A Re-Evaluation of Critical Fire Weather in the Southeastern United States

Example Case

79 °F Afternoon surface temperature: Afternoon surface dewpoint: 43 °F 26 % Minimum relative humidity: Maximum wind speed: 16 mph Maximum Fosberg index: 19 Energy release component: 35 100-hour dead fuel moisture: 16.3% 16.1% 1000-hour dead fuel moisture: Burning Index: 37

Example Case



Honey Prairie Fire in Georgia (2011)

- 309,200 acres burned
- Persisted for 16 days
- Caused by lightning

Research Outline

- Examined fires that burned at least 100 acres
- Fires from FL, GA, SC, NC, MS, AL in the years 2002-2013
- Basic overview (break down fires by state, cause, month)
- Analyzing individual parameters
- Bivariate analyses

Fires By State



- Disproportionate number of fires occurred in Florida · Averaged about 110 fires per year 2002-2013

- Fewest number of fires in the Carolinas · Averaged about 29 fires per year 2002-2013



Nearly half of all fires in Florida caused by lightning
 Very few fires in Mississippi caused by lightning

Fires By Month



Fire weather season peaks in late winter/early spring
 Relatively inactive during late summer and fall

Lightning Fires By Month



- Most lightning-caused fires occur in late spring/early summer

Relative Humidity



Average Relative Humidity Box Plot



Average Relative Humidity (%)

Relative Humidity



Average Relative Humidity Box Plot



- 30% of all fires had relative humidities of 35% or less
 - Broad distribution of relative humidity

Temperature



Average Temperature Box Plot



Average Temperature (C)

Temperature



Average Temperature Box Plot



- Negatively-skewed (favorable) distribution
- However, such temperatures are frequently observed

Fosberg Index



Average Fosberg Index Box Plot



Average Fosberg Index

Fosberg Index



Average Fosberg Index Box Plot



- Positively-skewed (unfavorable) distribution
- Less than 1% of all fires had Fosberg indices above 50

Wind Speed



Average Wind Speed Box Plot



Average Wind Speed (m/s)

Wind Speed



Average Wind Speed Box Plot



- Positively-skewed (unfavorable) distribution
- 75% of all fires occurred with wind speeds over 5 m/s (11 mph)

Environmental Parameters as a Predictor

- No single environmental parameter appears to be a reliable predictor
- Suggests wildfires are more driven by fuels
- Can fuel parameters be used as a predictor?

Energy Release Component

Percentage **South Carolina North Carolina** Mississippi Threshold Georgia **Florida Histogram of Energy Release Component** Alabama

Percentile Plot of Energy Release Component

Energy Release Component



Energy Release Component

Energy Release Component



Energy Release Component

South Carolina North Carolina Mississippi Georgia Florida Alabama

Significant discrepancy between Florida and other states
 Majority of fires in Florida, fewest in the Carolinas and Georgia

100-Hour Dead Fuel Moisture



South Carolina North Carolina Mississippi Georgia Florida Alabama

100-hour Dead Fuel Moisture

- Again, significant discrepancy between Florida and other states

- Majority of fires fall between 14% and 18% in Florida
- Majority of fires fall between 12% and 16% in other states

Burning Index



South Carolina North Carolina Mississippi Georgia Florida Alabama

- Several burning indices close to 0
- Not every fire weather event is going to have a burning index

Fuel Parameters as a Predictor

- Fuel parameters show slightly more favorable distributions
- Fires still occur under a wide range of values
- Some combination of parameters is needed to obtain a reliable predictor
- Combinations of parameters analyzed in two ways:
 - Combining two or more parameters together mathematically (multiplication and division)
 - Checking what percentage of fires fell under a set of criteria (Example: How many fires had a temperature over 70°F and a wind speed over 5 m/s?)

