



Fire Weather Services for North Carolina Operating Plan

NWS Blacksburg, VA

NWS Raleigh, NC

NWS Greenville-Spartanburg, SC

NWS Wakefield, VA

NWS Morehead City, NC

NWS Wilmington, NC

NWS Morristown, TN

2024

This operating plan will be a semi-permanent document, specifying Fire Weather services provided by the 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 Forest Service
- US Fish and Wildlife Service
- US Army - Fort Liberty
- 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](#), valid from 2017 through 2022.

Service Area and Organizational Directory

NWS Service Area and Organizational Information

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 Greenville-Spartanburg, SC. For a map of the fire weather zones in NC, see [Appendix B](#).

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 the meteorologist-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.

Meteorologist-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.

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.

The National Weather Service Weather Forecast Offices will provide 24-hour, 365 days a year service. The NWS WFO's can be reached using the contact information below.

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.

Blacksburg Weather Forecast Office

[Blacksburg Weather Forecast Office](#)

VA Tech Corporate Research Center

**1750 Forecast Drive
Blacksburg, Virginia 24060**

MIC: Douglas Butts

Program Leader: Phil Manuel (Certified IMET)

Email: phillip.manuel@noaa.gov

WFO RNK (Blacksburg, VA) serves the following counties in northwest North Carolina:

Alleghany	Ashe	Caswell	Rockingham
Stokes	Surry	Watauga	Wilkes
Yadkin			

Greenville-Spartanburg Weather Forecast Office

[Greenville-Spartanburg Weather Forecast Office](#)

1549 GSP Drive

Greer, South Carolina 29651

MIC: Stephen Wilkinson

Program Leader: Mike Rehnberg

Email: michael.rehnberg@noaa.gov

IMET Trainee: Justin Lane

Email: justin.lane@noaa.gov

WFO GSP (Greenville-Spartanburg, SC) serves the following counties in southwest North Carolina:

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

Swain

Transylvania

Union

Yancey

Morehead City Weather Forecast Office

[Morehead City Weather Forecast Office](#)

533 Roberts Road

Newport, North Carolina 28570

MIC: David Glenn

Program Leader: Scott Kennedy (Certified IMET)

Email: scott.kenedy@noaa.gov

Certified IMET: Tom Lonka

Email: tom.lonka@noaa.gov

WFO MHX (Morehead City, NC) serves the following counties in eastern North Carolina:

Beaufort

Carteret

Craven

Dare

Duplin

Greene

Hyde

Jones

Lenoir

Martin

Onslow

Pamlico

Pitt

Tyrrell

Washington

Morristown Weather Forecast Office

[Morristown Weather Forecast Office](#)

5974 Commerce Blvd.

Morristown, Tennessee 37814

MIC: George Matthews

Program Leader: Sam Roberts (Certified IMET)

Email: sam.roberts@noaa.gov

WFO MRX (Morristown, TN) serves the following counties in western North Carolina:

Cherokee

Clay

Raleigh Weather Forecast Office

[Raleigh Weather Forecast Office](#)

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

MIC: Jonathan Blaes

Program Leader: Jimmy Taeger (Certified IMET)

Email: jimmy.taeger@noaa.gov

WFO RAH (Raleigh, NC) serves the following counties in central North Carolina:

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	

Wakefield Weather Forecast Office

[Wakefield Weather Forecast Office](#)

10009 General Mahone Highway
Wakefield, Virginia 23888

MIC: Jeff Orrock

Program Leader: Andrew Zimmerman

Email: andrew.zimmerman@noaa.gov

Certified IMET: Jonathan McGee

Email: jonathan.mcgee@noaa.gov

WFO AKQ (Wakefield, VA) serves the following counties in northeast North Carolina:

Bertie	Camden	Chowan	Currituck
Gates	Hertford	Northampton	Pasquotank
Perquimans			

Wilmington Weather Forecast Office

[Wilmington Weather Forecast Office](#)

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

MIC: Vacant

Program Leader: Terry Lebo (Certified IMET)

Email: terrence.lebo@noaa.gov

Assistant Program Leader: Jordan Baker

Email: jordan.baker@noaa.gov

WFO ILM (Wilmington, NC) serves the following counties in southeast North Carolina:

Bladen	Brunswick	Columbus	New Hanover
Pender	Robeson		

Participating Agencies

The following agencies are participants of this operating plan:

National Park Service

NOAA National Weather Service

The Nature Conservancy

NC Forest Service

US Army - Fort Liberty

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

The National Weather Service provides several products to support local, state, and federal fire agencies. Some products provide weather data for large areas (county or multi-county wide) and are intended to be a general overview for planning purposes. Others are point specific down to a 2.5 km gridpoint and are intended for detailed site specific forecasts intended for incidents, such as wildfires and prescribed burning plans.

The [Fire Weather Planning Forecast \(FWF\)](#) and [Fire Weather Area Forecast Matrix \(AFW\)](#) are area wide forecasts and primarily should be used for input in decision-making related to pre-suppression and other planning or resource management activities, as well as for determining general weather trends. Generally, these products are not recommended to be used with wildfire or prescribed burning plans.

The [Fire Weather Point Forecast Matrix \(PFW\)](#) is a site specific tabular forecast for predetermined locations in the forecast area, generally for RAWs and ECONet locations. It is intended for decision support related to pre-suppression and other planning or resource management activities at or near a specific point. The PFW is updated at least twice daily with the issuance of the FWF but many offices issue with intermediate forecast updates. Check the product issuance time for latency.

The [Activity Planner and Hourly Weather Graph](#) are web based tools that provide graphical and tabular point specific forecasts for a 2.5 km gridpoint for the latitude and longitude input by the user. Forecast data in these products are sampled from the NWS National Digital Forecast Database (NDFD). This database is updated several times a day and will generally reflect the most up to date forecast from the NWS. Most fire weather forecast elements are available in this database and are suitable for most prescribed burn plans or short-lived wildfires.

An experimental tool developed at NWS Duluth, MN named [Fire Weather Dashboard](#) is similar to the hourly weather graph and tabular point specific forecast, but uses a different interface and may provide a more desirable look of the forecast data. There are also helpful overlays available on the “point and click” map.

The [Spot Forecast](#) is a point specific forecast for a 2.5 km grid point and is the most up to date and scrutinized forecast from the NWS. In addition, spot requests provide the NWS forecast office situational awareness of critical incidents within their forecast area. This allows the NWS to provide additional decision support to discuss specific concerns about the forecast, relay critical forecast updates, and provide notification of an impending significant weather event directly to the incident officials. Spot Forecasts are recommended for most wildfires and large or potentially impactful prescribed burns (such as near environmentally sensitive areas, near critical infrastructure, or if changeable or significant weather is predicted).

Several of the NWS forecast elements can also be found on the NC State Climate Office [Fire Weather Intelligence Portal](#) in gridded format. This data originates from several sources. Elements listed under NWS Gridded Forecasts come from the NDFD. Elements listed under NWS Gridded Fire Products for NC are not available from NDFD and sent by NWS forecast offices to NWS Eastern Region servers, which the NC State Climate Office then downloads for the Portal. Elements listed under NWS Fire Weather Zone Forecast are graphical representations of the FWF and are zone or multi-zone averages of these elements. Elements listed under National Blend of Models Forecasts are a blend of many forecast models to achieve an average forecast for this element. Blended model forecasts should be used cautiously, especially when changeable weather is expected as blending models tend to smooth out the details of these changes.

The Southern Fire Exchange, North Carolina Prescribed Fire Council, the Joint Fire Science Program, and the University of Florida hosted a webinar by the National Weather Service and North Carolina State Climate Office in December 2020 that provided an overview of National Weather Service fire weather products and functionality of the NC State Climate Office Fire Weather Intelligence Portal. The YouTube recording for this training is linked here: [SFE Webinar: Overview of Fire Weather Products for Controlled Burners](#)

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.

Generally, the FWF is not recommended to be used with prescribed burning or wildfire burning plans as it provides an average of the conditions over a large area and may not provide the detail required for a site specific forecast. This is especially true in coastal and mountain counties where coastal influences and terrain can cause weather conditions to vary over relatively short distances.

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).

Format/Content of the FWF

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 >= 10% and < 30%; "Partly Cloudy" or "Partly Sunny" are used when cloud cover is forecast to be >= 30% and < 60%; "Mostly Cloudy" is used when cloud cover is >= 60% and < 80%; "Cloudy" is used when cloud cover is forecast to be >= 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 ("MAX/MIN 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 may include a 24 hour trend value, noting the difference from the previous day's maximum/minimum temperature (such as at WFO MRX).
- **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 may be provided, such as at WFO MRX.

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 ("WND20FT/EARLY and WND20FT/LATE")** - Surface wind speed and direction represent an 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 the 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 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.
- **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").

Note: Offices serving North Carolina have agreed to attempt to keep mixing heights within 1000 feet of those from neighboring offices.

