Table of Contents

Guide to Percentiles and Thresholds.................................................. 1
Fire Business.................................................................................... 2
Predictive Service Area Map............................................................ 4
Firefighter Pocket Cards
  Central Texas................................................................................ 5
  Coastal Plains............................................................................... 9
  High Plains.................................................................................. 13
  Hill Country................................................................................. 17
  Lower Gulf Coast......................................................................... 21
  Northeast Texas............................................................................ 25
  North Texas.................................................................................. 29
  Rio Grande Plains......................................................................... 33
  Rolling Plains............................................................................... 37
  Southeast Texas............................................................................ 41
  Southern Plains............................................................................. 45
  Trans Pecos.................................................................................. 49
  Upper Gulf Coast.......................................................................... 53
  Western Pineywoods...................................................................... 57
Fire Danger Description..................................................................... 61
Rate of Spread and Flame Length in Grass Fuel Types................. 62
Web Links.......................................................................................... 68
Note Pages...................................................................................... 69
Firefighter’s Guide to Percentiles and Thresholds

Percentiles and thresholds are used to help us measure the significance of National Fire Danger Rating System (NFDRS) outputs as they relate to levels of fire risk, fuel conditions and fire danger. Have you ever asked a firefighter the question, “How are your fires burning,” and you get a response something like “real hot”? The definition of “real hot” will vary depending upon who you ask. One objective of this refresher is to define the NFDRS and fire weather thresholds that relate to problematic fire behavior.

**Percentiles** are based on a scale of 0-100. We use percentiles to sort and rank a collection of data. **Thresholds** are the actual values of NFDRS indices Energy Release Component (ERC), Burning Index (BI), Keetch Byram Drought Index (KBDI), weather observations (RH, windspeed) or fuel moistures (1hr,1000hr) that mark the change from one category to another. As an example, the Fort Davis RAWS has calculated the BI every day for 14 years for a total of 5,000 observations. In sorting through these 5,000 BI observations, we find that only 10% of these BI observations have a BI value of 60 or greater. The BI of 60 is the threshold. BI values greater than or equal to the threshold of 60 exceed the 90th percentile. We found that only three percent of the observations occur above the BI value of 74. Crossing the threshold of a 74 BI ranks in the 97th percentile.

<table>
<thead>
<tr>
<th>Percentiles</th>
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<tbody>
<tr>
<td>0 - 49</td>
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<td>50 - 74</td>
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<td>75 - 89</td>
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<td>90 - 96</td>
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<td>97+</td>
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Whether we are looking at fuel moistures, ERC, BI or KBDI, we generally make the same associations when rating the percentiles. At the low end of the scale in the green and blue we see normal to below normal conditions. Initial attack should be successful with few complexities. At the upper end of the scale in the orange and red we see unusual or rare conditions, and we would expect to see complex fires where initial attack may often fail. So the difficult category to describe, and thus maybe the most important category for initial attack, is the middle or transition zone in the yellow. Somewhere in the yellow, fires transition from normal to problematic.
Fire managers and firefighters should never observe unexpected fire behavior. We should be able to use the tools available to us and anticipate containment problems that may occur during initial attack. It would be great if there were one magic index or number that would predict fire business. Unfortunately this number does not exist. We should look at combinations of fire weather, fuel moistures and NFDRS indices to gauge fire risk potential. Establishing thresholds and color coding percentiles is an attempt to help firefighters judge the daily fire risk. If all of the thresholds were in the red, it would be easy to recognize that it was going to be a tough day on the fireline. Most days the thresholds will not totally agree. Some will be in the yellow while others may be in blue or orange. Two key thresholds to watch for are the combination of ERC and BI. ERC is a good indicator of fuel conditions. BI is a good indicator of daily weather influences. The combination of these two indices can provide firefighters a sense of what to expect on the fireline.

The fire weather thresholds are also key thresholds to monitor. Fire weather thresholds can be used in combination with ERC if a forecast BI is not available. If the ERC is in the yellow percentiles and the fire weather thresholds are met or exceeded, expect an active day. All of the indices and threshold values have applications in forecasting fire risk and should be monitored. Remember to stay current with weather changes and update the morning forecasts if needed.
Predictive Service Area Map

http://ticc.tamu.edu/PSA
Fire Danger Area:
- Dead F.M. Critical %’s
- 10 Hr - 8%, 100 Hr - 12%
- 1000 Hr - 13%
  * Meets NWCG Wx Station Standards

Fire Danger Interpretation:
- EXTREME -- Use extreme caution
  (Caution) -- Watch for change
- Moderate -- Lower Potential, but always be aware

Maximum -- Highest Burning Index by day
for 2004 - 2013
Average -- shows peak fire season over 10 years (909 observations)
90th Percentile -- Only 10% of the 909 days from 2004 - 2013
  had an Burning Index above 58

Local Thresholds - Watch out: Combinations
  of any of these factors can greatly increase fire behavior:
  20’ Wind Speed over 15 mph, RH less than 25%,
  Temperature over 90, Energy Release Component over 47

Remember what Fire Danger tells you:
- ✔ Burning Index gives day-to-day fluctuations
  calculated from 2 pm temperature, humidity, wind,
  daily temperature & rh ranges, and precip duration.
- ✔ Wind is part of BI calculation.
- ✔ Watch local conditions and variations across
  the landscape -- Fuel, Weather, Topography.
- ✔ Listen to weather forecasts -- especially WIND.

Past Experience:
The Wilderness Ridge Fire occurred on 2/28/2009 in Bastrop County, burning 1,491 acres
and destroying 26 homes. A minimum RH of 20%, sustained winds from 8-13 mph from
the North with gusts to 27mph were observed at the Bastrop RAWS. Extreme fire
behavior was observed in association with the passage of a strong dry cold front. Live
fuel moisture measured from Lobolly pine in Bastrop County, was 112%. The 10th
percentile for Lobolly pine in Central TX is 120%.

Responsible Agency: Mike Dunivan, TFS
FF+4.0.2 02/11/2014-14:52 (C:\Users\m.dunivan\Fire Family\Texas Working Set 01282013)

Design by NWCG Fire Danger Working Team
Fire Danger Area:
- Dead F.M. Critical %'s
- 10 Hr - 6%, 100 Hr - 12%
- 1000 Hr - 13%
* Meets NWCG Wx Station Standards

Fire Danger Interpretation:

- **EXTREME** -- Use extreme caution
- **Cautio**n -- Watch for change
- **Moderate** -- Lower Potential, but always be aware

Maximum -- Highest Energy Release Component by day for 2004 - 2013
Average -- shows peak fire season over 10 years (1839 observations)
90th Percentile -- Only 10% of the 1839 days from 2004 - 2013 had an Energy Release Component above 47

Local Thresholds - Watch out: Combinations of any of these factors can greatly increase fire behavior:
- 20' Wind Speed over 15 mph, RH less than 25%
- Temperature over 90, Burning Index over 56

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Remember what Fire Danger tells you:
- Energy Release Component gives seasonal trends calculated from 2 pm temperature, humidity, daily temperature & rh ranges, and precip duration.
- Wind is NOT part of ERC calculation.
- Watch local conditions and variations across the landscape -- Fuel, Weather, Topography.
- Listen to weather forecasts -- especially WIND.

Past Experience:
The Bastrop County Complex occurred on 9/4/2011 in Bastrop County burning 34,068 acres, destroying 1,649 homes and killing two people. Strong subsidence from tropical storm Lee and an approaching cold front from the NW provided a strong boundary of instability and extremely critical weather covering large portions of Central and East TX. This weather event, combined with extreme fuel dryness in a highly populated area, produced disastrous results. Weather observations from the Bastrop RAWS included North winds from 10-15mph with gusts 25-30, RH 20-24% and Temperature 97-101 degrees. Live fuel moisture measured from Loblolly pine was 83%. The 10th percentile for Loblolly pine in Central TX is 120%.

