRAPHICAL DESCRIPTOR AND FIRE WEATHER ZONE GROUP]

\$\$

FIRE WEATHER PLANNING FORECAST (AFTERNOON)

NATIONAL WEATHER SERVICE

TIME-DATE

...HEADLINE... (REQUIRED FOR RED FLAG WARNINGS AND FIRE WEATHER WATCHES...SIGNIFICANT FEATURES AT OTHER TIMES RECOMMENDED)

.DISCUSSION...

NDZXXX-XXX>XXX-DDHHMM-

GEOGRAPHICAL DESCRIPTORS

...RED FLAG WARNING/FIRE WEATHER WATCH HEADLINE... (AS NEEDED)

.TONIGHT...

SKY/WEATHER.....

MIN TEMPERATURE...

24 HR TREND.....

MAX HUMIDITY.....

24 HR TREND.....

WIND (20 FT).....

OPTIONAL ELEMENTS...

.TOMORROW...

SKY/WEATHER.....

MAX TEMPERATURE...

24 HR TREND.....

MIN HUMIDITY.....

24 HR TREND.....

WIND (20 FT).....

OPTIONAL ELEMENTS...

.TOMORROW NIGHT...

SKY/WEATHER.....

MIN TEMPERATURE...

MAX HUMIDITY.....

WIND (20 FT).....

OPTIONAL ELEMENTS...

.FOLLOWING DAY...

SKY/WEATHER.....

MAX TEMPERATURE...

MIN HUMIDITY.....

WIND (20 FT).....

OPTIONAL ELEMENTS...

.FORECAST DAYS 3 THROUGH 7... (WINDS MUST BE INCLUDED DAYS 3-5, MAY BE INCLUDED DAYS 6 & 7)

.DAY3... (DAYS CAN BE COMBINED)

.DAY4...

.DAY5...

.DAY6...

.DAY7...

\$\$

[FORECAST FOR NEXT GEOGRAPHICAL DESCRIPTOR AND FIRE WEATHER ZONE GROUP]

\$\$

### 3. National Fire Danger Rating System Forecasts

The following is an example of the point forecast for the RAWS sites in the Bismarck forecast area. The Grand Forks product will look the same, but will be for the RAWS sites in their forecast area.

FNUS83 KBIS 061944  
FWMBIS

FCST,320101,100407,13,1,54,27,1,1,W,14,,56,29,72,26,0,0,N  
FCST,320220,100407,13,2,54,31,1,1,S,11,,56,28,81,20,0,0,N  
FCST,320401,100407,13,1,56,34,1,1,SSE,06,,57,29,81,29,0,0,N  
FCST,321703,100407,13,2,54,29,1,1,W,13,,58,30,78,15,0,0,N  
FCST,322503,100407,13,2,51,30,1,2,WNW,14,,54,30,72,24,0,0,N  
FCST,322701,100407,13,2,55,34,1,2,SE,05,,60,30,78,19,0,0,N  
FCST,322901,100407,13,1,55,35,1,2,NNW,10,,60,31,81,22,0,0,N  
FCST,323536,100407,13,1,53,36,1,1,N,14,,60,30,85,28,0,0,N  
FCST,323804,100407,13,2,49,32,1,2,WNW,14,,55,30,72,27,0,0,N  
FCST,320501,100407,13,1,52,41,1,1,NNE,04,,52,27,92,41,0,0,N  
FCST,328501,100407,13,2,55,34,1,2,WNW,06,,61,32,78,23,0,0,N  
FCST,324101,100407,13,1,56,34,1,1,SSE,06,,57,29,81,29,0,0,N

Both the Grand Forks and Bismarck NWS offices provide 7-day point forecasts for the RAWS sites. The following is an example of the 7-day point forecast for Crosby RAWS and Lostwood RAWS. The text continues for 11 more RAWS sites within the Bismarck forecast area. The Grand Forks text product will look much the same, but will be valid for the RAWS sites in Grand Forks' forecast area.