- **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 disperse smoke. Refer to [Appendix G](#) for further details regarding the correlation of the Ventilation Rate and Burn Category.
- **Dispersion ("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 G](#) for further details on dispersion categories.

- **Atmospheric Dispersion Index ("ADI")** - ADI refers to Lavdas atmospheric dispersion index (ADI), a forecast computed from mixing height, transport wind, and stability class. The value reported is the average maximum value for the zone grouping, which filters out extremes. Refer to [Appendix G](#) for further details of the Lavdas dispersion index (ADI).
- **Low Visibility Occurrence Risk Index ("LVORI")** - An index derived from the Lavdas ADI and the relative humidity, that gages the probability of visibility restrictions in fog or smoke. The index is based on a study of traffic accidents in Florida. The value reported is the maximum value for the zone grouping, in order to capture the highest values. Refer to [Appendix G](#) for further details on LVORI categories.
- **Minimum Surface Visibility and Obstruction ("MIN VSBY")** - The minimum surface visibility, and if restricted below 7 miles, the obstruction causing the restriction. The value reported is the minimum value for the zone grouping, in order to capture the lowest values. Visibility values of 7 to 10 miles are considered unrestricted.
- **Lightning Activity Level ("LAL")** - A numerical value, which is used to describe the expected lightning activity for that day. Refer to [Appendix G](#) for further details on the LAL.
- **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.

- **DSI (Davis Stability Index)** - The Davis Stability Index is the maximum surface temperature (in deg C) minus the 850 mb temperature (in deg C). If the difference is <10 deg C, it is considered a Category 1 (stable); between 10 deg C and 14 deg C, it is considered a Category 2 (conditionally unstable); between 15 deg C and 17 deg C, it is considered a Category 3 (unstable); and >17 deg C, it is considered a Category 4 (absolutely unstable).

Note: DSI is only computed for the daytime period. DSI was requested by the South Carolina Forestry Commission, therefore only computed by WFO's GSP and ILM, who also serve SC counties.

- **Turner Stability Class** - Turner Stability is another measure of atmospheric stability, incorporating the parameters of ceiling height, solar radiation, day/night time period, and wind speed. Values A, B, C (or 1, 2, 3) are only possible for daytime periods, while values E, F, G (or 5, 6, &) are only used for night time periods. Value D (4) is possible for both day or night. Turner Stability values (A-G) range from extremely unstable, moderately unstable, slightly unstable, neutral, slightly stable, moderately stable, extremely stable
- **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** - Refers to the time and/or temperature at which the morning inversion will burnoff, or the time the inversion will setup in the evening. The format for the inversion burnoff will generally be <Temp>/HHMM, with the time being local time. If an inversion did not set up the previous night, "None" will be noted. If the inversion mixed out during the previous night, "Mixed" will be noted followed by the time it mixed out (i.e., Mixed/0400). If the inversion is not forecast to mix out throughout the day, "Continued" will be noted. The format for the inversion setup time will be HHMM. If an inversion is not expected to develop overnight, "None" will be noted (i.e., strong winds keep the lower levels mixed).

Note: WFO's MRX and RNK are not currently producing 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 2000 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. The WPA section

of [Appendix G](#) 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: Only produced at WFO's GSP, MHX and ILM. Included at ILM year-round, immediately below the discussion section and above zone groupings.

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 H](#). 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.

Fire Weather Point Forecast Matrix (PFW)

The Fire Weather Point Forecast Matrix (PFW) is a tabular-type product used by natural resource management personnel for decision support related to pre-suppression and other planning or resource management activities at or near a specific point. These points are predetermined by the customers, and are semi-permanent in nature, meaning they can be changed from time to time, but not on a daily basis.

Generally, the forecast points listed in the PFW are those that are included in the National Fire Danger Rating System (NFDRS) Forecasts (i.e. RAWs locations and NC ECONet sites). If an agency has a critical burn they are planning or there is a prolonged wildfire, they may request to have a point added to the PFW to aid in their planning and decision making processes. If an agency would like to have a point added to the PFW, contact the NWS Fire Weather program manager responsible for the location. A name, elevation, latitude, and longitude for the location is required to have the point added. It may take 2-3 days (sometimes longer) to have a point added to the PFW, so it is not advantageous to make a request for a near-term project or short-lived wildfire where a Spot Forecast is more appropriate.

Note: WFO MRX does not issue a PFW, but includes this information in the PFM for RAWS points.

Product Overview and Issuance Criteria

The PFW provides a detailed prediction of elements for three days out at 3-hour intervals, including smoke management parameters through day 2, and a more general 3 to 7 day forecast without smoke management parameters. The winds given in this forecast are not terrain corrected winds. The PFW is issued at least twice daily, once in the morning (between 3:00 and 6:30 AM) and the other in the afternoon (between 2:00 and 4:00 PM). Many offices provide intermediate updates as well. For an example and information on decoding the product, click on [PFW Guide](#).

Fire Weather Area Forecast Matrix (AFW)

The Fire Weather Area Forecast Matrix (AFW) is a tabular-type product used by natural resource management personnel for decision support related to pre-suppression and other planning or resource management activities in a specific fire weather zone. These forecasts are produced for each individual fire weather zone, normally a whole county (example: Buncombe County), but in some cases a part of one county (example: Polk Mountains), or parts of several counties (example: Great Smoky Mountains National Park which is in Swain and Haywood Counties).

Generally, the AFW should not be used for prescribed burning or wildfire burning plans as it provides an average of the conditions over a large area and may not provide the detail required for a site specific forecast. This is especially true in coastal and mountain counties where coastal influences and terrain can cause weather conditions to vary over relatively short distances.

Product Overview and Issuance Criteria

The AFW provides a detailed prediction of elements for three days out at 3-hour intervals, including smoke management parameters through day 2, and a more general 3 to 7 day forecast without smoke management parameters. The winds given in this forecast are not terrain corrected winds. The AFW is issued with the regular forecast package, once in the morning (between 3:00 and 6:30 AM) and the other in the afternoon (between 2:00 and 4:00 PM), as well as with intermediate updates throughout the day. For an example and information on decoding the product, click on [AFW Guide](#).

Note: This is an experimental product issued only by WFO GSP.

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.

Requesting a Spot Forecast provides the NWS forecast office situational awareness of critical incidents within their forecast area. This allows the NWS to provide additional decision support to discuss specific concerns about the forecast, relay critical forecast updates, and provide notification of an impending significant weather event directly to the incident officials. Spot Forecasts are recommended for most wildfires and large or potentially impactful prescribed burns (such as near environmentally sensitive areas, near critical infrastructure, or if changeable or significant weather is predicted).

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 <https://www.weather.gov/spot/request/>. This form, along with instructions on how to use it, is available on the fire weather web pages of the local NWS sites. 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.

Note: Current, local observations allow the forecaster to change the forecast based on current conditions, including important weather elements such as temperature, dew point and wind direction and speed.

- 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 if there are questions about the spot request or if the NWS needs to notify the requesting official about a forecast update or an impending significant weather

event approaching the area. Ensure this is a number that will reach the appropriate personnel, either someone at the fire location or dispatch that can immediately relay the information to the fire location.

- 6) 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 [WS Form D-1](#).

National Fire Danger Rating System (NFDRS) Forecasts

Issuance

NFDRS forecasts will be issued for all RAWS and North Carolina ECONet stations within the County Warning Area on a daily basis. NFDRS forecast is a 7 day forecast. 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.

The NWS will notify the station owner if they deem the data received from a RAWS to be bad, especially if it is internally inconsistent with general meteorological practices. An example of internal inconsistency would include: a negative humidity, an abnormally high temperature, or an abnormally low temperature for the season. These things, when they occur, are normally an indication that sensors need to be replaced.

The information needed by the NWS to produce the NFDRS forecast can be supplied by either the GACC meteorologist or the agency representative within the state or local area. This data is readily available from the WIMS catalog.

WIMS access for NWS personnel is also available. The GACC meteorologist can assist with that as needed. WIMS access is through the National Application Portal (NAP) and a username and password is required for each individual that requires access. NAP does not allow for group accounts due to security concerns and regulations.

Contents

The NFDRS forecast will be a forecast of the observation at 1300 LT for the next 7 days. The format of the NFDRS forecast is specified in [National Weather Service Directive 10-401](#). The forecast will include the following elements:

- a. ZONE/FCST: Shows whether this forecast is for an NFDRS zone or individual station. Zone average trends are forecast when enough observations are available for the zone area. Individual site forecasts are done where only a few observations are available.
- b. NO: Individual NFDRS Site Number (or NFDRS Zone 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

Note: 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, though not currently used at any sites).
- g. RH: Relative Humidity in percent valid at 1300 LST (or RH trend + or - percent, though not currently used at any sites).
- 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 a 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 time lag 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:

For zone average forecasts:

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

For individual site forecasts:

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

The 7 day NFDRS forecast will typically be grouped by NFDRS site with a 7 day forecast for one site followed by the 7 day forecast for the next site (as shown below). The forecast may also be grouped by date with the forecast for all NFDRS sites for one day together followed by the forecasts for the following day, etc.