Temperature ÷ 100-Hour Fuel Moisture



Temperature ÷ 100-Hour Fuel Moisture



Temperature and 100-hr distributions were originally broad
 Distribution becomes narrow when combined in this way

Average Relative Humidity Histogram

Average Wind Speed Histogram



Relative Humidity

Average Wind Speed (m/s)

Average Wind Speed / Average RH







- Narrow, but positively-skewed distribution

- Again, distributions become narrow when combined this way



- Negatively-skewed (favorable)
- Plotted on a logarithmic scale (hence the log in the equation)



- Negatively-skewed (favorable)
- Plotted on a logarithmic scale (hence the log in the equation)



- Negatively-skewed (favorable)
- Plotted on a logarithmic scale (hence the log in the equation)

- Cells highlighted green are where an algorithm detected a significant "jump" while still "catching" at least 50% of the fires
- Cells highlighted yellow are where an algorithm detected a significant "jump", but without "catching" a majority of the fires
- Cutoff values are obtained by finding the most favorable value while still maintaining several green cells (minimize FAR)

Temperature vs Wind Speed

- Several green cells at 24°C (75°F)

	Wind Sp	eed (m/	s)																	
	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0
0.0	100.0	98.77	95.14	89.69	83.12	76.1	68.08	59.27	50.37	40.17	30.15	23.08	16.75	11.54	7.51	5.15	3.45	2.32	1.52	0.83
2.0	99.92	98.69	95.06	89.61	83.04	76.01	68.03	59.21	50.32	40.12	30.13	23.08	16.75	11.54	7.51	5.15	3.45	2.32	1.52	0.83
4.0	99.68	98.45	94.85	89.4	82.88	75.85	67.9	59.08	50.24	40.04	30.1	23.05	16.72	11.51	7.48	5.13	3.45	2.32	1.52	0.83
6.0	99.39	98.16	94.58	89.16	82.67	75.64	67.71	58.95	50.13	39.93	29.99	23.02	16.69	11.49	7.45	5.13	3.45	2.32	1.52	0.83
8.0	99.07	97.84	94.28	88.86	82.37	75.35	67.41	58.68	49.92	39.74	29.86	22.94	16.64	11.43	7.4	5.1	3.45	2.32	1.52	0.83
10.0	98.08	96.85	93.38	87.95	81.52	74.63	66.77	58.12	49.41	39.29	29.54	22.76	16.48	11.35	7.32	5.07	3.42	2.3	1.5	0.83
12.0	96.53	95.35	91.96	86.65	80.34	73.64	65.87	57.26	48.64	38.78	29.22	22.52	16.29	11.22	7.18	4.94	3.31	2.19	1.39	0.75
14.0	94.1	92.95	89.58	84.38	78.29	72.01	64.45	56.12	47.6	37.95	28.55	21.98	15.87	10.92	6.97	4.75	3.18	2.14	1.34	0.72
16.0	91.11	89.96	86.75	81.65	75.83	69.76	62.61	54.43	46.1	36.81	27.48	21.18	15.28	10.47	6.68	4.54	3.02	2.0	1.28	0.69
18.0	86.57	85.5	82.51	77.8	72.2	66.4	59,56	51.71	43.8	35.12	26.15	20.01	14.45	9.8	6.06	4.01	2.72	1.82	1.12	0.64
20.0	81.7	80.69	77.86	73.5	68.11	62.55	56.09	48.85	41.53	33.39	24.92	18.99	13.73	9.38	5.72	3.77	2.48	1.68	1.07	0.61
22.0	73.02	72.17	69.52	65.54	60.58	55.4	49.76	43.3	36.54	29.43	22.04	16.88	12.23	8.36	5.07	3.39	2.24	1.52	0.96	0.59
24.0	62.82	62.05	59.54	56.17	52.06	47.6	42.71	37.02	30.96	25.13	18.96	14.56	10.5	7.08	4.41	2.86	1.84	1.26	0.8	0.51
26.0	51.34	50.59	48.26	45.38	41.64	37.71	33.41	28.47	23.32	18.64	13.84	10.68	7.48	5.07	3.1	2.14	1.39	1.01	0.59	0.4
28.0	39.13	38.54	36.62	34.21	31.2	28.04	24.44	20.3	16.16	12.58	9.13	7.16	4.86	3.39	2.06	1.39	0.77	0.64	0.37	0.24
30.0	28.5	28.07	26.63	24.63	22.2	19.6	16.91	13.54	10.18	7.77	5.34	3.95	2.56	1.76	1.2	0.75	0.35	0.32	0.16	0.08
32.0	18.59	18.22	17.2	15.68	13.89	12.13	10.26	7.91	5.48	4.17	2.86	2.0	1.28	0.83	0.53	0.24	0.13	0.11	0.03	0.0
34.0	8.17	7.99	7.48	6.6	5.8	5.15	4.17	3.02	2.03	1.55	1.1	0.75	0.45	0.29	0.19	0.05	0.03	0.0	0.0	0.0
36.0	2.46	2.43	2.3	2.08	1.79	1.6	1.36	1.07	0.69	0.48	0.29	0.16	0.11	0.05	0.05	0.03	0.03	0.0	0.0	0.0
38.0	0.67	0.67	0.61	0.56	0.43	0.35	0.35	0.27	0.16	0.13	0.08	0.05	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40.0	0.05	0.05	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Temperature vs Wind Speed

