

# **Fire Weather Services**

for

## **North Carolina**

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### **Operating Plan**

**NWS Blacksburg, VA**

**NWS Greenville-Spartanburg, SC**

**NWS Morehead City, NC**

**NWS Morristown, TN**

**NWS Raleigh, NC**

**NWS Wakefield, VA**

**NWS Wilmington, NC**

**2008**

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This operating plan will be a semi-permanent document, specifying Fire Weather services provided by National Weather Service in North Carolina. The plan incorporates procedures detailed in the Interagency Agreement for Meteorological Services.

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# Introduction

## **Purpose of AOP.**

This Operating Plan serves as the official document governing the interaction and relationships between the National Weather Service, and the federal, state and local natural resource and land management agencies or cooperators in North Carolina.

## **Explanation of relationship between AOP and MOU.**

This State Operating Plan is issued in lieu of a formal Memorandum of Understanding (MOU) between the National Weather Service, federal, state, and other agencies that rely on fire weather support. The plan will outline forecast operations and services available to users. This includes products and formats, dissemination and coordination, and the responsibilities of the partners.

This Operating Plan will be the governing document for fire weather procedures and cooperation among the following agencies:

- NOAA National Weather Service
- US Forest Service
- USDI National Park Service
- NC Division of Forest Resources
- US Fish and Wildlife Service
- US Army - Fort Bragg
- US Marine Corps - Camp Lejeune
- US Air Force - Dare County Bomb Range
- The Nature Conservancy
- USDI Bureau of Indian Affairs
- NC Division of Parks & Recreation
- US Army - Sunny Point Military Ocean Terminal
- US Marine Corps - Cherry Point
- NC Wildlife Resources Commission

The Southern Area Mobilization Guide and the National Mobilization Guide further define the relationship between the natural resource agencies and the NWS Incident Meteorologist.

This Operating Plan for Fire Weather Services conforms with the [Interagency Agreement for Meteorological Services](#) , concluded in October, 2002.

# Service Area and Organizational Directory

## Service Area

The service area covered by this AOP is the state of North Carolina, served by the National Weather Service Weather Forecast Offices at Blacksburg, VA (RNK), Greenville - Spartanburg, SC (GSP), Morehead City, NC (MHX), Morristown, TN (MRX), Raleigh, NC (RAH), Wakefield, VA (AKQ), and Wilmington, NC (ILM).

Forecast areas are tied to the "radar umbrella" of the WSR-88D Doppler Radar. The umbrella is the area which is covered by the radar volume scan. This means that forecasts are not bound by state political borders, although county borders are generally observed. The North Carolina portion of the Great Smoky Mountains National Park is covered by the NWS office in Morristown, TN. For a map of the fire weather zones in NC, see the appendix.

The **AKQ forecast area** covers portions of northeast North Carolina.

The northeast North Carolina counties covered by WFO AKQ (Wakefield, VA) include:

Bertie	Camden	Chowan
Currituck	Gates	Hertford
Northampton	Pasquotank	Perquimans

The **GSP forecast area** covers much of western North Carolina.

The western North Carolina counties covered by WFO GSP (Greenville - Spartanburg, SC) include:

Alexander	Avery	Buncombe	Burke
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Cabarrus	Caldwell	Catawba	Cleveland
Davie	Gaston	Graham	Haywood
Henderson	Iredell	Jackson	Lincoln
Macon	Madison	McDowell	Mecklenburg
Mitchell	Polk	Rowan	Rutherford
Swain	Transylvania	Union	Yancey

The **ILM forecast area** covers southeast North Carolina.

The southeast North Carolina counties covered by WFO ILM (Wilmington, NC) include:

Bladen	Brunswick	Columbus
New Hanover	Pender	Robeson

The **MHX forecast area** covers eastern North Carolina.

The eastern North Carolina counties covered by WFO MHX (Morehead City, NC) include:

Beaufort	Carteret	Craven
Dare	Duplin	Greene
Hyde	Jones	Lenoir
Martin	Onslow	Pamlico
Pitt	Tyrell	Washington

The **MRX forecast area** covers southwest North Carolina, and the Great Smoky Mountain National Park portion of Haywood and Swain Counties.

The southwest North Carolina counties covered by WFO MRX (Morristown, TN) include:

Cherokee	Clay	Northwest Haywood	Northern Swain
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The **RAH forecast area** covers central North Carolina.

The central North Carolina counties covered by WFO RAH (Raleigh, NC) include:

Alamance	Anson	Chatham	Cumberland
Davidson	Durham	Edgecombe	Forsyth
Franklin	Granville	Guilford	Halifax
Harnett	Hoke	Johnston	Lee

Montgomery	Moore	Nash	Orange
Person	Randolph	Richmond	Sampson
Scotland	Stanly	Vance	Wake
Warren	Wayne	Wilson	

The **RNK forecast area** covers northwest North Carolina.

The northwest North Carolina counties covered by WFO RNK (Blacksburg, VA) include:

Alleghany	Ashe	Caswell
Rockingham	Stokes	Surry
Watauga	Wilkes	Yadkin

## **National Weather Service Headquarters**

NWS Headquarters, located in Silver Spring, Maryland, establishes policies and coordinates the national fire weather program. The national program manager coordinates the program with the regional program managers. The national program manager also works with the national headquarters of the Federal forestry and other natural resource management agencies and the Association of State Foresters in determining overall requirements for meteorological support. The national program manager coordinates national training in forestry and fire weather for NWS forecasters.

## **National Weather Service Regional Headquarters**

Regional Headquarters manage the technical operational aspects of the fire weather program within each region. They also provide guidance and assistance to meteorologists-in-charge (MIC) on program operations and developing issues through Supplements to the National Directives System (NDS) and conferences. Regional Headquarters advise National Headquarters on matters pertaining to technical planning and operations. The regional program managers coordinate the regions' fire weather programs and advise the Regional Directors on the operational and administrative aspects of the regions' programs.

## **Weather Forecast Offices (WFO)**

Weather Forecast Offices prepare and disseminate forecast products for all sectors of the population, including those for the Fire Weather program. These offices are responsible for providing forecasts for user agencies within their County Warning and Forecast Area (CWFA). Most offices have a designated fire weather focal point or fire weather program leader.

The National Weather Service Weather Forecast Offices will provide 24-hour, 365 days a year service. The NWS WFO's can be reached at:

**[Blacksburg Weather Forecast Office](#)**

**VA Tech Corporate Research Center  
1750 Forecast Drive  
Blacksburg, Virginia 24060**

**[National Weather Service](#)**

**1549 GSP Drive  
Greer, South Carolina 29651**

**[National Weather Service](#)**

**533 Roberts Road  
Newport, North Carolina 28570**

**[National Weather Service](#)**

**5974 Commerce Blvd.  
Morristown, Tennessee 37814**

**[National Weather Service](#)**

**Centennial Campus  
1005 Capability Drive  
Research Building III, Suite 300  
Raleigh, North Carolina 27606**

**[National Weather Service](#)**

**10009 General Mahone Highway  
Wakefield, Virginia 23888**

**[National Weather Service](#)**

**2015 Gardner Drive  
Wilmington, North Carolina 28405**

NOTE: Unlisted telephone numbers used for coordination cannot be listed here. All user agencies have been or will be provided voice and fax numbers to be used for official purposes only.

## **Meteorologists-in-Charge (MIC)**

The Meteorologists-in-Charge are responsible for the provision of adequate weather services for the offices' assigned areas of program responsibility. The MIC's will ensure

that the focal points or program leaders are provided adequate time for user liaison and assistance activities.

**Michael Caropolo, Wilmington, NC**

**Darin Figurskey, Raleigh, NC**

**Larry Gabric, Greenville-Spartanburg, SC**

**Thomas Kriehn, Morehead City, NC**

**George Mathews, Morristown, TN**

**Tony Siebers, Wakefield, VA**

**Dave Wert, Blacksburg, VA**

## **Program Leaders (or Focal Points)**

Fire weather focal points and program leaders are the "customer service representatives" for the program. The focal points or program leaders, as representatives of the MIC's, are in regular contact with the partner agencies, helping them assess their meteorological needs, informing them of NWS products and services available to meet these needs, and educating them in the most effective use of the various NWS products and resources, including NOAA Weather Radio (NWR). Focal points and program leaders will work with users to utilize existing NWS products and services produced for other programs that could meet the requirements of natural resource management. The focal points and program leaders are also tasked with ensuring staff meteorologists are trained and remain proficient in preparing forecast products for support of the fire weather program. Fire Program Leaders can be reached via e-mail on their NWS office fire weather homepage.

