Southern Area Wildfire Risk Assessment

Fall 2025

Southern Area Decision Support Group

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Executive Summary

The Southern Area typically experiences 2 fire seasons – one in the spring and another in the fall. Summer, while hot and periodically dry, is usually a period of green up and elevated humidity that translates into lower fire danger across the region. Late summer conditions, however, can be a strong predictor of the severity of the upcoming fall season. This wildfire risk assessment evaluates conditions and trends from the summer season and assesses the potential for activity over the fall 2025 fire season. The outlook period extends from early October through the end of December 2025. The analysis includes a look at trends from this past summer, the current weather situation, the extended forecast, fuels conditions compared to normal for the time of year, relevant National Fire Danger Rating System (NFDRS) indices and metrics such as Energy Release Component (ERC), KBDI, 100-hour fuel moisture, and woody live fuel moisture for select areas, as well as late summer fire occurrence across the GACC. Recommendations are provided based on the findings and conclusions of the analysis.

This assessment is summarized into three scenarios: best-case, worst-case and most likely - with a description of how each might unfold. Keep in mind that accurately predicting fall fire activity remains challenging this year due to several factors. Although drier than normal conditions are expected as La Niña develops, the potential for tropical moisture complicates forecasts, making it difficult to pinpoint specific fire risks. To date, tropical activity has been extremely light with little relief in the way of beneficial moisture. Tropical season is also closer to the end than to the beginning, and at the time of this writing, tropical activity or impacts do not appear imminent. One landfalling system can obviously change conditions across a large swath of the region, so uncertainty exists as to the exact impacts from tropical activity.

Another factor that could create additional uncertainty this fall is the fact that the Weather Information Management System (WIMS) has been retired, and as of October 1, the Fire Environment Mapping System (FEMS) is now the system of record for NFDRS. FEMS calculates fuel moisture differently, uses daily maximums and minimums rather than the traditional 1300-hour readings, and therefore the outputs are likely to be somewhat different than fire managers have been accustomed to seeing. Indices from FEMS might be slightly higher or lower than WIMS would have been, so fire managers may have to adjust their reference points and thresholds when considering fire danger and staffing. This may be especially true considering FEMS just recently came online, and the fire community is still learning the nuances of the outputs.

Best-Case Scenario:

In a best-case scenario for fall 2025, tropical activity or a coastal low type system would bring widespread rainfall to the region to alleviate late summer drought in areas where it is beginning to materialize. This influx of moisture would significantly reduce fire risks that have built up over the dry summer months. Significant rains would help restore soil moisture, rejuvenate

vegetation, and increase the moisture content in dry heavy fuels, making it less likely for large-scale wildfires to occur. Another potential best-case scenario would be for frequent weather fronts to cross the region, bringing consistent precipitation on a timely basis. Frequency of rain events, rather than rainfall totals, are a significant determinant of fire danger in the Southern Area specifically in the hardwood forests of the Southern Apps. Wet frontal passages are not a common event this time of year for the Southern Area, however, as October is typically one of the driest months of the entire year across the Region.

Overall risk in either of the scenarios described would be reduced but not eliminated. Concerns would still linger in areas that have a primarily fine fuel fire environment. These 1-hour fuels, such as grasslands in Texas and Oklahoma or deciduous hardwood forests in the Piedmont and Mountain areas of the region, can dry very quickly after leaf fall and support fire spread with surprisingly short periods of dry windy weather. Additionally, concerns still linger in pine forests within the region that have elevated mortality due to insect infestations and drought, particularly along the Gulf Coast states that experienced a severe drought during the fall of 2023.

Additionally, the timing of precipitation events can be important in counteracting the effects from leaf fall. Precipitation after leaf fall tends to compact the light, fluffy leaf litter and can help reduce flammability and rates of spread. Any prolonged rain event or even sustained periods of increased humidity – which did occur in November of 2024 – will help to reduce fire danger across the region.

Worst Case Scenario:

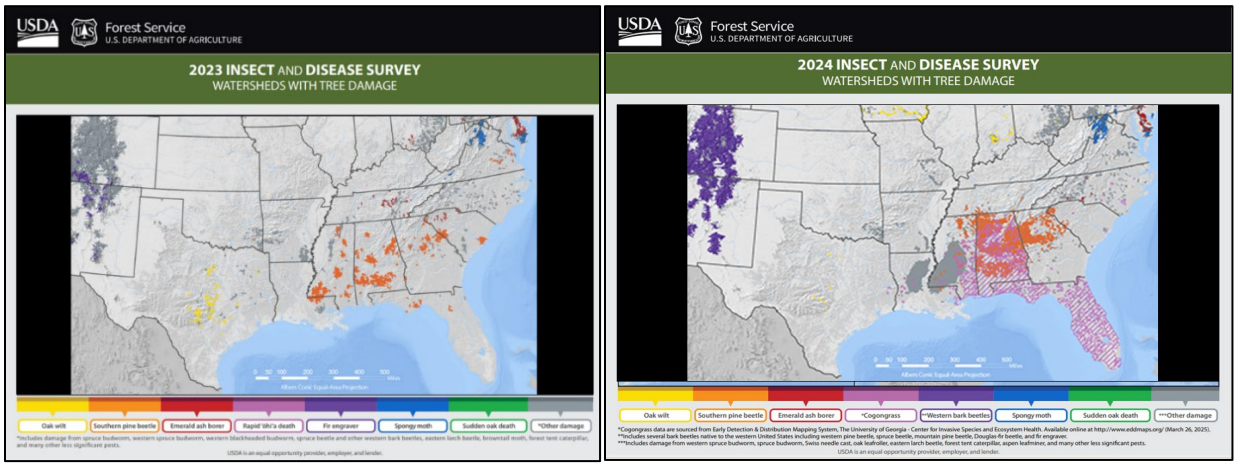
In a worst-case scenario, the lack of tropical activity would continue well into the fall. No precipitation relief would be received from the tropics and given that October is typically a drier month – absent tropical moisture or other coastal storm – it is likely that fuels would continue to dry and areas of drought would continue to expand. Since late August, rainfall across the South has been spotty and localized. 30-day departure from normal precipitation indicates expanding areas of drought across a large part of the region. More areas than not are showing rainfall deficits over the last 30 days, and many areas significantly so. Soils and fuels will enter the Fall season in a dry condition and will continue to dry further under a worst-case scenario.

These extremely dry conditions will occur simultaneously with an increase in fine fuel loading from hardwood leaf drop as grass and herbaceous fuels begin to cure with the onset of cooler temperatures. An abundance of fine fuel added to an already dry fire environment could be a recipe for an extremely busy fire season. Noteworthy fall fire seasons in recent years have occurred under similar conditions over analogous time periods.

Adding to the threat are dry cold fronts and windy conditions that are common during La Niña years. These fronts typically provide very little precipitation but do usually bring elevated winds and low relative humidity behind the front. These conditions will rapidly dry vegetation and make it easier for fires to start and spread quickly. This dynamic could create a broad zone of

heightened wildfire risk, currently forecast to extend from Texas and Oklahoma eastward into the Appalachians. The combination of drought-stressed fuels and weather patterns favorable to fire spread could pose a severe threat across the region.

Another concern that remains is the legacy of pine beetle infestations across parts of the Gulf States. These infestations have left behind large amounts of standing dead timber, which serve as potent fuel sources for fires. Line production rates and overall suppression difficulty increases considerably in areas with large amounts of available and standing dead fuel, and spotting from copious dead snags is a major concern.



U.S. Forest Service Forest Health Protection insect and disease survey maps for 2023 and 2024 showing widespread southern pine beetle impacts across the Gulf Coast states, emerald ash borer in the Southern Apps, and spongy moth damage in Virginia (https://www.fs.usda.gov/science-technology/data-tools-products/fhp-mapping-reporting/detection-surveys).

In the Appalachian region, Hurricane Helene damage remains across huge swaths of forested land. Incredible amounts of downed timber are continuing to cure and become available. The 1- and 10-hour fuel loadings in most cases still remain and are mixed in with the heavy dead and down, creating a fuel arrangement that would likely display extremely high resistance to control under a worst-case scenario.

Human activity can also play a role in wildfire risk. Warm, dry weather typically encourages outdoor work and recreation. Activities like camping and hunting can increase the likelihood of accidental ignitions. If La Niña continues into the fall, the combination of these factors—intensified drought, insufficient tropical moisture, windy cold fronts, beetle-kill, hurricane-downed fuels and human activity—could create a prolonged period of severe wildfire danger across much of the Southern Area.

Most Likely Scenario:

There are several factors that appear to be aligning that could produce an outcome similar to what has been described in the worst-case scenario. The further into early fall that we go without

a tropical event or even significant widespread precipitation, the more likely this scenario becomes.

To begin with, the Southern Area is entering the fall season on a dry note. Rainfall has been sparse over the last 30 to 45 days across much of the region. KBDI values are significantly elevated in many states. Energy Release and Burning Index values are not currently at levels that are overly concerning in most locations. This can be attributed to higher humidity and lower wind speeds recently. However, fuels and soil moistures are at levels that would be concerning if fire weather conditions were to develop.