Responsible Agency: Mike Dunivan, TFS
FF+F 4.0.2 02/11/2014-09:47 (C:\Users\mdunivan\Fire Family\Texas Working Set 01282013)

Design by NWCG Fire Danger Working Team
Fire Danger Area:
- Dead F.M. Critical %'s
- 10Hr. - 7%, 100Hr. - 13%
- 1000Hr. - 14%
  * Meets NWCG Wx Station Standards

Fire Danger Interpretation:

EXTREME  -- Use extreme caution
(Caution)  -- Watch for change
Moderate  -- Lower Potential, but always be aware

Maximum -- Highest Burning Index by day
for 2004 - 2013

Average -- shows peak fire season over 10 years (908 observations)
90th Percentile  -- Only 10% of the 908 days from 2004 - 2013
had an Burning Index above 55

Local Thresholds - Watch out: Combinations
of any of these factors can greatly increase fire behavior:
20' Wind Speed over 15 mph, RH less than 25%,
Temperature over 90, Energy Release Component over 44

Remember what Fire Danger tells you:
✓ Burning Index gives day-to-day fluctuations
calculated from 2 pm temperature, humidity, wind,
daily temperature & rh ranges, and precip duration.
✓ Wind is part of BI calculation.
✓ Watch local conditions and variations across
  the landscape -- Fuel, Weather, Topography.
✓ Listen to weather forecasts -- especially WIND.

Past Experience:
The Burns Ranch Fire occurred on 3/18/2008 in Hidalgo County, burning 25,600 acres.
The fire burned in grass & brush. Heavy herbaceous fuel loadings present due to above
normal precipitation in 2007. A minimum RH of 12%, sustained winds from 13-27 mph
from the Northwest, with gusts to 41 mph, was observed at the Linn-San Manuel RAWS.
With large amounts of cured herbaceous fuels and critical fire weather present, very
active fire behavior was observed.

Responsible Agency: Mike Dunivan, TFS
FF+4.0.2 02/11/2014-14:59 (C:\Users\mdunivan\Fire Family\Texas Working Set 01282013)
Design by NWCG Fire Danger Working Team
Coastal Plains

Fire Danger Area:
- Dead F.M. Critical %’s
- 10Hr. - 7%, 100Hr. - 13%
- 1000Hr. - 14%
  * Meets NWCG Wx Station Standards

Fire Danger Interpretation:
- **EXTREME** -- Use extreme caution
- (Caution) -- Watch for change
- **Moderate** -- Lower Potential, but always be aware

Maximum -- Highest Energy Release Component by day for 2004 - 2013
Average -- shows peak fire season over 10 years (1840 observations)
90th Percentile -- Only 10% of the 1840 days from 2004 - 2013 had an Energy Release Component above 44

Local Thresholds - Watch out: Combinations of any of these factors can greatly increase fire behavior:
- 20' Wind Speed over 15 mph, RH less than 25%,
- Temperature over 90, Burning Index over 55

Remember what Fire Danger tells you:
✔ Energy Release Component gives seasonal trends calculated from 2 pm temperature, humidity, daily temperature & rh ranges, and precip duration.
✔ Wind is NOT part of ERC calculation.
✔ Watch local conditions and variations across the landscape -- Fuel, Weather, Topography.
✔ Listen to weather forecasts -- especially WIND.

Past Experience:
The SMAC Fire occurred on 6/18/2011 in Brooks County burning approximately 30,000 acres. Weather observations from the AWOS in Falfurrias included South to Southeast winds from 16-23 mph with gusts up to 31 mph, minimum RH of 28% and maximum temperature of 102 degrees. Extreme fire behavior was observed in grass and brush fuels. Live fuel moisture measured from Mesquite, in nearby Starr County, was 96%. The 10th percentile for Mesquite in the Coastal Plains is 100%.

Responsible Agency: Mike Dunivan, TFS
FF+4.0.2 02/11/2014-11:20 (C:\Users\m.dunivan\Fire Family\Texas Working Set 01282013)

Design by NWCG Fire Danger Working Team
FIRE DANGER -- High Plains PSA

Maximum, Average, and 90th Percentile, based on 10 years data

Years to Remember: 2006 2011

East Amarillo Complex
Crawford Ranch

Fuel Model: G - Short-Needle (Heavy Dead)
Fire Danger Area:
- Dead F.M. Critical %
- 10 Hr. - 4%, 100 Hr. - 7%
- 1000 Hr. - 10%
  * Meets NWCG Wx Station Standards

Fire Danger Interpretation:
- **EXTREME** — Use extreme caution
- **Caution** — Watch for change
- **Moderate** — Lower Potential, but always be aware

Maximum — Highest Burning Index by day
for 2004 - 2013

Average — shows peak fire season over 10 years (895 observations)

90th Percentile — Only 10% of the 895 days from 2004 - 2013
had an Burning Index above 98

Local Thresholds - Watch out: Combinations
of any of these factors can greatly increase fire behavior:
- 20' Wind Speed over 25 mph, RH less than 15%,
- Temperature over 90, Energy Release Component over 67

Remember what Fire Danger tells you:
- ✔ Burning Index gives day-to-day fluctuations
  calculated from 2 pm temperature, humidity, wind,
  daily temperature & rh ranges, and precip duration.
- ✔ Wind is part of BI calculation.
- ✔ Watch local conditions and variations across
  the landscape — Fuel, Weather, Topography.
- ✔ Listen to weather forecasts — especially WIND.

Past Experience:
Both the East Amarillo Complex (3/12/06) and the Crawford Ranch Fire (4/9/11) occurred
as a result of Southern Plains Outbreak events. The East Amarillo Complex burned
907,245 acres. There were 3 near misses, 3 injuries and 12 fatalities associated with the
fire. The fire ran 45 miles with a 5 mph average ROS. Weather observed at the Cedar
RAWS included min. RH of 15%, sustained winds ranging from 20-32mph with gusts to
56 mph. The Crawford Ranch Fire burned 35,097 acres. There were 4 firefighter injuries
that occurred when their engine became stuck in deep sand and was overrun. The AWOS
in Dumas recorded a min. RH of 8%, max. temperature of 90 degrees, sustained winds
from 20-40 mph with gusts to 49 mph.

Responsible Agency: Mike Dunivan, TFS
FF+4.0.2 02/11/2014-15:06 (C:\Users\m.dunivan\Fire Fam\il...\Texas Working Set 01282013)

Design by NWCG Fire Danger Working Team
Fire Danger Area:
- Dead F.M. Critical %’s
- 10 Hr. - 4%, 100 Hr. - 7%
- 1000 Hr. - 10%
  * Meets NWCG Wx Station Standards

Fire Danger Interpretation:
- **EXTREME** -- Use extreme caution
- (Caution) -- Watch for change
- **Moderate** -- Lower Potential, but always be aware

Maximum -- Highest Energy Release Component by day for 2004 - 2013
Average -- shows peak fire season over 10 years (1835 observations)
90th Percentile -- Only 10% of the 1835 days from 2004 - 2013 had an Energy Release Component above 67

Local Thresholds - Watch out: Combinations of any of these factors can greatly increase fire behavior:
- 20' Wind Speed over 25 mph, RH less than 15%,
- Temperature over 90, Burning Index over 98

Remember what Fire Danger tells you:
- ✓ Energy Release Component gives seasonal trends calculated from 2 pm temperature, humidity, daily temperature & rh ranges, and precip duration.
- ✓ Wind is NOT part of ERC calculation.
- ✓ Watch local conditions and variations across the landscape -- Fuel, Weather, Topography.
- ✓ Listen to weather forecasts -- especially WIND.

Past Experience:
The Canyon Fire occurred on 5/24/11 in Randall County burning 16,803 acres, destroying 8 structures and several miles of fence. This very large grass fire occurred during a Southern Plains Outbreak event and burned into Palo Duro Canyon. The Burning Index (BI), the day the fire initiated, was 154 at the Cedar RAWS. The 97th percentile for BI in the High Plains is 120. Weather observations from the Cedar RAWS included Southwest winds from 20-28 mph with gusts to 44mph, minimum RH of 7% and maximum temperature of 91 degrees.