**[Phil Badgett \(phillip.badgett@noaa.gov\)](mailto:phillip.badgett@noaa.gov), Raleigh, NC**

**[David Gaffin \(david.gaffin@noaa.gov\)](mailto:david.gaffin@noaa.gov), Morristown, TN**

**[Larry Brown \(larry.brown@noaa.gov\)](mailto:larry.brown@noaa.gov), Wakefield, VA**

**[Phil Manuel \(phillip.manuel@noaa.gov\)](mailto:phillip.manuel@noaa.gov), Blacksburg, VA**

**[Jim Merrell \(james.merrell@noaa.gov\)](mailto:james.merrell@noaa.gov), Morehead City, NC**

[Ron Steve \(ronald.steve@noaa.gov\)](mailto:ronald.steve@noaa.gov), Wilmington, NC

[John Tomko \(john.tomko@noaa.gov\)](mailto:john.tomko@noaa.gov), Greenville-Spartanburg, SC

## **Participating Agencies**

The following agencies are participants of this operating plan:

**USDI National Park Service.**

**NOAA National Weather Service**

**Nature Conservancy**

**NC Division of Forest Resources**

**US Army - Fort Bragg**

**US Army - Sunny Point Military Ocean Terminal**

**US Marine Corps - Camp Lejeune**

**US Air Force - Dare County Bomb Range**

**US Fish and Wildlife Service**

**US Forest Service**

**USDI Bureau of Indian Affairs**

**NC Wildlife Resources Commission**

**NC Division of Parks & Recreation**

# Services Provided by the National Weather Service

## Basic Services

### Fire Weather Planning Forecast (FWF)

The Fire Weather Planning Forecast (FWF) is a zone-type product used by natural resource management personnel primarily for input in decision-making related to pre-suppression and other planning or resource management activities, as well as for determining general weather trends that might impact burning condition and thereby fire behavior of wildfires and prescribed fires. The decisions impact firefighter safety, protection of the public, property, and the natural resource, and resource allocation.

### *Product Overview and Issuance Criteria*

The FWF provides a detailed prediction of elements for three specific 12-hour periods (four 12-hour periods with the afternoon forecast), a general 3 to 7 day forecast, and an 8 to 14 day extended outlook. The FWF is issued twice daily, once during the morning (between 3:00 and 6:30 AM), and the other during the afternoon (between 2:00 and 4:00 PM). The morning forecast, to be disseminated no later than 8:30 AM, consists of three periods: "Today" (valid from issuance through 6 PM local time), "Tonight" (6 PM to 6 AM), and "Tomorrow" (6 AM to 6 PM). The afternoon version, to be disseminated no later than 4:00 PM, consists of four periods: "Tonight" (6 PM to 6 AM), "Tomorrow" (6 AM to 6 PM), "Tomorrow Night" (6 PM to 6 AM), and the "Following Day" (6 AM to 6 PM).

Note: WFO MRX only produces an afternoon FWF between February 15 and May 15, but will issue an afternoon FWF on request during prolonged drought conditions.

### *Format/Content of the FWF*

- Format - The format of the Fire Weather Forecast is specified in National Weather Service Directive 10-401.
- Headlines - A headline is **required** when Red Flag Warnings and/or Fire Weather Watches are in effect. The headline will include the warning type, location, reason for issuance (e.g., high winds and low humidity), and effective time period(s). The headline is also included in the body of the FWF, in each appropriate zone grouping. Other headlines are requested since the natural resource agencies are also considered "all risk agencies". When significant weather trends of locally-defined critical weather elements are forecast or

observed during non-watch/warning periods, they will be identified in the headline.

- Discussion - The discussion should be a brief, clear, non-technical description of the weather patterns that influence the weather in the forecast area.
- Cloud Cover ("CLOUD COVER") - This is an indication of the expected sky condition. "Clear" or "Sunny" descriptors are designated when the forecast cloud cover is < 10%; "Mostly Clear" or "Mostly Sunny" are used when cloud cover is forecast to be  $\geq$  10% and < 30%; "Partly Cloudy" or "Partly Sunny" are used when cloud cover is forecast to be  $\geq$  30% and < 60%; "Mostly Cloudy" is used when cloud cover is  $\geq$  60% and < 80%; "Cloudy" is used when cloud cover is forecast to be  $\geq$  80%.
- Precipitation Type ("PRECIP TYPE") - This refers to the predominant precipitation type during the forecast period, with an exception. When both "showers" and "thunderstorms" are included in the public forecast, "thunderstorms" will be designated as the precipitation type in the FWF.
- Chance of Precipitation ("CHANCE PRECIP") - Refers to the probability of measurable precipitation (0.01 inches or more) during the forecast period. This will be rounded to the nearest 10%. Note: Drizzle and snow flurries are not considered measurable precipitation and thus will not be given a probability.
- Temperature ("TEMP") - Refers to the forecasted maximum and minimum temperature for the zone, in degrees F, as measured at a standard 4.5 ft above the ground level. Also included is a 24 hour trend value, noting the difference from the previous day's maximum/minimum temperature.
- Relative Humidity ("MAX/MIN RH") - Forecasted minimum relative humidity is provided during the daytime periods, while maximum RH is included at night. Also, as with temperature, a 24-hour trend is provided, except at WFO RNK.

Note: The lowest average humidity typically occurs during the warmest part of the day. However, if it is expected to occur at a different time of the day, this will be noted in the "Remarks" portion of the forecast.

- Surface Winds ("WND20FT2MIN/EARLY and WND20FT2MIN/LATE") - Surface wind speed and direction represent a two-minute average at 20 feet above the ground or 20 ft above the vegetative cover. Wind direction is the direction the wind blows from, to eight points of the compass. The "EARLY" designation refers to morning hours (before noon) during daytime periods, and also the evening hours (before midnight) during nighttime periods. "LATE" refers to the afternoon hours during the daytime periods, and also the pre-dawn hours (after midnight) during the nighttime periods. Wind gusts, which are rapid fluctuations in wind speed of usually less than 30 seconds in duration, are indicated in the forecast if gustiness is expected. Forecasts for highest probable gust will be preceded by "G".
- Precipitation Amount ("PRECIP AMOUNT") - Refers to the forecasted precipitation amount (in hundredths of an inch) whenever the chance of precipitation is 20% or greater.

- Precipitation Duration ("PRECIP DURATION") - Refers to the duration of the measurable precipitation (in hours) when the probability of measurable precipitation is greater than or equal to 20%. A precipitation duration forecast of "1" is used for "1 hour or less" duration.
- Precipitation Begin/End ("PRECIP BEGIN/END") - Refers to the time measurable precipitation begins or ends. Only used by WFO MRX and WFO RNK.
- Mixing Height ("MIXING HGT") - Mixing height is defined as the atmospheric limit above which vigorous vertical mixing does not take place. Mixing height forecasts are given in feet above the ground ("FT-AGL"), except at WFO MRX, where mixing heights are given in feet above mean sea level ("FT-MSL"), but will be given in AGL in a spot forecast upon customer request.
- Transport Wind ("TRANSPORT WND") - Defined as the average wind direction and speed from the surface to the top of the mixed layer. Direction of the transport wind (where the wind is blowing from) and speed will be given. The speed will be in MPH.
- Ventilation Rate ("VENT RATE")

- Refers to a multiplication of the mixing height and transport wind., With units in ft MPH. Ventilation rates, forecasted during the daytime, are used to calculate the Burn Category for each day. The ventilation rate gives the potential for the atmosphere to to disperse smoke. Refer to Appendix 1 for further details regarding the correlation of the Ventilation Rate and Burn Category.

Note: Not included by WFO MRX.

- Dispersion ("DISPERSION")

- Refers to the forecasted smoke dispersion category at night, based on the surface wind speed. The dispersion category gives a general indication of the state of the atmosphere with respect to its ability to disperse smoke. The dispersion forecast (nighttime) is analogous to the daytime Ventilation Rate, though only a forecast during the evening hours is provided as a large majority of controlled/prescribed fire operations are completed before midnight. A spot forecast is recommended for critical operations that might involve smoke drift towards a populated area. Refer to Appendix 2 for further details on Dispersion categories.

Note: WFO's GSP and ILM do not produce dispersion forecasts due to differences in categories between NC and SC.

WFO MRX produces a Lavdas dispersion index forecast computed from the 20-foot wind speed, mixing height, transport wind, and cloud cover. Refer to the Appendix for further details of the MRX Lavdas dispersion index.

- Lightning Activity Level ("LAL")

- A numerical value, which is used to describe the expected lightning activity for that day. Refer to Appendix 3 for further details on the LAL.

Note: WFO MRX does not produce a lightning activity level forecast.

- Haines Index ("HAINES INDEX")

- The index infers the stability of the atmosphere. In the North Carolina Coastal Plain and Piedmont, "low elevation" is assumed for the calculation of the Haines Index. It utilizes the atmospheric temperature at 950 mb and 850 Mb as well as taking into account the moisture levels (dew point depression) at 850 Mb. In the North Carolina mountains, the "mid level" Haines Index is calculated using the temperatures at 850 Mb and 700 Mb, and the dew point depression at 850 Mb.

Haines Index values range from 2 through 6.

On western fires Haines Index values of 5 or 6 serve as an alert that fires or prescribed burns can experience control challenges. Local regional studies in North Carolina have shown that a Haines Index of 4 represents the initiating threshold whereby the atmosphere can support large fire growth. In the absence of strong winds, fire growth will be primarily "plume dominated", with crowning and spotting on all sides. As wind speeds increase, coupled with a starting Haines Index of 4 or greater, there is an increased threat for large wind-driven fires.

- 3 through 7 Day Forecast - The outlook period is an extended forecast for the zone, or the entire forecast area, provided in narrative form (non-digital, non-tabular), and appended either at the bottom of each zone grouping (for just that zone), or at the end of all the zone groupings (for the entire area).

