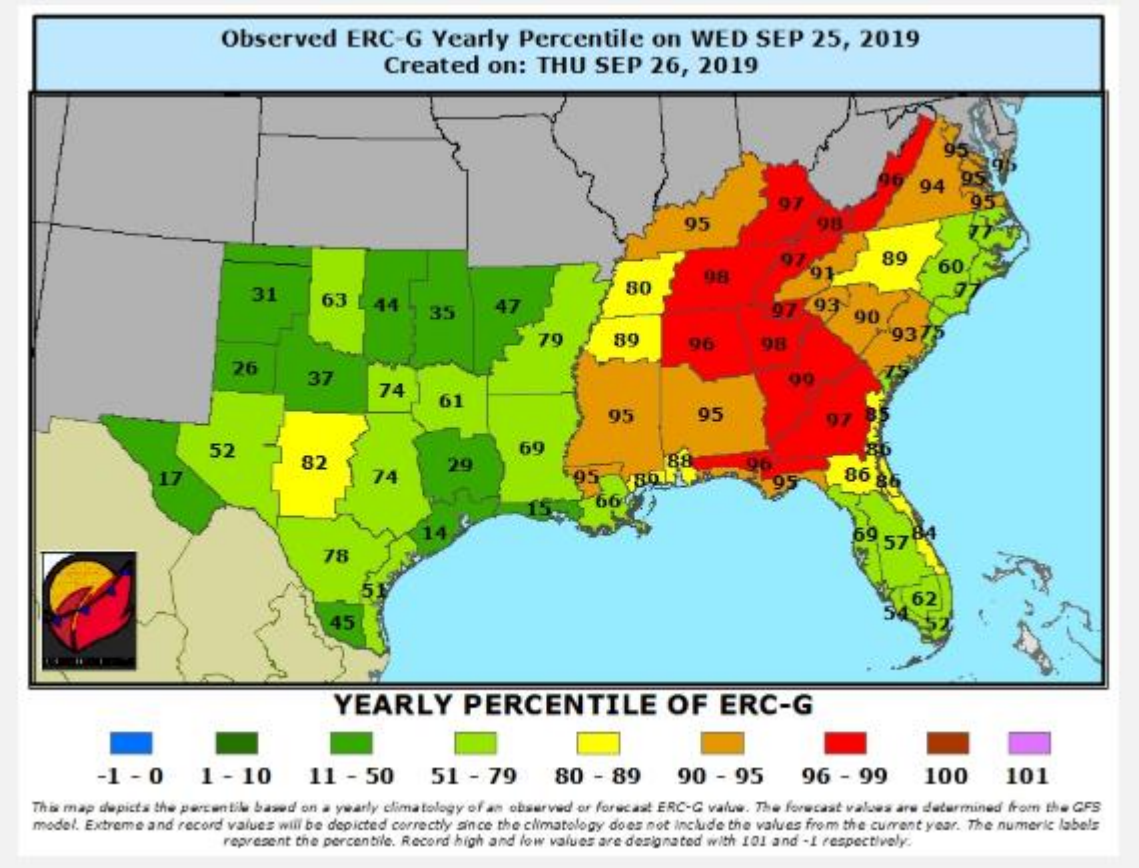
Southern Area Wildfire Risk Assessment

Fall 2019



Southern Area Coordination Center
Rapid Assessment Team

Table of Contents

Executive Summary

Overall, drought conditions had improved across the Southern Area Geographic Area over the past two years. During the spring of 2015 drought conditions began establishing across Southern Appalachian mountain states and steadily spread and increased in severity through the fall of 2016. The historic 2016 fire season concluded with increased moisture and over the course of the next two years (2017 and 2018) the overall fire environment significantly improved in severity. Significant rainfall deficits coupled with hotter than normal temperatures during the past three months have resulted in a resurgence of drought condition across large expanses of the Geographic Area. In response to this building drought a Fire Risk Analysis was conducted to assess the potential and expected fire situation for the fall fire season. The assessment period extends from late September through December. The analysis included a look at the current weather situation and extended forecast, fuels compared to normal for the time of year, National Fire Danger Rating System's energy release component for each Southern Area Predictive Service Area, and fire occurrence. Recommendations are provided based on the findings and conclusions of the analysis.

The portion of the region in this analysis is entering their normal fire season. Combined with typical environmental factors, however, are persisting and building drought conditions that are expected to broaden over the upcoming months.

In response to the drought and its impact on the fire risk potential within the Southern Region, a fire risk analysis was conducted to determine:

- What is the probability of an above average fall fire season and what are the anticipated impacts?
- Where are the critical locations in the Southern Area?
- What are the key fire environment indicators and thresholds which demonstrate above normal fire potential?
- What are the season ending or season altering event probabilities?
- What are the possible impacts long term drought could have leading into the spring fire season (e.g., 1000hr, duff/organic matter outlooks)?

The primary components of weather, fuels, fire behavior, and fire occurrence were analyzed to assess the fire risk potential within the Southern Area.

Based on current fuel conditions and forecasted weather conditions, the most likely scenario is an above average level of wildfire activity for the next month and beyond. This level of activity will likely cause and increased demand for firefighting resources being mobilized within states. There is also a high probability that the Southern Area will see higher than normal mobilization across state boundaries and from outside the Geographic Area, for this time of the year. Although not assessed in entirety in this analysis, analysts have noted the potential for a transitioning to La Nina year and if this transition comes to fruition, fire danger conditions could remain and worsen over the next year.

Analysis Findings and Recommendations

Analysis Findings

The analysis findings indicate the following probabilities for the fall fire season for the analysis area:

Scenario Description for the 2019 Fall Fire Season (October through December)	Probability
Most Likely Case The entire Geographic Area, specifically interior areas, stays warm and dry through November and into December. The fall fire season begins earlier and extends deeper into fall than normal due to the persisting and building drought and the predicted weather pattern. A normal amount of initial attack activity is experienced for this time of the year; however, new ignitions would observe elevated fire behavior and spread potential due to prolonged drought and minimal rainfall frequency (i.e., fires would get bigger faster). Additional aviation and ground resources are required due to fire behavior and resulting resistance to control. Several Type III incidents occur simultaneously in the geographic area, with a higher probability of both Type II and Type I IMT deployments. It is expected that fire personnel movement would occur across state lines and from out of the Geographic Area. The only mitigating weather factor could be moderated relative humidity values and wind, due to a probability of frontal passages being held north of our northern boundary.	70
Best Case Normal rainfall pattern develops. This brings frequent rainfall events and enough moisture to mitigate rainfall deficits and compact leaves after leaf drop. The normal fall time wildfire occurrence develops and very light to no initial attack is experienced. Larger diameter fuels observe raised moistures that substantially limit their availability to contribute to fire spread and intensity. Leaf drop coincides with precipitation and results in compacted and moist understory conditions unconducive to rapid fire spread.	15
Worst case Rainfall frequency and amounts are little and strong dry cold fronts bring significant fire weather after leaf drop. Escalating drought condition, coupled with extreme fire weather events, results in numerous large fire incidents and heavy initial attack workload across the entire Geographic Area. These areas experience a well above average fall fire season, including numerous extended attack (Type I and II) fires. Large scale mobilization of out of region resources occurs. A transition to La Nina is experienced and overall drought and associated fire danger conditions escalate over the next year.	15

Table 1. Analysis findings for the Southern Area 2019 Fall Fire Season with Probability Rating

It is noted that although the fall of 2016 represents the most recent analogous year, analysts and fire managers should be aware of the subtle differences. The drought of 2016 had been persisting and building, beginning in the spring of 2015. The building drought of 2019 really started establishing itself over the past few months.. Planning and implementation actions taken in 2019 should be based on current and expected conditions with 2016 serving as a reminder and not necessarily as a decision making driver.

Recommendations

- Fire managers must consider potential extreme fire behavior, which can be expected with the current drought conditions under moderate fire weather conditions. As fire danger indices exceed the 97th percentile, extreme fire behavior and rapid fire spread characteristics should be expected. Tactics should be altered to provide for firefighter and public safety. Appropriate management response may be point protection rather than direct attack.
- Do not expect any fire to be routine. Be prepared to utilize indirect tactics with extended mop-up. Utilize aerial supervision to help direct crews and keep them informed on fire behavior. Ensure that LCES is in place before engaging on any fire. Remember to STOP, THINK, and TALK before you ACT… and actively look for ways to minimize risk to firefighters in what is forecast to be a period of very high fire danger.
- Maintain capabilities to mobilize Type I, II, and III teams.
- Augmentation of initial attack resources will likely be required throughout the fall. This will result from increased fire behavior, fire spread, and longer mop-up times due to drought stressed fuels and soil.
- Additional resources, both ground and aviation, may be needed.
- Ensure firefighter pocket cards are up to date and posted on the national website. http://fam.nwcg.gov/fam-web/pocketcards/
- Maintain national standardized predictive services products in a timely fashion. Produce new products as requested.
- Fire behavior prediction outputs, calculated with current and expected environmental factors, show a tendency to exceed direct fire suppression tactic thresholds and be conducive to large fire growth.
    - As the drought conditions deepen and fall leaf drop occurs careful consideration of line construction locations and holding capability of the available resources should be observed due to increased spotting potential of fine non-compacted fuel load.
    - Due to increasing drought conditions organic duff layers of the forest floor may be susceptible to ignition and longer duration smoldering fire, typical leaf blower line construction may not be as effective in creating fire lines or may only be effective for short durations (<1-2 hours).
    - In any slash-blowdown fuel type, specifically but not limited to hurricane fuels, flame lengths will exceed direct attack capabilities of hand crews, dozers, engines, and tractor plows. Resources should remain cognizant when implementing strategy and tactics in these fuels.

Introduction and Background

Escalating drought conditions over a large portion of the Southern Area Geographic Area presents a concern for the potential impact it could hold for a fall fire season. The National Drought Monitor (Fig. 1) shows the size and severity of the drought. Each of the thirteen states that makeup the Geographic Area are experiencing some variation of drought conditions. Overlaid as a comparison is the transitioning drought monitor defined in the fall of 2016. It is only provided as a potential benchmark forecast for the next three months, if conditions continue trending warmer and dryer than normal.

The different levels of drought are classified by percentiles, with exceptional rating in the top 2-3% of the historical record. It takes a long period of dry weather to reach the exceptional level. Figure 2 shows that drought conditions have been developing in the central portion of the Southern Region for the past twelve months. The legend shows direction of change over time and is displayed as deteriorating (increasing drought) or improving (decreasing drought). Deteriorating (increasing drought) conditions are indicated over most of the area involving the southern Appalachian Mountains, northern Florida, and both Texas and portions of southern Oklahoma. The primary difference between 2019 and the fall of 2016 is the drought coverage area. Currently, drought conditions essentially cover the entire Geographic Area. The states in the center of the drought bullseye include northern Georgia, Alabama, Mississippi, and South Carolina, far western North Carolina, and far southeastern Tennessee. Virginia, eastern Kentucky, and Oklahoma have also experienced deteriorating drought conditions over the past year.

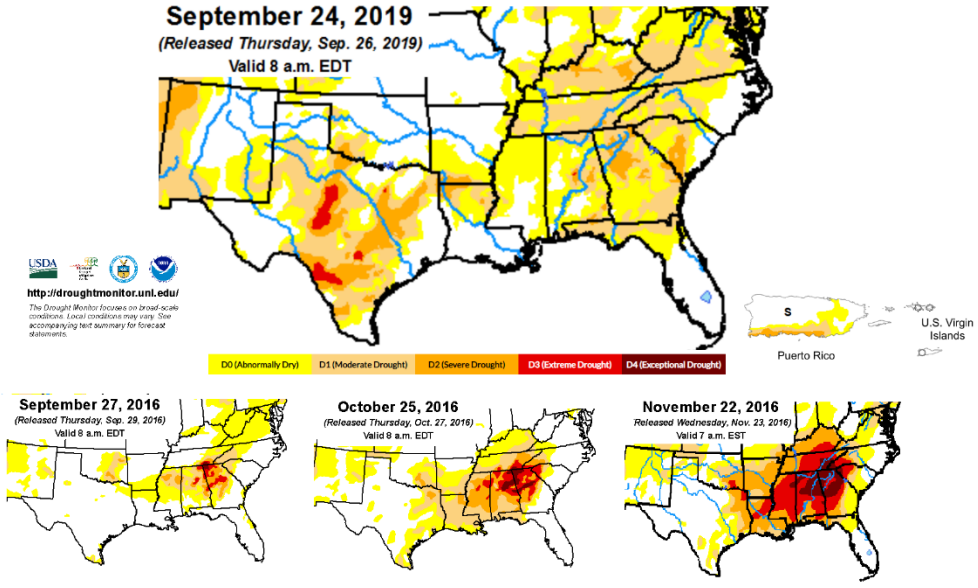


Figure 1. The National Drought Monitor displays the size and severity of drought conditions across the United States. Source: National Drought Monitor website

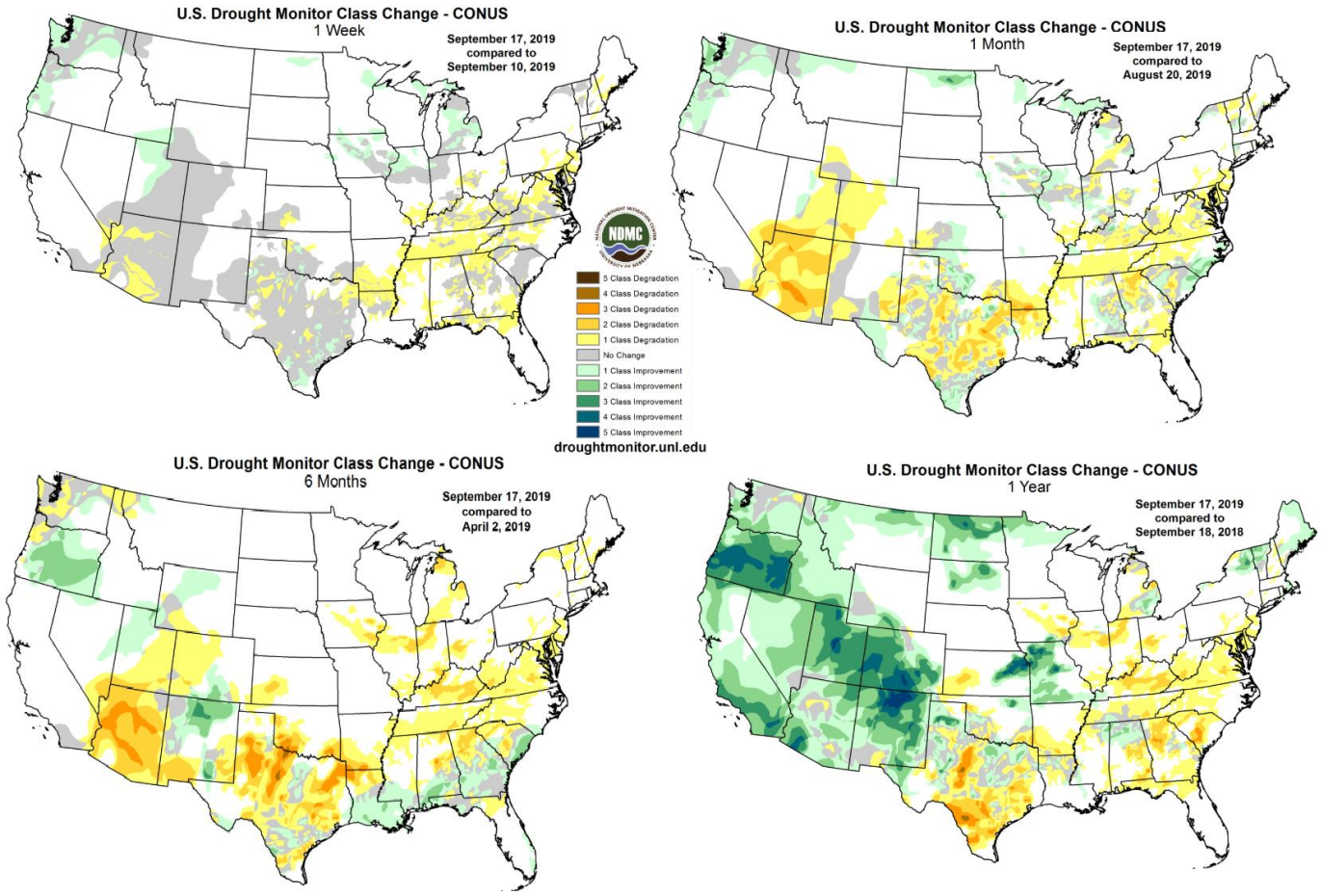


Figure 2. National Drought Monitor Class Change at 1 week, 1 month, 6 months, and 1 year. Source: National Drought Monitor website

The impacts of drying and drought in the Geographic Area are significant. Of chief importance to fire managers is the impact it can have on the vegetation and down woody material, collectively called fuels. Drought places stress on vegetation through reduced moisture availability. The result is a corresponding reduction in the moisture content of the foliage, as well as reduced moisture content in both the duff layers and down material on the forest floor. There is an inverse relationship between fuel moisture content and the availability of a fuel to ignite and burn. As fuel moisture content decreases, fuel availability for ignition and burning increases. With the drought, this process has taken place over an extended period of time, resulting in an increased amount of available fuels for combustion in a wildland fire. Along with increased fuel availability comes the potential for increased fire intensities and difficulties of control. The net result of all these conditions is an increase in the fire risk potential and the amount and type of firefighting resources needed to respond to the situation.

Figure 3 below provides a general overview of the droughts impact on the vegetation. It is the USGS normalized differential vegetative index (NDVI) departure from average greenness image collected on September 23, 2019. The departure from average greenness portrays how green each pixel is compared to its historical average greenness for the week the image was collected. Overall, departure from average condition is significantly contrasted when comparing current

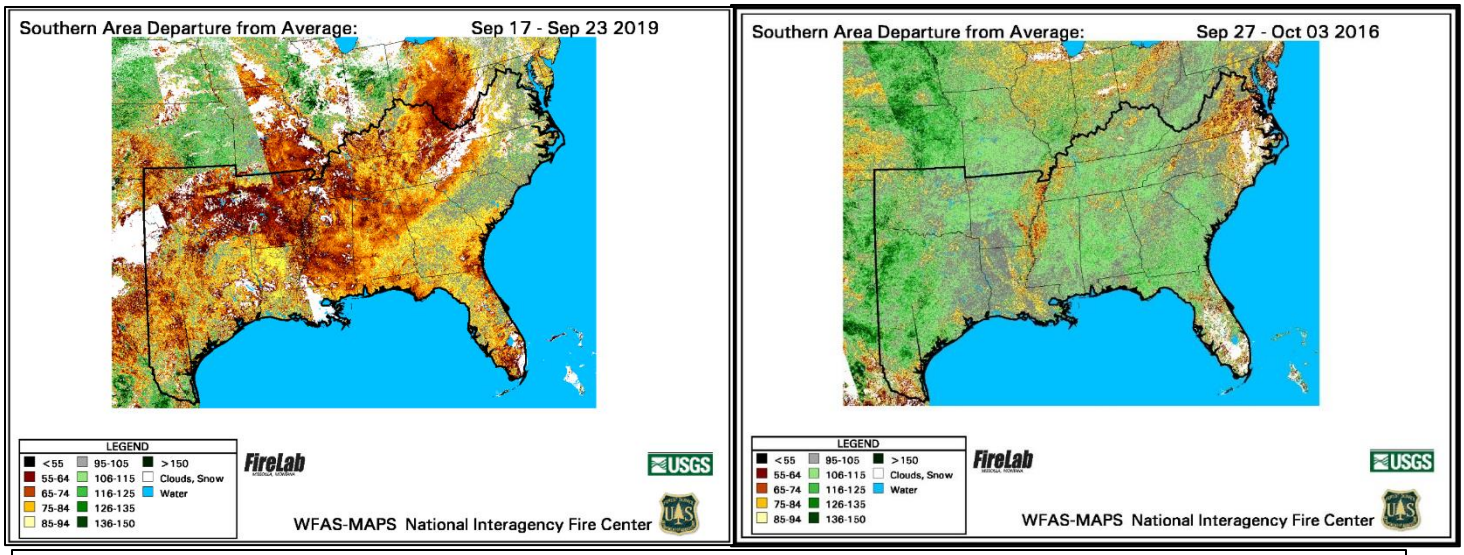


Figure 3.Departure from Average Greenness for the southeastern United States from Sept. 27th - Oct. 3rd, 2016, compared to those values being observed from Sept. 17 – 23, 2019. Source: WFAS.net

conditions to those experienced in 2016. The product displayed here does a fairly good job of detailing portions of the analysis area where fire managers should be aware of potential differences in perceived "normal" like fall conditions.
This area is very similar to that shown on the drought map as seen in Figure 1 and is an indicator of stressed vegetation.