Responsible Agency: Mike Dunivan, TFS
FF+4.0.2 02/11/2014-11:24 (C:\Users\mdunivan\Fire Fam...\Texas Working Set 01282013)
Design by NWCG Fire Danger Working Team
FIRE DANGER -- Hill Country PSA
Maximum, Average, and 90th Percentile, based on 10 years data

Years to Remember: 2008 2011

Fuel Model: G - Short-Needle (Heavy Dead)
Fire Danger Area:
- Dead F.M. Critical %'s
- 10 Hr. - 5%, 100 Hr. - 10
- 1000 Hr. - 12%
* Meets NWCG Wx Station Standards

Fire Danger Interpretation:
- **EXTREME** -- Use extreme caution
- **(Caution)** -- Watch for change
- **Moderate** -- Lower Potential, but always be aware

Maximum -- Highest Burning Index by day for 2004 - 2013
Average -- shows peak fire season over 10 years (1349 observations)
90th Percentile -- Only 10% of the 1349 days from 2004 - 2013 had an Burning Index above 69

Local Thresholds - Watch out: Combinations of any of these factors can greatly increase fire behavior:
- 20' Wind Speed over 15 mph, RH less than 25%,
- Temperature over 90, Energy Release Component over 55

Remember what Fire Danger tells you:
- ✔ Burning Index gives day-to-day fluctuations calculated from 2 pm temperature, humidity, wind, daily temperature & rh ranges, and precip duration.
- ✔ Wind is part of BI calculation.
- ✔ Watch local conditions and variations across the landscape -- Fuel, Weather, Topography.
- ✔ Listen to weather forecasts -- especially WIND.

Past Experience:
The Silver fire (2/25/08) and the Wildcat fire (4/10/11) occurred as a result of Southern Plains Outbreak events. Both fires occurred in Coke County and burned predominately in brush fuels. The Silver fire burned 20,200 acres destroying multiple homes and other structures, while the Wildcat fire burned 158,308 acres. High winds with gusts near 40 mph, very low RH, frost cured herbaceous fuels and extremely dry juniper brush were major factors in the growth of both fires.

Responsible Agency: Mike Dunivan, TFS
FF+4.0.2 02/11/2014-15:18 (C:\Users\mdunivan\Fire Family\Texas Working Set 01282013)
Design by NWCG Fire Danger Working Team
FIRE DANGER -- Hill Country PSA

Maximum, Average, and 90th Percentile, based on 10 years data

Energy Release Component

0 10 20 30 40 50 60 70 80
Apr May Jun Jul Aug Sep Oct

Extreme
Moderate

Years to Remember: 2006 2011

Energy Release Component

Oasis
Dos Amigos
Kirk Ranch

Fuel Model: G - Short-Needle (Heavy Dead)
Fire Danger Area:
- Dead F.M. Critical %'s
- 10 Hr. - 5%, 100 Hr. - 10
- 1000 Hr. - 12%
  * Meets NWCG Wx Station Standards

Fire Danger Interpretation:
- **EXTREME** -- Use extreme caution
- **(Caution)** -- Watch for change
- **Moderate** -- Lower Potential, but always be aware

Maximum -- Highest Energy Release Component by day for 2004 - 2013

Average -- shows peak fire season over 10 years (1994 observations)

90th Percentile -- Only 10% of the 1994 days from 2004 - 2013 had an Energy Release Component above 55

Local Thresholds - Watch out: Combinations of any of these factors can greatly increase fire behavior:
- 20' Wind Speed over 15 mph, RH less than 25%,
- Temperature over 90, Burning Index over 89

Remember what Fire Danger tells you:
- ✓ Energy Release Component gives seasonal trends calculated from 2 pm temperature, humidity, daily temperature & rh ranges, and precip duration.
- ✓ Wind is NOT part of ERC calculation.
- ✓ Watch local conditions and variations across the landscape -- Fuel, Weather, Topography.
- ✓ Listen to weather forecasts -- especially WIND.

Past Experience:
The Oasis fire occurred on 4/26/11 in Kimble County burning 9445 acres. The Oasis fire occurred on the eastern edge of a Southern Plains Outbreak event. The Burning Index (BI) on the day the fire initiated was 108 at the Mason RAWS. The 97th percentile for BI in the Hill Country PSA is 79. Weather observations from the ASOS in Junction included Southwest to West winds from 12-21 mph with gusts to 35 mph, minimum RH of 6% and a maximum temperature of 98 degrees. Live fuel moisture measured from juniper in Kimble County was 64%. The 10th percentile for juniper in the Hill Country PSA is 80%.

Responsible Agency: Mike Dunivan, TFS

Design by NWCG Fire Danger Working Team
FIRE DANGER -- Lower Coast PSA

Maximum, Average, and 90th Percentile, based on 10 years data

Years to Remember: 2006 2008

Fuel Model: G - Short-Needle (Heavy Dead)
**Fire Danger Area:**
- Dead F.M. Critical %'s
- 10Hr. - 8%, 100Hr. - 15%
- 1000Hr. - 16%
  * Meets NWCG Wx Station Standards

**Fire Danger Interpretation:**
- **EXTREME** -- Use extreme caution
- **(Caution)** -- Watch for change
- **Moderate** -- Lower Potential, but always be aware

Maximum -- Highest Burning Index by day for 2004 - 2013
Average -- shows peak fire season over 10 years (1041 observations)
90th Percentile -- Only 10% of the 1041 days from 2004 - 2013 had an Index above 48

**Local Thresholds - Watch out:** Combinations of any of these factors can greatly increase fire behavior:
- 20' Wind Speed over 15 mph, RH less than 30%
- Temperature over 90, Energy Release Component over 34

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**Remember what Fire Danger tells you:**
- Burning Index gives day-to-day fluctuations calculated from 2 pm temperature, humidity, wind, daily temperature & rh ranges, and precip duration.
- Wind is part of BI calculation.
- Watch local conditions and variations across the landscape -- Fuel, Weather, Topography.
- Listen to weather forecasts -- especially WIND.

**Past Experience:**
Remember: Any change in wind speed or direction will have an immediate impact on flame lengths and rate of spread on fires in fine fuels. When grass fuels are cured, rapid rates of spread can be expected on windy days when 10 hour fuel moistures are below 8%. ERC values (FM - G) above 34 exceed the 90th percentile. Live woody fuel moistures less than 100% in mesquite and less than 85% in live oak, can contribute to single and/or group tree torching.

Responsible Agency: Mike Dunivan, TFS
FF+4.0.2 02/11/2014-15:29 (C:\Users\mdunivan\Fire Family\Texas Working Set 01282013)

Design by NWCG Fire Danger Working Team
Fire Danger Area:
- Dead F.M. Critical %’s
- 10Hr. - 8%, 100Hr. - 15%
- 1000Hr. - 16%
  * Meets NWCG Wx Station Standards

Fire Danger Interpretation:
- EXTREME -- Use extreme caution
- (Caution) -- Watch for change
- Moderate -- Lower Potential, but always be aware

Maximum -- Highest Energy Release Component by day for 2004 - 2013
Average -- shows peak fire season over 10 years (1998 observations)
90th Percentile -- Only 10% of the 1998 days from 2004 - 2013 had an Energy Release Component above 34

Local Thresholds - Watch out: Combinations of any of these factors can greatly increase fire behavior:
- 20' Wind Speed over 15 mph, RH less than 30%,
- Temperature over 90, Burning Index over 49

Remember what Fire Danger tells you:
- ✓ Energy Release Component gives seasonal trends calculated from 2 pm temperature, humidity, daily temperature & rh ranges, and precip duration.
- ✓ Wind is NOT part of ERC calculation.
- ✓ Watch local conditions and variations across the landscape -- Fuel, Weather, Topography.
- ✓ Listen to weather forecasts -- especially WIND.

Past Experience:
Remember: Any change in wind speed or direction will have an immediate impact on flame lengths and rate of spread on fires in fine fuels. When grass fuels are cured, rapid rates of spread can be expected on windy days when 10 hour fuel moistures are below 8%. BI values (FM - G) above 49 exceed the 90th percentile. Live woody fuel moistures less than 100% in mesquite and less than 85% in live oak, can contribute to single and/or group tree torching.

Responsible Agency: Mike Dunivan, TFS
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Design by NWCG Fire Danger Working Team
Fire Danger Area:
- Dead F.M. Critical %’s
- 10 Hr. - 6%, 100 Hr. - 10
- 1000 Hr. - 12%
  * Meets NWCG Wx Station Standards

Fire Danger Interpretation:
- **EXTREME** -- Use extreme caution
- (Caution) -- Watch for change
- Moderate -- Lower Potential, but always be aware

Maximum -- Highest Burning Index by day for 2004 - 2013
Average -- shows peak fire season over 10 years (1350 observations)
90th Percentile -- Only 10% of the 1350 days from 2004 - 2013 had an Burning Index above 59

Local Thresholds - Watch out: Combinations of any of these factors can greatly increase fire behavior:
- 20' Wind Speed over 20 mph, RH less than 25%, Temperature over 90, Energy Release Component over 55

Remember what Fire Danger tells you:
- Burning Index gives day-to-day fluctuations calculated from 2 pm temperature, humidity, wind, daily temperature & rh ranges, and precip duration.
- Wind is part of BI calculation.
- Watch local conditions and variations across the landscape -- Fuel, Weather, Topography.
- Listen to weather forecasts -- especially WIND.