- Wind speed cutoff value around 6 m/s (13 mph)

	Wind Sp	eed (m/	s)																	
	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0
0.0	100.0	98.77	95.14	89.69	83.12	76.1	68.08	59.27	50.37	40.17	30.15	23.08	16.75	11.54	7.51	5.15	3.45	2.32	1.52	0.83
2.0	99.92	98.69	95.06	89.61	83.04	76.01	68.03	59.21	50.32	40.12	30.13	23.08	16.75	11.54	7.51	5.15	3.45	2.32	1.52	0.83
4.0	99.68	98.45	94.85	89.4	82.88	75.85	67.9	59.08	50.24	40.04	30.1	23.05	16.72	11.51	7.48	5.13	3.45	2.32	1.52	0.83
6.0	99.39	98.16	94.58	89.16	82.67	75.64	67.71	58.95	50.13	39.93	29.99	23.02	16.69	11.49	7.45	5.13	3.45	2.32	1.52	0.83
8.0	99.07	97.84	94.28	88.86	82.37	75.35	67.41	58.68	49.92	39.74	29.86	22.94	16.64	11.43	7.4	5.1	3.45	2.32	1.52	0.83
10.0	98.08	96.85	93.38	87.95	81.52	74.63	66.77	58.12	49.41	39.29	29.54	22.76	16.48	11.35	7.32	5.07	3.42	2.3	1.5	0.83
12.0	96.53	95.35	91.96	86.65	80.34	73.64	65.87	57.26	48.64	38.78	29.22	22.52	16.29	11.22	7.18	4.94	3.31	2.19	1.39	0.75
14.0	94.1	92.95	89.58	84.38	78.29	72.01	64.45	56.12	47.6	37.95	28.55	21.98	15.87	10.92	6.97	4.75	3.18	2.14	1.34	0.72
16.0	91.11	89.96	86.75	81.65	75.83	69.76	62.61	54.43	46.1	36.81	27.48	21.18	15.28	10.47	6.68	4.54	3.02	2.0	1.28	0.69
18.0	86.57	85.5	82.51	77.8	72.2	66.4	59,56	51.71	43.8	35.12	26.15	20.01	14.45	9.8	6.06	4.01	2.72	1.82	1.12	0.64
20.0	81.7	80.69	77.86	73.5	68.11	62.55	56.09	48.85	41.53	33.39	24.92	18.99	13.73	9.38	5.72	3.77	2.48	1.68	1.07	0.61
22.0	73.02	72.17	69,52	65.54	60.58	55.4	49.76	43.3	36.54	29.43	22.04	16.88	12.23	8.36	5.07	3.39	2.24	1.52	0.96	0.59
24.0	62.82	62.05	59,54	56,17	52.06	47.6	42.71	37.02	30.96	25.13	18.96	14.56	10.5	7.08	4.41	2.86	1.84	1.26	0.8	0.51
26.0	51.34	50,59	48.26	45.38	41.64	37.71	33.41	28.47	23.32	18.64	13.84	10.68	7.48	5.07	3.1	2.14	1.39	1.01	0.59	0.4
28.0	39.13	38.54	36.62	34.21	31.2	28.04	24.44	20.3	16.16	12.58	9.13	7.16	4.86	3.39	2.06	1.39	0.77	0.64	0.37	0.24
30.0	28.5	28.07	26.63	24.63	22.2	19.6	16.91	13.54	10.18	7.77	5.34	3.95	2.56	1.76	1.2	0.75	0.35	0.32	0.16	0.08
32.0	18.59	18.22	17.2	15.68	13.89	12.13	10.26	7.91	5.48	4.17	2.86	2.0	1.28	0.83	0.53	0.24	0.13	0.11	0.03	0.0
34.0	8.17	7.99	7.48	6.6	5.8	5.15	4.17	3.02	2.03	1.55	1.1	0.75	0.45	0.29	0.19	0.05	0.03	0.0	0.0	0.0
36.0	2.46	2.43	2.3	2.08	1.79	1.6	1.36	1.07	0.69	0.48	0.29	0.16	0.11	0.05	0.05	0.03	0.03	0.0	0.0	0.0
38.0	0.67	0.67	0.61	0.56	0.43	0.35	0.35	0.27	0.16	0.13	0.08	0.05	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40.0	0.05	0.05	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Process Continued For All Combinations