- Inversion Information

- Refers to the time and/or temperature at which the morning inversion will burnoff, or the time the inversion will setup in the evening. If the inversion is not surface based (yet still at low levels, e.g. below 1000 feet), meteorological factors other than nighttime radiational cooling may be taking place and as such, inversion information may not be given ("Inversion" remains in the forecast through the day, which would be reflected by a low mixing height). Conversely, there will be situations when a low level inversion does not develop at night; during these situations when a "NO INV" or "NONE" will be noted. Note: WFO's GSP and ILM will include burnoff time and temperature in the morning, as well as setup time in the evening. WFO MHX includes burnoff temperature only. Other inversion notation includes CONT (for continued inversion), and MIXED/HHMM (when and inversion mixes out at local time HH:MM).

Note: WFO MRX does not produce an inversion forecast.

- Wind Profile Analysis

- It is recognized that the profile of wind speed with altitude on active fire days is an important factor in fire behavior. Certain profiles of wind speed marked by decreasing speed above a maximum or a jet within 1500 ft of the surface can cause fires to behave erratically when combined with a rapid decrease in air temperature with altitude on the order of 5.5 degrees F per 1000 ft. Appendix 4 describes these types of profiles (Adverse Wind Profiles) that contribute toward adverse fire behavior.

The WPA is included in the remarks section of zone groupings that include North Carolina non-mountain counties from March through May. At the request of one or more partner agencies, the WPA can be included at other times of the year during periods of high fire danger.

Note: WFO MRX does not produce a wind profile analysis.

## Update Criteria for the Fire Weather Planning Forecast

The Fire Weather Forecaster will maintain a weather watch to ensure that the forecast remains accurate. When unexpected changes occur or are forecast to occur which significantly deviate from the previous forecast, the forecast will be updated. The decision to update, to an extent, is at forecaster discretion. The update criteria for various elements are listed in the Appendix. It is a shared responsibility for the WFO's and the natural resource agencies to monitor the need to update a forecast. Respective agency personnel will also provide feedback as to the updating of an FWF, NFDRS Point, or Spot Forecast.

## Site Specific Wildland Fire Forecasts (Spot Forecasts)

### ***Criteria***

Spot forecasts are special, non-routine forecasts prepared upon request of any federal agency, or state agency when there is some aspect of federal resources involved and/or interagency protection agreements currently exist, that needs site specific weather forecasts for: 1) controlling the spread of wildfire; 2) planning and managing prescribed fires; or 3) other specialized forest management activities. In the event of an emergency which threatens life and/or property, spot forecasts can also be provided to any federal, state, or local agency.

### ***Contents***

Spot forecasts are highly detailed forecasts for a specific location within the forecast area. The format of the spot forecast is specified in National Weather Service Directive 10-401. The forecasts will be **headlined** for a **Red Flag**

**Warning or Fire Weather Watch.** The forecasts will begin with a discussion, and may contain any or all of the following weather elements: sky conditions; maximum and minimum temperatures, minimum and maximum relative humidity values, wind speed and direction; probability of precipitation; precipitation type, duration and amount; mixing heights; transport wind; inversion height; inversion onset and burnoff times or temperatures; ventilation and smoke management levels; wind profiles; stability indices (IE., Haines Index), and lightning activity levels (LAL). Since these are site specific and can be initiated because of critical circumstances, tailored products can be requested (e.g. temperature, relative humidity, and wind speed forecasts on a two hour incremental time period).

### ***Procedures for Requesting a Spot Forecast***

Spot forecasts will be prepared when requested by a user agency. Federal, state and local agencies may request spot forecasts in support of wildfire suppression or other emergencies where lives and/or property may be threatened. Due to the detailed and specific nature of this forecast product, it is imperative that the user provide the forecaster with necessary and sufficient information so that a reliable forecast can be prepared.

Requests for spot forecasts should be made using the web based spot forecast request form. This form, along with instructions on how to use it, are available on the fire weather web pages of the local NWS sites, which can be accessed at [www.erh.noaa.gov](http://www.erh.noaa.gov). The web based spot forecast request form should be filled out as completely as possible by the user agency prior to submitting the request. In times when internet access is hindered or not possible, spot forecasts may be requested and disseminated via fax or phone. If faxing a request, users should use the Fire Weather Special Forecast Request Form, [WS Form D-1](#). Section I of WS Form D-1 should be filled out as completely as possible by the user agency prior to submitting the request by the fax to the forecast office. If the request is made by phone, all information in Section I should be provided to the forecast office.

While there is no dedicated fire weather forecaster, the forecast office will give a high priority to spot forecasts in the absence of weather phenomena in the CWFA that pose a threat to life and property. To ensure that the request for a spot forecast is handled properly and appropriately, users should adhere to the following guidelines:

- 1) Allow adequate time for the forecaster to prepare the forecast. This will normally be between 20 and 30 minutes. On particularly busy fire weather days, spot forecasts will be handled on a first-come, first-serve basis, with wildfires or other life threatening events taking the highest priority.
- 2) Provide as much on-site or near-site weather information as possible. At a minimum, the user must provide at least one observation within an hour of the

request. This observation must contain the following: location of the observation; elevation at the observation site; time of the observation; wind direction, speed, and level (eye or 20 foot); dry and wet bulb temperatures (or dry bulb temperature and relative humidity); any remarks about the state of the weather, particularly anything that may affect fire behavior. If possible, include some observations from the previous day that might give the forecaster an indication of daily trends.

- 3) As much as possible, specify the time period for which the forecast is needed.
- 4) As much as possible, specify the weather elements of most importance for which a forecast is needed, and/or critical values of these elements.
- 5) Provide a contact point name and phone number where the forecaster can call back, if necessary. (Also include a fax number for returning completed forecasts if the web based spot forecast form is not used).
- 6) In order to receive prompt attention for a fax request, please phone the office to let the forecaster know the request is on the way.
- 7) Natural resource agency personnel should contact the appropriate NWS forecast office for a spot update if the forecast conditions appear unrepresentative of the actual weather conditions. Whenever possible, users should provide feedback, positive or negative, to the NWS forecast office concerning the performance of the spot forecast during or shortly after an event. This will assist forecasters in subsequent forecasts for the same or similar conditions.

Click for example of spot request form [D1](#).

## **National Fire Danger Rating System (NFDRS) Forecasts**

### **Issuance**

NFDRS forecasts will be issued for any predetermined site from which an NFDRS observation is received, provided the observation is received on time, is complete, and is deemed accurate. The natural resource agencies will determine which observation sites (normally RAWs sites) will be NFDRS sites. Initiation of NFDRS forecasts for a new site will be coordinated with the NWS, and the agency requesting new NFDRS service will provide the NWS with information about the site location. Forecasts will not be provided for sites with bad data. The NWS will notify the owner agency when bad data is received from a RAWs station.

## Contents

The NFDRS forecast will be a forecast of the next day observation at 1300 LT. The format of the NFDRS forecast is specified in National Weather Service Directive 10-401. The forecast will include the following elements:

a. ZONE/FCTS: Shows whether this forecast is for an NFDRS zone or individual station. Zone average trends are forecast when enough observation are available for the zone area. Individual site forecasts are done where only a few observation are available.

b. NO: NFDRS Zone Number (or individual NFDRS site number).

c. YYMMDD: Year, month and day of valid forecast time.

d. 13: Valid forecast time. Always 1300 LST.

e. 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 = fog

5 = drizzle

6 = rain

7 = snow or sleet

8 = showers (in sight or at the station)

9 = thunderstorm

(Categories 5, 6 or 7 sets NFDRS index to 0)

f. TEMP: Temperature in degrees F valid at 1300 LST (or temperature trend + or - degrees F).

g. RH: Relative Humidity in percent valid at 1300 LST (or RH trend + or - percent).

- h. LAL1: Lightning Activity Level 1400 LST to 2300 LST.
- i. LAL2: Lightning Activity Level 2300 LST to 2300 LST.
- j. WDIR: Wind Direction. Used only for point forecast (FCST) version. Enter direction using sixteen point compass (N, NNE, NE, ENE, etc.) valid at 1300 LST (20 ft level, 10 minute average).
- k. WSPD: Wind Speed. Enter wind speed in mph (or wind speed trend + or - mph) valid at 1300 LST (20 ft, 10 minute average).
- l. 10HR: 10 hour timelag fuel moisture in percent valid at 1300 LST (or trend + or - percent).
- m. Tx: Maximum temperature from 1300 LST to 1300 LST tomorrow.
- n. Tn: Minimum temperature from 1300 LST to 1300 LST tomorrow.
- o. RHx: Maximum relative humidity from 1300 LST to 1300 LST tomorrow.
- p. RHn: Minimum relative humidity from 1300 LST to 1300 LST tomorrow.
- q. PD1: Precipitation duration in hours 1300 LST to 0500 LST.
- r. PD 2: Precipitation duration in hours 0500 LST to 1300 LST.
- s. WETFLAG: Y or N. Indicates whether liquid water will be on the fuels at 1300 LST tomorrow. (Use with caution. A "Y" will set all the NFDRS indices to zero!).

Format. The NFDRS Forecast will follow the comma delimited format as shown:

ZONE,NO,YYMMDD,13,WX,TEMP,RH,LAL1,LAL2,WSPD,10HR,TX,TN,RHx,RHn,PD1,PD2,WETFLAG

FCST,NO,YYMMDD,13,WX,TEMP,RH,LAL1,LAL2,WDIR,WSPD,10HR,TX,TN,RHx,RHn,PD1,PD2,WETFLAG

#### Procedures

The land management agencies are responsible for taking, quality controlling, transmitting and archiving the NFDRS observations. Observation must be received at the NWS in a timely manner. Forecasts will only be prepared for predetermined sites, and only from those sites for which an observation has been received. The NWS will prepare and transmit the NFDRS forecasts no later than 4 PM. Although the data cutoff time for ingest into the NFDRS software is 7 PM,

preliminary calculations based on the forecast are used by the land managers to make staffing decisions at shift briefing time (4 PM).

