

Introduction to OK-FIRE:
Wildland Fire and Fire Weather

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Oklahoma State University**

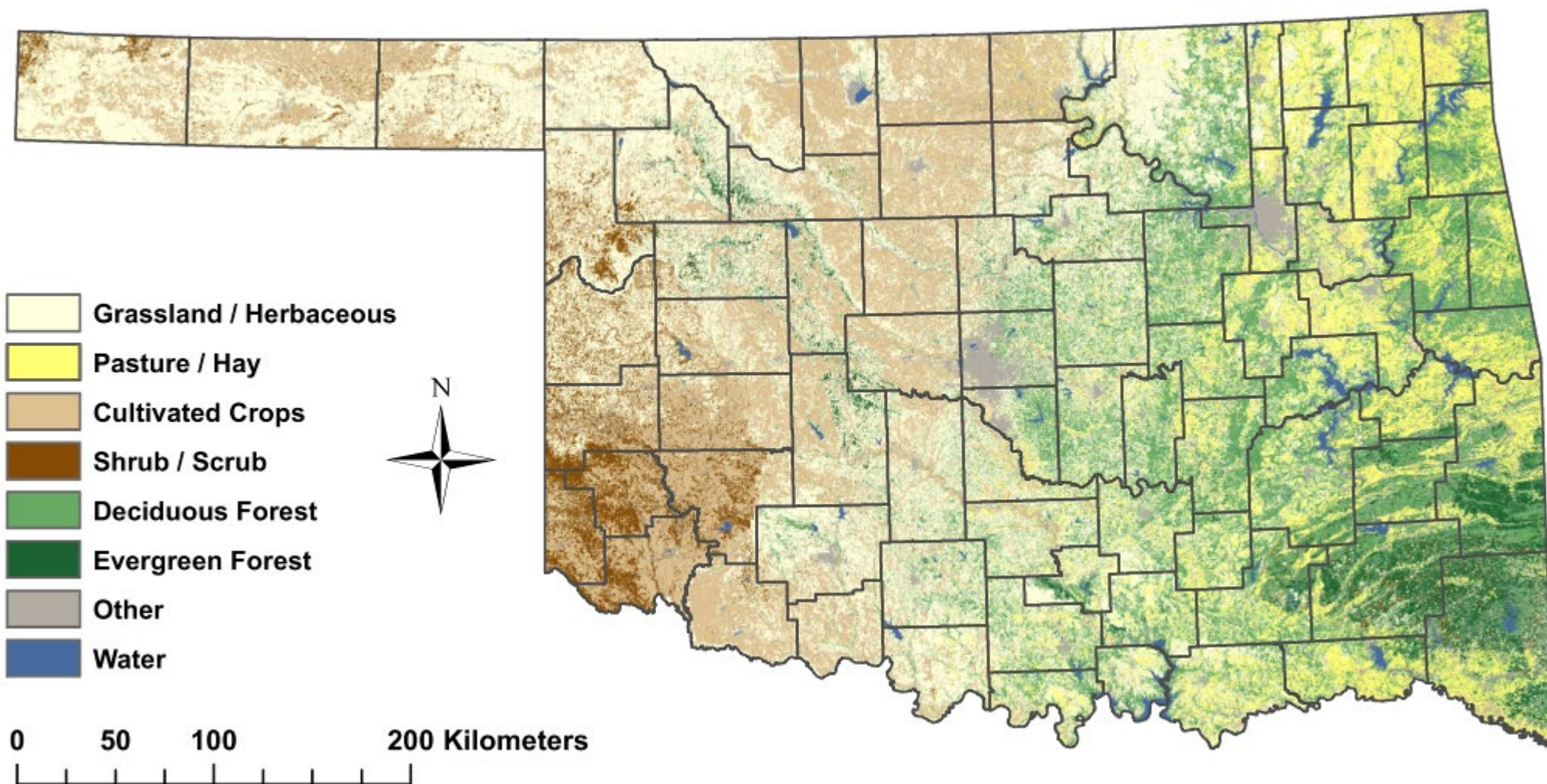
Questions You Should Be Able to Answer by the End of this Module

- What kinds of fires are meant by “wildland fire”?
- What are the two weather data sources for OK-FIRE?
- What are the two most important fire weather variables and in what order?
- What are the three main weather regimes associated with wildfire outbreaks during the dormant season?
- What is the main cause of wildfires during the growing season?

What is Wildland Fire?

Wildland fire is an overarching term describing any non-structure fire that occurs in vegetation and natural fuels. Wildland fire encompasses both wildfire and prescribed fire.





Wildfires







A photograph of a prescribed fire in a pine forest. Bright orange and yellow flames are visible on the ground, burning through dry grass and brush. Several tall, dark pine trees stand in the background, their trunks partially obscured by the smoke and fire. The scene is captured from a low angle, emphasizing the intensity of the fire.

Prescribed Burns





Smoke







10:02 84°

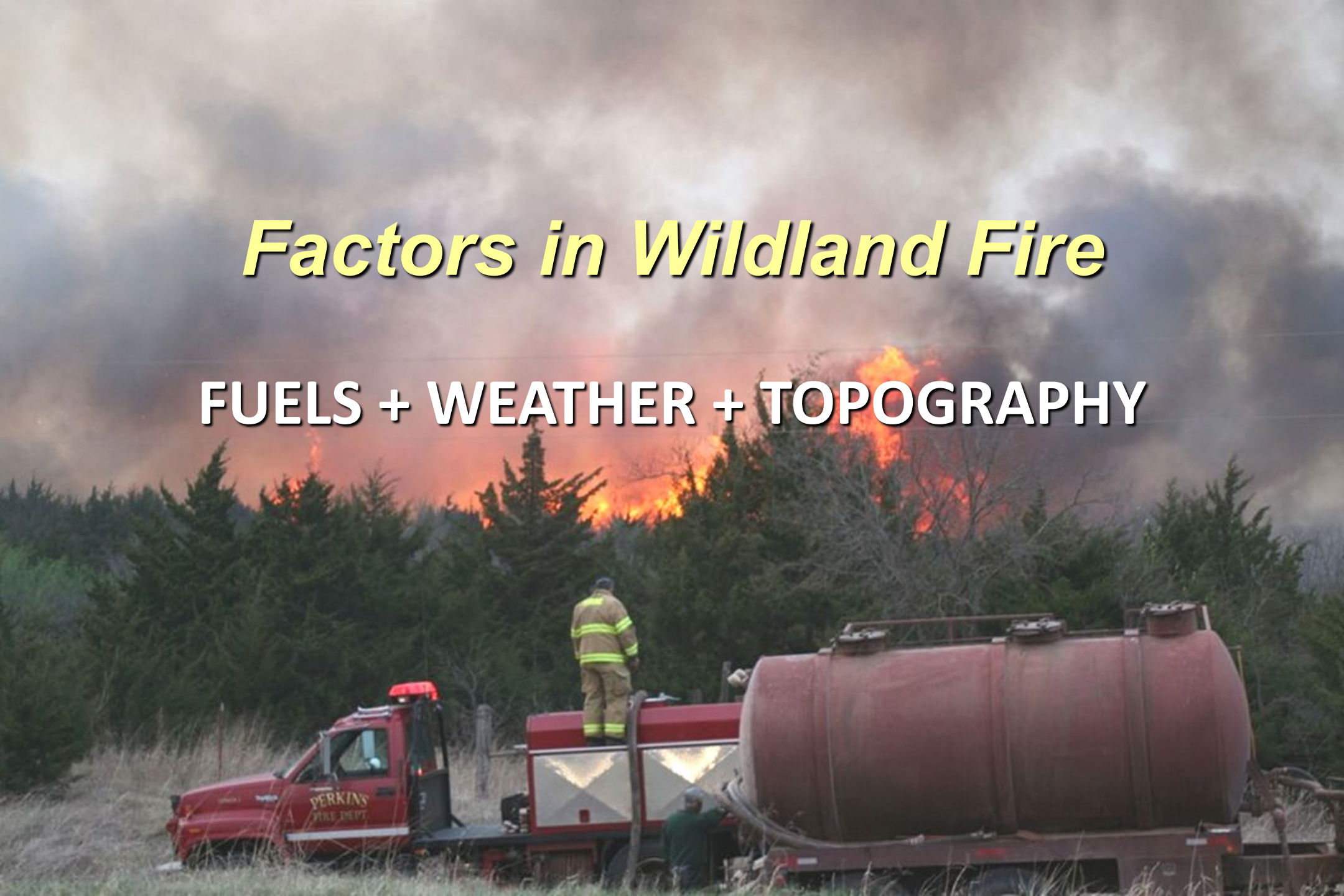


KOTV - DT



Factors in Wildland Fire

FUELS + WEATHER + TOPOGRAPHY



Factors in Wildland Fire: What Can I Control?

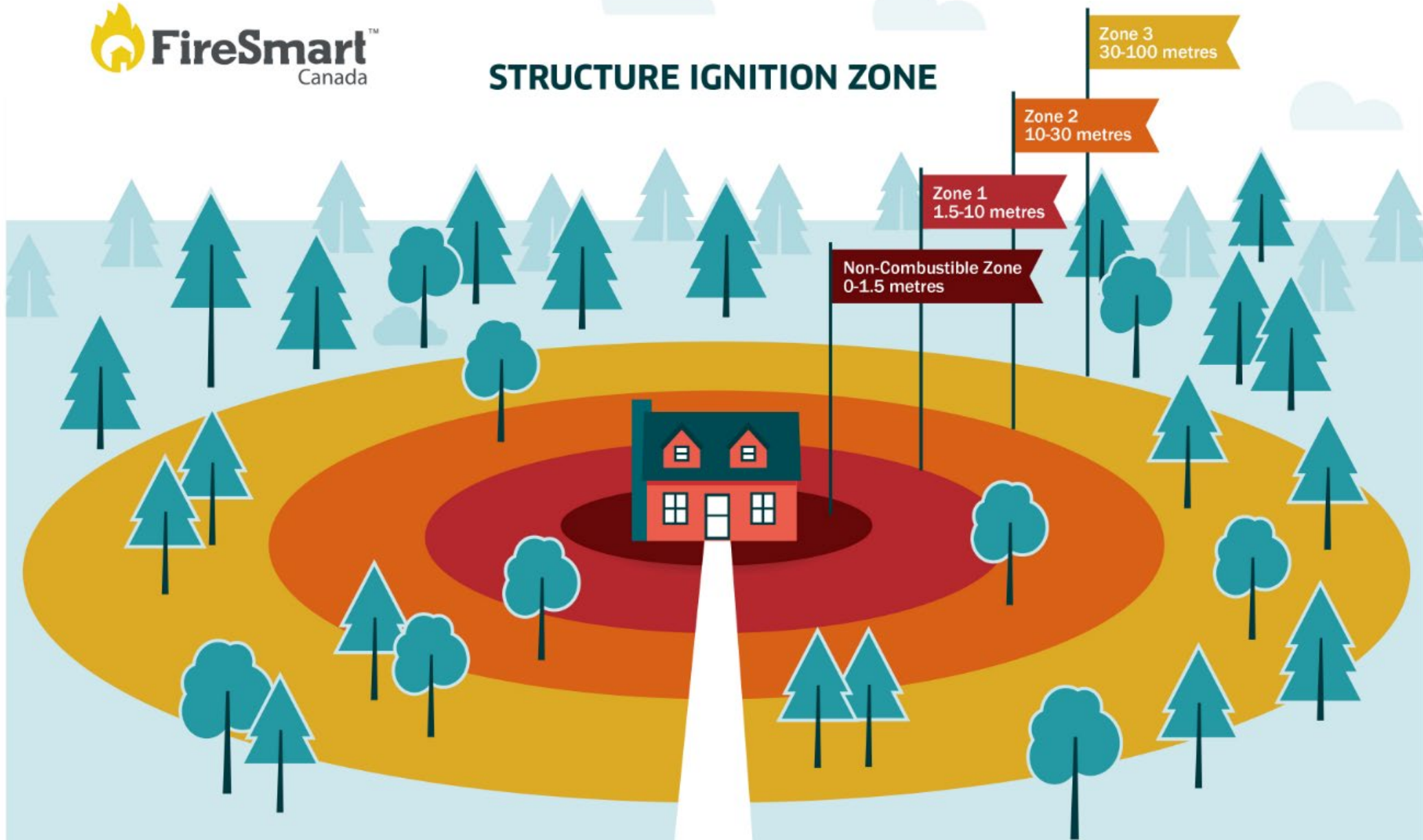
FUELS + WEATHER + TOPOGRAPHY



**Control Fuels on Your Property,
Especially Around Structures!**



STRUCTURE IGNITION ZONE



FireSmart® your property

If you wait, you may be too late



Priority Zone 1 HOME / 10 metres

This should be a fire-resistant zone, free of all materials that could easily ignite from a wildfire.



REGULAR MAINTENANCE:

Regularly clean your roof, gutters, etc. of debris.

FIRESMART RENOVATIONS:

As your budget allows, renovate your home with fire-resistant materials, mesh debris screens, a chimney spark arrestor, etc.



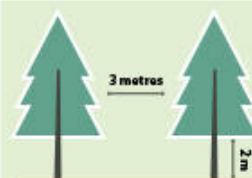
FIRESMART LANDSCAPING: Keep woodpiles, propane tanks, outbuildings and combustibles at least 10 metres away from your home. Consult the *FireSmart® Guide to Landscaping* for more tips.



YARD MAINTENANCE: Regularly mow your lawn. Remove deadfall, coniferous trees and other flammable vegetation. Sweep your decks and rake up tree needles, leaves and debris.

Priority Zone 2 10 - 30 metres

Reduce fuels in this area by thinning and pruning vegetation and trees. This will slow a fire's spread.



TREE SPACING:

Space trees at least three metres apart.

PRUNING TREES:

Prune all branches within two metres of the ground.



REMOVE SURFACE FUELS: Regularly clean up accumulations of fallen branches, dry grass, needles and other flammable debris from the ground.



PLANTING NEW TREES: If you're going to plant new trees in this zone, consider planting deciduous species like aspen, poplar and birch. They have lower flammability rates.

Priority Zone 3 30 - 100 metres

Try to thin out trees and other vegetation. This will help reduce a wildfire's intensity and slow its spread.



THIN AND REMOVE CONIFEROUS TREES:

Space dominant trees at least three metres apart, and remove any understory trees that are in close proximity that could act as a ladder for fire to move into the tree tops and spread. Retain deciduous trees which are resistant to wildfire.



NOT YOUR LAND? If there's property within 100 metres of your home that is owned by your neighbours, get them engaged in the *FireSmart® Community Recognition Program*!



GET IN TOUCH: Think your community is at risk to wildfire? Contact your municipal councillor, planning department or fire service to express your concerns.



BC Wildfire
Service

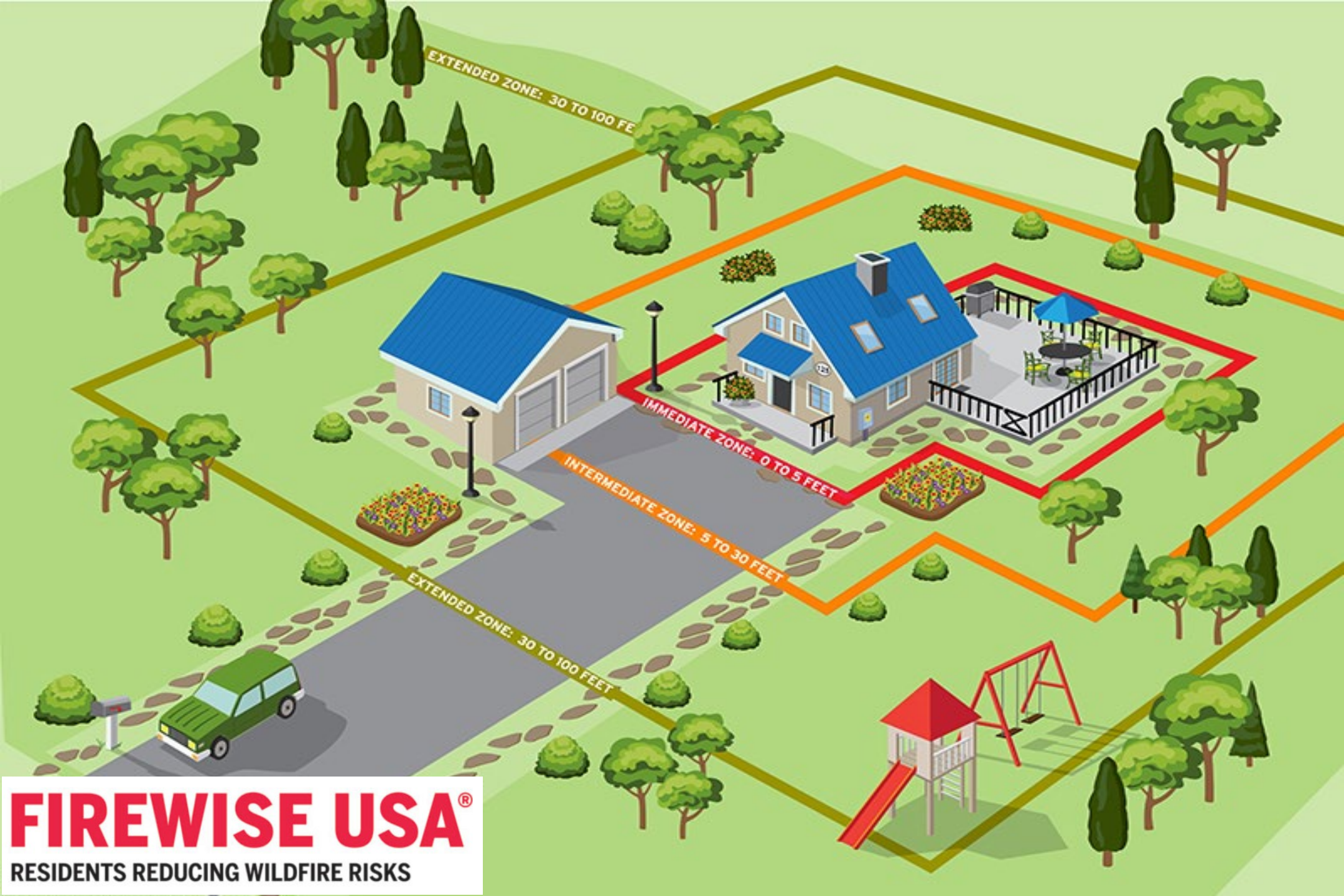


LEARN MORE:

BC Wildfire Service: www.bcwildfire.ca

FireSmart Canada: www.firesmartcanada.ca





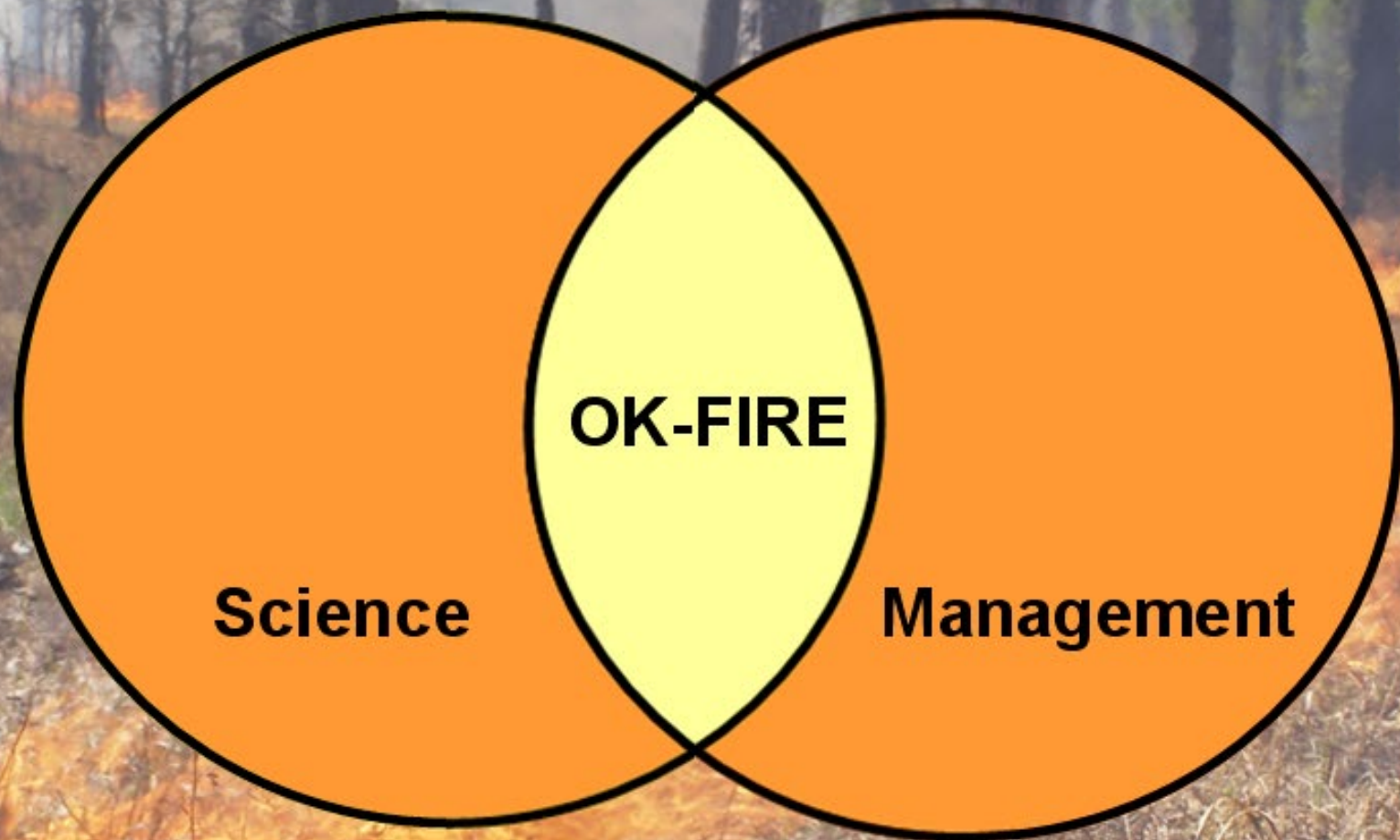
FIREWISE USA[®]
RESIDENTS REDUCING WILDFIRE RISKS







A Program of the Oklahoma Mesonet



What is “OK-FIRE” ?

- Suite of *weather-based products* developed for wildland fire management in Oklahoma
- Separate wildland fire management *website module*
- *Regional training and support* for users

OK-FIRE User Groups

- **US Forest Service**
- **Bureau of Indian Affairs**
- **US Army Corps of Engineers**
- **National Park Service**
- **US Fish and Wildlife Service**
- **Natural Resources Conservation Service**
- **Oklahoma Forestry Services**
- **Oklahoma Dept. of Wildlife Conservation**
- **The Nature Conservancy**
- **Fire Departments / Emergency Managers**
- **Private Landowners**

A large, intense fire is burning in a forest, with bright orange and yellow flames rising from the trees. Thick black smoke is billowing from the fire, filling the upper portion of the image. The foreground is filled with dry, brown grass and some green shrubs. The word "PRODUCTS" is overlaid in the center of the image in a bold, yellow, sans-serif font with a black outline.

PRODUCTS

Subject Areas in OK-FIRE

- Fire Weather
- Fire Danger
- Smoke Dispersion
- Other Areas (e.g., Satellite and Radar Maps)



Types of Products

- MAPS, including animation and zooming
- Site-specific CHARTS
- Site-specific TABLES



Time Modes of Products

- PAST (all going back 30 days; many, 1 year)
- CURRENT (most recent)
- FORECAST (through 84-hr forecast period)



A large, intense fire is burning in a field of tall grass and trees. The fire is bright orange and yellow, with thick black smoke rising from it. The word "WEBSITE" is overlaid in the center of the image in a bold, yellow, sans-serif font. The background shows a clear blue sky and some distant trees.

WEBSITE

OK-FIRE Website

Current Station Conditions >

Current Maps >

Past & Forecast Animated Maps>

Past & Forecast Charts/Tables >

Fire Prescription Planner >

NWS Forecast Chart (Stillwater) >

NWS Forecast Table (Stillwater) >

Relative Greenness Zoom Map >

Default Fuel Model Zoom Map >

Fire Advisories and Outlooks >

3.9 μ Infrared Satellite Map >

Recent Lightning Activity >

Oklahoma Burn Bans >

Additional Resources >

Contact and Product Information>

News >

Current Fuel Model for Stillwater

T-Tallgrass with brush

Default is T

Station Fuel Model Options

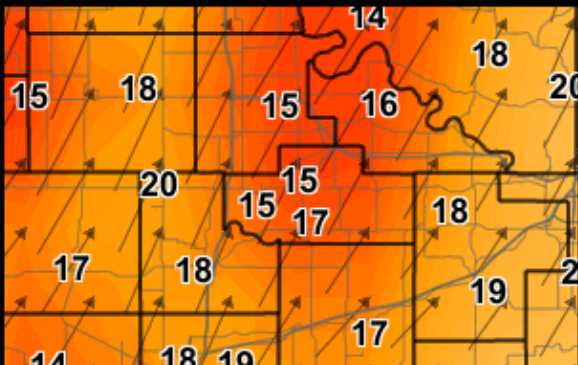
January 24, 2018 - Very high fire danger can be expected on Thursday over much of the state, with sustained

OK-FIRE

Share

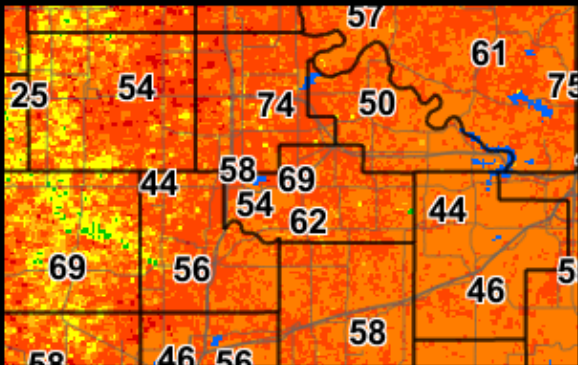
Tweet

Current Relative Humidity and Wind Direction



0 100

Current Burning Index



Station:

Weather

Relative Humidity:

Past 1-hr RH Change:

10-m Wind:

Max Wind Gust:

Temperature:

24-hr Rainfall:

Dispersion:

Sunrise / Sunset:

Stillwater

Thu 1/25/18 12:10 pm CST

14%

-5%

SSW 17 mph

26 mph

64°F

0.00 in

Moderately Good

7:35 am / 5:47 pm

Bristow

Thu 1/25/18 12:10 pm CST

19%

-2%

SW 16 mph

23 mph

64°F

0.00 in

Moderately Good

7:31 am / 5:44 pm

Fire Danger

Current Fire Danger:

Burning Index:

Spread Component:

Ignition Component:

NFDRS Fuel Model:

1-hr Fuel Moisture:

10-hr Fuel Moisture:

Soil Moisture:

KBDI:

Relative Greenness:

Thu 1/25/18 11:00 am CST

HIGH

69

62

34%

T

6%

8%

51%

118

19%

Thu 1/25/18 11:00 am CST

HIGH

40

10

42%

R

6%

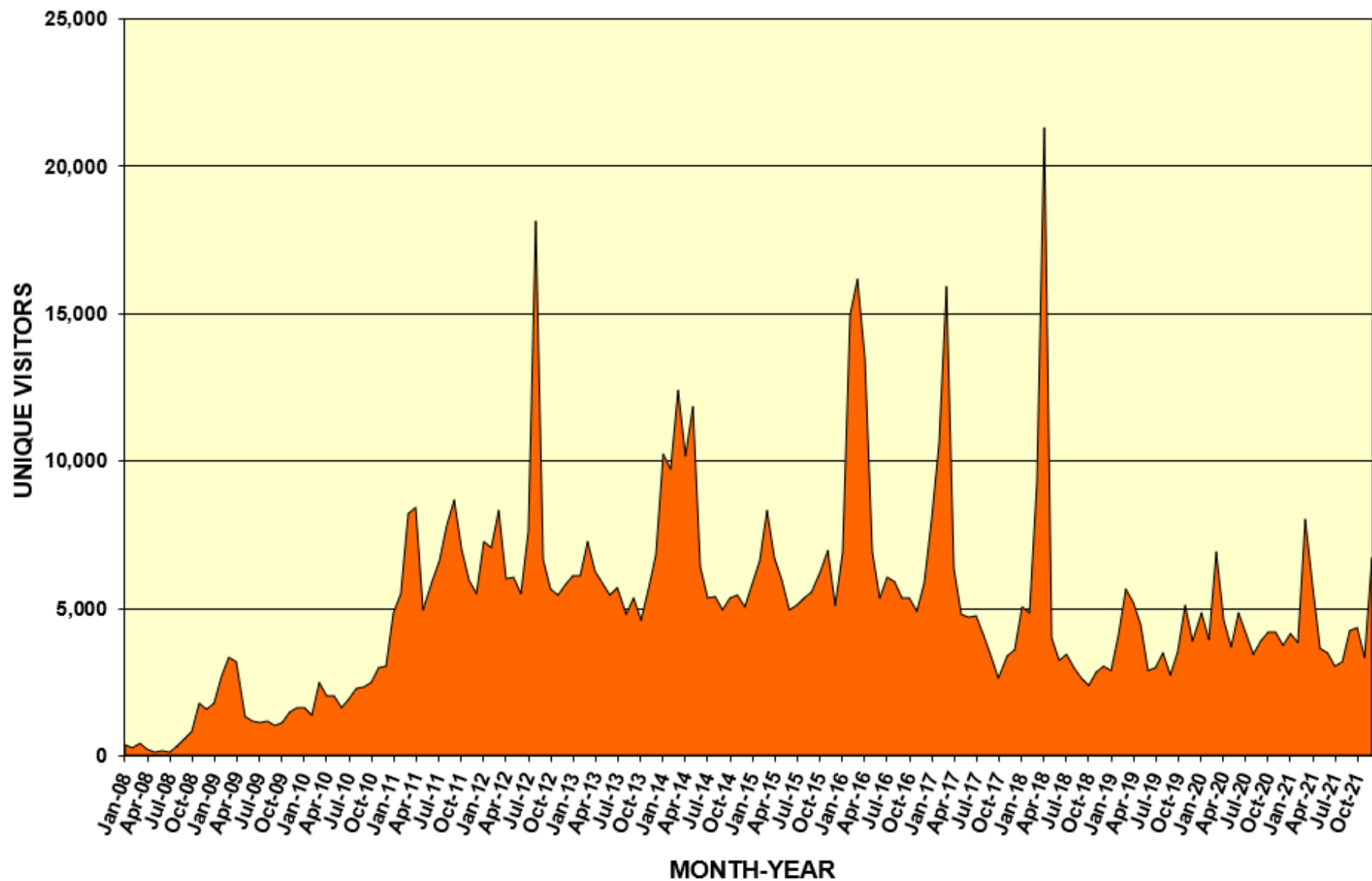
8%

93%

198

7%

OK-FIRE Website Usage Since 2008

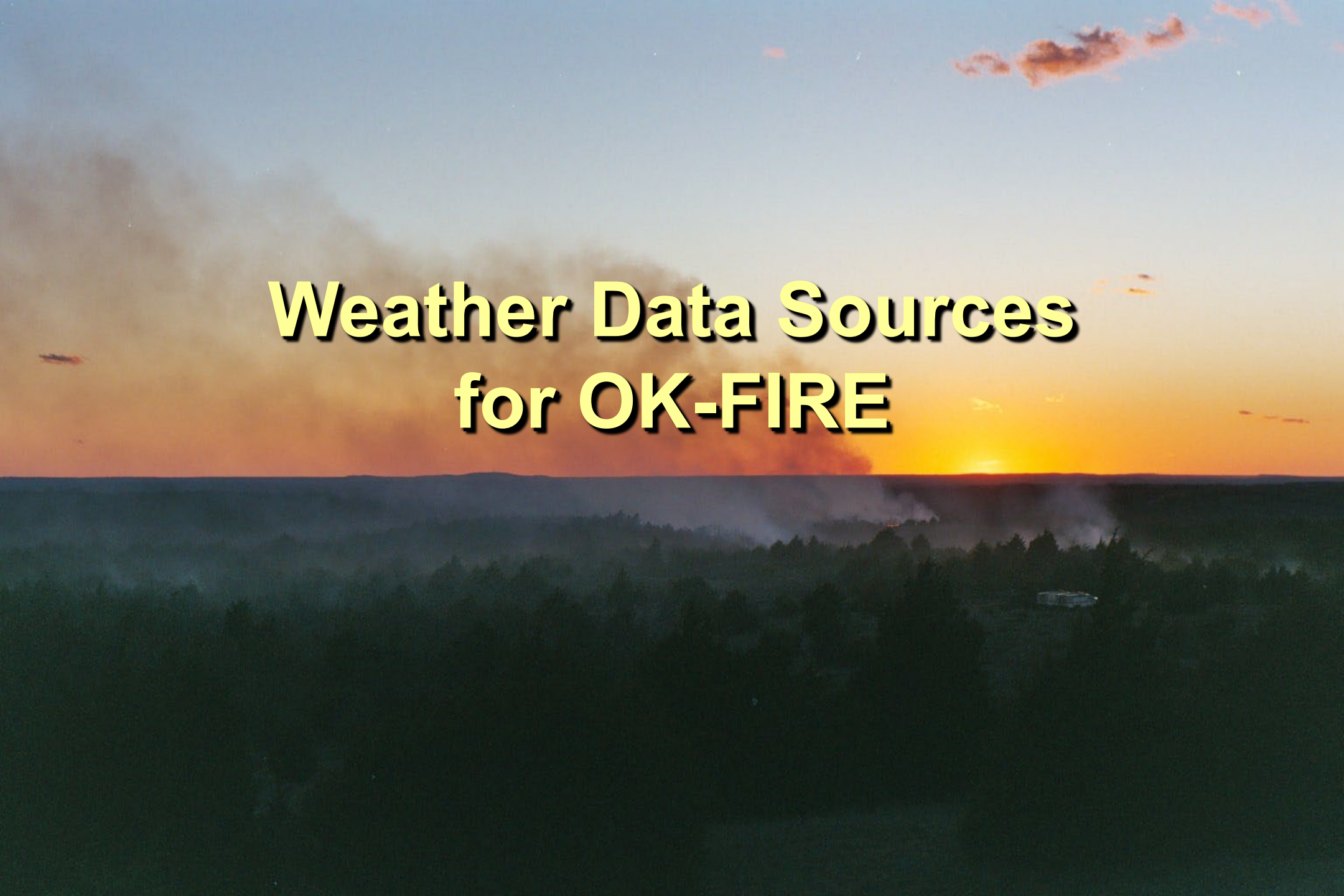


A large, intense fire is burning in a forest, with bright orange and yellow flames rising from the trees. Thick black smoke is billowing from the fire, filling the upper portion of the image. The foreground is filled with dry, brown grass and some green shrubs. The word "TRAINING" is overlaid in large, bold, yellow capital letters with a black outline, centered horizontally across the middle of the image.

