



# LANDFIRE Southeastern Drought Adjusted Surface Fuel Product

## Responding to the 2023 Western Gulf Coast Drought

Jim Smith, TNC LF Program Lead

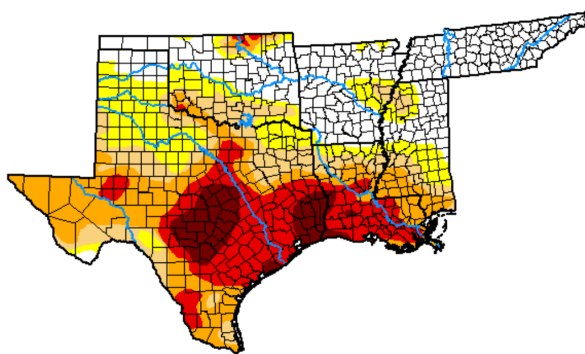
LANDFIRE (LF) provides multiple, annual products related to [wildland](#) surface and canopy fuels. Most of these layers are static and are produced once per year, based on an average (not extremely wet or dry) set of weather assumptions. However, surface and canopy fuels are not static by nature, rather they fluctuate seasonally and with changing weather throughout the year.

To respond to the changing nature of these fuels and better capture these fluctuations, the LANDFIRE Program created two seasonal fuel products (MoD-FIS) based on indices, one for the [Southeastern US](#) using Keetch

Byrum Drought Index (KDBI) and another for the Southwestern/Great Basin areas based on the Normalized Difference Vegetation Index (NDVI). In this document we will demonstrate how the SE KDBI process provides seasonally adjusted LANDFIRE surface fuels and describe how LANDFIRE modified fuel products during a recent historic drought along the Gulf coast of Louisiana, Mississippi, and East Texas.

**2023 DROUGHT IMPACTS:** In the late summer and early Autumn of 2023, the western Gulf region of the United States experienced a historical drought (Fig 1).

### U.S. Drought Monitor South



**August 22, 2023**  
(Released Thursday, Aug. 24, 2023)  
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	28.77	71.23	55.22	41.06	21.84	6.42
<b>Last Week</b> 08-15-2023	36.53	63.47	47.48	29.13	9.52	0.75
<b>3 Months Ago</b> 05-23-2023	58.20	41.80	28.62	16.60	7.27	1.02
<b>Start of Calendar Year</b> 01-03-2023	39.16	60.84	37.91	24.21	11.22	2.36
<b>Start of Water Year</b> 09-27-2022	18.74	81.26	52.10	32.52	13.33	2.83
<b>One Year Ago</b> 08-23-2022	23.17	76.83	65.01	51.63	28.35	6.56

*Intensity:*

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>

*Author:*

David Simeral  
Western Regional Climate Center



[droughtmonitor.unl.edu](https://droughtmonitor.unl.edu)

Figure 1: Drought Monitor for the area showing the extent of the extreme drought August 22, 2023



As a result, the region experienced several significant fires that exhibited behavior and extents that were outside of typical fires for this area.

**REGIONAL ANALYSIS:** Using the program gNEXUS, a system for assessing crown fire hazard, LANDFIRE experts conducted a regional analysis (Fig 2) of how the KDBI-modulated surface fuel layer changed the predicted spread rate, the amount of crown fire and distribution of flame lengths of a potential wildland fire.

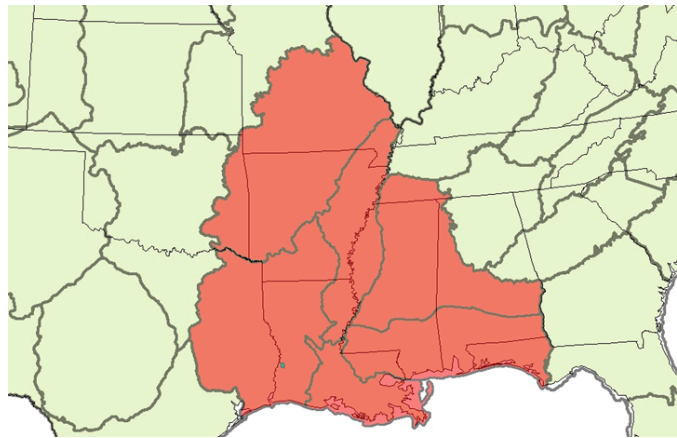


Figure 2: Fire behavior analysis region

Figure 3 shows how the expected fire type changed from the original (average - not extremely wet or dry) LF FBFM40 layer (blue bars) compared to the modified MoD-FIS layer (orange) for the analysis region. Note that SE KDBI shown in Figure 3 represents

later drought conditions in October 20, 21 and 22 (Julian dates 293, 294 and 295) because LANDFIRE was not producing the SE KDBI in August during the peak time of the fire.