The known facts are that leaf fall is beginning to occur in northern portions of the Region as well as those areas of higher topographic elevations. This will continue to occur in other areas as the fall progresses. Fine fuel loading will increase. Fuel shading will decrease, and fine fuels will be exposed to increased sunlight. What is not known is if or when a tropical system may provide significant rainfall to reduce fire danger or when and where weather fronts may provide beneficial moisture. Fine fuels react very quickly to fire weather conditions. Even without drought or during those times that ERC or KBDI levels are not high, fire spread can occur in fine fuel environments with very brief dry periods that are accompanied by winds and low relative humidity.

In those areas where precipitation deficits persist, there is a high likelihood of an above average fire season. History suggests that an alignment of late summer dryness, lack of tropical moisture, typical dry fall weather and increased fine fuel accumulation from leaf fall are the ingredients to bring about a busy fall season. There are multiple areas of the Southern Region where these conditions currently exist.

Areas of Texas and Oklahoma have experienced an unusually high amount of grass growth over this spring and summer. The expanse (acreage) as well as the height and continuity of this grass growth coupled with seasonal curing could prove to be problematic for fire control efforts. Areas of East Texas, much of Louisiana, Mississippi and Alabama have KBDI levels in the 600’s to low 700’s. Fire occurrence in these areas has been steadily increasing recently.

The Southern Appalachian states are also in a drying trend and long-range forecasts do not offer much relief. ERCs and KBDI values are currently within a normal range for this time of year in western North and South Carolina, North Georgia, east Tennessee and Virginia. With leaf fall beginning to occur and forecasts that lean towards continued dry weather, it will not take long for those 1-hour fuels to respond to dry conditions and become readily available for fire spread, regardless of ERC or KBDI levels. These are also the states that have the most significant Helene damage. Fuel from Helene is continuing to cure and become more available by the day. Any fire occurrence in these damaged areas will likely produce problematic fire behavior with a high resistance to control.

Example of blowdown and damaged forest fuels on the Blue Ridge Parkway (NPS) in spring 2025, six months after Hurricane Helene (photo credit: Kelly Cagle, USFS)

Piedmont areas of the Region including Georgia, North Carolina and South Carolina have elevated KBDI levels and are currently experiencing a rainfall deficit over the last 30 to 45 days. These areas will soon experience leaf fall and should be considered at increased risk of elevated fire danger if conditions remain dry as forecasts indicate.

Another area of heightened concern is the Gulf Coastal Plain. While most of the Atlantic Coastal Plain is currently receiving beneficial precipitation from a nor'easter moving up the Eastern Seaboard, rainfall departures of 4 to 6 inches over the last 30 days along the Gulf Coast are common. Swamps in north Florida are low on water or are in some cases completely dry and are no longer dependable to hold as containment lines. Recent fires on the National Forests in Florida have proven more difficult to contain fire spread than initially expected. Fire occurrence in coastal North and South Carolina has been on a noteworthy increase recently, with fires displaying increased resistance to containment along with occasional persistent groundfire. It remains to be seen how much recharge coastal areas of the Carolinas will receive from the current nor'easter affecting that area, but some isolated areas have already received 3-5" of rain.

When considering the current fuels situation across the Southern Area, the recent dry weather, the expectation of a continued dry weather pattern, leaf fall that is or will be occurring, and the normal seasonal curing of annual grasses, weeds and other vegetation, it appears more likely than not that the Southern Area will experience a fall fire season with above average conditions and potential. Increased fire occurrence should be expected, higher intensity fires are likely, and the resistance to containment these fires display will most likely exceed what is considered routine. It is probable that elevated conditions and potential will be in place across much of the Southern Region simultaneously, and therefore, the potential exists for multiple areas to have ongoing fire activity occurring at the same time. It is also possible these conditions could persist for much of the Fall, as the November outlook appears to be dry as well. This situation underscores the need

for continued close monitoring of weather patterns and fuel conditions, as well as preparedness for rapid response to any emerging fire threats.

Key Findings

- Early summer of 2025 was unusually wet across the Southeast and kept fire occurrence minimal through most of the summer. Fire activity has been slowly increasing as of late across the Region.
- An unusually cool August across the Piedmont of Georgia, South Carolina and North Carolina kept fire activity almost non-existent during that month. Strong drying conditions have been in place since that time, however.
- Wet weather in Texas and Oklahoma during spring has contributed to noteworthy grass growth. Grass loadings are well above normal and have been a frequent topic of conversation amongst fire managers in those states. Concern for implications to fire control efforts is high.
- Only 1 tropical system has made landfall in the US this season- Chantal in South Carolina in July. That is a significant departure from recent hurricane seasons.
- La Niña Development: Historically La Niña conditions have been accompanied by warmer and drier conditions in the southeastern states. *Barring sufficient moisture recharge from tropical systems or other coastal storms which may form in the coming weeks, the Southern Area should expect above normal fire potential this fall*. Suppression difficulty and resistance to control will be particularly elevated in areas with excessive fine fuel loading such as Texas and Oklahoma, the Gulf Coast states affected by beetle-kill, and the areas of the Southern Appalachians impacted by Hurricane Helene.
- Warm Ocean Conditions: Very warm sea surface temperatures remain in the Gulf and Atlantic that, combined with La Nina, could contribute to late-season tropical cyclone activity. One landfalling tropical storm could alleviate fire danger across a broad area for a period of time.

Management Implications and Recommendations

- Expect Extreme Fire Behavior: In areas where fire danger indices exceed the 97th percentile, anticipate rapid fire spread, higher intensity, and increased spotting both in numbers and distance. Fire intensity may prevent direct attack.
- Consider the indices that are chosen to portray fire danger. ERC and KBDI are a typical default metric in the Southern Area. Currently, KBDI and woody live fuel moisture more accurately portray underlying drought conditions than ERC, 100-hour, and 1000-hour fuel moistures. For areas that contain predominantly fine fuels, Burning Index or Spread Component may be a better gauge of fire spread potential on any single day – especially if wind is in the forecast.
- Prolonged Mop-Up in Drought Areas: Fires in drought-affected regions may smolder for extended periods, requiring more resources for mop-up and patrol. Be prepared for

possible reburns on contained fires. Adjust tactics for firefighter and public safety, using point protection where necessary.

- Monitor Days Since Rain: Rainfall immediately following leaf drop reduces wildfire risk. However, dry periods after leaf fall increase fire risk significantly. Backpack blowers are less effective when ground fuels are consuming.
- Caution in Prescribed Burns: Drought conditions can amplify fire behavior and extend the mop up and monitoring period. Prescribed burns may need additional staffing and contingency resources for safe execution.
- Prepare for Dry Cold Fronts: Expect rapid drops in humidity and strong gusty winds during fall cold fronts, which can sharply elevate fire behavior.
- Monitor Frost-Cured Vegetation: Leaf drop combined with frost curing can rapidly escalate fire conditions, especially during days with extreme temperature swings.
- Address Fatigue: Extended fire suppression efforts may lead to firefighter fatigue. Monitor fatigue closely and use out-of-region resources to relieve local personnel.
- Update Firefighter Pocket Cards: Ensure all pocket cards are current and posted online for reference.
- Use Predictive Services: Helpful products are refreshed daily on the SACC website.
- Prioritize Safety: Always STOP, THINK, TALK, and ACT to minimize risks to firefighters.

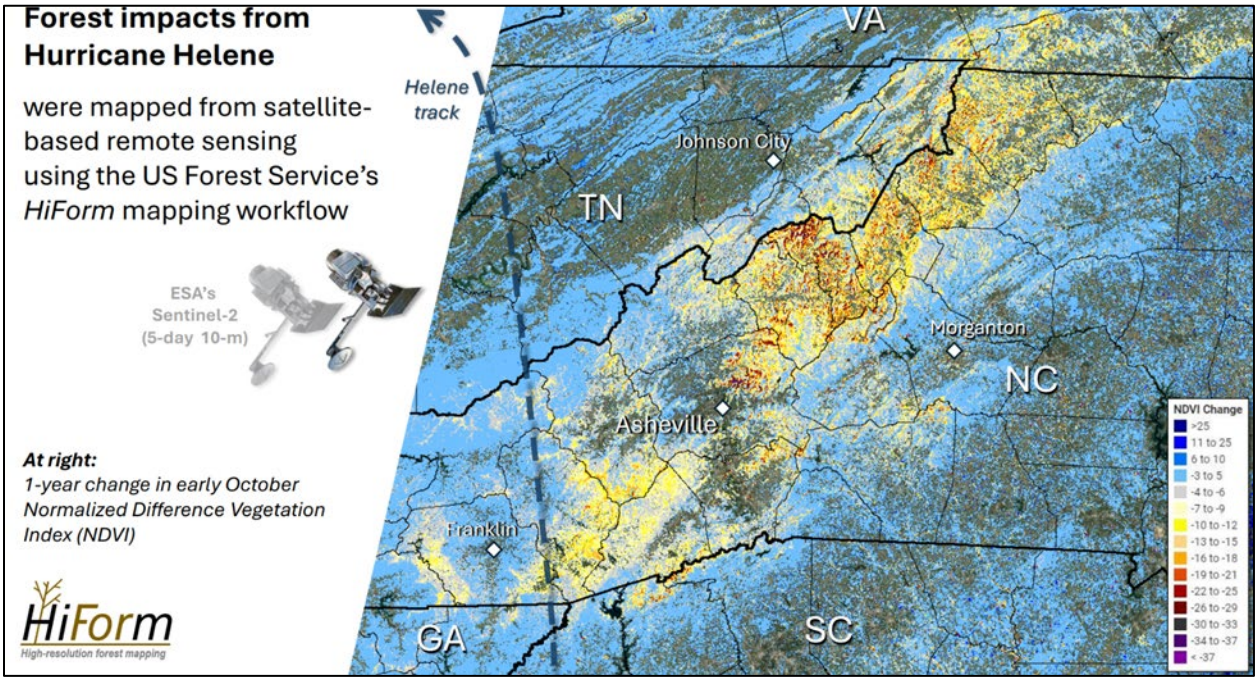
Special Considerations for Hurricane Helene-Impacted Areas