FNUS83 KBIS 232232  
FWMBIS

FCST,320101,160224,13,2,31,73,1,1,NNW,18,,39,21,100,62,0,0,N  
FCST,320101,160225,13,2,30,70,1,1,SW,06,,33,16,100,68,0,0,N  
FCST,320101,160226,13,0,42,56,1,1,W,12,,43,22,100,54,0,0,N  
FCST,320101,160227,13,2,38,62,1,1,N,09,,44,24,100,54,0,0,N  
FCST,320101,160228,13,2,27,73,1,1,W,09,,40,17,100,58,0,0,N  
FCST,320101,160229,13,2,25,69,1,1,NNE,09,,32,15,100,66,0,0,N  
FCST,320101,160301,13,2,30,67,1,1,WNW,08,,31,15,94,58,0,0,N  
FCST,320220,160224,13,3,29,80,1,1,NNW,18,,38,21,100,64,0,0,N  
FCST,320220,160225,13,2,28,72,1,1,W,08,,32,16,100,71,0,0,N  
FCST,320220,160226,13,1,38,65,1,1,WNW,16,,39,21,100,63,0,0,N  
FCST,320220,160227,13,2,35,68,1,1,NNE,09,,41,24,100,62,0,0,N  
FCST,320220,160228,13,2,21,81,1,1,W,08,,37,15,99,63,0,0,N  
FCST,320220,160229,13,2,23,68,1,1,ENE,08,,28,12,100,64,0,0,N  
FCST,320220,160301,13,2,28,69,1,1,W,08,,28,13,95,58,0,0,N

#### 4. Fire Weather Watches and Red Flag Warnings

URGENT - FIRE WEATHER MESSAGE  
National Weather Service Bismarck ND  
401 AM CDT Fri May 4 2020

...RED FLAG WARNING IN EFFECT THIS AFTERNOON AND EARLY EVENING FOR  
CENTRAL NORTH DAKOTA...

.Critical fire weather conditions are expected across central North Dakota  
this afternoon and early evening. Westerly winds will increase to around  
25 mph, gusting to 40 mph, with relative humidity values falling as low as  
17 percent. Any fires that ignite will spread rapidly in dry fuels and become  
difficult to control or suppress.

NDZ002>005-010>013-019>023-025-034>037-042-045>048-050-051-042115-  
/O.NEW.KBIS.FW.W.0003.180504T1800Z-180505T0000Z/  
Burke-Renville-Bottineau-Rolette-Mountrail-Ward-McHenry-Pierce-  
Mercer-Oliver-McLean-Sheridan-Wells-Foster-Morton-Burleigh-Kidder-  
Stutsman-Grant-Sioux-Emmons-Logan-La Moure-McIntosh-Dickey-  
401 AM CDT Fri May 4 2018 /301 AM MDT Fri May 4 2018/

...RED FLAG WARNING IN EFFECT FROM 1 PM CDT /NOON MDT/ THIS  
AFTERNOON TO 7 PM CDT /6 PM MDT/ THIS EVENING FOR WIND AND LOW  
RELATIVE HUMIDITY FOR CENTRAL NORTH DAKOTA...

The National Weather Service in Bismarck has issued a Red Flag  
Warning for wind and low relative humidity, which is in effect  
from 1 PM CDT /noon MDT/ this afternoon to 7 PM CDT /6 PM MDT/  
this evening.

- \* AFFECTED AREA...Central North Dakota.
- \* WINDS...Northwest 25 mph with gusts to 40 mph.
- \* RELATIVE HUMIDITY...As low as 17 percent.
- \* IMPACTS...Any fires that ignite will spread rapidly and become  
difficult to control or suppress.

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 can  
contribute to extreme fire behavior.

&&

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Transport winds.....West 6 to 9 mph shifting to the southeast 5 to 13 mph in the late evening. Winds becoming south to 15 mph early Sunday morning.

Smoke dispersal.....Fair to excellent (27900-70500 knot-ft) decreasing to poor (4300 knot-ft) in the late evening and overnight.

TIME (CDT)	6PM	7PM	8PM	9PM	10P	11P	MID	1AM	2AM	3AM	4AM	5AM
Sky (%)	4	6	8	11	15	21	28	38	50	62	71	75
Weather cov								CHC	CHC	CHC	CHC	CHC
Weather type								RW	RW	RW	RW	RW
Tstm cov								CHC	CHC	CHC	CHC	CHC
Chc of pcpn (%)	0	0	0	0	0	0	0	30	30	30	30	30
Temp	89	87	82	77	72	69	66	64	63	62	61	60
RH	24	26	33	38	44	51	56	60	63	66	70	75
20 FT wind dir	NW	NW	N	E	E	E	E	E	SE	SE	SE	E
20 FT wind spd	6	4	2	2	4	5	5	5	5	5	4	1
20 FT wind gust	7	5		3	5	6	6	6	6	6	5	2
Mix hgt (kft)	8.8	8.4	5.6	2.2	0.9	0.8	1.0	0.8	0.6	0.5	0.7	0.7
Transp wind dir	W	W	W	E	E	SE	SE	SE	S	S	S	S
Transp wind spd	9	7	6	5	6	7	9	10	13	15	16	16
Haines index	6	6	6	6	6	6	6	6	6	5	5	5

.SUNDAY...