Analysis Area Acre Difference in Fire Type

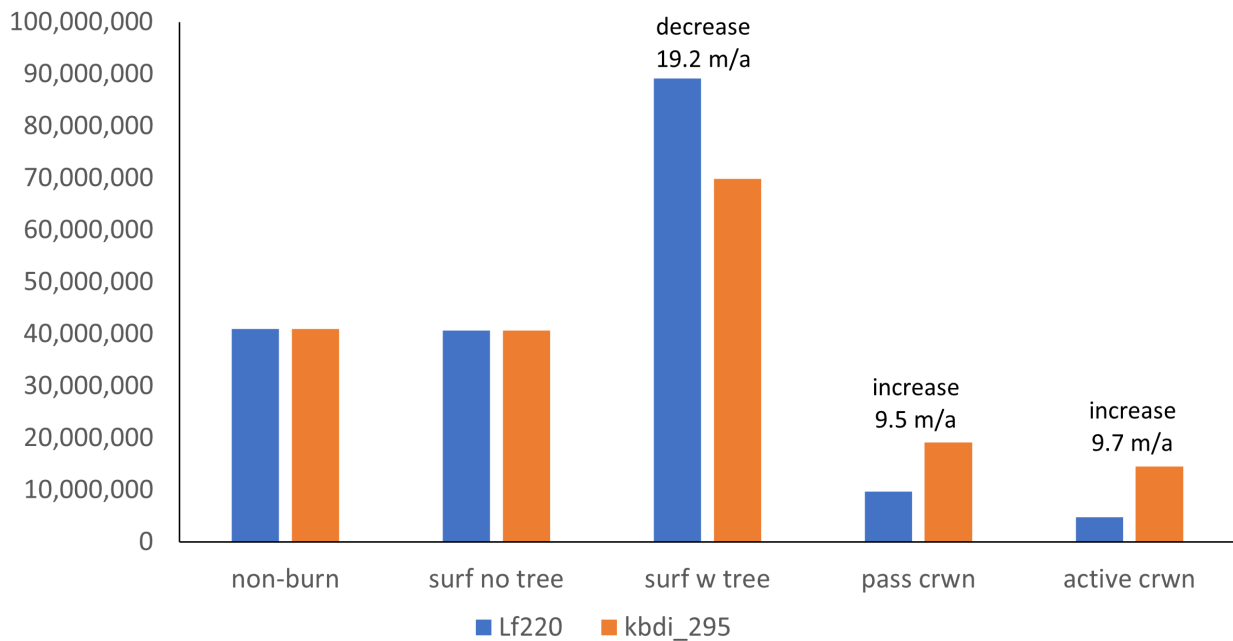


Figure 3: Comparison of predicted fire type before and after the drought using LANDFIRE's LF2020 (Lf220) Southeastern MoD-FIS product (kdbi\_295)



The KDBI modulated fuels more than doubled the acres in the two crown fire categories (Fig 3. passive/active crown) across the analysis region, from around 12 million acres in total to nearly 30 million acres. The Active Crown fire category by itself increased by nearly 10 million acres for the analysis region.

Figure 4 provides a refined look at fire spread rate, another important measure when predicting fire behavior. From the figure below, we can see that, with the KDBI product (*kdbi\_295*), fire spread rates increase and shift to the next higher (or faster to spread) category than with the original LF2020 fuel product (*Lf220*).