Past Experience:
The PK Complex occurred on 4/9/2011 in Palo Pinto County, burning 126,734 acres and destroying 168 homes. This Complex of 4 fires occurred as a result of a Southern Plains Outbreak event. Most of the growth occurred on April 15th with post frontal conditions, strong north winds and low RH. Fire threatened town of Strawn and jumped highways 18, and 18. Significant factors were amount of old dense juniper stands, with live fuel moistures around 80% and two weeks of accelerated drying leading up to the fire. Post frontal afternoon conditions on the 15th from the Possum Kingdom RAWS included Northwest winds from 20-25mph with gusts to 45, RH 6-8%, and temperatures from 72-74 degrees.

Responsible Agency: Mike Dunivan, TFS
FF+4.0.2 02/11/2014-15:37 (C:\Users\mdunivan\Fire Family\Texas Working Set 01282013)

Design by NWCG Fire Danger Working Team
FIRE DANGER -- North Texas PSA

Maximum, Average, and 90th Percentile, based on 10 years data

Years to Remember: 2006, 2011

101 Ranch Fire
Johnson Mountain

Fuel Model: G - Short-Needle (Heavy Dead)
Fire Danger Area:
- Dead F.M. Critical %’s
- 10 Hr. - 6%, 100 Hr. - 10
- 1000 Hr. - 12%
* Meets NWCG Wx Station Standards

Fire Danger Interpretation:
- **EXTREME** -- Use extreme caution
- (Caution) -- Watch for change
- **Moderate** -- Lower Potential, but always be aware

Maximum -- Highest Energy Release Component by day for 2004 - 2013
Average -- shows peak fire season over 10 years (1840 observations)
90th Percentile -- Only 10% of the 1840 days from 2004 - 2013 had an Energy Release Component above 55

Local Thresholds - Watch out: Combinations of any of these factors can greatly increase fire behavior:
- 20’ Wind Speed over 20 mph, RH less than 25%,
- Temperature over 90, Burning Index over 59

Remember what Fire Danger tells you:
- Energy Release Component gives seasonal trends calculated from 2 pm temperature, humidity, daily temperature & rh ranges, and precip duration.
- Wind is NOT part of ERC calculation.
- Watch local conditions and variations across the landscape -- Fuel, Weather, Topography.
- Listen to weather forecasts -- especially WIND.

Past Experience:
The 101 Ranch fire occurred on 8/30/2011 in Palo Pinto County burning 6555 acres and destroying 39 homes. Weather observations from the Possum Kingdom RAWS included South winds from 10-17 mph with gusts to 29, minimum RH of 12% and maximum temperature of 108 degrees. The fire burned in cured grasses and extremely dry juniper brush. Live fuel moisture, measured soon after the fire, from juniper in Palo Pinto County was 70%. The 10th percentile for juniper in the North Texas PSA is 85%.

Responsible Agency: Mike Dunivan, TFS
FF+4.0.2 02/11/2014-12:03 (C:\Users\mdunivan\Fire Family\Texas Working Set 01282013)

Design by NWCG Fire Danger Working Team
FIRE DANGER -- Northeast Texas PSA
Maximum, Average, and 90th Percentile, based on 10 years data

Years to Remember: 2006 2011

Fuel Model: G - Short-Needle (Heavy Dead)
Fire Danger Area:
- Dead F.M. Critical %’s
- 1 Hr. - 7%, 100Hr. - 13%
- 1000Hr. - 15%
  * Meets NWCG Wx Station Standards

Fire Danger Interpretation:
- **EXTREME** -- Use extreme caution
- **(Caution)** -- Watch for change
- **Moderate** -- Lower Potential, but always be aware

Maximum -- Highest Burning Index by day
for 2004 - 2013
Average -- shows peak fire season over 10 years (909 observations)
90th Percentile -- Only 10% of the 909 days from 2004 - 2013
had an Burning Index above 44

Local Thresholds - Watch out: Combinations
of any of these factors can greatly increase fire behavior:
- 20' Wind Speed over 15 mph, RH less than 25%,
- Temperature over 90, Energy Release Component over 41

Remember what Fire Danger tells you:
- Burning Index gives day-to-day fluctuations
  calculated from 2 pm temperature, humidity, wind,
  daily temperature & rh ranges, and precip duration.
- Wind is part of BI calculation.
- Watch local conditions and variations across
  the landscape -- Fuel, Weather, Topography.
- Listen to weather forecasts -- especially WIND.

Past Experience:
Remember: Any change in wind speed or direction will have an immediate impact on
flame lengths and rate of spread on fires in fine fuels. When grass fuels are cured, rapid
rates of spread can be expected on windy days when 10 hour fuel moistures are below
7%. ERC values (FM - G) above 41 exceed the 90th percentile. In general, live woody
fuel moistures less than 120% can contribute to single and/or group tree torching in
southern yellow pine.

Responsible Agency: Mike Dunivan, TFS
FF+4.0.2 02/11/2014-15:50 (C:\Users\mdunivan\Fire Family\Texas Working Set 01282013)

Design by NWCG Fire Danger Working Team
FIRE DANGER -- Northeast Texas PSA

Years to Remember: 2006 2011

Fuel Model: G - Short-Needle (Heavy Dead)
Northeast Texas

Fire Danger Area:
- Dead F.M. Critical %'s
- 1 Hr. - 7%, 100Hr. - 13%
- 1000Hr. - 15%
  * Meets NWCG Wx Station Standards

Fire Danger Interpretation:
- EXTREME -- Use extreme caution
- (Caution) -- Watch for change
- Moderate -- Lower Potential, but always be aware

Maximum -- Highest Energy Release Component by day for 2004 - 2013

Average -- shows peak fire season over 10 years (1839 observations)

90th Percentile -- Only 10% of the 1839 days from 2004 - 2013 had an Energy Release Component above 41

Local Thresholds - Watch out: Combinations of any of these factors can greatly increase fire behavior:
- 20' Wind Speed over 15 mph, RH less than 25%,
- Temperature over 90, Burning Index over 44

Remember what Fire Danger tells you:
- Energy Release Component gives seasonal trends calculated from 2 pm temperature, humidity, daily temperature & rh ranges, and precip duration.
- Wind is NOT part of ERC calculation.
- Watch local conditions and variations across the landscape -- Fuel, Weather, Topography.
- Listen to weather forecasts -- especially WIND.

Past Experience:
The Bear Creek fire occurred in Cass County on 9/4/2011 burning 41,050 acres and destroyed 92 homes. Strong subsidence from tropical storm Lee and an approaching cold front from the NW provided a strong boundary of instability and extremely critical weather. Significant factors also included high risk pine plantation fuels and extreme fuel dryness. North wind sustained at 15 with gusts to 35, RH near 30% and temps near 95 degrees were observed at the Gilmer RAWS. Longview ASOS observed N-NE wind at 20-25mph with gusts to 40, RH near 30% and temps about 92 degrees. Live fuel moisture measured from loblolly pine in Cass County was 140%. The 10th percentile for loblolly pine in the Northeast Texas PSA is 120%.

Responsible Agency: Mike Dunivan, TFS
FF+4.0.2 02/11/2014-12:09 (C:\Users\mdunivan\Fire Famil...\Texas Working Set 01282013)

Design by NWCG Fire Danger Working Team
Fire Danger Area:
- Dead F.M. Critical %’s
- 10Hr. - 8%, 100Hr. - 11%
- 1000Hr. - 13%
  * Meets NWCG Wx Station Standards

Fire Danger Interpretation:
- **EXTREME** -- Use extreme caution
- **(Caution)** -- Watch for change
- **Moderate** -- Lower Potential, but always be aware

Maximum -- Highest Burning Index by day
for 2004-2013
Average -- shows peak fire season over 10 years (1211 observations)
90th Percentile -- Only 10% of the 1211 days from 2004-2013
had an Burning Index above 54

Local Thresholds - Watch out: Combinations
of any of these factors can greatly increase fire behavior:
- 20' Wind Speed over 15 mph, RH less than 25%
- Temperature over 90, Energy Release Component over 50

Remember what Fire Danger tells you:
- ✓ Burning Index gives day-to-day fluctuations
  calculated from 2 pm temperature, humidity, wind,
  daily temperature & rh ranges, and precip duration.
- ✓ Wind is part of BI calculation.
- ✓ Watch local conditions and variations across
  the landscape -- Fuel, Weather, Topography.
- ✓ Listen to weather forecasts -- especially WIND.

