Learning OK-FIRE:
A Weather-Based Operational Decision Support System for Wildland Fire Management

Dr. J. D. Carlson, Fire Meteorologist
Biosystems & Agricultural Engineering
OK-FIRE Program Manager
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
Prescribed Burns
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!
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 councilor, planning department or fire service to express your concerns.

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
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)
OK-FIRE Website

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

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

<table>
<thead>
<tr>
<th>Station</th>
<th>Stillwater</th>
<th>Bristow</th>
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<tbody>
<tr>
<td>Weather</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relative Humidity:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Past 1-hr RH Change:</td>
<td>14%</td>
<td>19%</td>
</tr>
<tr>
<td>10-m Wind:</td>
<td>5%</td>
<td>2%</td>
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<tr>
<td>Max Wind Gust:</td>
<td>8SW 17 mph</td>
<td>SW 16 mph</td>
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<tr>
<td>Temperature:</td>
<td>64°F</td>
<td>64°F</td>
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<td>24-hr Rainfall:</td>
<td>0.00 in</td>
<td>0.00 in</td>
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<tr>
<td>Dispersion:</td>
<td>Moderately Good</td>
<td>Moderately Good</td>
</tr>
<tr>
<td>Sunrise / Sunset:</td>
<td>7:35 am / 5:47 pm</td>
<td>7:31 am / 5:44 pm</td>
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</table>

Fire Danger

Current Fire Danger:

| Burning Index: | 69 | 40 |
| Spread Component: | 62 | 10 |
| Ignition Component: | 34% | 42% |
| NDFRS Fuel Model: | T | R |
| 1-hr Fuel Moisture: | 6% | 6% |
| 10-hr Fuel Moisture: | 8% | 8% |
| Soil Moisture: | 51% | 93% |
| KBDI: | 118 | 198 |
| Relative Greenness: | 19% | 7% |
TRAINING
Weather Data Sources for OK-FIRE
The OKLAHOMA MESONET
(current and past weather conditions)
Winds blow in a direction along the staff from the barbed end toward the dot representing the Mesonet station.

Calm winds are denoted by a circle around the dot representing the Mesonet station.
Forecast Meteogram Chart for Stillwater

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)
<table>
<thead>
<tr>
<th>NAM Forecast Run</th>
<th>Weather Products</th>
<th>Fire Model Products</th>
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</thead>
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<tr>
<td>00Z</td>
<td>10 p.m. CST</td>
<td>11 p.m. CST</td>
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<tr>
<td>06Z</td>
<td>4 a.m. CST</td>
<td>5 a.m. CST</td>
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<tr>
<td>12Z</td>
<td>10 a.m. CST</td>
<td>11 a.m. CST</td>
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<tr>
<td>18Z</td>
<td>4 p.m. CST</td>
<td>5 p.m. CST</td>
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</table>
Current Burning Index

Fire Danger

Current Fire Danger:

- Burning Index: 7
- Spread Component: 4
- Ignition Component: 4%
- NFDRS Fuel Model: T
- 1-hr Fuel Moisture: 10%
- 10-hr Fuel Moisture: 12%
- Soil Moisture: 99%
- KBDi: 39
- Relative Greenness: 58%

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
Important Weather Variables in Wildland Fire

- Air Temperature
- Relative Humidity
- Wind Speed
- Wind Direction
- Precipitation
Air Temperature
Note: Dewpoint itself is irrelevant to fire danger.
Relative Humidity = 70%
Air Temperature = 37°F

Relative Humidity = 15%
Air Temperature = 80°F
Relative Humidity

- **> 85%** Fuels may be too moist for fire; heavy smoke possible
- **35-85%** Normal range for prescribed burning
- **20-35%** Containment difficult; quick ignition; spot fires increase
- **< 20%** Extreme fire behavior; spot fires frequent
Wind Speed
(second most important variable)
Wind – How It’s Portrayed

Current Fire Weather Conditions

Mesonet
# Wind – How It’s Portrayed

<table>
<thead>
<tr>
<th>Date</th>
<th>TAIR (°F)</th>
<th>TDEW (°F)</th>
<th>RELH (%)</th>
<th>WDIR</th>
<th>WSPD (mph)</th>
<th>1-hr PRECIP (in)</th>
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<td>44</td>
<td>81</td>
<td>NW</td>
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<td>45</td>
<td>65</td>
<td>ESE</td>
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Wind direction and speed chart: Wind directions from 0° to 360° are represented with arrows pointing in the respective cardinal directions, including NE, ENE, E, ESE, SE, SSE, S, SSE, SW, SSW, WSW, WNW, NNW, and NW. The wind speed is indicated by the length of the arrow, and precipitation is denoted by the amount of rain collected in the 1-hour period.
Wind – How It’s Portrayed

Wind Speed and Direction

Mesonet

9:10 PM May 3, 2017 CDT
Created 9:14:31 PM May 3, 2017 CDT. © Copyright 2017
Wind Speed

- **< 5 mph**  
  Generally unsuitable for prescribed burning; variable direction

- **5-15 mph**  
  Normal range for prescribed burning

- **15-20 mph**  
  Threshold range

- **> 20 mph**  
  Increasingly problematic; spot fires increase; containment more difficult
Typical Fire Danger Pattern Resulting from Daily Cycles of T, RH, and Wind
Oklahoma Wildfire Climatology
(1992-2018)
Oklahoma Wildfire Monthly Climatology
(48,212 wildfires from 1992-2018)
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)
Winds are expected to shift from southwest to northwest over the next couple of hours across northwest Oklahoma.

Strong south winds will drive the fires very quickly toward the north and northeast.

Conditions not expected to improve until after sunset.
Relative Humidity (3 p.m.)
Winds (3 p.m.)
(2) NW/N Winds and Low RH
March 23, 2011
(34 fires; 20,000+ acres burned)
Relative Humidity (3 p.m.)
Max Wind Gusts (3 p.m.)
(3) Dry Line Event

Dry Line
Relative Humidity and Winds

10:00 PM January 21, 2018 CST

Mesonet

Created 10:05:31 PM January 21, 2018 CST. © Copyright 2018
1-hour Relative Humidity Change (%)
3-hour Relative Humidity Change (%)
Rhea Fire
April 12-27, 2018
286,196 acres
3.9 Micron Infrared
Visible (Blue)
Relative Humidity and Winds

[Map of relative humidity and winds over Oklahoma with percentage and wind direction indicated.]
Wind Gusts

Wind Gusts (mph)

Mesonet

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

http://drought.unl.edu/dm
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

http://droughtmonitor.unl.edu
Glencoe fire: 6,887 acres, 23 homes destroyed
Temperature – 3 p.m., Aug. 4, 2012
Cleveland/Mannford Complex
August 5-10, 2011
20,129 acres
Ferguson Fire
September 1-9, 2011
39,907 acres
16” Fraction of Plant Available Water (Medicine Park)

40,000 acre Ferguson fire
Operational Product on OK-FIRE:
16” Percent Plant Available Soil Moisture

Large Wildfire Potential
(May - October)

LOW
MODERATE
HIGH
EXTREME

% Concurrent Soil Moisture

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

Mesonet

6:30 PM August 11, 2018 CDT
Created 7:00:41 PM August 11, 2018 CDT. © Copyright 2018
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QUESTIONS ?
Web Site Demo:
Weather Products in OK-FIRE