TRAINING





A landscape photograph showing a dense forest of evergreen trees in the foreground and middle ground. In the distance, a bright orange and yellow sunset is visible on the horizon, with smoke or mist rising from the forest. The sky is a mix of blue, orange, and white, with some scattered clouds. The text "Weather Data Sources for OK-FIRE" is overlaid in the center of the image in a bold, yellow, sans-serif font with a black drop shadow.

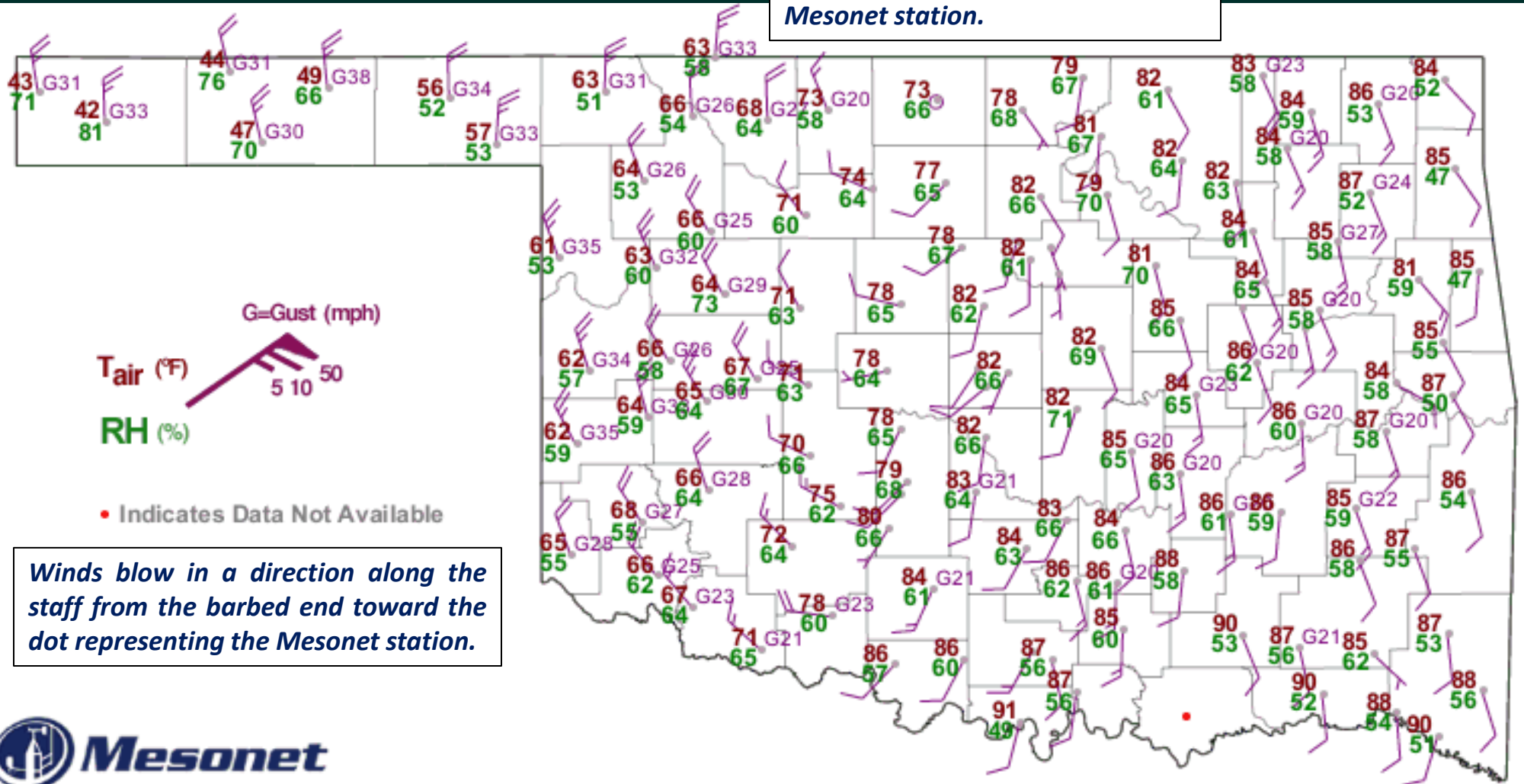
Weather Data Sources for OK-FIRE

The OKLAHOMA MESONET

(current and past weather conditions)



Calm winds are denoted by a circle around the dot representing the Mesonet station.

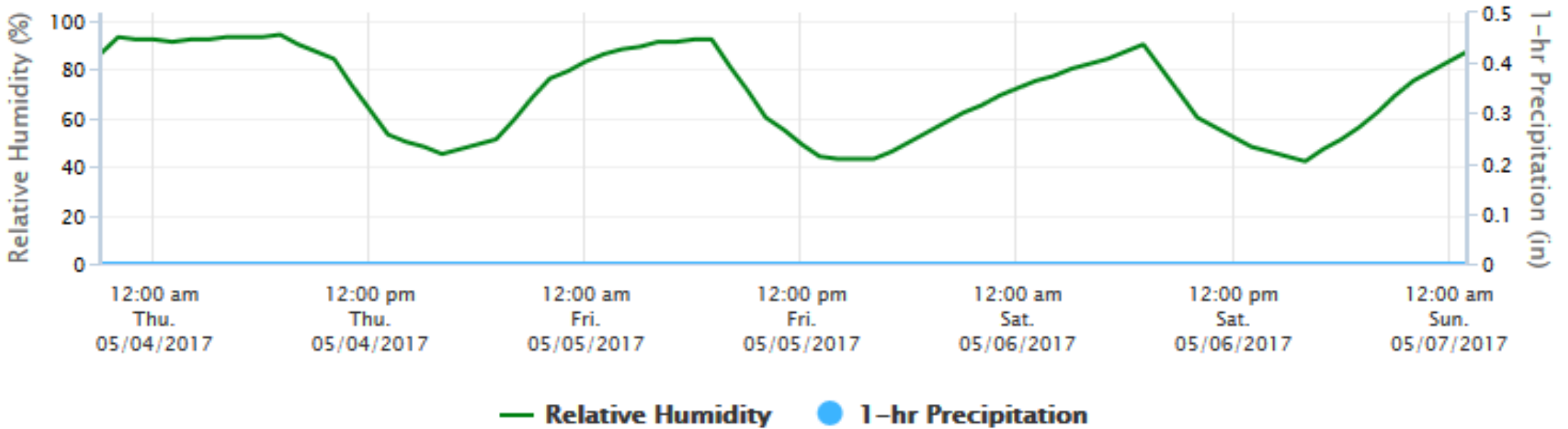


Current Fire Weather Conditions

12:30 PM October 9, 2017 CDT

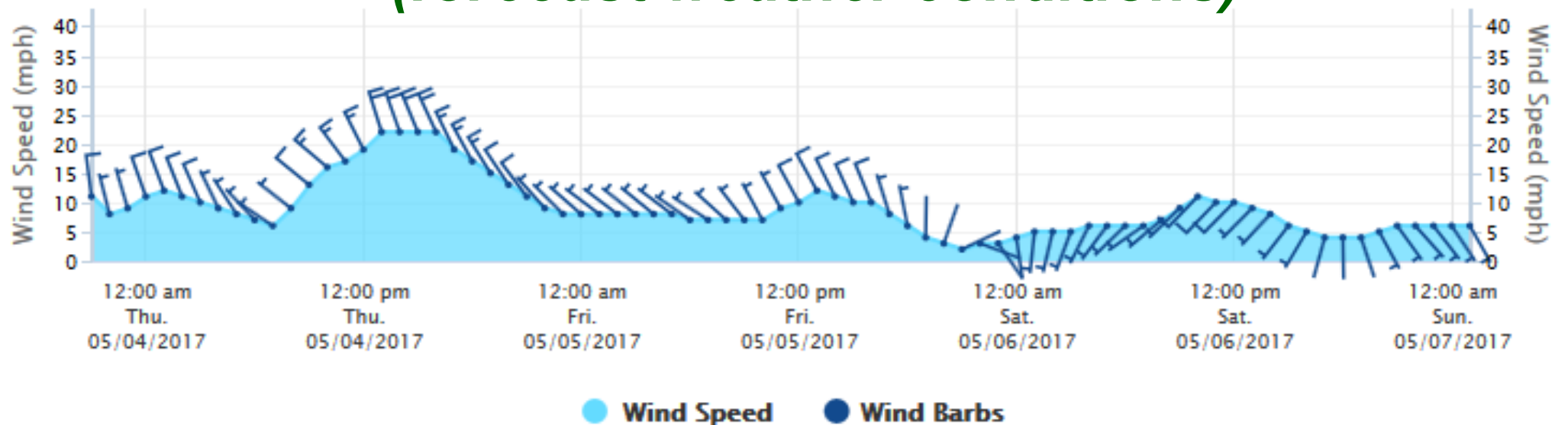
Created 12:35:34 PM October 9, 2017 CDT. © Copyright 2017

Forecast Meteogram Chart for Stillwater



www.mesonet.org

84-h Output from the NAM Model (forecast weather conditions)



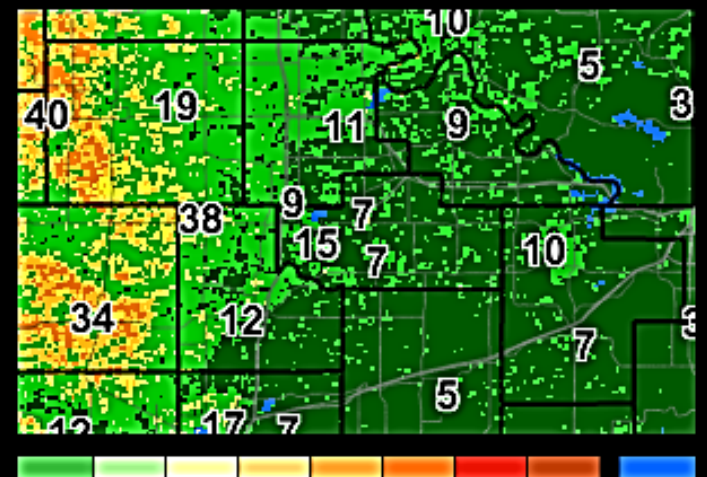
NAM Forecast Model Runs

- 00Z (GMT, UTC) = 6 p.m. CST (7 p.m. CDT)
of day before
- 06Z = midnight CST (1 a.m. CDT)
- 12Z = 6 a.m. CST (7 a.m. CDT)
- 18Z = 12 noon CST (1 p.m. CDT)

Time Updated Forecasts Available on OK-FIRE

<u>NAM Forecast Run</u>	<u>Weather Products</u>	<u>Fire Model Products</u>
00Z	10 p.m. CST	11 p.m. CST
06Z	4 a.m. CST	5 a.m. CST
12Z	10 a.m. CST	11 a.m. CST
18Z	4 p.m. CST	5 p.m. CST

Current Burning Index



Fire Danger

Current Fire Danger:

Burning Index:

Spread Component:

Ignition Component:

NFDRS Fuel Model:

1-hr Fuel Moisture:

10-hr Fuel Moisture:

Soil Moisture:

KBDI:

Relative Greenness:

Tue 10/10/17 6:00 pm CDT

LOW

7

4

4%

T

10%

12%

99%

39

58%

Tue 10/10/17 6:00 pm CDT

LOW

9

1

9%

R

10%

12%

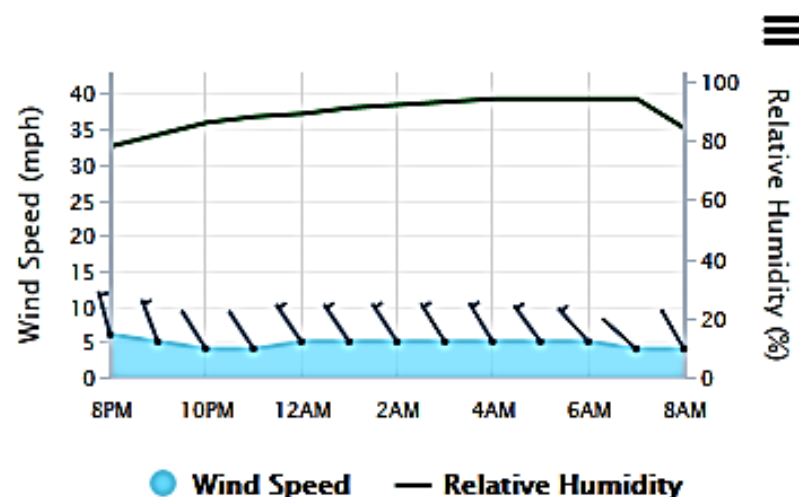
100%

39

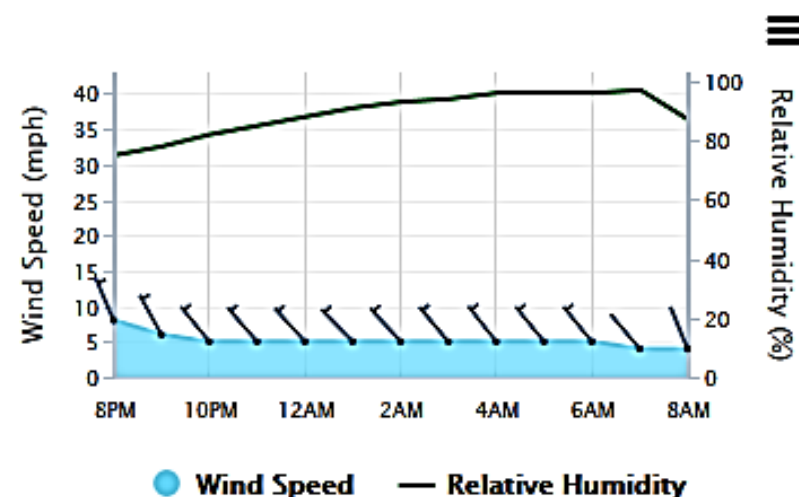
70%

NAM 12-hr Forecast Charts for Stillwater

Latest forecast based on 1 pm CDT 10/10/17 NAM; NEXT 6-hr update expected 11 pm CDT 10/10/17

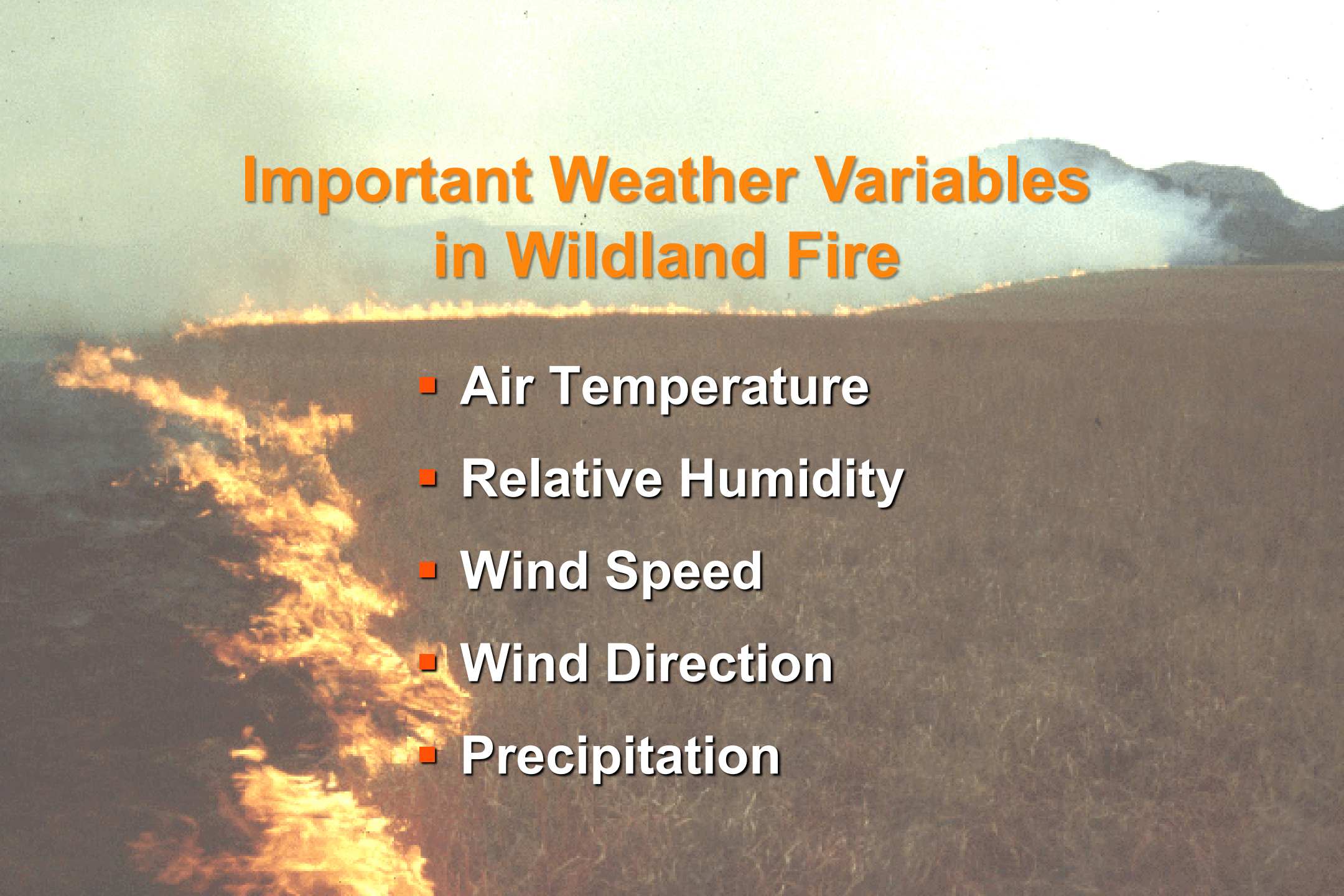


NAM 12-hr Forecast Charts for Pawnee



FIRE WEATHER

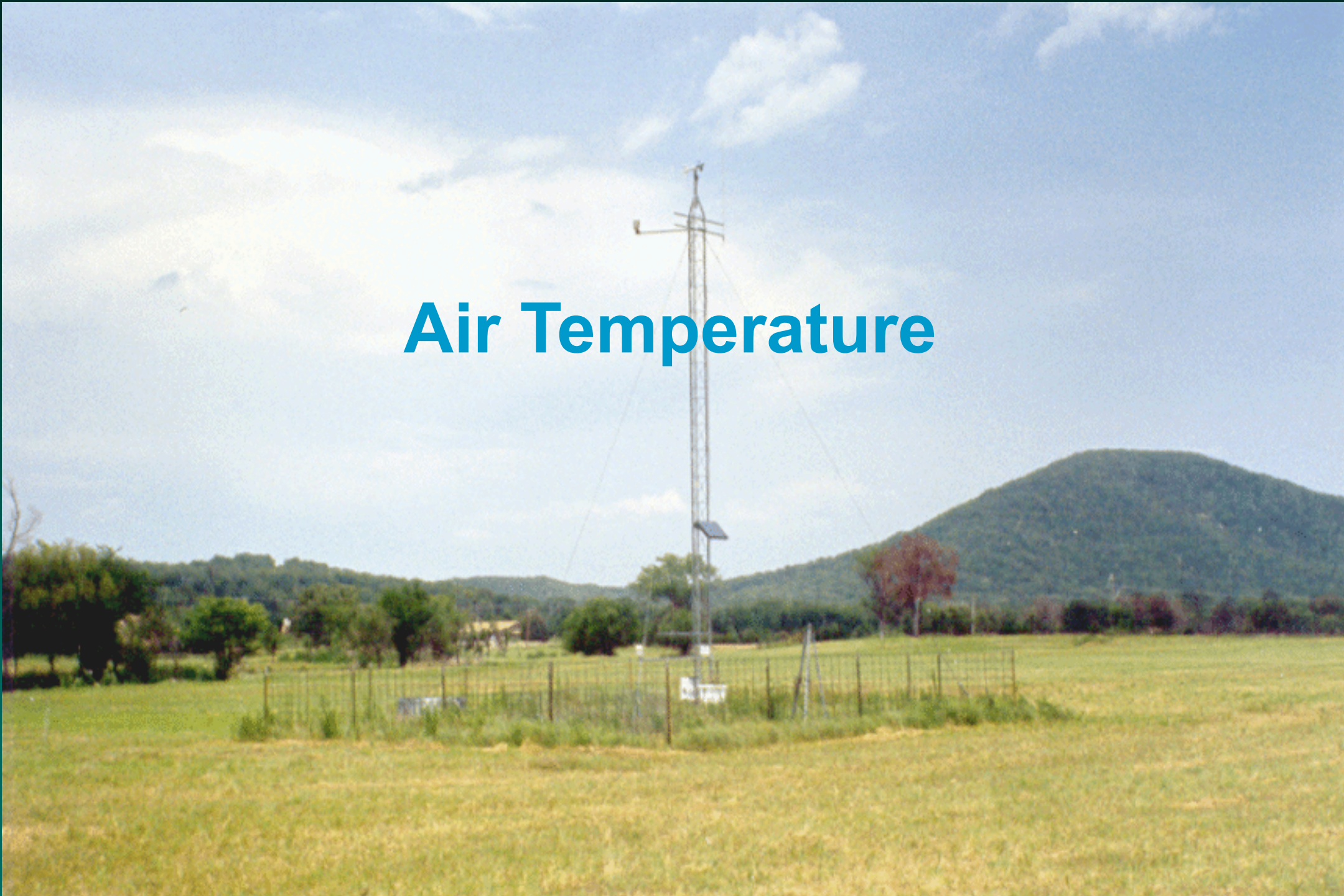


A photograph of a wildfire. In the foreground, a large, intense fire plume rises from the ground, showing bright orange and yellow flames. In the background, a long, horizontal fire front stretches across the horizon. The sky is hazy and light-colored, with some smoke visible near the horizon.

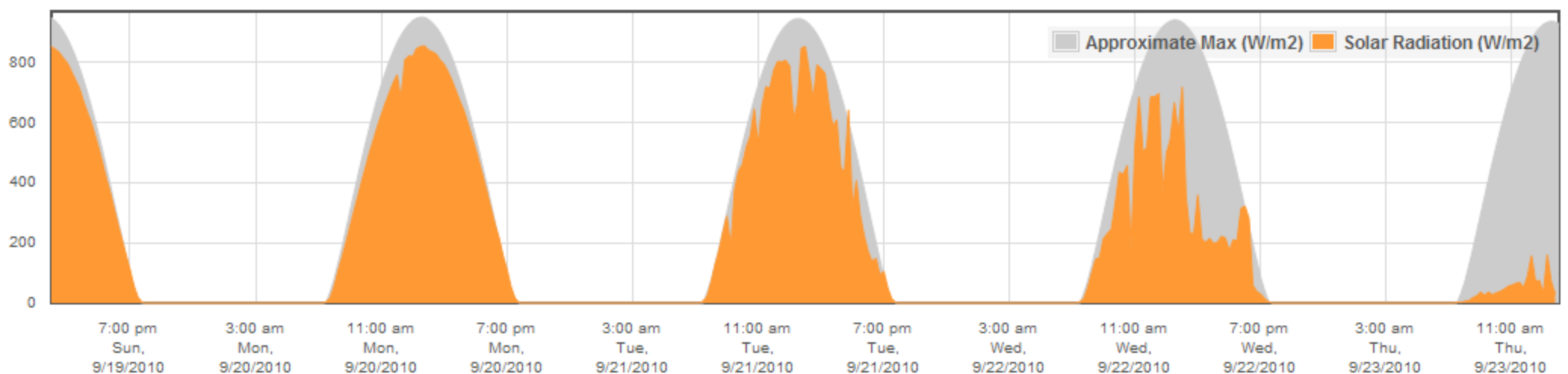
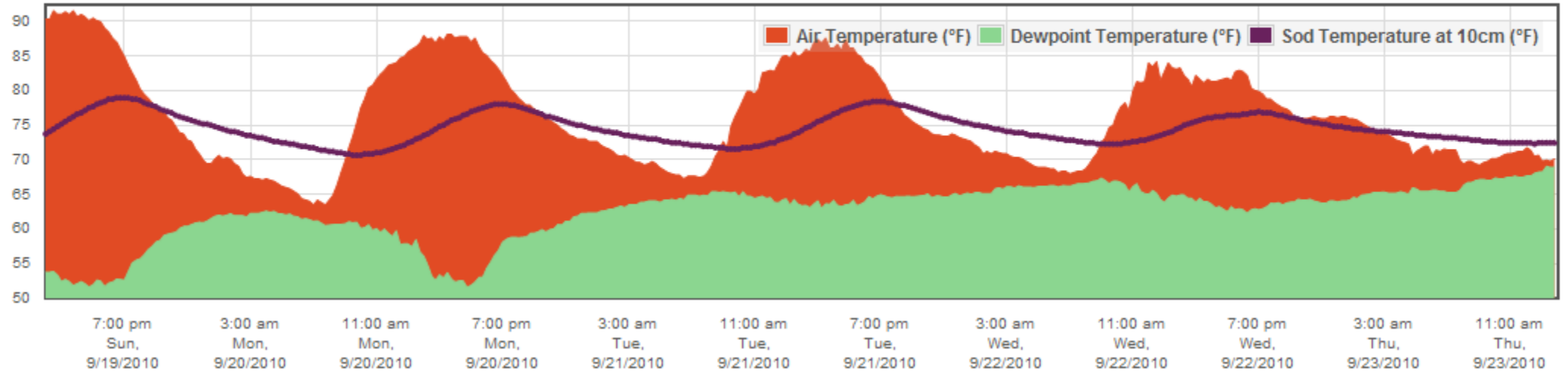
Important Weather Variables in Wildland Fire

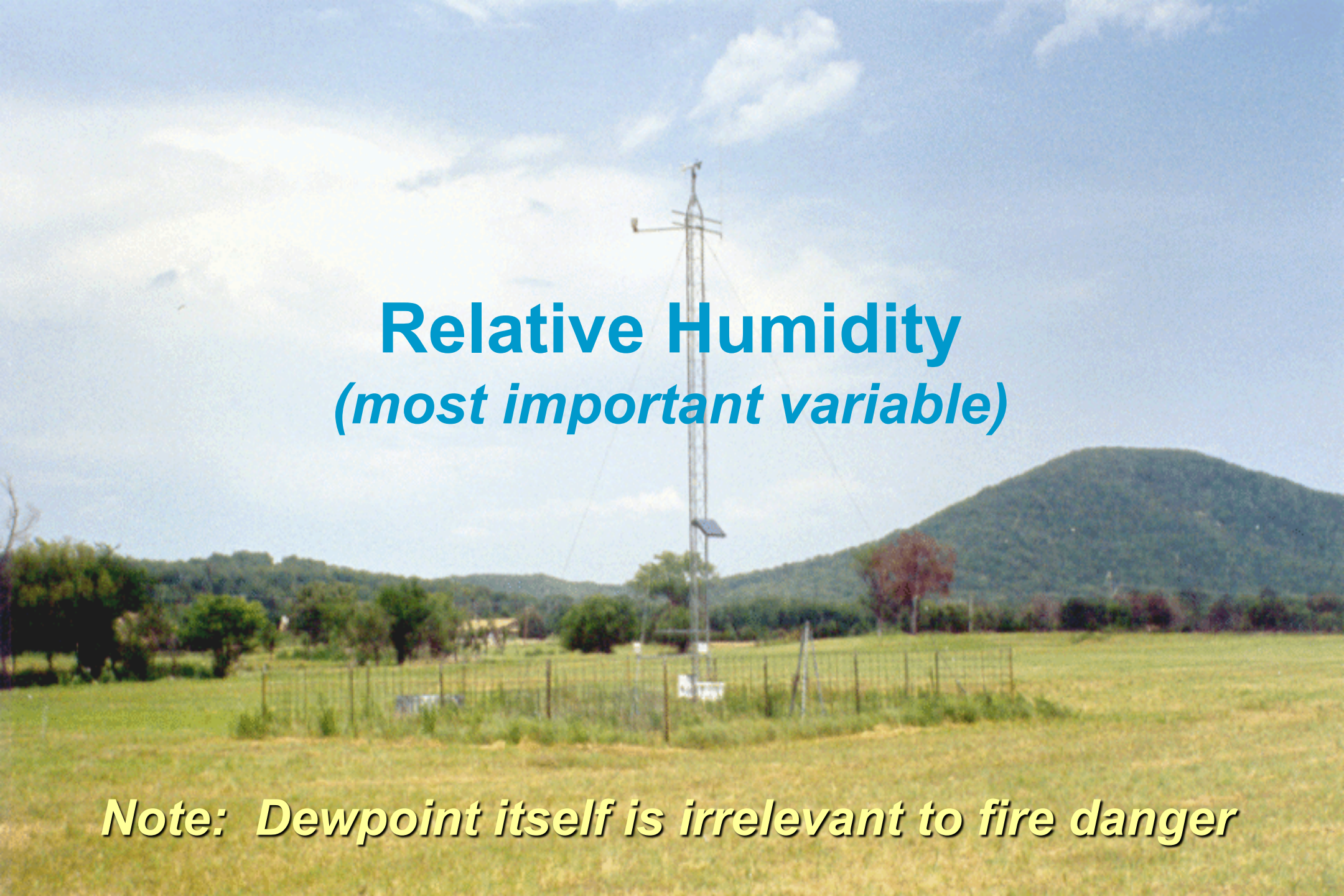
- Air Temperature
- Relative Humidity
- Wind Speed
- Wind Direction
- Precipitation

Air Temperature



Meteogram for Arnett

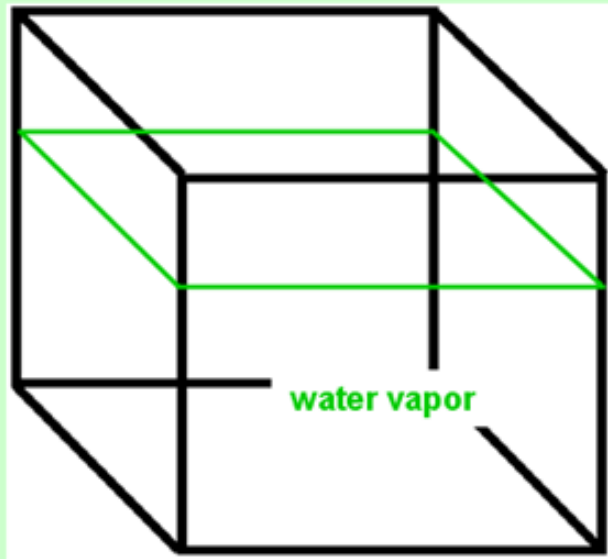


A photograph of a weather station tower in a grassy field. The tower is a tall, slender metal structure with various instruments at the top, including a wind vane and a cup anemometer. It is supported by guy wires. The tower is situated in a green field with a fence in the foreground. In the background, there are rolling green hills under a blue sky with scattered white clouds. The text "Relative Humidity (most important variable)" is overlaid in the center of the image.

