

National Weather Service Baltimore/Washington Office Emergency Manager/Media Conference



Andrew “Woody” Woodcock
Lead Forecaster
Fire Program Leader

Agenda

Review of fire weather meteorology

The fire weather products we issue

Go through a worst case scenario...



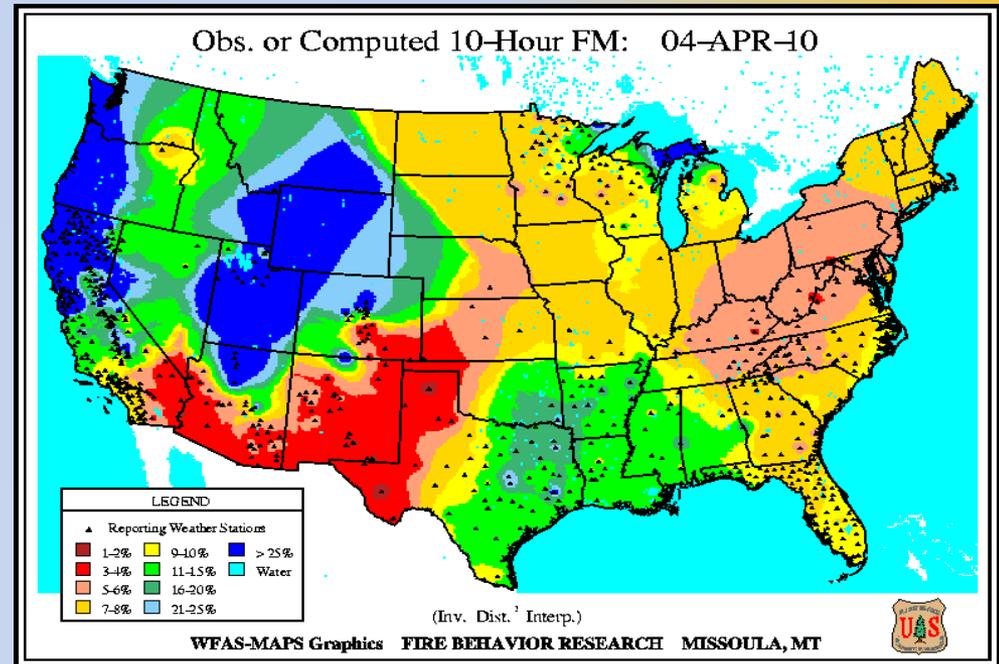
Fire Weather – what elements are we most concerned with?

Fuel Moisture –

10-hour, 1/4 to 1" diameter.
Moisture must be 8% or less.

Wind – sustained winds
of 20 mph or greater

Relative Humidity – less than
30% for VA and MD.
25% or less for WV



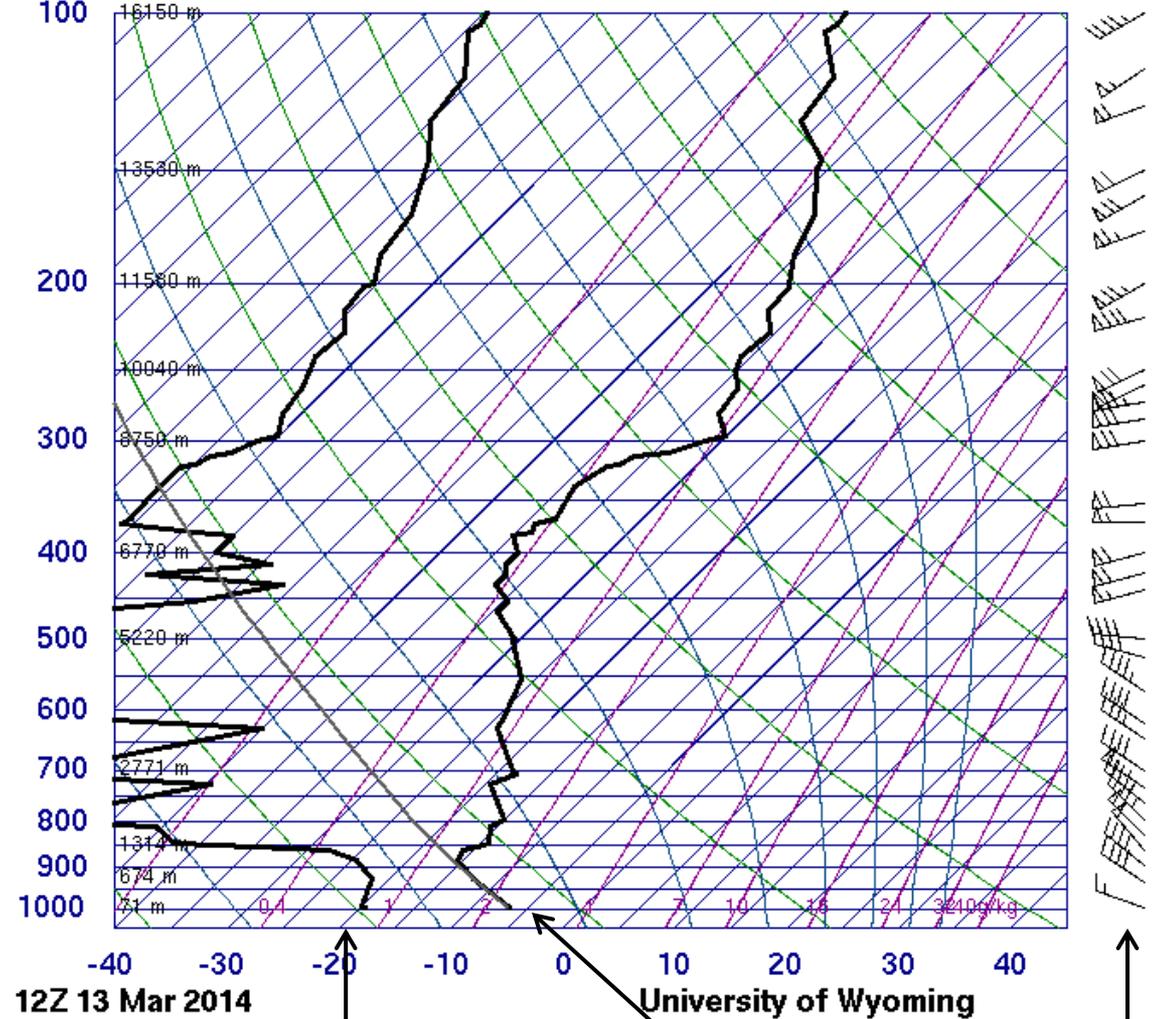
Fuel Moisture map - issued by the US Forest Service