NFDRS #, Date		
FCST	315140, 210219	13, 3, 38, 89, 2, 1, NNW, 06, , 39, 34, 100, 89, 16, 8, N
FCST	315140, 210220	13, 1, 40, 41, 1, 1, NW, 08, , 40, 29, 100, 41, 0, 0, N
FCST	315140, 210221	13, 1, 41, 39, 1, 1, NE, 02, , 41, 24, 81, 39, 0, 0, N
FCST	315140, 210222	13, 2, 52, 71, 1, 1, SSW, 07, , 52, 29, 97, 36, 0, 0, N
FCST	315140, 210223	13, 0, 53, 44, 1, 1, W, 07, , 55, 33, 97, 44, 0, 0, N
FCST	315140, 210224	13, 1, 58, 47, 1, 1, W, 06, , 58, 37, 87, 42, 0, 0, N
FCST	315140, 210225	13, 1, 60, 51, 1, 1, SSW, 05, , 60, 39, 95, 45, 0, 0, N
FCST	315201, 210219	13, 6, 38, 100, 2, 1, NNW, 09, , 40, 37, 100, 100, 16, 8, N
FCST	315201, 210220	13, 1, 40, 50, 1, 1, NW, 09, , 40, 32, 100, 50, 7, 0, N
FCST	315201, 210221	13, 1, 39, 50, 1, 1, NNE, 04, , 40, 28, 75, 48, 0, 0, N

Procedures

The Land Management Agencies are responsible for taking, quality controlling, transmitting, and the archiving of NFDRS observations from RAWS sites and other mutually agreed upon observation networks (such as NC ECONet). Forecasts will be prepared for all sites, unless obvious errors are transmitted or the observation is internally inconsistent for prolonged periods of time. The observation(s) should be received by the NWS in a timely manner.

Missing observations sometimes occur due to signal override, satellite outages, or other elements beyond the control of the station owner. In these types of situations, NFDRS forecasts should still be issued. Suspension of the NFDRS forecast should be coordinated with the GACC meteorologist, the Regional RAWS coordinator for that geographic area, and the station owner.

If the station owner, typically a Land Management employee, is unable to service the sensors on his station, the NFDRS forecast can be suspended until the station comes back into service. When regular maintenance is being performed on a timely basis, long term outages beyond five days should not occur, or at least occur very infrequently. The Land Management Agencies do not have a mandatory turn-around time on maintenance issues. An NFDRS forecast can be made based on conditions in the surrounding area, even though a particular RAWS site may be temporarily out of service.

NFDRSv4 requires a continuum of observations spanning 24 hours every day. Short term outages of an hour or so will generally not pose too much of a problem in the computation of indices; however, long term outages of eight hours or more could lead to significant errors. This is due to the fact that every observation throughout the day is needed to accurately model fuel moisture values.

The NWS will prepare and transmit the NFDRS forecasts no later than 3 PM. Although

the data cutoff time for ingest into the NFDRS software is 7 PM, preliminary calculations based on the forecast are used by 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. WFO Raleigh is the primary NWS liaison office to the NC Forest Service and will collaborate with all NWS offices serving NC during times of critical fire weather conditions.

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 firefighting 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 E](#).**

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 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 48 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 F](#).**

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 96 hours in advance of the expected onset 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. A Fire Weather Watch will not be carried over into the first period of the forecast. 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 F](#).**

Increased Fire Danger Statements

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. **This statement 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. The statements will normally be issued 12 to 24 hours in advance (or for the next operational day time period).

The following criteria will be used for Fire Danger Statements:

1. RH within 5% of Red Flag Criteria (30% or lower)

AND

2. 20 ft wind speeds or gusts within 5 MPH of Red Flag Criteria (sustained 15 MPH or gusts to 25 MPH)

AND

3. Low fuel moisture as determined by land managers.

These criteria may be waived at the request of the land managers, typically for unusual or dangerous situations.

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, relayed verbally by phone call and/or personalized email. Spot requests should include a reachable voice number (such as a cell phone or dispatch) in case NWS forecasters need to reach out with questions about the spot request and/or to notify the requesting official about critical forecast updates. 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 [Appendix D](#) for a listing of NWS transmitters serving 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 All Hazards Meteorological Response System (AMRS), and the Incident Remote Automated Weather Station (IRAWS). The IMET, AMRS, and the IRAWS are considered national firefighting resources, and can be requested through the North Carolina Interagency Coordination Center.

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

AMRS workstations are collocated with Weather Forecast Offices that have certified IMETS. These AMRS workstations are maintained by the IMETS and are typically shipped with the IMET being mobilized. As of 2024, the AMRS workstations located in NC are at NWS Raleigh, NWS Wilmington, and NWS Morehead City. Other nearby AMRS workstations are located at NWS Columbia in SC, NWS Greenville/Spartanburg, NWS Roanoke and NWS Wakefield in VA, and NWS Morristown in TN. (see map in [Appendix J](#) for AMRS locations).

The AMRS is composed of two pelican cases, one large shipping box and one medium size. The large case contains a laptop computer, extra monitor, belt weather kit, smartphone with wireless internet connectivity for obtaining weather data, a printer and office supplies. The volume is about 7 cubic feet, and its weight is about 90 pounds. The medium case consists of an upper air balloon sounding system, radiosondes with balloons, a nozzle and regulator for a helium tank, and miscellaneous expendables. Its volume is about 3 cubic feet and it weighs 55 pounds.

Total weight of the AMRS is 145 lbs. with a volume of 10 cubic feet. The cubic feet and weight are necessary for shipment by air.

Requests for the 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 National Fire Weather Operations Coordinator (NFWOC) 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 IRAWS are desirable, it is the IMET's responsibility to ensure the IRAWS 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 the 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.
6. Resource orders should include the following statement:
As per the National Mob Guide, Chapter 20, Pages 39 & 40
(<https://www.nifc.gov/nicc/mobguide/Chapter%2020.pdf>), In Special Needs please put:
 - *AOV/POV/SUV-Sized 4x4 Rental and air travel with excess baggage approved*
 - *Cell phone, laptop, printer and upper air equipment approved*

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 on 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 fire line maps. If possible, the IMET should be assigned a radio with the fire line 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 meetings, 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 arrange transport of the Fire RAWS back to its cache location or to the controlling fire weather office. The user agency will also arrange transport of any peripheral equipment (e.g. helium tanks for supporting the AMRS) back to the local vendor. Travel arrangements will be made for the IMET back to his or her home office. The IMET is responsible for arranging transport of the AMRS workstation back to the home office. If the AMRS unit resides at a different location than the IMET's home office, 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 to 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 knowledge of NWS technologies used in the monitoring of weather, or the preparation of products.

Agency Computer Resources

The 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 indicate the county, and the last two digits indicate 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 automatically flows into WIMS via the NESDIS ID. If a station is not satellite telemetered, the data must be manually entered into WIMS. All 24 observations are needed to accurately compute fire danger indices. NFDRSv4 features a much higher degree of automation than the previous system, however the state of the weather is computed by the Nelson Model. The station owner has an opportunity to edit that value if he deems it inappropriate or erroneous on a given day. Non-NFDRS stations are exempt from these procedures. Even with automated observations, the responsibility still rests with the RAWS owner to ensure that observations are being transmitted, recorded, and archived properly in WIMS. NFDRS forecasts are based on RAWS observations that appear on the daily collective and it is important these observations are accurate.

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 a sensor failure, he should relay that information to the appropriate NWS office. It is the station owner's responsibility to make sure that their station is and remains in good working order and repairs are made in a timely manner. Owners of NFDRS stations can still (and should) correct any errors in their respective observations.

It is important to note, observations are the most important single effort the control agencies put into the Fire Weather Program. Potential fire danger is derived from these observations. The Fire Danger Rating System is the guidance tool that, together with the weather forecast, is used to make a variety of management decisions. It is important that observers be well trained and informed of the necessity for accurate, timely, and representative 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 NC Forest Service 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 4 or higher (on a scale from 1 to 5), 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 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 other's fields of expertise, operations and equipment. Visits to offices and work centers, as well as 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 [Appendix C](#) 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 webpages. A copy of this plan will be made available to NWS Eastern Region Headquarters, NIFC, and NWS Headquarters by January 31 of the current year. The State Liaison Office will retain a copy of the AOP for five years.