It has been slightly over a year since Hurricane Helene made landfall and blazed a path of destruction from Florida up through Georgia and South Carolina and into the Southern Apps. Over this past year, 1- hour 10-hour, and some 100-hour fuels from vegetation impacted by this disturbance have likely become fully cured, while 1000-hour fuels are beginning to cure, and in some cases, the outer bark and cambium are becoming available to burn. Structurally, the open canopy conditions over large areas of tree blowdown have exposed fuels to increased sunlight and reduced wind drag, and have released the mountain laurel and rhododendron understory. These impacted areas did not have a canopy during this growing season to shade surface fuels and moderate the drying influences of sun and wind. Although treetops now on the ground have lost most of their leaves and needles, there is still an increased risk of higher flame lengths, increased fire line intensities, and short to medium range spot fires from damaged fuels. Under moist conditions, the larger tree boles laying on the ground break up fine fuel continuity and may continue to impede fire spread until these heavy fuels become more available. There have also been multiple reports of standing eastern hemlocks with broken crowns causing spot fires over creeks and riparian areas which used to hold fire. The extreme winds from Helene caused the bark to become looser and flakier in many hemlocks facilitating fire spread into tree crowns and leading to increased spotting potential.

Firefighters should be aware of these changes to fuels, how fuels may respond under drier conditions, and the safety watchouts associated with degraded ingress/egress, snag hazards, fire behavior, and overall response. In many cases, wildfire suppression operations will need to be adjusted to consider more indirect attack strategies, use of larger heavy equipment, safety

checklists and briefings, improved personnel accountability, and extended attack due to slowed suppression efforts. Prescribed fire this coming fall in the Helene-impacted area will require burn plan revisions, careful planning, higher burn staffing, and increased consideration of contingency plans. For more in-depth treatment of Helene's impacts to fuels and fire behavior, as well as recommendations for adjusting fire management operations to mitigate safety concerns, refer to Fuels and Fire Management Considerations for Hurricane Helene Damaged Areas and Post-Hurricane Fuels and Suppression Considerations Bulletin produced by USFS Region 8 Fire and Aviation Management and hosted on the Southern Fire Exchange website: Resources for Understanding Hurricane Impacts on Prescribed Fire and Wildfire

The following map produced by Steve Norman at Southern Research Center Eastern Forest Threat Assessment Center (EFETAC) displays the Hurricane Helene impact area across the Southern Appalachians estimated from HiForm Normalized Difference Vegetation Index (NDVI) pre- and post-Helene change detection. EFETAC continues to provide updated and improved Hurricane Helene spatial change detection products as additional remote sensing imagery is acquired. Current and future updated HiForm spatial data products, including links to data in AGOL, can be found on the HiForm website: https://hiform.org/projects/2024-hurricane-helene-southern-appalachians

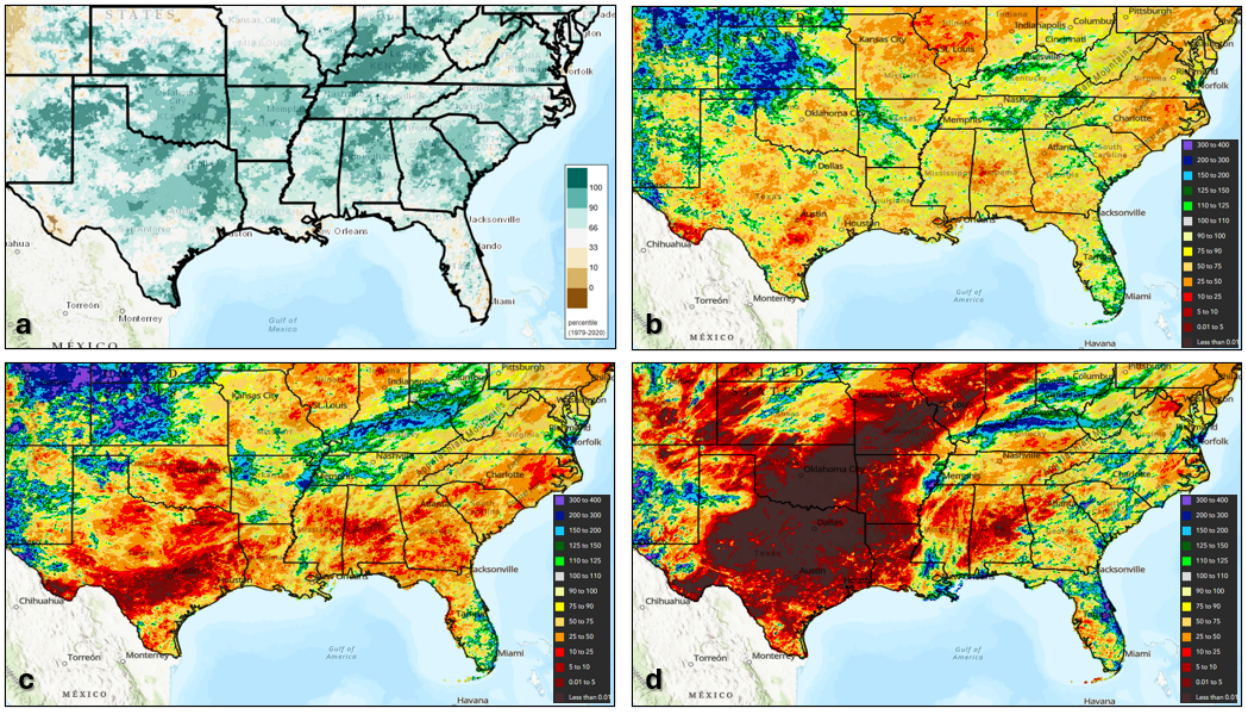


LANDFIRE released their disturbance and fuel model product updates for 2024 at the end of September 2025. These updates include spatial representation of the estimated Hurricane Helene disturbance footprint in Southern Appalachia from EFETAC's HiForm change detection product and fuel model crosswalks to represent slash and blowdown fuel models in impacted areas. These LANDFIRE products, updated for 2024, can be found on the LANDFIRE website and a description of LANDFIRE's process for producing preliminary Hurricane Helene disturbance products can be found at LANDFIRE Hurricane Helene Preliminary Disturbance Mapping.

Climate and Weather Assessment

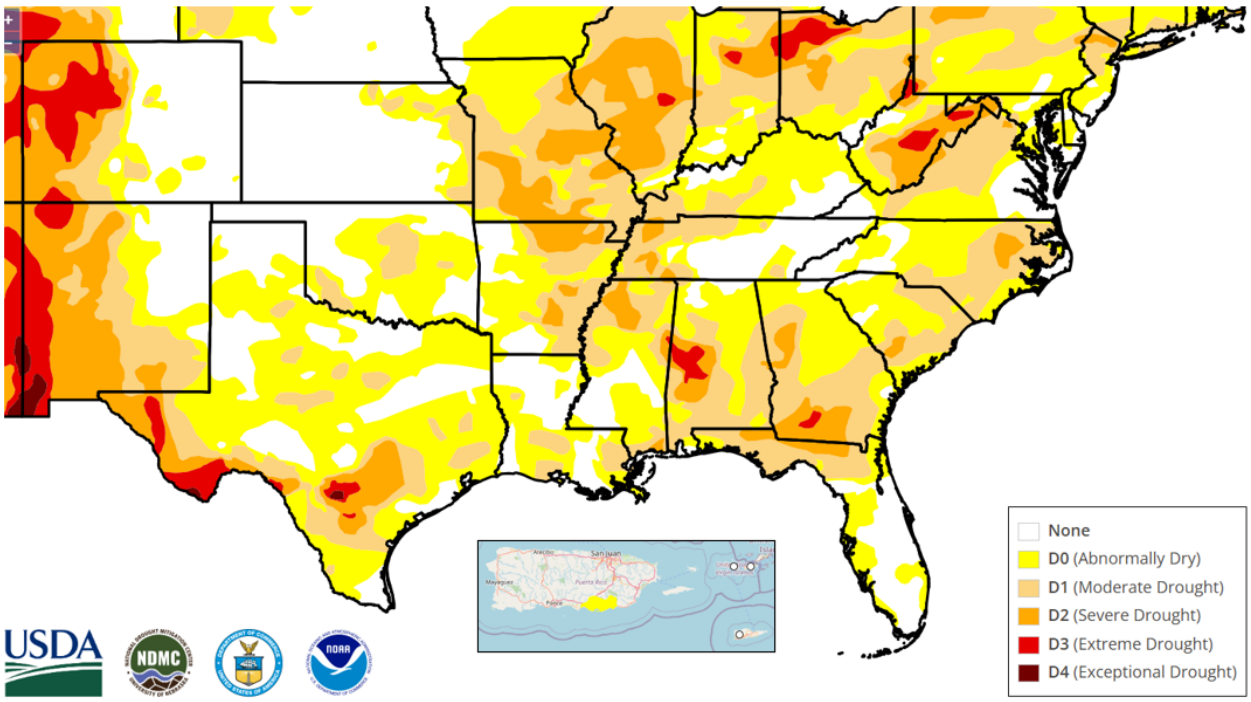
Summary

- La Niña conditions are developing and are expected to have significant impacts on dormant season fire activity across the Southern Area
- Late season tropical cyclone development is likely and could influence rainfall patterns in October and November, but confidence is low in the details
- Absent any tropical impacts, drought will develop or intensify across large portions of the Southern Area during the rest of October into November, with high confidence
- Except for the Mid-Mississippi Valley, drought is likely to persist through the 2025-2026 dormant season, impacting areas with problematic fuel loads from the Plains to the Southeast