## **Fire Weather Watch and Red Flag Programs**

During periods in which critical fire weather conditions are expected or imminent, the NWS will issue statements, watches and warnings to describe the level of urgency to the appropriate user agencies. These issuances will be coordinated with natural resource agencies.

### **Definition of a Red Flag Event**

A Red Flag Event occurs when critical weather conditions develop which could lead to extensive wildfire occurrence or to extreme fire behavior. Red Flag Events represent a threat to life and property, and may adversely impact fire fighting personnel and resources. Critical weather conditions include combinations of the following: strong, gusty winds; very low relative humidity; high to extreme fire danger; significant wind shifts; and lightning. **Specific criteria can be found in the Appendix.**

### **Red Flag Warning**

A Red Flag Warning will be issued, after coordination with the appropriate natural resource agencies, when a Red Flag Event is occurring or is imminent. The warning will be issued for all or a portion of the forecast area. It will be issued immediately once the forecaster and the appropriate natural resource agency have determined that a Red Flag Event is ongoing. Otherwise, it shall be issued for impending Red Flag conditions when there is a high degree of confidence that conditions will develop within 24 hours. The warning will continue until the conditions cease to exist or fail to develop as forecast. At such time, the warning will be canceled. The format of the Red Flag Warning is specified in National Weather Service Directive 10-401. **A sample Red Flag Warning and cancellation are in the Appendix.**

### **Fire Weather Watch**

A Fire Weather Watch will be issued, after coordination with the appropriate natural resource agencies, to advise of the possible development of a Red Flag Event in the near future. It will be issued for all or part of the forecast area. A Fire Weather Watch is issued when the forecaster and appropriate natural resource agencies are reasonably confident that a Red Flag Event will occur. A watch should be issued 12 to 48 hours in advance of, but not more 72 hours in advance of, the expected onset of of the critical weather conditions. The watch will remain

in effect until either it is determined the Red Flag Event will not develop, or that the watch should be upgraded to a warning. If conditions are not expected to occur as forecast, the watch will be canceled. The format of the Fire Weather Watch is specified in National Weather Service Directive 10-401. **A sample Fire Weather Watch and cancellation are in the Appendix.**

## **Fire Danger Statements and Blow-Up Alerts**

When fire danger or fire occurrence is high and is coupled with critical weather conditions, user agencies may request that the NWS issue a Fire Danger Statement or Blowup Alert. These statements will be issued in coordination with the requesting agency and will only be issued with their approval. The NWS will use the Special Weather Statement (SPS) for these issuances.

## **Communications**

The primary means of communication used by the NWS is the Advanced Weather Interactive Processing System (AWIPS). Products transmitted by this means include pre-suppression forecasts, Fire Weather Watches, Red Flag Warnings, and Fire Danger Statements. Spot Forecasts will be disseminated only to the requesting agency by means of the Internet, or as a backup, telefax (FAX). Therefore, anytime a request for a spot forecast is made, the requesting agency must include a FAX number. A voice number should also be included in case problems are encountered with the fax transmission. Other means of communication may be utilized upon mutual agreement with the user agencies.

Public products produced by the National Weather Service are available over All Hazards NOAA Weather Radio (NWR). See the Appendix for a listing of NWS transmitters servicing North Carolina.

## **Participation in Interagency Groups**

At a minimum, one NWS representative (usually the State Liaison WFO Fire Weather Program Leader or MIC) will attend the State Interagency meetings or working groups where fire weather or smoke management policy is discussed as an integral part of the meeting. However, it is strongly recommended that all NWS offices with fire weather responsibility attend the meetings to ensure uniform representation.

## Special Services

Special fire weather services are those services that are uniquely required by natural resource agencies and go beyond the normal forecast operations of the NWS. Special services include Incident Meteorologist (IMET) deployment, station visits, training, and other pertinent meteorological services that are designated as non-routine.

Typically, special services require NWS personnel to be away from the Forecast Office and, in some instances, be in overtime status. User agencies are responsible for covering the cost of NWS overtime, travel and per diem expenses. Reimbursement of costs for special services will be as outlined in the [Interagency Agreement for Meteorological Services](#)

## Incident Support

On-site forecast service support is available for wildfires and prescribed burns. This includes the deployment of an Incident Meteorologist (IMET) and related service equipment such as the Advanced Technology Meteorological Unit (ATMU), the All Hazards Meteorological Response System (AMRS), and the Fire Remote Automated Weather Station (Fire RAWS). The IMET, ATMU, AMRS, and the Fire RAWS are considered national fire fighting resources, and can be requested through the North Carolina Interagency Coordination Center.

The ATMU and AMRS are modularized and mobile systems of equipment used by an Incident Meteorologist (IMET) for data collection and forecast preparation. Only trained personnel will operate the ATMU and AMRS, and this service equipment will only be dispatched to an incident when a certified IMET is requested. The IMET is responsible for ordering and arranging shipment for the ATMU and AMRS.

There are 25 ATMUs cached across the country, mostly in the western states. The nearest [ATMU cache](#) to the state of North Carolina is London, KY, where two are maintained. [AMRS workstations](#) are also pre-positioned across the country, most of which are collocated with existing Weather Forecast Offices that contain certified IMETS. These AMRS workstations are maintained by the IMETS and are typically shipped with the IMET being mobilized.

The ATMU is composed of one large shipping box consisting of a theodolite with tripod, a belt weather kit, PIBAL weather balloons, a nozzle and regulator for a helium tank, and office supplies and miscellaneous expendables. Its volume is 13.8 cubic feet and it weighs 122 pounds.

The AMRS is also composed of one large shipping box, and contains a laptop computer, a satellite dish (BGAN) for obtaining weather data, a printer and office supplies. The volume is 6.7 cubic feet, and its weight is about 90.

Total weight of the ATMU and AMRS is 212 lbs with a volume of 20.5 cubic feet. The cubic feet are necessary for shipment by air. The same specification shown are listed in the user agencies' National Mobilization Guide.

Requests for the ATMU, AMRS, and IMET should be made through the North Carolina Interagency Coordination Center. Typically, the IMET nearest the incident will be deployed. However, during times of limited resources, IMETs from other areas of the country may be called. The decision will be made by the Special Meteorologist to NIFC (SMC) in conjunction with the MIC and IMET from the affected offices. It is the responsibility of the IMET to arrange shipment of the AMRS workstation.

The success of the operation depends in part on the user agency providing shelter and logistical support. Prior to the use of this equipment, the IMET is expected to have coordinated with the local user agency to ensure proper field support. If an IMET determines that an ATMU and/or Fire RAWS is desirable, it is the IMET's responsibility to ensure the ATMU and Fire RAWS have also been ordered for the incident.

The requesting agency is responsible for any storage of service equipment while in transit, and shelter for the IMET and service equipment at the site. A sheltered work area, of at least 50 square feet with a table and chair, must be protected from excessive dust, free of standing water or condensation, and must be heated and/or cooled sufficiently to allow efficient operation of equipment. Power (120V AC) must be provided for the AMRS's electrical equipment, and priority telephone access during certain short periods each day must be made available.

The procedure for requesting IMETs will follow the guidelines outlined in the national MOA, the National Mobilization Guide, and the Southern Area Interagency Mobilization Guide. The following information will be provided to the requested IMET:

1. Name of fire.
2. Location of fire.
3. Directions to location where the IMET is to report and the location of ICP.
4. Name of Incident Commander, Plans Chief, and FBAN, if available.
5. Request and Resource Order number for IMET.

Upon arrival at the incident and after going through the appropriate check-in procedures, the IMET will:

1. Brief the Fire Behavior Analyst (FBAN), Planning Section Chief (PSC), and the Incident Commander (IC) on current and expected weather as it affects the fire.
2. Establish a schedule with the IC and the FBAN for written forecasts and formal briefings.
3. Request a briefing of the fire situation and potential behavior problems from the FBAN. As time and resources permit, incident management should arrange for an aerial inspection trip for the meteorologist and should provide the forecaster with current fireline maps. If possible, the IMET should be assigned a radio with the fireline frequency.
4. Arrange for a schedule of observations from key points around the fire and from nearby lookouts and fire danger stations, in cooperation with the FBAN and PSC. On large fires, some personnel (at least two) should be permanently assigned to this duty. On smaller fires, this information can be provided by Division Supervisors equipped with belt weather kits.

IMET duties will vary with incident management team requirements, but the IMET is expected to provide daily weather forecasts for the incident, participate in shift briefings, planning and strategy meeting, and coordinate daily with the local Weather Forecast Office (WFO) and /or other IMETs at nearby incidents.

Demobilization is initiated at the incident, and will be coordinated through the North Carolina Interagency Coordination Center. Upon release, the user agency will transport the ATMU and Fire RAWS back to its cache location or to the controlling fire weather office. Travel arrangements will be made for the IMET back to his or her home office. The IMET is responsible for transporting the AMRS workstation back to the home office. If the AMRS unit resides at a different location than the IMET, the IMET must make arrangements to ship the equipment to the proper office, and charge any shipping cost to the fire.