Signatory Page

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

Greg Hicks NC Forest Service Department of Agriculture and Consumer Services	Date
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Laura Hendrick Webster USMC Cherry Point	Date
---	-------------

Phillip Manuel Fire Weather Program Leader NWS Blacksburg, VA	Date
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Mike Rehnberg Fire Weather Program Leader NWS Greenville-Spartanburg, SC	Date
---	-------------

Jimmy Taeger Fire Weather Program Leader NWS Raleigh, NC	Date
---	-------------

Scott Kennedy
Fire Weather Program Leader
NWS Morehead City/Newport, NC

Date

Sam Roberts
Fire Weather Program Leader
NWS Morristown, TN

Date

Andrew Zimmerman
Fire Weather Program Leader
NWS Wakefield, VA

Date

Terry Lebo
Fire Weather Program Leader
NWS Wilmington, NC

Date

Pete Steponkus
Forest Fire Management Officer
Environmental Conservation Branch
USMC Camp Lejeune

Date

Brian Tonihka
Appalachian-Piedmont-Coastal Zone FMO
Great Smoky Mountains National Park
National Park Service

Date

Michael Haisten
Interim Forest Fire Management Offices
National Forests in North Carolina
U.S. Forest Service

Date

Caleb Jones
Fire Management Officer
U.S. Fish & Wildlife Service

Date

Chris Jordan
Lands Program Coordinator
North Carolina Wildlife Resources Commission

Date

Steven Ippoliti
Predictive Services Meteorologist
Southern Area Coordination Center

Date

Carmella Stirrat
North Carolina Chapter Fire Manager
The Nature Conservancy

Date

Thomas Crate
NC Division of Parks and Recreation
Department of Natural and Cultural Resources

Date

Gabe Pinkston
Fire Management Specialist, Forestry Branch
US Army Fort Liberty

Date

Robert Montgomery
USAF Dare County Bomb Range

Date

Reese Kerbow
Chief, Fire and Aviation Management
Eastern Cherokee Agency
Bureau of Indian Affairs

Date

Wes Sketo
NC Prescribed Fire Council

Date

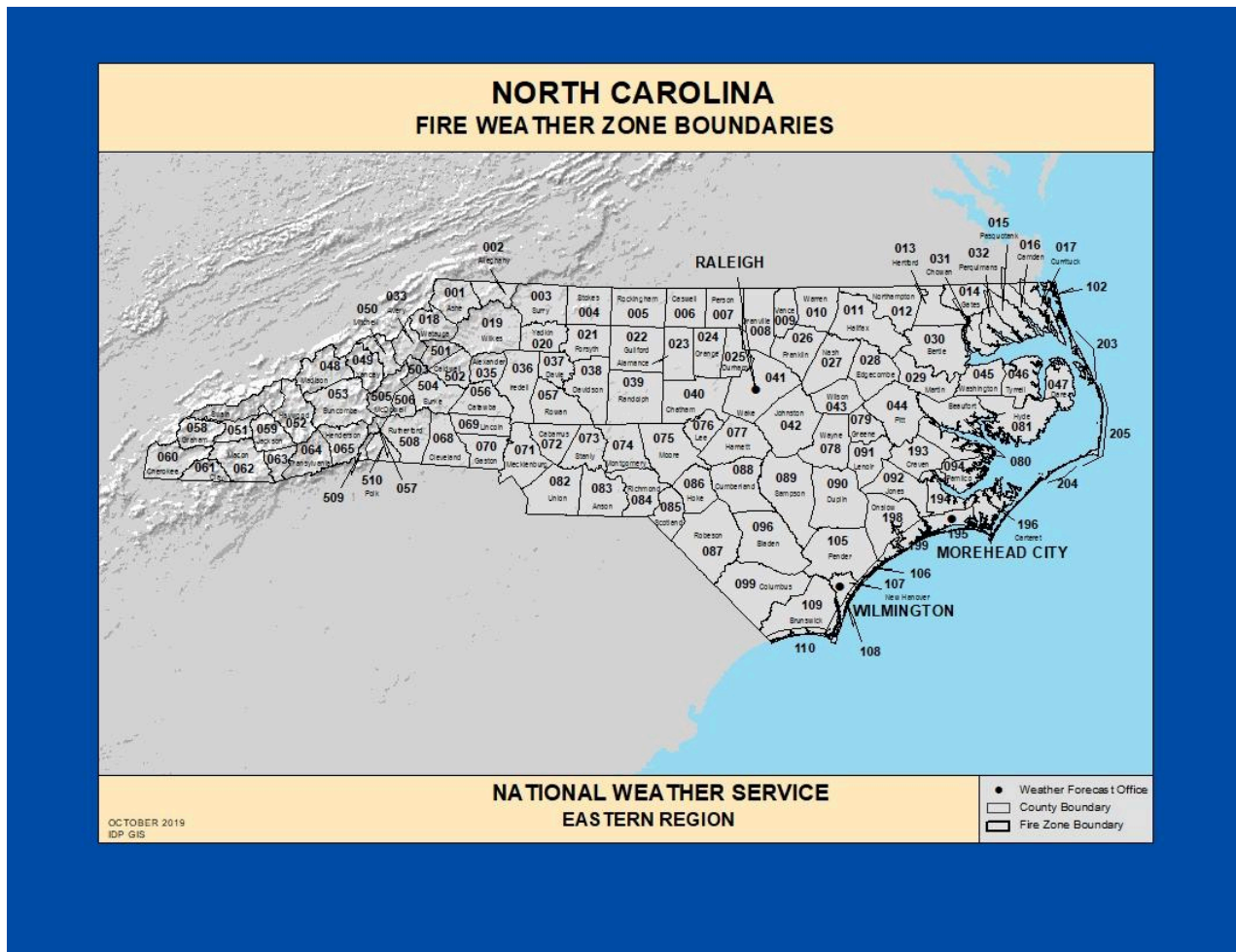
Appendices

Appendix A: Interagency Agreement

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

Appendix B: 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. Below is a map of Fire Weather Zones in North Carolina, [click here](#) for a larger pdf version of this map.



Appendix C: Catalog of Fire Weather Observation Sites

[Click here](#) for a map of NC fire weather observation sites

[Click here](#) for a map of NC Forest Service Region 1 fire weather observation sites

[Click here](#) for a map of NC Forest Service Region 2 fire weather observation sites

[Click here](#) for a map of NC Forest Service Region 3 fire weather observation sites

Remote Automated Weather Stations (ALL CAPS) and NC ECONet Stations

Station Name	County	Office	Station #	Lat	Lon	Elevation
Anson Peaking Plant	Anson	RAH	318142	34.970N	79.918W	457 ft
BACK ISLAND	Pender	ILM	319402	34.533N	77.722W	20 ft
Bald Head Island Clb	Brunswick	ILM	442501	33.863N	77.998W	5 ft
Bdr Belt Tobacco RS	Columbus	ILM	319741	34.413N	78.792W	94 ft
Bearwallow Mountain	Henderson	GSP	316140	35.461N	82.358W	4219 ft
BEAUFORT	Beaufort	MHX	317801	35.520N	76.761W	25 ft
Buckland Elementary	Gates	AKQ	311440	36.470N	76.761W	34 ft
Burnsville Tower	Yancey	GSP	313440	35.919N	82.260W	2689 ft
BUSICK	Yancey	GSP	313402	35.768N	82.194W	2892 ft
Butner Beef Catt Lab	Durham	RAH	312641	36.175N	78.809W	469 ft
BUXTON	Dare	MHX	315407	35.246N	75.534W	18 ft
CASWELL GAMELANDS	Caswell	RNK	310801	36.385N	79.291W	580 ft
CEDAR ISLAND	Carteret	MHX	319604	35.002N	76.297W	7 ft
Cent Crops Res Stn	Johnston	RAH	317441	35.670N	78.493W	365 ft
CHEOAH	Graham	GSP	315501	35.337N	83.825W	2000 ft
CHEROKEE	Swain	GSP	313902	35.620N	83.207W	3400 ft
Cherry Res Stn	Wayne	RAH	317540	35.379N	78.045W	63 ft

COW MOUNTAIN	Swain	GSP	313903	35.474N	83.323W	2395 ft
CROATAN	Carteret	MHX	319602	34.761N	76.896W	69 ft
Lower C P Tobacco RS	Lenoir	MHX	318840	35.303N	77.573W	68 ft
DARE BOMB RANGE	Dare	MHX	315406	35.761N	75.871W	3 ft
DAQ Clayton Profiler	Johnston	RAH	317442	35.592N	78.459W	269 ft
DAVIDSON RIVER	Transylvania	GSP	316001	35.349N	82.776W	3210 ft
DUKE FOREST	Orange	RAH	312501	35.967N	79.092W	564 ft
ELIZABETH CITY	Pasquotank	AKQ	311503	36.347N	76.278W	15 ft
FAIRFIELD	Hyde	MHX	317901	35.542N	76.223W	10 ft
FINCH'S STATION	Wayne	RAH	317501	35.428N	78.023W	87 ft
FORT LIBERTY	Cumberland	RAH	318503	35.140N	79.064W	469 ft
Frying Pan Mountain	Haywood	GSP	314040	35.394N	82.774W	5320 ft
GRANDFATHER	McDowell	GSP	314201	35.768N	82.040W	1600 ft
GREEN CROSS	Bertie	AKQ	313001	36.010N	76.900W	52 ft
GUION FARM	Henderson	GSP	316102	35.213N	82.590W	2600 ft
Hamlet Tower	Richmond	RAH	318242	34.842N	79.738W	321 ft
HIGHLANDS	Macon	GSP	315803	35.083N	83.217W	3800 ft
HOFMANN FOREST	Onslow	MHX	319507	34.825N	77.320W	42 ft
Horace Williams Arpt	Orange	RAH	312541	35.934N	79.064W	511 ft
HORSESHOE HOUSE	Moore	RAH	318203	36.469N	79.381W	367 ft
Horticultural CRS	New Hanover	ILM	319940	34.321N	77.916W	43 ft
Horticultural CRS	Sampson	RAH	318640	35.022N	78.282W	166 ft
Hwy Patrol Comm Stn	Martin	MHX	315140	35.839N	77.093W	72 ft
JACKSON COUNTY	Jackson	GSP	315902	35.316N	83.207W	2800 ft
JESSEN STATION	Yancey	GSP	313404	36.053N	82.379W	3634 ft
Jockey's Ridge State Park	Dare	MHX	315409	35.965N	75.635W	15 ft
Lake Wheeler Rd Lab	Wake	RAH	314941	35.728N	78.680W	382 ft