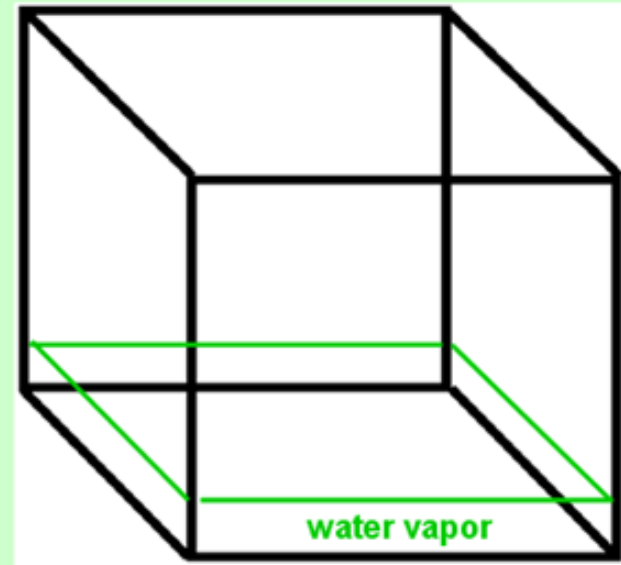
Relative Humidity

(most important variable)

Note: Dewpoint itself is irrelevant to fire danger

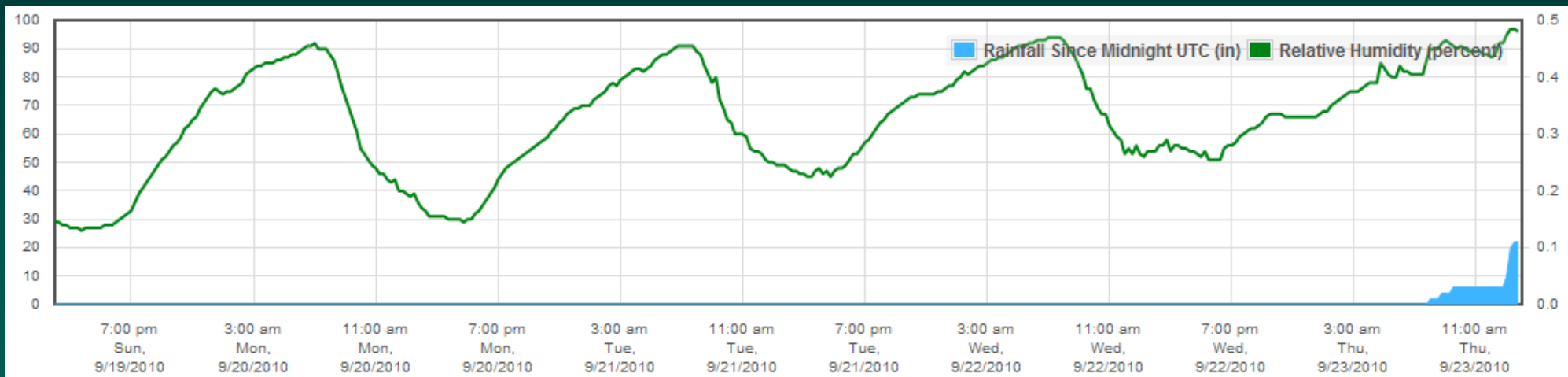


Relative Humidity = 70%
Air Temperature = 37F



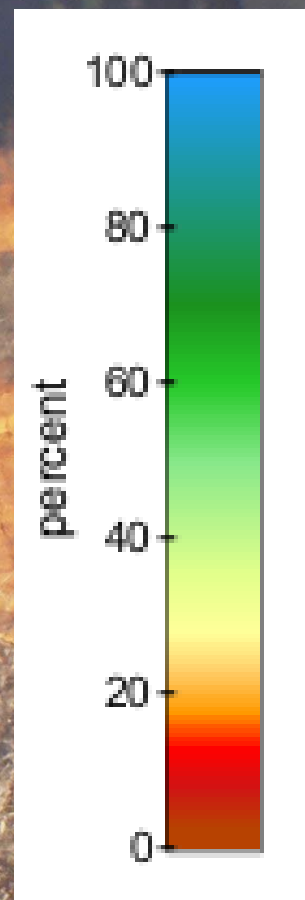
Relative Humidity = 15%
Air Temperature = 80F





Relative Humidity

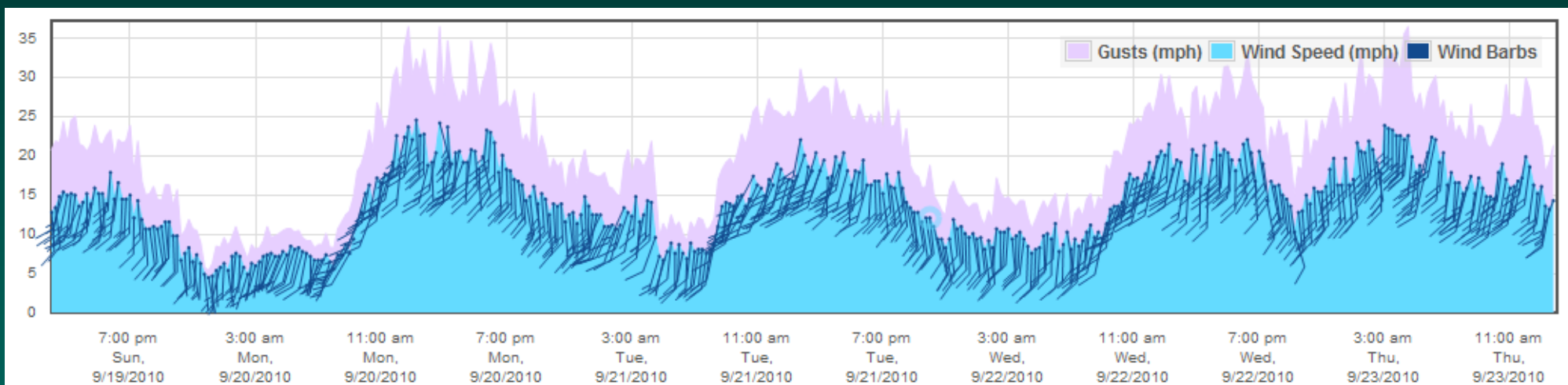
- **> 80%** Fuels may be too moist for fire; heavy smoke possible
- **30-80%** Normal range for prescribed burning
- **20-30%** Containment difficult; quick ignition; spotfires increase
- **< 20%** Extreme fire behavior; spotfires frequent



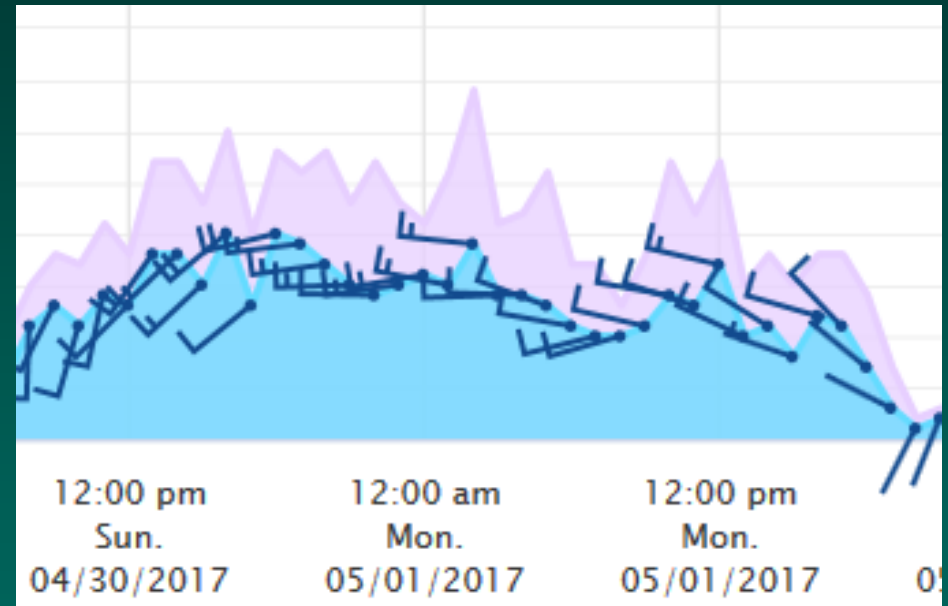
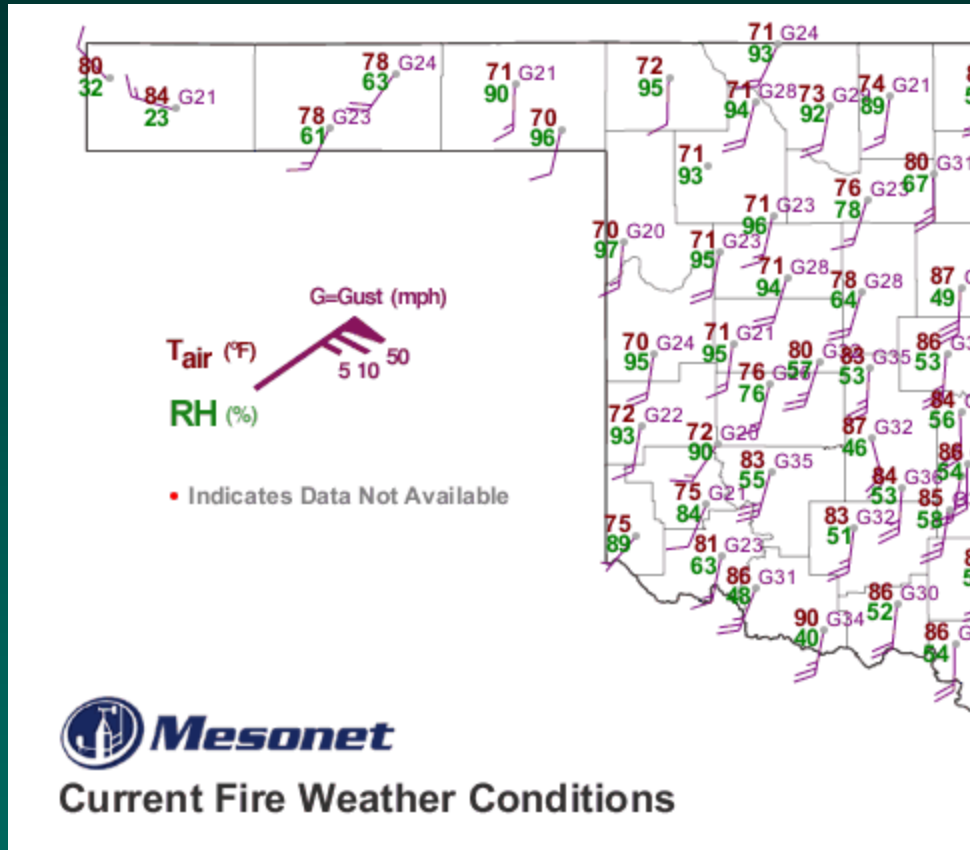
A tall, slender meteorological tower stands in the center of a grassy field. The tower is supported by guy wires and has various instruments at the top, including a wind speed sensor. In the background, there is a line of trees and a large, rounded hill under a blue sky with scattered white clouds. The foreground is a field of dry, yellowish grass.

Wind Speed

(second most important variable)

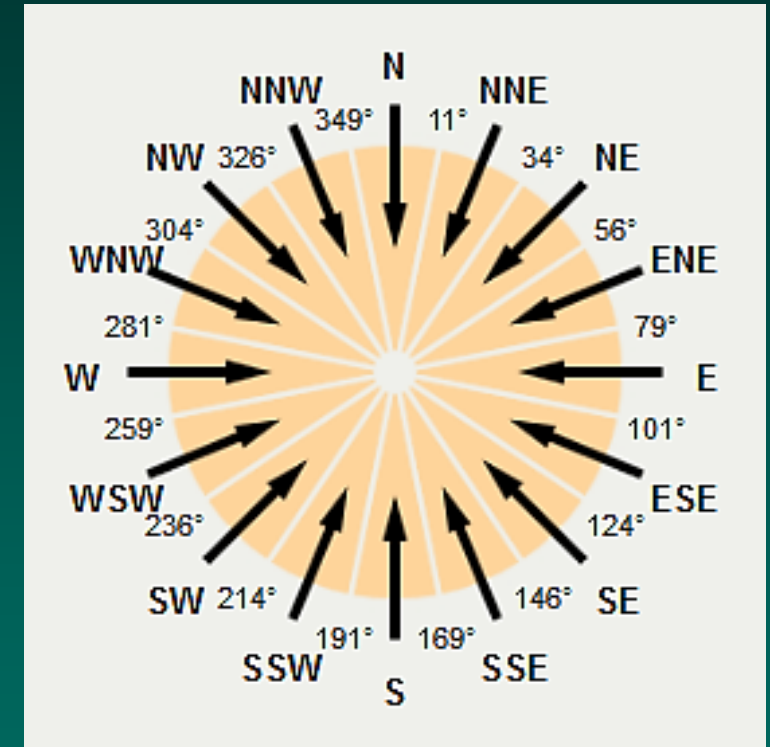


Wind – How It's Portrayed

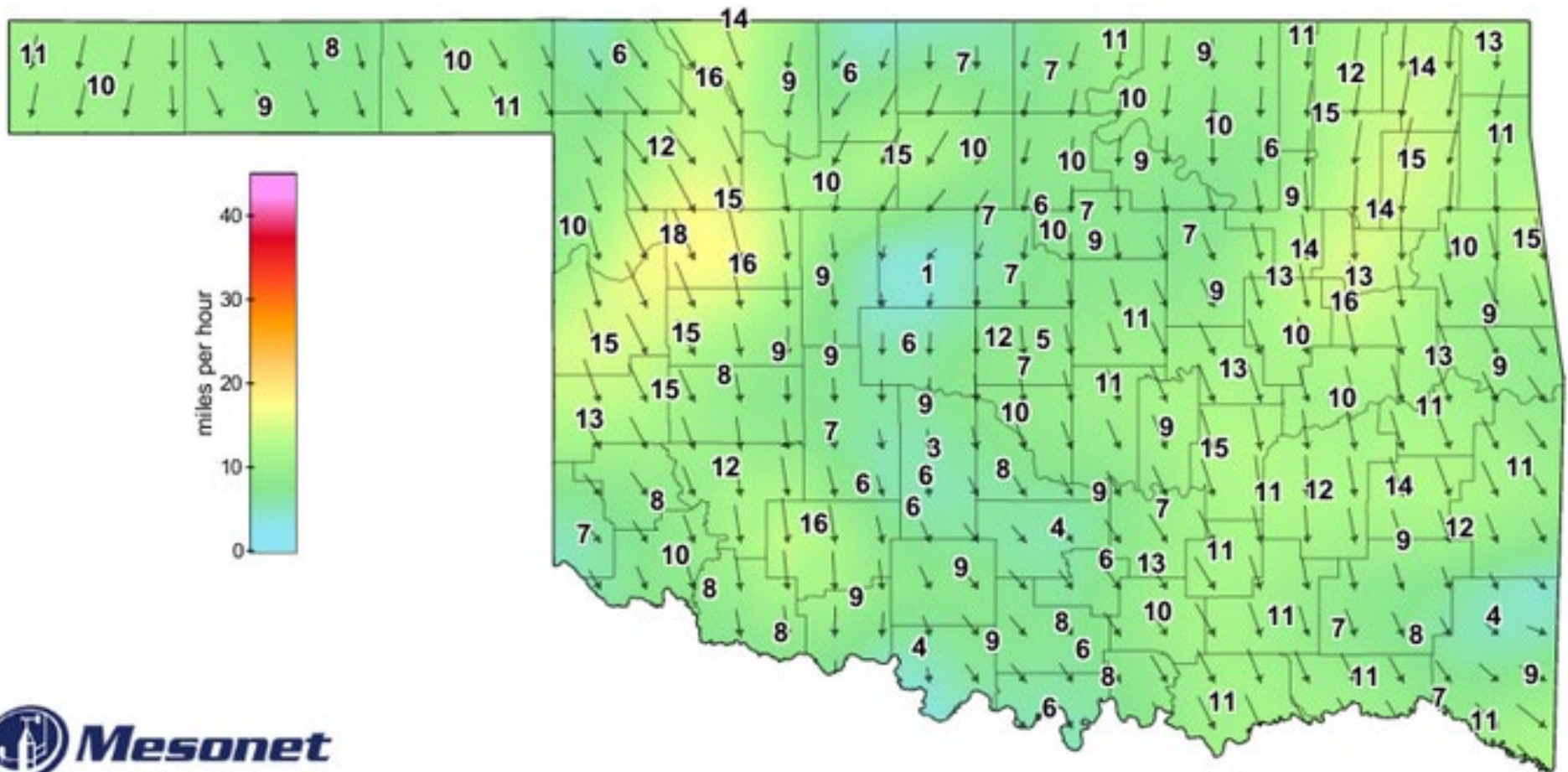


Wind – How It's Portrayed

Date ▲	TAIR (°F) ◆	TDEW (°F) ◆	RELH (%) ◆	WDIR ◆	WSPD (mph) ◆	1-hr PRECIP (in)
Fri May 05, 2017 8:00 am CDT	49	44	81	NW	7	0
Fri May 05, 2017 9:00 am CDT	56	47	71	NW	7	0
Fri May 05, 2017 10:00 am CDT	62	48	60	NNW	7	0
Fri May 05, 2017 11:00 am CDT	65	48	55	NNW	9	0
Fri May 05, 2017 12:00 pm CDT	67	47	49	NNW	10	0
Fri May 05, 2017 1:00 pm CDT	69	46	44	NNW	12	0
Fri May 05, 2017 2:00 pm CDT	70	46	43	NNW	11	0
Fri May 05, 2017 3:00 pm CDT	71	47	43	NNW	10	0
Fri May 05, 2017 4:00 pm CDT	71	47	43	NNW	10	0
Fri May 05, 2017 5:00 pm CDT	70	48	46	NNW	8	0
Fri May 05, 2017 6:00 pm CDT	69	50	50	NNW	6	0
Fri May 05, 2017 7:00 pm CDT	68	51	54	N	4	0
Fri May 05, 2017 8:00 pm CDT	65	50	58	NNE	3	0
Fri May 05, 2017 9:00 pm CDT	63	50	62	ENE	2	0
Fri May 05, 2017 10:00 pm CDT	60	48	65	ESE	3	0



Wind – How It's Portrayed



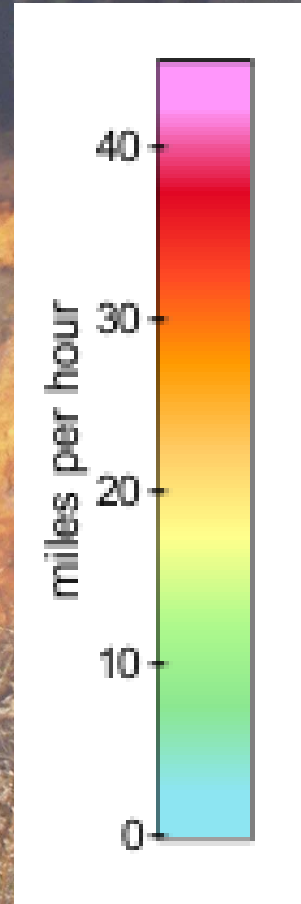
Wind Speed and Direction

9:10 PM May 3, 2017 CDT

Created 9:14:31 PM May 3, 2017 CDT, © Copyright 2017

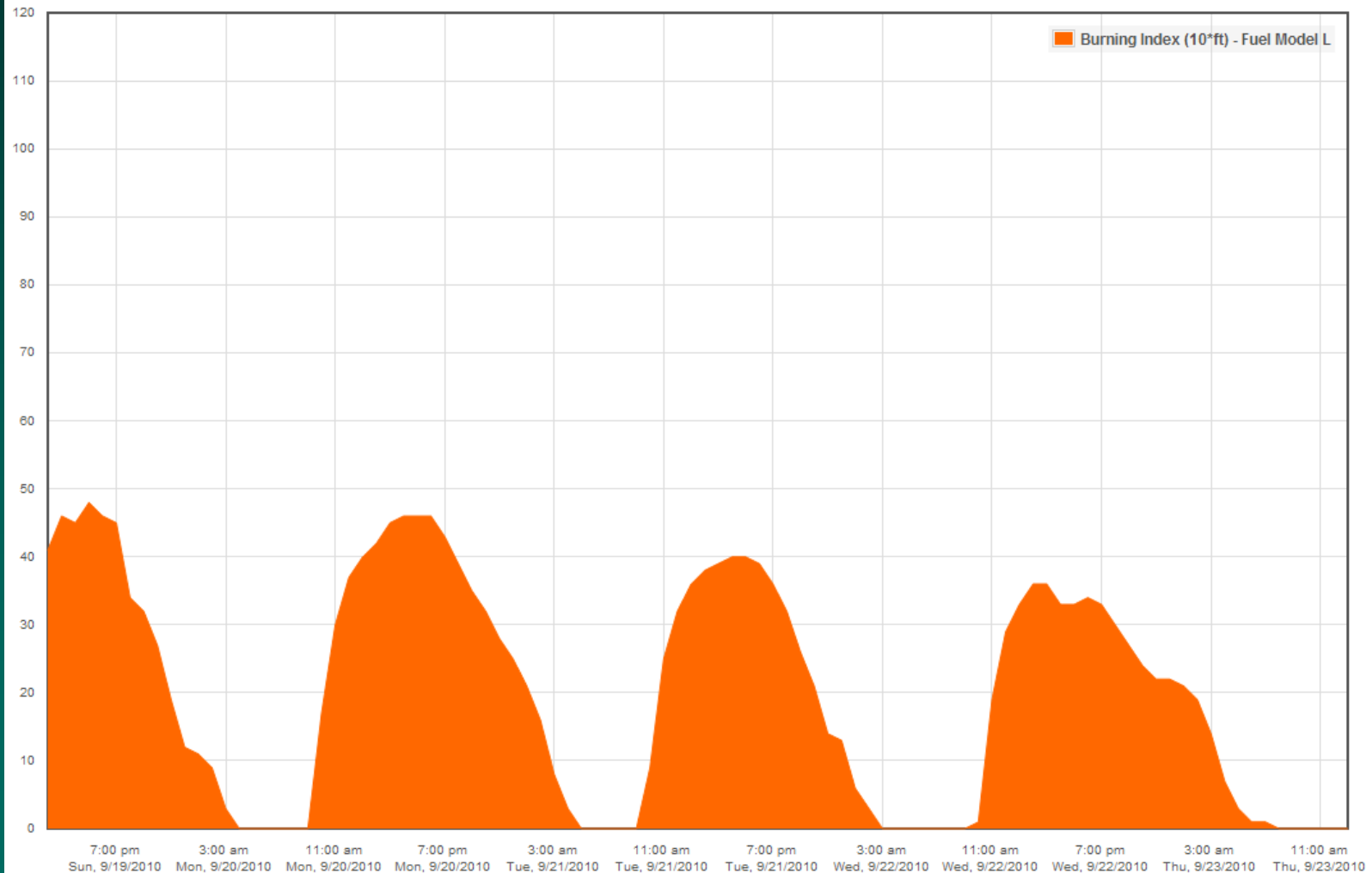
Wind Speed

- < 4 mph Generally unsuitable for prescribed burning; variable direction
- 4-15 mph Normal range for prescribed burning
- 15-20 mph Threshold range
- > 20 mph Increasingly problematic; spotfires increase; containment more difficult



Typical Fire Danger Pattern Resulting from Daily Cycles of T, RH, and Wind

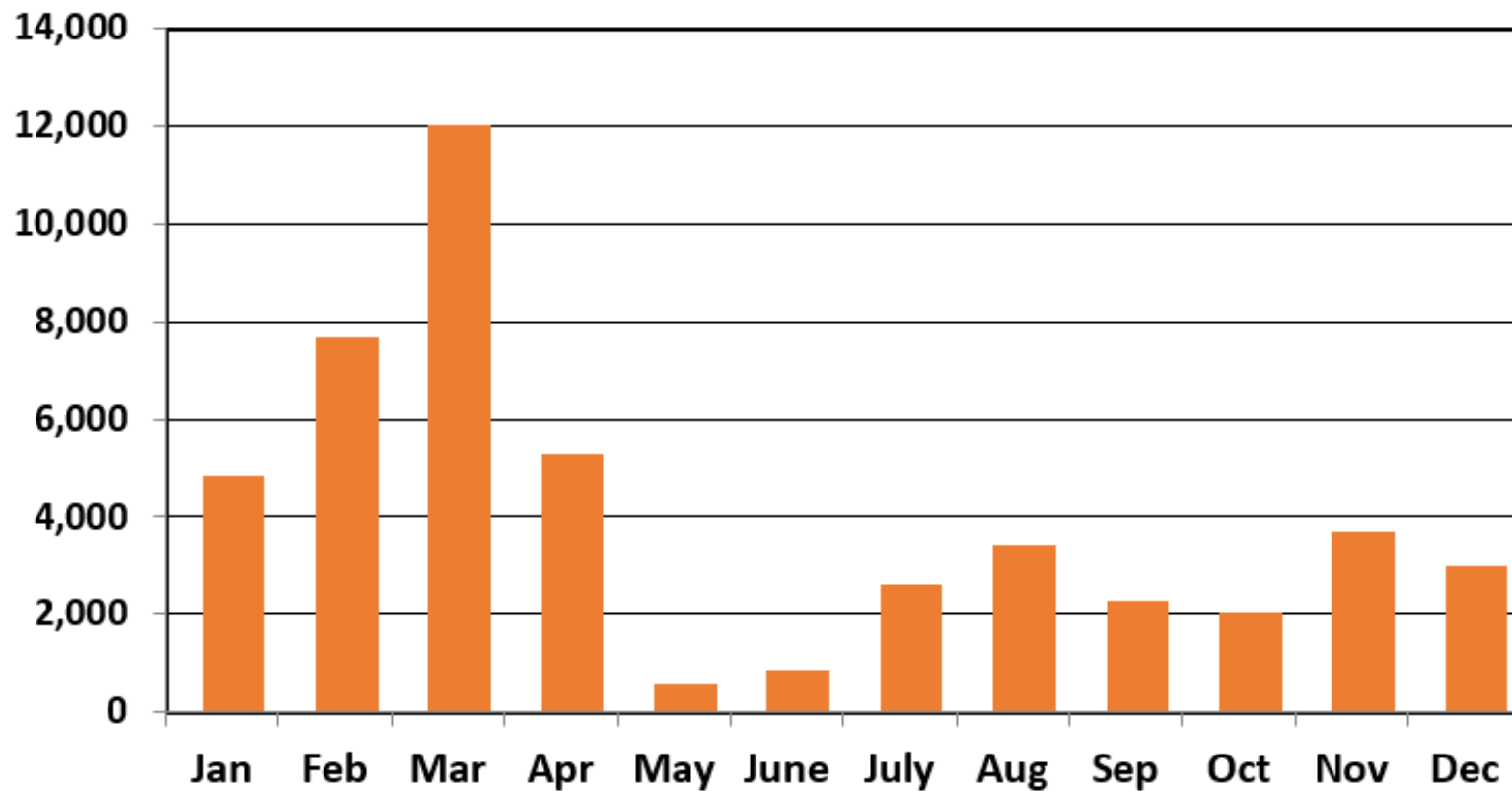
Firegram for Arnett



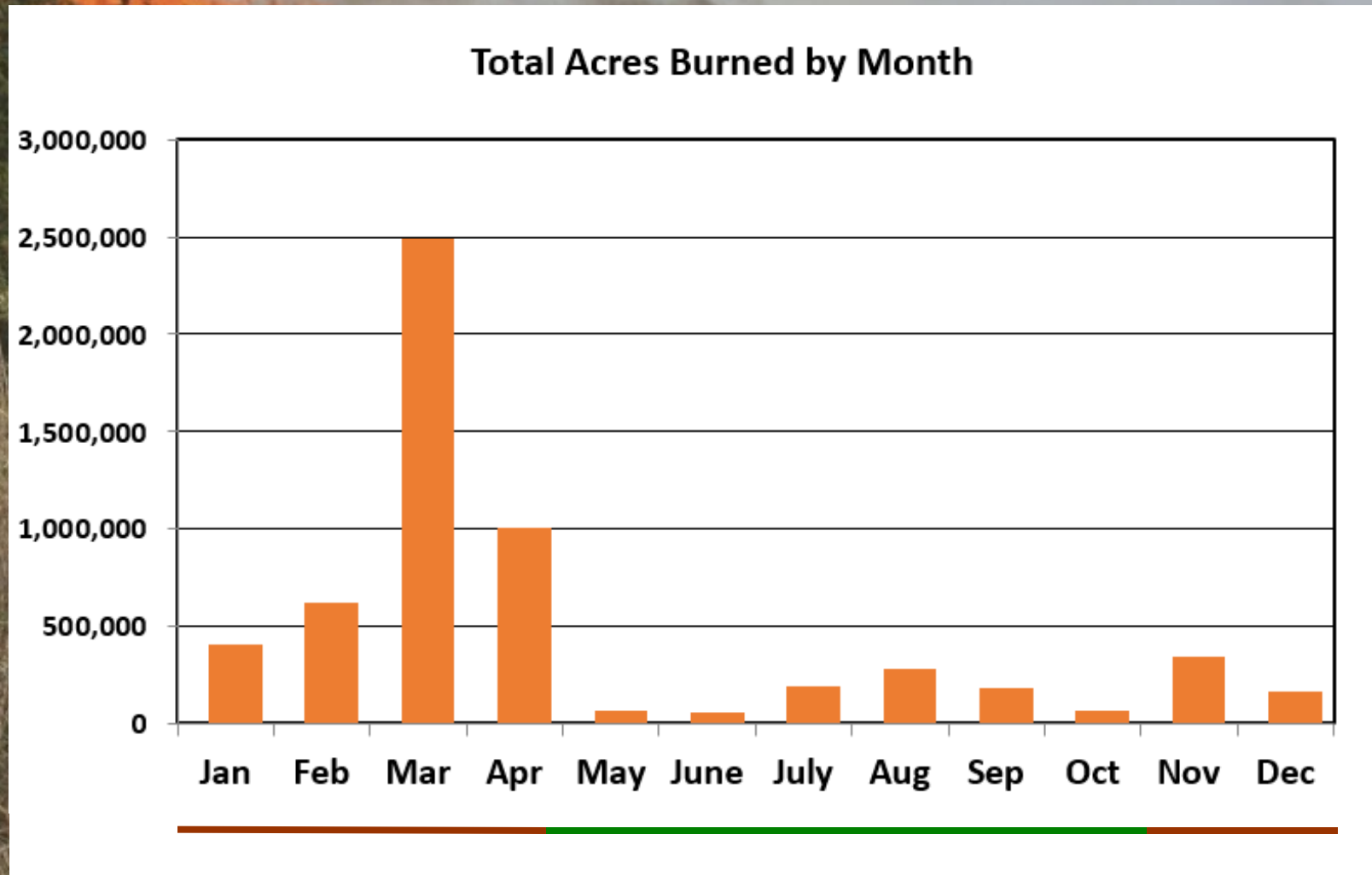
***Oklahoma Wildfire Climatology
(1992-2018)***

Oklahoma Wildfire Monthly Climatology (48,212 wildfires from 1992-2018)