We launch weather balloons at least twice a day. Data radioed back gives us information on winds, temperature, and dew point (moisture) to over 60,000 feet



72403 IAD Sterling



Dew point

Temperature

Winds

We are also concerned with: chance of wetting rain, chance of lightning, and potential for wind shifts⁴

Technical Fire Weather Terms

Mixing Height: This gives the **vertical potential of the atmosphere to disperse smoke**. Upper air data provides more accurate mixing values. At night the value falls to the inversion height.

Transport Wind: Defined as **the average winds from the surface to the mixing height (how the wind that will carry the smoke)**. Daytime periods only.

Mixing Height x Transport Wind =

Ventilation Rate: This measures **volume of smoke moved by dispersion**. Daytime periods only.

The Haines Index. This is also determined from the upper air data. It indicates the **potential for wildfire growth**.

Haines Index, Potential for Rapid Fire Growth.

Values: 2 = “low”, 4 = “low,” 5 = “moderate”, 6 = “high”

Wind is the key in wildfires

Wind speed and wind direction are the primary determinants of a fire's **shape, direction, and rate of spread**.

Fuel type, fuel moisture, and terrain characteristics are also important.

Wind speed affects the shape of a fire. A stronger wind will create a **longer elliptical-shaped** fire. When the wind is light, the fire takes on a **more rounded** shape.

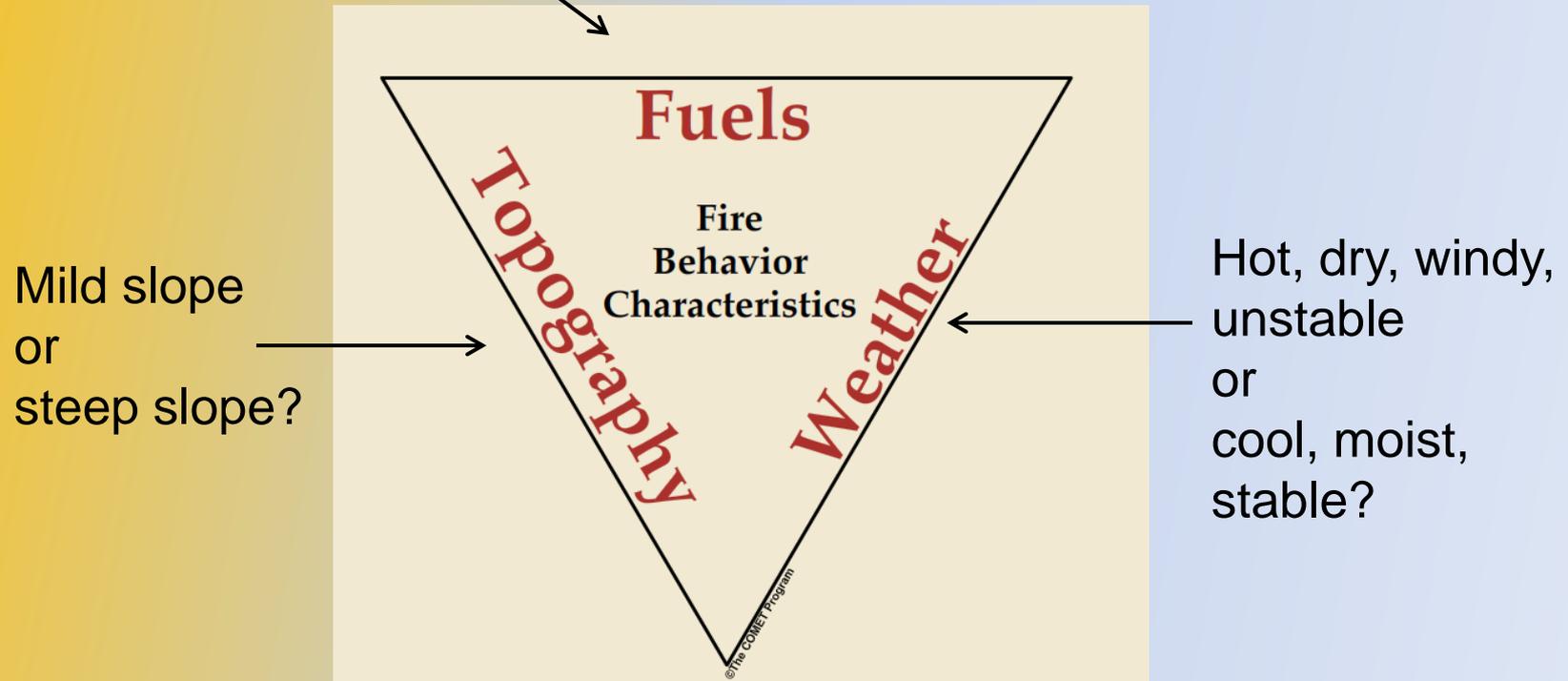
In addition to rapidly spreading the fire, **strong winds can carry embers** or sparks (firebrands) ahead of the main fire which can help to start new fires. This is known as spotting.



The three components of fire danger

What types of fuels are available for the fire to burn? Are there fine fuels (10 hour)? Are there larger fuels (100 hour)?