Sky/weather.....Partly sunny. Chance of showers and thunderstorms early in the morning.

Chance of pcpn.....30 percent.

Max temperature.....Around 85.

Min humidity.....36 percent.

Wind (20 ft).....Light winds becoming north 5 to 10 mph. Gusty and erratic winds expected near thunderstorms in the morning.

Mixing height.....400-1700 ft AGL increasing to 4600-5200 ft AGL.

Transport winds.....Southwest 12 to 15 mph shifting to the northeast 9 to 16 mph in the late morning and afternoon.

Smoke dispersal.....Poor to good (4500-50100 knot-ft) increasing to good to excellent (55500-72500 knot-ft) late in the afternoon.

Haines Index.....4 to 6 OR (low) to (high).

TIME (CDT)	6 AM	9 AM	NOON	3 PM
Sky (%)	75	52	51	56
Weather cov	CHANCE	S CHC	S CHC	
Weather type	RNSHWR	RNSHWR	RNSHWR	NONE
Tstm cov	CHANCE	S CHC	S CHC	
Chc of pcpn (%)	30	20	20	10
Temp	59	67	80	85
RH	80	68	45	36
20 FT wind	N 3G5	N 6	N 8	N 10
Mix hgt (ft)	500	1100	4000	4700
Transport wind	SW 15	E 12	NE 9	NE 14
Haines index	6	5	4	4

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Forecaster...(NWS Forecaster Name)  
 Requested by...(Requesting Agent Name)  
 Type of request...PRESCRIBED (or WILDFIRE or HAZMAT, etc.)  
 .TAG 1810677.0/BIS  
 .DELDT 05/26/18  
 .EMAIL (email of requesting agent)



## B. Red Flag Warning Criteria and the Red Flag Matrix –

The following red flag matrix was based on calculations for Rate of Spread of wildfires using “Behave” software given certain wind and relative humidity values on a sunny summer day with a temperature of 80F, is used as a “first look” when considering the need for a Red Flag Warning. The chart is meant as a guide, and is not absolute.

Some special considerations (discretion clause) to take into account:

NWS will maintain limited flexibility in using and interpreting the Red Flag Matrix. This flexibility allows forecaster discretion, and will allow forecasters to issue a Red Flag Warning, albeit sparingly, for unforeseen or drastic weather events, such as:

- 1) Dry thunderstorm activity is foreseen during an extremely dry period.
- 2) Anytime the forecaster foresees a change in weather that would result in a significant increase in fire danger (e.g., very strong winds associated with a cold front even though the fire danger rating is below the high category, extensive lightning, etc.)
- 3) During the off-season (post freeze of RAWS stations and pre-greenup of the RAWS stations) forecasters will use the discretion while cross-referencing the Red Flag Matrix in Red Flag decision-making.



**Red Flag Matrix**

Relative Humidity (%)

		40%	35%	30%	25%	20%	15%	10%
Sustained Wind Speed (mph)	5 mph	NO	NO	NO	NO	NO	NO	NO
	10 mph	NO	NO	NO	NO	NO	NO	NO
	15 mph	NO	NO	NO	NO	NO	NO	NO
	20 mph	NO	NO	NO	NO	YES	YES	YES
	25 mph	NO	NO	YES	YES	YES	YES	YES
	30 mph	NO	NO	YES	YES	YES	YES	YES
	35 mph	NO	YES	YES	YES	YES	YES	YES
	40 mph	NO	YES	YES	YES	YES	YES	YES