## **Other Special Services**

Other special services may include weather station visits by partner agency personnel, RAWS site surveys and inspections, weather observer training, and course development work or related program work. These activities would typically be at the full expense of the requesting agency unless other arrangements have been made.

NWS meteorologists may also be asked to assist in other non-routine services (e.g. briefings or coordination calls) during periods of high fire danger or fire occurrence. MICs and Fire Program Leaders are to ensure the natural resource agency needs are met with little expense to either agency.

## **Fire Weather Training**

NWS meteorologists will be available to assist in user-oriented training. This includes fire behavior courses, such as S-190 and S-290, where the meteorologist will serve as part of the cadre for that course. Requests for training assistance should be made through the NWS office's Fire Weather Program Leader or Meteorologist-in-Charge (MIC). Sufficient advance notice should be given to allow for scheduling and proper preparation. Costs incurred by the NWS in providing training assistance will be borne by the requesting agency.

# **Natural Resource Agency Responsibilities**

## **Operational Support and Predictive Services**

### **Program Management**

The natural resource agencies will oversee the fire weather observation program, including the siting and maintenance of the observing equipment, fire weather training of their personnel, and the proficiency of their personnel in the use of the NWS Spot software.

### **Monitoring, Feedback and Improvement**

Natural resource agencies will monitor the quality and timeliness of NWS fire weather products, and provide feedback the NWS in order to improve services to the agencies.

### **Technology Transfer**

The natural resource agencies may, from time to time, advise the NWS of new technologies being implemented to monitor meteorological or fuel parameters, or to improve communication, coordination, training or reference. Natural resource agency personnel may, with prior arrangement, visit an NWS office to acquire a knowledge of NWS technologies used in the monitoring of weather, or the preparation of products.

### **Agency Computer Resources**

Internet will be the primary method of obtaining the Fire Weather Forecast, Red Flag Warning, Fire Weather Watch, and for both requesting and receiving a Spot

Forecast. As a backup method, a request can be made to the NWS for a product to be faxed to the customer agency. NFDRS observations will be entered into WIMS, and forecasts and calculations based on these observations will be received by WIMS, or by internet via a WIMS website.

## Fire Weather Observations

Fire weather observation stations provide the specialized weather observations for fire weather forecasts, wildfire control and suppression, and various other land management operations. These stations were selected very carefully in each state and federal district. Sites were chosen to represent homogeneous weather conditions across a district. Stations may either be manned sites operated by land management agencies, or unmanned, Remote Automatic Weather Stations (RAWS) maintained by any of the federal or state land management agencies in the area.

All observation stations are assigned a 6-digit identification/location number. The first two digits indicate the state, the second two digits indicated the county, and the last two digits indicated the consecutively-assigned station number for that county. Land managers who wish to have a number assigned to a station should contact the GACC meteorologist at SACC in Atlanta.

RAWS stations are also assigned an 8 character alphanumeric identifier based on satellite transmission time. The NESDIS ID, transmit channel and time are assigned by the US Forest Service National RAWS program.

Observations from a satellite telemetered RAWS will automatically flow into WIMS via the NESDIS ID. Observations are only entered manually if the RAWS is a manual station. The RAWS owner currently must enter WIMS and manually change a recorded observation (an R ob) to an observed observation (an O ob), manually enter the state of the weather, and save the observation to WIMS. This action is generally applied only to the daily 1300 hour LST observation.

As a part of the ongoing reprogramming efforts in WIMS, the change from R to O will soon be completely automated and a State of the Weather (SOW) will be computed (in part) from solar radiation data. Once that change is implemented (sometime in the future), manual daily entry in WIMS will no longer be necessary for satellite telemetered stations. If a station is not satellite telemetered, the entire 1300 hour LST observation must be manually entered into WIMS. Non-NFDRS stations are naturally exempt from these procedures.

Even with automated conversions to O type observations, the responsibility still rests with the RAWS owner to ensure that observations are being transmitted, recorded, and archived properly in WIMS. The additional automation will greatly simplify the daily process, however there will still be the need for observations to be checked for integrity and consistency. Managing the NFDRS model

parameters will still be manual process in WIMS. Automation of O type observations will help streamline the WIMS collective that is distributed to the NWS via AWIPS. NFDRS forecasts are based on RAWs observations that appear on the daily collective.

Sensor failure will often result in erroneous or (at best) suspicious values. If the NWS becomes aware of such a situation, it is prudent to contact the station owner. Similarly, if a station owner becomes aware of sensor failure, he should relay that information to the appropriate NWS office. It is that stations owner's responsibility to make sure that their station is and remains in good working order and that repairs are made in a timely manner. Owners of NFDRS stations can still (and should) correct any errors in their respective observations.

## On - Site Support

The user agencies are also responsible for maintaining observation site equipment. NWS personnel may accompany the user on maintenance trips or for annual inspection visits, which could also serve as liaison with the users.

## Training

The responsibility of training natural resource agency employees will be that of the agencies themselves. However, the NWS will be available to assist when requested to do so. Any expenses incurred by the NWS will normally be charged to the user agency, unless other arrangements have been made.

# Joint Responsibilities

Joint responsibilities include the following:

## **Meetings between the NWS offices and the natural resource agencies.**

At least one statewide meeting hosted by the NWS is normally attempted each year, usually coordinated by the NWS State Liaison Offices in Raleigh. Individual NWS offices normally conduct a meeting with all of their customers, from all affected states, either each year or every other year.

The Division of Forest Resources conducts at least two meetings per year, roughly every summer and winter, with all natural resource agencies and NWS offices serving North Carolina invited to attend. These meetings typically will be held in central North Carolina, to minimize travel distance. Although the agenda includes many internal division matters they are of interagency consequence.

Therefore, the NWS is a Strategic Partner and is invited to these meetings since topics often include NWS operations.

## **Conference Calls.**

During times of very high or extreme fire danger, or a Readiness Plan of 5 or higher (on a scale from 1 to 7), the NCFS Central Office may initiate a conference call to discuss fire danger and weather. This call may include various partner agencies, and either some, or all of the NWS offices serving North Carolina, depending on the extent of the area of concern. When more than one NWS office is participating, NCFS will ask one NWS office to lead the weather discussion, which may be followed by input from the other NWS offices for their area. At times when the entire state is the area of concern, the NWS State Liaison Office in Raleigh will normally lead the discussion, but this may vary if the area of concern is skewed toward another NWS office's area. Conference calls will normally be held in the late morning, when NWS offices are beginning to consider their afternoon forecast package.

## **Maintenance and Revision of the Annual Operating Plan.**

The AOP should be revised each year by the end of January, with cooperation and participation from each NWS office and each natural resource agency. The state liaison office will be custodian of the plan.

## **Notification of NWS Changes in Operating Procedures.**

From time to time, NWS headquarters, or NWS Eastern Region Headquarters, will send draft versions of future directives to their forecast offices for review and comment. To ensure that the natural resource partner agencies have an opportunity to review and comment on proposed changes, the NWS State Liaison Office in Raleigh will forward a copy of draft directives to NCFS when they are received. NCFS will then forward draft NWS directives to the rest of the natural resource partner agencies for review. Comments and suggestions can be forwarded to the NWS State Liaison Office in Raleigh, which will forward them to NWS Eastern Region Headquarters.

## **Agreements on Services Provided.**

Agreements on services and standards are normally reached at statewide meetings, but may be achieved at by a series of local meetings or by other means such as telephone or e-mail. NWS offices and land managers should be aware of the ripple effect an agreement might have on other NWS offices and their customers, particularly when service areas cross state lines.

## **Workplace Visits.**

Natural resource agencies and the NWS collaborate on familiarization of personnel in each others fields of expertise, operations and equipment. Visits to offices and work centers, as well field job sites can meet part of these requirements.

## **Service Evaluation.**

Services provided by the NWS, and delivery of observations and information from the natural resource agencies to the NWS in support of these services, shall be under constant evaluation by both parties.

## **Numbering and archiving of observation stations.**

The GACC, when requested to do so by a natural resource agency, shall assign a station ID number for fire weather observation platforms.

The land management agency will provide the station name, location (county, latitude, and longitude), and elevation to the GACC meteorologist.

The GACC meteorologist will assign the number and assist the station owner in establishing a station catalog in WIMS.

The numbering convention uses a six digit number, starting with 31 (for NC). The following two digit number designates the county, and the counties are numbered from 01 in the northwest, to 99 in the southeast.

The GACC meteorologist is responsible for maintaining a database of RAWS stations in his area. This information can be provided to the NWS regional program manager upon request.

The master list for North Carolina will be the list included in the appendix of this operating plan, which will be updated at least annually with any new or changed stations.

## **Effective Dates on the AOP**

The effective dates of this Annual Operating Plan will be from January 1 through December 31 of the current calendar year. This plan will be subject to review and revision by all signatory parties each year, or more frequently as operations warrant.

This plan will be available on the WFO fire weather Web pages. A copy of this plan will be sent to NWS Eastern Region Headquarters by January 31 of the current year. Eastern Region Headquarters will forward a copy of the plan to NIFC and NWS Headquarters.

## Signatory Page

The following signatories have agreed to the terms and conditions of this Annual Operating Plan, which is subject to revision on a least an annual basis, or more frequently as operations necessitate. Actual signatures are maintained on file.