Arrived at the following cutoff values (outside of Florida):

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Temperature > 75 °F
Relative Humidity < 40 %
100-hr Fuel Moisture < 16 %
ERC > 30
Wind speed > 11 mph
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* Fosberg Index not included for the criteria due to having a largely unfavorable distribution
* Require at least 3 of these criteria be met to issue a critical risk

Process Continued For All Combinations

Arrived at the following cutoff values (in Florida):

Temperature > 77 °F Relative Humidity < 50 % 100-hr Fuel Moisture < 18 % ERC > 25 Wind speed > 11 mph Probability of thunderstorms > 40 %

* Fosberg Index not included for the criteria due to having a largely unfavorable distribution

* Require at least 4 of these criteria be met to issue a critical risk

Example Case Revisited With New Criteria

At least 3 of the following 5 criteria:

Temperature > 75 °F Relative Humidity < 40 % 100-hr Fuel Moisture < 16 % ERC > 30 Wind speed > 11 mph

Afternoon surface temperature: Minimum relative humidity: Maximum wind speed: Energy release component: 100-hour fuel moisture:



Another Case (5000-acre fire)

At least 3 of the following 5 criteria:

Temperature > 75 °F Relative Humidity < 40 % 100-hr Fuel Moisture < 16 % ERC > 30 Wind speed > 11 mph

Afternoon surface temperature: Minimum relative humidity: Maximum wind speed: Energy release component: 100-hour fuel moisture:



A Third Case (100-acre fire)

At least 3 of the following 5 criteria:

Temperature > 75 °F Relative Humidity < 40 % 100-hr Fuel Moisture < 16 % ERC > 30 Wind speed > 11 mph

Afternoon surface temperature: Minimum relative humidity: Maximum wind speed: Energy release component: 100-hour fuel moisture:



Example Florida Case (8100-acre fire)

At least 4 of the following 6 criteria:

Temperature > 77 °F Relative Humidity < 50 %100-hr Fuel Moisture < 18 % ERC > 25Wind speed > 11 mph Thunderstorm Probability > 40 %

Afternoon surface temperature: Minimum relative humidity: Maximum wind speed: Energy release component: 100-hour fuel moisture: Thunderstorm probability:

87 °F	
49 %	
18 mph	
18	X
17.3%	
10 % - 40 %	

Another Example Florida Case (1294-acre fire)

At least 4 of the following 6 criteria:

Temperature > 77 °F Relative Humidity < 50 % 100-hr Fuel Moisture < 18 % ERC > 25 Wind speed > 11 mph Thunderstorm Probability > 40 %

Afternoon surface temperature: Minimum relative humidity: Maximum wind speed: Energy release component: 100-hour fuel moisture: Thunderstorm probability: 68 °F 57 % 33 mph 27 14.5% < 10 %