**Use Red Flag Matrix when  
Fire Danger is: High, Very  
High, or Extreme**

**Red Flag Conditions  
needed for at least  
3 consecutive hours**

### C. Spot Forecast Fax Request Form and Instructions

WS FORM D-1 (1-2005) (Supersedes Previous Editions)		<b>SPOT REQUEST</b> (See reverse for instructions)				U.S. Department of Commerce NOAA National Weather Service							
Please call the NWS Weather Forecast Office (WFO) when submitting a request and also after you receive a forecast to ensure request and forecast were received. Please provide feedback to WFO on forecast.													
1. Time†		2. Date		3. Name of Incident or Project			4. Requesting Agency						
5. Requesting Official			6. Phone Number			7. Fax Number		8. Contact Person					
9. Ignition/Incident Time and Date		12. Reason for Spot Request (choose one only) <input type="radio"/> <b>Wildfire</b> <input type="radio"/> <b>Non-Wildfire</b> Under the Interagency Agreement for Meteorological Services (USFS, BLM, NPS, USFWS, BIA) <input type="radio"/> <b>Non-Wildfire</b> State, tribal or local fire agency working in coordination with a federal participant in the Interagency Agreement for Meteorological Services <input type="radio"/> <b>Non-Wildfire</b> Essential to public safety, e.g. due to the proximity of population centers or critical infrastructure.					13. Latitude/Longitude:						
10. Size (Acres)							14. Elevation (ft, Mean Sea Level) Top:                      Bottom:						
11. Type of Incident <input type="radio"/> <b>Wildfire</b> <input type="radio"/> <b>Prescribed Fire</b> <input type="radio"/> <b>Wildland Fire Use (WFU)</b> <input type="radio"/> <b>HAZMAT</b> <input type="radio"/> <b>Search And Rescue (SAR)</b>							15. Drainage						
		16. Aspect		17. Sheltering <input type="radio"/> <b>Full</b> <input type="radio"/> <b>Partial</b> <input type="radio"/> <b>Unsheltered</b>									
18. Fuel Type: <input type="checkbox"/> Grass <input type="checkbox"/> Brush <input type="checkbox"/> Timber <input type="checkbox"/> Slash <input type="checkbox"/> Grass/Timber Understory <input type="checkbox"/> Other _____ Fuel Model: 1,2,3    4,5,6,7    8,9,10    11,12,13    2,5,8													
19. Location and name of nearest weather observing station (distance & direction from project):													
20. Weather Observations from project or nearby station(s): (Winds should be in compass direction e.g. N, NW, etc.)													
Place		Elevation	†Ob Time	20 ft. Wind Dir    Speed		Eye Level Wind. Dir    Speed		Temp. Dry    Wet		Moisture RH    DP		Remarks (Relevant Weather, etc)	
21. Requested Forecast Period Date			22. Primary Forecast Elements (Check all that are needed) (for management ignited wildland fires, provide prescription parameters):					23. Remarks (other needed forecast elements, forecast needed for specific time, etc.)					
Start _____			Needed:										
End _____			Sky/Weather _____										
Forecast needed for:			Temperature _____										
<input type="radio"/> Today			Humidity _____										
<input type="radio"/> Tonight			20 ft Wind _____										
<input type="radio"/> Day 2			Valley _____										
<input type="radio"/> Extended			Ridge Top _____										
			Other (Specify in #23) _____										
24. Send Forecast to: ATTN:			25. Location:					26. Phone Number: Fax Number:					
27. Remarks (Special requests, incident details, Smoke Dispersion elements needed, etc.):													

EXPLANATION OF SYMBOLS: † Use 24-hour clock to indicate time. Example: 10:15 p.m. = 2215; 10:15 a.m. = 1015  
Indicate local standard time or local daylight time

WS FORM D-1  
WS FORM D-1, January 2005

**INSTRUCTIONS:**

**I. Incident Personnel:**

1. Complete items 1 through 27 where applicable.

13. Weather Observations from project or nearby station(s):											
Place	Elevation	†Ob Time	20 ft. Wind		Eye Level Wind.		Temp.		Moisture		Remarks (Relevant Weather, etc.)
			Dir	Speed	Dir	Speed	Dry	Wet	RH	DP	
Unit G-50	1530'	0830	NW	6-8	NW	3-5	32		72		Observations from unit RAWS station, 50% cloud cover.

- a. Example of weather conditions on site:
- b. If the incident (HAZMAT, SAR) involves marine, put the wave/swell height and direction in the Remarks section.
2. Transmit in numerical sequence or fax to the appropriate Weather Forecast Office. (A weather forecaster on duty will complete the special forecast as quickly as possible and transmit the forecast and outlook to you by the method requested)
3. Retain completed copy for your records.
4. **Provide feedback to NWS utilizing separate page.** Be sure to include a copy of the spot forecast with any feedback submission including forecaster's name. Feedback to NWS personnel is imperative to assist with future forecasts. Remember, feedback on correct forecasts is equally as valuable as feedback on incorrect forecasts! If spot forecast is significantly different than conditions on site, a second forecast may be required.