Fuels cannot burn until all internal moisture has been vaporized, and the fuel is heated to its ignition temperature. The lower the moisture content, the easier it is to ignite.



If threat drops in one of the parameters there needs to be an increase in the others to keep the same level of fire danger

Products

Hazardous Weather Outlook

Our “one stop shop” product where we highlight all potentially hazardous weather events for the next week

If it were several days in advance we would have wording indicating the threat of high wind and wildfire spread

ARLINGTON/FALLS CHURCH/ALEXANDRIA-STAFFORD-SPOTSYLVANIA-KING GEORGE-
212 AM EDT FRI MAR 14 2014

THIS HAZARDOUS WEATHER OUTLOOK IS FOR THE MARYLAND PORTION OF THE CHESAPEAKE BAY...TIDAL POTOMAC RIVER...AND ADJACENT COUNTIES IN CENTRAL MARYLAND AND NORTHERN VIRGINIA AS WELL AS THE DISTRICT OF COLUMBIA.

.DAY ONE...TONIGHT

NO HAZARDOUS WEATHER IS EXPECTED AT THIS TIME.

.DAYS TWO THROUGH SEVEN...FRIDAY THROUGH WEDNESDAY

A FIRE WEATHER WATCH IS IN EFFECT FOR THE ENTIRE AREA FRIDAY AFTERNOON.

A SMALL CRAFT ADVISORY IS IN EFFECT FOR THE WATERS FRIDAY AFTERNOON THROUGH FRIDAY NIGHT. A SMALL CRAFT ADVISORY WILL LIKELY BE NEEDED FOR PORTIONS OF THE WATERS SUNDAY AND MONDAY.

LOW PRESSURE WILL BRING THE CHANCE FOR ACCUMULATING SNOW LATE SUNDAY AND MONDAY. THE BEST CHANCE FOR ACCUMULATING SNOW WILL BE NEAR AND WEST OF INTERSTATE 95. BOTH THE MONDAY MORNING AND EVENING COMMUTE MAY BE IMPACTED.

.SPOTTER INFORMATION STATEMENT...

SPOTTER ACTIVATION IS NOT EXPECTED AT THIS TIME.

\$\$

Products

Fire Weather Forecast

FIRE WEATHER PLANNING FORECAST FOR W AND CTL MD...E WV...N VA AND DC
NATIONAL WEATHER SERVICE BALTIMORE MD/WASHINGTON DC
512 AM EDT FRI MAR 14 2014

...FIRE WEATHER WATCH IN EFFECT FROM NOON EDT TODAY THROUGH THIS
AFTERNOON...

.DISCUSSION...

SOUTH-SOUTHWEST WINDS WILL INCREASE THIS AFTERNOON...GUSTING BETWEEN
25 AND 30 MPH...AT THE SAME TIME AS RELATIVE HUMIDITY DECREASES TO
20 TO 30 PERCENT. THESE FACTORS COMBINED WITH LOW FUEL MOISTURE SUPPORTS
A CONTINUATION OF THE FIRE WEATHER WATCH FOR THIS AFTERNOON.

BREEZY AND WARM CONDITIONS ARE EXPECTED FOR SATURDAY. THE NEXT SIGNIFICANT
CHANCE FOR PRECIPITATION WILL BE LATE SUNDAY INTO MONDAY.

DCZ001-142115-
DISTRICT OF COLUMBIA-
INCLUDING THE CITIES OF...WASHINGTON
512 AM EDT FRI MAR 14 2014

...FIRE WEATHER WATCH IN EFFECT FROM NOON EDT TODAY THROUGH THIS
AFTERNOON...

	TODAY	TONIGHT	SAT
CLOUD COVER	MCLEAR	PCLDY	PCLDY
PRECIP TYPE	NONE	NONE	NONE
CHANCE PRECIP (%)	0	0	0
MX/MN TEMP (24H TREND)	60 (+24)	40 (+16)	65
MX/MN RH% (24H TREND)	22 (-1)	68 (+16)	28
AM WIND (MPH)	S 7		SW 10
PM WIND (MPH)	S 14 G23	S 14 G21	W 13
PRECIP AMOUNT	0.00	0.00	0.00
PRECIP DURATION			
PRECIP BEGIN			
PRECIP END			
MIXING HGT (FT-AGL)	2910		8150
TRANSPORT WND (MPH)	S 24		W 28
VENT RATE (KT-FT)	62140		192360
LAL	1	1	1
HAINES INDEX	4	4	4

REMARKS...NONE.

Forecast over an area
for wind, relative
humidity, temperature,
precipitation.

MX/MN TEMP (24H TREND)	60 (+24)	40 (+16)	65
MX/MN RH% (24H TREND)	22 (-1)	68 (+16)	28
AM WIND (MPH)	S 7		SW 10
PM WIND (MPH)	S 14 G23	S 14 G21	W 13
PRECIP AMOUNT	0.00	0.00	0.00
PRECIP DURATION			
PRECIP BEGIN			
PRECIP END			
MIXING HGT (FT-AGL)	2910		8150
TRANSPORT WND (MPH)	S 24		W 28
VENT RATE (KT-FT)	62140		192360
LAL	1	1	1
HAINES INDEX	4	4	4
REMARKS...	NONE.		

Mixing height

potential of the atmosphere to disperse smoke

Transport wind

how the wind that will carry the smoke

Ventilation Rate

volume of smoke moved by dispersion

Haines Index

potential for wildfire growth

Forecast over an area for wind, relative humidity, temperature, precipitation.

Products

Spot Weather Forecast

SPOT FORECAST FOR PACK HORSE FIRE...VIRGINIA DEPT. OF FORESTRY
NATIONAL WEATHER SERVICE BALTIMORE MD/WASHINGTON DC
147 PM EDT MON APR 14 2014

FORECAST IS BASED ON REQUEST TIME OF 1324 EDT ON APRIL 14.
IF CONDITIONS BECOME UNREPRESENTATIVE...CONTACT THE NATIONAL WEATHER
SERVICE.