X X \checkmark \checkmark X

Conclusions

Summarized Findings

- Fire weather "season" in late winter/early spring
- More fires occur in Florida than other states
- Significant number of fires in Florida driven by lightning
- Critical fire weather criteria heavily dependent on fuels
- Fire weather criteria in Florida different than other states

Conclusions

Topics Not Addressed

- Influences of ENSO on severity of fire season
- Behavior of the regional plantation when subjected to extreme stresses (drought, extreme cold, extreme heat)
- Climatology of each parameter
- Composite parameters were formulated, but not extensively tested

Conclusion

Potential Issues With New Forecasting Criteria

- False alarm rate?
- Which thresholds could be relaxed?
 - Ex: Should a forecaster pay less attention to fuel moisture if the temperature is extremely high or vice versa?

- Predictability?

· Fires are largely fuel driven, fuel behavior is difficult to predict

Questions?

Energy Release Component vs Temperature

- Several green cells at ERC = 30

E R C

		Tempera	ature (°C)																	
		0.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	26.0	28.0	30.0	32.0	34.0	36.0	38.0
- [0.0	100.0	99.92	99.68	99.39	99.07	98.08	96.53	94.1	91.11	86.57	81.7	73.02	62.82	51.34	39.13	28.5	18.59	8.17	2.46	0.67
Į	5.0	99.89	99.81	99.57	99.28	98.96	97.97	96.42	93.99	91.0	86.46	81.6	72.92	62.71	51.23	39.02	28.42	18.51	8.17	2.46	0.67
	10.0	98.02	97.94	97.7	97.41	97.09	96.1	94.55	92.12	89.13	84.62	79.75	71.07	60.87	49.41	37.29	27.06	17.87	8.12	2.43	0.67
	15.0	93.75	93.67	93.43	93.14	92.82	91.83	90.3	87.87	84.94	80.5	75.67	67.07	57.0	45.75	33.92	24.2	16.11	7.67	2.43	0.67
	20.0	86.49	86.4	86.22	85.95	85.63	84.64	83.23	80.9	78.12	73.82	69.36	61.22	51.68	41.03	29.97	21.18	14.16	6.84	2.3	0.67
	25.0	75.27	75.19	75.03	74.76	74.57	73.64	72,36	70.22	67.74	63.86	59.96	52.72	44.04	34.51	24.57	17.07	11.24	5.72	1.98	0.56
	30.0	59.59	59,51	59.4	59.19	59.05	58.23	57.16	55.69	53.82	50,75	47.44	42.07	35.12	27.54	19.18	13.22	8.68	4.54	1.63	0.45
	35.0	37.9	37.87	37.85	37.66	37.61	37.34	36.65	36.06	35.02	32.88	30.85	27.54	23.18	18.03	12.53	8.44	5.5	3.18	1.31	0.35
ľ	40.0	17.41	17.41	17.39	17.28	17.25	17.23	16.88	16.64	16.11	14.98	14.0	12.63	10.87	9.0	6.54	4.19	2.88	1.9	0.83	0.19
	45.0	5.42	5.42	5.42	5.4	5.37	5.37	5.26	5.15	5.05	4.91	4.73	4.51	3.93	3.39	2.54	1.74	1.26	0.96	0.51	0.11
Į	50.0	1.2	1.2	1.2	1.2	1.2	1.2	1.18	1.15	1.15	1.15	1.15	1.07	0.96	0.91	0.85	0.64	0.51	0.43	0.21	0.03
ļ	55.0	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.21	0.19	0.19	0.11	0.03
	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Energy Release Component vs Temperature

- Again, temperature cutoff around 24°C (75°F)