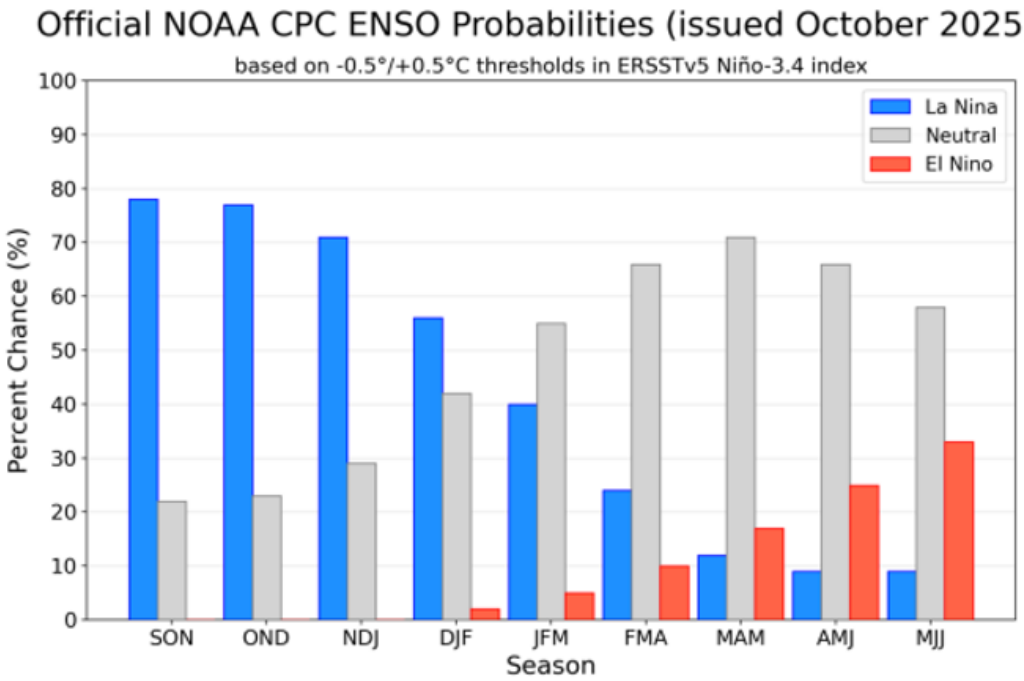
a) Rainfall percentiles from March to August 2025 (Climate Toolbox), b) 60-day percent of normal rainfall ending October 8th, c) 30-day percent of normal rainfall ending October 8th, d) 14-day percent of normal rainfall ending October 9th, 2025 (NOAA).

- The growing season in 2025 was abnormally wet throughout most of the Southern Area, increasing grass and herbaceous fuel production
- Conditions have been trending drier over the past couple of months, resulting in curing of grasses and herbaceous fuels in the driest areas, along with unusually low live fuel moisture where dryness is most severe
- As of October 9th, no wetting rain has occurred in 40+ days over portions of Texas, Oklahoma, Mississippi, Alabama, Georgia and North Carolina



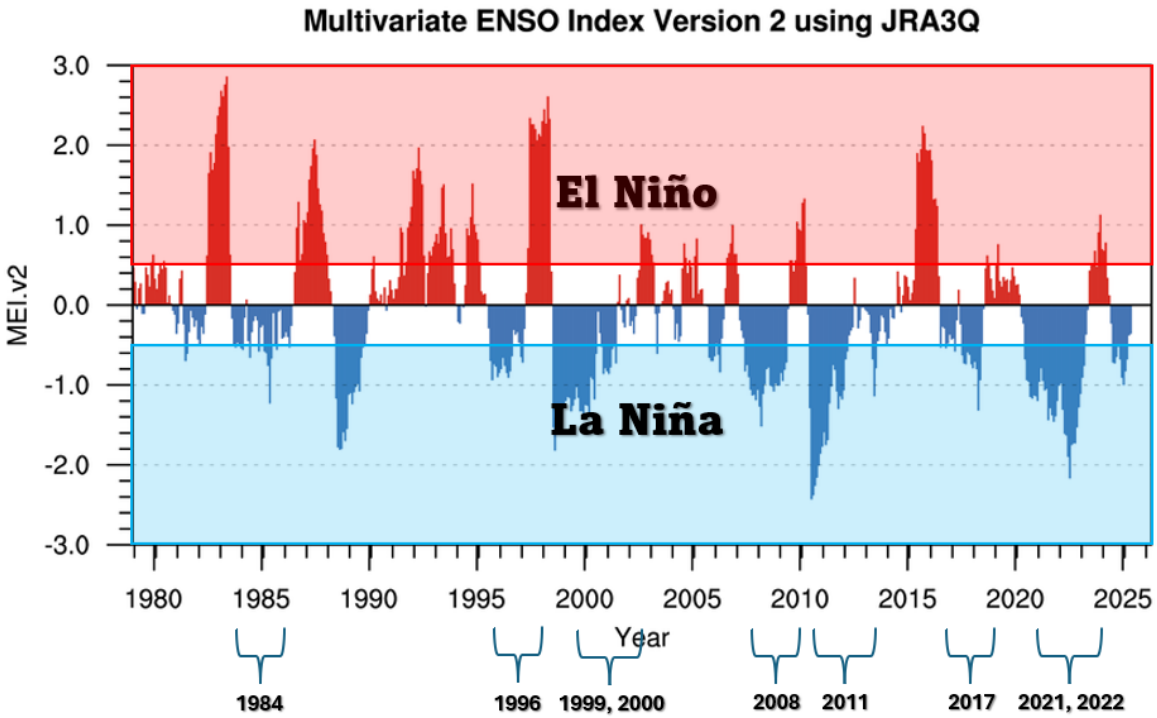
The U.S. Drought Monitor update from October 7th depicts abnormal dryness or drought in some portion of every Southern Area state. Exceptional drought continues in Texas, with extreme drought in portions of Texas, Mississippi, Alabama and Georgia. Severe drought covers parts of Texas, Arkansas, Kentucky, Tennessee, Mississippi, Alabama, Florida, Georgia, South Carolina, North Carolina and Virginia.

- There is a mosaic pattern of drought across the Southern Area as of October 7th, 2025
- Long-term exceptional drought continues in small portions of south-central and western Texas, with recent increases in severe or extreme drought in Texas, Mississippi, Alabama, Georgia, Florida, South Carolina, North Carolina and Virginia
- Drought has been intensifying in some portion of every state over the past month, with at least two-category degradation in parts of Texas, Oklahoma, Louisiana, Mississippi, Alabama, Florida, Georgia, South, Carolina, North Carolina, Tennessee and Virginia
- Conditions have improved by two categories over the past month due to heavy rain in portions of Arkansas, Tennessee and Kentucky