.DISCUSSION...

SOUTHERLY WINDS WILL BRING WARM AIR TODAY. SOUTHERLY WINDS
MAY GUST AS HIGH AS 35 MPH AT TIMES THIS AFTERNOON. A COLD FRONT WILL
APPROACH TONIGHT. THE FRONTAL PASSAGE IS EXPECTED TO OCCUR FROM THE WEST
BETWEEN 11 AM AND 1 PM ON TUESDAY. SHOWERS WILL ACCOMPANY THE FRONT.
A WIND SHIFT TO THE NORTHWEST WILL OCCUR BEHIND THE FRONT...AND NORTHWEST
WINDS WILL BE GUSTY FOR TUESDAY AFTERNOON AND TUESDAY NIGHT.

.REST OF TODAY...

SKY/WEATHER.....MOSTLY CLOUDY (70-80 PERCENT).
MAX TEMPERATURE.....AROUND 74.
MIN HUMIDITY.....49 PERCENT.
WIND (20 FT).....SOUTH WINDS 15 TO 16 MPH WITH GUSTS UP TO 35
MPH.
CWR.....10 PERCENT.
MIXING HEIGHT.....3300-3900 FT AGL.
TRANSPORT WINDS.....SOUTHWEST 30 TO 32 MPH.
SURFACE WINDS.....SOUTH WINDS 15 TO 16 MPH.

TIME (EDT)	2 PM	4 PM
SKY (%).....	70	74
WEATHER COV.....		
WEATHER TYPE....	NONE	NONE
TEMP.....	71	70
RH.....	53	57
20 FT WIND.....	S 12	S 13
20 FT WIND GUST..	21	25
CWR.....	10	10

Forecast for a particular location, **requested by fire managers**. This may be used for prescribed burns or on-going fires

Fire Weather Page

[Weather.gov](#) > [Sterling, VA](#) > Fire Weather Page

Sterling, VA
Weather Forecast Office

[Current Hazards](#) [Current Conditions](#) [Radar](#) [Forecasts](#) [Rivers and Lakes](#) [Climate and Past Weather](#) [Local Programs](#)



[2014 Maryland \(Fire Weather\) Operations Plan](#) (.pdf file)

[2014 Virginia \(Fire Weather\) Operations Plan](#) (.pdf file)

[2013 West Virginia \(Fire Weather\) Operations Plan](#) (.pdf file)

[Click here for 2014 Updates](#)

[National Weather Service - Main Fire Weather Webpage](#)

[Latest Red Flag Warning / Fire Weather Watch](#)
(if recently issued/available)

[Fire Weather Forecast](#) - NWS Sterling, VA ([map of area](#))
(Available Year Round)

[Fire Weather Matrix \(FWM\)](#) - ([How to Decode](#))

[Graphic Fire Weather Forecast](#)
(Select Fire Weather option at upper right of screen after selection)

[INTERNET - Spot Forecast Request](#)

[NWS Sterling County Codes](#)

To request a spot forecast go to the [weather.gov/lwx](#) web page



It's under the "forecasts" tab

Products

URGENT - FIRE WEATHER MESSAGE
NATIONAL WEATHER SERVICE BALTIMORE MD/WASHINGTON DC
210 AM EDT FRI MAR 14 2014

...ENHANCED POTENTIAL OF FIRE SPREAD FRIDAY AFTERNOON...

DCZ001-MDZ003>007-009>011-013-014-016>018-502-VAZ025>031-036>040-
042-050>057-501-502-504-WVZ050>053-055-502-504-506-141415-
/O.CON.KLWX.FW.A.0002.140314T1600Z-140314T2200Z/
DISTRICT OF COLUMBIA-WASHINGTON-FREDERICK MD-CARROLL-
NORTHERN BALTIMORE-HARFORD-MONTGOMERY-HOWARD-SOUTHERN BALTIMORE-
PRINCE GEORGES-ANNE ARUNDEL-CHARLES-ST. MARYS-CALVERT-
CENTRAL AND EASTERN ALLEGANY-AUGUSTA-ROCKINGHAM-SHENANDOAH-
FREDERICK VA-PAGE-WARREN-CLARKE-NELSON-ALBEMARLE-GREENE-MADISON-
RAPPAHANNOCK-LOUDOUN-ORANGE-CULPEPER-
PRINCE WILLIAM/MANASSAS/MANASSAS PARK-FAIRFAX-
ARLINGTON/FALLS CHURCH/ALEXANDRIA-STAFFORD-SPOTSYLVANIA-
KING GEORGE-NORTHERN FAUQUIER-SOUTHERN FAUQUIER-EASTERN HIGHLAND-
HAMPSHIRE-MORGAN-BERKELEY-JEFFERSON-HARDY-EASTERN GRANT-
EASTERN MINERAL-EASTERN PENDLETON-
210 AM EDT FRI MAR 14 2014

...FIRE WEATHER WATCH REMAINS IN EFFECT FROM NOON EDT TODAY
THROUGH THIS AFTERNOON FOR STRONG GUSTY WINDS AND LOW RELATIVE
HUMIDITY FOR NORTH CENTRAL VIRGINIA...THE SHENANDOAH VALLEY...EASTERN
WEST VIRGINIA AND MUCH OF MARYLAND...

* HUMIDITY...15 TO 25 PERCENT FRIDAY AFTERNOON.

* WINDS...SOUTHWEST 10 TO 20 MPH WITH GUSTS 25 TO 30 MPH.

* FUEL MOISTURE...LESS THAN 10 PERCENT.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

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

&&

Fire Weather Watch

There is a potential for
critical fire conditions
to occur.

This is usually issued
around 48 hours out.

Products

WWUS81 KLWX 130824
RFWLWX

URGENT - FIRE WEATHER MESSAGE
NATIONAL WEATHER SERVICE BALTIMORE MD/WASHINGTON DC
424 AM EDT THU MAR 13 2014

...ENHANCED POTENTIAL OF FIRE SPREAD TODAY...