LEXINGTON	Davidson	RAH	314602	35.792N	80.312W	751 ft
LOCUST GAP	Macon	GSP	315802	35.181N	83.527W	3920 ft
LUMBERTON	Robeson	ILM	319201	34.595N	79.085W	120 ft
Mountain Res Station	Haywood	GSP	314041	35.488N	82.968W	2755 ft
MT ISLAND LAKE	Gaston	GSP	316602	35.379N	80.993W	500 ft
Mt Jefferson Tower	Ashe	RNK	310142	36.403N	81.463W	4608 ft
Mt Mitchell St Park	Yancey	GSP	313441	35.759N	82.271W	6215 ft
Mtn Horticulture CRS	Henderson	GSP	316141	35.427N	82.559W	2067 ft
N Durham Water RF	Durham	RAH	312640	36.029N	78.859W	332 ft
N Stanly Middle Sch	Stanly	RAH	316941	35.410N	80.237W	580 ft
NATURE CONSERVANCY	Brunswick	ILM	319802	34.048N	78.290W	56 ft
NC A&T SU Res Farm	Guilford	RAH	312342	36.067N	79.734W	792 ft
NEW BERN	Craven	MHX	319004	35.097N	77.111W	20 ft
NORTH COVE PINNACLE	Burke	GSP	314301	35.817N	81.937W	2657 ft
Oxford Tobacco R Stn	Granville	RAH	310841	36.303N	78.617W	500 ft
Pamlico Aqua Fld Lab	Beaufort	MHX	317840	35.362N	76.716W	10 ft
Peanut Belt Res Stn	Bertie	AKQ	313040	36.132N	77.176W	76 ft
Piedmont Res Stn	Rowan	GSP	314541	35.698N	80.622W	680 ft
PILOT MOUNTAIN	Surry	RNK	310302	36.257N	80.493W	1083 ft
POCOSIN LAKES NWR	Washington	MHX	315201	35.747N	76.511W	11 ft
RAVEN KNOB	Surry	RNK	310301	36.476N	80.857W	1300 ft
RENDEZVOUS MOUNTAIN	Wilkes	RNK	312001	36.226N	81.296W	2380 ft
Reedy Crk Field Lab	Wake	RAH	314942	35.807N	78.744W	468 ft
ROCKINGHAM	Richmond	RAH	318202	34.960N	79.690W	400 ft
RUTHERFORD COUNTY	Rutherford	GSP	316302	35.429N	81.939W	1056 ft
Sandhills Res Stn	Montgomery	RAH	317040	35.188N	79.684W	618 ft
SANDY RUN (CL1)	Onslow	MHX	319505	34.612N	77.488W	40 ft

SEVEN MILE RIDGE	Madison	GSP	313302	35.803N	82.650W	2150 ft
Siler City Airport	Chatham	RAH	314840	35.707N	79.500W	614 ft
Spindale Tower	Rutherford	GSP	316341	35.335N	81.913W	1078 ft
Spruce Pine Tower	Mitchell	GSP	311740	35.901N	82.059W	2749 ft
SUNNY POINT	Brunswick	ILM	319803	34.003N	77.958W	30 ft
TAYLORSVILLE	Alexander	GSP	313601	35.912N	81.138W	1190 ft
Taylorsville Tower	Alexander	GSP	313640	35.914N	81.191W	1167 ft
Tidewater Res Stn	Washington	MHX	315240	35.849N	76.651W	20 ft
TOW STRING	Swain	GSP	313904	35.547N	83.292W	2927 ft
TROY	Montgomery	RAH	317001	35.367N	79.867W	541 ft
TURNBULL CREEK	Bladen	ILM	319302	34.683N	78.582W	98 ft
TUSQUITEE	Cherokee	MRX	315602	65.040N	84.070W	1600 ft
UNC Asheville Tower	Buncombe	GSP	314141	35.622N	82.566W	2367 ft
Upper Coastal Pln RS	Edgecombe	RAH	312940	35.893N	77.680W	91 ft
Upper Mtn Res Stn	Ashe	RNK	310141	36.402N	81.297W	3009 ft
Upper Piedmt Res Stn	Rockingham	RNK	310540	36.382N	79.700W	858 ft
Wayah Bald Mountain	Macon	GSP	315840	35.173N	83.581W	5469 ft
WARRENTON	Warren	RAH	311001	36.361N	78.099W	435 ft
WHITEVILLE	Columbus	ILM	319701	34.336N	78.729W	98 ft
Williamsdale Fld Lab	Duplin	MHX	318741	34.766N	78.101W	56 ft

ASOS Observation Sites

[Click here](#) for a map of ASOS, AWOS and Military observation site locations.

Station Name	ID	Lat	Lon	Elevation
Asheville Regional Airport	AVL	35.433N	82.533W	2140 ft
Beaufort, Michael J Smith Airport	MRH	34.730N	76.660W	10 ft

Burlington-Alamance Regional Airport	BUY	36.049N	79.475W	617 ft
Charlotte-Douglass International Airport	CLT	35.218N	80.950W	728 ft
Elizabeth City, CG Air Station/Regional Airport	ECG	36.250N	76.170W	33 ft
Fayetteville Regional Airport	FAY	34.991N	78.880W	189 ft
Gastonia Municipal Airport	AKH	35.200N	81.150W	797 ft
Greensboro, Piedmont Triad International Airport	GSO	36.098N	79.937W	926 ft
Halifax Northampton Regional Airport	IXA	36.330N	77.635W	145 ft
Hatteras, Billy Mitchell Field	HSE	35.220N	75.620W	10 ft
Hickory Regional Airport	HKY	35.733N	81.383W	1143 ft
Lumberton Municipal Airport	LBT	34.610N	79.059W	126 ft
Martin County Airport	MCZ	35.862N	77.178W	75 ft
Maxton, Laurinburg-Maxton Airport	MEB	34.792N	79.366W	220 ft
Monroe Regional Airport	EQY	35.017N	80.617W	679 ft
New Bern, Coastal Carolina Regional Airport	EWN	35.070N	77.050W	20 ft
Raleigh/Durham International Airport	RDU	35.878N	78.788W	435 ft
Rocky Mount-Wilson Regional Airport	RWI	35.856N	77.892W	159 ft
Southern Pines, Moore County Airport	SOP	35.237N	79.391W	461 ft
Tarboro-Edgecombe Airport	ETC	35.937N	77.547W	53 ft
Wilmington International Airport	ILM	34.270N	77.900W	33 ft
Winston-Salem, Smith Reynolds Airport	INT	36.134N	80.222W	969 ft

AWOS Observation Sites

[Click here](#) for a map of ASOS, AWOS and Military observation site locations.