Risk Analysis

Weather

ENSO NEUTRAL?
The El Niño Southern Oscillation (ENSO) has recently moved from El Niño to neutral and is expected to stay neutral through the winter. This means that the sea surface temperatures (SSTs) of the equatorial Pacific Ocean have cooled slightly over the past several weeks. It also means that ENSO will become a less reliable indicator of long-term weather patterns in the Southern US region, although the likelihood of a repeat of last fall's strong El Niño that brought us higher than normal precipitation.

Most forecasters focus on Niño 3.4 (see figure 4) as it tends to be the best general indicator of the ENSO. However, as can be seen in figure 4, Niño 1&2 (eastern equatorial Pacific Ocean), are cooler than the more western Niño 3&4. This could indicate a more La Nina-like pattern for the Southern US.

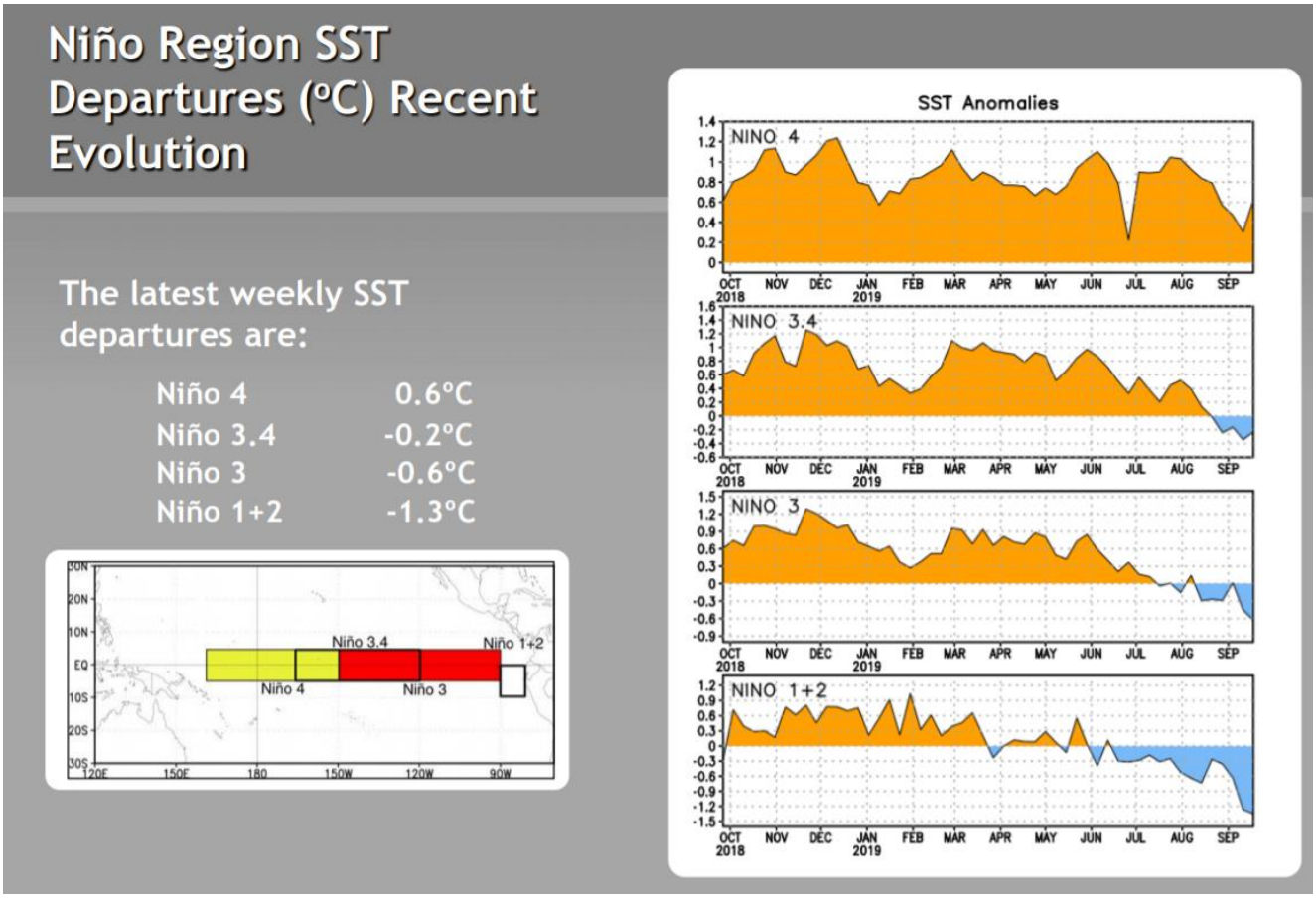


Figure 4. Location of Niño zones and recent evolution of SSTs. The y-axis on the set of graphs to the right represent the departure from normal SST in ºC.

A La Niña-like pattern would mean that storm track further north across the continental US. The Pacific Northwest would be cool and wet, and the New England region is also cool and wet. However, because the storms are tracking near or just south of the Great Lakes, the Southeast is generally drier and warmer, and the moisture associated with the storms does not penetrate far enough south to provide the Southeast with more than just spotty or scattered precipitation.

Kentucky and Virginia sit on the cusp between receiving the southern extent of the storms that are tracking across the Great Lakes and then turning northward into New England. This allows for some moisture to work its way into northern portions of Kentucky and Virginia with the better coverage further north in Ohio, Pennsylvania, and Michigan. The northern most portions of Kentucky and Virginia are situated such that they could see regular precipitation, while areas south of I-64 see significantly less than normal precipitation. As you move further south into North Carolina, Tennessee, Georgia, northern Alabama, and the western reaches of South Carolina, winter precipitation is distinctly less than climatological averages.

PRECIPITATION FREQUENCIES

The fall fire season in general is highly dependent upon the precipitation frequency. The frequency is more important than the amount that actually falls. If you have a rain/snow frequency of zero to three days, there will be no fire season. If the frequency runs from three to seven days, there is generally some initial attack activity in days five through seven, but the fires

are generally small and can be managed with local resources. Even if precipitation amounts are less than average, they will still prevent a fall fire season if they are spaced less than about three to five days apart.

Rainfall frequencies beyond seven days can easily become problematic, especially if resources and personnel are in short supply or are unavailable for other reasons. Rainfall frequencies of 7-14 days can lead to small incidents (Type III) of short duration that can place a strain on local resources. Frequencies of 14-21 days can lead to slightly larger incidents with multiple fires going on simultaneously.

Finally, rainfall frequencies beyond 21 days will often include a team deployment, perhaps even a Type I team. These frequencies must be considered throughout the leaf-drop period. Most of the fires in the southern US are human caused, with debris burning being the leading cause where burn bans are not in effect. Lightning starts, while they do occur, are fairly rare in the fall. Law enforcement efforts can be effective during and after the leaf-drop season in preventing fire occurrence.

PRECIPITATION AND TEMPERATURE OUTLOOK

The 6-10 day precipitation probability maps from the Climate Prediction Center indicate a significant chance of above normal temperatures for the South and below normal precipitation for the much of the region, with some areas having an equal chance of above or below normal precipitation.

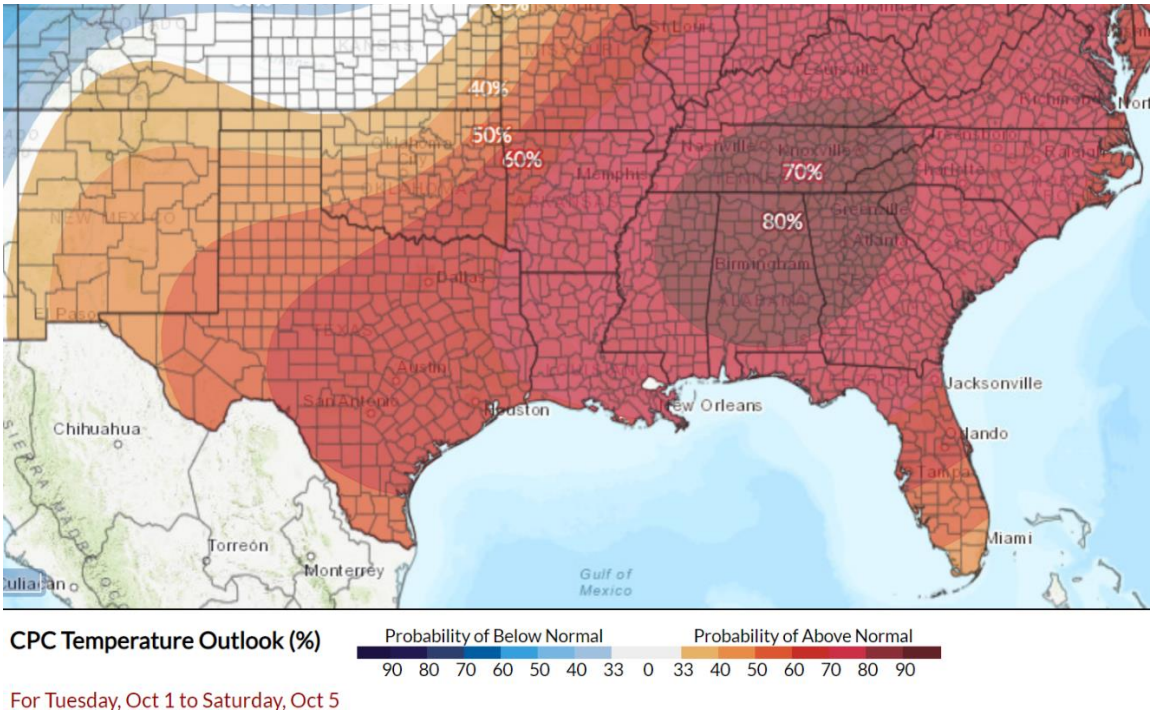


Figure 5. Map 1- Six to ten day outlook temperature probability

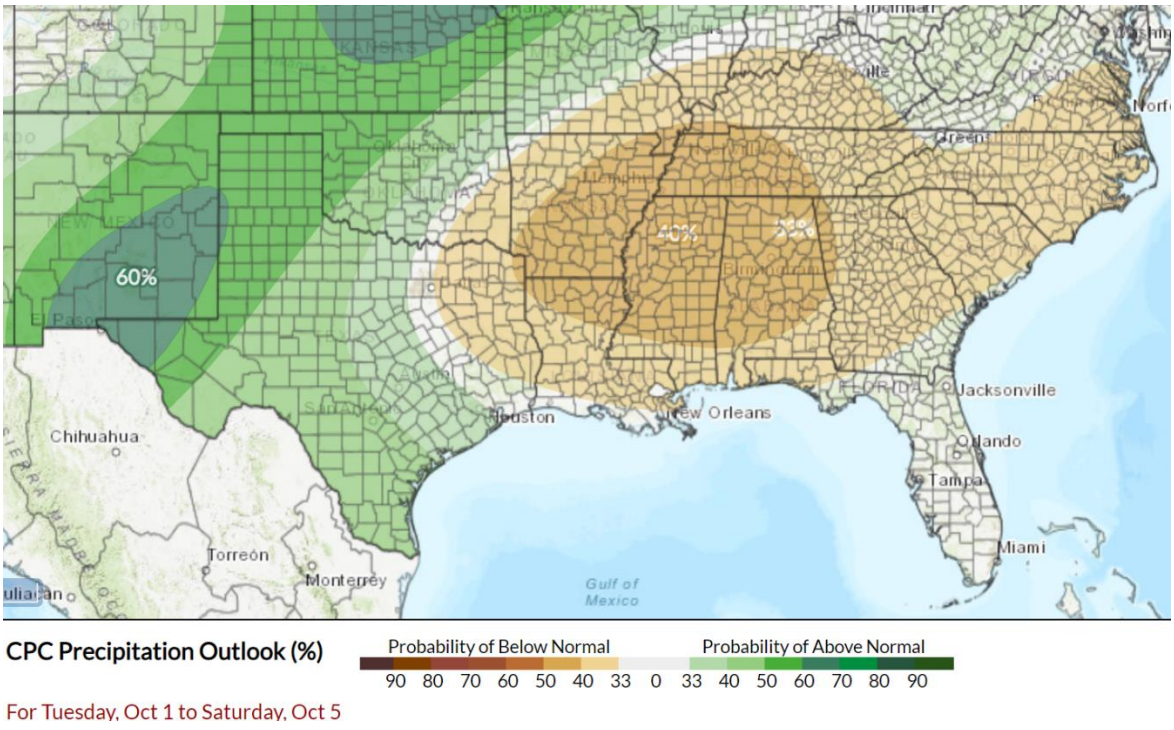


Figure 6. Map 2 - Six to ten day outlook precipitation probability.

The 8-14 day outlook for temperature still shows above normal temperatures for most of the Southern Region, but equal chances of above or below normal precipitation or even a slight chance of above normal for areas of TX, OK, AR and TN.

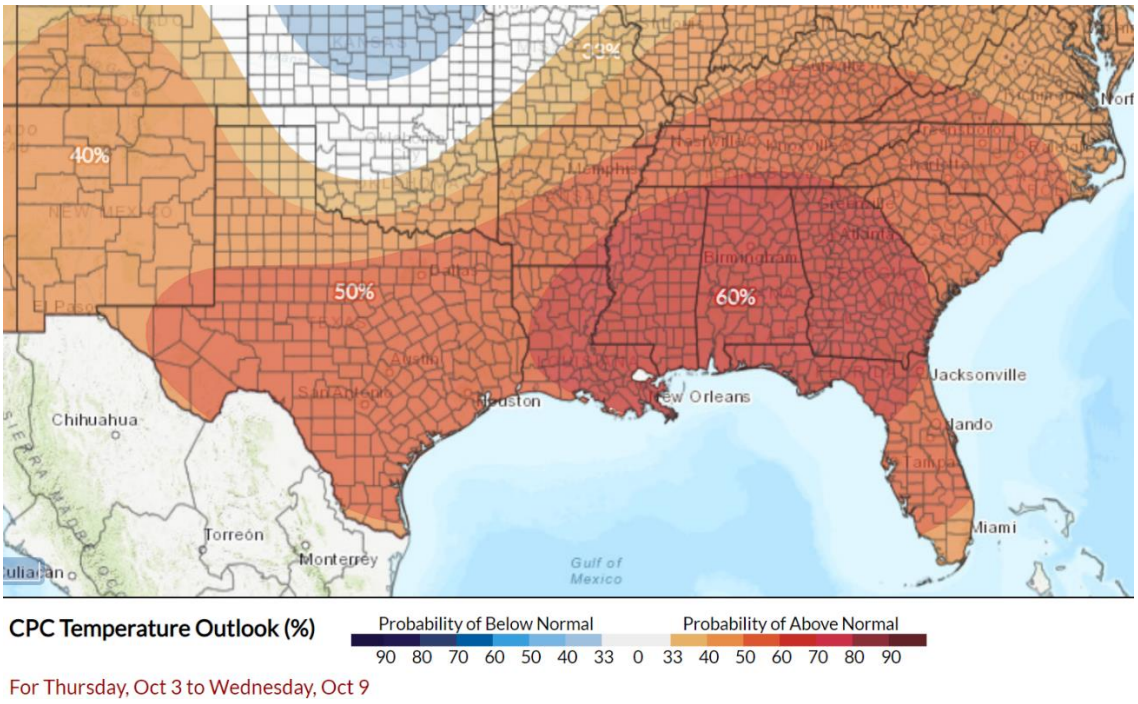


Figure 7. Map 1 - Eight to 14 day outlook temperature probability.

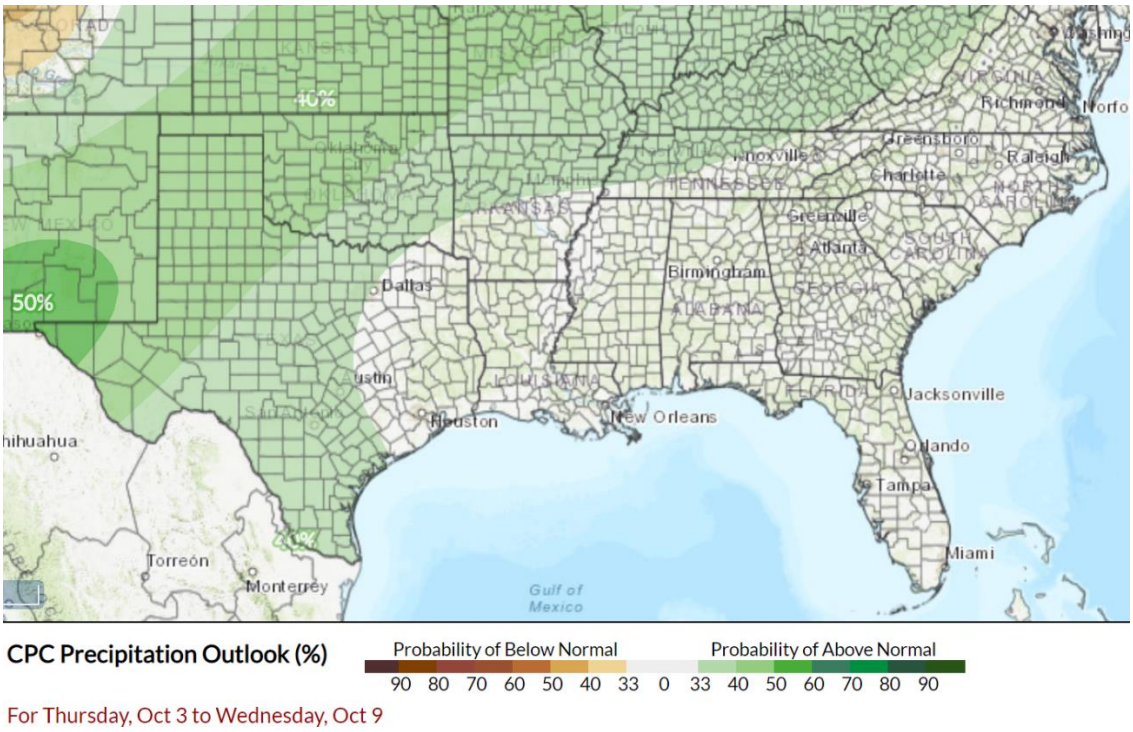


Figure 8. Map 2 - Eight to 14 day outlook precipitation probability

The long-term, three-month outlooks continue to project above normal temperatures across the entire Southern Area. These above normal readings could lead to delayed leaf drop and later than normal first frost and hard freezes. Most of the area has an equal chance of above or below normal precipitation except along the Atlantic seaboard which is predicted to be above normal. This is due to possible tropical systems or Atlantic SSTs that have a stronger influence under ENSO neutral conditions. The November-January outlook shows an equal chance of above or below normal precipitation for the entire South.