VAZ036>040-042-050>057-501-502-131630-
/O.UPG.KLWX.FW.A.0001.140313T1300Z-140313T2200Z/
/O.NEW.KLWX.FW.W.0001.140313T1300Z-140313T2200Z/
NELSON-ALBEMARLE-GREENE-MADISON-RAPPAHANNOCK-LOUDOUN-ORANGE-
CULPEPER-PRINCE WILLIAM/MANASSAS/MANASSAS PARK-FAIRFAX-
ARLINGTON/FALLS CHURCH/ALEXANDRIA-STAFFORD-SPOTSYLVANIA-
KING GEORGE-NORTHERN FAUQUIER-SOUTHERN FAUQUIER-
424 AM EDT THU MAR 13 2014

...RED FLAG WARNING IN EFFECT FROM 9 AM THIS MORNING TO 6 PM EDT
THIS EVENING FOR HIGH WINDS AND LOW HUMIDITY FOR NORTHERN AND
CENTRAL VIRGINIA EAST OF THE BLUE RIDGE...

THE NATIONAL WEATHER SERVICE IN STERLING VIRGINIA HAS ISSUED A
RED FLAG WARNING FOR HIGH WINDS AND LOW HUMIDITY...WHICH IS IN EFFECT
FROM 9 AM THIS MORNING TO 6 PM EDT THIS EVENING. THE FIRE WEATHER
WATCH IS NO LONGER IN EFFECT.

- * HUMIDITY...20 TO 25 PERCENT.
- * WINDS...NORTHWEST 15 TO 25 MPH WITH GUSTS UP TO 45 MPH.
- * FUEL MOISTURE...LESS THAN 10 PERCENT.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

A RED FLAG WARNING MEANS THAT CRITICAL FIRE WEATHER CONDITIONS
ARE EITHER OCCURRING NOW...OR WILL SHORTLY. A COMBINATION OF
STRONG WINDS...LOW RELATIVE HUMIDITY...AND WARM TEMPERATURES CAN
CONTRIBUTE TO EXTREME FIRE BEHAVIOR.

&&

Red Flag Warning

Critical fire conditions are occurring or are expected to occur shortly.

This is issued within 24 hours of the potential event.

NWS Incident Meteorologists (IMETs) may be sent to the base camp to provide specialized weather briefings tailored to the specifics of the fire



What agencies do we work with on wildfires and prescribed fires?

U.S. Forest Service

U.S. Fish and Wildlife Service

Virginia Department of Forestry

Maryland Department of Natural Resources

West Virginia Department of Forestry

The National Park Service

The Nature Conservancy

State and Local Emergency
Managers

Departments of Transportation



I asked Mid Atlantic Fire Managers what they would consider a “worst case” scenario. They replied...

“the outbreak of wild land fires that covered many thousands of acres in a very short time frame.”

“a scenario where we had a fire in one of more urban refuges or NPS properties around the metro area which leaves, or threatens to leave, the agency boundaries.”

“ a big wildfire in an urban area similar to some of the environs around Northern VA, involving lots of local jurisdictions and responders. Dry winter, windy day in March before leaf-on.”



I briefed the following scenario at the Virginia Fire Managers meeting in Charlottesville on October 9th. They thought it was realistic, but also said this:

“If this happens, you should be thankful you’ll just be forecasting the weather...”