\_\_\_\_\_/signed/\_\_\_\_\_  
1/31/08  
Margit Bucher  
North Carolina Field Office  
The Nature Conservancy

\_\_\_\_\_/signed/\_\_\_\_\_  
2/28/08  
Mary Noel  
National Forests in North Carolina  
USDA Forest Service

\_\_\_\_\_/signed/\_\_\_\_\_  
2/28/08  
Wib Owen  
Division of Forest Resources  
North Carolina Department of Environment and Natural Resources

\_\_\_\_\_/signed/\_\_\_\_\_  
2/19/08  
John Mangus  
USMC Cherry Point

\_\_\_\_\_/signed/\_\_\_\_\_  
2/01/08  
Tom Crews  
District 1 Fire Management Officer  
U.S. Fish & Wildlife Service

\_\_\_\_\_/signed/\_\_\_\_\_  
2/13/08  
Bryan Henderson  
USAF Seymour Johnson AFB

\_\_\_\_\_/signed/\_\_\_\_\_  
2/12/08  
Denver S. Ingram  
Predictive Services Program Manager  
Southern Area Coordination Center

\_\_\_\_\_/signed/\_\_\_\_\_  
2/04/08  
John Ward  
US Army Fort Bragg

\_\_\_\_\_/signed/\_\_\_\_\_  
2/08/08  
Phillip Manuel  
Fire Weather Program Leader  
NWS Blacksburg, VA

\_\_\_\_\_/signed/\_\_\_\_\_  
2/12/08  
John Tomko  
Fire Weather Program Leader  
NWS Greenville-Spartanburg, SC

\_\_\_\_\_/signed/\_\_\_\_\_  
2/12/08  
David Gaffin  
Fire Weather Program Leader  
NWS Morristown, TN

\_\_\_\_\_/signed/\_\_\_\_\_  
1/31/08  
James Merrell  
Fire Weather Program Leader  
NWS Newport/Morehead City, NC

\_\_\_\_\_/signed/\_\_\_\_\_  
2/10/08  
Phillip Badgett  
Fire Weather Program Leader  
NWS Raleigh, NC

\_\_\_\_\_/signed/\_\_\_\_\_  
2/10/08  
Larry Brown  
Fire Weather Program Leader  
NWS Wakefield, VA

\_\_\_\_\_/signed/\_\_\_\_\_  
2/27/08  
Ron Steve  
Fire Weather Program Leader  
NWS Wilmington, NC

\_\_\_\_\_/signed/\_\_\_\_\_  
2/15/08  
Isaac Harrold  
North Carolina Wildlife Resources Commission

## Appendices

**Interagency Agreement for the Meteorological Services in Support of Agencies with Land and Fire Management Responsibilities [\(Click Here\)](#)**

### Fire Weather Zone Maps

Fire weather zones consist of groups of counties (or occasionally single counties) selected based on homogeneous climatology and expected weather. These groupings may change from forecast issuance to forecast issuance, and may contain counties from adjacent states served by the same NWS office. For a map of the NC

fire weather forecast zones, [click here](#).

## **Catalog of Fire Weather Observation Sites**

Name; County; Office; Station Number; Latitude; Longitude; Elevation

ALLIGATOR RIVER; Dare Co.; Morehead City, NC (MHX); 315405; 35.8550 N;  
75.8720 W, 7'

BACK ISLAND; Pender Co.; Wilmington, NC (ILM); 319402; 34.5328 N; 77.7219 W,  
20'

BEAUFORT; Beaufort Co.; Morehead City, NC (MHX); 317801; 35.5200 N; 76.9300  
W, 25'

BUSICK; Yancey Co.; Greenville-Spartanburg, SC (GSP); 313402; 35.7689 N;  
82.1911 W; 2892'

CASWELL GAMELANDS; Caswell Co.; Blacksburg, VA (RNK); 310801; 34.3850 N;  
79.2910 W; 580'

CEDAR ISLAND; Carteret Co.; Morehead City, NC (MHX); 319604; 35.0020 N;  
76.2969 W; 7'

CHEOAH; Graham Co.; Greenville-Spartanburg, SC (GSP); 315501; 35.2000 N;  
83.5900 W; 1500'

CHEROKEE; Swain Co.; Morristown, TN (MRX); 313902; 35.6197 N; 83.2042 W;  
3400'

CROATAN; Carteret Co.; Morehead City, NC (MHX); 319602; 34.8000 N; 76.8700 W;  
20'

D-2 LENOIR; Caldwell Co.; Greenville-Spartanburg, SC (GSP); 313501; 35.9319 N;  
81.4969 W; 1135'

DAVIDSON; Transylvania Co.; Greenville-Spartanburg, SC (GSP); 316001; 35.3506  
N; 82.7675 W; 3210'

DUKE FOREST; Orange Co.; Raleigh, NC (RAH); 312501; 35.9667 N; 79.0917 W;  
564'

ELIZABETH CITY; Pasquotank Co.; Wakefield, VA (AKQ); 311502; 36.2070 N;

76.1630 W; 15'

FAIRFIELD; Hyde Co.; Morehead City, NC (MHX); 317901; 35.5420 N; 76.2230 W; 10'

FIRE TOWER (CL2); Onslow Co.; Morehead City, NC (MHX); 319506; 34.6114 N; 77.2917 W; 20'

FORT BRAGG; Cumberland Co.; Raleigh, NC (RAH); 318503; 35.1397 N; 79.0644 W; 469'

GRANDFATHER; McDowell Co.; Greenville-Spartanburg, SC (GSP); 314201; 35.7564 N; 82.0439 W; 1600'

GREEN CROSS; Bertie Co.; Wakefield, VA (AKQ); 313001; 36.0100 N; 76.9000 W; 52'

GUION FARM; Henderson Co; Greenville-Spartanburg, SC (GSP); 316102; 35.2133 N; 82.5900 W; 2600'

HIGHLANDS; Macon Co.; Greenville-Spartanburg, SC (GSP); 315803; 35.0828 N; 83.2168 W; 3800'

HOFFMAN FOREST; Onslow Co.; Morehead City, NC (MHX); 319507; 34.8250 N; 77.3200 W; 42'

JACKSON CO; Jackson Co.; Greenville-Spartanburg, SC (GSP); 315902; 35.3167 N; 83.2000 W; 2800'

LAUREL SPRINGS; Ashe Co., Blacksburg, VA (RNK); 310101; 36.4020 N; 81.2970 W; 3000'

LEXINGTON; Davidson Co., Raleigh, NC (RAH); 314602; 35.7922 N; 80.3119 W; 751'

MACKAY ISLAND; Currituck Co.; Wakefield, VA (AKQ); 311601; 36.3300 N; 76.0000 W; 12'

MATTAMUSKEET; Hyde Co.; Morehead City, NC (MHX); 317902; 35.5000 N; 76.3000 W; 20'

MT ISLAND LAKE; Gaston Co.; Greenville-Spartanburg, SC (GSP); 316602; 35.3789 N; 80.9925 W; 500'

NATURE CONSERVANCY; Brunswick Co.; Wilmington, NC (ILM); 319802; 34.0483 N; 78.2903 W; 56'

NEW BERN; Craven Co.; Morehead City, NC (MHX); 319004; 35.0970 N; 77.1108 W; 20'

NORTH COVE; Burke Co.; Greenville-Spartanburg, SC (GSP); 314301; 35.8167 N; 81.9372 W; 2657'

POCOSIN LAKES; Washington Co.; Morehead City, NC (MHX); 315201; 35.7470 N; 76.5108 W; 11'

RENDEZVOUS MOUNTAIN; Wilkes Co., Blacksburg, VA (RNK); 312001; 36.2260 N; 81.2960 W; 2380'

ROCKINGHAM; Richmond Co., Raleigh, NC (RAH); 318202; 34.9600 N; 79.6900 W; 400'

ROCKY MOUNT; Nash Co., Raleigh, NC (RAH); 312802; 35.9731 N; 77.7986 W; 105'

RUTHERFORDTON; Rutherford Co.; Greenville-Spartanburg, SC (GSP); 316302; 35.4286 N; 81.9394 W; 1056'

SANDY RUN (CL 1); Onslow Co.; Morehead City, NC (MHX); 319505; 34.6119 N; 77.4875 W; 40'

SEVEN MILE RIDGE; Madison Co.; Greenville-Spartanburg, SC (GSP); 313302; 35.8031 N; 82.6503 W; 2150'

SUNNY POINT; Brunswick Co.; Wilmington, NC (ILM); 319803; 34.0028 N; 77.9581 W; 30'

TAYLORSVILLE, Alexander Co.; Greenville-Spartanburg, SC (GSP); 313601; 35.9119 N; 81.1375 W; 1190'

TROY; Montgomery Co.; Raleigh, NC (RAH); 317001; 35.7922 N; 79.8667 W; 541'

TURNBULL CREEK; Bladen Co.; Wilmington, NC (ILM); 319302; 34.6831 N; 78.5817 W; 98'

TUSQUITEE; Cherokee Co.; Morristown, TN (MRX); 315602; 35.0400 N; 84.0700 W; 1600'

WAYAH; Macon Co.; Greenville-Spartanburg, SC (GSP); 315802; 35.1691 N;  
83.4061 W; 2160'

WHITESVILLE; Columbus Co.; Wilmington, NC (ILM); 319701; 34.3360 N; 78.7286  
W; 98'

## **ASOS Observation Sites**

Name; ID; Latitude; Longitude; Elevation

Asheville Regional Airport; AVL; 35.4333 N; 82.5333 W; 2140'