Station Name	ID	Lat	Lon	Elevation
Ahoskie: Tri-County Airport	ASJ	36.300N	77.170W	68 ft
Albemarle: Stanly County Airport	VUJ	35.417N	80.151W	609 ft

Andrews-Murphy; Western Carolina Regional Airport	RHP	35.190N	83.860W	1696 ft
Asheboro Municipal Airport	HBI	35.655N	79.895W	673 ft
Brunswick County Airport	SUT	33.930N	78.070W	26 ft
Clinton; Sampson County Airport	CTZ	34.976N	78.365W	148 ft
Concord Regional Airport	JQF	35.385N	80.710W	690 ft
Columbus County Municipal Airport	CPC	34.270N	78.710W	98 ft
Currituck County Airport	ONX	36.400N	76.020W	16 ft
Edenton; Northeast Regional Airport	EDE	36.030N	76.570W	20 ft
Elizabethtown; Curtis L. Brown Jr. Field	EYF	34.602N	78.579W	132 ft
Engelhard; Hyde County Airport	7W6	35.562N	77.956W	6 ft
Erwin; Harnett County Airport	HRJ	35.379N	78.783W	199 ft
Franklin; Macon County Airport	1A5	35.223N	83.419W	2020 ft
Goldsboro-Wayne Municipal Airport	GWW	35.461N	77.965W	134 ft
Henderson Field Airport	ACZ	34.718N	78.004W	38 ft
Henderson-Oxford Airport	HNZ	36.362N	78.529W	527 ft
Hyde County Airport	7W6	35.562N	75.956W	6ft
Jackson County Airport	24A	35.316N	83.207W	2857 ft
Jefferson; Ashe County Airport	GEV	36.430 N	81.420W	3179 ft
Kenansville; Duplin County Airport	DPL	35.000N	77.980W	138 ft
Kill Devil Hills; First Flight Airport	FFA	36.018N	75.672W	12 ft
Kinston; Kinston Regional Jetport at Stallings Field	ISO	35.330N	77.620W	10 ft
Lexington; Davidson County Airport	EXX	35.781N	80.304W	733 ft
Lincolnton, Lincoln County Regional Airport	IPJ	35.483N	81.161W	875 ft
Louisburg; Franklin County Airport	LHZ	36.023N	78.330W	369 ft
Manteo; Dare County Regional Airport	MQI	35.920N	75.700W	13 ft
Morganton-Lenoir Airport	MRN	35.820N	81.611W	1270 ft
Mount Airy, Surry County Airport	MWK	36.460N	80.550W	1247 ft

Mount Olive Municipal Airport	W40	35.221N	78.039W	167 ft
North Wilkesboro: Wilkes County Airport	UKF	36.220N	81.110W	1299 ft
Pitt-Greenville Airport	PGV	35.630N	77.400W	26 ft
Reidsville, Shiloh Airport	SIF	36.437N	79.851W	692 ft
Richlands: Albert J Ellis Airport	OAJ	34.830N	77.620W	95 ft
Rockingham Hamlet Airport	RCZ	34.895N	79.758W	358 ft
Roxboro, Person County Airport	TDF	36.285N	78.984W	610 ft
Rutherford County Airport, Marchman Field	FQD	35.428N	81.935W	1078 ft
Salisbury, Rowan County Airport	RUQ	35.646N	80.520W	773 ft
Sanford-Lee County Regional Airport	TTA	35.584N	79.101W	247 ft
Shelby Municipal Airport	EHO	35.256N	81.601W	847 ft
Siler City Municipal Airport	SCR	35.704N	79.504W	614 ft
Smithfield, Johnston County Airport	JNX	35.541N	45.390W	165 ft
Statesville Municipal Airport	SVH	35.765N	80.957W	965 ft
Wadesboro, Anson County Airport	AFP	35.021N	80.077W	298 ft
Washington-Warren Airport	OCW	35.570N	77.050W	39 ft
Watauga County Hospital Helipad	TNB	36.200N	81.650W	3146 ft

Military Observation Sites

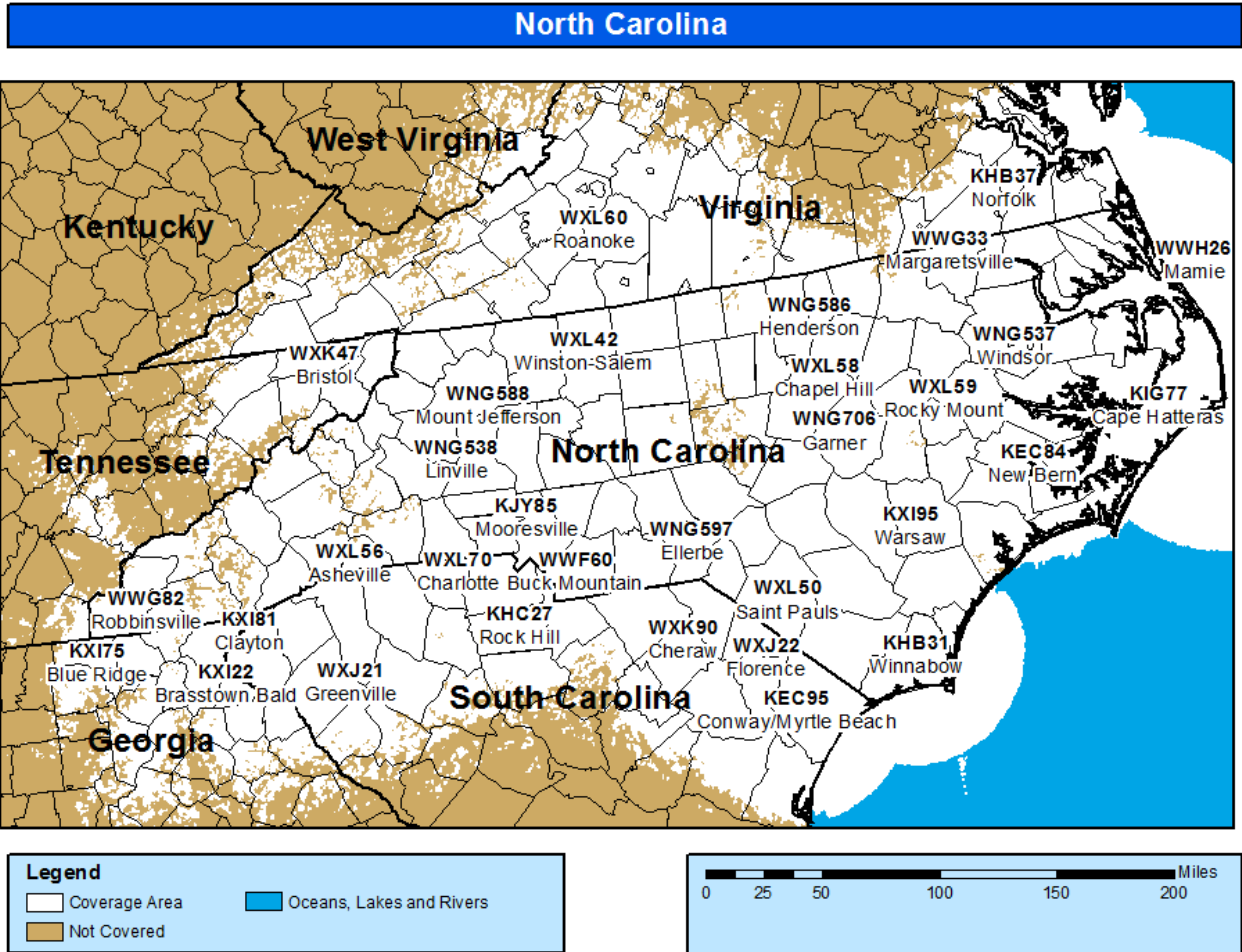
[Click here](#) for a map of ASOS, AWOS and Military observation site locations.

Station Name	ID	Lat	Lon	Elevation
Fayetteville: Pope AFB	POB	35.171N	9.015W	217 ft
Fayetteville: Simmons AAF	FBG	35.132N	78.937W	242 ft
Goldsboro: Seymour-Johnson AFB	GSB	35.339N	77.961W	110 ft
Hoffman: Mackall AAF	HFF	35.037N	79.498W	376 ft
Havelock: Cherry Point MCAS	NKT	34.900N	76.880W	30 ft

Jacksonville: New River MCAS	NCA	34.720N	77.450W	26 ft
Piney Island Bombing Range	NBT	35.022N	76.463W	16 ft
Stumpy Point; Dare County Gunnery Range	2DP	35.683N	75.900W	10 ft
Swansboro; Bogue Field Marine Corps Auxiliary Field	NJM	34.690N	77.029W	21 ft

Appendix D: All Hazards NOAA Weather Radio

Below is a table of All Hazards NOAA Weather Radio Transmitters serving North Carolina. A map of transmitter location and coverage areas is below. An additional map of transmitter locations can be found by [clicking here](#). A map of each transmitter coverage area can be found by clicking the transmitter location link in the table below.