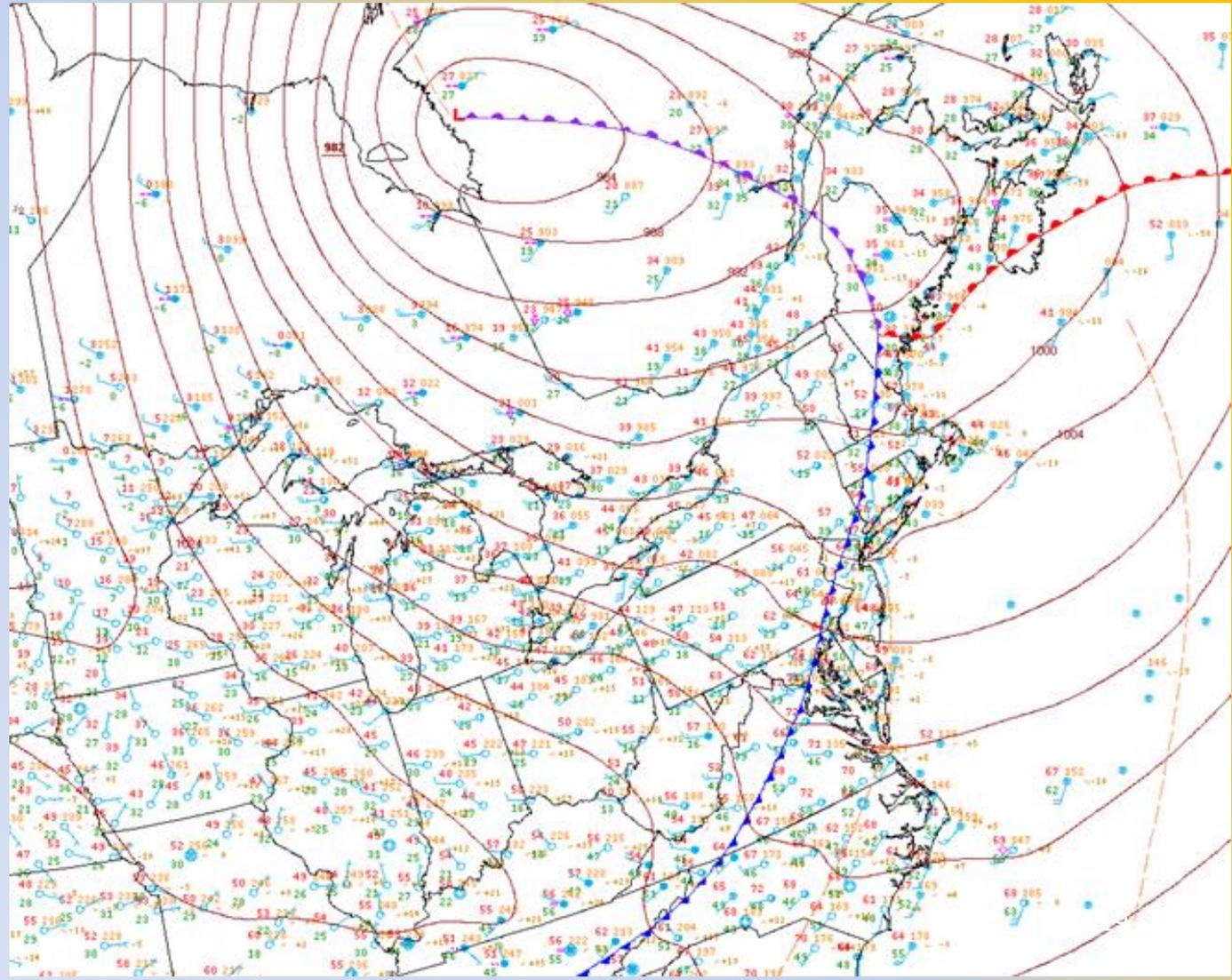


“The Scenario” – the meteorological set up

March 25-28, 2016. We had a cold winter with little precipitation. The fuels on the ground (leaves that had dropped the previous fall) are extremely dry. The 10 hour fuels had a fuel moisture of 6%, which is very low.

Late night on the Friday the 25th the Mid Atlantic experienced a dry cold frontal passage. A strong, cold high pressure area will be building into the region for the weekend.

Weather Map, 11 pm, Friday March 25, 2016



Specialized products we issued in the days leading up to the event

Area Forecast Discussion

815 pm Wed Mar 23 2016

. Marine...

In the extended portion of the forecast a strong cold front is expected to push through the waters early Sat morning. Winds should easily reach gale wrng levels. The strong pressure gradient/winds should last into the beginning of the new week.

. Fire...

We are concerned about the coming wknd – we've had an extremely dry winter. While riding my bike I've noticed how brown the grasses are in fields. Models continue to show a cold front moving east of the mountains late Fri night and off the coast Sat morning. A strong pressure gradient will be pushing into the Mid Atlc behind the front – creating very windy conditions and a dangerous fire situation area-wide.

This is already mentioned in the HWO. A watch will likely be issued Thu...and a Red Flag on Friday which would likely last thru the wknd.

Fire threat should abate Monday.

Fire Weather Watch

245 pm Thu Mar 24 2016

...Fire Weather Watch in effect from late Friday night through Monday morning for eastern West Virginia...Northern Virginia...Washington DC and much of Maryland...

* Humidity...20 to 25 percent

* Winds...25 to 35 mph with gusts to 45 mph

* Fuel Moisture...less than 8 percent

A fire weather watch means that critical fire weather conditions are forecast to occur. Listen for later forecasts and possible Red Flag Warnings.

Red Flag Warning

250 pm Fri Mar 25 2016

Red Flag Warning in effect from 6 am Saturday to 8 pm Sunday for eastern West Virginia...Northern Virginia...Washington DC and central Maryland...

* Humidity...20 percent

* Winds...25 to 35 mph with gusts to 45 mph

• Fuel Moisture...5 to 8 percent

A Red Flag Warning means that critical fire weather conditions are either occurring or are expected shortly. A combination of strong wind and low relative humidity are contributing to extreme fire behavior.

March 25-28, 2016 Fire Weather Concerns

Haines Index = 6, “high”

No temperature inversion is present. Mixing height is “high.” The ventilation index is “good.” Daytime transport winds are “strong.”

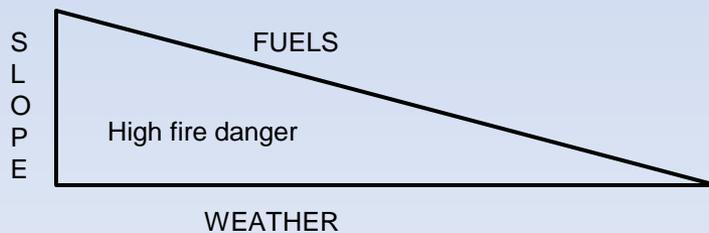
Beginning the morning of Saturday the 26th, on both days of the weekend, by 9 am surface winds were blowing from the northwest at 20 mph with gusts to 30 mph.

On Saturday and Sunday, by 1 pm winds were from the northwest at 30 mph, with gusts as high as 45 mph.