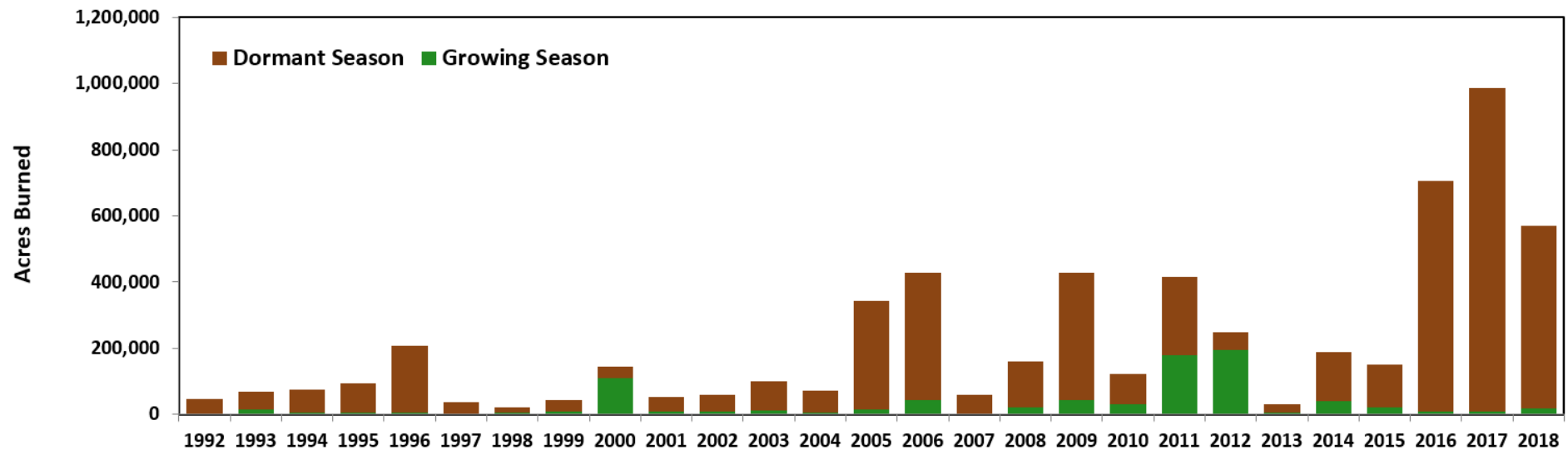
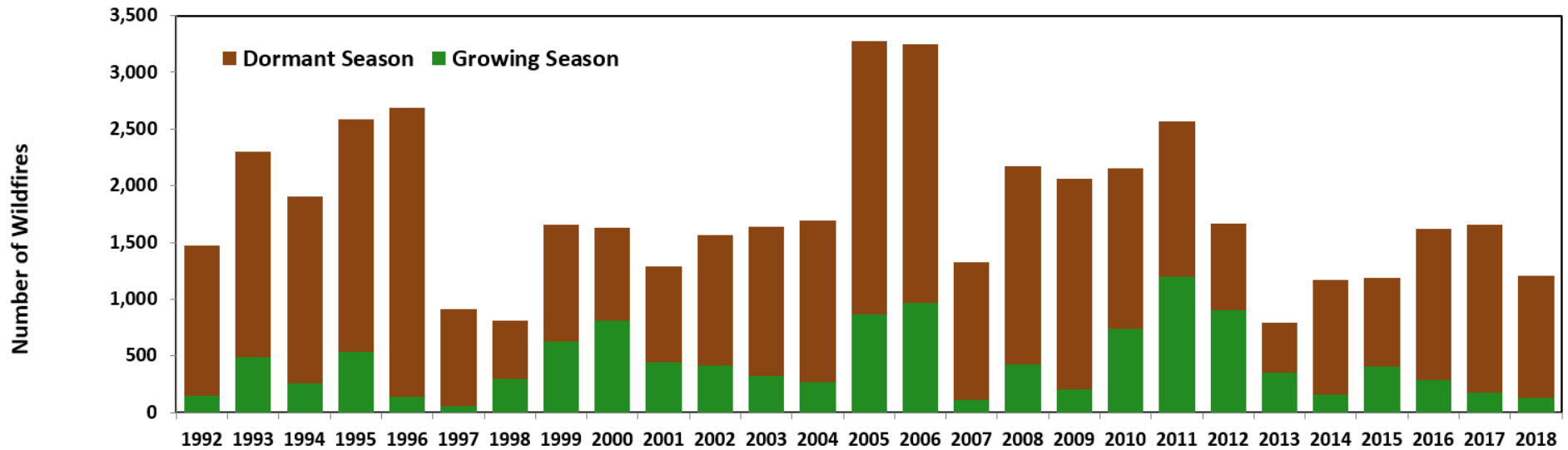
Total Number of Wildfires by Month



Oklahoma Wildfire Monthly Climatology (48,212 wildfires from 1992-2018)



Oklahoma Wildfires by Year (1992-2018)



***Weather Regimes Associated with
Oklahoma Wildfire Outbreaks***



Dormant Season Fires

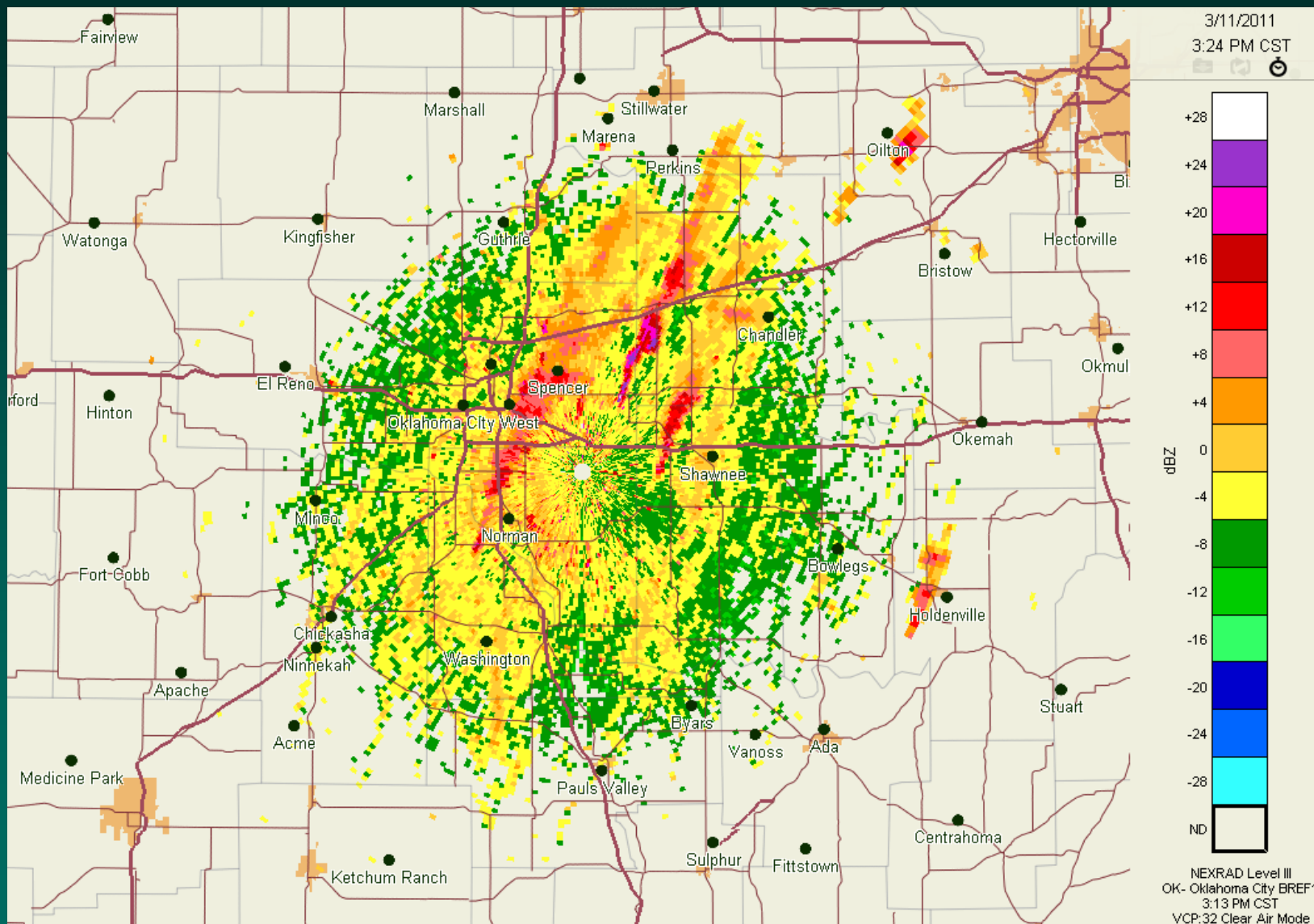


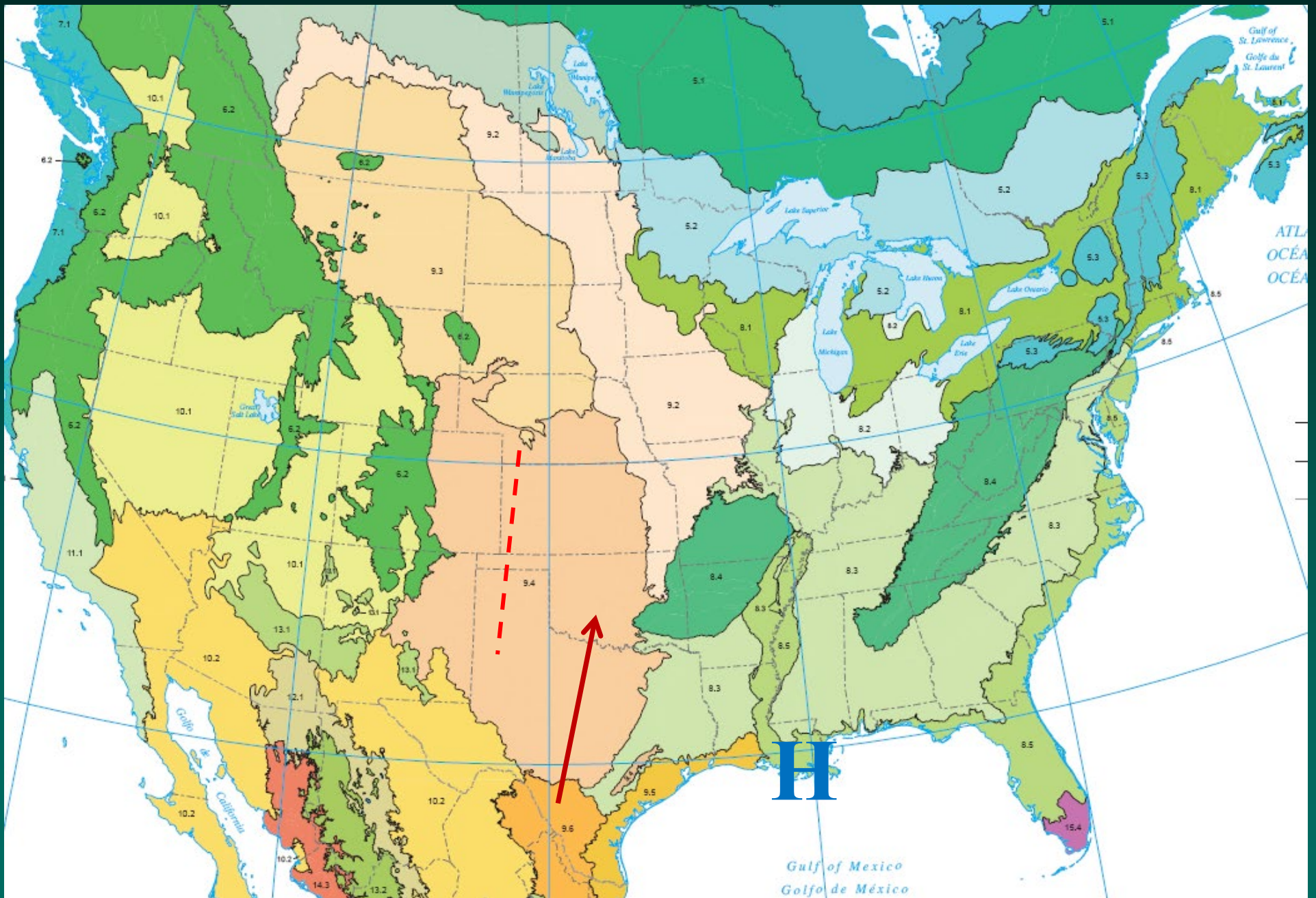
Starbuck Fire

March 6-23, 2017
662,700 acres



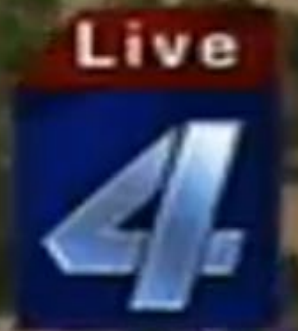
(1) S/SW Winds with Low RH

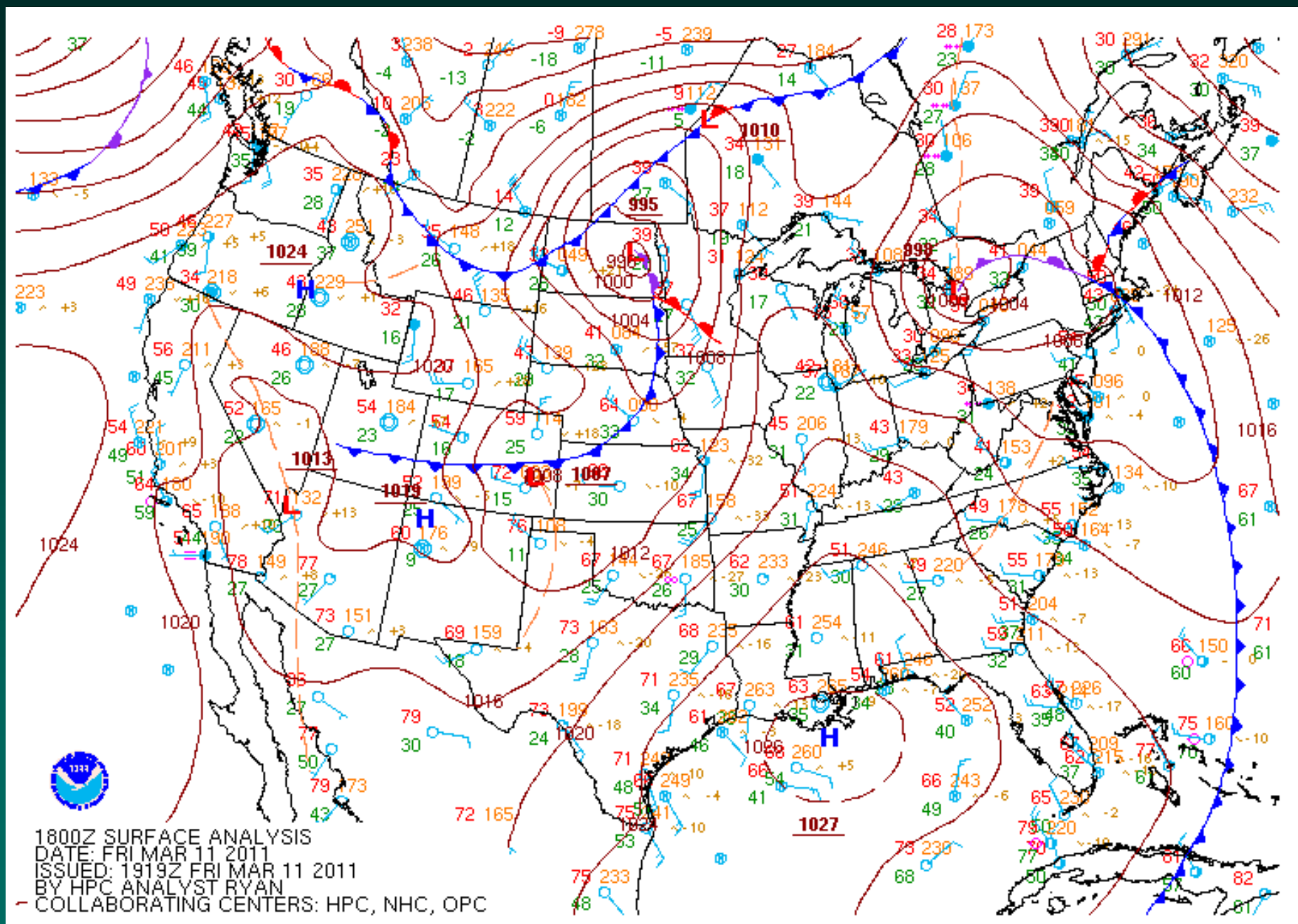


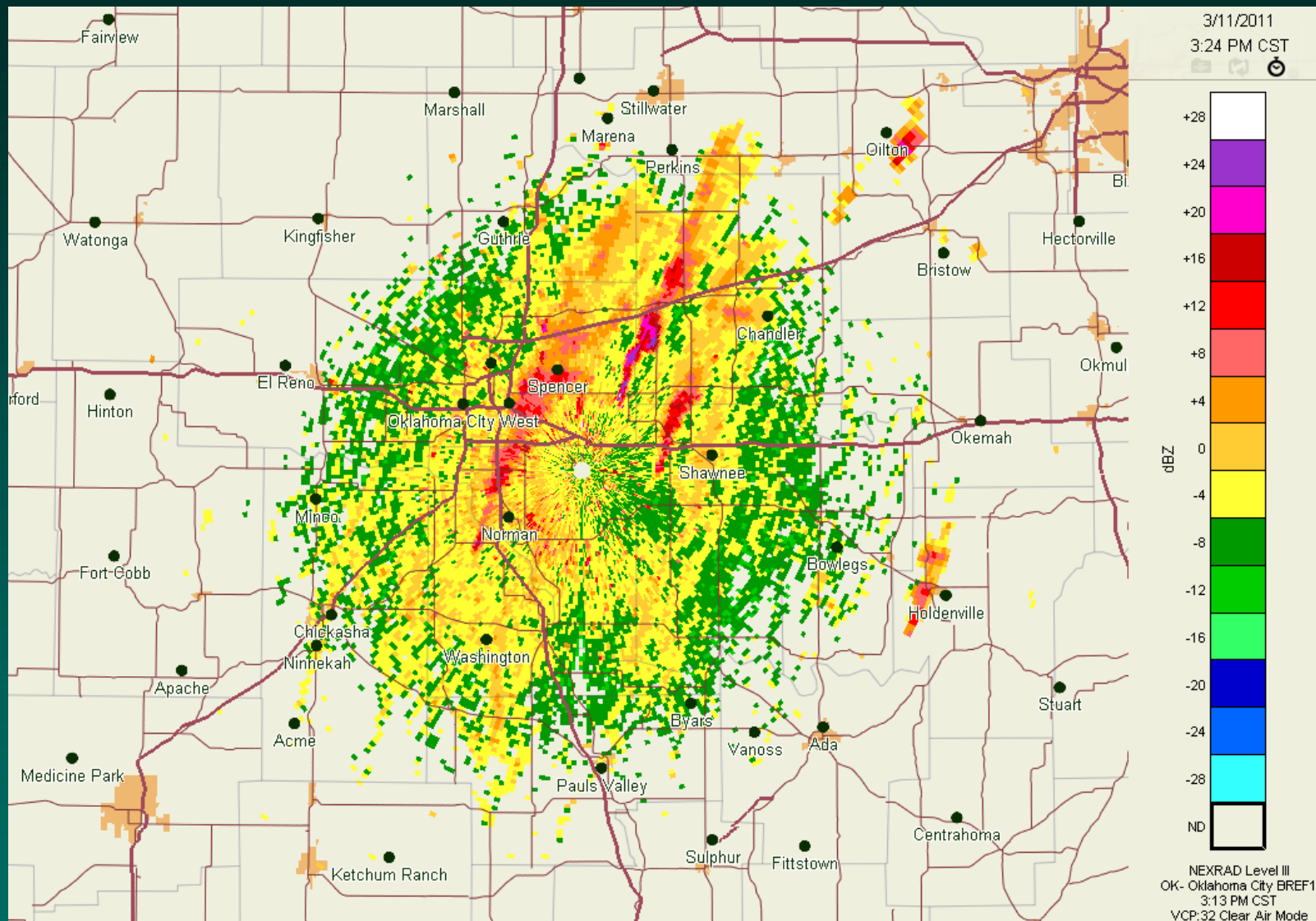


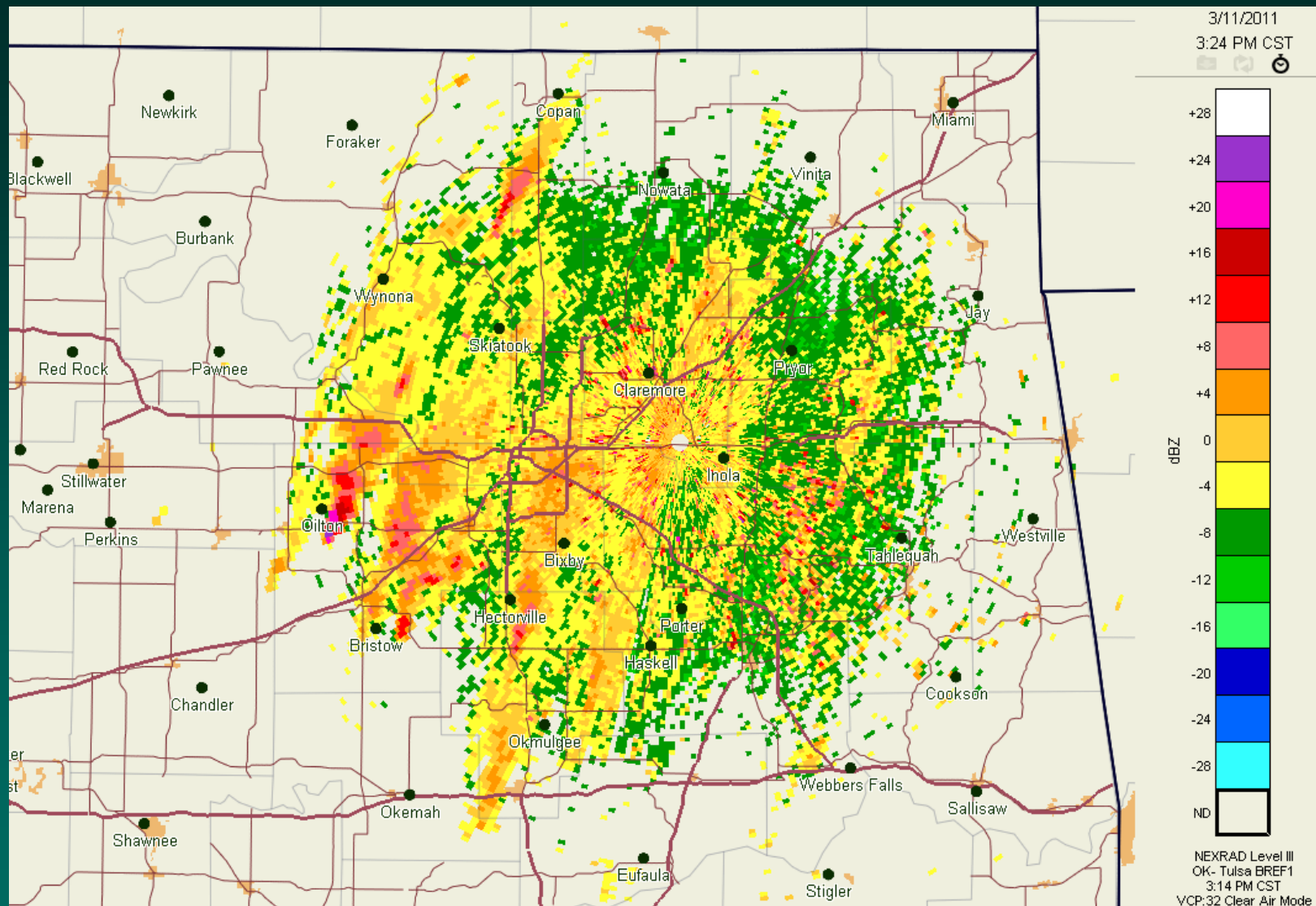
March 11, 2011

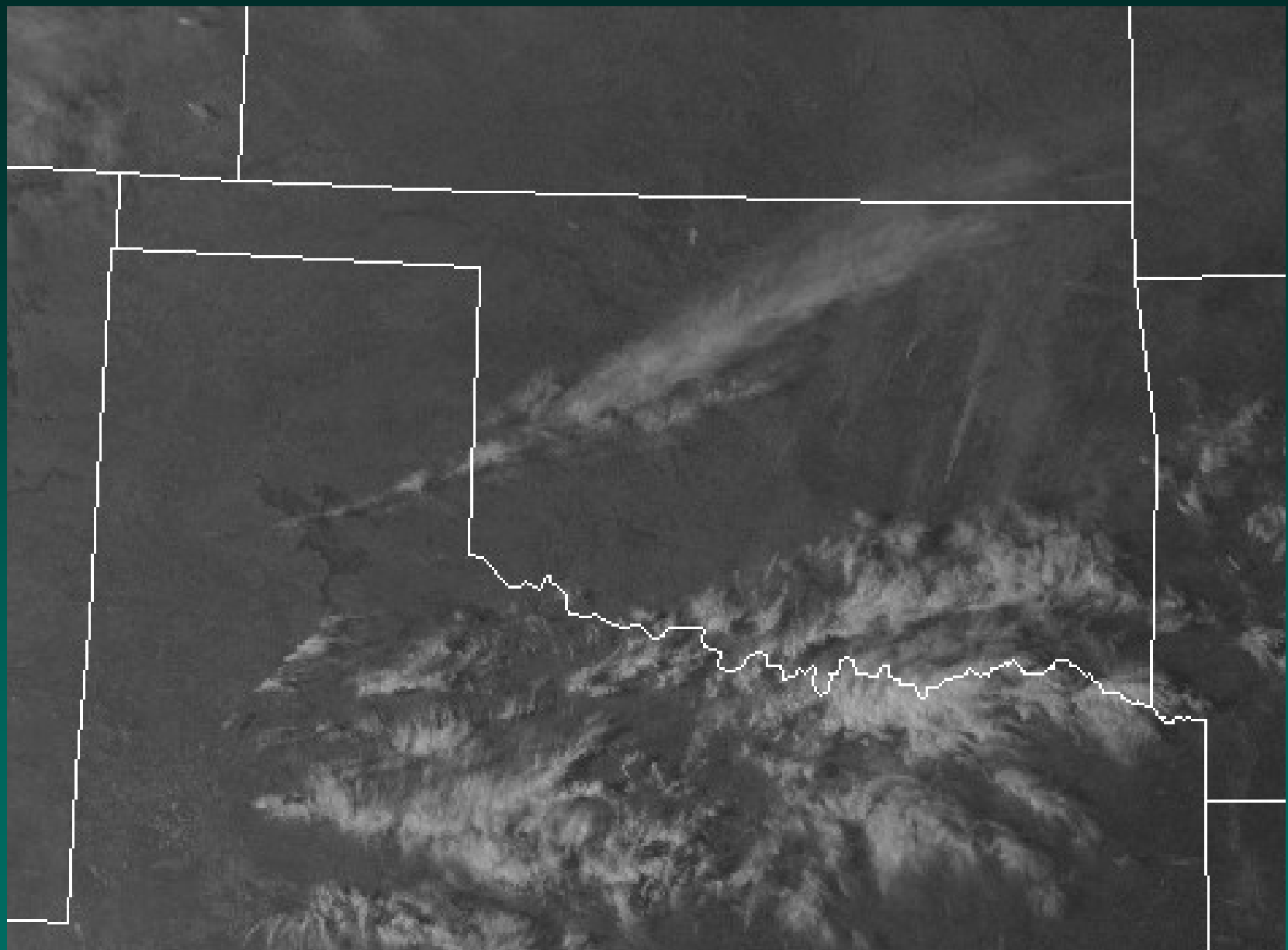
(73 fires; 28,000+ acres burned)