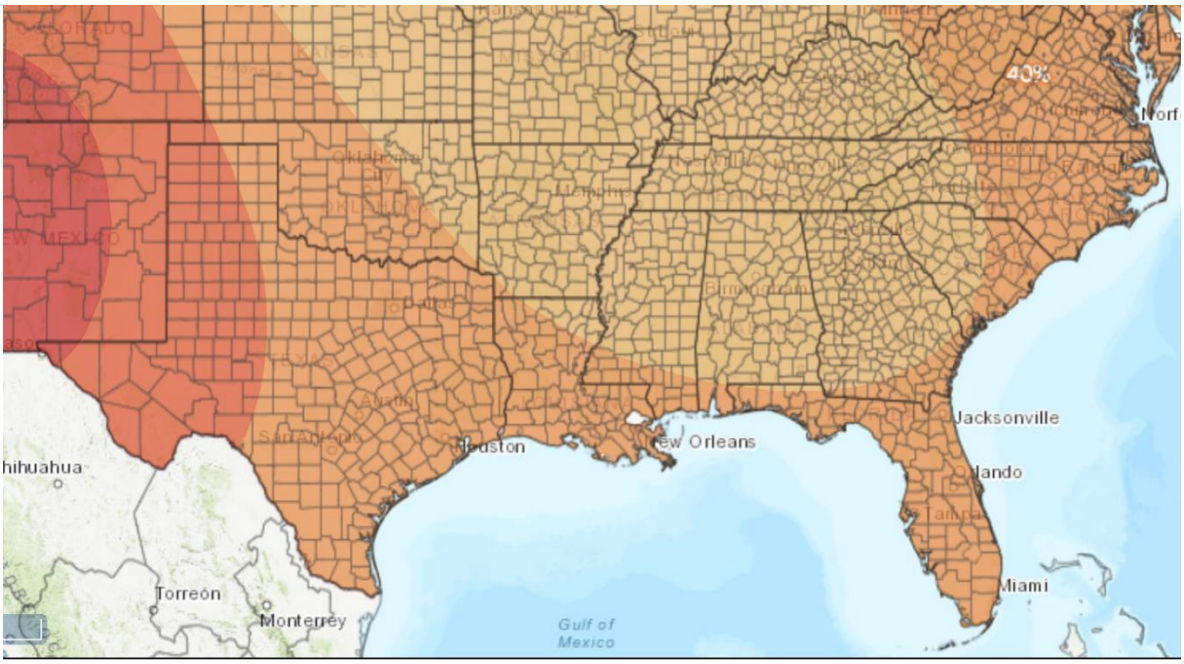


Figure 9. Map 1 – Three Month outlook temperature probability, issued on September 19th.

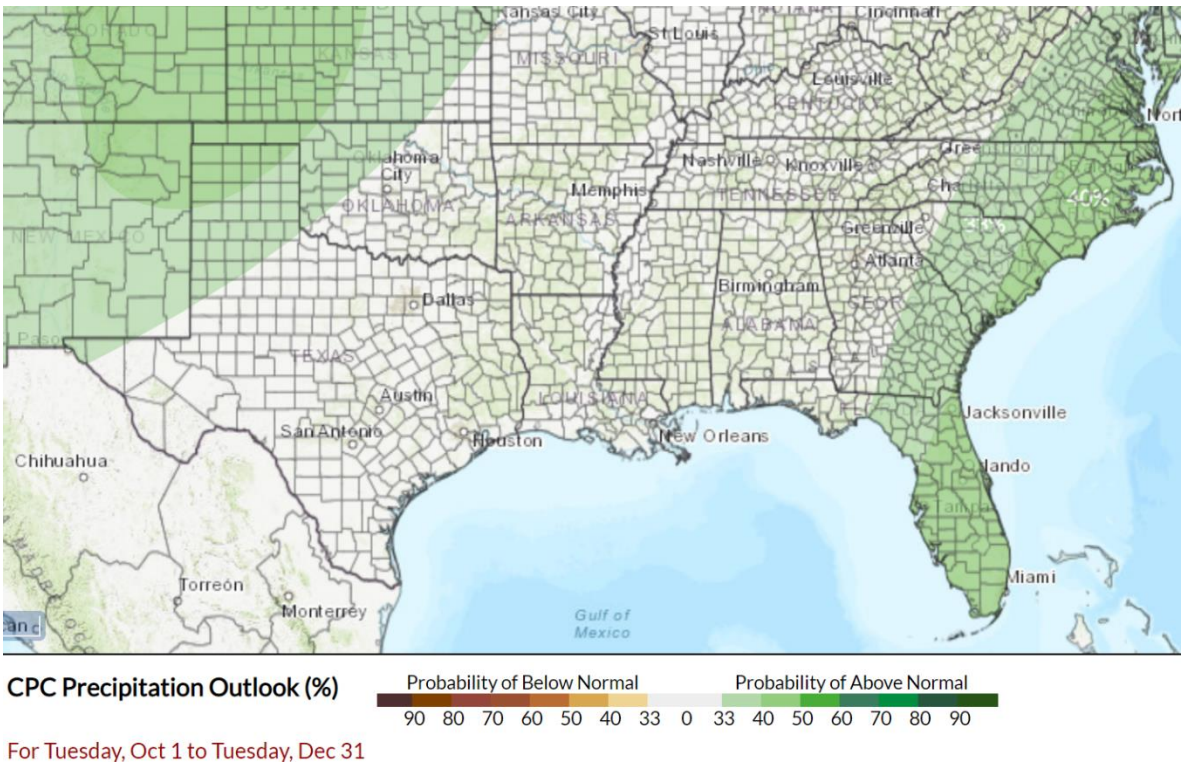


Figure 10. Map 2 – Three Month outlook precipitation probability, issued on September 19th.

DRY COLD FRONTS

The other factor to consider in the fall fire season is dry cold fronts. October and November are the best months for that to occur. When that happens, the dewpoint will drop and the relative humidity can plummet into a 15-20% range. This typically translates into 10-hour fuel moisture values around 3-5%. If conditions are unusually dry before the dry cold front, it is not unprecedented that RH values of 8-15% could be realized. These types of conditions are extremely dangerous in areas with hardwood litter because dry cold fronts are often accompanied by 24-36 hours of fairly strong winds (15-25 miles per hour with gusts of 30-40 mph) in the wake of the frontal passage. Stronger winds almost always lead to larger fires that are more difficult to control and can lead to more complex incidents, especially if there are other fires that are ongoing before the dry front passes. La Niña typically has more dry fronts than its warm water counterpart, El Niño. Abnormally low RH values can be realized for four or five days following a dry frontal passage before recovering above 40% where fuel moistures return to a more manageable state. The dryness can also be accumulative and self-propagating.

TROPICAL SYSTEMS

The occurrence of tropical events provides a wildcard into the fall fire season of the southeastern United States. These systems typically produce rainfall amounts of six to twelve inches along and east of their center. Sometimes these amounts will swell to near twenty inches for slow moving systems or may decline to three to eight inches for systems that move more quickly.

The areas that lie along and east of the track that receive rain from a tropical system will likely not see significant fire activity for fourteen to twenty-one days afterwards. We have seen tropical events squash fire activity for as much as thirty days in the areas where copious amounts of rain fall. The high levels of ground moisture tend to be a self-reinforcing mechanism that promotes additional rainfall with subsequent frontal passages that maintains a low level of fire activity and high moisture content or even saturated fuels.

To the west of the track however, the gradient of rainfall totals is very sharp and it drops off to nearly nothing as your move westward away from the track of the event. As you move 50 or more miles west of the track, you typically enter a zone of subsidence where fire activity and dryness are exacerbated and accentuated. These areas can actually see their fire activity increase, and potentially be fanned by strong winds as the system passes by to the east. This situation can be particularly dangerous in the Appalachian Mountains if the prevailing wind flow runs parallel to the drainage and local topography where an existing fire is burning. Down slope winds associated with tropical events will often significantly lower humidity values beyond what is forecast and the added wind factor can pose control issues.

DROUGHT CONDITIONS

Short term drought conditions (less than 6 months) are already present due to building deficits from the summer. They have intensified considerably in the past week due to lack of rain and unseasonably warm temperatures, creating “flash droughts” in many areas. Areas of drought extend across the Southern Area, with KDBIs above 600 from North Carolina through Texas (Figure 11).

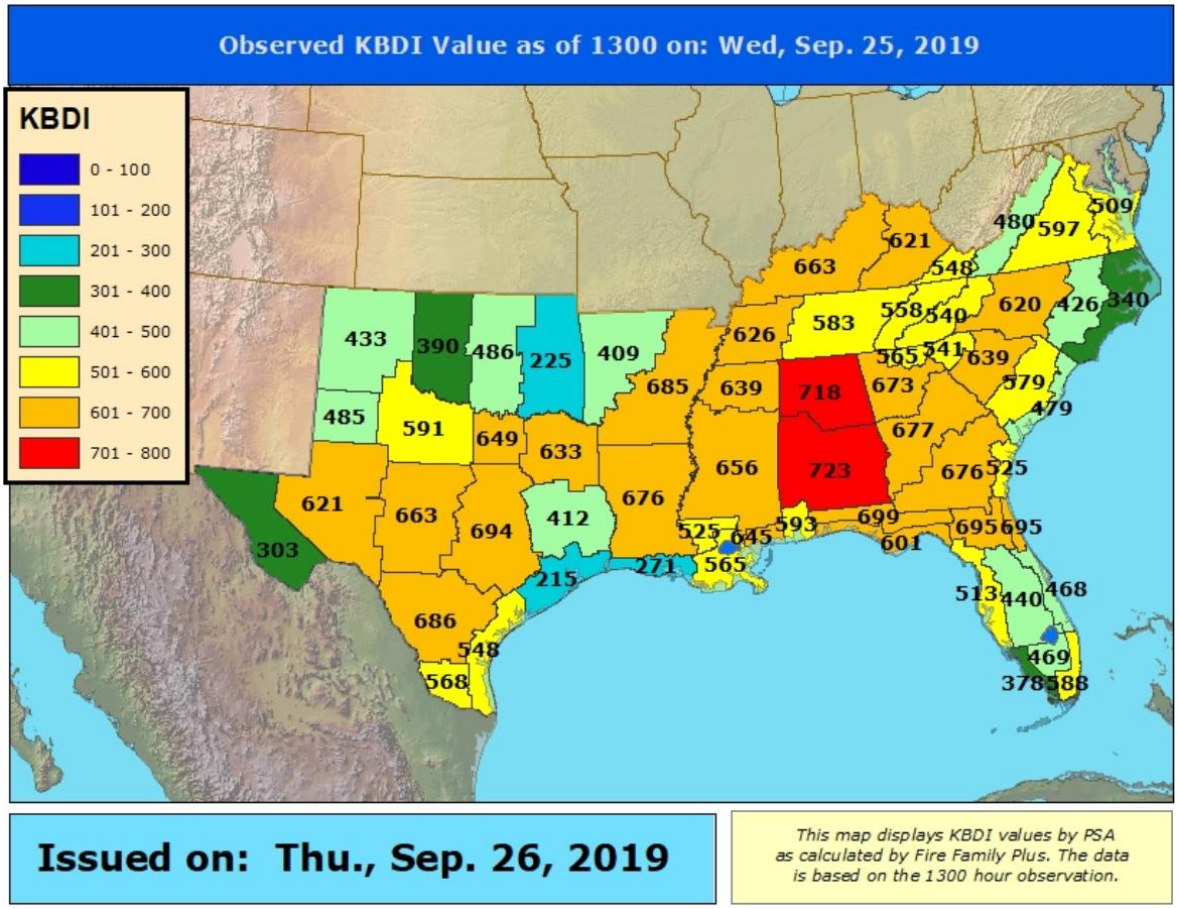


Figure 11. Map of Keetch-Byram Drought Index

The only significant areas not experiencing abnormal dryness are those affected by Dorian and Imelda, NW Arkansas, and parts of west Texas.

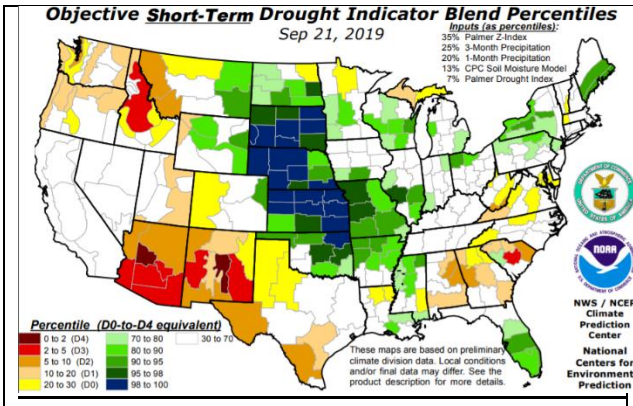


Figure 12. Map of Objective Short-Term Drought Indicator Blend Percentiles

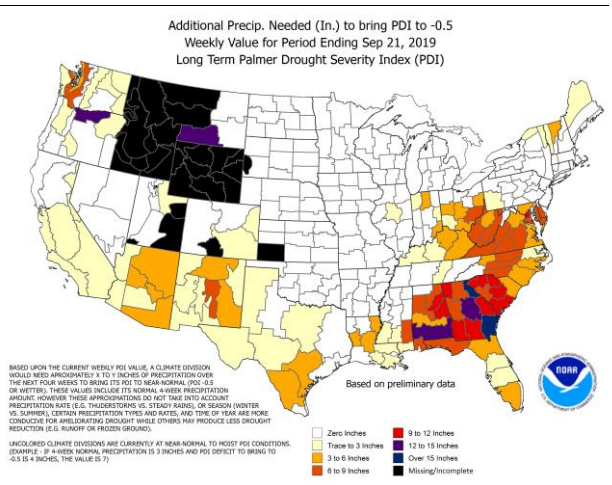


Figure 13. Precipitation Needed to Bring the Long Term Palmer Drought Index Back to Near Normal.

Figure 14 demonstrates the short-term moisture deficit for the past month as compared with the same period in 2016. Most of the locations in the assessment area are 5 to 50% of normal rainfall for the past 30 days. More areas are in precipitation deficit now than in 2016.

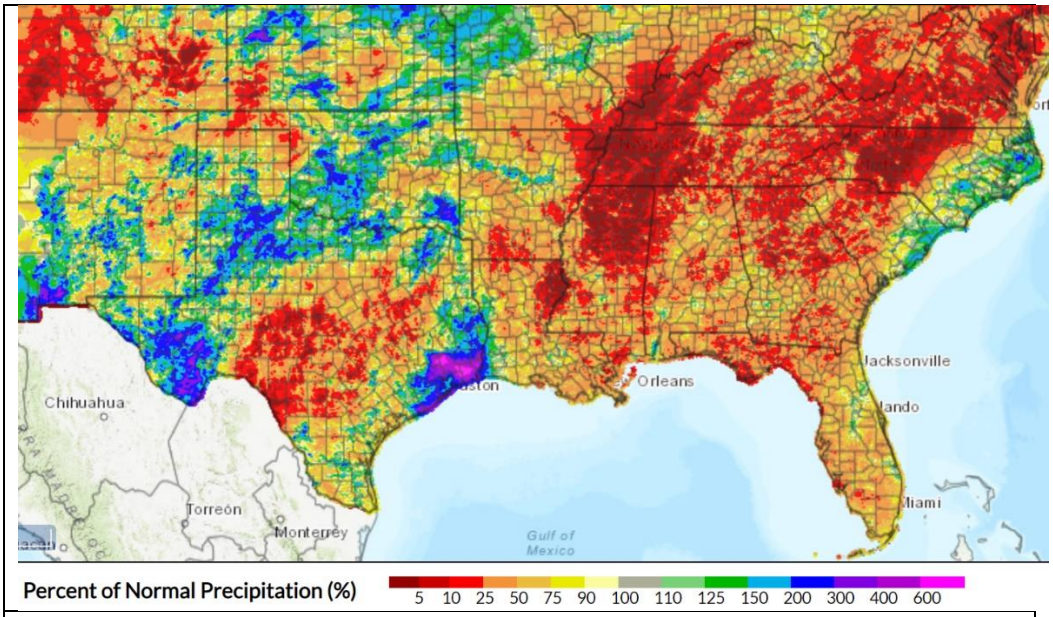
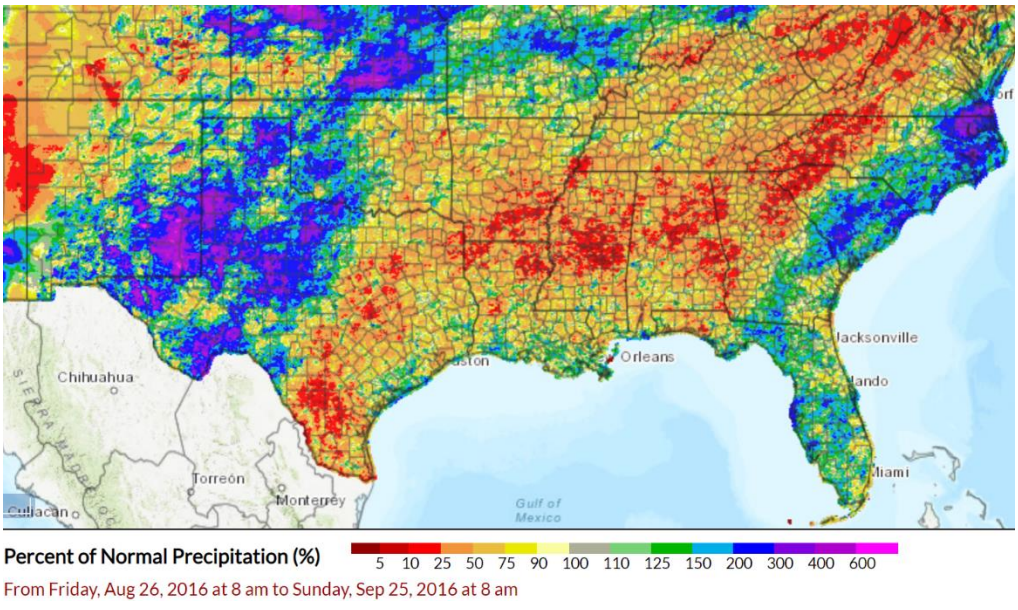


Figure 14. Map above showing the Advanced Hydrologic Precipitation Analysis (AHPS), the short-term moisture deficit, for the past month in the Southern Area. Most locations in the assessment area are at 5 to 50% of normal rainfall for the past 30 days. Compare with the same time period in 2016 below.



Drought development/persistence is likely over most of the southern Appalachians, from Charleston, WV extending down into portions of coastal Alabama and Georgia. Portions of central and north Texas as well as central South Carolina will see drought persist. Areas of eastern NC and SC that received some relief from Dorian's rains will continue to dry out with

much higher than normal temperatures and lower than average precipitation over the next several days.

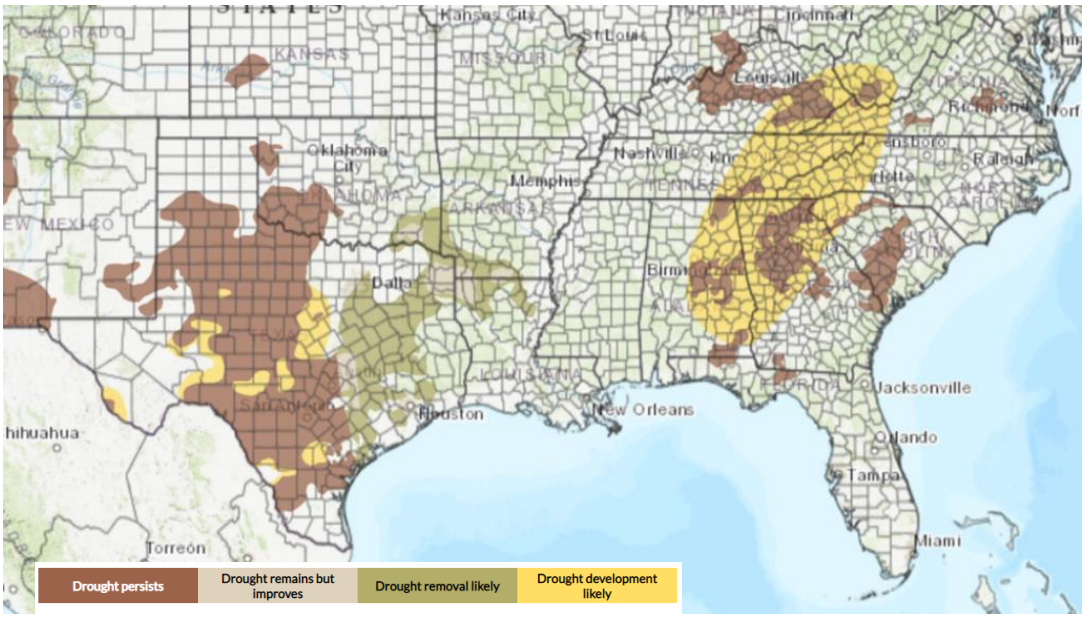


Figure 15. Map of Seasonal Drought Outlook from Sept. 19 - Dec. 31, 2019

If ENSO remains neutral through the winter, some recovery is expected in December and January with a return to seasonal patterns. However, if La Nina does develop, lower than average precipitation and warmer temperatures could mean a moisture deficit heading into spring fire season

Fuel and Fire Danger Conditions

Initial attack will continue to increase, only being abated briefly by light to moderate showers that may affect localized areas. Leaf drop and frost may be delayed by higher than normal temperatures, but these effects may be countered by increased drying of herbaceous fuels due to lack of moisture. Large fuel classes (100 hour and 1000 hour) have dried out and are being at least partially consumed in wildfires. These fuel moistures will continue to lower through October and subsequently lead to an increase in the potential for involvement in fires that occur. Duff will become more available to burn and complete consumption of fuels to mineral soil or rock in the driest locations may occur. Any fire that escapes initial attack in the drier areas will be very resistant to control efforts. Expect some torching, especially in overstocked pine plantations, and increased spotting. Since fire intensities will be higher than normal, particularly in heavy dead and downed fuels, direct attack may not be safe or successful. Expect the need for extended mop-up. Expect an increase in long duration fires with heavy fuels being available to burn and leaves coming off trees. Also, expect a higher than normal probability of reburn on contained fires.