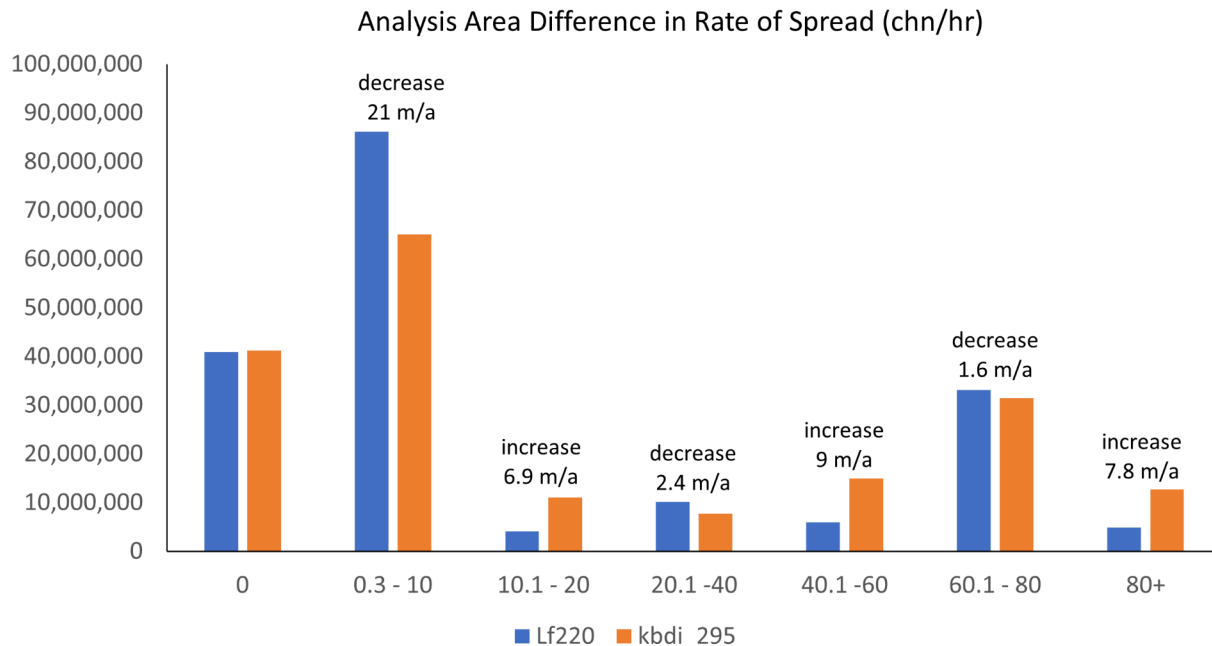


Figure 4: Comparison of predicted fire spread rate before and after the drought using LANDFIRE’s Southeastern MoD-FIS product

**TIGER ISLAND FIRE:** During the Summer of 2023, the Tiger Island Fire in SE Louisiana (Figure 5) burned more than 31,000 acres, damaging more than 20 homes and structures. We investigated how the FBFM40 shifted throughout the drought according to the LF SE MoD-FIS.

By comparing the original LF2020 and the MoD-FIS FBFM40 values for the final Tiger Island fire perimeter in August (Table 1), we can see the shift from one surface fuel model

to another. For example, more than 40% of the burned area transitioned from a timber type (TU) surface model to either a shrub (SH) or grass (GR) surface fuel model during the drought. The modulated LF product clearly reflected how the drought could make fire behavior more extreme. This LF SE MoD-FIS data set that presents daily values for the [Southeastern US](#), provides a useful product for predicting fire behavior based on seasonality or critical changes in recent weather.