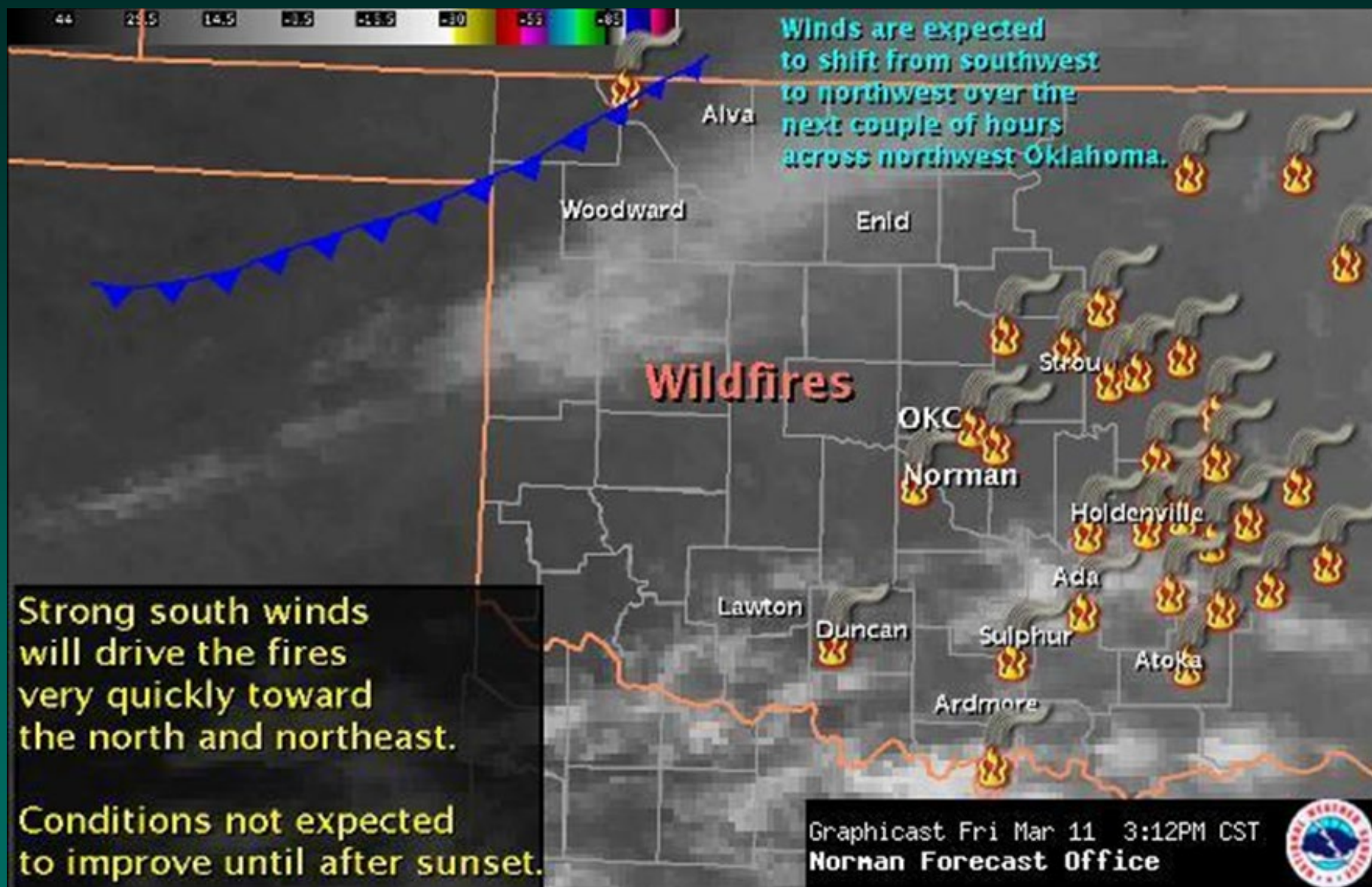








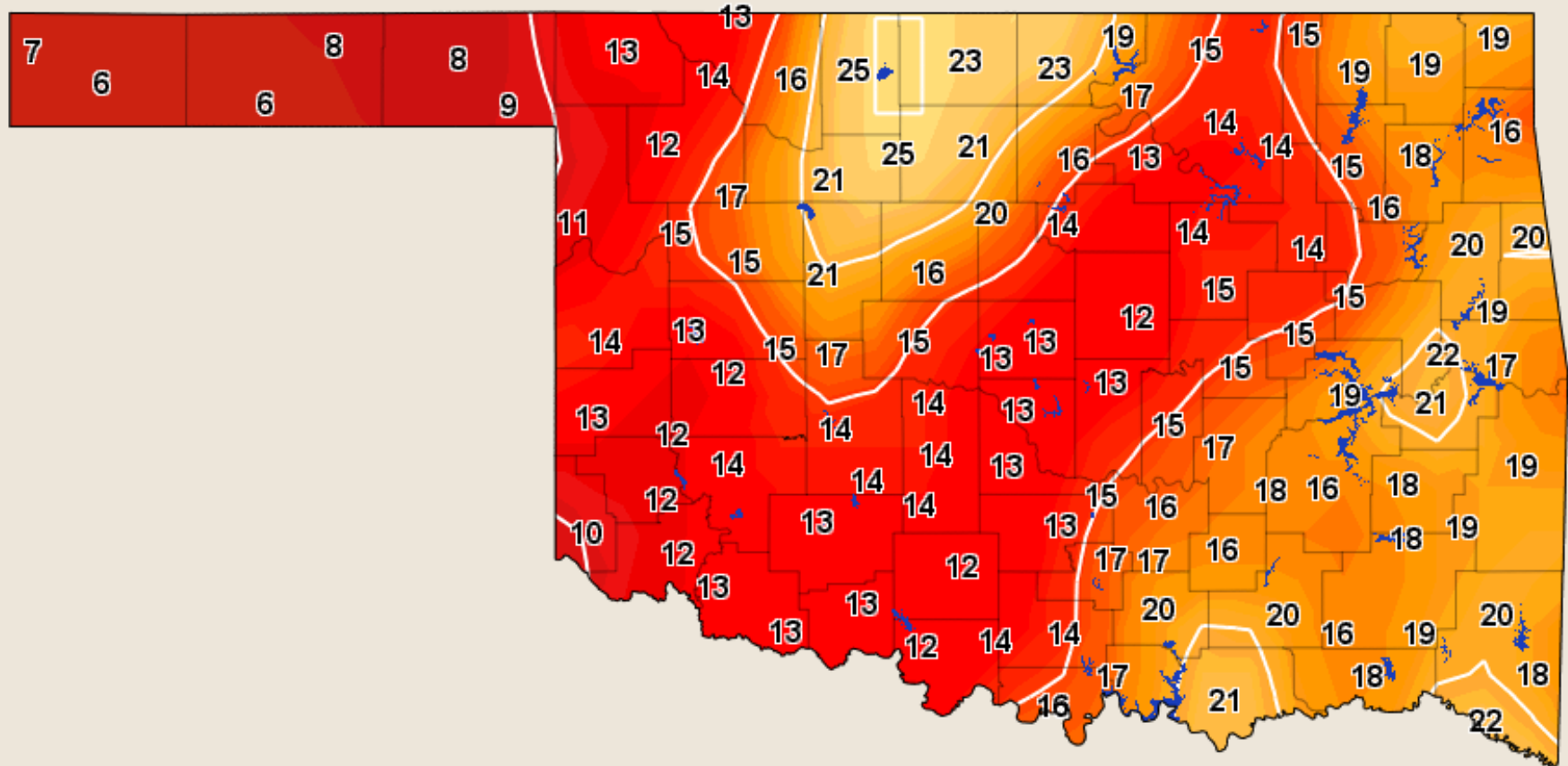




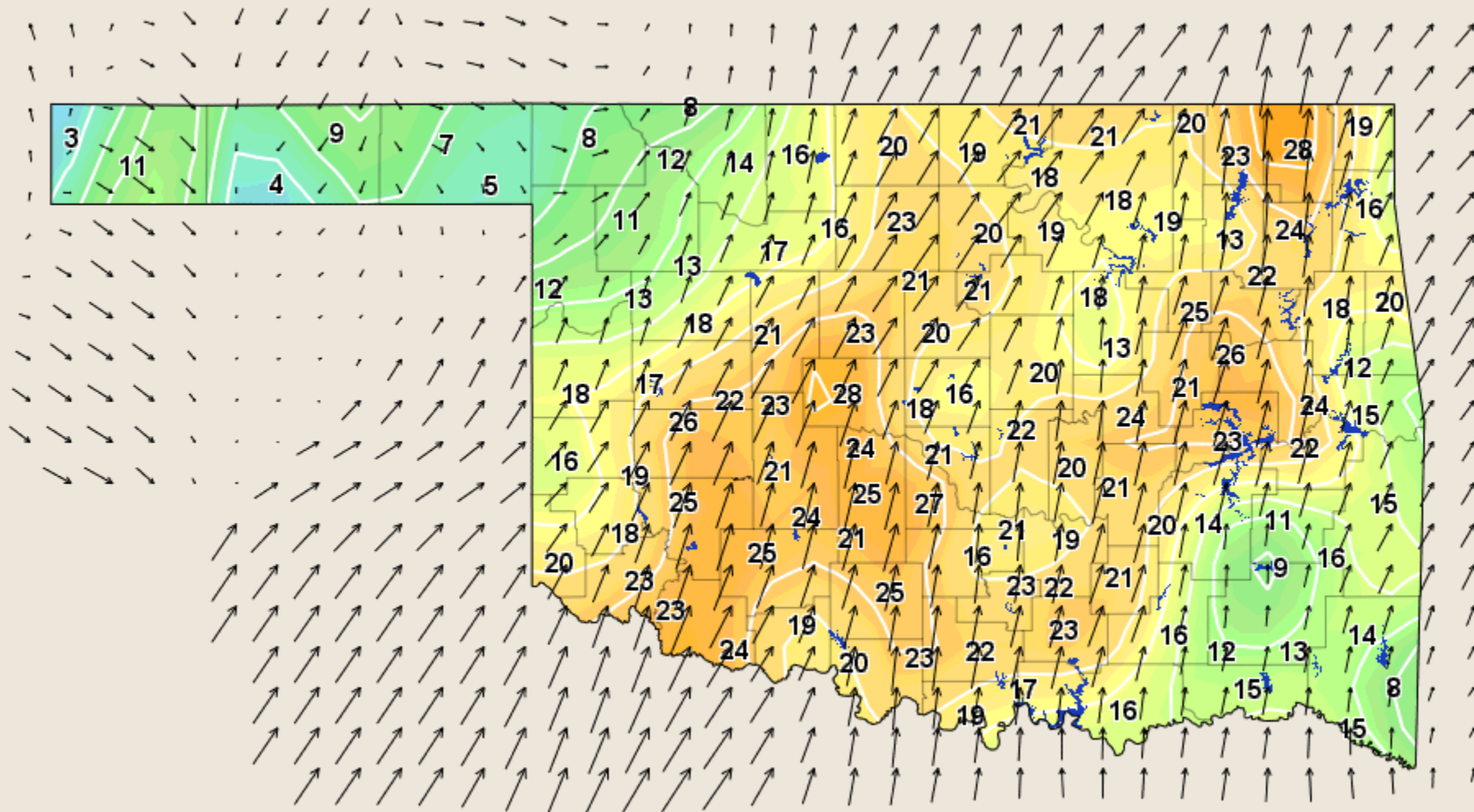




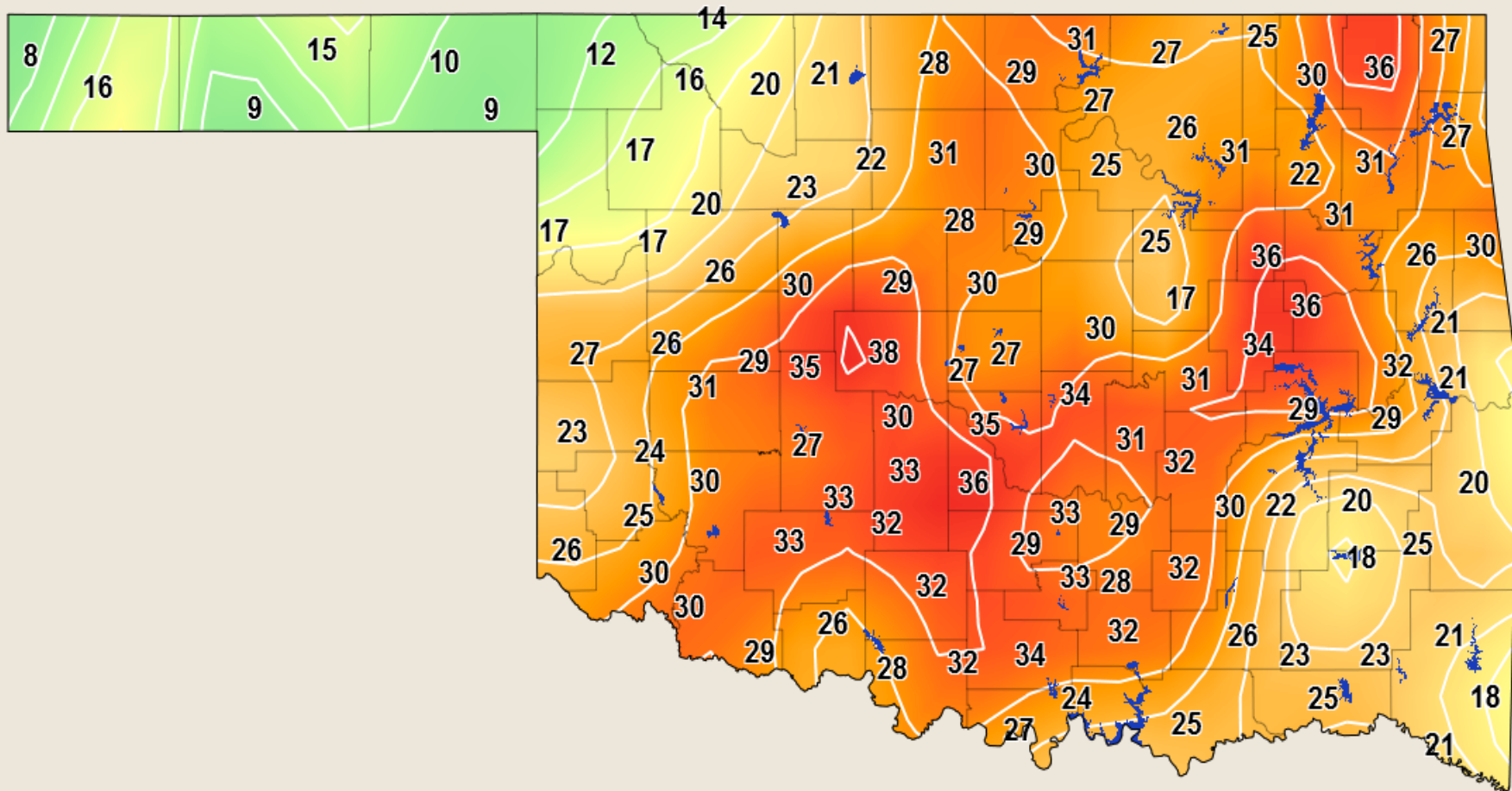
Relative Humidity (3 p.m.)



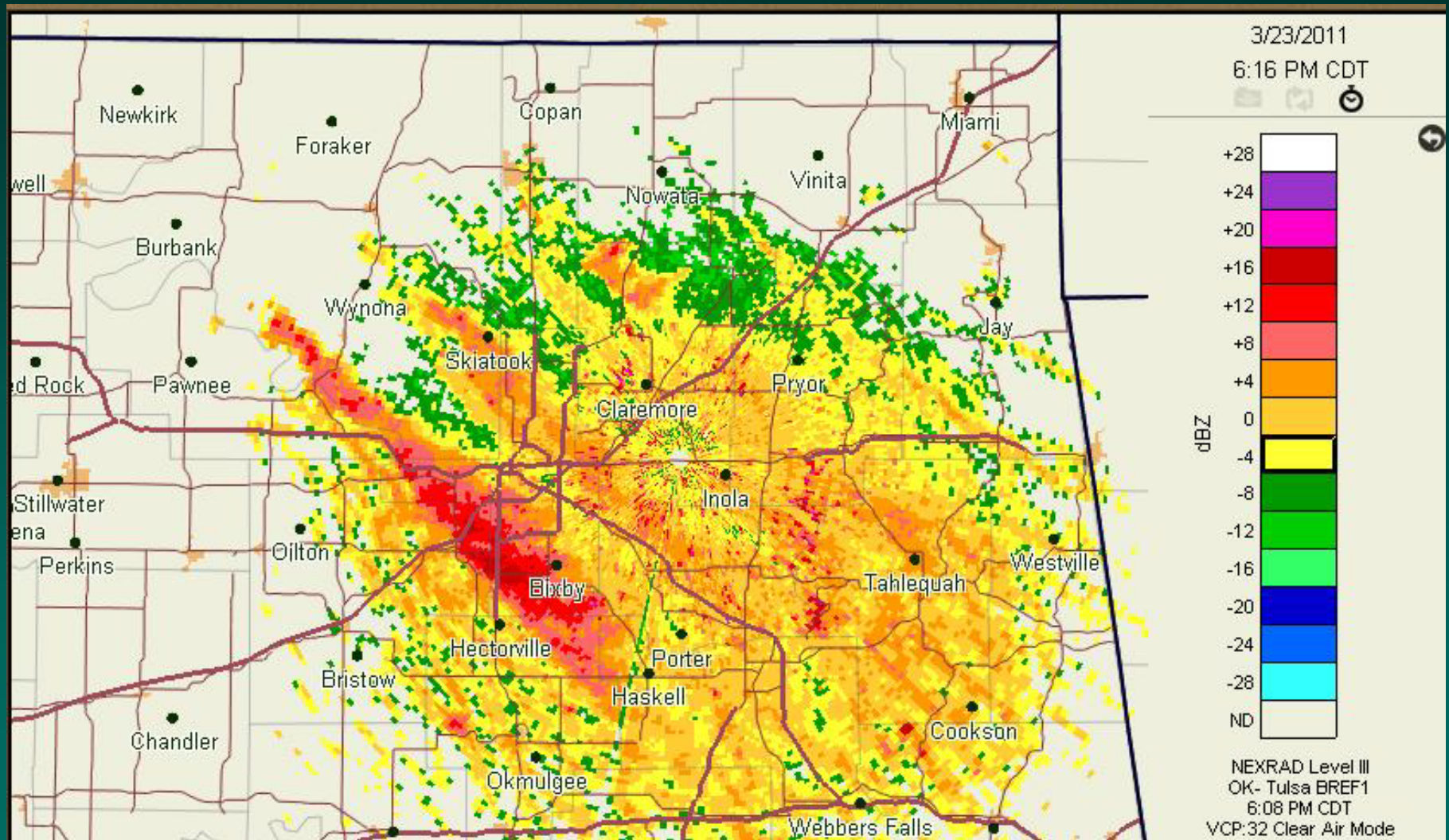
Winds (3 p.m.)

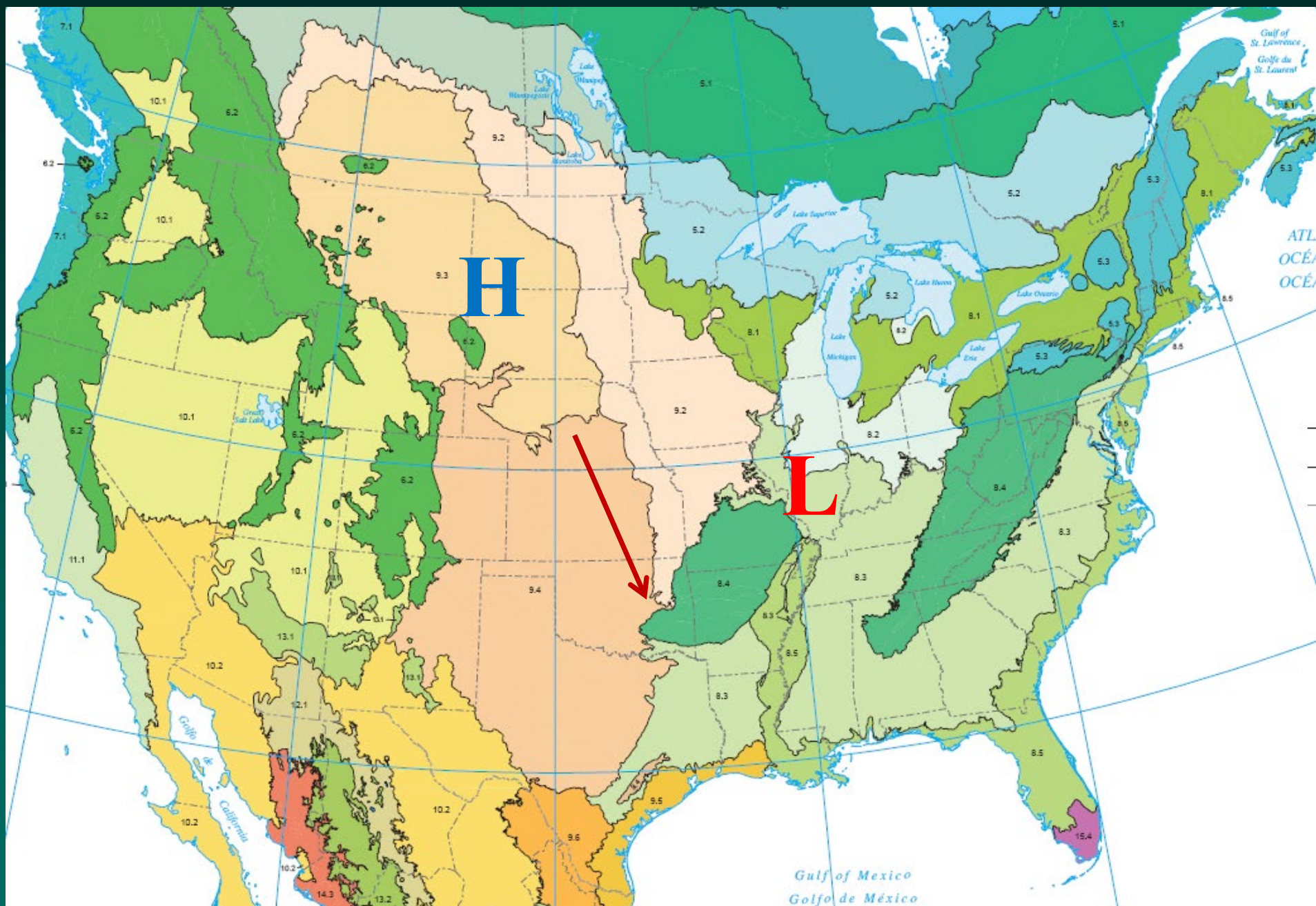


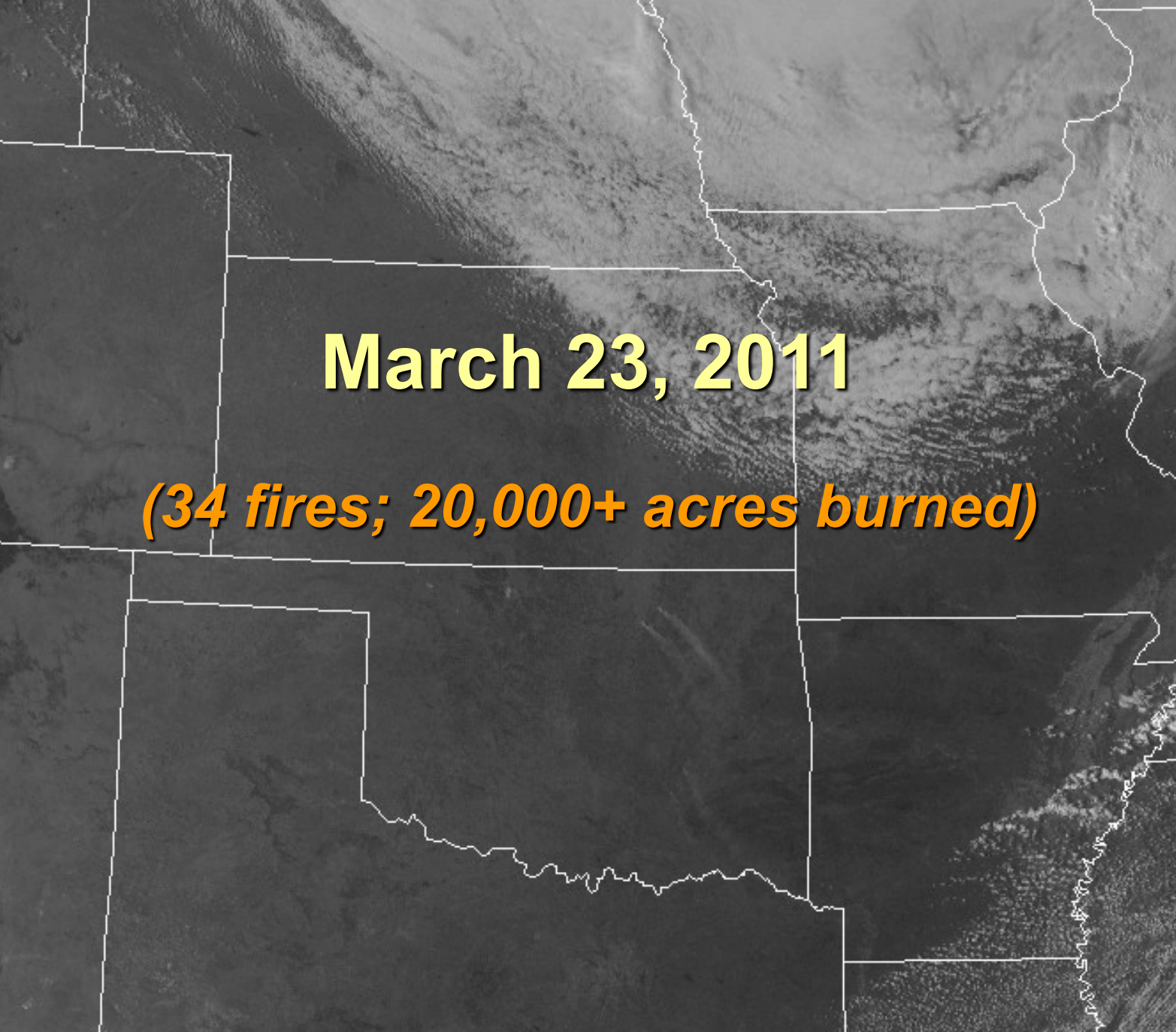
Max Wind Gusts (3 p.m.)



(2) NW/N Winds and Low RH

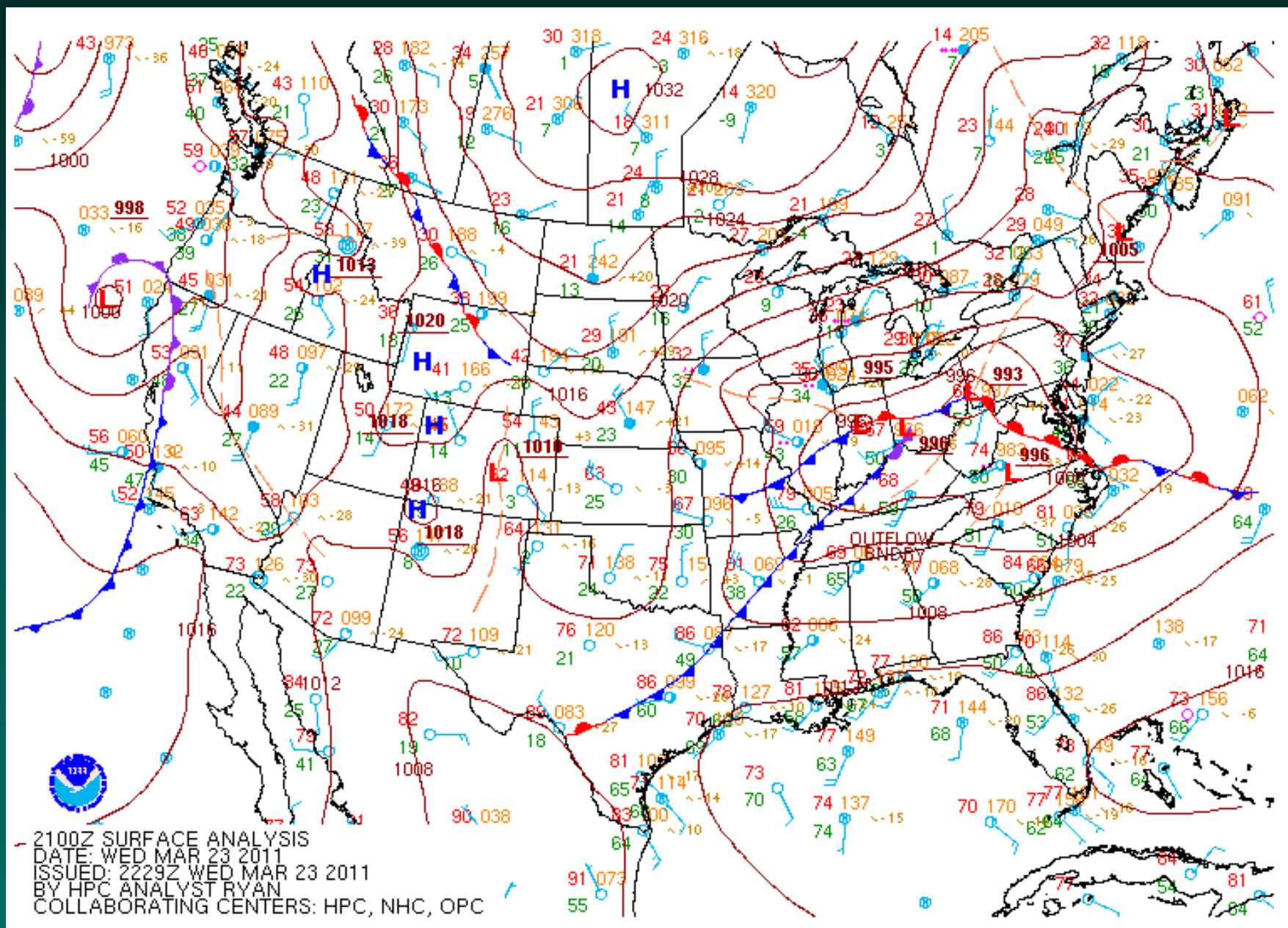


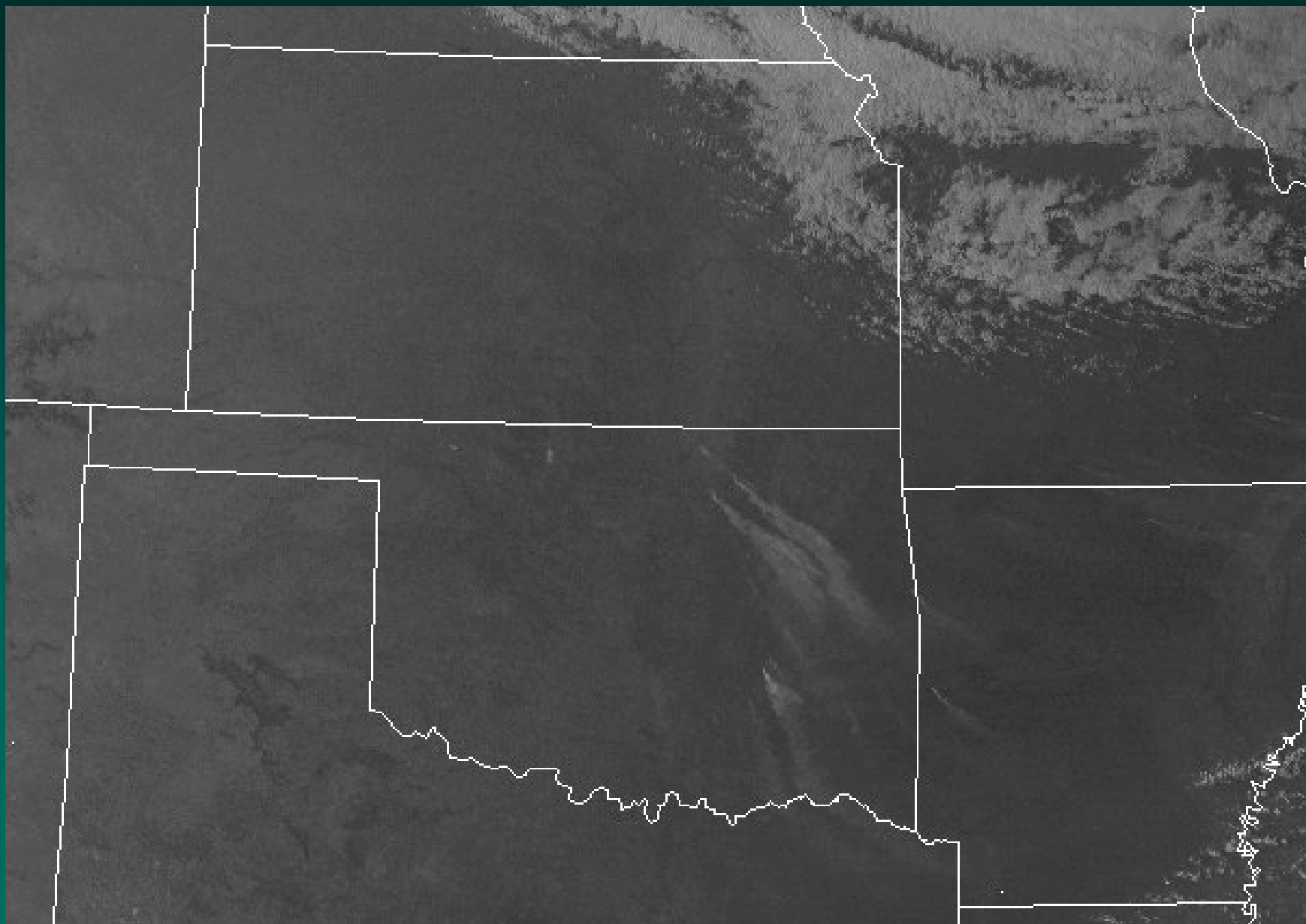


A grayscale aerial photograph of a region in the western United States, showing state boundaries and a large fire scar. The image is overlaid with a dark green background. The text "March 23, 2011" is centered in the upper half of the image in a bold, yellow font. Below it, the text "(34 fires; 20,000+ acres burned)" is centered in a bold, orange font. The photograph shows a large, dark, irregularly shaped area in the center, which is the fire scar. The surrounding areas are lighter and show some texture, possibly from vegetation or terrain. The state boundaries are marked by thin white lines.