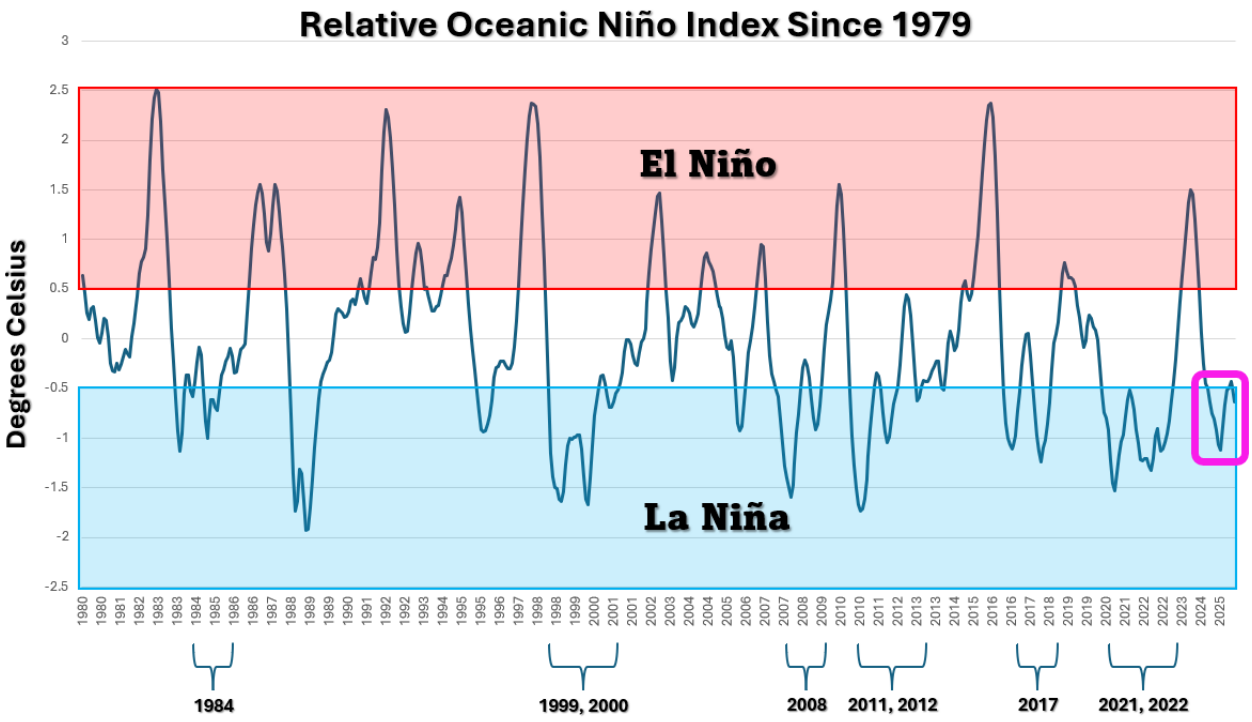
A probabilistic forecast from NOAA indicates the developing La Niña will likely persist through meteorological winter, with increasing odds of ENSO-neutral conditions during the January-to-March period in 2026.

- NOAA issued a La Niña Advisory on October 9th, 2025, indicating that La Niña conditions are now developing in the central and eastern tropical Pacific
- NOAA favors a continuation of La Niña conditions through meteorological winter, with a trend towards ENSO-neutral conditions no later than spring 2026
- Weather conditions often lag the changes in Pacific sea surface temperatures, so La Niña's impacts may continue into spring 2026



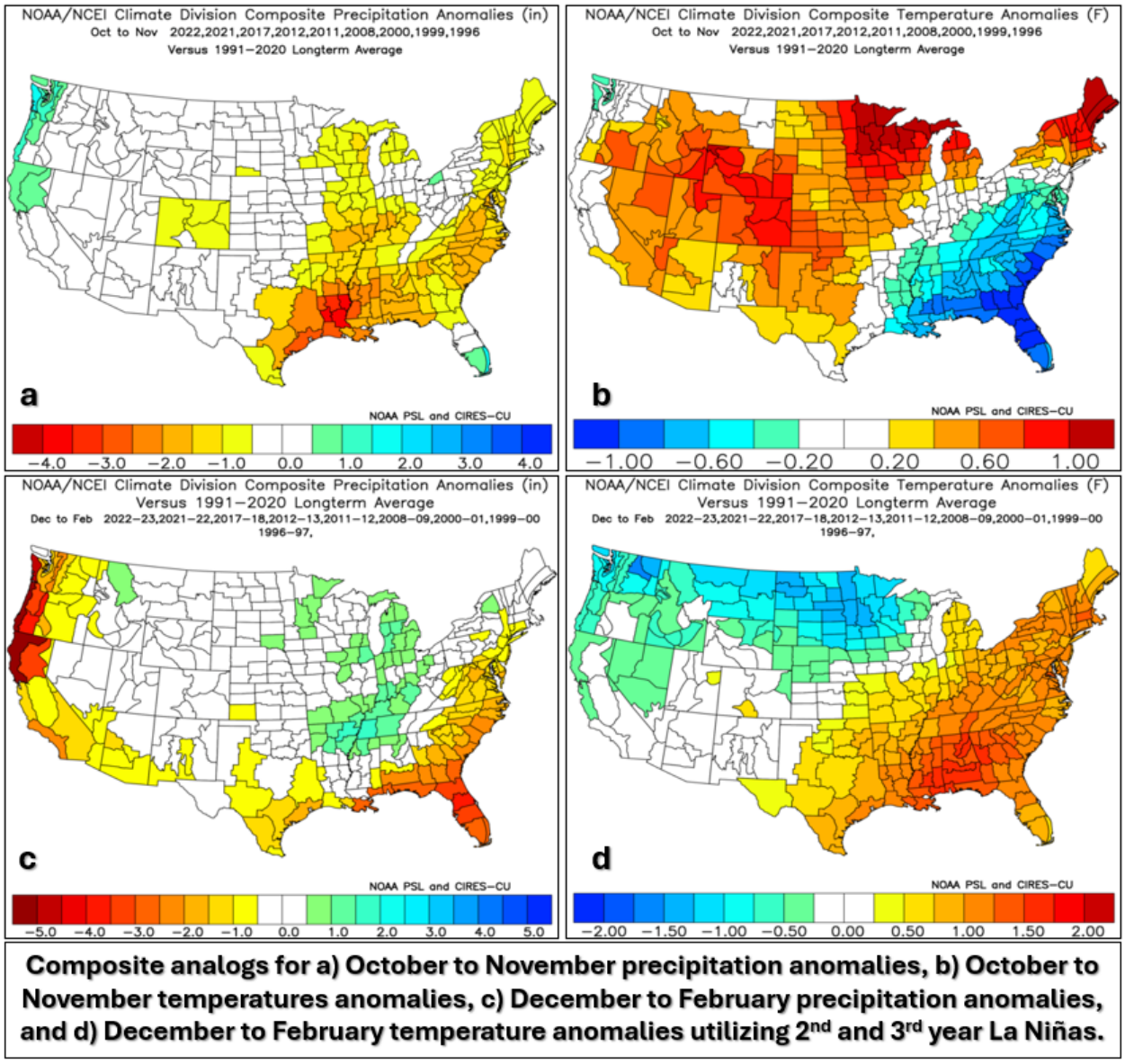
The Multivariate ENSO Index (MEIv2) bi-monthly values are plotted since 1979, with red colors denoting warm or El Niño conditions and blue colors denoting cool or La Niña conditions in the central and eastern tropical Pacific. Years at the bottom denote double- or triple-dip La Niñas. The MEIv2 is not used in NOAA's official declaration of ENSO conditions and stopped updating in mid-2025. NOAA

The multivariate ENSO index (MEIv2) goes further than NOAA's traditional Oceanic Niño Index (ONI), factoring in Pacific sea surface temperatures, in addition to sea level pressure, surface winds and outgoing longwave radiation, which accounts for cloudiness and associated rainfall patterns across the tropical Pacific. The MEIv2 trace since 1979 shows the variability in duration and magnitude of ENSO events and accounts for the atmospheric response to changes in the ocean. While the ONI did not reach La Niña criteria during the winter of 2024-2025, the MEIv2 indicated a weak to borderline moderate La Niña event. Winters beginning in 1984, 1996, 1999, 2000, 2008, 2011, 2017, 2021 and 2022 were either a double- or triple-dip La Niña, meaning those conditions developed for the second or third year in a row, respectively. As such, per the MEIv2, we are heading into a double-dip La Niña, providing one basis for analogs this fall and winter.



The Relative Oceanic Niño Index (RONI) tri-monthly values are plotted since 1979, with blue shading denoting La Niña conditions and red shading denoting El Niño conditions in the central and eastern Tropical Pacific. Years at the bottom denote double- or triple-dip La Niñas. RONI accounts for excess global ocean warmth and is not used in NOAA's official declaration of ENSO conditions.

The Relative Oceanic Niño Index (RONI) is a newer methodology of calculating sea surface temperature anomalies in the central and eastern tropical Pacific, which subtracts global mean sea surface temperatures. This method is still being researched, but it may better account for the overall warming trend observed in recent decades, which has accelerated the past several years. Similar to the MEIv2, the RONI indicated weak to borderline moderate La Niña conditions during the winter of 2024-2025. Based on this index, double- or triple-dip La Niñas began in 1984, 1999, 2000, 2008, 2011, 2012, 2017, 2021 and 2022.