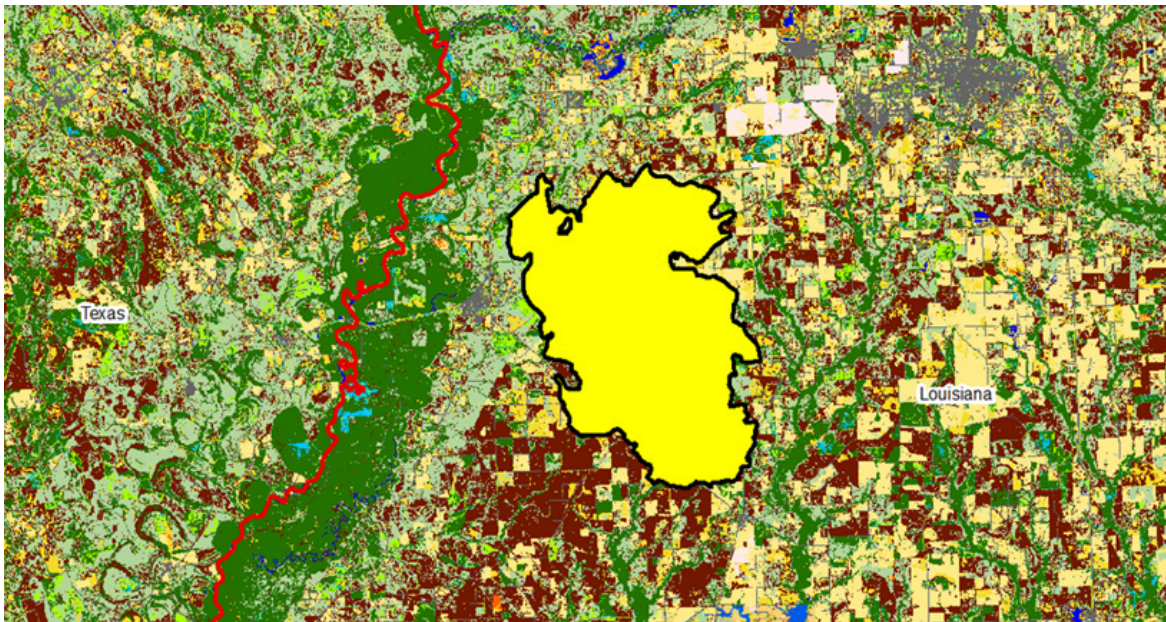


Figure 5: Map showing the final burn perimeter for the Tiger Island Fire

LF2020 Original FBFM40	October 22 KDBI Modified FBFM40	Acres	Percent of fire with this surface fuel model change in SE MoD-FIS
TU3	SH9	8,369	27.2%
TL6	GR3	4,347	14.1%
TL9	TU3	3,672	11.9%
GR3	GR6	3,402	11.0%
TL2	TU5	3,214	10.4%
TL6	TU3	1,565	5.1%
TU2	TU3	1,225	4.0%
SH4	SH9	1,185	3.8%
TU1	TU5	1,014	3.3%
NB1	NB1	935	3.0%
TL3	TU1	623	2.0%
SH6	SH9	524	1.7%
GR2	GR3	342	1.1%
GS2	GS3	262	0.9%
TL5	TU2	187	0.6%

Table 1: LF2020 Original and KDBI modified FBFM40 surface fuel models (SE MoD-FIS) for the total area burned in the Tiger Island Fire



Change Type	Spread Rate Change Percent	Flame Length Change Acres
no change	35%	15%
very low to low	2%	0%
very low to moderate	10%	10%
low to moderate	4%	27%
moderate to high	35%	0%
moderate to very high	0%	42%
high to very high	11%	2%

Table 2: Summarized changes in predicted spread rate and flame length using the KDBI modulated FBFM40 LANDFIRE layer

Using the [FBFM40 descriptions](#), the increased fire behavior due to the drought is even more evident. Approximately two-thirds of the final burned area increased in spread rate category and more than 80% exhibited an increase in predicted flame length in the LF MoD-FIS product. It is especially important to note that more than 40% of the final burned area increased in predicted flame length from moderate to very high.

**SUMMARY:** How wildland surface and canopy fuels changes daily with weather is an important part of understanding and managing wildland fires. Responding to requests from the user community, the LANDFIRE Program is now providing seasonal/modulated fuel products for two regions of the US with modified mapped

FBFM40 using indices called MoD-FIS. For the Southeastern US, the MoD-FIS product is linked to the previous three days of the Keetch-Byrum Drought Index. To explore the value of this product, we compared the LF2020 FBFM40 LANDFIRE layer to SE MoD-FIS values in a region that experienced a historic drought in 2023. The modified fuels product clearly increased fire behavior during the drought. Fire planners and managers can expect more useful fuels information in times of unusual weather using the suite of LANDFIRE MoD-FIS products.

Do you have a story to share after using LANDFIRE data? If so, get in touch at [landfire@tnc.org](mailto:landfire@tnc.org) – we would appreciate hearing from you.