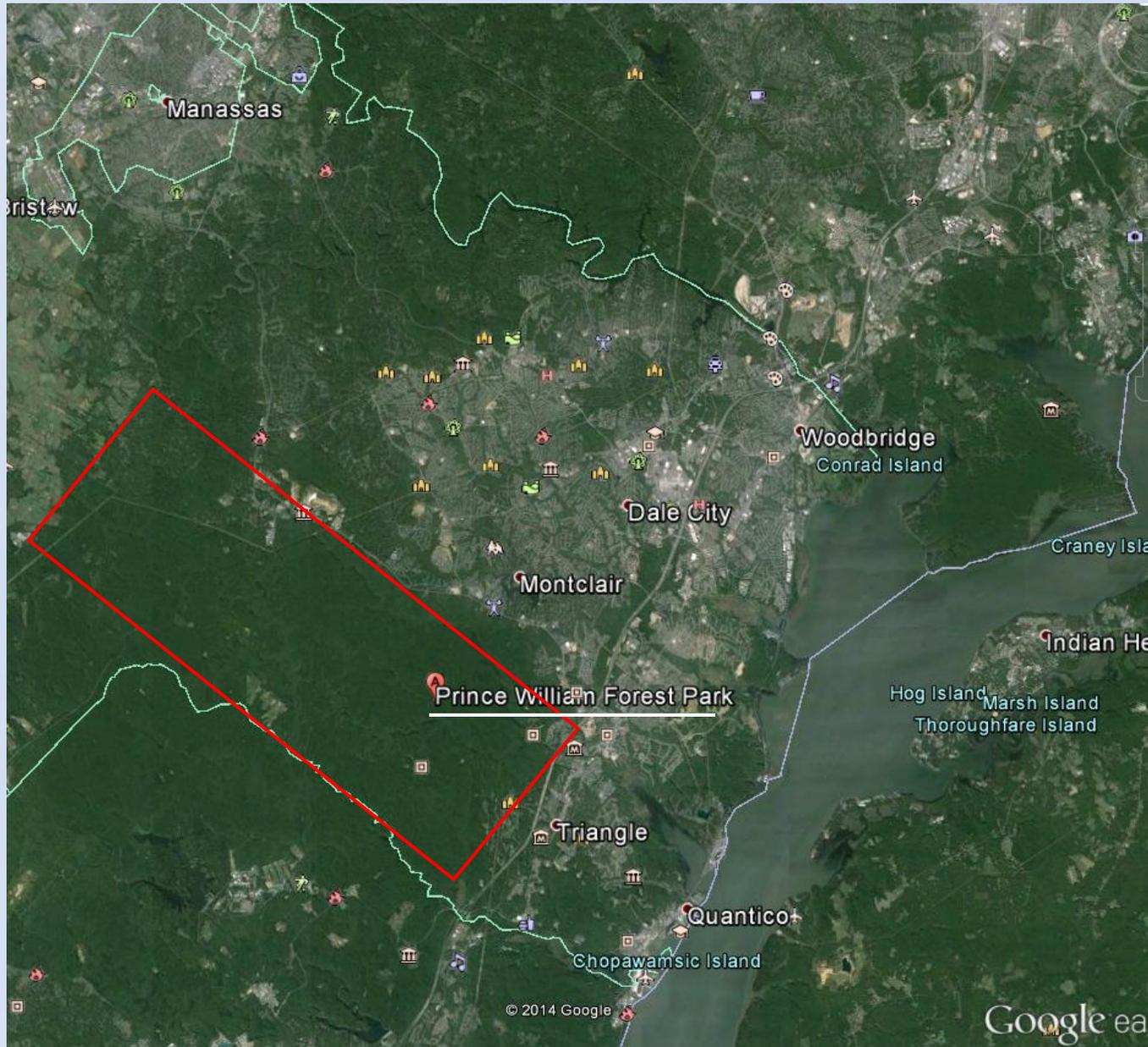
The winds do not drop below 20 mph until 9 pm, but occasionally gust to 15-20 mph all night

Winds finally diminish on the afternoon of the 28th

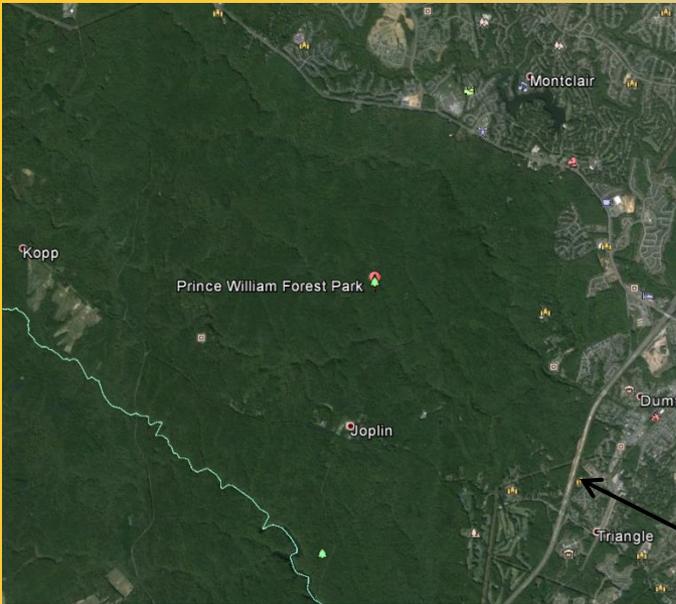
If threat drops in one of the parameters there needs to be an increase in the others to keep the same level of fire danger



“The location”



Prince William Forest Park

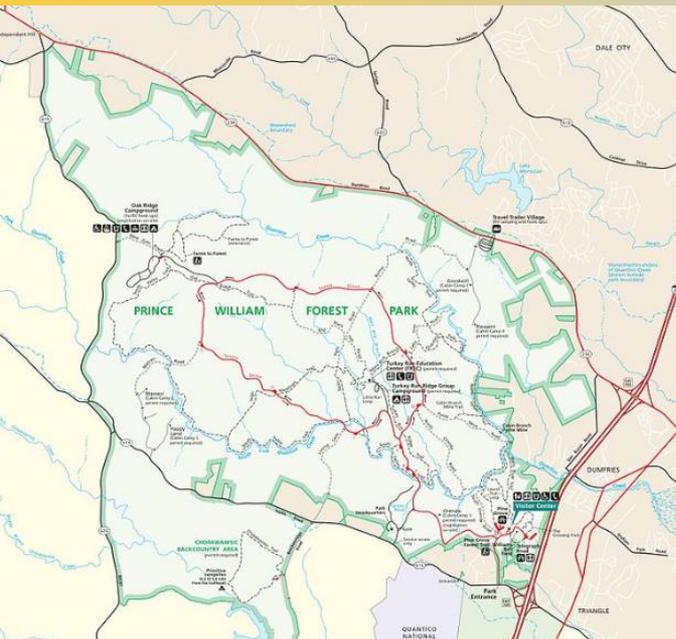


The largest natural protected area in the Washington DC metropolitan area

Over 19,000 acres

Adjacent to the Quantico Marine Corps Base

I-95 abuts it to the east



37 miles of hiking trails

21 miles of cycling trails

Terrible news!