E R C

		Tempera	ature (°C	C)																	
		0.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	26.0	28.0	30.0	32.0	34.0	36.0	38.0
[0.0	100.0	99.92	99.68	99.39	99.07	98.08	96.53	94.1	91.11	86.57	81.7	73.02	62.82	51.34	39.13	28.5	18.59	8.17	2.46	0.67
[5.0	99.89	99.81	99.57	99.28	98.96	97.97	96.42	93.99	91.0	86.46	81.6	72.92	62.71	51.23	39.02	28.42	18.51	8.17	2.46	0.67
[10.0	98.02	97.94	97.7	97.41	97.09	96.1	94.55	92.12	89.13	84.62	79.75	71.07	60.87	49.41	37.29	27.06	17.87	8.12	2.43	0.67
[15.0	93.75	93.67	93.43	93.14	92.82	91.83	90.3	87.87	84.94	80.5	75.67	67.07	57.0	45.75	33.92	24.2	16.11	7.67	2.43	0.67
ſ	20.0	86.49	86.4	86.22	85.95	85.63	84.64	83.23	80.9	78.12	73.82	69.36	61.22	51.68	41.03	29.97	21.18	14.16	6.84	2.3	0.67
[25.0	75.27	75.19	75.03	74.76	74.57	73.64	72.36	70.22	67.74	63.86	59.96	52.72	44.04	34.51	24.57	17.07	11.24	5.72	1.98	0.56
[30.0	59.59	59,51	59.4	59.19	59.05	58.23	57.16	55.69	53.82	50,75	47.44	42.07	35.12	27.54	19.18	13.22	8.68	4.54	1.63	0.45
[35.0	37.9	37.87	37.85	37.66	37.61	37.34	36.65	36.06	35.02	32.88	30.85	27.54	23.18	18.03	12.53	8.44	5.5	3.18	1.31	0.35
[40.0	17.41	17.41	17.39	17.28	17.25	17.23	16.88	16.64	16.11	14.98	14.0	12.63	10.87	9.0	6.54	4.19	2.88	1.9	0.83	0.19
[45.0	5.42	5.42	5.42	5.4	5.37	5.37	5.26	5.15	5.05	4.91	4.73	4.51	3.93	3.39	2.54	1.74	1.26	0.96	0.51	0.11
[50.0	1.2	1.2	1.2	1.2	1.2	1.2	1.18	1.15	1.15	1.15	1.15	1.07	0.96	0.91	0.85	0.64	0.51	0.43	0.21	0.03
	55.0	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.21	0.19	0.19	0.11	0.03
	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

100-Hour Fuel Moisture vs Temperature

- 100-hour fuel moisture cutoff value around 16%

	Tempera	ature (°C)																	
	0.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	26.0	28.0	30.0	32.0	34.0	36.0	38.0
10.0	1.5	1.5	1.5	1.5	1.5	1.5	1.44	1.44	1.31	1.2	1.1	1.04	0.83	0.69	0.51	0.37	0.29	0.24	0.08	0.03
12.0	15.71	15.68	15.65	15.52	15.49	15.33	14.98	14.64	13.94	12.66	11.32	9.64	7.32	5.53	3.74	2.46	1.76	1.44	0.67	0.21
14.0	44.87	44.82	44.68	44.5	44.42	43.86	42.92	41.75	40.17	37.13	34.27	29.59	23.72	17.76	11.99	8.41	5.9	3.79	1.6	0.48
16.0	72.97	72.89	72.65	72.41	72.17	71.26	70.03	68.32	66.11	62.34	58.28	51.23	42.52	33.41	23.77	17.01	11.51	5.9	2.14	0.64
18.0	91.99	91.91	91.67	91.4	91.08	90.12	88.78	86.57	83.81	79.51	74.84	66.37	56,49	45.62	33.95	24.6	16.48	7.83	2.43	0.67
20.0	98.96	98.88	98.64	98.34	98.02	97.04	95.49	93.06	90.09	85.63	80.8	72.12	61.91	50.51	38.38	27.96	18.27	8.15	2.43	0.67
22.0	99.92	99.84	99.6	99.31	98.99	98.0	96.45	94.02	91.03	86.51	81.65	72.97	62.77	51.28	39.08	28.47	18.56	8.17	2.46	0.67
24.0	100.0	99.92	99.68	99.39	99.07	98.08	96.53	94.1	91.11	86.57	81.7	73.02	62.82	51.34	39.13	28.5	18.59	8.17	2.46	0.67
26.0	100.0	99.92	99.68	99.39	99.07	98.08	96.53	94.1	91.11	86.57	81.7	73.02	62.82	51.34	39.13	28.5	18.59	8.17	2.46	0.67
28.0	100.0	99.92	99.68	99.39	99.07	98.08	96.53	94.1	91.11	86.57	81.7	73.02	62.82	51.34	39.13	28.5	18.59	8.17	2.46	0.67
30.0	100.0	99.92	99.68	99.39	99.07	98.08	96.53	94.1	91.11	86.57	81.7	73.02	62.82	51.34	39.13	28.5	18.59	8.17	2.46	0.67