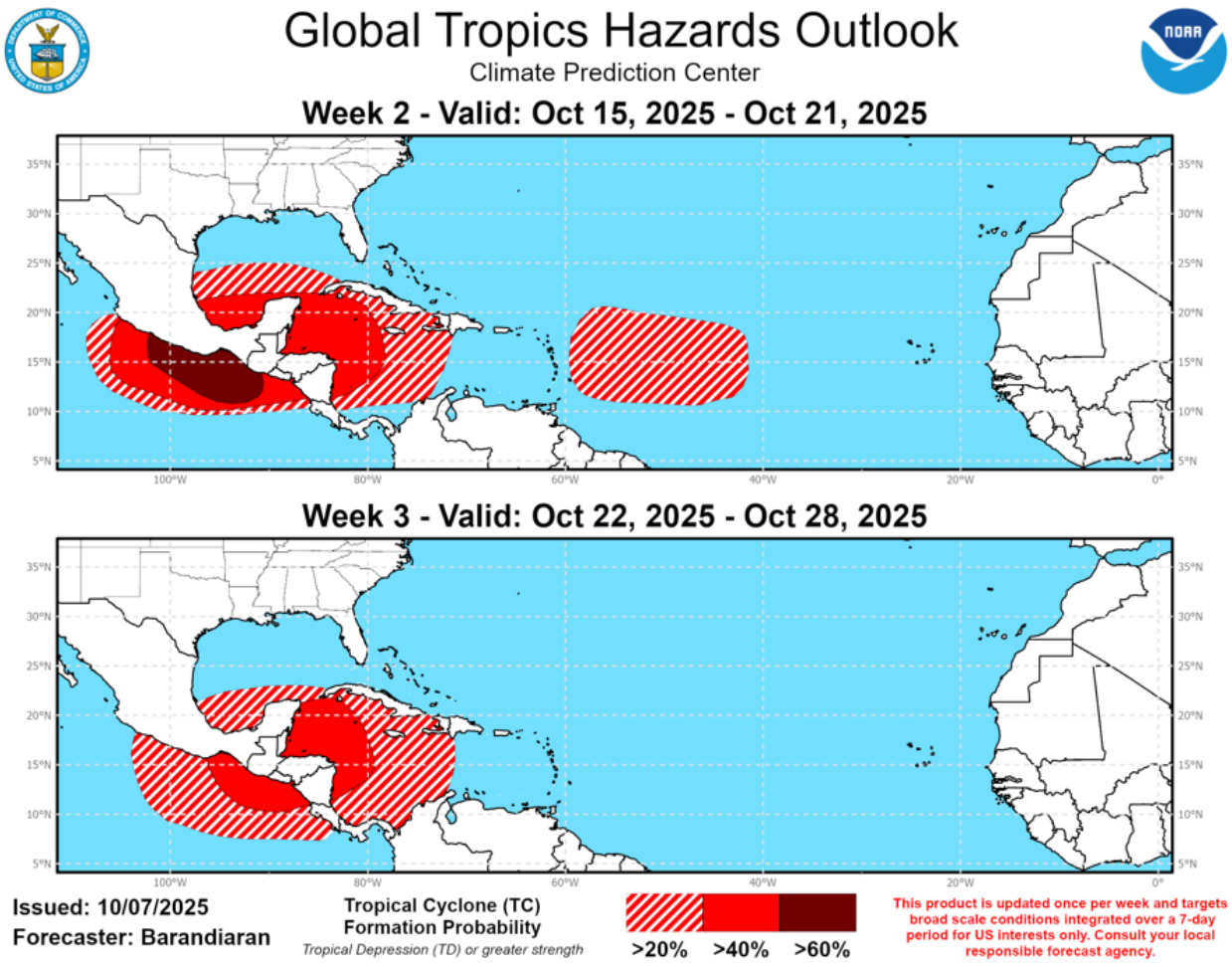


Composite analogs for a) October to November precipitation anomalies, b) October to November temperatures anomalies, c) December to February precipitation anomalies, and d) December to February temperature anomalies utilizing 2nd and 3rd year La Niñas.

Multi-year La Niña events provide the basis for the above analogs for the remainder of 2025 into early 2026, using a combination of the MEIv2 and RONI. They are as such: 1996-1997, 1999-2000, 2000-2001, 2008-2009, 2011-2012, 2012-2013, 2017-2018, 2021-2022 and 2022-2023. Analogs were only considered within or after the 1991-2020 climate reference period, as years prior (like 1984) tend to skew the composite temperature analogs towards a cooler state that no longer exists.

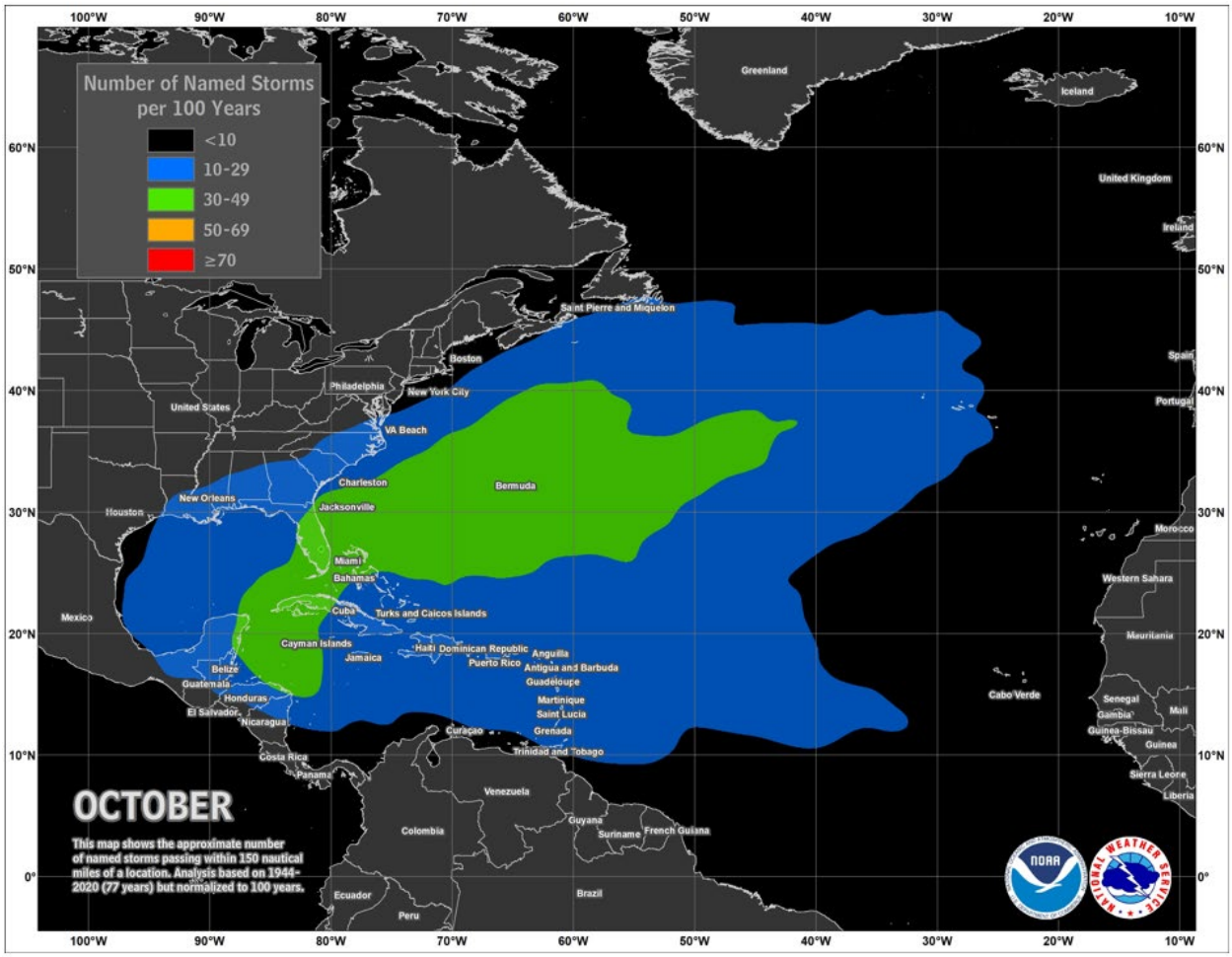
These multi-year events may intensify the atmospheric impacts experienced, but there are certainly other global sea surface temperature and weather patterns that occur on sub-seasonal or seasonal timescales that are more difficult to account for. That said, La Niña's impacts in the contiguous U.S. are often most reliable in the Southern Area during winter, with more variability over the western and northern U.S.

The temperature pattern from fall to winter tends to flip across the region, with fall warmth over the Plains spreading east across most of the rest of the region during the winter months. Fall temperatures tend to be quite cool in the Southeast, especially for the coastal plain. Rainfall patterns in fall are highly dependent on late season tropical activity, especially in October, while the storm track can dip south into the region later in November. During winter, precipitation tends to be above average over the inland Mississippi Valley, with dryness most likely along the southern tier and East Coast. A moisture gradient is common from the Plains to the Appalachians, adding some uncertainty to these areas.