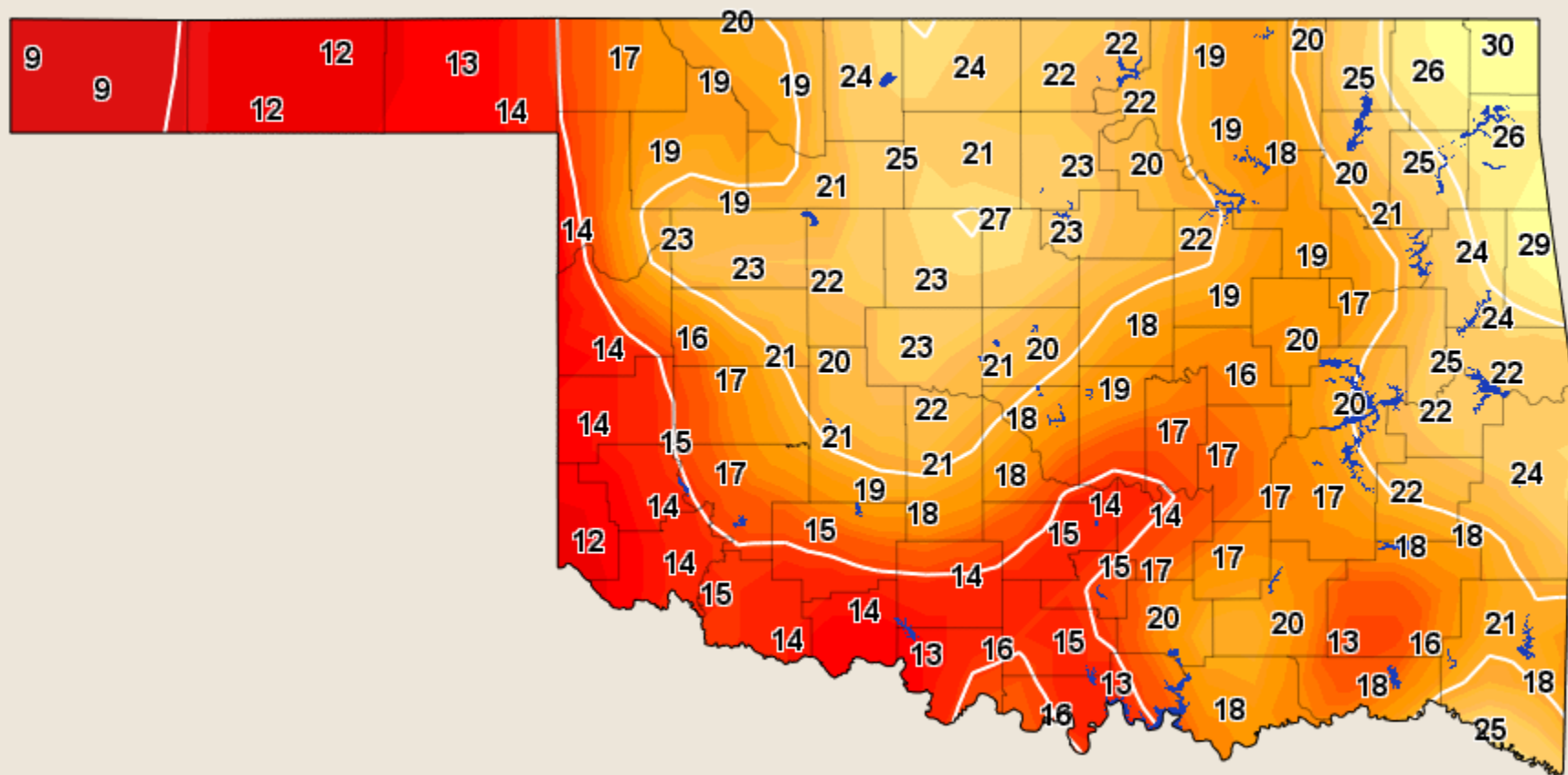
March 23, 2011

(34 fires; 20,000+ acres burned)

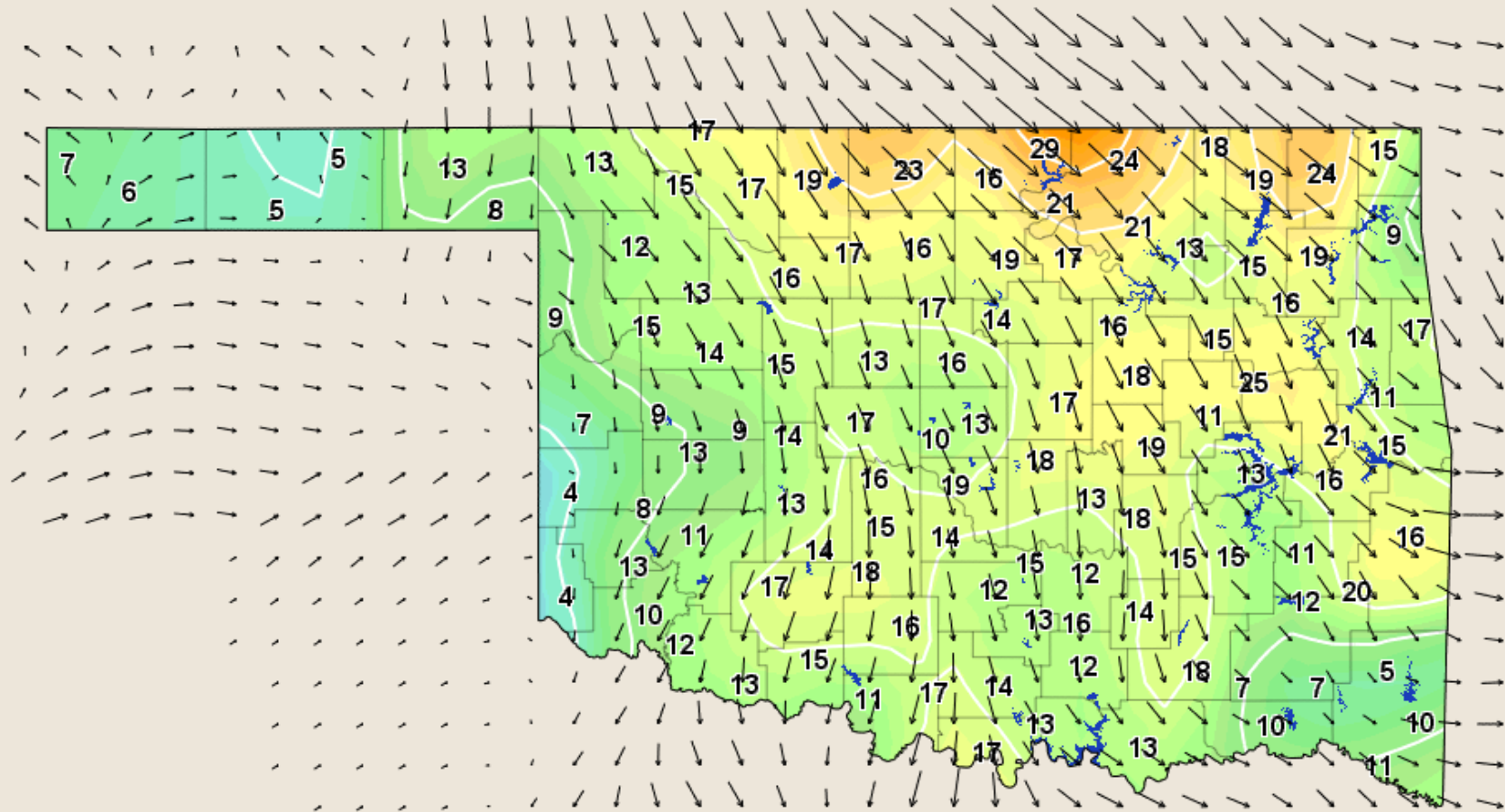




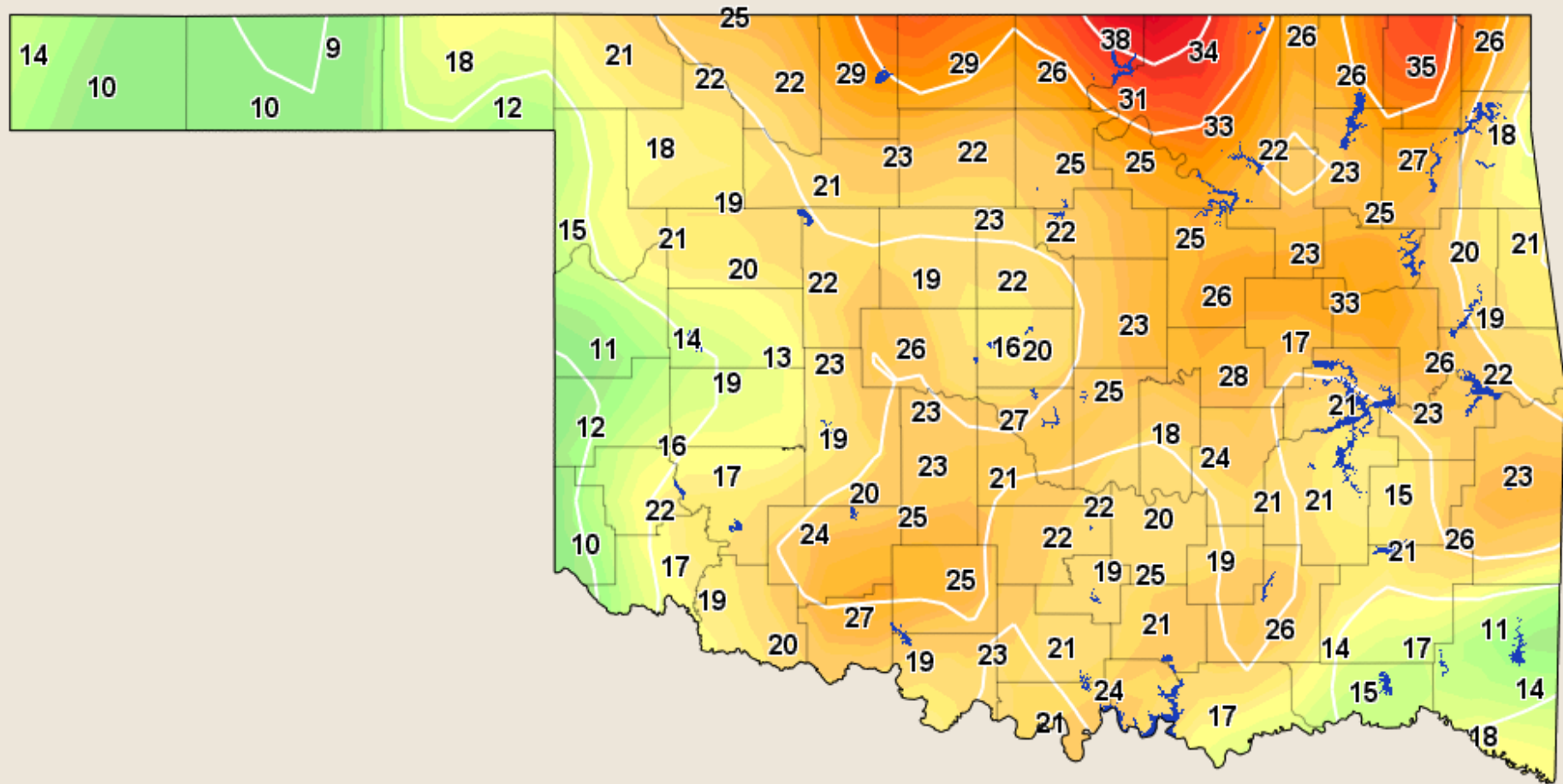
Relative Humidity (3 p.m.)



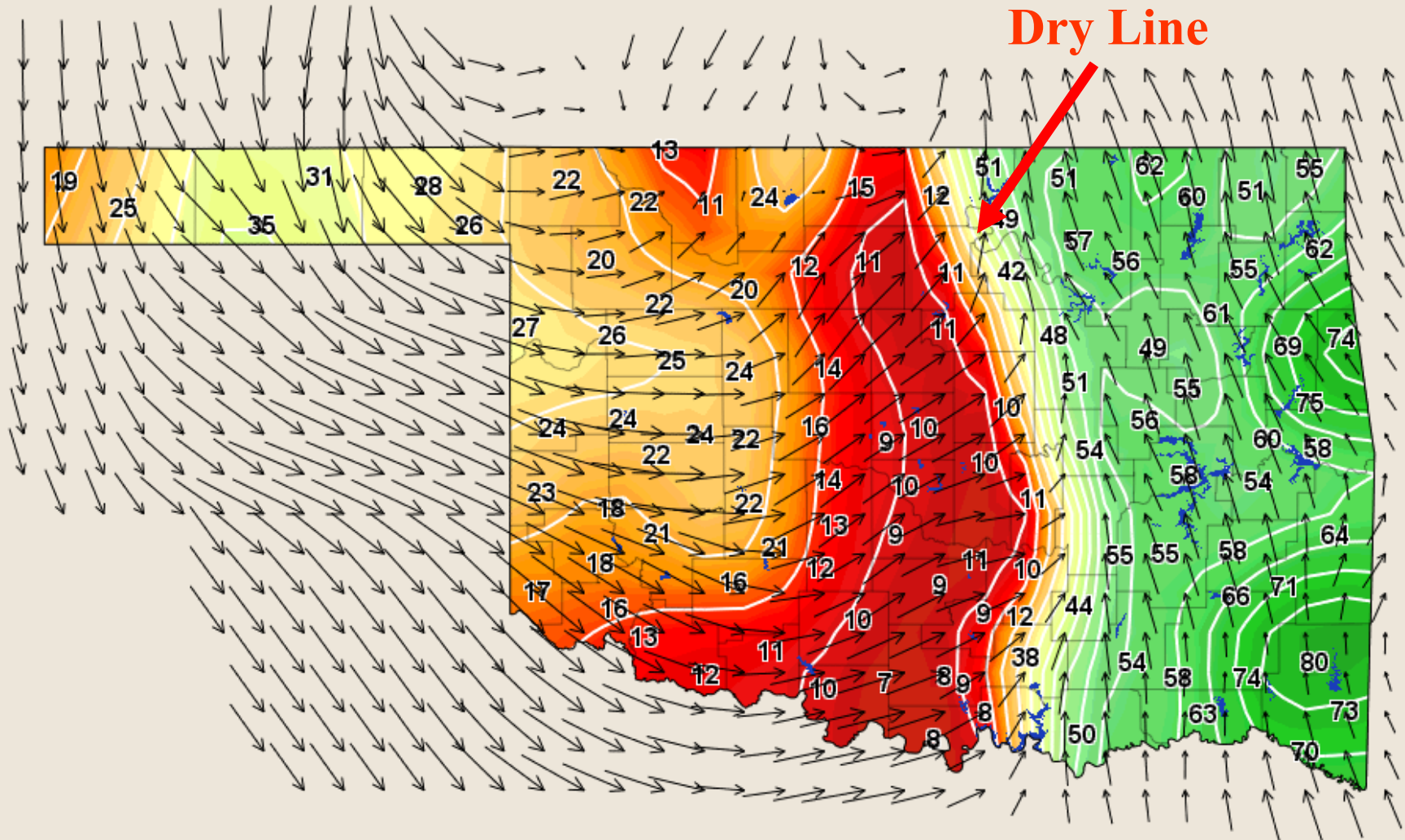
Winds (3 p.m.)



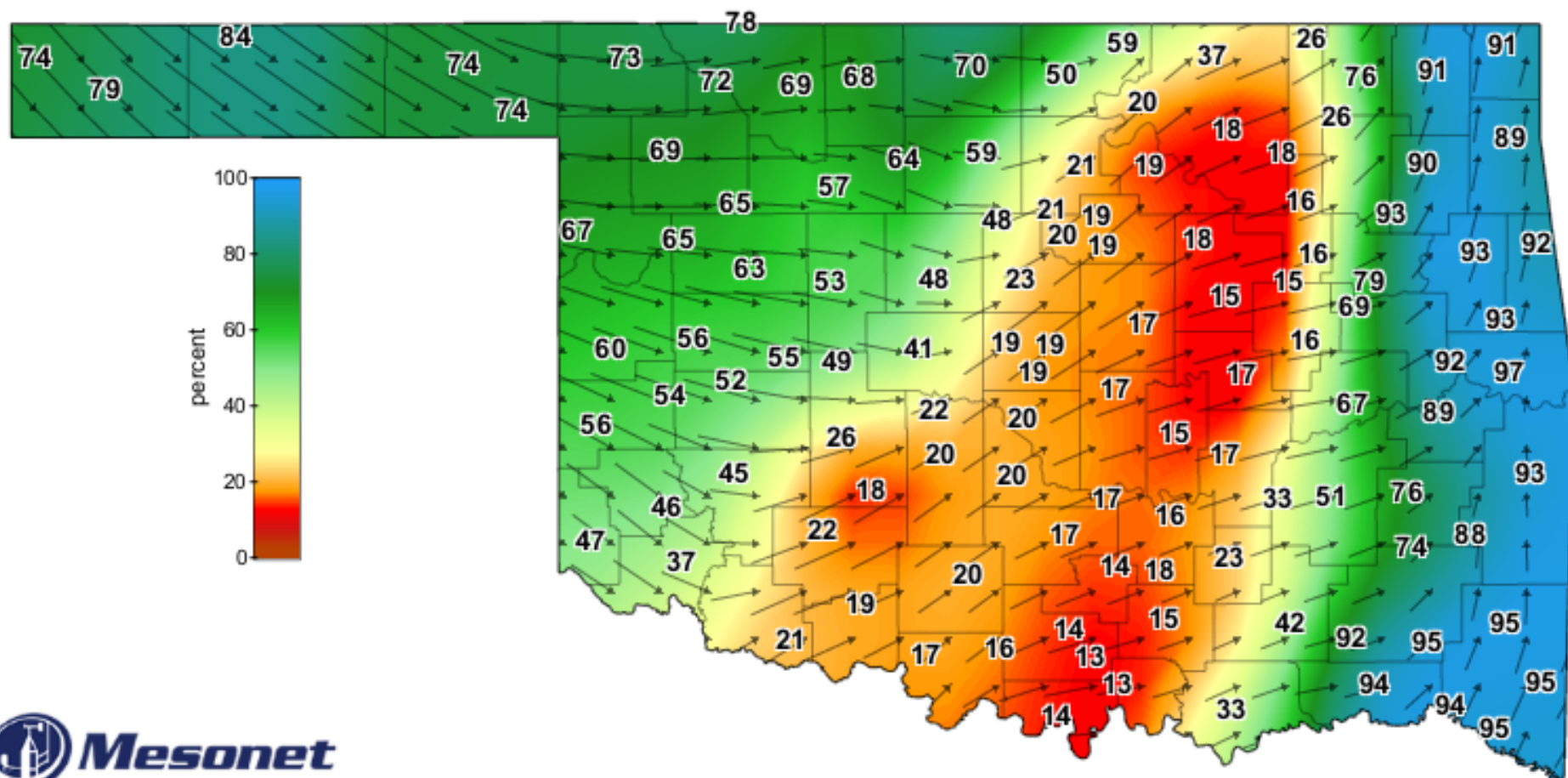
Max Wind Gusts (3 p.m.)



(3) Dry Line Event



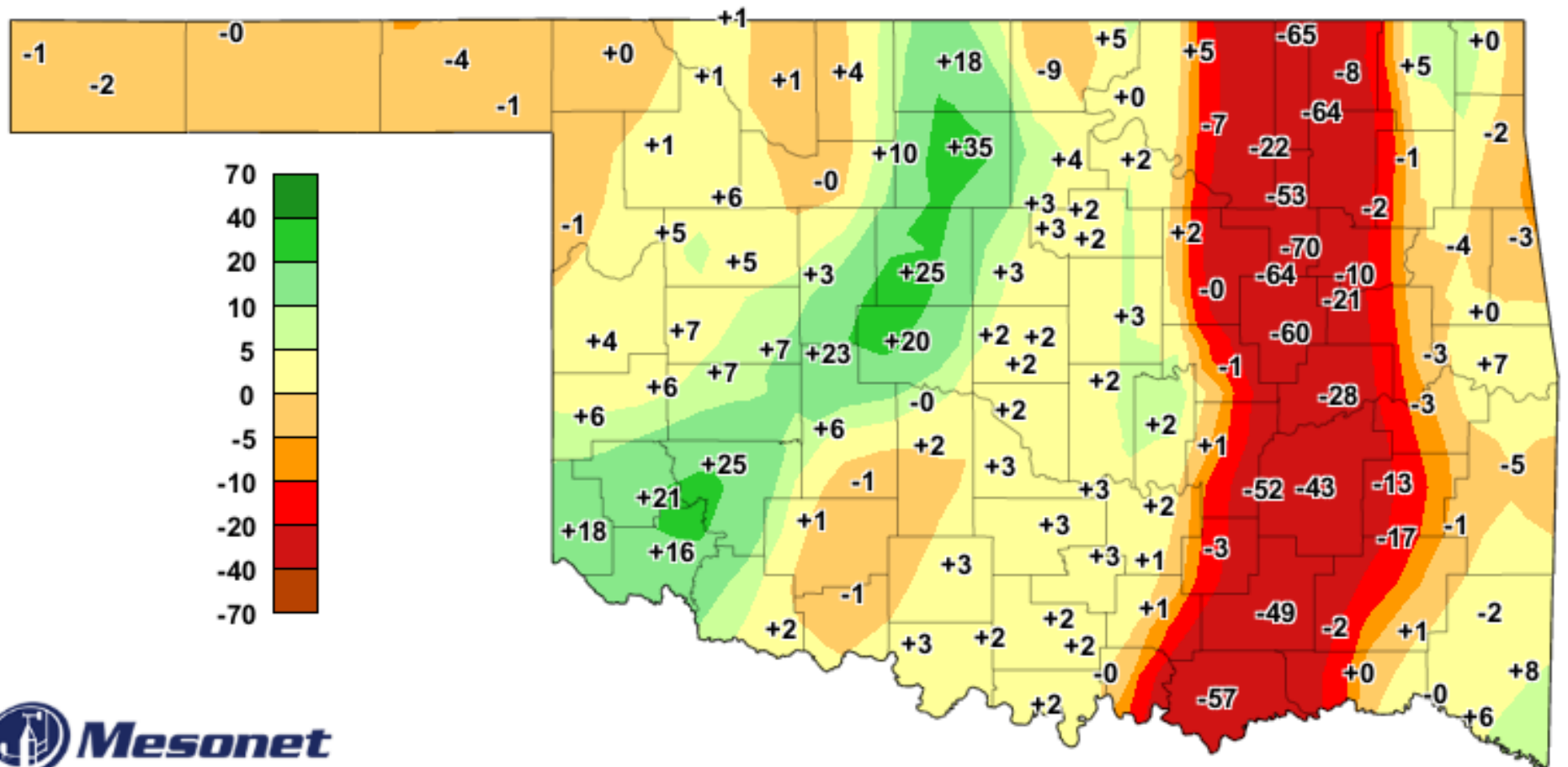




Relative Humidity and Winds

10:00 PM January 21, 2018 CST

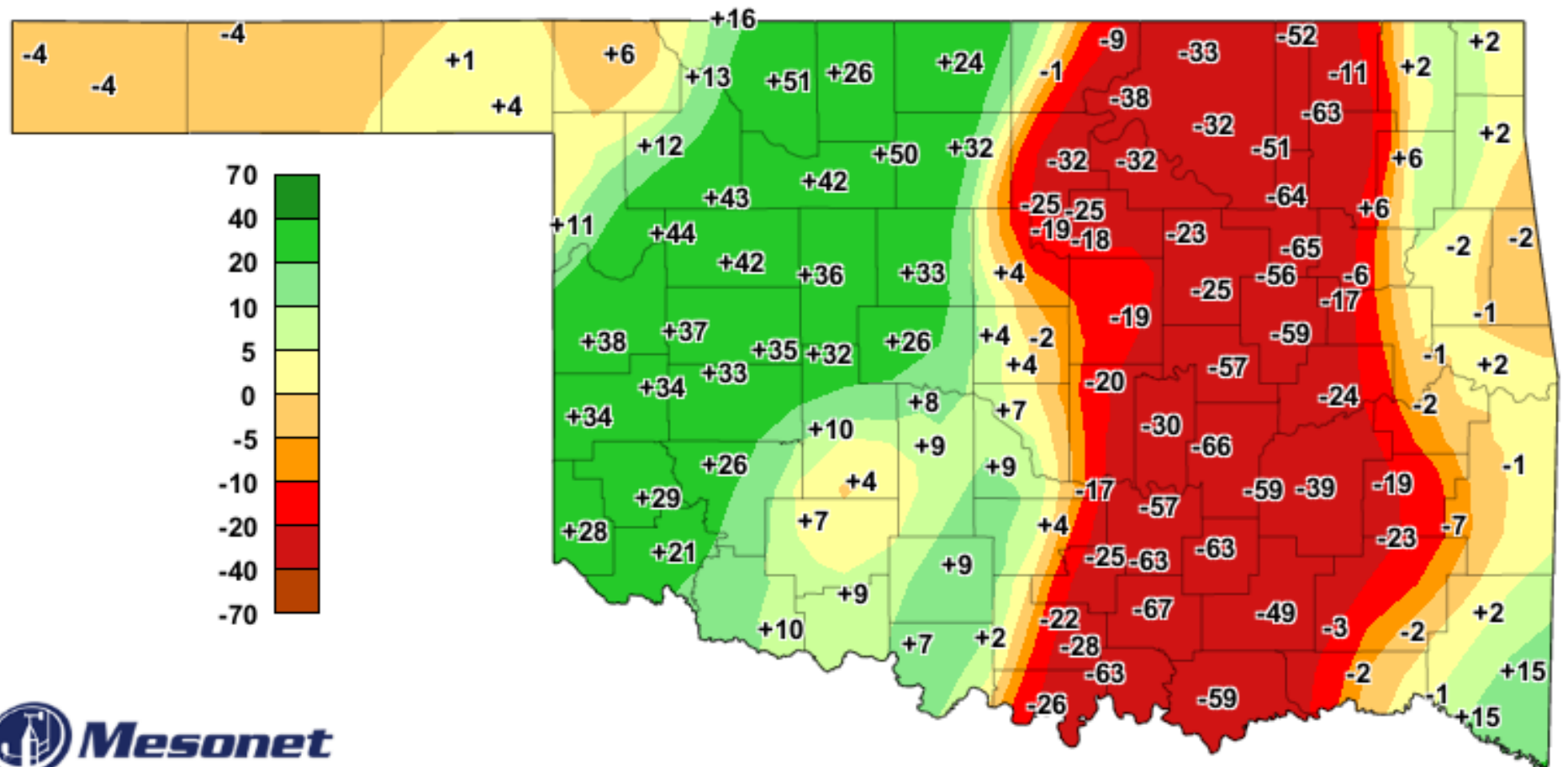
Created 10:05:31 PM January 21, 2018 CST. © Copyright 2018



1-hour Relative Humidity Change (%)

10:00 PM January 21, 2018 CST

Created 10:05:35 PM January 21, 2018 CST. © Copyright 2018



3-hour Relative Humidity Change (%)