Beaufort; MRH; 34.7300 N; 76.6600 W; 10'

Burlington, Burlington-Alamance Regional Airport; BUY; 36.0485 N; 79.4749 W; 617'

Charlotte-Dougllass International Airport; CLT; 35.2167 N; 80.9500 W; 728'

Chapel Hill, Horace Williams Airport; IGX; 35.9350 N; 79.0659 W; 512'

Cherry Point; NKT; 34.9000 N; 76.8800 W; 30'

Elizabeth City CG Air Station/Regional Airport; ECG; 36.2500 N; 76.1700 W; 33'

Fayetteville; Fayetteville Regional Airport; FAY; 34.9912 N; 78.8803 W; 189'

Gastonia Municipal Airport; AKH; 35.0167 N; 80.6167 W; 679'

Greensboro; Piedmont Triad International Airport; GSO; 36.0977 N; 79.9373 W; 926'

Hatteras; HSE; 35.2200 N; 75.6200 W; 10'

Hickory Regional Airport; HKY; 35.7333 N; 81.3833 W; 1143'

Lumberton Municipal Airport; LBT; 34.6099 N; 79.0594 W; 126'

Maxton; Laurinburg-Maxton Airport; MEB; 34.7919 N; 79.3658 W; 220'

Monroe Regional Airport; EQY; 35.2000 N; 81.1500 W; 797'

New Bern; EWN; 35.0700 N; 77.0500 W; 20'

New River; NCA; 34.7200 N; 77.4500 W; 26'

Raleigh/Durham; Raleigh/Durham International Airport; RDU; 35.8776 N; 78.7875 W; 435'

Roanoke Rapids; Halifax County Airport; RZZ; 36.4395 N; 77.7093 W; 256'

Rocky Mount; Rocky Mount-Wilson Regional Airport; RWI; 35.8563 N; 77.8919 W; 159'

Southern Pines; Moore County Airport; SOP; 35.2374 N; 79.3912 W; 461'

Wilmington International Airport; ILM; 34.2700 N; 77.9000 W, 33'

Winston-Salem; Smith Reynolds Airport; INT; 36.1337 N; 80.2220 W, 969'

## **AWOS Observation Sites**

Name; ID; Latitude; Longitude; Elevation

Ahoskie; Tri-County Airport; ASJ; 36.3000 N; 77.1700 W, 68'

Albemarle; Stanly County Airport; VUJ; 35.4167 N; 80.1508 W, 609'

Andrews-Murphy; Cherokee County; RHP; 35.1900 N; 83.8600 W, 1696'

Asheboro; Asheboro Municipal Airport; HBI; 35.6545 N; 79.8947 W, 673'

Brunswick County Airport; SUT; 33.9300 N; 78.0700 W; 26'

Clinton; Sampson County Airport; CTZ; 34.9756 N; 78.3646 W; 148'

Concord Regional Airport; JQF; 35.3852 N; 80.7097 W; 690'

Columbus County Municipal Airport; CPC; 34.2700 N; 78.7100 W; 98'

Currituck County Airport; ONX (formerly 9W7); 36.4000 N; 76.0200 W; 16'

Edenton, Northeast Regional Airport; EDE; 36.0300 N; 76.5700 W; 20'

Erwin; Harnett County Airport; HRJ; 35.3794 N; 78.7830 W; 199'

Franklin Airport; 1A5; 35.2226 N; 83.4190 W; 2020'

Goldsboro; Goldsboro-Wayne Municipal Airport, GWW; 35.4606 N; 77.9649 W; 134'

Jefferson; Ashe County Airport; GEV; 36.4300 N; 81.4200 W; 3179'

Kenansville; DPL; 35.0000 N; 77.9800 W; 138'

Kinston, ISO; 35.3300 N; 77.6200 W; 10'

Lexington; Davidson County Airport; EXX; 35.7811 N; 80.3039 W; 733'

Lincolnton, Lincoln County Regional Airport; IPJ; 35.4833 N; 81.1613 W; 875'

Louisburg; Franklin County Airport; LHZ; 36.0233 N; 78.3303 W; 369'

Manteo; MQI; 35.9200 N; 75.7000 W; 13'

Morganton-Lenoir Airport; MRN; 35.8202 N; 81.6114 W; 1270'

Mount Airy, Surry County Airport; MWK; 36.4600 N; 80.5500 W; 1247'

North Wilkesboro; UKF; 36.2200 N; 81.1100 W; 1299'

Oxford; Oxford Airport; HNZ; 36.3616 N; 78.5292 W; 527'

Pitt-Greenville; PGV; 35.6300 N; 77.4000 W; 26'

Richlands; OAJ; 34.8300 N; 77.6200 W; 95'

Roxboro; Person County Airport; TDF; 36.2849 N; 78.9842 W; 610'

Rutherfordton; Rutherford County Airport, Marchman Field; FQD; 35.4282 N; 81.9351 W; 1078'

Salisbury; Rowan County Airport; RUQ; 35.6459 N; 80.5203 W; 773'

Sanford; Sanford-Lee County Regional Airport; TTA; 35.5837 N; 79.1008 W; 247'

Shelby Municipal Airport; EHO; 35.2556 N; 81.6010 W; 847'

Smithfield; Johnston County Airport; JNX; 35.5409 N; 78.3903 W; 165'

Statesville Municipal Airport; SVH; 35.7653 N; 80.9567 W; 965'

Wadesboro; Anson County Airport; AFP; 35.0206 N; 80.0771 W; 298'

Washington; OCW; 35.5700 N; 77.0500 W; 39'

Watauga County Hospital Helipad; TNB; 36.2000 N; 81.6500 W; 3146'

## **Military Observation Sites**

Name; ID; Latitude; Longitude; Elevation

Fayetteville; Pope AFB; POB; 35.1708 N; 79.0145 W, 217'

Fayetteville; Simons AAF; FBG; 35.1318 N; 78.9367 W, 242'

Goldsboro; Seymour-Johnson AFB; GSB; 35.3393 N; 77.9607 W, 110'

Hoffman; Mackall AAF; HFF; 35.0365 N; 79.4975 W, 376'

## **All Hazards NOAA Weather Radio Transmitters Serving North Carolina Counties**

For a map of each transmitter reception area, click [here](#).

Location, Office, Call Sign, Frequency, Counties Served

Aynor, SC; Wilmington, NC (ILM); KEC-95; 162.400 MHz; Brunswick, Columbus

Blue Ridge, GA; Peachtree City, GA (FFC); KXI-75; 162.475 MHz; Cherokee

Brasstown, GA; Peachtree City, GA (FFC); KXI-22; 162.500 MHz; Clay

Buck Mt., NC; Raleigh, NC (RAH); WWF-60; 162.500 MHz; Anson, Cabarrus,

Davidson, Montgomery, Randolph, Richmond, Rowan, Stanly, Union

Cape Hatteras, NC; Morehead City, NC (MHX); KIG-77; 162.475 MHz; Dare, Hyde, Tyrell, Washington

Chapel Hill, NC; Raleigh, NC (RAH); WXL-58; 162.500 MHz; Alamance, Chatham, Durham, Franklin, Granville, Johnston, Lee, Orange, Person, Randolph, Vance, Wake, Warren

Cheraw, SC; Columbia, SC (CAE); WXK-90; 162.450 MHz; Anson, Richmond, Scotland

Ellerbe, NC; Raleigh, NC (RAH); WNG-597; 162.400 MHz; Anson, Hoke, Montgomery, Moore, Randolph, Richmond, Scotland, Stanly

Fayetteville, NC; Raleigh, NC (RAH); WXL-50; 162.475 MHz; Bladen, Cumberland, Harnett, Hoke, Lee, Montgomery, Moore, Richmond, Sampson, Scotland, Robeson

Garner, NC; Raleigh, NC (RAH); KXI-72; 162.450 MHz; Franklin, Harnett, Johnston, Nash, Wake, Wayne, Wilson

Glassy Mt., GA; Greenville-Spartanburg, SC (GSP); KXI-81; 162.450 MHz; Macon

Grandmother Mt., NC; Greenville-Spartanburg, SC (GSP); WNG-538, 162.450 MHz; Alexander, Avery, Burke, Caldwell, Catawba McDowell, Mitchell, Watauga, Yancey

Henderson, NC; Raleigh, NC (RAH); WNL-59, 162.500 MHz; Franklin, Granville, Person, Vance, Warren

Joanna Bald Mt., NC; Greenville-Spartanburg, SC (GSP); WWG-82; 162.400 MHz; Cherokee, Clay, Graham, Jackson, Macon, Swain

Lumber, NC; Wilmington, NC (ILM); WWF-89; 162.525 MHz; Bladen, Columbus, Hoke, Robeson, Scotland

Mamie, NC; Wakefield, VA (AKQ); WWH-26; 162.425 MHz; Camden, Currituck, Pasquotank, Perquimans

Margarettsville, NC; Wakefield, VA (AKQ); WWG-33; 162.450 MHz; Northampton

Mooresville, NC; Greenville-Spartanburg, SC (GSP); KYJ-85; 162.525 MHz; Alexander, Cabarrus, Catawba, Davie, Lincoln, Gaston, Iredell, Mecklenburg, Rowan