Transmitter Location	Office	Call Sign	Frequency	NC Counties Served
Asheville, Mt. Pisgah, NC	GSP	WXL-56	162.400 MHz	Avery Buncombe Burke Haywood Henderson Jackson Madison McDowell

				Mitchell Polk Rutherford Transylvania Yancey
Blue Ridge, GA	FFC	KXI-75	162.475 MHz	Cherokee
Brasstown Bald, GA	FFC	KXI-22	162.500 MHz	Clay
Buck Mt., NC	RAH	WWF-60	162.500 MHz	Anson Cabarrus Davidson Montgomery Moore Randolph Richmond Rowan Stanly Union
Cape Hatteras, NC	MHX	KIG-77	162.475 MHz	Dare Hyde Tyrrell Washington
Chapel Hill, NC	RAH	WXL-58	162.550 MHz	Alamance Chatham Durham Franklin Granville Harnett Johnston Lee Moore Orange Person Randolph Vance Wake Warren
Charlotte, Spencer Mt., NC	GSP	WXL-70	162.475 MHz	Alexander Anson Cabarrus Catawba Cleveland Gaston Iredell Lincoln

				Mecklenburg Montgomery Richmond Rowan Stanly Union
Cheraw, SC	CAE	WXK-90	162.450 MHz	Anson Richmond Scotland
Clayton, Glassy Mt., GA	GSP	KXI-81	162.450 MHz	Macon
Conway/Myrtle Beach, Aynor, SC	ILM	KEC-95	162.400 MHz	Brunswick Columbus
Ellerbe, NC	RAH	WNG-597	162.400 MHz	Anson Hoke Montgomery Moore Randolph Richmond Scotland Stanly
Garner, NC	RAH	WNG-706	162.450 MHz	Durham Franklin Harnett Johnston Nash Wake Wayne Wilson
Greenville, SC	GSP	WXJ-21	162.550 MHz	Polk Rutherford
Halifax, South Boston, VA	RNK	KJY-86	162.525 MHz	Caswell Granville Person
Henderson, NC	RAH	WNG-586	162.500 MHz	Franklin Granville Person Vance Warren
Linville, Grandmother Mt., NC	GSP	WNG-538	162.450 MHz	Alexander Avery Burke Caldwell Catawba

				McDowell Mitchell Rutherford Watauga Wilkes Yancey
Margarettsville, NC	AKQ	WWG-33	162.450 MHz	Bertie Gates Halifax Hertford Northampton
Mamie, NC	MHX	WWH-26	162.425 MHz	Camden Currituck Dare Pasquotank Tyrrell
Mooresville, NC	GSP	KJY-85	162.525 MHz	Alexander Cabarrus Catawba Davidson Davie Gaston Iredell Lincoln Mecklenburg Rowan
Mount Jefferson, NC	RNK	WNG-588	162.500 MHz	Alexander Alleghany Ashe Caldwell Catawba Davie Iredell Watauga Wilkes
New Bern, NC	MHX	KEC-84	162.400 MHz	Beaufort Carteret Craven Duplin Greene Hyde Jones Lenoir Martin Onslow Pamlico Pitt

Norfolk/Driver, VA	AKQ	KHB-37	162.550 MHz	Bertie Camden Chowan Currituck Gates Hertford Northampton Pasquotank Perquimans
Roanoke, Poor Mt., VA	RNK	WXL-60	162.475 MHz	Caswell Rockingham
Robbinsville, Joanna Bald Mt., NC	GSP	WWG-82	162.525 MHz	Cherokee Clay Graham Jackson Macon Swain
Rock Hill, SC	GSP	KHC-27	162.425 MHz	Cleveland Mecklenburg Union
Rocky Mount, Tarboro, NC	RAH	WXL-59	162.475 MHz	Bertie Edgecombe Greene Halifax Martin Nash Northampton Pitt Warren Wilson
St. Pauls, NC	ILM	WXL-50	162.475 MHz	Bladen Columbus Cumberland Duplin Harnett Hoke Moore Robeson Sampson Scotland
Tri-Cities, TN	MRX	WXK-47	162.550 MHz	Ashe Avery Madison Mitchell Watauga Yancey

Warsaw, NC	MHX	KXI-95	162.425 MHz	Bladen Duplin Jones Lenoir Onslow Pender Sampson Wayne
Windsor, NC	AKQ	WNG-537	162.525 MHz	Beaufort Bertie Chowan Edgecombe Gates Halifax Hertford Martin Northampton Perquimans Pitt Washington
Winnabow, NC	ILM	KHB-31	162.550 MHz	Bladen Brunswick Columbus New Hanover Onslow Pender
Winston-Salem, NC	RAH	WXL-42	162.400 MHz	Alamance Alexander Alleghany Caswell Davidson Davie Forsyth Guilford Iredell Randolph Rockingham Rowan Stokes Surry Wilkes Yadkin

Appendix E: 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) of 20 mph or greater, or gusts to 30 mph.
Note: **WFO MRX** uses sustained winds of 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.

Appendix F: Fire Weather Products and Examples

See the links in the table for the latest fire weather products from NWS offices serving North Carolina.

Fire Weather Forecast	AKQ	GSP	ILM	MHX	MRX	RAH	RNK
Point Fire Weather Forecast	AKQ	GSP	ILM	MHX	-	RAH	RNK
Area Fire Weather Forecast	-	GSP	-	-	-	-	-
Red Flag Warning/ Fire Weather Watch (see note below)	AKQ	GSP	ILM	MHX	MRX	RAH	RNK
NFDRS Forecast (FWM)	AKQ	GSP	ILM	MHX	MRX	RAH	RNK

NOTE: Red Flag Warning and Fire Weather Watch products are only available if they have been recently issued. Make sure to check the date for validity.

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

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

Appendix G: Fire Weather Parameter Definitions

Burn Category Table

Ventilation Rate (ft-mph)	Burn Category
0 to 14759	0
14760 to 33499	1*
33500 to 44999	2
44500 to 59999	3
60000 to 111999	4
112000 and above	5

* To qualify as a BC-1 day, the minimum predicted mixing height must be at least 1,640 feet **and** the minimum transport wind must be 9 MPH.

Dispersion Table

Surface Wind (mph)	Dispersion Category
Near Calm	Stagnant
2 to 4	Very Poor
5 to 8	Poor
9 to 12	Fair
>12	Good
>14	Excellent

Lavdas Atmospheric Dispersion Index (ADI)

The Lavdas atmospheric dispersion index (ADI) was designed to estimate the atmosphere's ability to disperse smoke from a prescribed fire and is a more complex metric of dispersion potential than the ventilation index. The ADI incorporates transport wind speed, mixing height and stability class to develop an index value from 1 to over 100. Values of ADI range from ≥ 100 indicating "very good" dispersion to ≤ 6 indicating

“very poor” dispersion. High values indicate potential clearing events while low values indicate the potential for smoke to concentrate nearer the fire. Tables for daytime and nighttime ADI values and expected conditions are below. For a comprehensive review of atmospheric dispersion and stability, refer to the [NWCG Smoke Management Guide for Prescribed Fire](#).

Daytime ADI	Category	Sunrise to Sunset Conditions
1 to 6	Very Poor	Prescribed fire smoke at these levels does not disperse adequately.
7 to 12	Poor	Prescribed fires are permissible if other criteria are used to support decisions are utilized to evaluate smoke impacts on sensitive areas.
13 to 20	Generally Poor	Prescribed fires are permissible if other criteria are used to support decisions are utilized to evaluate smoke impacts on sensitive areas.
21 to 40	Fair	Any residual smoke likely to result in problems if surface wind speed is < 3 mph. Persistent low wind speeds can indicate air stagnation.
41 to 49	Generally Good	Typical afternoon forest values. Generally good dispersion, especially for prescribed fires less than 50 acres.
50 to 59	Good	Good dispersion for larger prescribed fires.
60 to 69	Very Good	Single fire smoke issues seem unlikely, but be aware of multiple fire effects on the airshed. Fire behavior often results in control problems.
>70	Excellent	Should not produce dispersion problems but may present control problems.

Nighttime ADI	Category	Sunset to Sunrise Conditions
1 to 4	Very Poor	Nighttime Smoke Dispersion “VERY

		POOR” surface wind speed 2 to 4 mph or Nighttime Smoke Dispersion “STAGNANT” surface wind speed < 2mph.
5 to 7	Poor	Nighttime Smoke Dispersion “POOR” with surface wind speed 5 to 8 mph.
8 to 12	Poor to Fair	Nighttime Smoke Dispersion “FAIR” with surface wind speed 9 to 12 mph. Surface wind speeds of 9 mph usually result in acceptable mid-flame wind speeds.
13 to 20	Good	Nighttime Smoke Dispersion “GOOD” with surface wind speed > 12 mph but beware of the influence of combustion rate.

Low Visibility Occurrence Risk index (LVORI)

LVORI Category	Interpretation
1	Lowest proportion of accidents with smoke and/or fog reported (130 of 127,604 accidents, or just over 0.0010 accidents)
2	Physical or statistical reasons for not including in category 1, but proportion of accidents not significantly higher.
3	Higher proportion of accidents than category 1, by about 30 to 50 percent, marginal significance (between 1 and 5 percent).
4	Significantly higher than category 1, by a factor of 2.
5	Significantly higher than category 1, by a factor of 3 to 10.
6	Significantly higher than category 1, by a factor of 10 to 20.
7	Significantly higher than category 1, by a factor of 20 to 40.
8	Significantly higher than category 1, by a factor of 40 to 75.
9	Significantly higher than category 1, by a factor of 75 to 125.
10	Significantly higher than category 1, by a factor of 150.

Lightning Activity Level

LAL Category	Interpretation
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

	strokes per minute	strokes per 5 minute	strokes per 15 minute
1	0	0	0
2	1	1-5	1-8
3	1-2	6-10	9-15
4	2-3	11-15	16-25
5	3	15	25
6	1-2	6-10	9-15

Wind Profile Analysis

During the months of March, April, and May at GSP, and MHX, and year round at ILM, 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 includes 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 here](#) 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.")