The evolution of the ENSO will play a significant role in the fall fire season in the Southeast. If SSTs areas 1&2 warm back to near normal, the season would likely become more normal, but a

continuation or increased cooling will likely produce significant fires. If a La Niña develops (only 15% chance through winter), a much stronger than normal fire season can be expected.

Energy release component (ERC) provides an index that is correlated with flammability of fuel and difficulty of suppression. ERC is often referred to as an indicator of fuel dryness. This index seems to be most useful for characterizing the seasonal severity of the fire season across the Southern Area. ERC for each Southern Area Predictive Service Area (PSA) can be calculated based on weather measurements taken at Remote Automatic Weather Stations (RAWS). The areas covered by the assessment are colored in Figure 16.

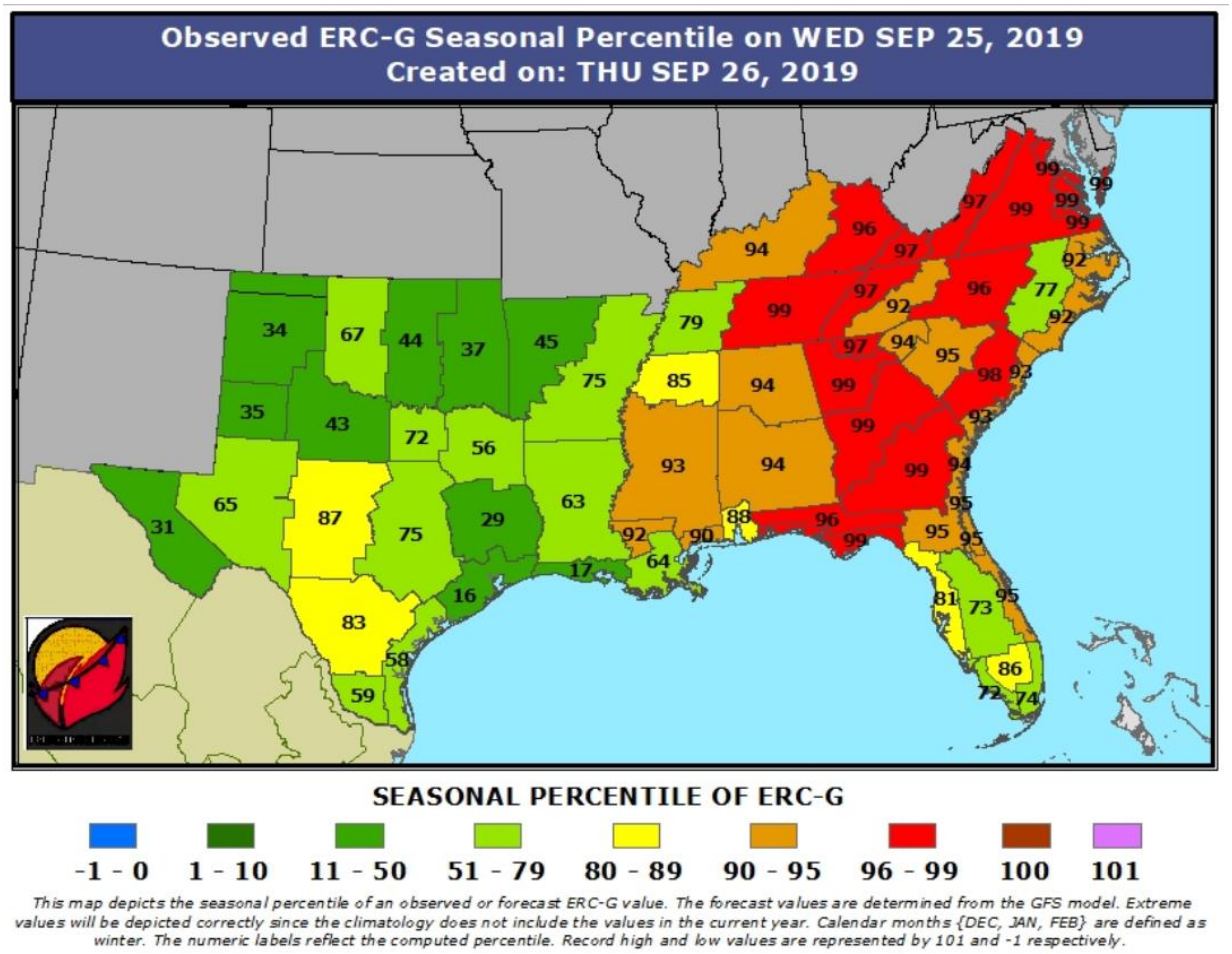


Figure 16 - Map of energy release component percentiles in the Southern Area on September 25th, 2019

Values above the 90th percentile are considered critical and represent fire danger that is only experienced less than 10% of the time. Also, any ERC value that is close to the 97th percentile is closest to the record high ERC value, signifying that those areas are at record high fire danger values for that time of the year. The areas highlighted above the 90th percentile represent the most critical areas currently. Some areas of the region will likely see more ERC values reach record high levels over the next seven to ten days unless rainfall is received.

Hurricane season is still quite active in October and 2019 has already been very active in the Atlantic Basin. Activity is predicted to continue to be high. Any tropical moisture system can cause a tremendous reduction in fire danger in localized areas. Currently, Karen is the only tropical system in the Atlantic Basin. It is predicted to weaken over the next few days as it meanders around between Bermuda and Puerto Rico.

November will bring increased leaf drop in lower elevation and lower latitudes, while higher elevations and higher latitudes will experience frost and hard freezes. These events will lead to increased availability of fine fuels that can be receptive to a wider variety of ignition sources. Frontal passages also increase during November. Dry fronts can significantly increase fire danger for a few days after passage with increased winds and lower RH. Given the possibility of lower than normal precipitation over much of the Region, expect fire danger to remain elevated. If precipitation does increase to normal levels, it will take some time for larger fuel moistures to increase to the point that they will not contribute to fire intensity.

For December and January, fire risks are expected to drop back to seasonal levels as temperatures cool and leaf drop becomes complete in all areas. If rain and snow amounts are well below normal, the southern Appalachians could continue to see issues with duff burning as fallen leaves will not be compacted as usual.

NOTE: Updated maps of the most recent observed FM100, FM1000, ERC, etc. values can be found on the Southern Area Coordination Center (SACC) Predictive Services page (http://gacc.nifc.gov/sacc/fire_weather.php). These maps are typically updated daily and are generally available between 730 and 800 AM Eastern time.

The Fire Weather Intelligence Portal (https://climate.ncsu.edu/fwip) has updated weather and NFDRS data and maps, as well as past and forecast conditions. It is hosted by NC State University, but it covers the entire Southern Region for all products and the CONUS for some products.

Figure 17 displays PSAs which were as analysis sample areas (highlighted in red fill). These graphs were chosen as they geographically well-spaced and representative of the current fire danger situation throughout region. These are NOT the only areas being impacted by increased fire danger.

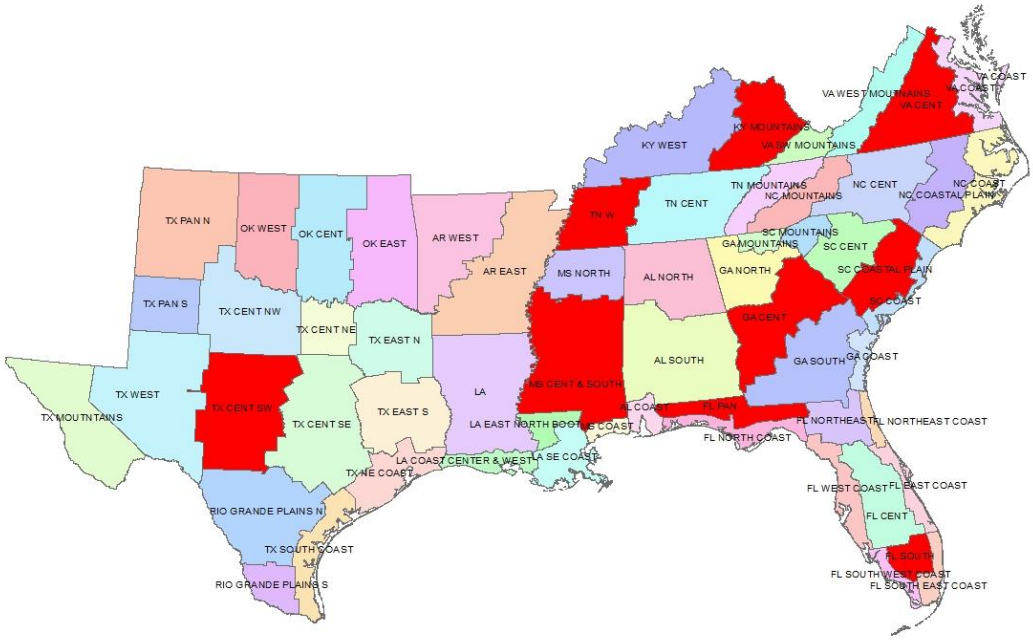
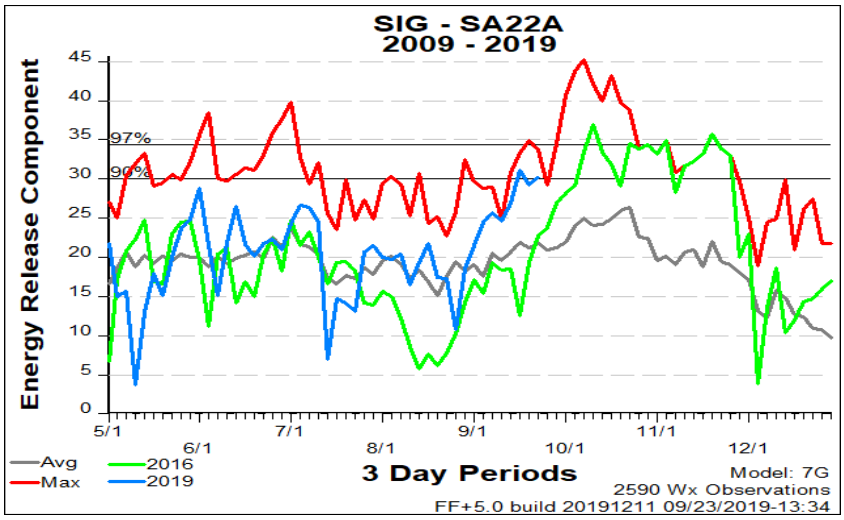


Figure 17. Predictive Service Areas of the Southern Area. PSAs used in following climatology, Growing Season Index, and season ending analyses are filled with red.

Figures 18-19 are examples from some of the most critical areas across the region of energy release component. ERC graphs in figures 20-26 have the current year ERC's and another year that was a significant fall fire season.

Figure 18. CENTRAL AND SOUTHERN MISSISSIPPI

ERC values for 2016 and 2019 in central and southern Mississippi. 2016 was graphed with the current year's trend because data shows 2016 was the most active fall fire season within the past 10 years.



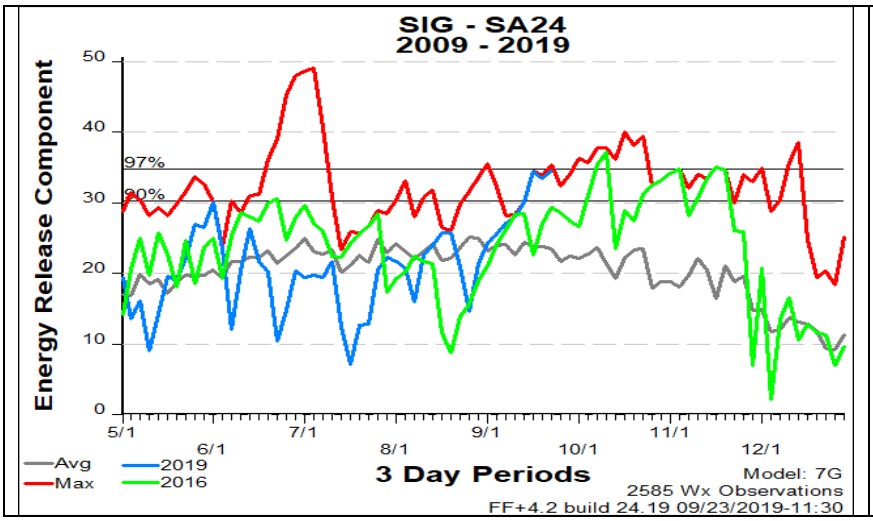
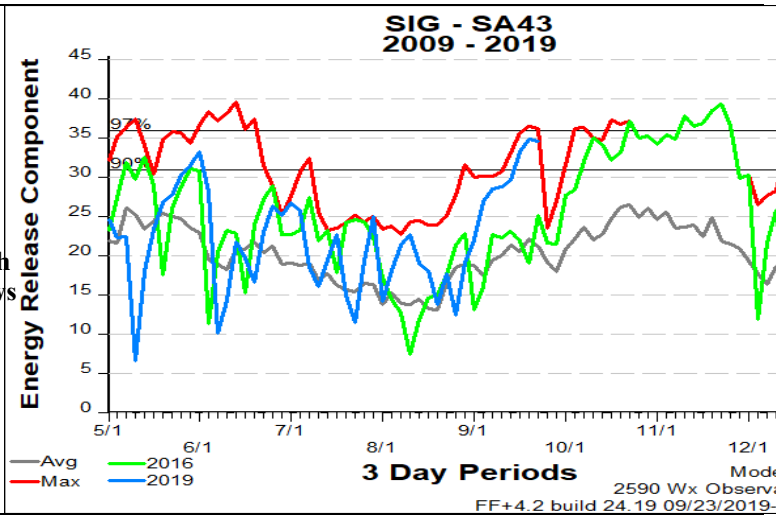


Figure 19. WEST TENNESSEE

ERC values for 2016 and 2019 in western Tennessee. 2016 was graphed with the current year's trend because data shows 2016 was the most active fall fire season within the past 10 years.

Figure 20. FLORIDA PANHANDLE

ERC Values for 2016 and 2019 in the Florida Panhandle. 2016 was graphed with the current year's trend because data shows 2016 was the most active fall fire season within the past 10 years.



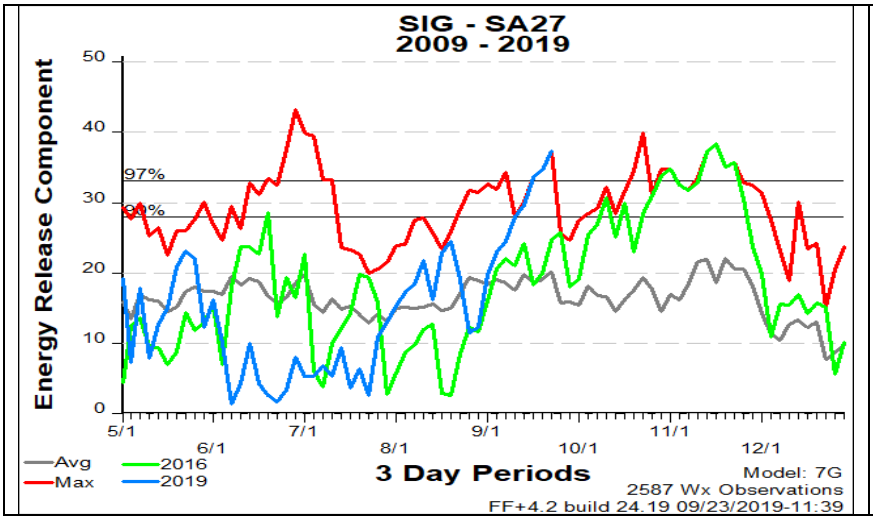
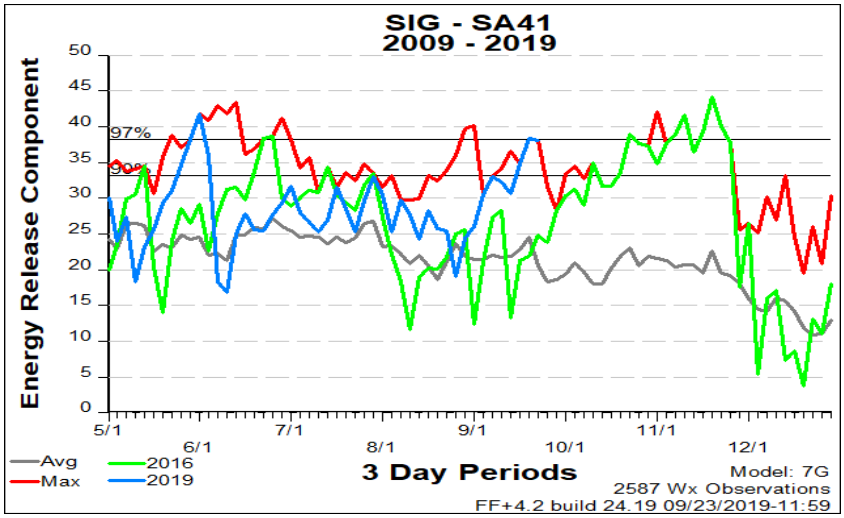


Figure 21. KENTUCKY MOUNTAINS

ERC Values for 2016 and 2019 in Kentucky mountains. 2016 was graphed with the current year's trend because data shows 2016 was the most active fall fire season within the past 10 years.

Figure 22. CENTRAL GEORGIA

ERC values for 2016 and 2019 in the Georgia piedmont. 2016 was graphed with the current year's trend because data shows 2016 was the most active fall fire season within the past 10 years.