100-Hour Fuel Moisture vs Temperature

- Again, temperature cutoff around 24°C (75°F)

F M 1 0 0

	Tempera	ature (°C)																	
	0.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	26.0	28.0	30.0	32.0	34.0	36.0	38.0
10.0	1.5	1.5	1.5	1.5	1.5	1.5	1.44	1.44	1.31	1.2	1.1	1.04	0.83	0.69	0.51	0.37	0.29	0.24	0.08	0.03
12.0	15.71	15.68	15.65	15.52	15.49	15.33	14.98	14.64	13.94	12.66	11.32	9.64	7.32	5.53	3.74	2.46	1.76	1.44	0.67	0.21
14.0	44.87	44.82	44.68	44.5	44.42	43.86	42.92	41.75	40.17	37.13	34.27	29.59	23.72	17.76	11.99	8.41	5.9	3.79	1.6	0.48
16.0	72.97	72.89	72.65	72.41	72.17	71.26	70.03	68.32	66.11	62.34	58.28	51.23	42.52	33.41	23.77	17.01	11.51	5.9	2.14	0.64
18.0	91.99	91.91	91.67	91.4	91.08	90.12	88.78	86.57	83.81	79.51	74.84	66.37	56.49	45.62	33.95	24.6	16.48	7.83	2.43	0.67
20.0	98.96	98.88	98.64	98.34	98.02	97.04	95.49	93.06	90.09	85.63	80.8	72.12	61.91	50.51	38.38	27.96	18.27	8.15	2.43	0.67
22.0	99.92	99.84	99.6	99.31	98.99	98.0	96.45	94.02	91.03	86.51	81.65	72.97	62.77	51.28	39.08	28.47	18.56	8.17	2.46	0.67
24.0	100.0	99.92	99.68	99.39	99.07	98.08	96.53	94.1	91.11	86.57	81.7	73.02	62.82	51.34	39,13	28.5	18.59	8.17	2.46	0.67
26.0	100.0	99.92	99.68	99.39	99.07	98.08	96.53	94.1	91.11	86.57	81.7	73.02	62.82	51.34	39.13	28.5	18.59	8.17	2.46	0.67
28.0	100.0	99.92	99.68	99.39	99.07	98.08	96.53	94.1	91.11	86.57	81.7	73.02	62.82	51.34	39.13	28.5	18.59	8.17	2.46	0.67
30.0	100.0	99.92	99.68	99.39	99.07	98.08	96.53	94.1	91.11	86.57	81.7	73.02	62.82	51.34	39,13	28.5	18.59	8.17	2.46	0.67