Past Experience:
The 322 Fire occurred on 3/14/2008 in Dimmitt County, burning 67,500 acres. The fire
burned through most of the Chaparral Wildlife Management Area. Extreme fire behavior
was observed in association with the passage of a strong dry cold front, critical fire
weather, high herbaceous fuel loadings and low live fuel moisture in brush. Brush species
such as mesquite, had already leafed out and foliage had become mature due to
abnormally high temperatures for that time of year. A minimum RH of 5%, maximum
temperatures of 98 degrees, sustained winds from the Southwest to the Northeast 10-15
mph with gusts to 23 was observed at the RAWS in Pearsall.

Responsible Agency: Mike Dunivan, TFS
FF+4.0.2 02/11/2014-16:01 (C:\Users\mdunivan\Fire Famil...\Texas Working Set 01282013)

Design by NWCG Fire Danger Working Team
FIRE DANGER -- Rio Grande Plains PSA

Maximum, Average, and 90th Percentile, based on 10 years data

Years to Remember: 2006 2008

Fuel Model: G - Short-Needle (Heavy Dead)
Fire Danger Area:
- Dead F.M. Critical %'s
- 10Hr. - 6%, 100Hr. - 11%
- 1000Hr. - 13%
  * Meets NWCG Wx Station Standards

Fire Danger Interpretation:

EXTREME  -- Use extreme caution
(Caution)  -- Watch for change
Moderate  -- Lower Potential, but always be aware

Maximum  -- Highest Energy Release Component by day
            for 2004 - 2013
Average   -- Shows peak fire season over 10 years (2138 observations)
90th Percentile  -- Only 10% of the 2138 days from 2004 - 2013
                  had an Energy Release Component above 50

Local Thresholds - Watch out: Combinations
of any of these factors can greatly increase fire behavior:
20' Wind Speed over 15 mph, RH less than 25%,
Temperature over 90, Burning Index over 53

Remember what Fire Danger tells you:
✔ Energy Release Component gives seasonal trends
  calculated from 2 pm temperature, humidity,
  daily temperature & rh ranges, and precip duration.
✔ Wind is NOT part of ERC calculation.
✔ Watch local conditions and variations across
  the landscape -- Fuel, Weather, Topography.
✔ Listen to weather forecasts -- especially WIND.

Past Experience:
The Montell fire occurred on 4/7/2006 in Uvalde County burning 2500 acres. A wind shift
occurred with the passage of dry cold front, resulting in the death of a ranch hand who
was attempting to contain the fire with a dozer. Reports say he was unaware that the fire
had changed direction and was not in communication with anyone who saw the fire was
running towards his location. Weather observations from the AWOS in Uvalde included
West winds shifting to the North from 15-24 mph with gusts to 33, minimum RH of 5%
and temperatures near 100 degrees. Live fuel moisture measured from juniper in Uvalde
County a few days after the fire was around 70%. The 10th percentile for juniper in the
Rio Grande Plains is 80%.

Responsible Agency: Mike Dunivan, Texas Forest Service
FF+4.0.2 02/11/2014-12:13 (C:\Users\mdunivan\Fire Family\Texas Working Set 01282013)

Design by NWCG Fire Danger Working Team
FIRE DANGER -- Rolling Plains PSA

Maximum, Average, and 90th Percentile, based on 10 years data

Years to Remember: 2006 2011

Fuel Model: G - Short-Needle (Heavy Dead)
Fire Danger Area:
- Dead F.M. Critical %’s
- 10Hr. - 5%, 100Hr. - 8%
- 1000Hr. - 10%
  * Meets NWCG Wx Station Standards

Fire Danger Interpretation:
- **EXTREME** -- Use extreme caution
- **(Caution)** -- Watch for change
- **Moderate** -- Lower Potential, but always be aware

Maximum -- Highest Burning Index by day for 2004 - 2013
Average -- shows peak fire season over 10 years (1208 observations)
90th Percentile -- Only 10% of the 1208 days from 2004 - 2013 had an Index above 79

Local Thresholds - Watch out: Combinations of any of these factors can greatly increase fire behavior:
- 20' Wind Speed over 15 mph, RH less than 20%
- Temperature over 90, Energy Release Component over 63

Remember what Fire Danger tells you:
- Burning Index gives day-to-day fluctuations calculated from 2 pm temperature, humidity, wind, daily temperature & rh ranges, and precip duration.
- Wind is part of BI calculation.
- Watch local conditions and variations across the landscape -- Fuel, Weather, Topography.
- Listen to weather forecasts -- especially WIND.

Past Experience:
The Southern Plains Outbreak weather pattern was first documented in December of 2005. Since then, numerous Outbreak events have led to many disastrous fires in the Rolling Plains PSA. The Carbon (1/1/06 - Eastland County), Buckle L 2 (3/12/06 - Childress County), Archer (2/25/08 - Archer County), Cedar Mountain (4/7/09 - Eastland County), Two Mile Hill (4/9/09 - Archer County) and the Swenson (4/8/11 - Stonewall County) fires are just a handful of the many fires that can be attributed to these Outbreak events. Extreme weather, large expanses of cured grass and volatile brush fuels, inability of fire fighting resources to combat fires on Outbreak days, etc. are common factors during the winter fire season.

Responsible Agency: Mike Dunivan, TFS
FF+4.0.2 02/11/2014-16:11 (C:\Users\mdunivan\Fire Family\Texas Working Set 01282013)

Design by NWCG Fire Danger Working Team
Fire Danger Area:
- Dead F.M. Critical %’s
- 10Hr. - 5%, 100Hr. - 8%
- 1000Hr. - 10%
  * Meets NWCG Wx Station Standards

Fire Danger Interpretation:
- EXTREME -- Use extreme caution
- (Caution) -- Watch for change
- Moderate -- Lower Potential, but always be aware

Maximum -- Highest Energy Release Component by day for 2004 - 2013
Average -- shows peak fire season over 10 years (1838 observations)
90th Percentile -- Only 10% of the 1838 days from 2004 - 2013 had an Energy Release Component above 63

Local Thresholds - Watch out: Combinations of any of these factors can greatly increase fire behavior:
- 20’ Wind Speed over 15 mph, RH less than 20%,
- Temperature over 90, Burning Index over 80

Remember what Fire Danger tells you:
- Energy Release Component gives seasonal trends calculated from 2 pm temperature, humidity, daily temperature & rh ranges, and precip duration.
- Wind is NOT part of ERC calculation.
- Watch local conditions and variations across the landscape -- Fuel, Weather, Topography.
- Listen to weather forecasts -- especially WIND.

Past Experience:
The White Hat fire occurred on 6/20/2011 in Nolan County burning 72,473 acres, destroying 8 homes. Even though this fire occurred in the summer, it did occur under the influence of a Southern Plains Outbreak event. Weather observations from the AWOS in Sweetwater included winds from the West-Southwest becoming North from 6-29 mph with gusts to 37, minimum RH 8% and maximum temperature of 104 degrees. This fire exhibited extreme fire behavior and Initiated in a grass and shrub fuel model. Live fuel moisture measured from juniper in nearby Coke County was 44%. Mortality in juniper begins to occur around 40%, The 3rd percentile for juniper in the Rolling Plains PSA is 70%.