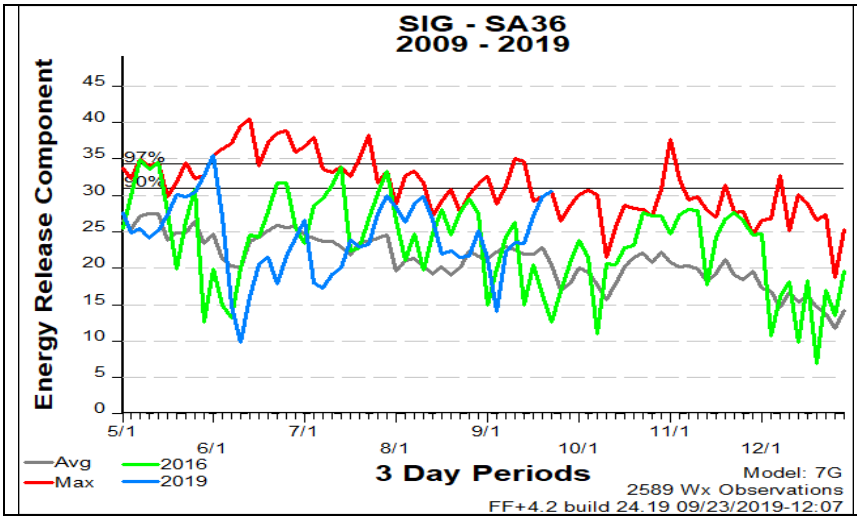
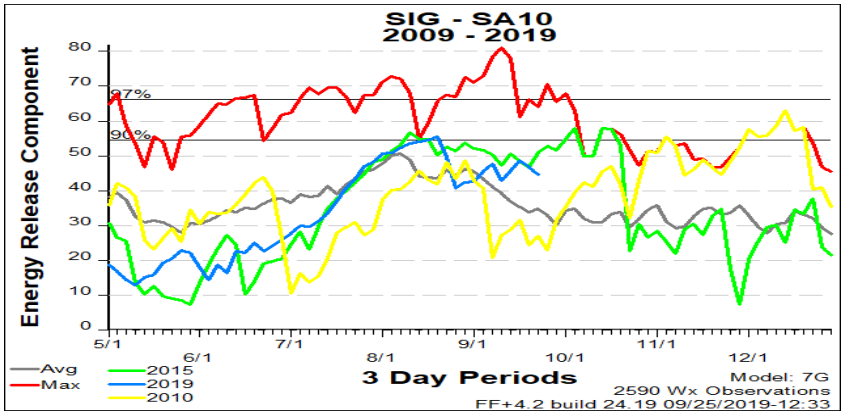


Figure 23. SOUTH CAROLINA COASTAL PLAIN

ERC values for 2016 and 2019 in the Southern Carolina coastal plain. 2016 was graphed with the current year's trend because data shows 2016 was the most active fall fire season within the past 10 years.

Figure 24. TEXAS CENTRAL SW

ERC values for 2016 and 2019 in Texas Central SW. 2010 and 2015 were graphed with the current year's trend because data show 2010 and 2015 were the most active fall fire seasons within the past 10 years.



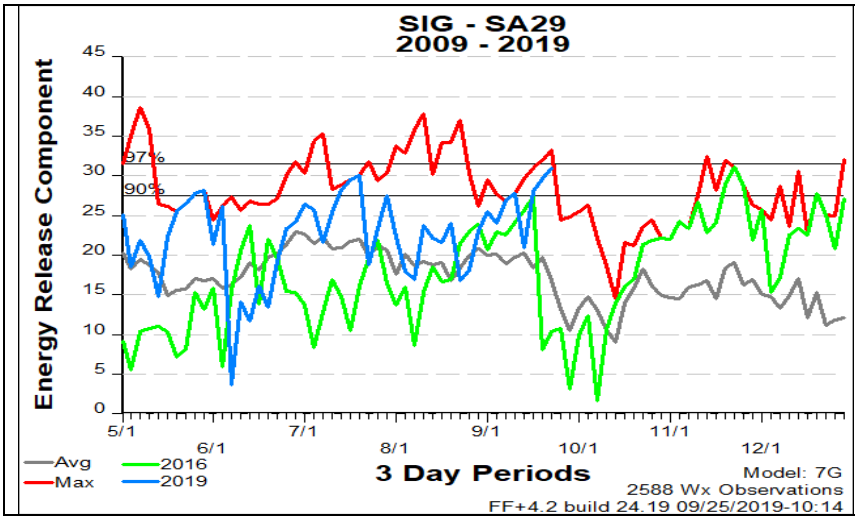
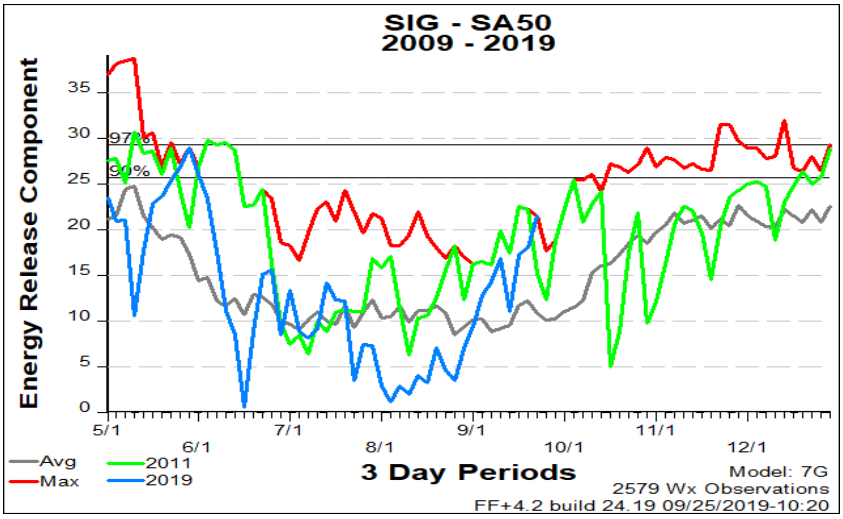


Figure 25. CENTRAL VIRGINIA

ERC values for 2016 and 2019 in Central Virginia. 2016 was graphed with the current year's trend because data shows 2016 was the most active fall fire season within the past 10 years.

Figure 26. SOUTH FLORIDA

ERC values for 2016 and 2019 in central and southern Mississippi. 2011 was graphed with the current year's trend because data shows 2011 was the most active fall fire season within the past 10 years.



Growing Season Index Analysis

The Growing Season Index (GSI) is a simple metric of plant physiological limits to photosynthesis. It is highly correlated to the seasonal changes in both the amount and activity of plant canopies. It predicts the green-up and senescence of live fuels and the influence of water stress events on vegetation. Increasing values of GSI indicate periods of improving conditions for live fuels and decreasing values indicate periods of detrimental weather conditions. GSI is calculated as a function of the three indicators of important weather factors that regulate plant functions. These indicators are combined into a single indicator that integrates the limiting effects of temperature, water and light deficiencies. The importance of each of the three indicators, as well as a more in-depth summary of GSI, can be found here -> (http://www.wfas.net/index.php/growing-season-index-experimental-products-96).

Figures 27-35were created using RAWS observations calculations from the past decade. In order to reflect actual GSI value trends, as well as true increasing or decreasing conditions, the following analysis displays both GSI and GSI Differential for each Predictive Service Area (PSA) Special Interest Group (SIG) assessed in the climatology section. Each set of graphs display a combination of current 2019 GSI values overlaid with both average and 2016 values. 2016 was used as an analogue year across the entire Southern Area Geographic Area.

Historically low GSI values across the analysis area are significant for both the fall fire season and the eventual transition to spring fire season. Drought stressed vegetation would have a tendency to not only provide for and promote fire growth through low live fuel moisture, but also could be more susceptible to undesired fire effects. Live vegetation is stressed and with reports from managers that leaves are changing, it is possible that leaves could start falling earlier.

Overall, it is observed that every area analyzed is trending at or below those levels recorded during the same time period of analogue years. This is fairly remarkable and may do a good job of predicting similar conditions experienced during those analogue years selected.

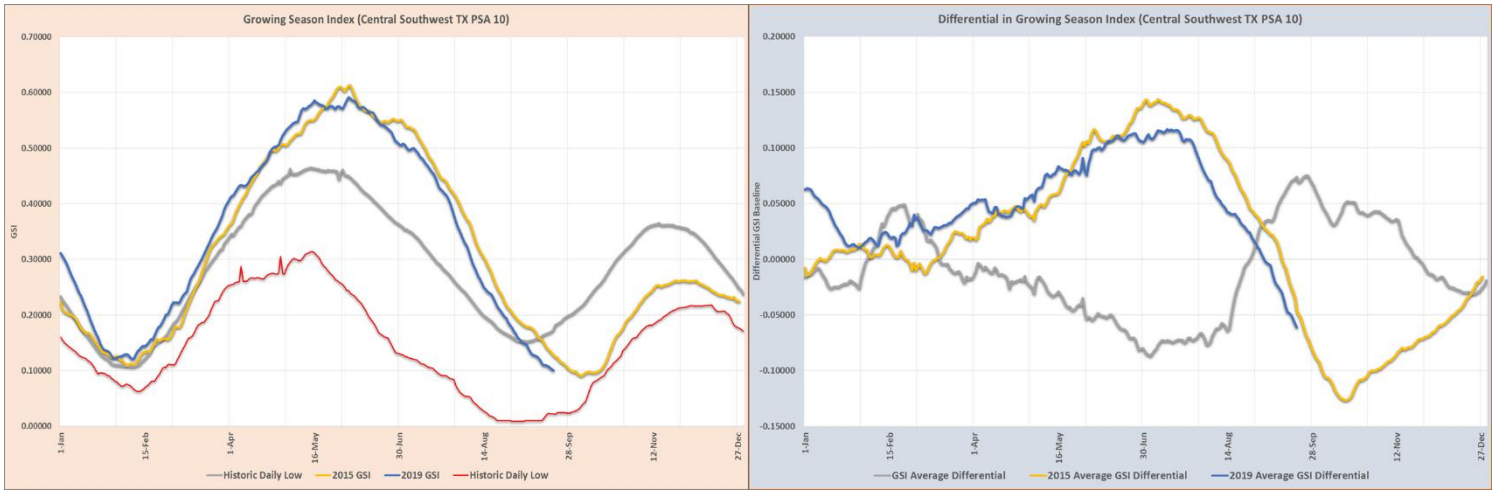


Figure 27. The graph on the left displays true Growing Season Index while the graph on the right displays trends of increasing or decreasing GSI throughout the year. For comparison purposes, historic minimum as well as calendar day average has been added. It is observed that central Texas is trending below 2015, which locals define as an analogue year.

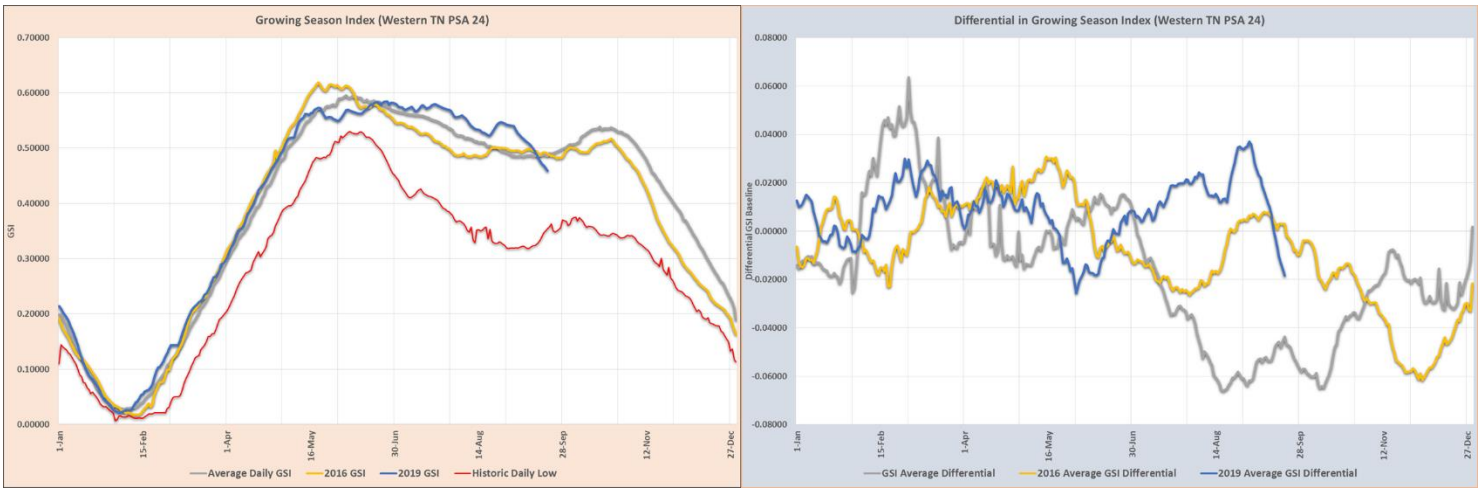


Figure 28. The graph on the left displays true Growing Season Index while the graph on the right displays trends of increasing or decreasing GSI throughout the year. For comparison purposes, historic minimum as well as calendar day average has been added. It is observed that western Tennessee is dramatically decreasing in GSI values and has currently fallen below those values recorded in 2016.

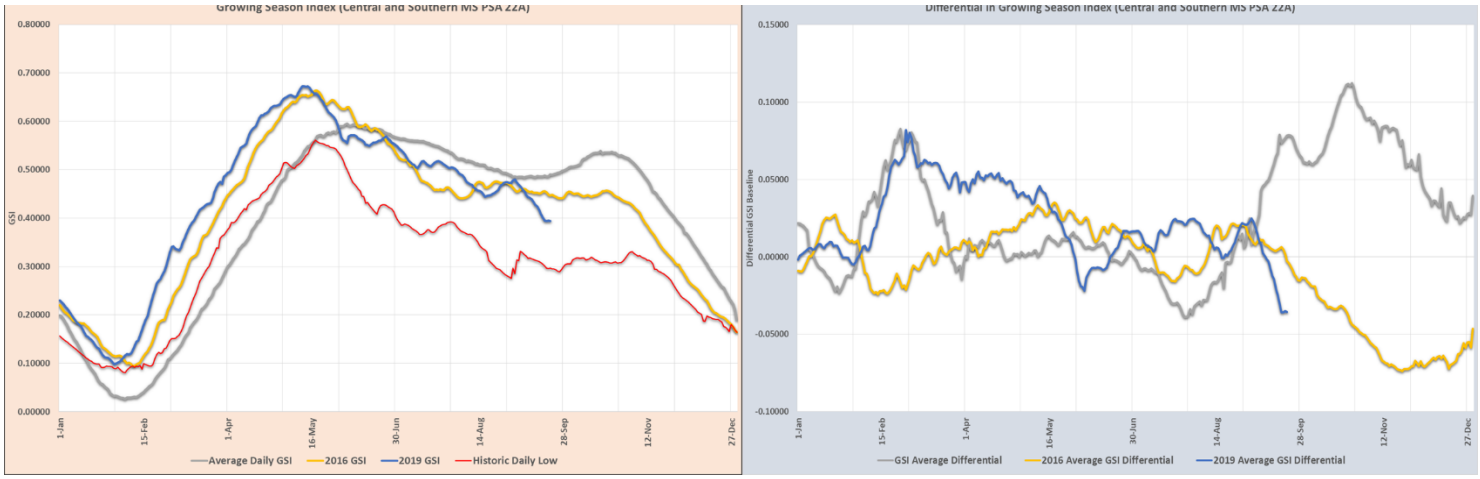


Figure 29. The graph on the left displays true Growing Season Index while the graph on the right displays trends of increasing or decreasing GSI throughout the year. For comparison purposes, historic minimum as well as calendar day average has been added. It is observed that portions of central and southern Mississippi are seeing decreasing trends currently lower than those values of 2016.

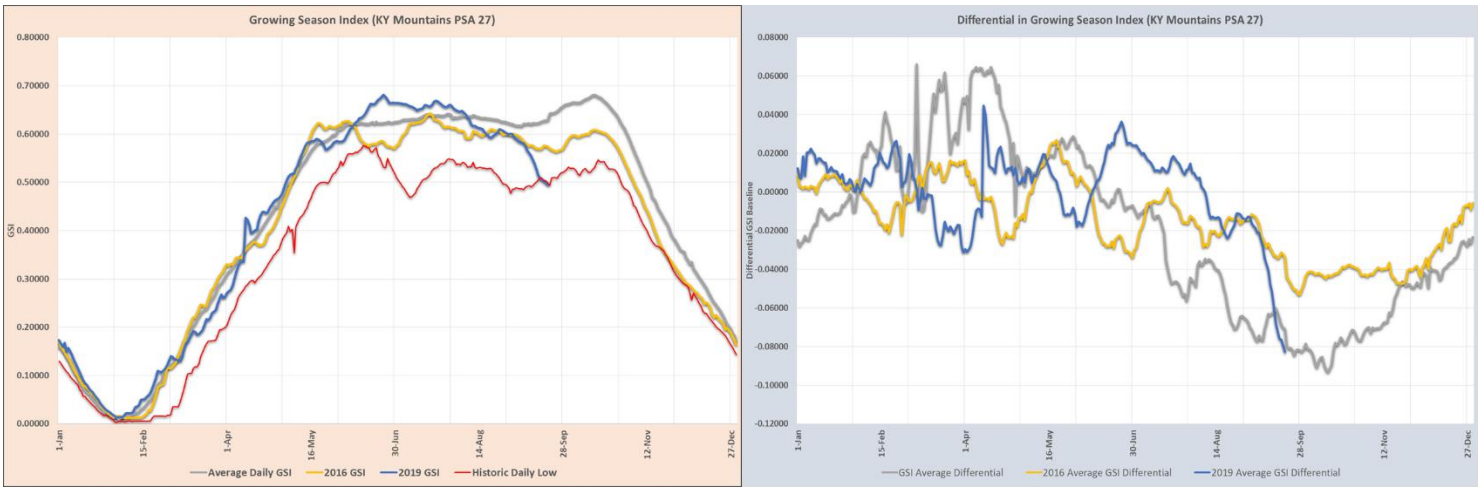


Figure 30. The graph on the left displays true Growing Season Index while the graph on the right displays trends of increasing or decreasing GSI throughout the year. For comparison purposes, historic minimum as well as calendar day average has been added. It is observed that the mountains of eastern Kentucky have trended with 2016 conditions and are currently breaking historic low records.

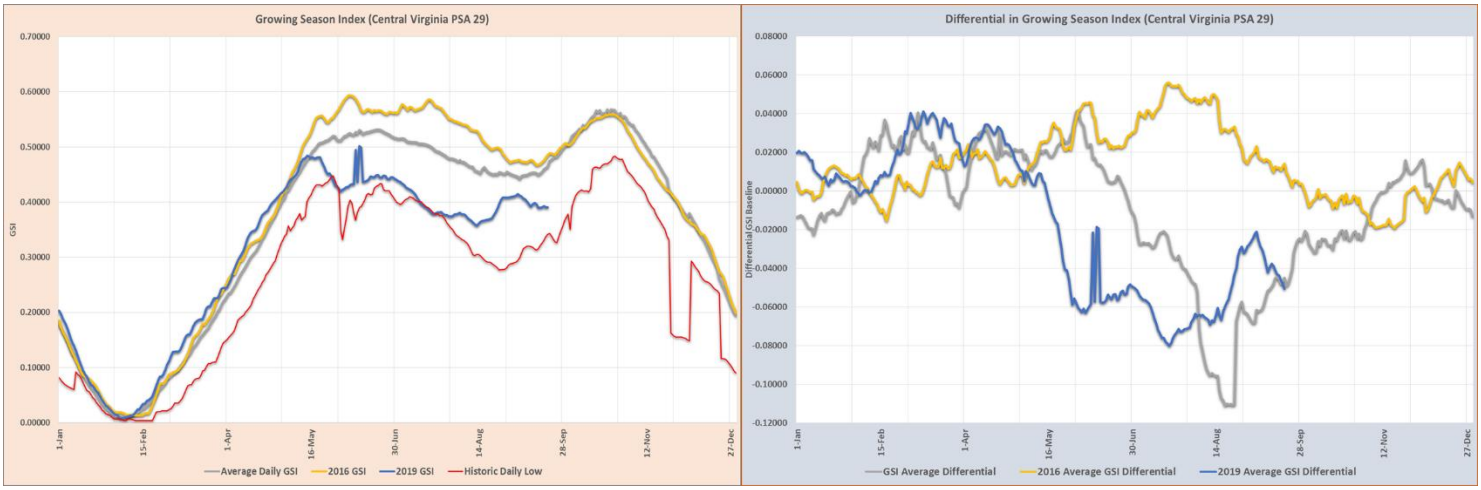


Figure 31. The graph on the left displays true Growing Season Index while the graph on the right displays trends of increasing or decreasing GSI throughout the year. For comparison purposes, historic minimum as well as calendar day average has been added. It is observed that central Virginia is trending below average and substantially lower than those values experienced in 2016.