Temperature vs 100-hour Fuel Moisture

- 100-hour fuel moisture cutoff around 16%

		Tempera	ature (°C)																	
		0.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	26.0	28.0	30.0	32.0	34.0	36.0	38.0
F м	10.0	1.5	1.5	1.5	1.5	1.5	1.5	1.44	1.44	1.31	1.2	1.1	1.04	0.83	0.69	0.51	0.37	0.29	0.24	0.08	0.03
1	12.0	15.71	15.68	15.65	15.52	15.49	15.33	14.98	14.64	13.94	12.66	11.32	9.64	7.32	5.53	3.74	2.46	1.76	1.44	0.67	0.21
Ŏ	14.0	44.87	44.82	44.68	44.5	44.42	43.86	42.92	41.75	40.17	37.13	34.27	29.59	23.72	17.76	11.99	8.41	5.9	3.79	1.6	0.48
	16.0	72.97	72.89	72.65	72.41	72.17	71.26	70.03	68.32	66.11	62.34	58.28	51.23	42.52	33.41	23.77	17.01	11.51	5.9	2.14	0.64
	18.0	91.99	91.91	91.67	91.4	91.08	90.12	88.78	86.57	83.81	79.51	74.84	66.37	56.49	45.62	33.95	24.6	16.48	7.83	2.43	0.67
	20.0	98.96	98.88	98.64	98.34	98.02	97.04	95.49	93.06	90.09	85.63	80.8	72.12	61.91	50.51	38.38	27.96	18.27	8.15	2.43	0.67
	22.0	99.92	99.84	99.6	99.31	98.99	98.0	96.45	94.02	91.03	86.51	81.65	72.97	62.77	51.28	39.08	28.47	18.56	8.17	2.46	0.67
	24.0	100.0	99.92	99.68	99.39	99.07	98.08	96.53	94.1	91.11	86.57	81.7	73.02	62.82	51.34	39.13	28.5	18.59	8.17	2.46	0.67
	26.0	100.0	99.92	99.68	99.39	99.07	98.08	96.53	94.1	91.11	86.57	81.7	73.02	62.82	51.34	39.13	28.5	18.59	8.17	2.46	0.67
	28.0	100.0	99.92	99.68	99.39	99.07	98.08	96.53	94.1	91.11	86.57	81.7	73.02	62.82	51.34	39,13	28.5	18.59	8.17	2.46	0.67
	30.0	100.0	99.92	99.68	99.39	99.07	98.08	96.53	94.1	91.11	86.57	81.7	73.02	62.82	51.34	39.13	28.5	18.59	8.17	2.46	0.67

Temperature vs 100-hour Fuel Moisture

- Again, temperature cutoff values around 24°C (75°F)

		Tempera	ature (°C)																	
		0.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	26.0	28.0	30.0	32.0	34.0	36.0	38.0
F	10.0	1.5	1.5	1.5	1.5	1.5	1.5	1.44	1.44	1.31	1.2	1.1	1.04	0.83	0.69	0.51	0.37	0.29	0.24	0.08	0.03
1	12.0	15.71	15.68	15.65	15.52	15.49	15.33	14.98	14.64	13.94	12.66	11.32	9.64	7.32	5.53	3.74	2.46	1.76	1.44	0.67	0.21
0	14.0	44.87	44.82	44.68	44.5	44.42	43.86	42.92	41.75	40.17	37.13	34.27	29.59	23.72	17.76	11.99	8.41	5.9	3.79	1.6	0.48
	16.0	72.97	72.89	72.65	72.41	72.17	71.26	70.03	68.32	66.11	62.34	58.28	51.23	42.52	33.41	23.77	17.01	11.51	5.9	2.14	0.64
	18.0	91.99	91.91	91.67	91.4	91.08	90.12	88.78	86.57	83.81	79.51	74.84	66.37	56.49	45.62	33.95	24.6	16.48	7.83	2.43	0.67
	20.0	98.96	98.88	98.64	98.34	98.02	97.04	95.49	93.06	90.09	85.63	80.8	72.12	61.91	50.51	38.38	27.96	18.27	8.15	2.43	0.67
	22.0	99.92	99.84	99.6	99.31	98.99	98.0	96.45	94.02	91.03	86.51	81.65	72.97	62.77	51.28	39.08	28.47	18.56	8.17	2.46	0.67
	24.0	100.0	99.92	99.68	99.39	99.07	98.08	96.53	94.1	91.11	86.57	81.7	73.02	62.82	51.34	39.13	28.5	18.59	8.17	2.46	0.67
	26.0	100.0	99.92	99.68	99.39	99.07	98.08	96.53	94.1	91.11	86.57	81.7	73.02	62.82	51.34	39.13	28.5	18.59	8.17	2.46	0.67
	28.0	100.0	99.92	99.68	99.39	99.07	98.08	96.53	94.1	91.11	86.57	81.7	73.02	62.82	51.34	39,13	28.5	18.59	8.17	2.46	0.67
	30.0	100.0	99.92	99.68	99.39	99.07	98.08	96.53	94.1	91.11	86.57	81.7	73.02	62,82	51.34	39,13	28.5	18.59	8.17	2.46	0.67