Responsible Agency: Mike Dunivan, TFS
FF+4.0.2 02/11/2014-14:02 (C:\Users\mdunivan\Fire Family\Texas Working Set 01282013)

Design by NWCG Fire Danger Working Team
FIRE DANGER -- Southeast Texas PSA
Maximum, Average, and 90th Percentile, based on 10 years data

Years to Remember: 2010 2011

Fuel Model: G - Short-Needle (Heavy Dead)
Fire Danger Area:
- Dead F.M. Critical %’s
- 10Hr. - 7%, 100Hr. - 14%
- 1000Hr. - 17%
* Meets NWCG Wx Station Standards

Fire Danger Interpretation:
- **EXTREME** -- Use extreme caution
- (Caution) -- Watch for change
- **Moderate** -- Lower Potential, but always be aware

Maximum -- Highest Burning Index by day for 2004 - 2013
Average -- shows peak fire season over 10 years (1093 observations)
90th Percentile -- Only 10% of the 1093 days from 2004 - 2013 had an Burning Index above 38

Local Thresholds - Watch out: Combinations of any of these factors can greatly increase fire behavior:
- 20' Wind Speed over 15 mph, RH less than 30%,
- Temperature over 90, Energy Release Component over 35

Remember what Fire Danger tells you:
- ☑ Burning Index gives day-to-day fluctuations calculated from 2 pm temperature, humidity, wind, daily temperature & rh ranges, and precip duration.
- ☑ Wind is part of BI calculation.
- ☑ Watch local conditions and variations across the landscape -- Fuel, Weather, Topography.
- ☑ Listen to weather forecasts -- especially WIND.

Past Experience:
The Pipeline Road Fire (4/16/2011) in Hardin Co., burned 7,101 acres. Arson fires are common in the SETX PSA. This fire was caused by an oil well flair. Fuels: primarily young dense pine plantation, ladder fuels (needle drape) and yaupon in the understory. The fire was extremely difficult to control due to weather, fuel conditions, very remote large continuous pine plantation without many fuel breaks. Indirect tactics and large burnouts were used to contain the fire. A min. RH 10%, max. temp 84 degrees, Northerly winds 9 mph with gusts to 24 was observed at the Southern Rough RAWS. LFM measured from pine in Tyler Co., was 113% & 112% in yaupon. The 10th percentile for pine is 120% & 115% in yaupon in SETX.

Responsible Agency: Mike Dunivan, TFS
FF+4.0.2 02/11/2014-16:20 (C:\Users\mdunivan\Fire Famil...\Texas Working Set 01282013)

Design by NWCG Fire Danger Working Team
FIRE DANGER -- Southeast Texas PSA
Maximum, Average, and 90th Percentile, based on 10 years data

Years to Remember: 2011

Fuel Model: G - Short-Needle (Heavy Dead)
Fire Danger Area:
- Dead F.M. Critical %'s
- 10Hr. - 7%, 100Hr. - 14%
- 1000Hr. - 17%
  * Meets NWCG Wx Station Standards

Fire Danger Interpretation:
- EXTREME -- Use extreme caution
- (Caution) -- Watch for change
- Moderate -- Lower Potential, but always be aware

Maximum -- Highest Energy Release Component by day for 2004 - 2013
Average -- shows peak fire season over 10 years (1840 observations)
90th Percentile -- Only 10% of the 1840 days from 2004 - 2013 had an Energy Release Component above 35

Local Thresholds - Watch out: Combinations of any of these factors can greatly increase fire behavior:
- 20' Wind Speed over 15 mph, RH less than 30%,
- Temperature over 90, Burning Index over 39

Remember what Fire Danger tells you:
- ✔ Energy Release Component gives seasonal trends calculated from 2 pm temperature, humidity, daily temperature & rh ranges, and precip duration.
- ✔ Wind is NOT part of ERC calculation.
- ✔ Watch local conditions and variations across the landscape -- Fuel, Weather, Topography.
- ✔ Listen to weather forecasts -- especially WIND.

Past Experience:
The Powerline Fire occurred on 6/18/11 in Jasper County. The weather pattern was dominant high pressure with consecutive accelerated drying days of near 100 degrees. Consecutive days of accelerated drying and pine plantation fuels are key. The fires grew in pine plantation fuels which included active crown fire and spotting. Weather observations from the Kirbyville RAWS included South-southwest winds 10-12 mph with gusts to 25, minimum RH 35% and maximum temperature of 101 degrees. Live fuel moisture measured from pine in nearby Newton County was 130%. The 10th percentile for pine in Southeast Texas is 120%.

Responsible Agency: Mike Dunivan, TFS
FF+4.0.2 02/11/2014-14:16 (C:\Users\mdunivan\Fire Family\Texas Working Set 01282013)

Design by NWCG Fire Danger Working Team
Fire Danger Area:
- Dead F.M. Critical %’s
- 10Hr. - 5%, 100Hr. - 8%
- 1000Hr. - 10%
  * Meets NWCG Wx Station Standards

Fire Danger Interpretation:
- EXTREME -- Use extreme caution
- (Caution) -- Watch for change
- Moderate -- Lower Potential, but always be aware

Maximum -- Highest Burning Index by day
  for 2004 - 2013
Average -- shows peak fire season over 10 years (1507 observations)
90th Percentile -- Only 10% of the 1507 days from 2004 - 2013
  had an Burning Index above 82

Local Thresholds - Watch out: Combinations
  of any of these factors can greatly increase fire behavior:
  20' Wind Speed over 15 mph, RH less than 15%,
  Temperature over 90, Energy Release Component over 65

Remember what Fire Danger tells you:
- ✓ Burning Index gives day-to-day fluctuations
  calculated from 2 pm temperature, humidity, wind,
  daily temperature & rh ranges, and precip duration.
- ✓ Wind is part of BI calculation.
- ✓ Watch local conditions and variations across
  the landscape -- Fuel, Weather, Topography.
- ✓ Listen to weather forecasts -- especially WIND.

Past Experience:
The Southern Plains Outbreak weather pattern was first documented in December of 2005. Since then, numerous Outbreak events have led to many disastrous fires in the Southern Plains PSA. The Rocker B (1/1/06 - Irion Co.), Glass (2/25/08 - Sterling Co.), Porter (3/14/08 - Pecos Co.), Williams (2/27/11 - Crockett Co.) and Hickman (4/9/11 - Midland Co.) fires are just a handful of the many fires that can be attributed to these Outbreak events. Extreme weather, large expanses of cured grass and volatile brush fuels, inability of fire fighting resources to combat fires on Outbreak days, etc. are common factors during the winter fire season.

Responsible Agency: Mike Dunivan, TFS
FF+4.0.2 02/11/2014-16:26 (C:\Users\mdunivan\Fire Family\Texas Working Set 01282013)

Design by NWCG Fire Danger Working Team
FIRE DANGER -- Southern Plains PSA
Maximum, Average, and 90th Percentile, based on 10 years data

Years to Remember: 2006 2011

Fuel Model: G - Short-Needle (Heavy Dead)
Fire Danger Area:
- Dead F.M. Critical %'s
- 10Hr. - 5%, 100Hr. - 8%
- 1000Hr. - 10%
  * Meets NWCG Wx Station Standards

Fire Danger Interpretation:

EXTREME -- Use extreme caution
(Caution) -- Watch for change
Moderate -- Lower Potential, but always be aware

Maximum -- Highest Energy Release Component by day
for 2004 - 2013
Average -- shows peak fire season over 10 years (1836 observations)
90th Percentile -- Only 10% of the 1836 days from 2004 - 2013
  had an Energy Release Component above 85

Local Thresholds - Watch out: Combinations
of any of these factors can greatly increase fire behavior:
20' Wind Speed over 15 mph, RH less than 15%,
Temperature over 90, Burning Index over 83

Remember what Fire Danger tells you:
- Energy Release Component gives seasonal trends
calculated from 2 pm temperature, humidity,
daily temperature & rh ranges, and precip duration.
- Wind is NOT part of ERC calculation.
- Watch local conditions and variations across
  the landscape -- Fuel, Weather, Topography.
- Listen to weather forecasts -- especially WIND.

Past Experience:
The Boyken Road fire occurred on 6/20/2011 in Howard County burning 5,067 acres. This
fire can be attributed to a Southern Plains Outbreak event. The Burning Index (BI - 78G)
the day of the fire was 92. The 90th percentile for BI in the Southern Plains is 83.
Weather observations from the AWOS in Big Spring included West-southwest winds,
eventually becoming Northwest, from 12-25 mph with gusts to 33, minimum RH of 7%
and maximum temperature of 104 degrees. Very active fire behavior was observed in
juniper brush. Live fuel moisture measured from juniper in nearby Coke County was 44%.
The 3rd percentile for juniper in the Southern Plains PSA is 70%. Mortality in juniper
occurs near 40% live fuel moisture content.