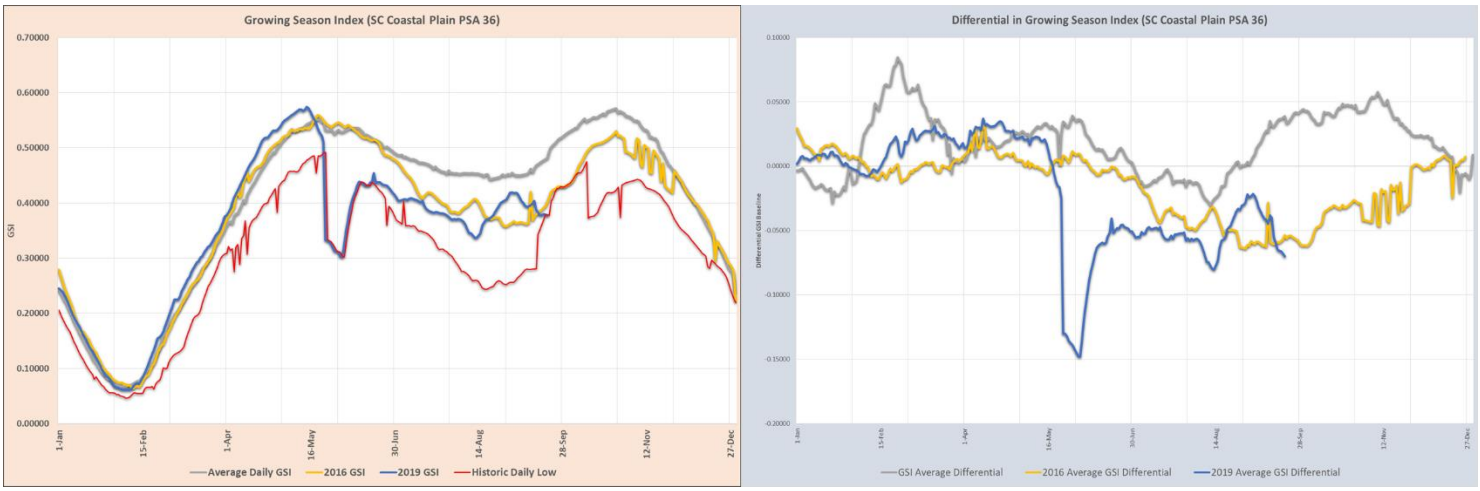


Figure 32. The graph on the left displays true Growing Season Index while the graph on the right displays trends of increasing or decreasing GSI throughout the year. For comparison purposes, historic minimum as well as calendar day average has been added. It is observed that the Coastal Plain of South Carolina has trended very close with 2016 and is currently decreasing to historic low levels.

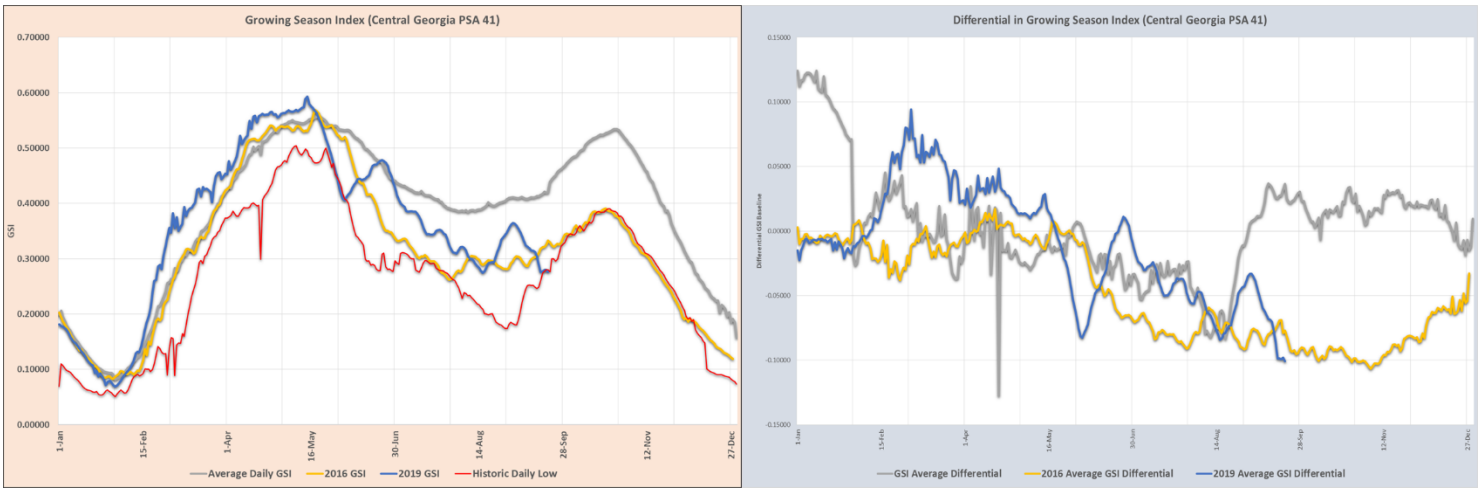


Figure 33. The graph on the left displays true Growing Season Index while the graph on the right displays trends of increasing or decreasing GSI throughout the year. For comparison purposes, historic minimum as well as calendar day average has been added. It is observed that central Georgia has trended very similarly to 2016 and is currently at historic low levels.

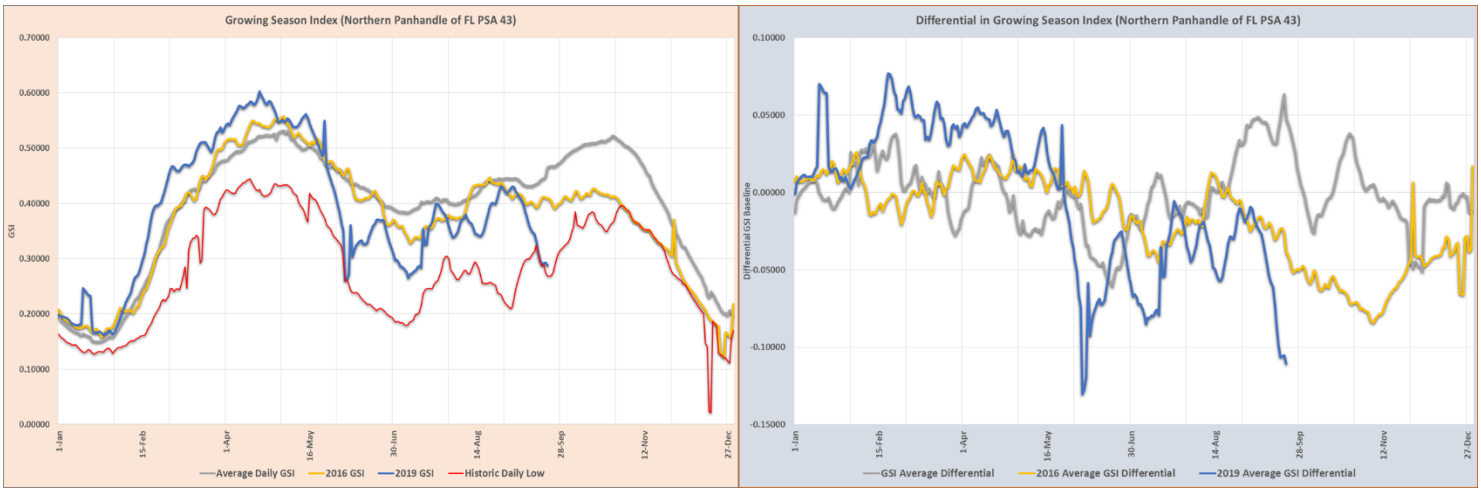


Figure 34. The graph on the left displays true Growing Season Index while the graph on the right displays trends of increasing or decreasing GSI throughout the year. For comparison purposes, historic minimum as well as calendar day average has been added. It is observed that the northern panhandle of Florida is currently decreasing in GSI while trending far below 2016 values and at historic low levels.

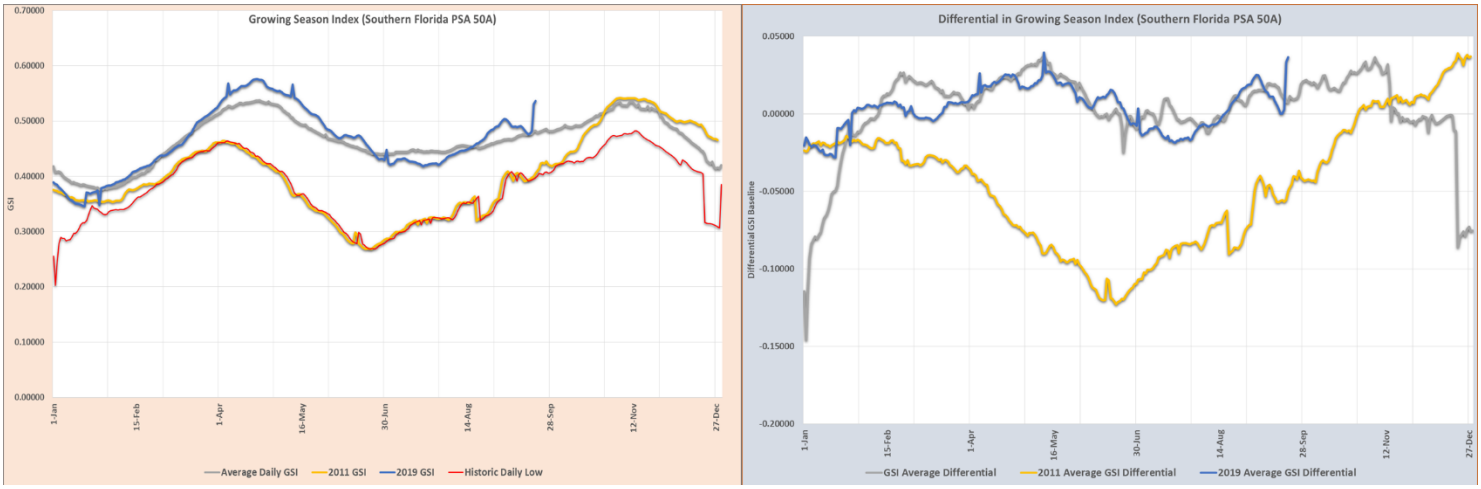


Figure 35. The graph on the left displays true Growing Season Index while the graph on the right displays trends of increasing or decreasing GSI throughout the year. For comparison purposes, historic minimum as well as calendar day average has been added. It is observed that southern Florida has trended above average and is experiences conditions far different than those of 2011.

Current Summarized Observations by Fire Managers

Daniel Martin, George Washington-Jefferson National Forest, Fire Management Officer

Some areas of the GW-Jeff are very dry with KBDIs over 500. The South Zone is right around the 90th percentile for ERC and above the 97th percentile for KBDI. The Central Zone has above average ERC and KBDIs above the 90th percentile, and the Eastern Divide shows similar patterns. However, the North Zone has around average ERC and below average KBDI.

In terms of fire, the central zone burned 10 days ago and were still getting duff consumption. Relative humidity in the 50-60% range and minimal winds have kept spread potential low, but a couple zones have reported dry lighting over the past few days. My opinion is that the foundation is in place for problematic fire behavior and resistance to control, so when the RH drops below 40% the 100hrs get down around 10% and the fall wind events start, we will have potential for a sporty fall fire season. My concern is the challenge to find resources in the fall, and with TX burning, it could be even worse.

John Miller, Virginia Department of Forestry, Chief of Resource Protection

Virginia is as dry as I have seen it in 20 years. As such, we are implementing a plan of action for high fire occurrence this fall. The drought is affecting us statewide, while historically it has only been this dry in one portion of the state at a time, in turn, creating an unprecedented area of concern. Our KBDIs currently range from 450-650 statewide, and fire activity is already occurring statewide, one month ahead of schedule. The forecast shows hot and dry weather through at least mid-October. All of these indicators suggest we are heading into a difficult fall fire season, perhaps as bad as the 1999 season. In response, eight Virginia counties currently have burn bans.

E.J. Bunzendahl, Daniel Boone National Forest, FMO

Conditions are extremely dry as it has been 29 days since significant rain (>.2”). Fuels are trending toward historic dryness for this time of year with 100-hr, 1000-hr, and KBDIs above the 97th percentile. Fires are already requiring control lines to mineral soil and wider than average. Suppression resources have reported full consumption of 1000-hr fuels and creation of stump holes. Our forest is currently at 50% capacity due to not filling positions during fire hire. The forest will issue a Supervisor’s order for campfire restrictions within the next day or two. State resources have reported torching of deciduous tree leaves even though leaves appear green. Most counties in the state have burn bans.

James Lerke, Land Between the Lakes, FMO

Same environmental conditions as in the Daniel Boone, and currently tracking above the 2016 trend lines. Complete consumption occurring in all fuel classes with moderate resistance to

control. We are bringing in an additional Type 6 engine and PREV to support our current resources. Tennessee sites are currently significantly drier than our Kentucky sites, but we are going into restrictions this week in conjunction with our partners in both states.

Brandon Howard, Kentucky Division of Forestry, Fire Management Chief

In Kentucky, conditions are much drier than normal, and we have seen an increase in fire activity over the past two weeks. The Pineville field office reported single tree torching on a fire last week, which is abnormal for us, as fire activity is typically isolated to the ground here. Additionally, we saw a fire grow to 650 acres in under 24 hours. These conditions are typical for a dry November, not September. Absent of any measurable rainfall for an extended period of time, I foresee preposition dozers and engines by mid-October at the latest. Currently, 26% of KY is in a moderate drought and 41% is abnormally dry. This encompasses 2/3 of the state with the largest concerns stemming from the mountainous regions of SE KY, where we often experience large fires that last for long durations during dry seasons, much like the one we're experiencing now. Conditions are similar to those we experienced in 2016.

Wade Waters, Tennessee Department of Agriculture, State Fire Chief

Despite continued hot and dry conditions, activity has remained steady due to little to no wind, moderate minimum RHs, and good recoveries. Leaf drop has begun in certain species and initiated extensive mop-up, but we are currently no seeing an uptick in the number of fires or control issues. We have initiated statewide burn regulations as well as our fall season staffing pattern one month earlier than normal. We have also initiated burn bans in 7 counties along with a statewide media push. If we get widespread adherence to burn regulations, short-term concerns will surround seasonal agricultural practices.

Steve Little, National Forests in NC, Assistant Fire Management Officer

In the Mountain and Piedmont units there have been extended periods (more than 10 days) without precip. There is still 95% leaf on, which will need to be monitored for shaded vs. unshaded surface fuels. Additionally, KBDI has continued to climb with several stations between 570 and 675. However, 100 and 1000 hr fuels are above the 15% threshold at this point. Mid-story live moisture is on the cusp of going below 125% when aspect and slope are considered.

From my experience, late summer/early fall trends we might expect include: fast moving surface fires, slope/wind driven short runs in mid-story if other factors aligned, isolated torching if other factors aligned, extended duff mop up, and continued patrol to clean lines from leaf fall. Additionally, be mindful that the distance and track of a hurricane can increase fire danger because if they are not close enough to provide rain, there is a pulling effect on surface wind and atmospheric moisture, in turn, creating steady strong surface winds with lower RH values.

Darryl Jones, South Carolina Forestry Commission, Forest Protection Chief

In South Carolina, ignitions have been higher than average, and acreage burned has been well above average. In September there have been 131 fires that burned 1227.8 acres, compared to the 5 year average of 55 fires for 221 acres and the 10 year average of 89 fires for 263 acres. Several fires have burned into the duff, resulting in 13 fires still being mopped up and monitored. In addition, several have gotten large—138 and 97 acres—and firefighters have reported short crown fire runs, individual tree torching, and spotting long distances. These increases in acres burned are a solid indicator of drought conditions, and little relief seems to be coming.

Mike Davis, Chattahoochee-Oconee NF, Fire Management Officer

Dry conditions currently in North Georgia with growing KBDIs as follows: Conasauga at 571-579, Blue Ridge 378-408, Chattooga River 526-713, and Oconee 692-701. They are accompanied by ERCs between 30 and 40, resulting in preparedness levels of 3 (high) and 4 (very high) based on the FDOP. We are seeing early leaf drop and saw scattered precipitation over the weekend. Biggest concern is remote dry lightning ignited fire. While we are not in the prolonged drought we saw in 2016, we are seeing Sept 2016-like KBDIs, but fortunately the ignitions are not there. On a 62-acre site prep burn on September 6th, personnel saw limited fire behavior in shading but that may change with an increase in leaf fall.

NW GA GFC: Fire activity has been increasing over the past 4 weeks, currently at an average of 20 fires/week. Drought conditions similar to 2016 with stump holes burning out, duff burning, and roots burning under fire breaks and escaping 6-8 weeks later. Trees are turning brown and dropping leaves. Scattered storms give us a couple days break in rainfall areas, but dry lightning has led to several new starts. Nervous about where we're heading come mid-October.

NE GA GFC: Fire activity is in line with current weather measures with 10hr. fuel moisture and KBDIs. Three counties are experiencing increased activity with KBDIs between 625 and 718 and 10hr fuel moistures between 7 and 8 percent.

Oconee GFC: Activity has been higher than normal, but all have been controlled to a small average. Most have been powerline fires.

Frank Sorrells, Chief of Forest Protection, Georgia Forestry Commission

We anticipate an active fall season and have already seen an increase in wildfire activity especially in the central and northern parts of Georgia. Wildfires are becoming more intense and requiring extended mop-up to hold. We can expect wildfire activity to continue to increase and coincide with leaf fall in the north GA regions, which begin early. KBDIs are running 100-200 points above average, 100- and 1000-hour fuels are generally in the low to mid-teens with 10 hour fuels falling to 5-7% daily in many locations.

Bottom line, it's getting dry; fires are increasing; and there is nothing in immediate forecast that I

see to change that. It is likely to get worse for us before it gets better.

Mitch Ketron, National Forest in Florida, Assistant Fire Management Officer

A 769 acre fire started by lightning burned in the Apalachicola Forest. The area had light to moderate hurricane damage, causing the FS to use existing FS roads and indirect attack. There was a lot of moisture on the ground and humidity was high with light Northward winds at 1-2 mph that then switched to SW in the afternoon. Flame length went from 2-8 feet, and some 1000 hour fuels were smoldering but not consuming. The attack had success from early ignition/burnout by the FS.

More generally, KBDI is around 570, and it was been 17 days since .10 in. of rain and 22 days since .25 in.

Steven Parrish, Apalachicola National Forest, Zone FMO

Swamps are dry enough to burn on top but too wet to operate equipment in. This was the largest driver in the 344 D Fire last week, as a big swamp was included in the zone, causing us to have to widen the burnout to get lines around it.

John Fish, Florida Forest Service, Fire Chief

In Florida, our biggest area of concern is the panhandle, especially in the 10 counties heavily impacted by Hurricane Michael last year. A drought is developing and getting worse there, particularly on the borders of Alabama and Georgia. We are sending an engine strike team and Regional Task Force to increase response capabilities in the area.

Randy Giachelli, Mississippi Forestry Commission, Fire Chief

We are in the early stages of fall fire season. There is no pattern right now with the fires, as they are burning all across the state. Fire activity is increasing with some short crown runs being reported and 1000-hour fuels completely consuming. The extended forecast shows 90 degrees and sunshine. However, fires have been kept manageable for now because the RHs have been in the high 30s to low 40s. We have increased our on call schedule to accommodate federal partners and are having weekly conference calls with federal partners. Three counties currently sit under a burn ban and more will be added. The worst will occur if any kind of wind events or the RHs dip way down, as they did in 2016. That said, we will stage our resources at work centers beginning this weekend.

Donald Smith, Louisiana Department of Agriculture and Forestry, Forest Protection Chief

We're dry here with fire numbers and acreage picking up and setting us up for a dry fall. Our largest area of concern at this time is NW LA.

Josh Graham, Ouachita and Ozark-St. Francis National Forest, Fire and Aviation Staff Officer

We are at 90% in Eastern Oklahoma and Southern Arkansas and 85% in Northern Arkansas.