Appendix H: FWF Update Criteria

Parameter	Update Criteria
Standard Air Temperature	+/- 5 degrees F
Relative Humidity	+/- 5%
20 ft AGL Wind Speed and Direction	+/- 5 mph and/or 45 degrees
Precipitation (POP, Duration and Amount)	same as for public zones Note: Duration guideline for NFDRS is +/- 2 hrs
Inversions	+/- 100 m or 328 ft
Transport Winds	+/- 5 mph and/or 45 degrees
Mixing Height	+/- 300 m or 984 ft
Stability	Must be in correct category 90% of the 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.

Appendix I: Table of Specialized Products Produced By WFO's

Fire Weather Experimental Grids

Wx Element\WFO	GSP	MHX	ILM	RAH	RNK	AKQ	MRX
Mixing Height	X	X	X	X	X	X	X
Haines Index	X	X	X	X	X	X	X
LAL	X	X	X	X	X	X	X
Transport Wind	X	X	X	X	X	X	X
20 foot wind	X	X	X	X	X	X	X
Pressure	X	X	X	X	X	X	X
ADI	X	X	X	X	X	X	X
LVORI	X	X	X	X	X	X	X
Turner Stability	X	X	X	X	X	X	X
Ceiling	X	X	X	X	X	X	X
Visibility	X	X	X	X	X	X	X

Activity Planner and Hourly Weather Graph products

Wx Element\WFO	GSP	MHX	ILM	RAH	RNK	AKQ	MRX
Mixing Height	X	X	X	X	X	X	X
Haines Index	X	X	X	X	X	X	X
LAL	X	X	X	X	X	X	X
Transport Wind	X	X	X	X	X	X	X
20 foot wind	X	X	X	X	X	X	X
Pressure	X	X	X	X	X	X	X
ADI	X	X	X	X	X	X	X
LVORI	X	X	X	X	X	X	X
Turner Stability	X	X	X	X	X	X	X
Ceiling	X	X	X	X	X	X	X
Visibility	X	X	X	X	X	X	X
Vent Rate	X	X	X	X	X	X	

Product\WFO	GSP	MHX	ILM	RAH	RNK	AKQ	MRX
Hourly Wx Graph	Link	Link	Link	Link	Link	Link	Link
Activity Planner	Link	Link	Link	Link	Link	Link	Link

Appendix K: 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.

January 2009:

Added information on ADI and LVORI to appendix. Updated RAWS and NWR transmitter lists in appendix.

January 2010:

Added new information on ADI and LVORI to content of the planning forecast, and links to a map and listing of NWR transmitters in NC, under Services Provided by the NWS. Updated location of Cheoah RAWS, Gastonia and Monroe ASOS's, and added maps of observation sites in the appendix. Corrected NOAA Weather Radio information for several transmitters. Added information on the Fire Weather Point Forecast Matrix (PFW).

January 2011:

Added information on visibility and obstruction to visibility as carried in the planning forecast and PFW by GSP. Removed mention of Great Smoky Mountain National Park from WFO MRX's area of responsibility.

January 2012:

Changed NC Division of Forest Resources to NC Forest Service under Introduction and Organization. Added section on AFW and link to AFW decoder. Changed name of WAYAH RAWS to FRANKLIN, and changed CHEROKEE RAWS from MRX area to GSP area.

Added JESSEN STATION RAWS in GSP area. Changed Wakefield, VA MIC from Bill Sammler to Jeff Orrock, and FPL from Larry Brown to Jonathan McGee. Changed Wilmington, NC FPL from Ron Steve to Josh Weiss.

January 2013:

Corrected the location of several RAWS sites, added new RAWS sites, and added new RAWS sites maps. Updated the Interagency Agreement to the latest version. Made the AOP conform to CMS standards.

January 2014:

Corrected the location of the Davidson RAWS site. Added the Mount Jefferson RAWS site.

Removed MATTAMUSKEET RAWS site. Clarified criteria for Fire Danger Statements. Replaced link to AMRS sites. Removed or replaced some dead links.

January 2015:

Changed names of Fire Program Leaders at NWS WFO's RAH (Phil Badgett to Scott Sharp) and MRX (David Gaffin to Timothy Doyle). Added GSO as RAH sounding site. Updated several ASOS locations. Updated links to NWR sites and maps. Updated information on products produced by each office.

January 2016:

Made changes to list of Meteorologists in Charge due to recent retirements. Added state agreement on Mixing Height discrepancies. Removed or replaced some dead links.

January 2017:

Made changes to list of Meteorologists in Charge. Change Fire Program Leader at GSP from John Tomko to Scott Krentz. Added/removed/corrected Lat/Lon info on 8 ECONet sites. Added/deleted/edited information for 4 RAWS sites.

January 2018:

Made changes to list of Meteorologists in Charge. Corrected Mixing Height information to indicate that WFO MRX reports in both FT-MSL and AGL. Changed Fire Program Leader at WFO MRX to Sam Roberts. Added/deleted/edited information for 8 RAWS sites. Deleted mention of Blowup Alert.

January 2019:

Changes made to list of Meteorologists in Charge. Changed Fire Program Leader at MHX from James Merrell to Scott Kennedy; and at ILM from Joshua Weiss to Terry Lebo. Removed Chapel Hill/IGX from list of ASOS sites (decommissioned). Added Siler City Airport (SCR) to lists of AWOS sites. Amended Burn Category for Burn

Category 0 (0 to 13,999).

January 2020:

Combined office information by location (rather than several lists). Fixed broken links and updated others to more modern examples. Created tables for RAWS, ASOS, AWOS, RAWS, and NOAA Weather Radio information. Updated ADI information to agree with the NWCG Smoke Management Guide. Updated NFDRS section with input from SACC to reflect NFDRS2016 information. Added descriptions to the Services Provided by the NWS to more clearly state the sampling area and intent of each NWS product.

Changes made to list of Meteorologists in Charge. Changed Fire Program Leader at RAH from Scott Sharpe (Retired) to James Morrow; and at ILM from Terry Lebo to Jordan Baker.

Added DARE BOMB RANGE and removed CAMP LEJEUNE 2 (CL2) and ALLIGATOR RIVER from RAWS table. Added IXA and ETC and removed IGX and RZZ from ASOS table. Added 7W6 and FFA to AWOS table. Moved NCA and NKT from ASOS table to Military ASOS table and added NBT, 2DP and NJM to Military ASOS table.

January 2021:

Changed Fire Program Leader at RAH from James Morrow to Jimmy Taeger.

Updated the NFDRS section to reflect the 7 day forecast and with the latest NFRDS 2016 status. Updated the Inversion section of the Fire Weather Planning Forecast (FWF) description to clarify formatter output and providing WFOs. Added NFDRS forecasts (with links) to the table in Appendix F. Updated Burn Category 0 and 1 in Appendix G.

In Appendix C, removed FRANKLIN RAWS and added LOCUST GAP RAWS, added Boone - ASU, updated or corrected the names for 6 other RAWS stations, and corrected 3 station numbers. Added RCZ and 24A to the AWOS table. Added links to MesoWest or the NC State Climate Office for all observation sites.

January 2022:

Changed Fire Program Leader at AKQ from Jonathan McGee to Andrew Zimmerman. Added Douglas Butts as Meteorologist in Charge and Reggie Roakes as an IMET Trainee at RNK. In Appendix C, added BUXTON RAWS, removed Boone - ASU Stn as it is no longer being used. Updated latitude, longitude, and elevation on several

ECONet stations.

January 2023:

Changed ILM MIC to vacant. Updated Sam Roberts (MRX), and Jonathan McGee (AKQ) to Certified IMET. Added Justin Lane (GSP) as an IMET Trainee. Removed Reggie Roaks (RNK). Changed Fire Program Leader at ILM to Terry Lebo and Jordan Baker to Assistant Program Leader. Updated Dispersion table in Appendix G to match that in [NC SMP Technote 6](#). Added Jockey's Ridge State Park to the RAWS/ECONet stations in Appendix C. Removed Mixing height methodology note for AKQ and RAH as all offices are using the same methodology. Updated IMET AMRS locations and IMET ordering procedures in the Incident Support section. NFDRS and Fire Weather Observations sections updated to reflect full implementation of NFDRS V4.

January 2024:

Changed Fire Program Leader at GSP to Mike Rehnberg. Updated wording for issuance times for the PFW and AFW products. In appendix C, updated the lat/lon for the Elizabeth City RAWS, added new AWOS sites; KACZ, KW40, KMCZ, and K7W6. Updated IMET AMRS locations in the Incident Support section. Changed Fort Bragg to Fort Liberty. Corrected NFDRS issuance time to "no later than 3 pm". Changed ECONet station Bald Head Island Csrvcy to Bald Head Island Clb. Added new ECONet sites Butner Beef Cattle Lab in Butner, Horace Williams Airport in Chapel Hill and UNC Asheville Weather Tower in Asheville. Corrected KSIF and KMQI's latitude. Updated maps of observations in Appendix C.