10:00 PM January 21, 2018 CST

Created 10:05:35 PM January 21, 2018 CST. © Copyright 2018

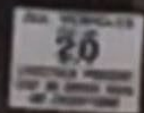
April 13, 2018

WGLN-001 Page 01 of Page 1

GOES-16 BAND 02 (VISIBLE - RED) 0.5 KM | VALID 13 APR 18 18:27:22 UTC

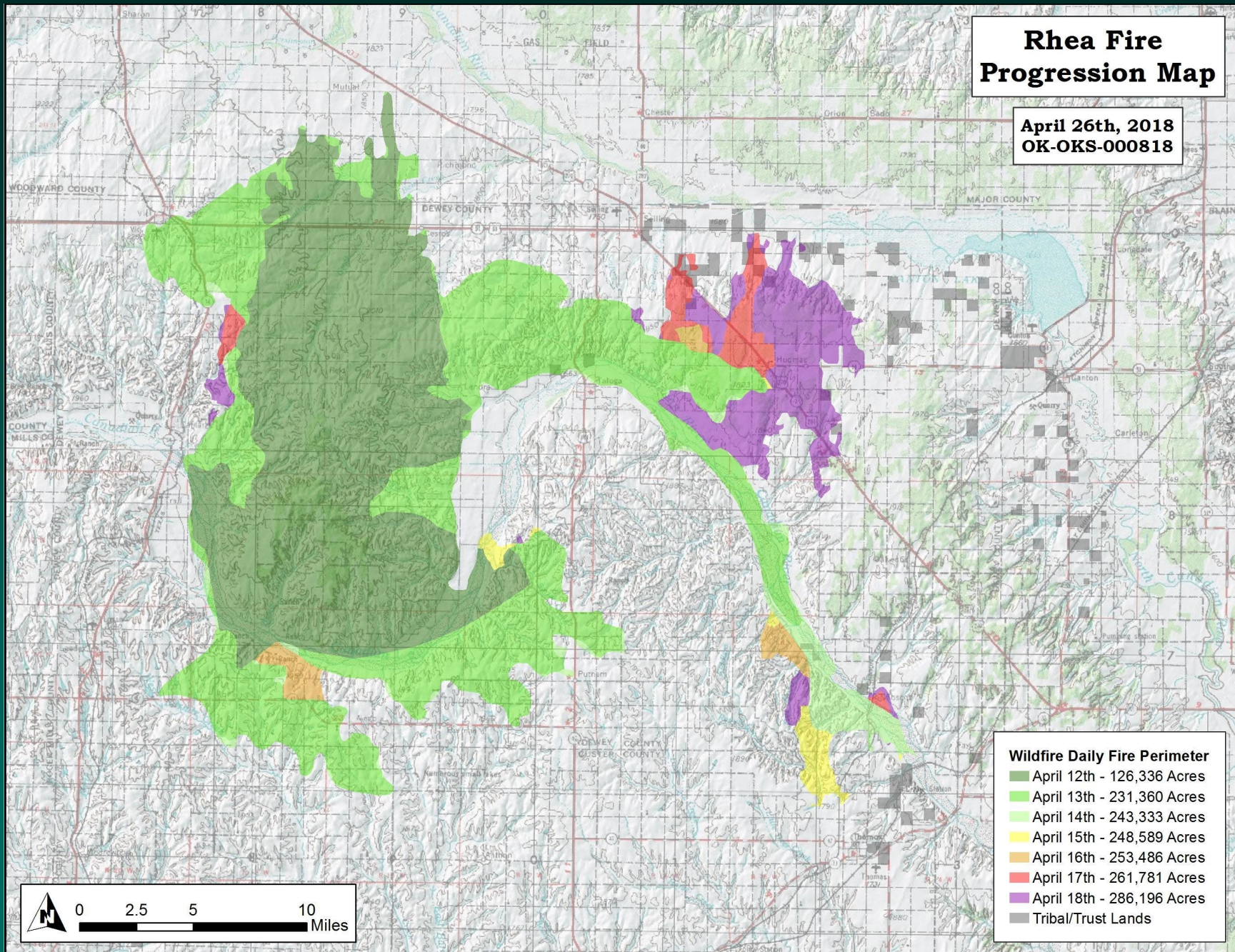
Rhea Fire

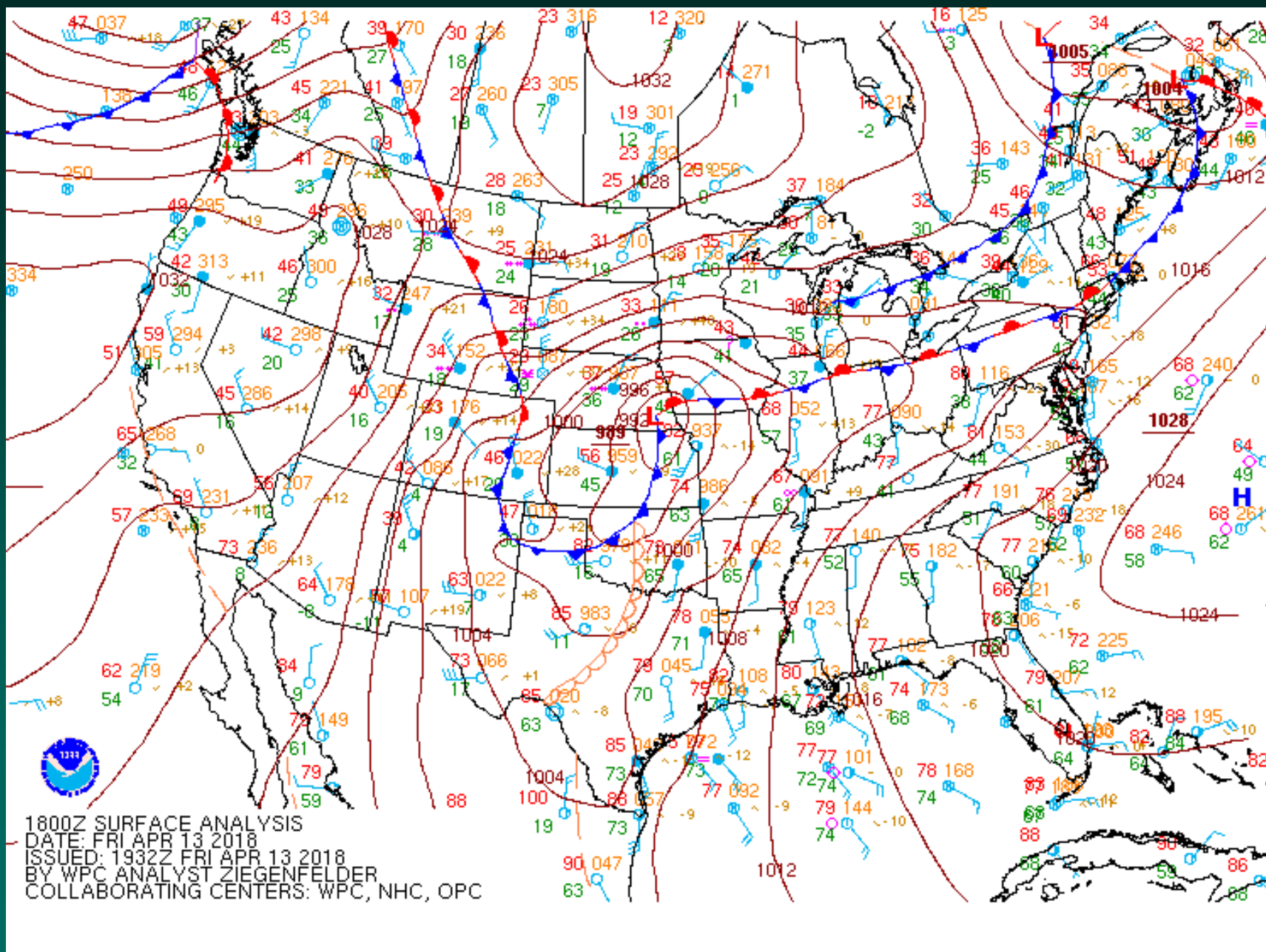
April 12-27, 2018
286,196 acres



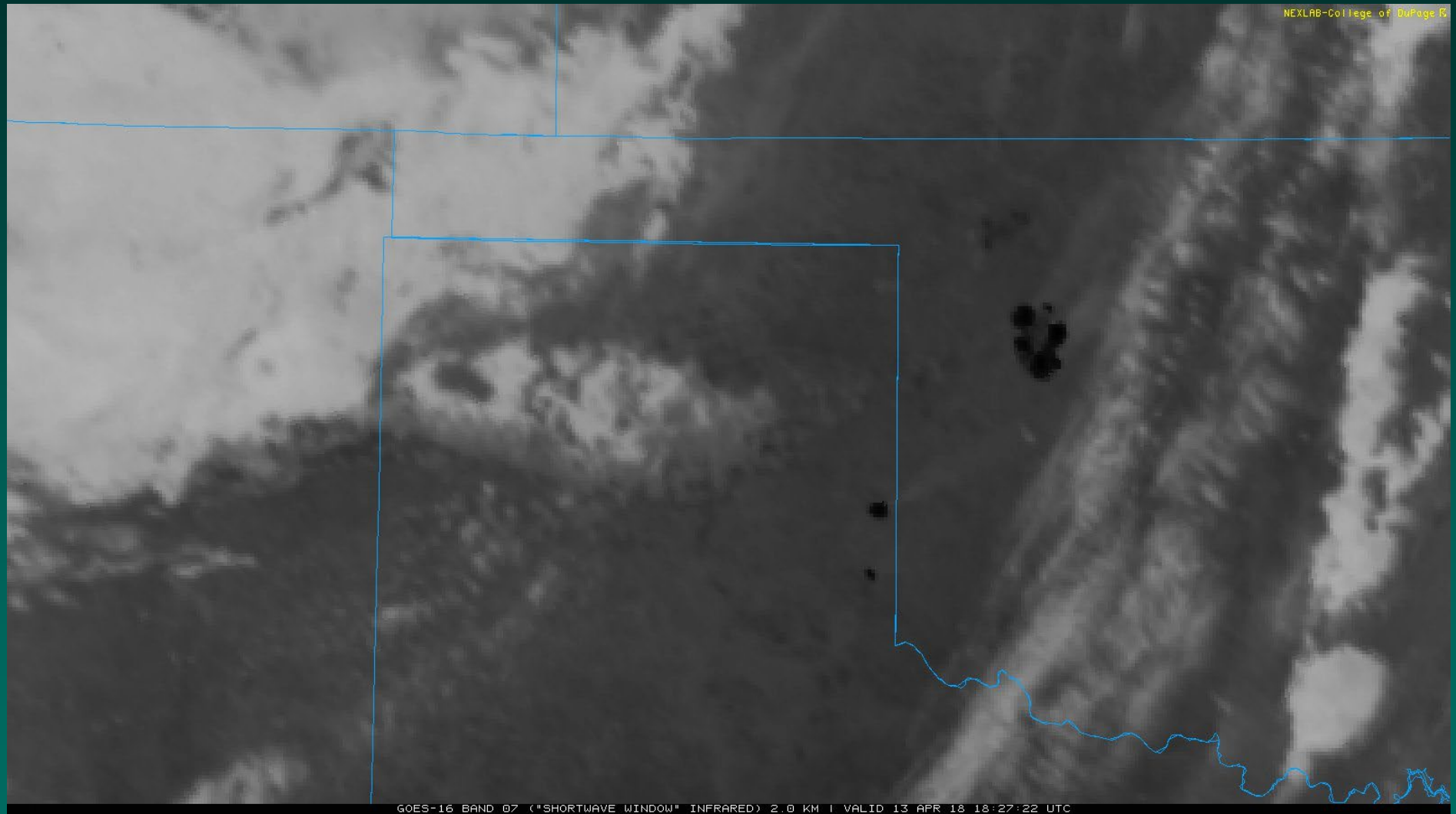
Rhea Fire Progression Map

April 26th, 2018
OK-OKS-000818

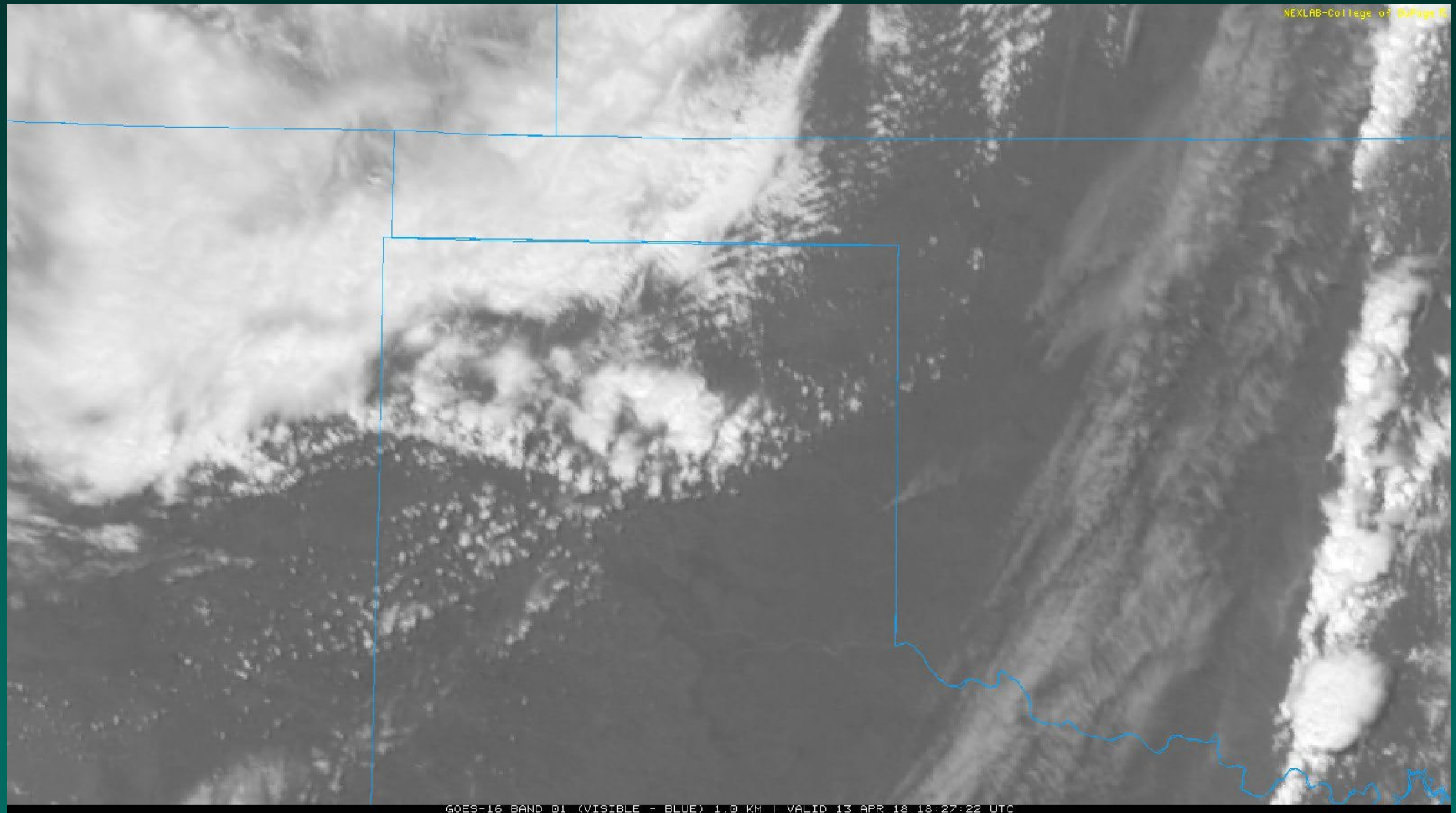




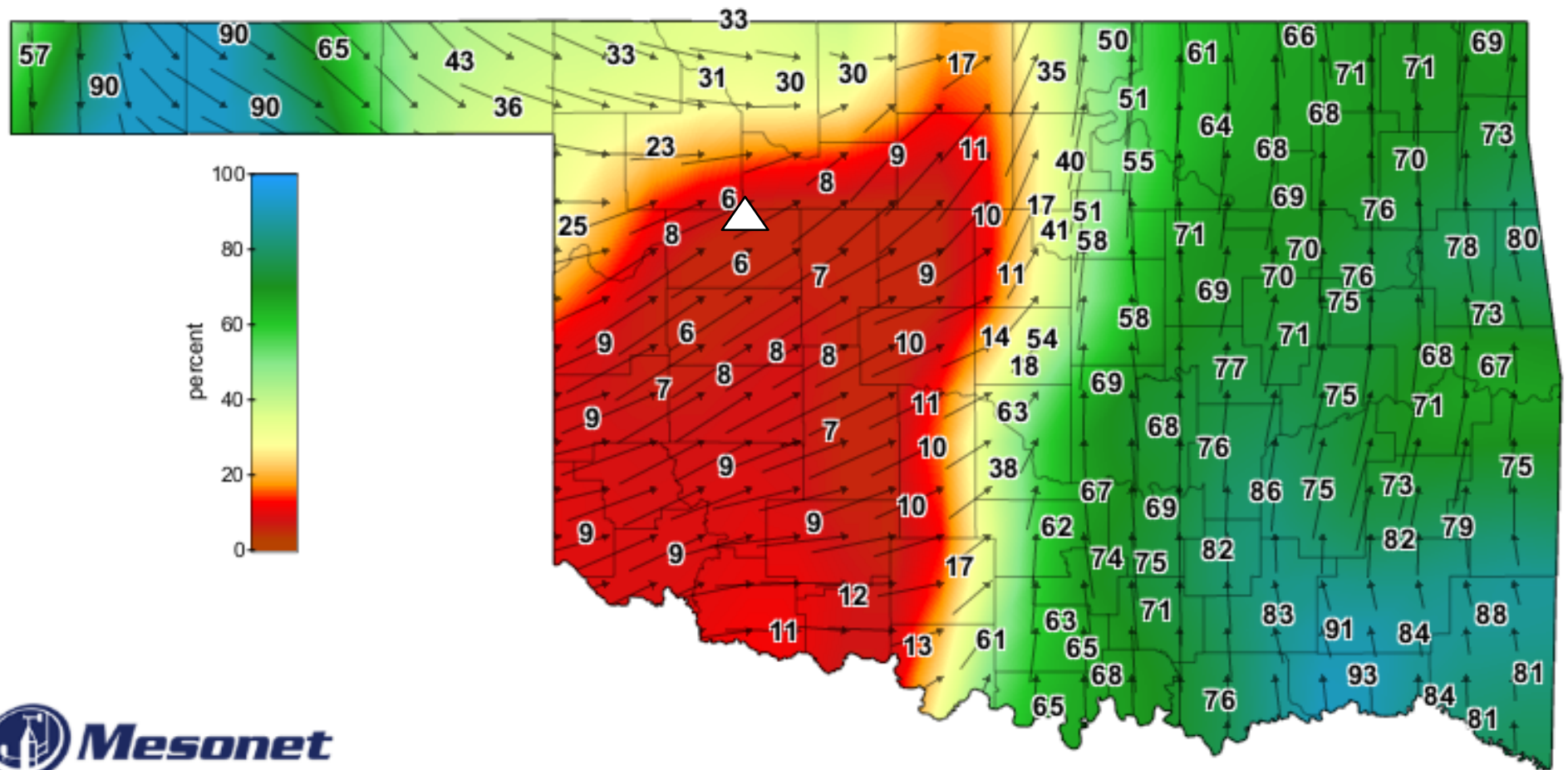
3.9 Micron Infrared



Visible (Blue)



Relative Humidity and Winds

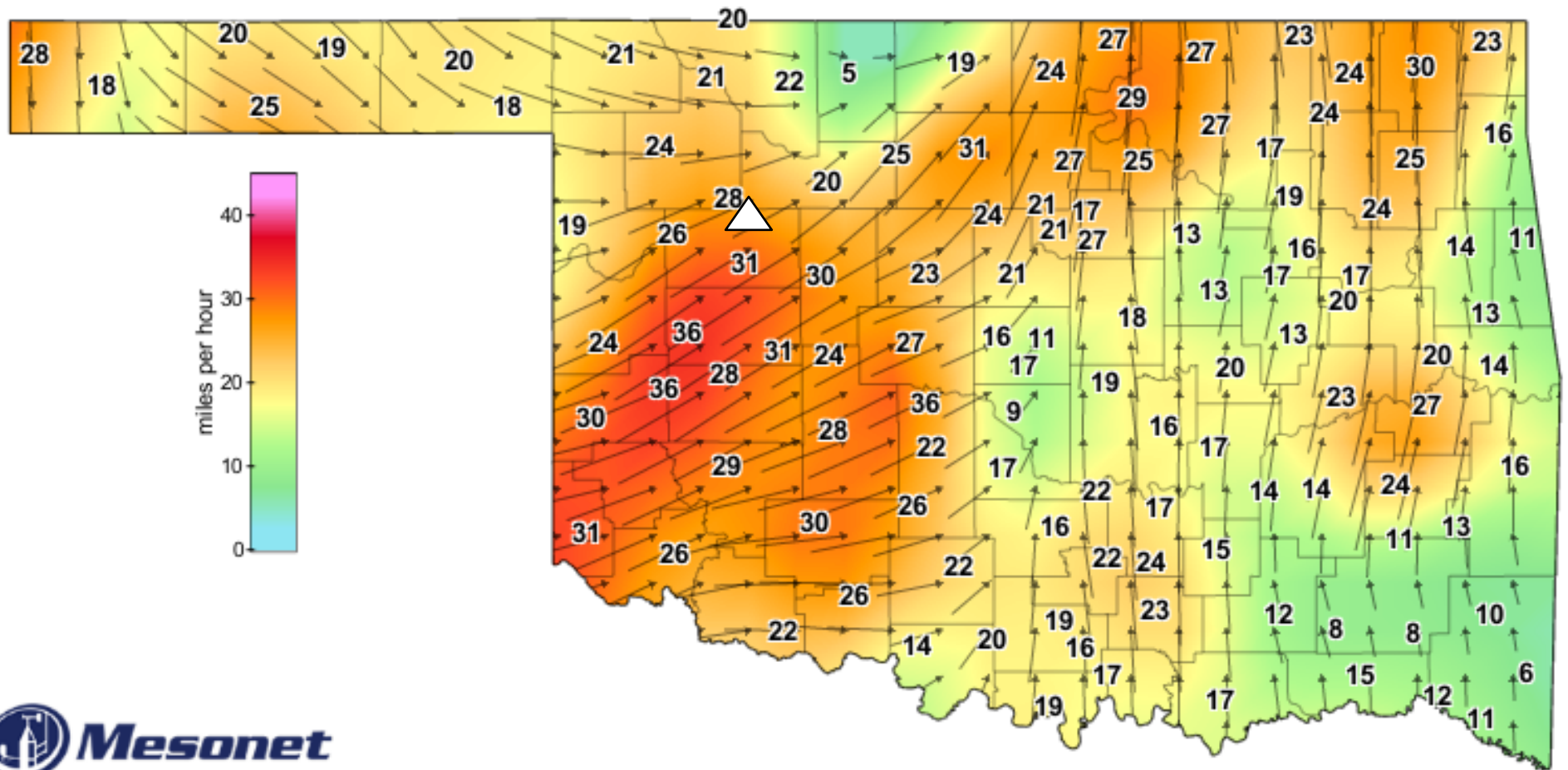


Relative Humidity and Winds

1:25 PM April 13, 2018 CDT

Created 1:30:31 PM April 13, 2018 CDT. © Copyright 2018

Winds

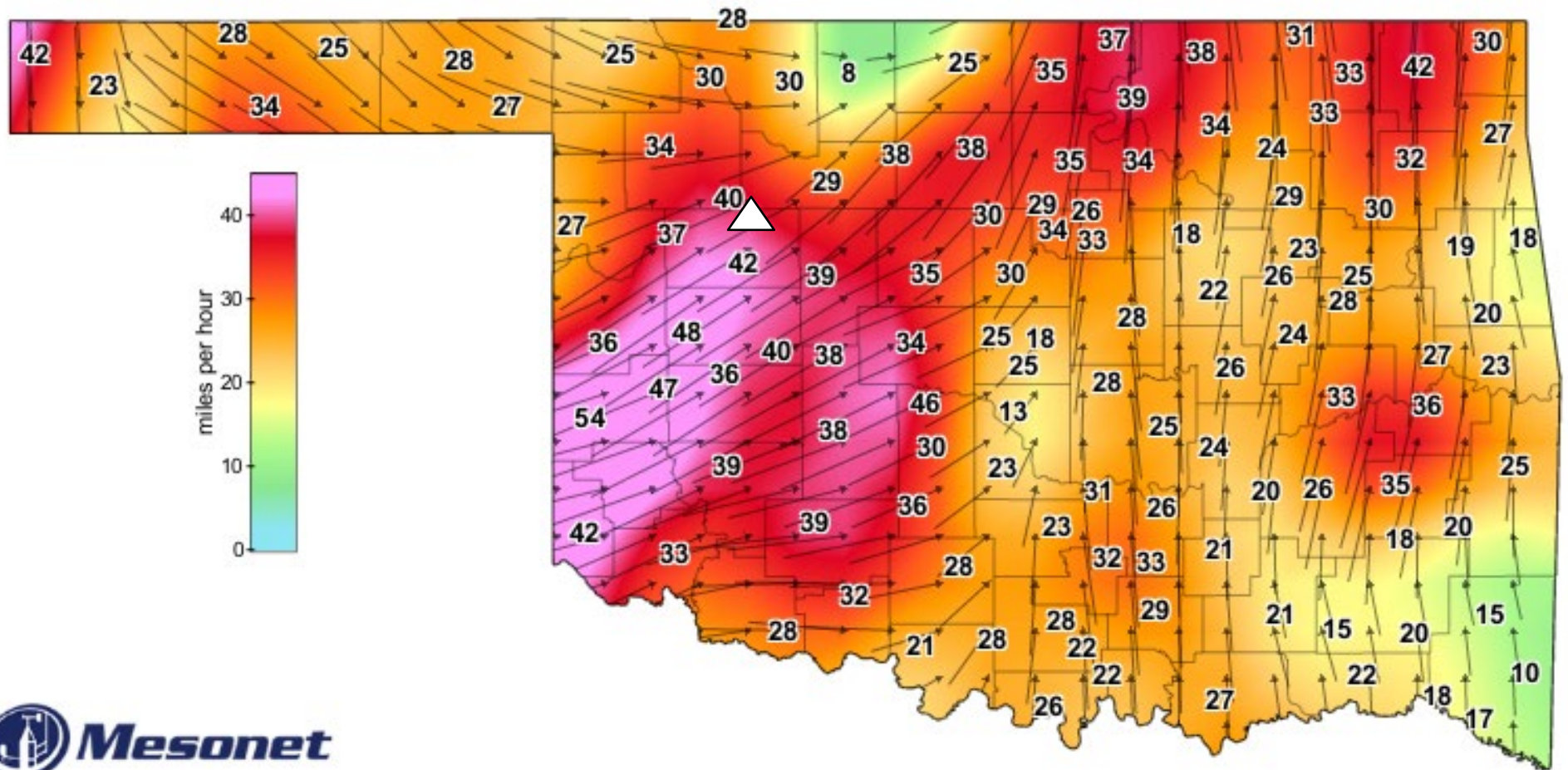


Wind Speed and Direction

1:25 PM April 13, 2018 CDT

Created 1:30:29 PM April 13, 2018 CDT. © Copyright 2018

Wind Gusts

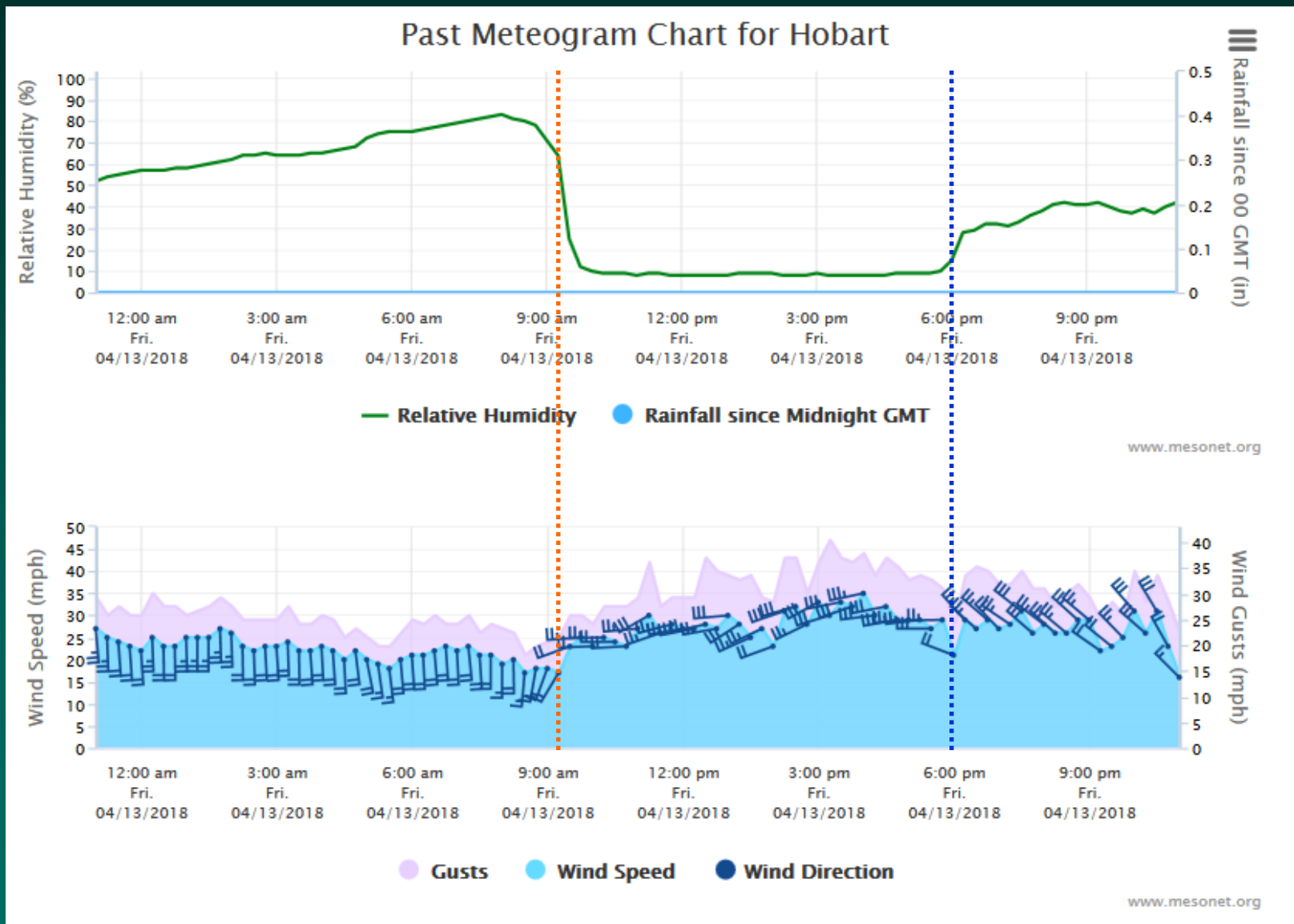


Wind Gusts (mph)

1:25 PM April 13, 2018 CDT

Created 1:30:32 PM April 13, 2018 CDT. © Copyright 2018

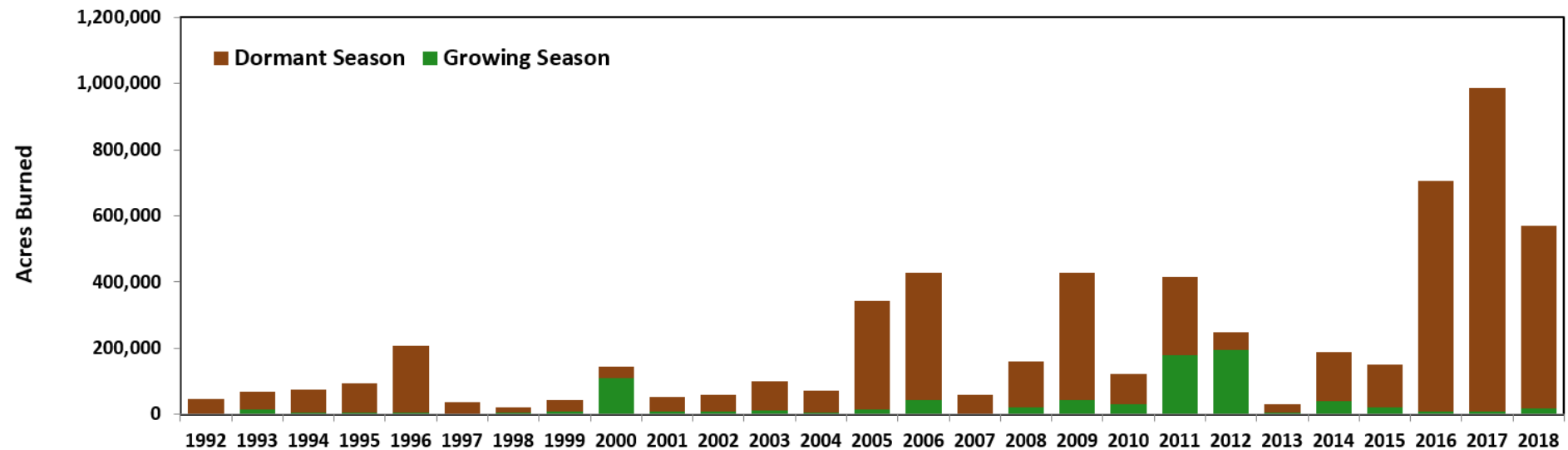
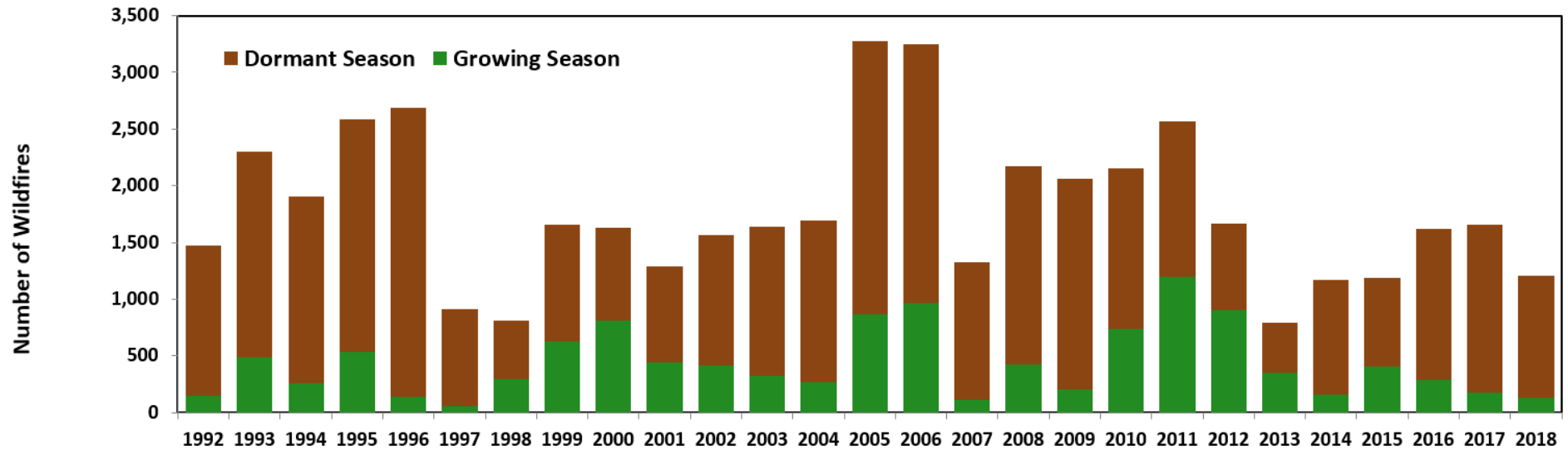
Passage of Dry Line and Cold Front at Hobart



A landscape photograph featuring a grassy field in the foreground, a line of trees on the left, and a power line tower in the distance. The sky is blue with scattered white clouds. The title "Growing Season Outbreaks" is overlaid in the center in a yellow, italicized font.