Brad Smith, Texas Forest Service, Wildland Fire Analyst

East of Austin is fairly dry and has high risk fuels. Moreover, there has been flash drop (above average temp and below average rain) in Texas from July through August, which is indicative of summer drying. Another piece of the puzzle is that central Texas has missed the precipitation, which should continue into October, resulting in more below average rain and above average temperatures. Frontal passages may come through, but they also may be dry and windy. Weather conditions are reminiscent of 2015, where early season rains were met with flash drop and dry summer and fall seasons. The fire potential coupled with the amount of fires to date will likely increase the need for resources in Texas. This demand may reduce the Southern Area's ability to get resources, and this could remain true through at least the end of October.

Lucas Minton, BIA-Eastern Region, Regional Fire Management Officer

Moderate drought conditions may lead to possible high fire danger levels in areas of the south. Most prediction models are showing at best a moderate fall fires season, and if ground fuel accumulation is sufficient, wind alignment may produce larger fires. Some BIA units have reported above average rainfall, which may lead to increased vegetation and available ladder fuels. In response, BIA units may be looking at fall prescribed fires to get to desires outcomes for consumption.

Fire Behavior

An analysis of potential fire behavior within the assessment area was conducted to provide fire managers and firefighters insights into the intensity, rates of spread and flame lengths of fires burning under current and expected fire environment conditions. These insights can be used to help inform staffing and fire response capability needs based on resistance to containment and line production capacity requirements. Fire behavior scenarios for 3 common fuel complexes throughout the assessment area (forested with shrub understory, forested with grass/shrub understory, forested with litter understory) were evaluated under various fuel moisture, wind speed and slope conditions using BEHAVE 5.0.5. Five fire behavior fuel models were utilized to represent typical fuel beds found in the common fuel complexes.

- Low Load, Humid Climate Timber-Shrub (SH4)
- High Load, Humid Climate Shrub (SH8)
- Moderate Load Broadleaf Litter (TL6)
- Very High Load Broadleaf Litter (TL9)
- Moderate Load, Humid Climate Timber-Grass-Shrub (Dynamic) (TU3)
- * High Load Blowdown (SB4): *This fuel model was also evaluated to represent hurricane and tornado impacted areas within the assessment area.*

Slope classes of 0, 35 & 70 percent were utilized for each fuel model run in order to represent the effects of slope on fire spread and intensity. These slope classes were identified based on common line construction modes (dozers and crews) and associated operability rating limits.

Considerably low fuel moisture percentages were the applied to each fuel model run based upon currently observed and expected fuel curing conditions. Due to the assumptions of the model variations of representative fuel dryness were utilized to represent availability and reactivity of the fuel models to wind and slope. An estimated 1 hour fire size and spread distance for new starts with no suppression response was also assessed for each fire behavior scenario.

RESULTS

The analysis results indicate that Fire Intensity Levels, Rates of Spread and Flame Lengths for each representative model have the potential to exceed direct fire suppression tactics and would be conducive to large fire growth. The tables below identify a range of fire behavior characteristics that can be expected under the moisture, wind speed, and slope scenarios analyzed. Under these analysis the majority of the fuel bed can be expected to be available for combustion including 1,000hour fuels and organic soils (duff). Live woody shrub component will contribute significantly to fire intensity and spotting potential.

Shrub Fuels

Shrub Fuel Model 8 (SH8) - High Load Humid Climate Shrub

The primary carrier of fire in the SH fuel models is live and dead shrub twigs and foliage in combination with dead and down shrub litter. Southern Region examples include: Mountain Laurel/rhododendron stands, Pocosins, palmetto, titi, gallberry, yopon, bays, 5-10 year old plantations, oak scrub).

Fire Behavior Fuel Moisture Analysis Inputs

1 Hour FDFM: 4%
10 Hour FDFM: 6%
100 Hour FDFM: 8%
Live Woody Fuel Moisture: 65%

	Slope 0%		Slope 35%		Slope 70%	
Windspeeds (20') (Adjustment Factor of .3)	**Low** (10mph)	**High** (30mph)	**Low** (10mph)	**High** (30mph)	**Low** (10mph)	**High** (30mph)
Flame Length (ft.)	9	17	11	18	14	20
Rate of Spread (ch/hr)	17	63	23	68	40	85
Fireline Intensity (Btu/ft/s)	732	2683	973	2924	1694	3646
1 Hour Fire Growth Potential (size: acres/perimeter: chains)	16ac / 47ch	99ac / 141ch	24 ac / 59ch	112 ac / 153ch	52ac / 95ch	151ac / 186ch

Table 1. Fire Behavior Characteristics for the SH8 Fuel Model

Implications to Mangers

If live woody moisture percentages are less than 100% and wind speeds are greater than 10 mph direct attack by dozer, tractor plows, or water delivery systems may not be effective or possible due to fire intensities. Direct attack by hand crews is not recommended under any of the modeled live fuel moistures, slopes or windspeeds.
Consideration of organic soils & duff layers contributing to fire intensity and long term duration should be expected if duff moisture percentages fall below 100%. Long duration smoldering, complete consumption of 1000 hour fuels and stump holes holding heat for long durations can be expected.
Reburn potential high in areas of heavy scorch.

Shrub Fuel Model 4 (SH4) - Low Load Humid Climate Timber-Shrub

Primary carrier of fire is light to moderate loading (3-5 year rough) mixed scrub/shrub, herbaceous and leaf litter/pine needle cast. Young pine plantations, shelterwood hardwood regeneration areas, flatwoods.

Fire Behavior Fuel Moisture Analysis Inputs
Live Fuel Moisture 65%
1 Hour: 4%
10 Hour: 6% 100 Hour: 8%

	Slope 0%		Slope 35%		Slope 70%	
Windspeeds (20') (Adjustment Factor of .4)	**Low** (10mph)	**High** (30mph)	**Low** (10mph)	**High** (30mph)	**Low** (10mph)	**High** (30mph)
Flame Length (ft.)	7	12	8	13	10	15
Rate of Spread (ch/hr)	22	96	30	104	53	127
Fireline Intensity (Btu/ft/s)	339	1460	457	1578	811	1932
1 Hour Fire Growth Potential (size: acres/perimeter: chains)	27ac / 62ch	236ac / 217ch	42 ac / 79ch	263 ac / 233ch	52ac / 129ch	151ac / 281ch

Table 2. Fire Behavior Characteristics for the SH4 Fuel Model – LFM 65%, Wind Adjustment Factor .4

Implications to Mangers -

In areas with live woody moisture percentages are less than 100%, direct attack by dozer, tractor plows or water delivery systems will be limited to fires with mid-flame wind speeds less than 30mph. As live fuel moisture drops to 65%, direct attack is only possible with dozer and tractor plow on flat ground with wind speeds less than 10mph. Fire spread will be more rapid but with less intensity than heavy load shrub.

Timber-Understory Fuels

Timber Understory Model 3 (TU3) Medium Load Humid Climate Timber-Shrub

The primary carrier of fire in the TU fuel models is forest litter in combination with herbaceous or shrub fuels. Wind speed and slope significantly affect rates of spread in this fuel type. The effect of live herbaceous moisture content on spread rate and intensity is strong and depends on the relative amount of grass and shrub load in the fuel model. Southern area comparative forest types: Open canopy (closure 35-50%) longleaf/shortleaf pine, 1-3 year rough flatwoods, and shelterwood cut hardwood stands 3-6 years.

Fire Behavior Fuel Moisture Analysis Inputs

- 1hr 4%
- 10hr 6%
- 100hr 8%
- Live Herbaceous Moisture 40%
- Live Woody Moisture 65%

	Slope 0%		Slope 35%		Slope 70%	
Windspeeds (20') (Adjustment Factor of .4)	**Low** (10mph)	**High** (30mph)	**Low** (10mph)	**High** (30mph)	**Low** (10mph)	**High** (30mph)
Flame Length (ft.)	8	15	9	16	11	17
Rate of Spread (ch/hr)	29	123	36	129	57	150
Fireline Intensity (Btu/ft/s)	519	2195	646	2321	1025	2700
1 Hour Fire Growth Potential (acres)	38	304	52	329	102	407

Table 3. Fire Behavior Characteristics for the TU3 Fuel Model

Implications to Mangers

Direct initial attack with hand crews, dozers and engines should be effective in these fuels under drought conditions (1hr: 3, 10hr: 5, 100hr: 6) with wind speeds less than 30 mph with no slope. Initial attack with equipment may be possible if fine dead fuel moistures are higher (1hr 6, 10hr 7, 100hr 8) and wind speed is at or below 10 mph.
As the drought conditions deepen and fall leaf drop occurs careful consideration of line construction locations and holding capability of the available resources should be observed due to increased spotting potential of fine non compacted fuel load. Organic duff soil can be expected to be available for ignition and sustained smoldering fire at moisture percentages less than 100%.

Timber Litter Fuels

Timber Litter Model 6 (TL6) Moderate Load Broadleaf Litter

Primary carrier of fire is moderate hardwood litter and dead/down woody fuel loading. Recently fallen hardwood leaf litter typically forms a fluffy bed of continuous fine fuels that dries rapidly and can be dispersed by moderate surface winds often contributing to fire spotting in front of the main fire and creating control problems on prepared fire breaks.

Fire Behavior Fuel Moisture Analysis Inputs

1 hour: 3%
10 hour: 5%
100 hour: 8%

	Slope 0%		Slope 35%		Slope 70%	
Windspeeds (20') (Adjustment Factor of .4)	**Low** (10mph)	**High** (30mph)	**Low** (10mph)	**High** (30mph)	**Low** (10mph)	**High** (30mph)
Flame Length (ft.)	2.5	4.9	2.9	5.1	3.8	5.6
Rate of Spread (ch/hr)	4.2	18.4	5.8	20	10.7	24.9
Fireline Intensity (Btu/ft/s)	41	179	57	195	104	242
1 Hour Fire Growth Potential size: (acres)/ perimeter(chains)	1ac/12ch	9ac/41ch	1.5ac/15ch	11ac/45ch	4ac/26ch	13ac/55ch

Table 4. Fire Behavior Characteristics for the TL6 Fuel Model – 1 hr FDFM 3%

Implications to Mangers

Overall, direct attack by hand crews and dozers should be effective in conditions of wind speeds less than 30 mph. Due to increasing drought conditions organic duff layers of the forest floor may be susceptible to ignition and longer duration smoldering fire, typical leaf blower line construction may not be as effective in creating fire lines or may only be effective for short durations (<1-2 hours).

Timber Litter Model 9 (TL9) High Load Broadleaf Litter

The primary carrier of fire in TL9 is very high load, fluffy broadleaf litter. TL9 can also be used to represent heavy needle-drape.

Fire Behavior Fuel Moisture Analysis Inputs

1 Hour: 3%
10 Hour: 5%,
100 Hour: 8%

	Slope 0%		Slope 35%		Slope 70%	
Windspeeds (20') (Adjustment Factor of .4)	**Low** (10mph)	**High** (30mph)	**Low** (10mph)	**High** (30mph)	**Low** (10mph)	**High** (30mph)
Flame Length (ft.)	4.5	8.4*	5.2	8.8*	6.9	9.8*
Rate of Spread (ch/hr)	6.5	25.7	9	28.2	16.6	35.8
Fireline Intensity (Btu/ft/s)	147	579	203	636	373	805
1 Hour Fire Growth Potential size: (acres)/ perimeter(chains)	2ac/18ch	17ac/58ch	4ac/24ch	19ac/63ch	9ac/39ch	27ac/78ch

Table 5. Fire Behavior Characteristics for the TL9 Fuel Model

Implications to Mangers

Direct attack by dozers should be effective in conditions of wind speeds less than 30 mph with a 1hr FDFM > than 7%. At very low 1 hour FDFM (3%) direct attack may be possible with winds less than 30%. Due to increasing drought conditions organic duff layers of the forest floor will be susceptible to ignition and longer duration smoldering fire, typical leaf blower line construction may not be as effective in creating fire lines or may only be effective for short durations (<1-2 hours).

Slash-Blowdown Fuel Type Models (SB)
Hurricane and/or Tornado Impacted Areas

Slash Blowdown Model (SB4) - High Load Blowdown

The primary carrier of fire in SB4 is heavy dead and down blowdown. Extremely High fire intensities and high resistance to containment can be expected in this fuel type.

Fire Behavior Fuel Moisture Analysis Inputs

1 Hour Fuel Moisture 4%
10 Hour Fuel Moisture 6%
100 Hour Fuel Moisture 8%
Wind Adjustment .5

Slope 0%

	Low (10mph)	High (30mph)
Flame Length (ft)	12	26
Rate of Spread (ch/hr)	53	268
Fireline Intensity (Btu/ft/s)	1398	6799

Table 6. Fire Behavior Characteristics for the SB4 Fuel Model

Implications to Mangers

Flame lengths will exceed direct attack capabilities of hand crews, dozers, engines and tractor plows in these blowdown areas. Focal areas for these fuel conditions are: Florida pan handle and southwest Georgia in the path of Hurricane Michael from 2018, tornado disturbed stands from Texas to North Carolina, flood plain and drainages impacted from severe flooding events in TX, MS, AR, LA, SC, NC.

Fire Occurrence

Fire potential has been elevated for the Southern Area as drought period continues across several states Majority parts of Southern Area are experiencing increasing drought conditions. Fire occurrence over the last ten years shows Alabama, Georgia, North Carolina, and Texas had the highest occurrence, similar to 2016 fall fires and acres (Figure 37). The month of October shows size class B fires occurred the most during the 10 year span. It is difficult to make predictions of fire occurrence for this fall fire season; however, fire managers should be aware of the possibility of multiple starts in one day given the current fire and fuels conditions. Figures 36 and 38 show the ten year average fire occurrence in Southern Area, but this does not tell the true story of fire occurrence during the fall fire season.

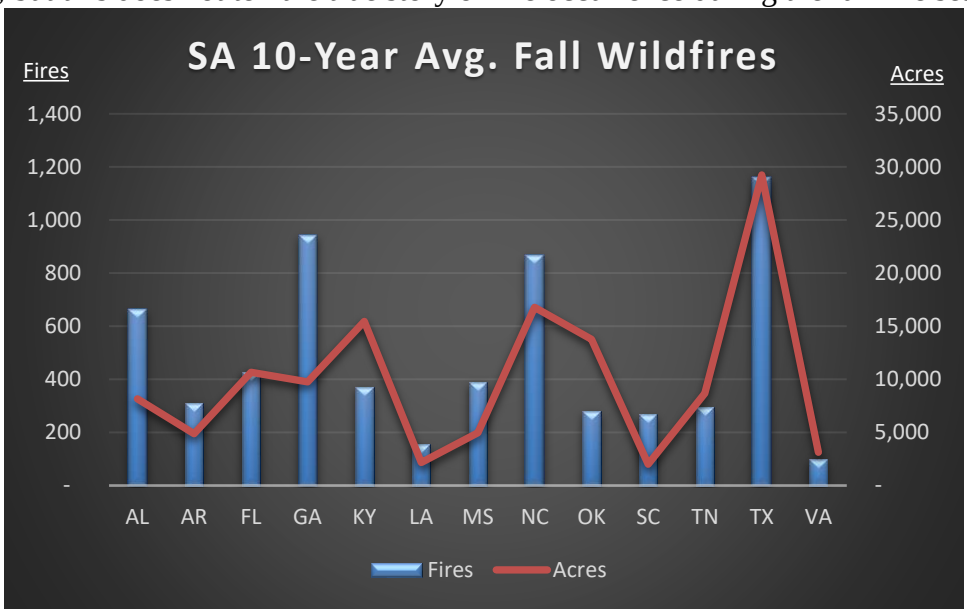


Figure 36. Average fire load during the fall fire season from 2009-2018 as reported each to Interagency Coordination Center in Southern Area.

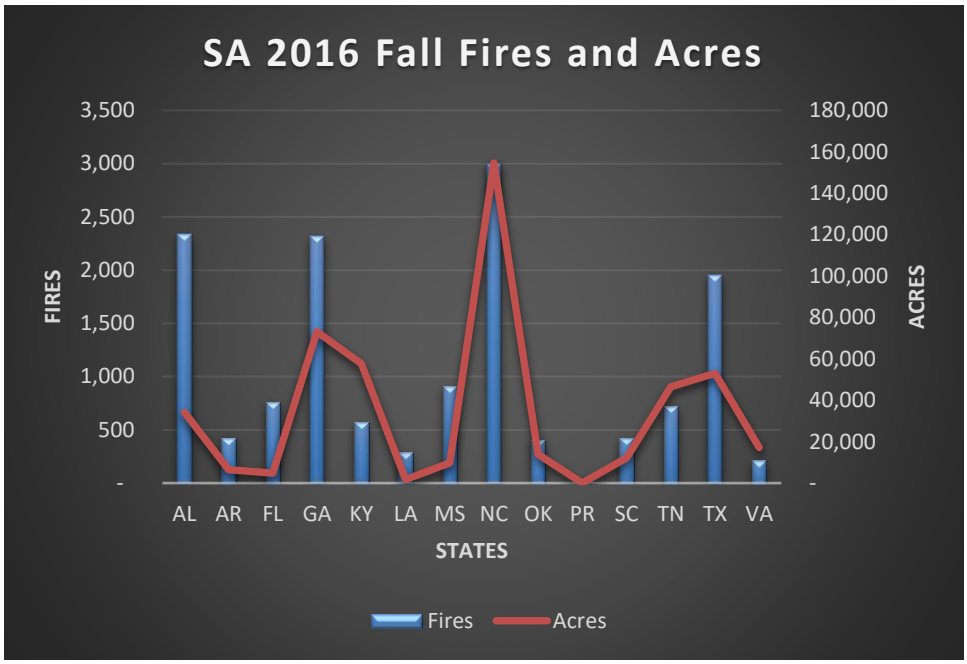


Figure 37. Total fires and acres Fall fire season of 2016 as reported to each Interagency Coordination Center in Southern Area.

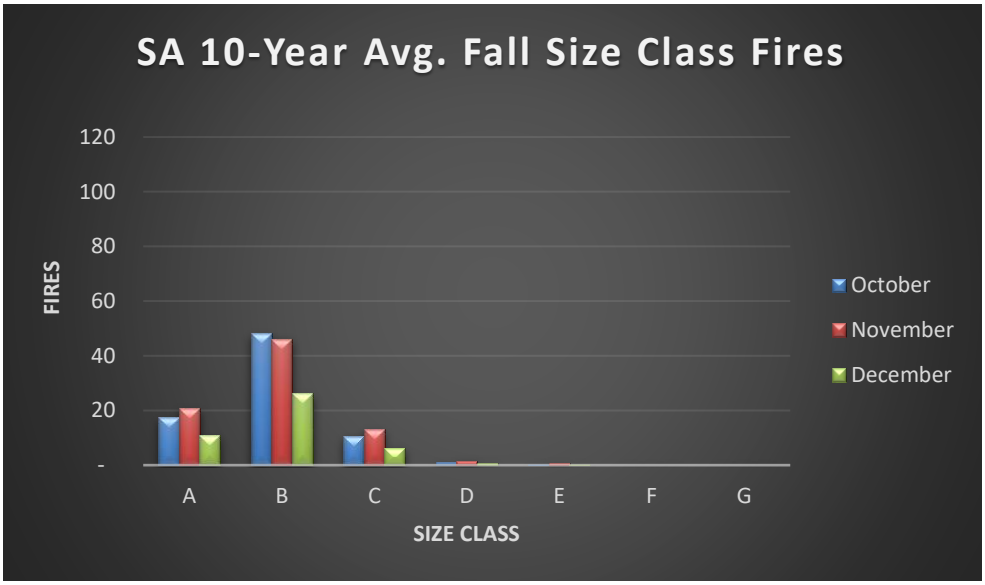


Figure 38. Average size class during Fall fire season from 2009-2018 as reported to each Interagency Coordination Center in Southern Area.

Fire Size Class		
A - .00-.25 Acres	D - 100-299.99 Acres	G - >5000 Acres
B - .26-9.99 Acres	E - 300-999.99 Acres	
C - 10-99.99 Acres	F - 1000-4999.99 Acres	

Table 7. Fire Size and Statistical Cause Class Descriptions

Season Ending Event

WHEN WILL THE FALL FIRE SEASON END?