Mount Jefferson, NC; Blacksburg, VA (RNK); WNG-588; 162.500 MHz; Alexander,

Alleghany, Ashe, Avery, Caldwell, Catawba, Davie, Iredell, Watauga, Wilkes

New Bern, NC; Morehead City, NC (MHX); KEC-34; 162.400 MHz; Beaufort, Carteret, Craven, Duplin, Greene, Hyde, Jones, Lenoir, Martin, Onslow, Pamlico, Pitt

Norfolk/Driver, VA; Wakefield, VA (AKQ); KHB-37; 162.550 MHz; Camden, Currituck, Gates, Pasquotank

Mt. Pisgah, NC; Greenville-Spartanburg, SC (GSP); WXL-56; 162.400 MHz; Avery, Buncombe, Burke, Caldwell, Haywood, Henderson, Jackson, Madison, McDowell, Mitchell, Polk, Rutherford, Transylvania, Yancey

Poor Mt., VA; Blacksburg, VA (RNK); WXL-60; 162.475 MHz; Caswell, Rockingham

Rock Hill, SC, Greenville-Spartanburg, SC (GSP); KHC-27; 162.425 MHz; Mecklenburg, Union

Spencer Mt., NC; Greenville-Spartanburg, SC (GSP); WXL-70; 162.475 MHz; Alexander, Anson, Cabarrus, Catawba, Cleveland, Davie, Gaston, Iredell, Lincoln, Mecklenburg, Rowan, Stanly, Union

Tarboro, NC; Raleigh, NC (RAH); WXL-59; 162.475 MHz; Edgecombe, Greene, Halifax, Nash, Northampton, Pitt, Warren, Wilson

Tri-Cities, TN; Bristol, TN (MRX); WXK-47; 162.550 MHz; Ashe, Avery, Madison, Mitchell, Watauga, Yancey

Warsaw, NC; Morehead City, NC (MHX); KXI-95; 162.425 MHz; Bladen, Duplin, Jones, Lenoir, Onslow, Pender, Sampson, Wayne

Windsor, NC; Wakefield, VA (AKQ); WNG-537; 162.525 MHz; Bertie, Chowan, Gates, Hertford, Northampton, Perquimans

Winnabow, NC; Wilmington, NC (ILM); KHB-31; 162.550 MHz; Bladen, Brunswick, Columbus, New Hanover, Onslow, Pender

Winston-Salem, NC; Raleigh, NC (RAH); WXL-42; 162.400 MHz; Alamance, Alexander, Alleghany, Caswell, Davie, Forsyth, Guilford, Iredell, Rockingham, Rowan, Stokes, Surry, Wilkes, Yadkin

## Red Flag Criteria

For North Carolina, two or more of the following weather criteria (1 to 4) must be occurring or expected, in addition to high (or greater) fire danger (5):

1. Relative Humidity of 25% or less.
2. Sustained wind (20 ft, 2 min avg.) of 20 mph or greater, or gusts to 30 mph.

Note: **WFO MRX** uses sustained wind 18 mph or greater.

3. Dry lightning.
4. A significant wind shift during times of active fire suppression.
5. High, Very High, or Extreme fire danger, as assessed by the natural resource agencies, and/or as generated by the processor in the Weather Information Management System (WIMS) and posted in the Wildland Fire Assessment System (WFAS). This will be obtained by the National Weather Service from the respective natural resource agency personnel and from WIMS or WFAS.
6. **WFO MRX only:** rainfall less than 0.25 inches during the past two days.

Note: In periods of prolonged drought, adjustments may be made to the criteria.

## Fire Weather Product Examples

Click here for the latest products from:

Blacksburg, VA (RNK): [Red Flag](#) or [Fire Weather Forecast](#)

Greenville-Spartanburg, SC (GSP): [Red Flag](#) or [Fire Weather Forecast](#)

Morehead City, NC (MHX): [Red Flag](#) or [Fire Weather Forecast](#)

Morristown, TN (MRX): [Red Flag](#) or [Fire Weather Forecast](#)

Raleigh, NC (RAH): [Red Flag](#) or [Fire Weather Forecast](#)

Wakefield, VA (AKQ): [Red Flag](#) or [Fire Weather Forecast](#)

Wilmington, NC (ILM): [Red Flag](#) or [Fire Weather Forecast](#)

Click here for an example of a [Red Flag Warning, Fire Weather Watch, Fire Weather Forecast, or Fire Danger Statement](#) from WFO Wilmington, NC

Click here for an example of a [Spot Forecast](#) from WFO Greenville-Spartanburg, SC

## **Burn Category Table**

### Ventilation Rate (ft mph) and Associated Burn Category

0 to 33499 = 1

33500 to 44999 = 2

44500 to 59999 = 3

60000 to 111999 = 4

112000 + = 5

## **Dispersion Table**

### Surface Wind (MPH) and Associated Dispersion Category

Near Calm = Stagnant

2 - 4 MPH = Very Poor

6 - 8 MPH = Poor

9 - 12 MPH = Fair

13 MPH + = Good

## MRX Lavdas Dispersion Index

1-6 = Very Poor

7-12 = Poor

13-20 = Generally Poor

21-40 = Fair

61-100 = Good

100+ = Very Good

## Lightning Activity Level

### LAL Categories

1: No Thunderstorms.

2: Cumulus clouds are common, but only a few reach the towering cumulus stage. A single thunderstorm must be confirmed in the rating area. The clouds mostly produce virga, but light rain will occasionally reach the ground.

3: Cumulus clouds are common. Swelling and towering cumulus cover less than 2/10ths of the sky. Thunderstorms are few, but two or three must occur within the observation area. Light to moderate rain will reach the ground, and lightning is infrequent.

4: Swelling cumulus and towering cumulus cover 2/10ths to 3/10ths of the sky. Thunderstorms are scattered, but more than three must occur within the observation area. Moderate rain is commonly produced, and lightning is frequent.

5: Towering cumulus and thunderstorms are numerous, they cover more than 3/10ths of the sky and occasionally obscure it. Rain is moderate to heavy, and lightning is frequent and intense.

6: Same as #3, but dry (little or no rain reaching the ground).

## Lightning Strokes

1: 0/min., 0/5 min., 0/15 min.

2: 1/min., 1-5/5 min., 1-8/15 min.

3: 1-2/min., 6-10/5 min., 9-15/15 min.

4: 2-3/min., 11-15/5 min., 16-25/15 min.

5: 3/min., 15/5 min., 25/15 min.

6: 1-2/min., 6-10/5 min., 9-15/15 min.

## Wind Profile Analysis

During the months of March, April, and May, forecast wind profiles for areas east of the mountains will be evaluated and categorized as favorable (for fire control), unfavorable (for fire control), or neutral (indeterminate for fire control).

The wind profile category for each zone grouping that include NC counties east of the mountains will be placed in remarks. If the category is neutral, an updated forecast will be issued once the morning soundings have been received and analyzed, categorizing each neutral grouping as either favorable or unfavorable.

## Adverse Wind Profiles

Click on the [table](#) for a brief overview of Adverse Wind Profiles; those that are deemed unfavorable for fire control.

(For a more complete treatment of the topic, reference "Vertical Wind Profiles and Associated Fire Behavior in Flat Country", Division of Fire Research, Southeastern Forest Experiment Station, August 20, 1957".)

## **FWF Update Criteria**

Standard Air Temperature: +/- 5 degrees F.

Relative Humidity: +/- 5%.

Wind Speed and Direction at 20 ft AGL: +/- 5 mph and/or 45 degrees.

Precipitation POP, duration and amount: same as for public zones. Note: duration guideline for NFDRS is +/- 2 hours.

Inversions: +/- 100 m or 328 ft.

Freezing Level: +/- 100 m or 328 ft.

Transports Winds: +/- 5 mph and/or 45 degrees.

Mixing Height: +/- 100 m or 328 ft.

Stability: Must be in correct category 90% of time.

Burn Category: One category of change.

Dispersion: One category of change.

Note: Morning upper air soundings from nearby weather balloon sites should be examined for update criteria.

## **Record of Changes to the AOP**

July 2005:

Noted in Appendix that adjustments may be made to Red Flag Criteria in periods of prolonged drought.

Added Conference Calls section to Joint Responsibilities.

Noted in Joint Responsibilities that NWS State Liaison Office forwards NWS draft directives to NCFS for review.

Noted in Appendix that NWS offices should check morning upper air soundings for update criteria.

Added Record of Change section to Appendix.

Added Table of Contents to printable version of AOP.

Made hot links to e-mail for names of NWS Fire Program Leaders in Service Area and Organizational Directory.

Noted in Service Area and Organizational Directory that NWS Fire Program Leaders can be reached via e-mail from their office's fire weather homepage.

January 2007:

Added the Lavdas Dispersion table used by MRX in the Appendix.

Noted the upcoming automation of R to O type NFDRS observations in Natural Resource Agency Responsibilities.

Noted in Services Provided by the National Weather Service the units for mixing height provided by MRX, and also that MRX provides the Lavdas Dispersion Index.

January 2008:

Added Cherokee RAWS site to the Appendix.

Noted that MRX provides FWF in the afternoon on request during drought in Services Provided by the National Weather Service.

Noted that MRX serves the Great Smoky Mountain portions of Haywood and Swain Counties under in Service Area and Organizational Directory, and changed the service area map to reflect this.

Noted that the Wind Profile Analysis can be provided at customer request outside of the spring fire season during high fire danger in Services Provided by the National Weather Service.

February 2008:

Updated NWR transmitter list in appendix.