**II. ALL RELAY POINTS should use this form to insure completeness of date and forecast. A supply of this form should be kept by each dispatcher and all others who may be relaying requests for forecasts or relaying completed forecasts to field units.**

**III. Forms are available from your local National Weather Service Weather Forecast Office. They may also be reproduced by other agencies as needed, entering the phone number and radio identification if desired.**

***NOTICE: Information provided on this form may be used by the National Weather Service for official purposes in any way, including public release and publication in NWS products. False statements on this form may be subject to prosecution under the False Statement Accountability Act of 1996 (18 U.S.C. § 1001) or other statutes.***

## D. Haines Index Calculations

Computing the Haines Index in Middle Terrain Elevations:

Stability Term = Temp(850mb) - Temp(700mb)

Moisture Term = Temp(850mb) - Dew Point Temp(850mb)

Each term is given a value of either 1, 2 or 3.

Stability Term Value:

1 – if 5 deg C or less

2 – if 6-10 deg C

3 – if 11 deg C or more

Moisture Term Value:

1 – if 5 deg C or less

2 – if 6-12 deg C

3 – if 13 deg C or more

The Stability and Moisture terms are added to calculate the Haines index.

Mid Level Haines Index

Potential for large fire growth

2 or 3

...very low

4

...low

5

...moderate

6

...high

## E. Lightning Activity Level Guide

### Lightning Activity Level Guide

LAL	Coverage
1	No T-storms
2	Isolated T-storms (1-14% coverage)
3	Widely Scattered T-Storms (15-24% coverage)
4	Scattered T-storms (25-54% coverage)
5	Numerous (55+% coverage)
6	>=15% coverage...little or no rain

## F. Smoke Dispersal and Ventilation Terms

### Smoke Dispersal Terms

Category	Description
<b>Very Poor</b>	High smoke pollution potential. Usually occurs in a very stable air (strong inversion) and light winds. Normally occurs late at night and early in the morning hours, but could occur during the daytime when a shallow pool of cold air intrudes into the area creating strong low level inversions. Burning is not advised under this category.
<b>Poor</b>	Moderate to High smoke potential. Burning not advised under this category. Most likely time of occurrence is from evening through the early morning.
<b>Fair</b>	Marginal smoke pollution potential. Dependent on trend of weather and local conditions. Generally acceptable for small burns of dry fuels.
<b>Good</b>	Moderate to Low smoke pollution potential. No inversion and gentle winds expected. Most likely to occur in the late morning and afternoon when surface heating usually breaks through the low level inversions.
<b>Very Good</b>	Low smoke pollution potential. Transport winds or mixing height lower than that for Excellent. Transport winds stronger than that for Good. Most likely to occur in the late morning and afternoon.
<b>Excellent</b>	Low smoke pollution potential. Unstable airmass and/or brisk winds. Best time to conduct burning operations if fire can be controlled. Most likely to occur in the late morning and afternoon or when a strong weather system affects the area, eliminating all low level inversions and generating moderate winds.

### Breakdown of Ventilation

#### Based on Mixing Height and Transport Wind

Excellent.....	150,000 Knot Feet and Greater
Very Good.....	100,000 to 150,000 Knot Feet
Good.....	60,000 to 100,000 Knot Feet
Fair.....	40,000 to 60,000 Knot Feet
Poor.....	Less than 40,000 Knot Feet

## G. Listing of RAWS Stations in North Dakota

The following is a listing of active RAWS stations in North Dakota as of February 1<sup>st</sup>, 2024.

### NWS Bismarck Forecast Area

Crosby	320101	Watford City	321703
Painted Canyon	322503	Sand Creek	323804
Lostwood	320220	Knife River	322701
J. Clark Salyer	320401	Long Lake	322901
Arrowwood	323536	Turtle Mountain	320501
Tatanka Prairie	328501	Williams Lookout	324101

### NWS Grand Forks Forecast Area

Hampden	320701	Devils Lake	321401
Sheyenne	324605		

## VI. Agency Signatures

This plan is valid for the 2024 North Dakota fire season.

/Signed/date

Jeffrey Savadel, NOAA National Weather Service Meteorologist in Charge (Bismarck)  
Representing both NWS offices with fire weather forecast responsibility in North Dakota

/Signed/date

Rod Skalsky, FMO, ND Group National Parks, National Park Service  
North Dakota Fire Council Chairman