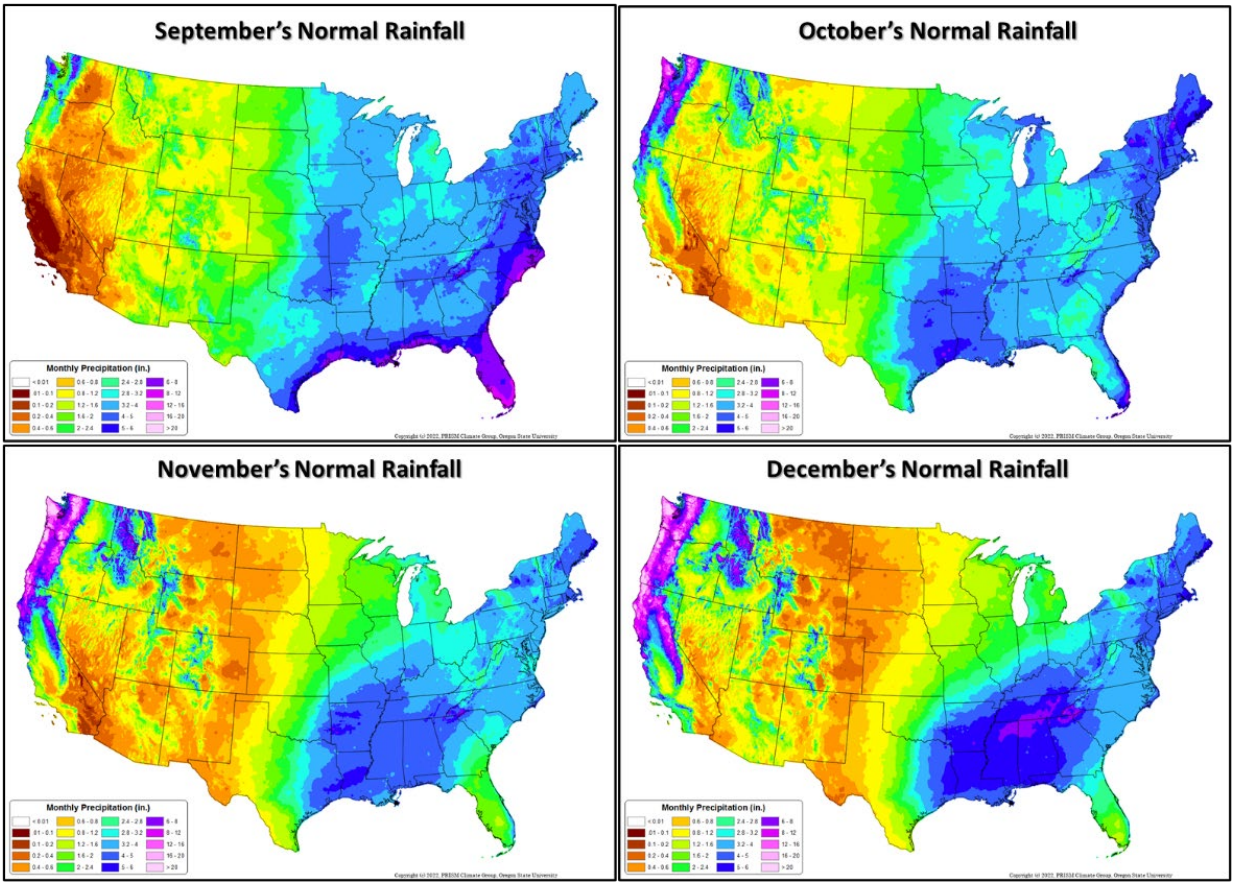
One consequence of our developing La Niña is a backloaded Atlantic hurricane season, with the bulk of the hurricane activity occurring after the traditional climatological peak. Atmospheric conditions through the remainder of October and potentially into November are likely to become increasingly favorable for tropical cyclone development in the western part of the basin, where sea-surface temperatures and ocean heat content are concerning. NOAA's extended outlook indicates at least a 40% chance of development through the rest of the month over the western Caribbean, with lower or shorter duration odds extending into the southern Gulf, as well. Additional activity may also develop from tropical waves exiting Africa, a risk that appears will occur later than normal this year. Confidence is low in whether any of this expected activity or

remnant tropical moisture impact the fire environment across the Southern Area ahead of the fall fire season.



October tropical cyclone climatology favors development in the northwestern Caribbean or along fronts draped from the Gulf into the subtropical Atlantic (i.e. north of the Caribbean islands). The Florida peninsula is most likely to see direct impacts; however, fall weather patterns similar to what is expected this year have brought tropical activity farther north into the eastern U.S. during October and November. Landfalls in Texas have not occurred after mid-October since at least 1944. While not clear in the monthly composite, storms that develop from African waves this late in the season most often recurve and miss the contiguous U.S.

Typical Rainfall and Precipitation Trends from September to December



Rainfall across the Southern Area typically trends from convective-dominant forcing in September and early October to precipitation associated with large-scale low-pressure systems in October, November and December. This is evident in the distribution of rainfall near the Gulf Coast and East Coast through the first part of the outlook period, which is largely driven by sea breeze thunderstorms typical of late summer. Tropical activity also contributes to rainfall patterns, but this is highly variable year-to-year. October is certainly a transition month regionally, with relatively drier conditions favored over the Appalachians and Southeast most years. Because of the waning influence of solar heating, October is normally the beginning of drier weather across Florida, which extends through the winter for most of the peninsula. At the same time, monsoonal activity that often influences rainfall patterns in western parts of the geographic area quickly wanes through September, occasionally lingering into October a handful of years, before high pressure increasingly dominates the High Plains and Texas mountains heading into fall.

Low pressure systems and their associated fronts would normally be expected to result in broader areas of soaking rainfall during late fall and early winter, with the focus trending from Arkansas, eastern Oklahoma, east Texas and Louisiana in November to the Tennessee Valley and southern

Appalachians by December. Precipitation near the Gulf Coast and East Coast may be influenced by tropical cyclones some years, with more abundant rainfall likely to occur in ENSO-neutral and especially La Niña years due to atmospheric conditions being more conducive to increased activity. Unfortunately, there is no obvious normal when it comes to determining where rainfall from tropical cyclones may be favored. In a normal year, rainfall needed to end the drought prior to the fall fire season is not favored to occur in areas of ongoing severe to exceptional drought without assistance from tropical cyclones.

Critical Fire Weather Patterns

Lingering Late Summer and Early Fall Weather Watchouts

- **Pre-frontal Compressional Warming**: As weather fronts approach, compressional warming can lead to hotter than anticipated high temperatures. This phenomenon occurs when air is forced to descend, heating as it compresses. This can also drive minimum relative humidity lower than forecasted, creating an environment conducive to fire spread. These conditions may develop rapidly, leaving limited time for fire managers to respond.
- **Erratic Thunderstorm Winds**: Thunderstorms, even those producing little or no rainfall, may generate erratic outflow winds. These winds, often far from the storm's core, can be unpredictable, stirring extreme fire behavior in areas with drought-affected or high-risk fuels. Such conditions can catch firefighting teams off-guard, potentially causing fires to spread quickly in unexpected directions.
- **Sea Breezes and Abrupt Wind Changes**: Even into October, sea breezes can develop along coastal areas, especially during warm weather with light background winds. These breezes can cause sudden shifts in wind velocities and directions, temporarily increasing fire danger by altering how a fire spreads, especially in regions with dry fuels.
- **High Temperatures Persisting into Fall**: While temperatures at or above 100°F become less common as the days shorten, they are still possible in the warmer parts of the region into late September and early October. Sandy or dry soils can exacerbate this trend, leading to localized hotspots of high fire danger.

Dry Cold Fronts

- **Fall and Winter Dry Fronts**: October and November are prime months for dry frontal passages, though they can occur throughout the fall and winter. These fronts typically bring little to no precipitation but are followed by dry air masses that result in critically low relative humidity levels during the day, with minimal recovery overnight. If a dry front is accompanied by a strong pressure gradient, expect sustained westerly or northerly winds with gusts of 30-40 mph, significantly increasing fire risk.

- **Fuel Drying**: These dry air masses can quickly deplete moisture in dead fuels, creating dangerous fire conditions, especially in areas with freshly fallen leaf litter, grass-heavy regions, or where surface fuels combine with ladder fuels in drought-stressed pine forests.

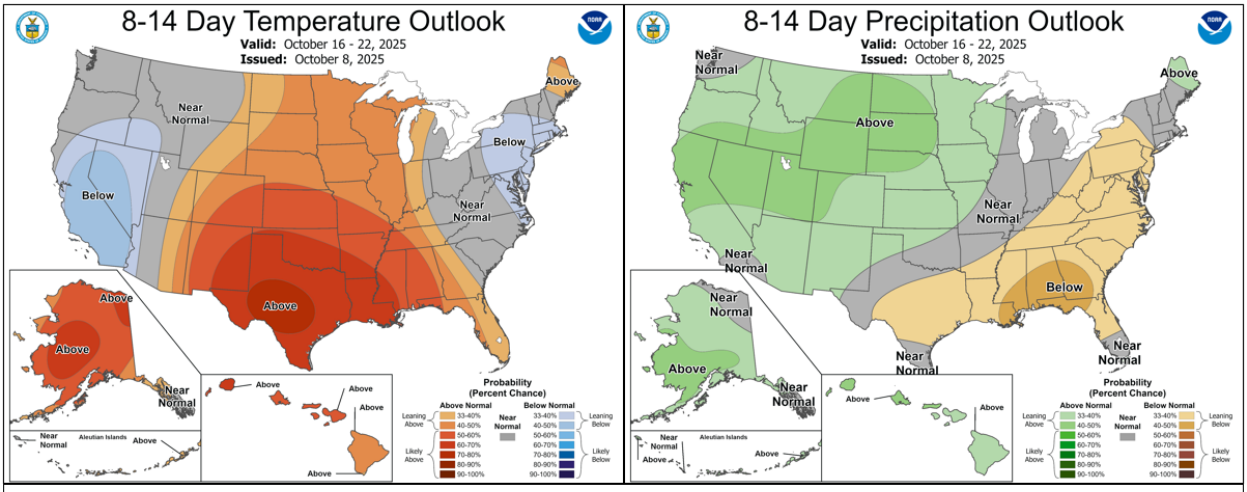
Tropical Cyclones and Their Adjacent Dry and Breezy Conditions

- **Dual Impact of Tropical Cyclones**: While tropical cyclones can quickly alleviate drought conditions through heavy rainfall, they can also generate critical fire weather on their periphery. Strong winds, not directly linked to the cyclone's core, often occur between the cyclone and high-pressure systems. As high-pressure systems strengthen in fall, they generate dry air masses, which, combined with subsiding air from cyclones, can create corridors of dry, gusty winds.
- **Subsidence and Fire Risk**: Subsidence, or downward-moving air on the edges of a cyclone, can warm as it descends, further drying the atmosphere. This warming can create localized areas of extreme fire danger, with enhanced winds contributing to faster fire spread. Tropical Storm Harold and Hurricane Idalia demonstrated this effect, leading to enhanced fire weather conditions. Historically, many tropical storms have resulted in similar impacts.