With the drought deepening across much of the region, fuel conditions becoming critical, and weather patterns showing no sign of relief, the question remains about when is the probable end of the season? There does not seem to be a significant weather pattern shift that would lead to an increase in precipitation events in the near-term future, as NFDRS components were analyzed in combination with historical weather data. This analysis provided a statistical fit to show a probabilistic end to the fall fire season.

Central/Southern Mississippi

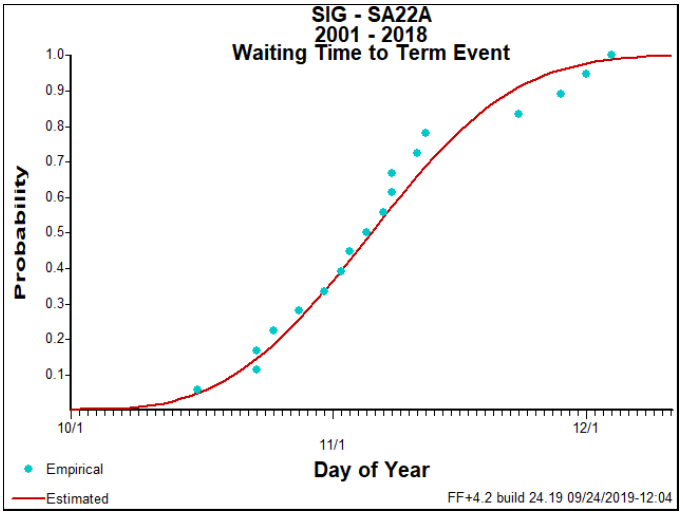


Figure 39. FireFamily Plus Term Analysis for central/southern Mississippi.

Using a combination of ERC <70th percentile and max daily temperatures of <70º over at least a 3-day period, we see the probabilistic chance of the season ending:

Probability	Date
.25	October 28
.50	November 6
.75	November 15
.90	November 23
.99	December 06

Table 8. Term Analysis Results for central/southern Mississippi for End Date of Fall Fire Season

West Tennessee

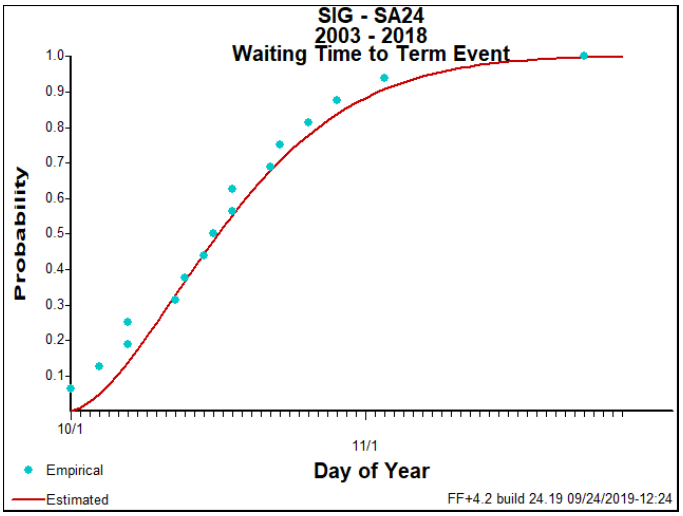


Figure 40. FireFamily Plus Term Analysis for west Tennessee

Using a combination of ERC <70th percentile and max daily temperatures of <70º over at least a 3-day period, we see the probabilistic chance of the season ending:

Probability	Date
.25	October 11
.50	October 17
.75	October 25
.90	November 3
.99	November 20

Table 9. Term Analysis Results for west Tennessee for End Date of Fall Fire Season

Kentucky Mountains

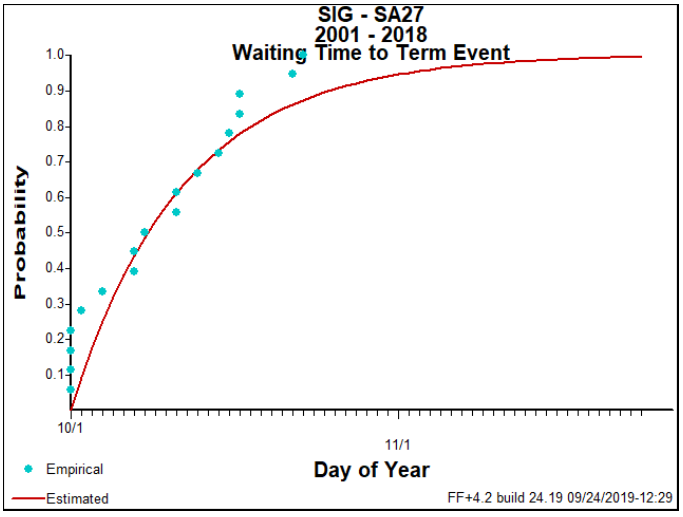


Figure 41. FireFamily Plus Term Analysis for Kentucky mountains

Using a combination of ERC <70th percentile and max daily temperatures of <70º over at least a 3-day period, we see the probabilistic chance of the season ending:

Probability	Date
.25	October 5
.50	October 9
.75	October 16
.90	October 26
.99	November 20

Table 10. Term Analysis Results for Kentucky mountains for End Date of Fall Fire Season

South Carolina Coastal Plain

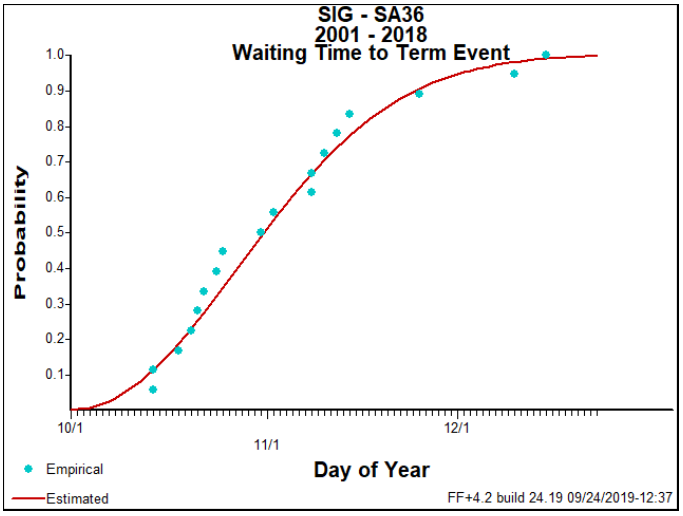


Figure 42. FireFamily Plus Term Analysis for SC coastal plain.

Using a combination of ERC <70th percentile and max daily temperatures of <70º over at least a 3-day period, we see the probabilistic chance of the season ending:

Probability	Date
.25	October 21
.50	November 1
.75	November 13
.90	November 25
.99	December 17

Table 11. Term analysis results for SC coastal plain for End Date of Fall Fire Season

South Florida

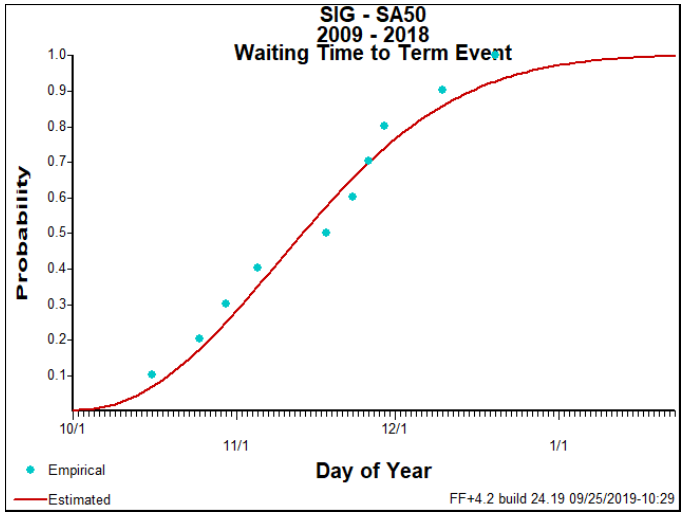


Figure 43. FireFamily Plus Term Analysis for the South Florida

Using a combination of ERC <70th percentile and max daily temperatures of <80º over at least a 3-day period, we see the probabilistic chance of the season ending:

Probability	Date
.25	October30
.50	November 12
.75	November 27
.90	December 12
.99	January 6

Table 12. Term analysis results for the South Florida for End Date of Fall Fire Season

Central Virginia

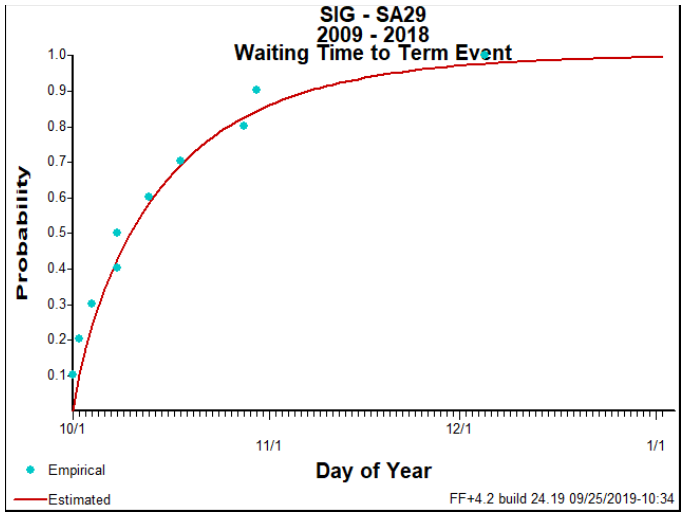


Figure 43. FireFamily Plus Term Analysis for Central Virginia

Using a combination of ERC <70th percentile and max daily temperatures of <70º over at least a 3-day period, we see the probabilistic chance of the season ending:

Probability	Date
.25	October 5
.50	October 11
.75	October 22
.90	November 8
.99	December 26

Table 13. Term analysis results for Central Virginia for End Date of Fall Fire Season

Texas Central SW

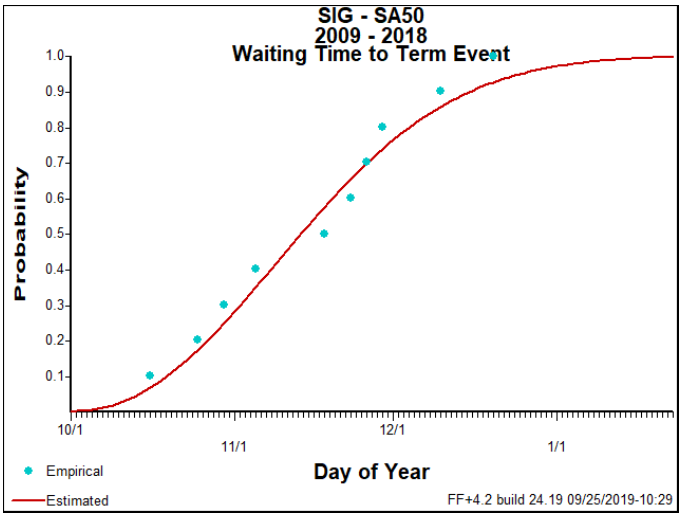


Figure 44. FireFamily Plus Term Analysis for the Texas Central SW

Using a combination of ERC <70th percentile and max daily temperatures of <70º over at least a 3-day period, we see the probabilistic chance of the season ending:

Probability	Date
.25	October 14
.50	October 27
.75	November 14
.90	December 5
.99	January 19

Table 14. Term analysis results for Texas Central SW for End Date of Fall Fire Season

Central Georgia

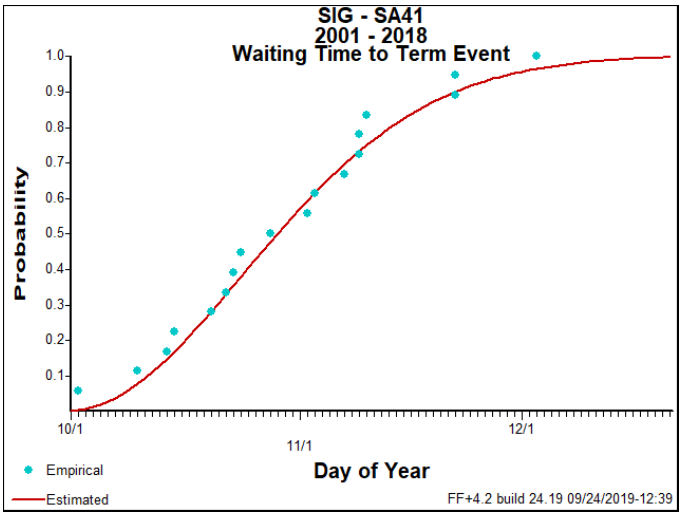


Figure 45. FireFamily Plus Term Analysis for central Georgia.

Using a combination of ERC <70th percentile and max daily temperatures of <70º over at least a 3-day period, we see the probabilistic chance of the season ending:

Probability	Date
.25	October 19
.50	October 30
.75	November 11
.90	November 23
.99	December 15

Table 15. Term analysis results for Georgia Piedmont for End Date of Fall Fire Season

Florida Panhandle

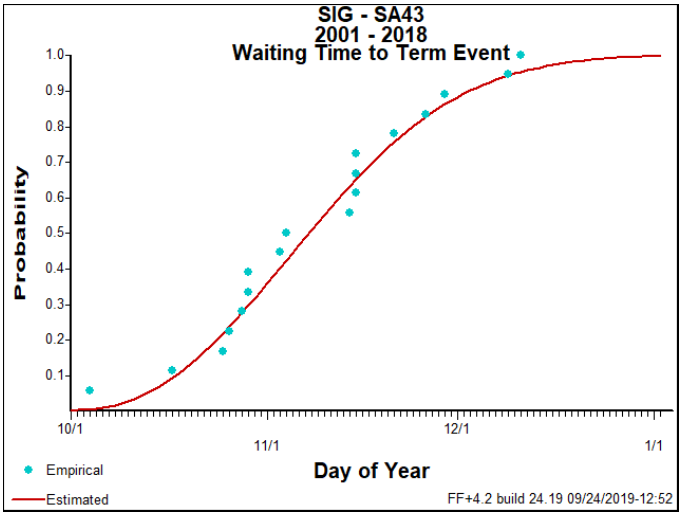


Figure 46. FireFamily Plus Term Analysis for the Florida Panhandle

Using a combination of ERC <70th percentile and max daily temperatures of <70º over at least a 3-day period, we see the probabilistic chance of the season ending:

Probability	Date
.25	October 27
.50	November 8
.75	November 21
.90	December 4
.99	December 26

Table 16. Term analysis results for the Florida Panhandle for End Date of Fall Fire Season

Summary

- Seasonal severity and conditions have started earlier than normal. Hardwood ecosystems within drought stricken areas are experiencing moisture content levels at very low levels, exceeding those levels observed in 2016.
- Heavy fuels are already adding to fire intensity. Fires are already taking longer to mop-up and requiring additional time commitment. Modification in strategy and tactics is already occurring.
- Actual fire occurrence, in terms of number of fire ignitions, is average for the time of year. However, current wildfires are demonstrating greater control problems than normal. Multiple Type III fires are currently occurring in the analysis area.
- Leaf drop, coupled with drought stricken fuels, and dry cold front passage could create an extremely volatile situation in the southern Appalachian Mountains in a few more weeks. Good, strong wetting and frequent rains need to occur after leaf drop to mitigate this scenario.
    - If frequent wetting rain events do not occur in association with leaf drop:
        - Fires will exhibit strong resistance to control. Fuels would be consumed through the organics and into mineral soil or rock. Fire intensities will be higher, with frequent torching and increased spotting which will likely preclude direct attack tactics.
        - Multiple Type I, II, and III fires would simultaneously occur.
        - Extreme rates of spread through light and fluffy leaf litter would quickly impact initial attack resource capabilities and require augmentation.
- Fire managers should continue to stay vigilant on fuel conditions coupled with daily fire weather forecasts.
- An increased frequency of rain events coupled with more normal humidity levels will mitigate the fuel dryness.
- Daily low RH values in the drier areas will result in continued high fire danger even with some precipitation unless rainfall returns to normal or above normal levels
- The frequency of precipitation events is critical to staying out of an extended fire season. These events need to take place on a five to seven day cycle.
- The short-term and long-term forecasts indicate a continuation of a relatively moist pattern for areas west of the Mississippi River.

Conclusions

Most Likely Case Probability – 70%
The entire Geographic Area, specifically interior areas, stays warm and dry through November and into December. The fall fire season begins earlier and extends deeper into fall than normal due to the persisting and building drought and the predicted weather pattern. A normal amount of initial attack activity is experienced for this time of the year; however, new ignitions would observe elevated fire behavior and spread potential due to prolonged drought and minimal rainfall frequency (i.e., fires would get bigger faster). Additional aviation and ground resources are required due to fire behavior and resulting resistance to control. Several Type III incidents occur simultaneously in the geographic area, with a higher probability of both Type II and Type I IMT deployments. It is expected that fire personnel movement would occur across state lines and from out of the Geographic Area. The only mitigating weather factor could be moderated relative humidity values and wind, due to a probability of frontal passages being held north of our northern boundary.

Best Case Probability – 15%
Normal rainfall pattern develops. This brings frequent rainfall events and enough moisture to mitigate rainfall deficits and compact leaves after leaf drop. The normal fall time wildfire occurrence develops and very light to no initial attack is experienced. Larger diameter fuels observe raised moistures that substantially limit their availability to contribute to fire spread and intensity. Leaf drop coincides with precipitation and results in compacted and moist understory conditions unconducive to rapid fire spread.

Worst case Probability – 15%
Rainfall frequency and amounts are little and strong dry cold fronts bring significant fire weather after leaf drop. Escalating drought condition, coupled with extreme fire weather events, results in numerous large fire incidents and heavy initial attack workload across the entire Geographic Area. These areas experience a well above average fall fire season, including numerous extended attack (Type I and II) fires. Large scale mobilization of out of region resources occurs. A transition to La Nina is experienced and overall drought and associated fire danger conditions escalate over the next year.

Recommendations

- Fire managers must consider potential extreme fire behavior, which can be expected with the current drought conditions under moderate fire weather conditions. As fire danger indices exceed the 97th percentile, extreme fire behavior and rapid fire spread characteristics should be expected. Tactics should be altered to provide for firefighter and public safety. Appropriate management response may be point protection rather than direct attack.
- Do not expect any fire to be routine. Be prepared to utilize indirect tactics with extended mop-up. Utilize aerial supervision to help direct crews and keep them informed on fire behavior. Ensure that LCES is in place before engaging on any fire. Remember to STOP, THINK, and TALK before you ACT… and actively look for ways to minimize risk to firefighters in what is forecast to be a period of very high fire danger.
- Maintain capabilities to mobilize Type I, II, and III teams.
- Augmentation of initial attack resources will likely be required throughout the fall. This will result from increased fire behavior, fire spread, and longer mop-up times due to drought stressed fuels and soil.
- Additional resources, both ground and aviation, may be needed.
- Ensure firefighter pocket cards are up to date and posted on the national website. http://fam.nwcg.gov/fam-web/pocketcards/
- Maintain national standardized predictive services products in a timely fashion. Produce new products as requested.
- Fire behavior prediction outputs, calculated with current and expected environmental factors, show a tendency to exceed direct fire suppression tactic thresholds and be conducive to large fire growth.
    - As the drought conditions deepen and fall leaf drop occurs careful consideration of line construction locations and holding capability of the available resources should be observed due to increased spotting potential of fine non-compacted fuel load.
    - Due to increasing drought conditions organic duff layers of the forest floor may be susceptible to ignition and longer duration smoldering fire, typical leaf blower line construction may not be as effective in creating fire lines or may only be effective for short durations (<1-2 hours).
    - In any slash-blowdown fuel type, specifically but not limited to hurricane fuels, flame lengths will exceed direct attack capabilities of hand crews, dozers, engines, and tractor plows. Resources should remain cognizant when implementing strategy and tactics in these fuels.

Southern Area Fire Risk Assessment Team Members

Cabe Speary……..…..… North Carolina Forest Service

Harold Rice……...……. U.S. Forest Service

Melissa Forder……..…….National Park Service

Mike Ward……..……U.S. Forest Service

Allen Hepworth ……..…… U.S. Forest Service

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