Responsible Agency: Mike Dunivan, TFS
FF+4.0.2 02/11/2014-14:21 (C:\Users\mdunivan\Fire Family\Texas Working Set 01282013)

Design by NWCG Fire Danger Working Team
Fire Danger Area:
- Dead F.M. Critical %’s
- 10Hr. - 3%, 100Hr. - 5%
- 1000Hr. - 6%
  * Meets NWCG Wx Station Standards

Fire Danger Interpretation:

EXTREME -- Use extreme caution
(Caution) -- Watch for change
Moderate -- Lower Potential, but always be aware

Maximum -- Highest Burning Index by day
for 2004 - 2013
Average -- shows peak fire season over 10 years (1185 observations)
90th Percentile -- Only 10% of the 1185 days from 2004 - 2013
had an Burning Index above 119

Local Thresholds - Watch out: Combinations
of any of these factors can greatly increase fire behavior:
20’ Wind Speed over 15 mph, RH less than 15%,
Temperature over 90, Energy Release Component over 93

Remember what Fire Danger tells you:
✓ Burning Index gives day-to-day fluctuations
  calculated from 2 pm temperature, humidity, wind,
  daily temperature & rh ranges, and precip duration.
✓ Wind is part of BI calculation.
✓ Watch local conditions and variations across
  the landscape -- Fuel, Weather, Topography.
✓ Listen to weather forecasts -- especially WIND.

Past Experience:
The Rockhouse fire occurred in Jeff Davis County on 4/9/2011. Marfa AWOS
observations included 30-35mph sustained with a peak gust to 50mph. Temperatures
reached 88 degrees and minimum RH was 12-14%. Observed weather at the Ft. Davis
RAWS during this run included SW wind near 20mph with gusts to 40mph. RH near 10%
and temperatures near 85 degrees were observed. This fire occurred under a Southern
Plains Outbreak pattern. The fire started near Marfa at 1230 hrs, burned through Ft.
Davis at 1600 hrs and crossed Wild Rose pass at 1800 hrs for a distance of 33 miles in
5.5 hours for an average rate of spread of 6 mph.

Responsible Agency: Mike Dunivan, TFS
FF+4.0.2 02/11/2014-16:31 (C:\Users\mdunivan\Fire Family\Texas Working Set 01282013)

Design by NWCG Fire Danger Working Team
Fire Danger Area:
- Dead F.M. Critical %’s
- 10Hr. - 3%, 100Hr. - 5%
- 1000Hr. - 6%
  * Meets NWCG Wx Station Standards

Fire Danger Interpretation:

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
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<tr>
<td>Caution</td>
<td>Watch for change</td>
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<tr>
<td>Moderate</td>
<td>Lower Potential, but always be aware</td>
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</tbody>
</table>

Maximum -- Highest Energy Release Component by day for 2004 - 2013

Average -- shows peak fire season over 10 years (1228 observations)

90th Percentile -- Only 10% of the 1228 days from 2004 - 2013 had an Energy Release Component above 93

Local Thresholds - Watch out: Combinations of any of these factors can greatly increase fire behavior:
- 20’ Wind Speed over 15 mph, RH less than 15%,
- Temperature over 90, Burning Index over 119

Remember what Fire Danger tells you:
- Energy Release Component gives seasonal trends calculated from 2 pm temperature, humidity, daily temperature & rh ranges, and precip duration.
- Wind is NOT part of ERC calculation.
- Watch local conditions and variations across the landscape -- Fuel, Weather, Topography.
- Listen to weather forecasts -- especially WIND.

Past Experience:
The Hughes Ranch fire occurred on 8/4/2008 in Presidio County burning 43,241 acres. The fire initiated on a Red Flag day and was starting by railroad crews who were grinding/welding on the tracks. The Burning Index that day was 130 (78G). The 97th percentile for BI in the Trans Pecos is 135. Weather observations from the AWOS in Marfa included Southwest winds from 10-26 mph with gusts to 38, minimum RH of 10% and maximum temperature of 97 degrees. Extreme fire behavior was observed in cured grass and shrub fuels.

Responsible Agency: Mike Dunivan, Texas Forest Service

Design by NWCG Fire Danger Working Team
FIRE DANGER -- Upper Coast PSA

Maximum, Average, and 90th Percentile, based on 10 years data

Years to Remember: 2006 2009

Chambers Co. Fire

Fuel Model: G - Short-Needle (Heavy Dead)
Fire Danger Area:
- Dead F.M. Critical %'s
- 10Hr. - 8%, 100Hr. - 15%
- 1000Hr. - 17%
  * Meets NWCG Wx Station Standards

Fire Danger Interpretation:
- EXTREME -- Use extreme caution
- (Caution) -- Watch for change
- Moderate -- Lower Potential, but always be aware

Maximum -- Highest Burning Index by day
for 2004 - 2013
Average -- shows peak fire season over 10 years (888 observations)
90th Percentile -- Only 10% of the 888 days from 2004 - 2013
had an Burning Index above 43

Local Thresholds - Watch out: Combinations
of any of these factors can greatly increase fire behavior:
20' Wind Speed over 15 mph, RH less than 30%,
Temperature over 90, Energy Release Component over 31

Remember what Fire Danger tells you:
✓ Burning Index gives day-to-day fluctuations
  calculated from 2 pm temperature, humidity, wind,
  daily temperature & rh ranges, and precip duration.
✓ Wind is part of BI calculation.
✓ Watch local conditions and variations across
  the landscape -- Fuel, Weather, Topography.
✓ Listen to weather forecasts -- especially WIND.

Past Experience:
Remember: Any change in wind speed or direction will have an immediate impact on
flame lengths and rate of spread on fires in fine fuels. When grass fuels are cured, rapid
rates of spread can be expected on windy days when 10 hour fuel moistures are below
8%. ERC values (FM - G) above 31 exceed the 90th percentile. Live woody fuel
moistures less than 130% in southern yellow pine, can contribute to single and/or group
tree torching.

Responsible Agency: Mike Dunivan, TFS
FF+4.0.2 02/11/2014-16:36 (C:\Users\mdunivan\Fire Family\Texas Working Set 01282013)
Design by NWCG Fire Danger Working Team
FIRE DANGER -- Upper Coast PSA
Maximum, Average, and 90th Percentile, based on 10 years data

Energy Release Component

May Jun Jul Aug Sep Oct

Years to Remember: 2011 2009

Lamar Fire

Fuel Model: G - Short-Needle (Heavy Dead)
Fire Danger Area:
- Dead F.M. Critical %’s
- 10Hr. - 8%, 100Hr. - 15%
- 1000Hr. - 17%
  * Meets NWCG Wx Station Standards

Fire Danger Interpretation:

- **EXTREME** -- Use extreme caution
- *(Caution)* -- Watch for change
- **Moderate** -- Lower Potential, but always be aware

Maximum -- Highest Energy Release Component by day
  for 2004 - 2013

Average -- shows peak fire season over 10 years (1837 observations)

90th Percentile -- Only 10% of the 1837 days from 2004 - 2013
  had an Energy Release Component above 31

Local Thresholds - Watch out: Combinations
  of any of these factors can greatly increase fire behavior:
  20' Wind Speed over 15 mph, RH less than 30%,
  Temperature over 90, Burning Index over 43

Remember what Fire Danger tells you:
- ✓ Energy Release Component gives seasonal trends
  calculated from 2 pm temperature, humidity,
  daily temperature & rh ranges, and precip duration.
- ✓ Wind is NOT part of ERC calculation.
- ✓ Watch local conditions and variations across
  the landscape -- Fuel, Weather, Topography.
- ✓ Listen to weather forecasts -- especially WIND.