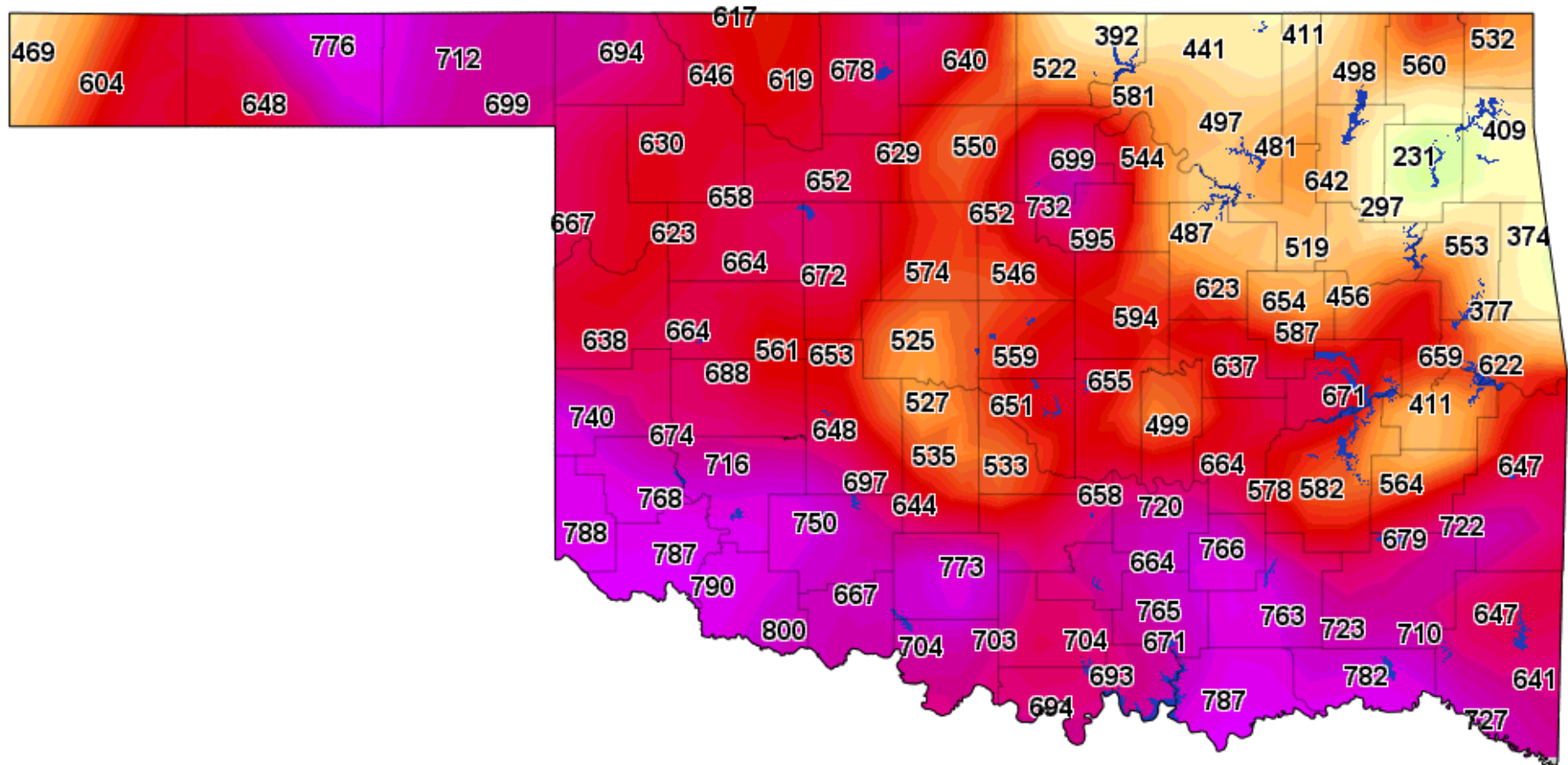
Growing Season Outbreaks

Oklahoma Wildfires by Year (1992-2018)



Keetch-Byram Drought Index

Aug. 16, 2011



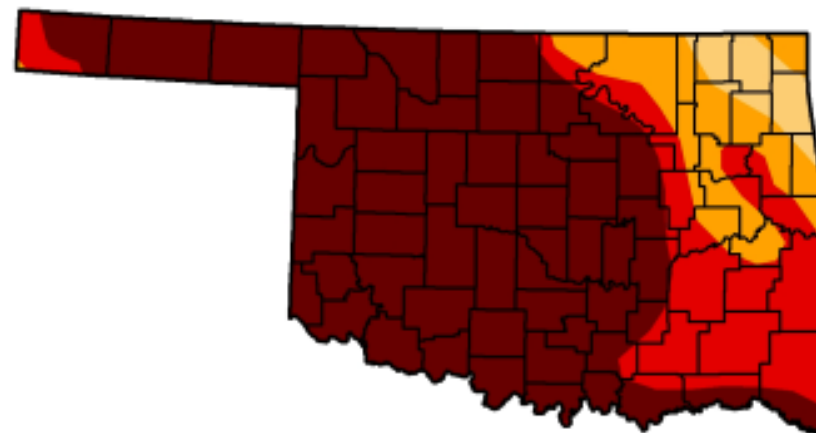
U.S. Drought Monitor

Oklahoma

August 16, 2011
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	96.35	85.39	66.84
Last Week (08/09/2011 map)	0.00	100.00	100.00	100.00	92.88	64.70
3 Months Ago (05/17/2011 map)	23.40	76.60	67.60	54.97	40.14	13.67
Start of Calendar Year (12/28/2010 map)	13.82	86.18	47.90	1.50	0.00	0.00
Start of Water Year (09/28/2010 map)	66.28	33.72	4.21	0.00	0.00	0.00
One Year Ago (08/10/2010 map)	85.46	14.54	4.27	1.34	0.00	0.00



Intensity:



The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

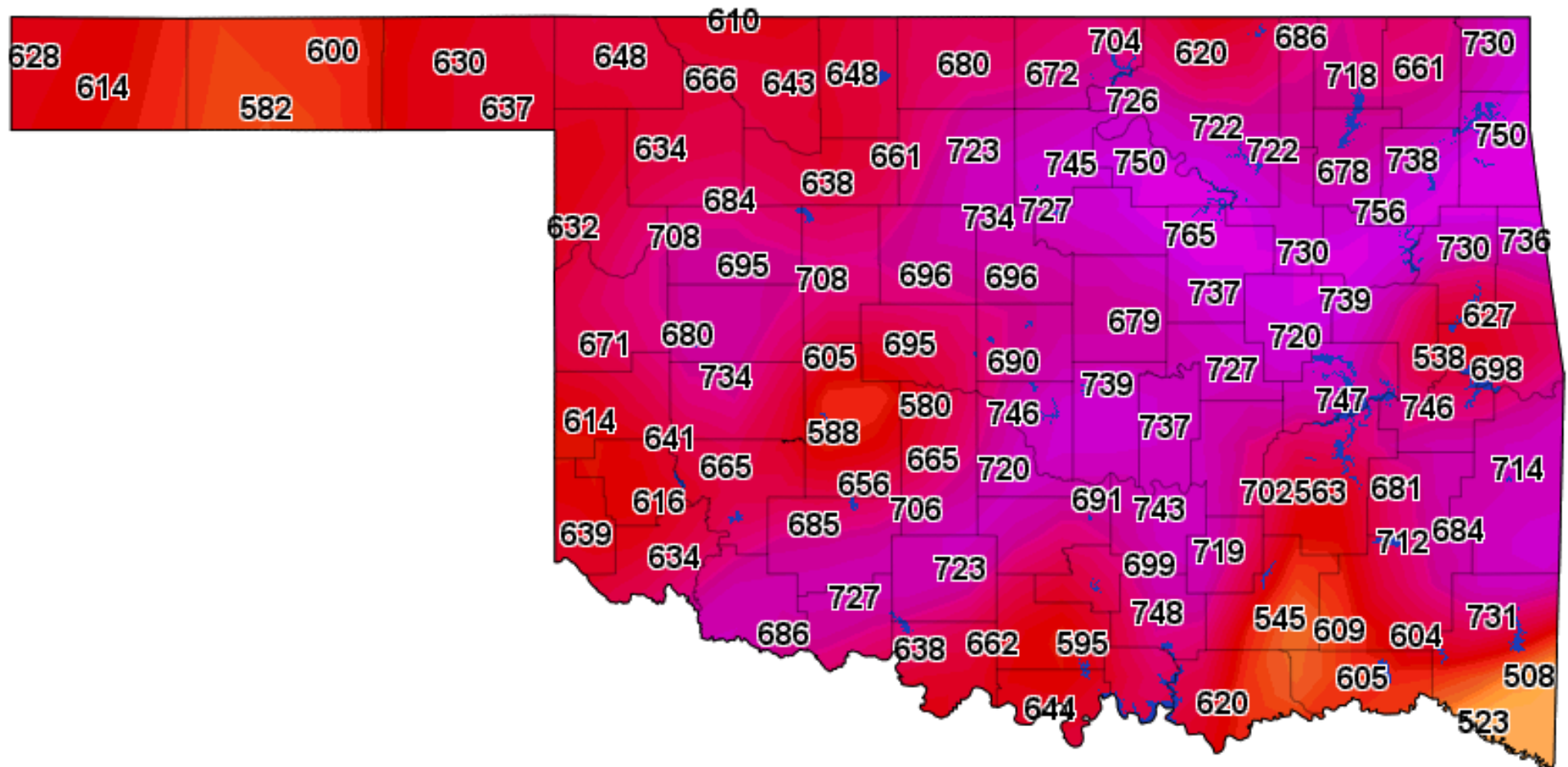
<http://drought.unl.edu/dm>



Released Thursday, August 18, 2011
Laura Edwards, Western Regional Climate Center

Keetch-Byram Drought Index

Aug. 15, 2012



U.S. Drought Monitor

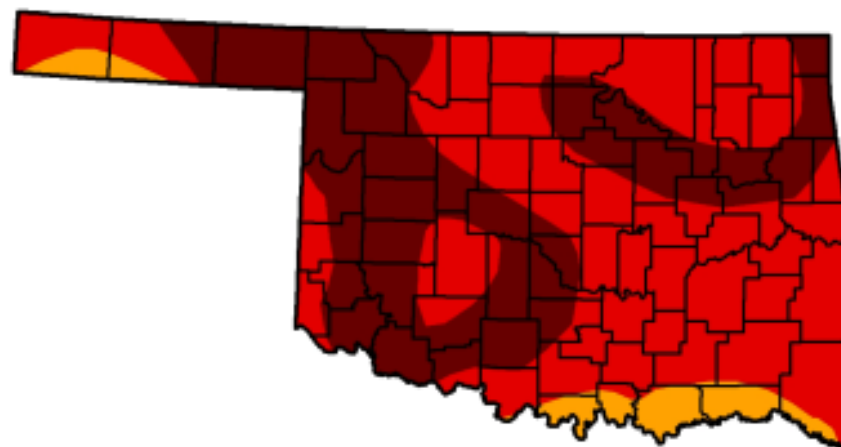
Oklahoma

August 14, 2012

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	100.00	94.59	38.86
Last Week (08/07/2012 map)	0.00	100.00	100.00	100.00	96.78	16.03
3 Months Ago (05/15/2012 map)	76.93	23.07	13.68	9.34	3.54	0.00
Start of Calendar Year (12/27/2011 map)	14.83	85.17	78.76	50.55	27.48	3.33
Start of Water Year (09/27/2011 map)	0.00	100.00	100.00	100.00	78.97	66.42
One Year Ago (08/09/2011 map)	0.00	100.00	100.00	100.00	92.88	64.70



Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

<http://droughtmonitor.unl.edu>



Released Thursday, August 16, 2012

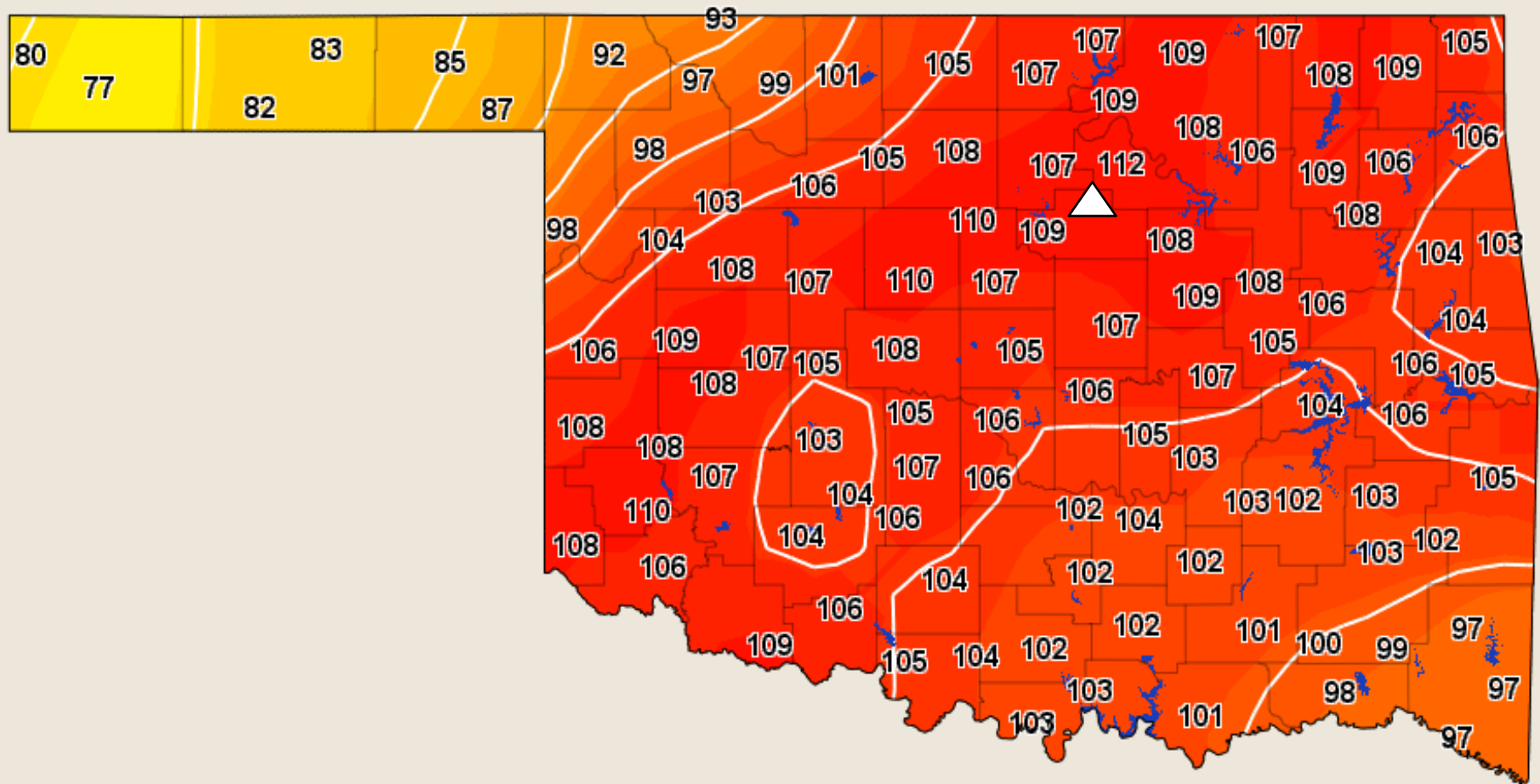
Michael Brewer, National Climatic Data Center, NOAA

A landscape photograph showing a grassy field in the foreground. On the left, there is a dense line of green trees. In the center, a utility pole with cross-arms and wires stands against a blue sky with a large, fluffy white cloud. The date "August 4, 2012" is overlaid in yellow text with a black shadow.

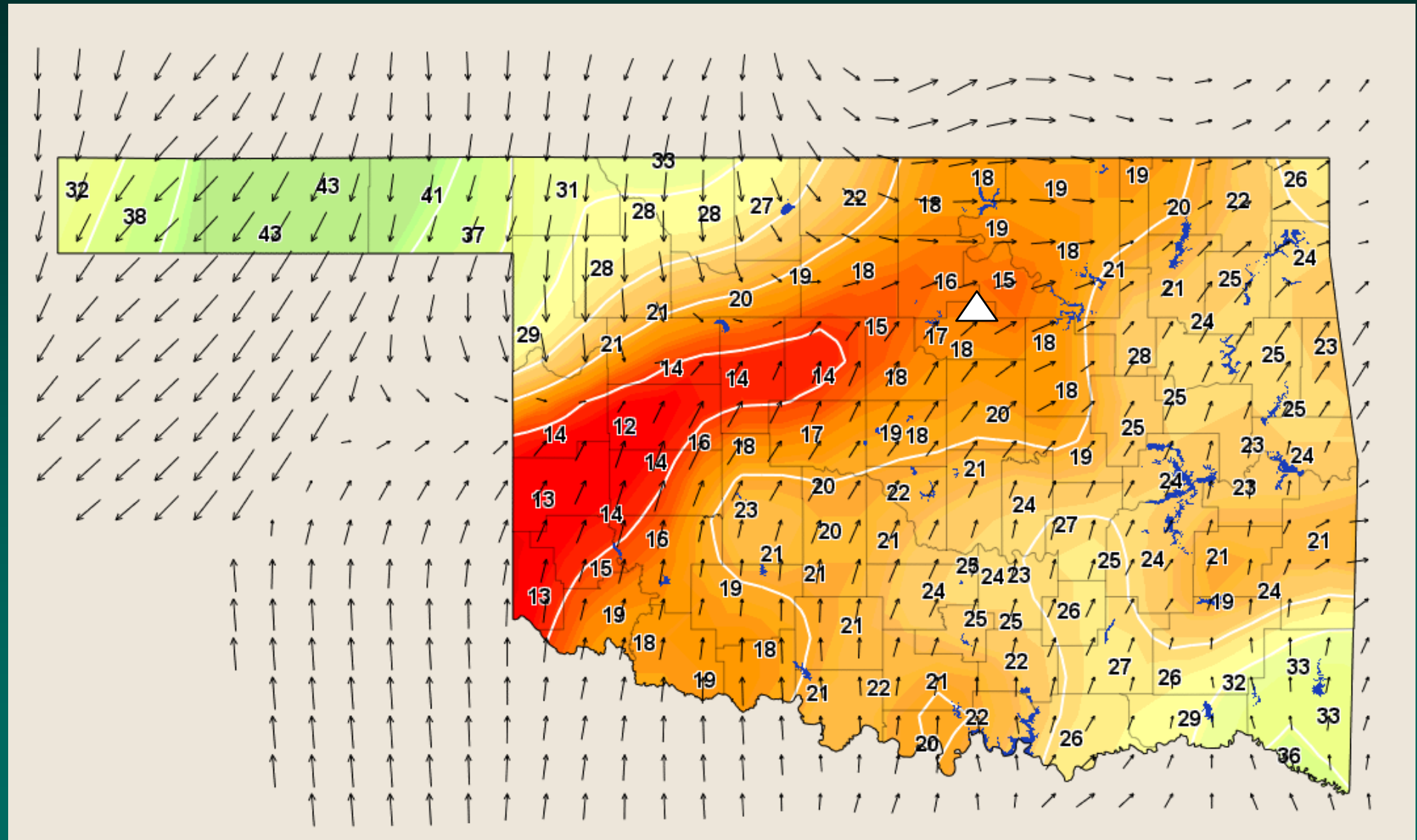
August 4, 2012

"Glencoe" fire: 6,887 acres, 23 homes destroyed

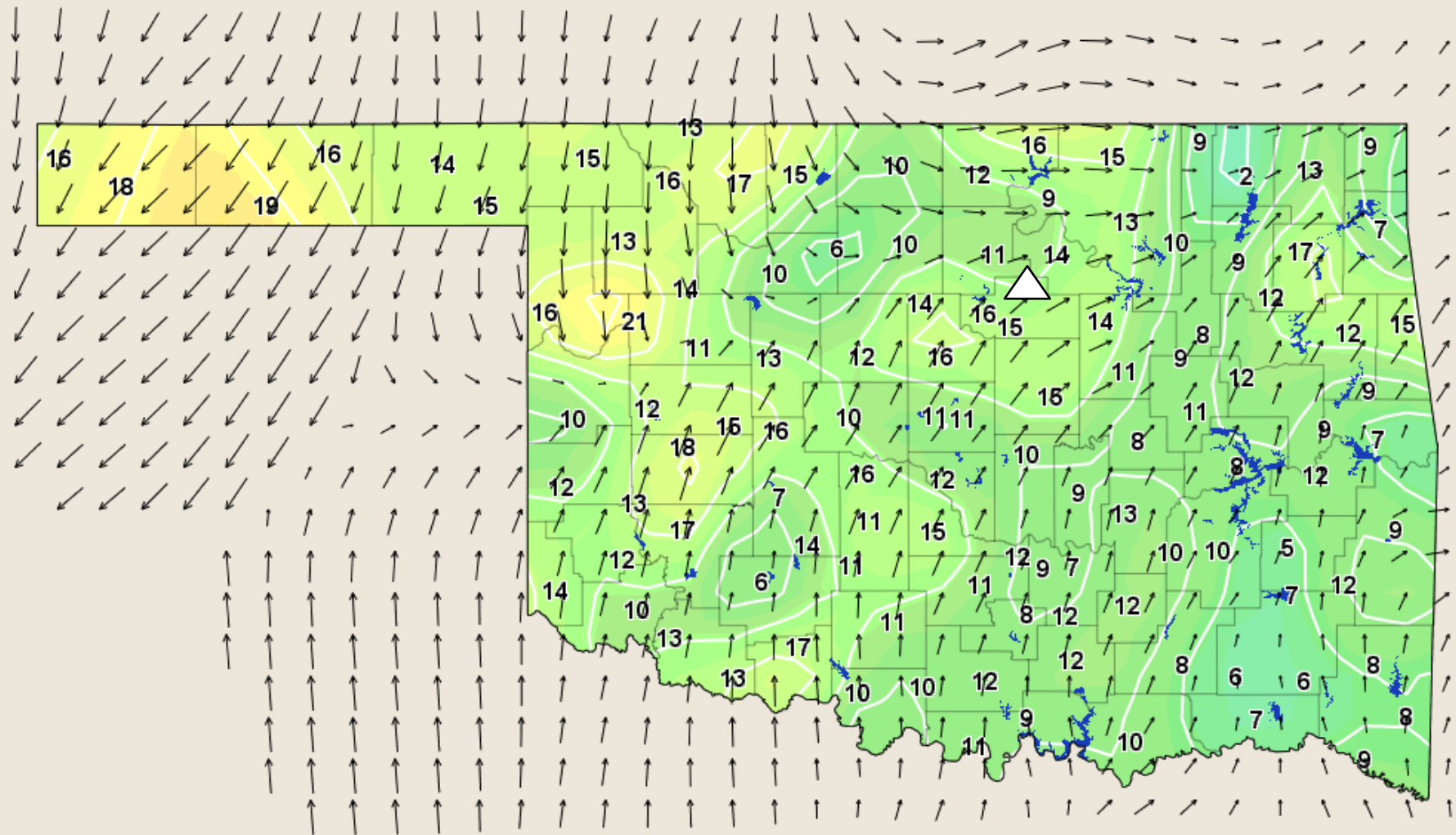
Temperature – 3 p.m., Aug. 4, 2012



Relative Humidity and Winds – 3 p.m., Aug. 4, 2012



Winds – 3 p.m., Aug. 4, 2012



Cleveland/Mannford Complex

August 5-10, 2011

20,129 acres

10:02 84°



KOTV - DT

LIVE

ON THE PHONE:

Ferguson Fire
September 1-9, 2011
39,907 acres

COMANCHE COUNTY WILDFIRE

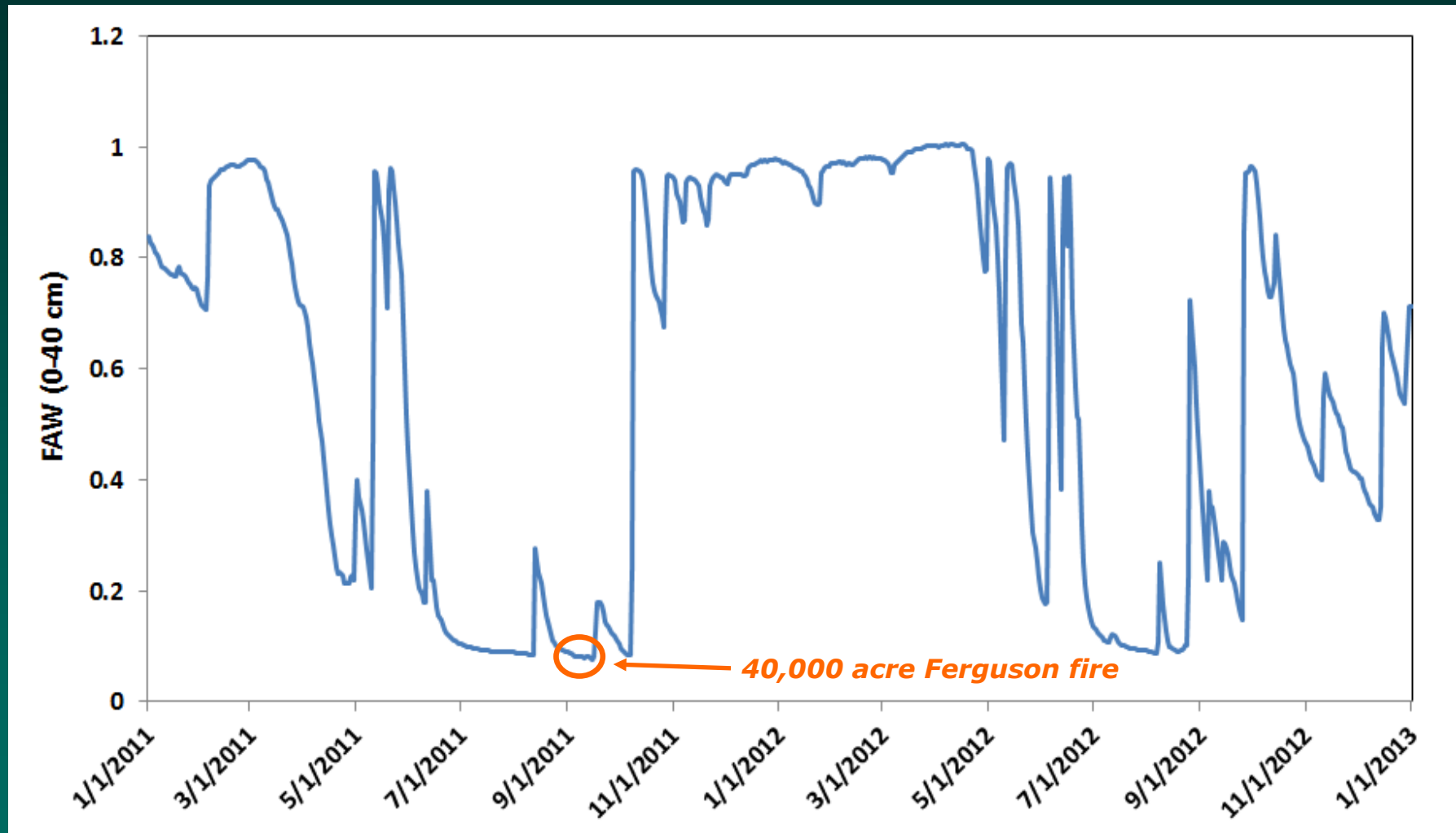
11:01 70°

RUSTY SURETTE
RED CROSS SPOKESMAN

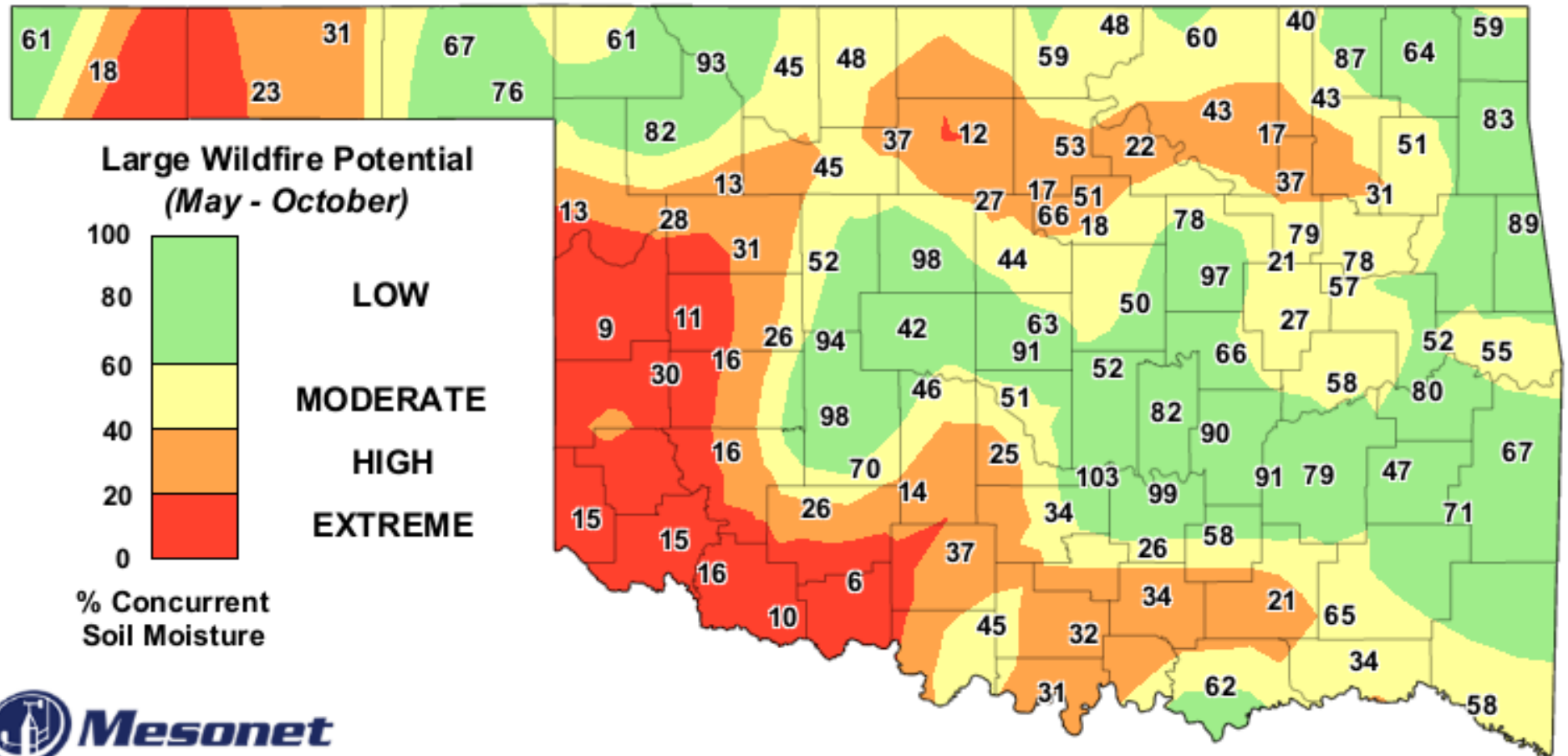


KWTN - DT

16" Fraction of Plant Available Water (Medicine Park)



Operational Product on OK-FIRE: 16" Percent Plant Available Soil Moisture



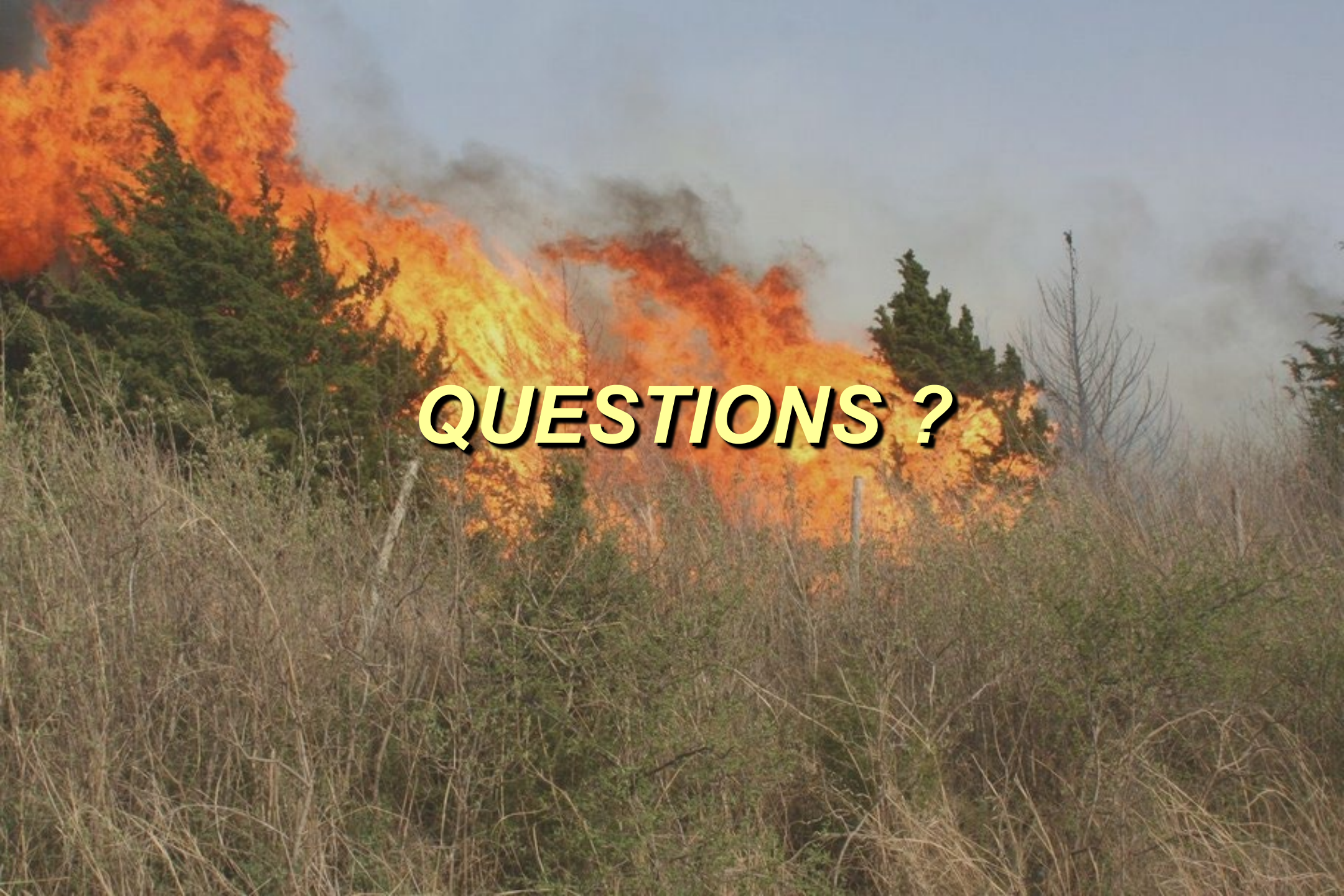
24-hr Avg 16-inch Plant Available Soil Moisture (%)

6:30 PM August 11, 2018 CDT

Created 7:00:41 PM August 11, 2018 CDT. © Copyright 2018

Questions You Should Be Able to Answer by the End of this Module

- What kinds of fires are meant by “wildland fire”?
- What are the two weather data sources for OK-FIRE?
- What are the two most important fire weather variables and in what order?
- What are the three main weather regimes associated with wildfire outbreaks during the dormant season?
- What is the main cause of wildfires during the growing season?

A photograph of a large fire burning in a forest. The fire is intense, with bright orange and yellow flames rising from the trees. Thick black smoke is billowing from the fire, filling the upper part of the frame. In the foreground, there is a dense thicket of dry, brown grass and some green shrubs. The background shows more trees, some of which are bare and skeletal. The sky is a pale, overcast blue.

QUESTIONS ?

The background image shows a landscape with a fire burning in the foreground on the left side. The fire is bright orange and yellow, with flames rising from the ground. In the background, there are hills or mountains, and a large plume of white smoke or steam is rising from the right side, partially obscuring the sky. The sky is a pale, hazy blue.

Web Site Demo:
Weather Products in OK-FIRE