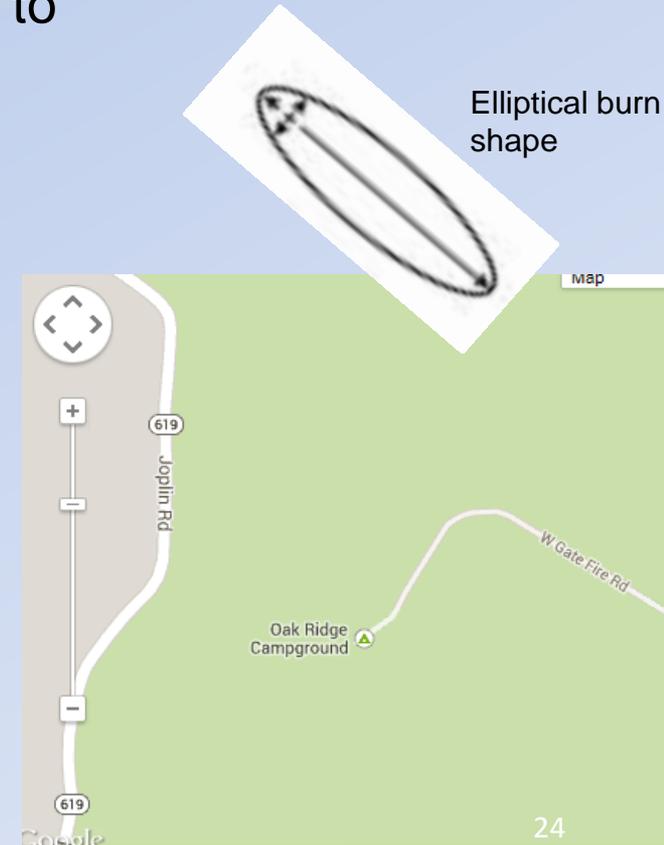
On the night of Friday March 25th campers at the Oak Ridge campground, at the aptly named West Gate Fire Road, did not put their camp fire completely out. Embers from this were picked up on the morning of Saturday the 26th.

Oak Ridge sits in the northwest corner of the park. Because the winds are from the northwest and increase to 30G45 mph the fire quickly burns an elliptical shape to the southeast.

Strong winds are carrying embers or sparks (firebrands) ahead of the main fire. This causes multiple new fires to form, all burning in elliptical shapes. The fire jumps Joplin Road onto Quantico Marine Corps Base.



The Marines bulldozed a fire break





A fire in Prince William Forest Park, March 2006

While the fires are ongoing we will...

Bring in additional staffing for the increased work load

Provide briefings to fire managers and emergency managers via telephone

Use NWS Chat to converse with emergency managers and media to convey meteorological information

Given the seriousness of the situation we'll likely be doing a wide range of media interviews

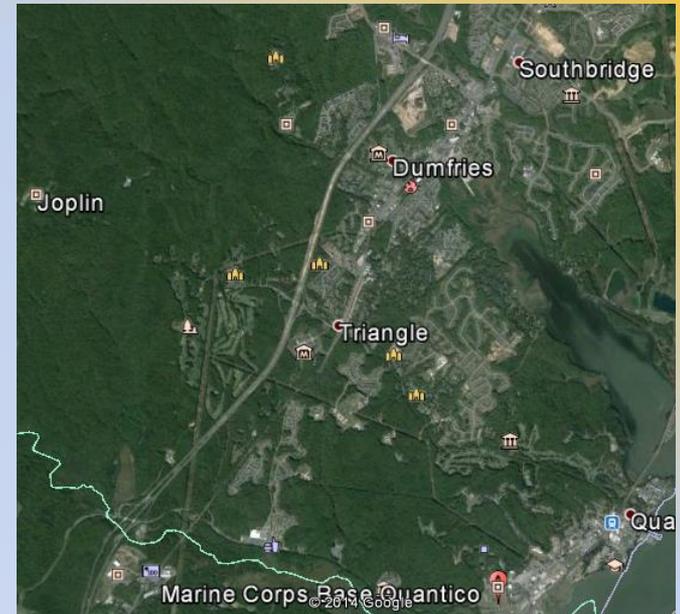


More bad news!

As wind speed decreased overnight fire spread slowed between 10 pm Saturday and 7 am Sunday. Speeds increase again after 9 am Sunday.

By mid morning Sunday smoke is streaming across I-95, slowing traffic to a crawl as visibility has dropped to $\frac{1}{4}$ mile. Air quality is seriously restricted in Dumfries, Triangle, and Quantico.

In the poor visibility at 10:30 am a tractor trailer carrying motor fuel flips on I-95.



Thoughts of Fire Managers...

On a given piece of ground the only input that will change will be the weather. The fuels and topography will remain the same and weather is always going to be the variable that dictates fire behavior.

I would utilize the daily forecasts to help determine tactics for that day and looking at the 3-7 day forecast to see when the weather (wind) will change/decrease.

Evening and nights would be ideal times (provided safety concerns are addressed) to work on containing the fire.

The NPS would have authority for fire fighting in PWFP, although initial response would originate with Prince William County and the Virginia Department of Forestry.

Primary authority for the private property adjacent to the Park would fall directly to the Prince William County Department of Fire-Rescue and the Virginia Department of Forestry.



Thoughts of VDOT Incident Command...

Relative to a tanker accident on the interstate, the lead law enforcement agency would be the Virginia State Police, the lead fire-rescue agency would be the Prince William County Department of Fire-Rescue. The lead transportation agency would be the Virginia Department of Transportation. Depending upon the incident dynamics, these agencies would work in single or unified command as a separate incident from the original fire or as a division under the original incident command.

The Emergency Management community would have duties affiliated with public messaging, continuity of service, mutual aid, and coordination.



Questions???