Past Experience:
Remember: Any change in wind speed or direction will have an immediate impact on
flame lengths and rate of spread on fires in fine fuels. When grass fuels are cured, rapid
rates of spread can be expected on windy days when 10 hour fuel moistures are below
8%. BI values (FM - G) above 43 exceed the 90th percentile. Live woody fuel moistures
less than 130% in southern yellow pine, can contribute to single and/or group tree
torching.
FIRE DANGER -- Western Pineywoods PSA

Maximum, Average, and 90th Percentile, based on 10 years data

Years to Remember: 2011

Fuel Model: G - Short-Needle (Heavy Dead)
Fire Danger Area:
- Dead F.M. Critical %'s
- 10Hr. - 7%, 100Hr. - 13%
- 1000Hr. - 15%  
  * Meets NWCG Wx Station Standards

Fire Danger Interpretation:

EXTREME -- Use extreme caution
(Caution) -- Watch for change
Moderate -- Lower Potential, but always be aware

Maximum -- Highest Burning Index by day
for 2004 - 2013
Average -- shows peak fire season over 10 years (1064 observations)
90th Percentile -- Only 10% of the 1064 days from 2004 - 2013 had an Burning Index above 45

Local Thresholds - Watch out: Combinations of any of these factors can greatly increase fire behavior:
20' Wind Speed over 15 mph, RH less than 30%,
Temperature over 90, Energy Release Component over 39

Remember what Fire Danger tells you:
- Burning Index gives day-to-day fluctuations calculated from 2 pm temperature, humidity, wind, daily temperature & rh ranges, and precip duration.
- Wind is part of BI calculation.
- Watch local conditions and variations across the landscape -- Fuel, Weather, Topography.
- Listen to weather forecasts -- especially WIND.

Past Experience:
The Josserand South Fire occurred on 4/15/11 in Trinity County, burning 1,369 acres and was started by debris burning. The majority of the fire burned in high risk pine plantation. A minimum RH of 11%, maximum temperature of 80 degrees, sustained winds from 10-15 mph from the Northwest with gusts to 29 mph was observed at the Lukfin RAWS. Extreme fire behavior was observed in plantation fuels, associated with the passage of a strong dry cold front. Live fuel moisture measured from pine in nearby Houston County, was 102%. The 3rd percentile for pine in the Western Pineywoods PSA is 105%.

Responsible Agency: Mike Dunivan, TFS
FF+4.0.2 02/11/2014-16:41 (C:\Users\mdunivan\Fire Family\Texas Working Set 01282013)
FIRE DANGER -- Western Pineywoods PSA

Maximum, Average, and 90th Percentile, based on 10 years data

Years to Remember: 2009 2011

Fuel Model: G - Short-Needle (Heavy Dead)
Fire Danger Area:
- Dead F.M. Critical %'s
- 10Hr. - 7%, 100Hr. - 13%
- 1000Hr. - 15%
  * Meets NWCG Wx Station Standards

Fire Danger Interpretation:
- EXTREME -- Use extreme caution
- (Caution) -- Watch for change
- Moderate -- Lower Potential, but always be aware

Maximum -- Highest Energy Release Component by day for 2004 - 2013
Average -- shows peak fire season over 10 years (1840 observations)
90th Percentile -- Only 10% of the 1840 days from 2004 - 2013 had an Energy Release Component above 39

Local Thresholds - Watch out: Combinations of any of these factors can greatly increase fire behavior:
- 20' Wind Speed over 15 mph, RH less than 30%,
- Temperature over 90, Burning Index over 46

Remember what Fire Danger tells you:
- Energy Release Component gives seasonal trends calculated from 2 pm temperature, humidity, daily temperature & rh ranges, and precip duration.
- Wind is NOT part of ERC calculation.
- Watch local conditions and variations across the landscape -- Fuel, Weather, Topography.
- Listen to weather forecasts -- especially WIND.

Past Experience:
The Riley Road fire occurred 9/5/2011 in Montgomery County burning 19,960 acres, destroying 73 homes. Strong subsidence from tropical storm Lee and an approaching cold front from the NW provided a strong boundary of instability and extremely critical weather. Significant factors also included high risk pine timber fuels, densely populated area and extreme fuel dryness. Northerly winds around 10 mph with gusts to 24, min. RH 12% and max. temps. of 95 degrees observed at the Conroe RAWS. Live fuel moisture measured from loblolly pine in Montgomery County was 129%. The 10th percentile for loblolly pine in the Western Pineywoods PSA is 120%.

Responsible Agency: Mike Dunivan, TFS
FF+4.0.2 02/11/2014-14:38 (C:\Users\mdunivan\Fire Family...\Texas Working Set 01282013)
Design by NWCG Fire Danger Working Team
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<tr>
<td><strong>Low-L (Green)</strong></td>
<td>Fuels do not ignite readily from small firebrands although a more intense heat source, such as lightning, may start fires in duff or punk wood. Fires in open cured grasslands may burn freely a few hours after rain, but woods fires spread slowly by creeping or smoldering and burn in irregular fingers. There is little danger of spotting.</td>
</tr>
<tr>
<td><strong>Moderate-M (Blue)</strong></td>
<td>Fires can start from most causes but, with the exception of lightning fires in some areas, the number of starts is generally low. Fires in open cured grasslands will burn briskly and spread rapidly on windy days. Timber fires spread slowly to moderately fast. The average fire is of moderate intensity, although heavy concentrations of fuel, especially draped fuel, may burn hot. Short distance spotting may occur, but is not persistent. Fires are not likely to become serious and control is relatively easy.</td>
</tr>
<tr>
<td><strong>High-H (Yellow)</strong></td>
<td>All fine dead fuels ignite readily and fires start easily from most causes. Unattended brush and camp fires are likely to escape. Fires spread rapidly and short distance spotting is common. High intensity burning may develop on slopes or in concentrations of fine fuels. Fires may become serious and their control difficult unless they are attacked successfully while they are small.</td>
</tr>
<tr>
<td><strong>Very High-VH (Orange)</strong></td>
<td>Fires start easily from all causes. Immediately after ignition they spread rapidly and increase quickly in intensity. Spot fires are a constant danger. Fires burning in light fuels may quickly develop high intensity characteristics, such as long range spotting and fire whirlwinds, when they are burning in heavier fuels.</td>
</tr>
<tr>
<td><strong>Extreme-E (Red)</strong></td>
<td>Fires start quickly, spread furiously, and burn intensely. All fires are potentially serious. Development into high intensity burning will usually be faster and occur from smaller fires than in the Very High fire danger class. Direct attack is rarely possible and may be dangerous except immediately after ignition. Fires that develop headway in heavy slash or conifer stands may be unmanageable while the extreme conditions last.</td>
</tr>
</tbody>
</table>
Rate Of Spread (ROS) and Flame Lengths (FL) In Grass Fuel Types

The following graphs illustrate the ROS and FL in three different grass fuel models. The 1 fuel model is the traditional short grass fire behavior grass fuel model representing light fuel loading. The Gr3 fuel model represents a grass fuel model with moderate fuel loading, and the Gr4 fuel model represents a grass fuel model with heavy fuel loading. These adjective fuel loadings of light, moderate and heavy are subjective and are used here to show the variable fuel conditions in the field.

Fine dead fuel moisture is a critical input in determining ROS and FL in grass fuel models. The instructions and reference tables for determining fine dead fuel moisture can be found on page B-22 in Appendix B of your fireline handbook. The graphs below range from 5% to 13% fine dead fuel moisture.

To use these graphs, first find the graph representing the fine dead fuel moisture that matches your expected conditions. FL and ROS are plotted by 20-foot windspeed from 5 to 30 mph. Tim Stubbs has put together a good explanation of the concept of adjective fire behavior and how firefighters can use FL and ROS to plan suppression tactics at http://ticc.tamu.edu/Documents/PredictiveServices/Fuels/adjective_fire_behavior.pdf
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http://www.tamu.edu/ticc/predictive_services/adjective_fire_behavior.pdf
Rate of Spread with 9% Fine Dead Moisture

Flame Length with 9% Fine Dead Moisture
Rate of Spread with 11% Fine Dead Moisture

Flame Length with 11% Fine Dead Moisture
Rate of Spread with 13% Fine Dead Moisture

Flame Length with 13% Fine Dead Moisture
Fire, Leadership & Safety Web Links

**ticc.tamu.edu**
Current weather, fuel and intelligence
see predictive services

**www.wildfirelessons.net**
Lessons learned, incident toolbox,
and 48 & 72 hour reports

**www.fireleadership.gov**
Fire leadership issues and courses

**www.nifc.gov/safety/safety_main.html**
National Interagency Fire Center site
for safety issues

**gacc.nifc.gov/sacc/**
Southern Area Coordination Center site
for Region 8

**gacc.nifc.gov/swcc/**
Southwest Area Coordination Center site
for Region 3

**www.fs.fed.us/fire**
US Forest Service - Fire & Aviation site