Mountain Waves

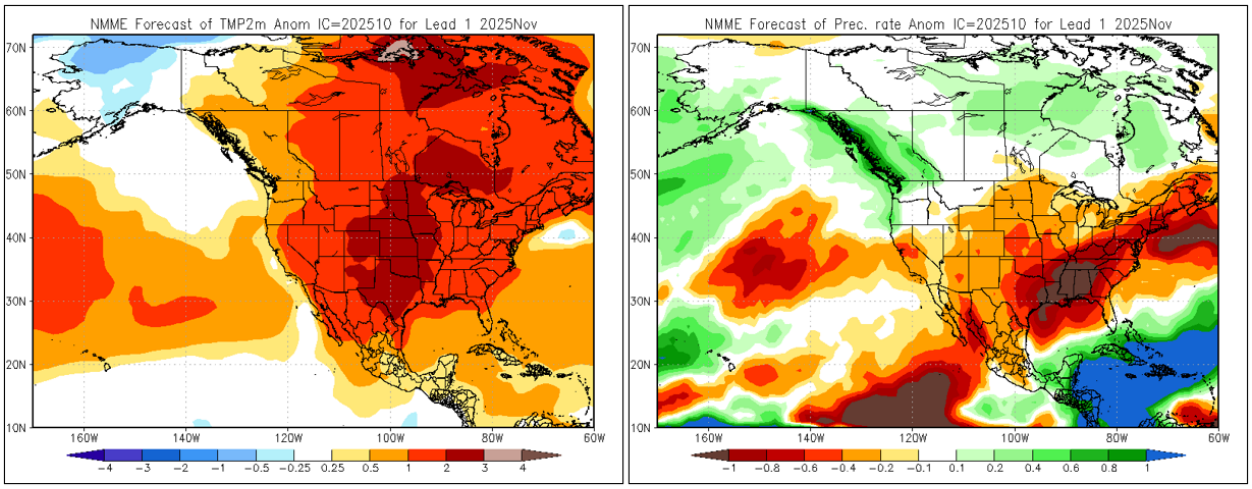
- **Mountain Wave Formation**: Mountain waves are air movements that occur near mountainous terrain, often during stable air conditions. These waves are particularly common in late fall and early winter in the Appalachians but can develop near any elevated terrain in the region. Mountain waves are most likely when the wind direction is within 30 degrees of being perpendicular to a ridge line.
- **Extreme Winds and Fire Risk**: These mountain waves can produce narrow but extreme wind events, with gusts exceeding hurricane-force levels. Wind direction may shift rapidly, catching fire crews off-guard. The eastern side of the Appalachians is especially vulnerable to these events, which can enhance fire spread by rapidly drying fuels and fanning flames. Additionally, mountain waves can cause new fire ignitions by downing power lines in high-wind areas.

Outlooks



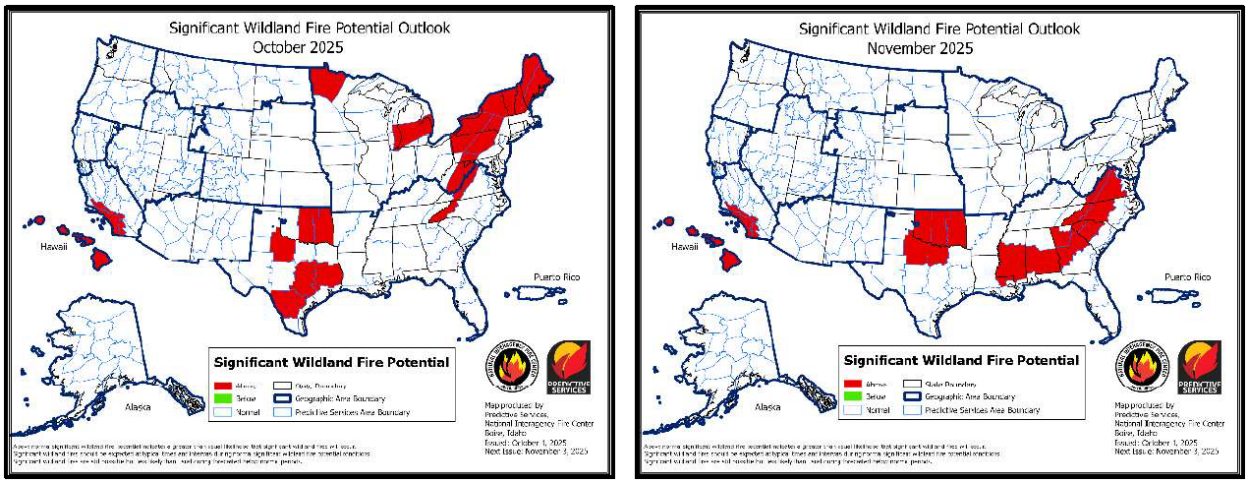
NOAA's temperature (left) and precipitation (right) outlooks for the October 16-22 period depict high confidence in above average temperatures from the Southern Plains to the Lower Mississippi Valley, trending to below average temperatures for the Mid-Atlantic coast. Below average rainfall is favored in most of the region, except far southern Florida and Texas, and northwestern portions of the region, where above average rainfall is slightly favored. A dry air mass will likely impact areas with below normal rainfall.

Aside from the nor'easter currently dropping heavy precipitation across the Eastern Seaboard or another non-tropical coastal storm impacting the region in the short term, most of the Southern area is favored to be dry into mid-October. Heading later into the month, rainfall is more likely than not to remain below average from Texas to the East Coast, with drought in these areas potentially exacerbated by above average temperatures and/or drier than normal air. Hot weather is most likely to persist in the Southern Plains but could affect the Gulf coastal plain at times. The pattern may support the first hard freezes of the year in the Appalachians by late October, but frost has generally been limited to the higher elevations of Virginia and North Carolina so far this fall. Tropical activity will have to be monitored closely.



The North American Multi-Model Ensemble (NMME) forecast for November temperatures (left) and precipitation (right) is depicted. Above average temperatures are favored throughout the Southern Area, with the warmest anomalies in portions of Arkansas, Louisiana, Texas and Oklahoma. The model blend strongly favors an unusually dry November throughout the region, with the exception of southern Florida, where wet conditions are favored. The driest anomalies include portions of Texas, Louisiana, Arkansas, Mississippi, Tennessee, Alabama, Georgia and North Carolina (NOAA).

Seasonal guidance that recently updated strongly supports a warm and dry November over the Southern Area. The NMME favors unusual warmth over western portions of the region, with significant dryness forecasted from eastern Texas and Gulf Coast to the Appalachians. Above average rainfall over southern Florida could be tied to stalled fronts and tropical activity. A strong signal for excessive rainfall is depicted across the Caribbean, including Puerto Rico and the U.S. Virgin Islands. While the NMME's overall pattern would favor persistent lower humidity, this crucial part of the forecast is of lower confidence. Monthly and seasonal guidance is a useful tool but often performs poorly across smaller regions. Additionally, with such warm sea surface temperatures adjacent to the region, just one tropical system or slow-moving storm system could dump more than a month's worth of rain in short order, as has occurred numerous times in 2025.



Significant Wildfire Potential Outlook maps for October and November 2025 from the National Interagency Fire Center (NIFC) Predictive Services (Issued: October 1, 2025).

Additional short and long-term outlooks from Predictive Services can be referenced at the following links:

SACC Daily Briefing

National 7-Day Significant Fire Potential

NIFC Predictive Services Wildland Fire Potential Outlook

Fuels and Fire Danger Conditions

Summer in the Southern Area began with normal to below average fire danger and wildfire activity, associated with above average precipitation and slightly elevated temperatures across most of the region in June, aside from South Florida and portions of West and South Texas which remained in drought. By the end of July, KBDIs and ERCs began to rise, while live fuel moistures (LFM) and 100-hour fuel moistures declined, as D0 drought began to re-appear in the Lower Mississippi Valley and surrounding states. KBDIs and ERCs began to normalize in South Florida in late June and in West Texas later in July as summer rains returned and began to alleviate drought conditions. High live fuel moistures associated with leaf-on conditions in the

Southern Apps, paired with cloudy conditions and occasional rainfall, kept fire danger low in that area most of the summer. This trend of moderately high fire danger indices continued into August for most of the region as below normal temps attenuated the effects of below normal precipitation. Fuels became more drought-stressed and available, as indicated by a drop in live fuel moistures and rise in KBDIs in September, as dry conditions persisted and drought expanded, particularly in portions of both Coastal Plains and Interior Highlands. Above normal precipitation for most of the summer across the Southern Area has contributed to above normal grass and herbaceous fuel loading. This trend is particularly concerning in the Southern Great Plains of Texas and Oklahoma where high grass loads have begun to cure and increased fire potential as drought continues to expand in portions of Texas and Oklahoma.

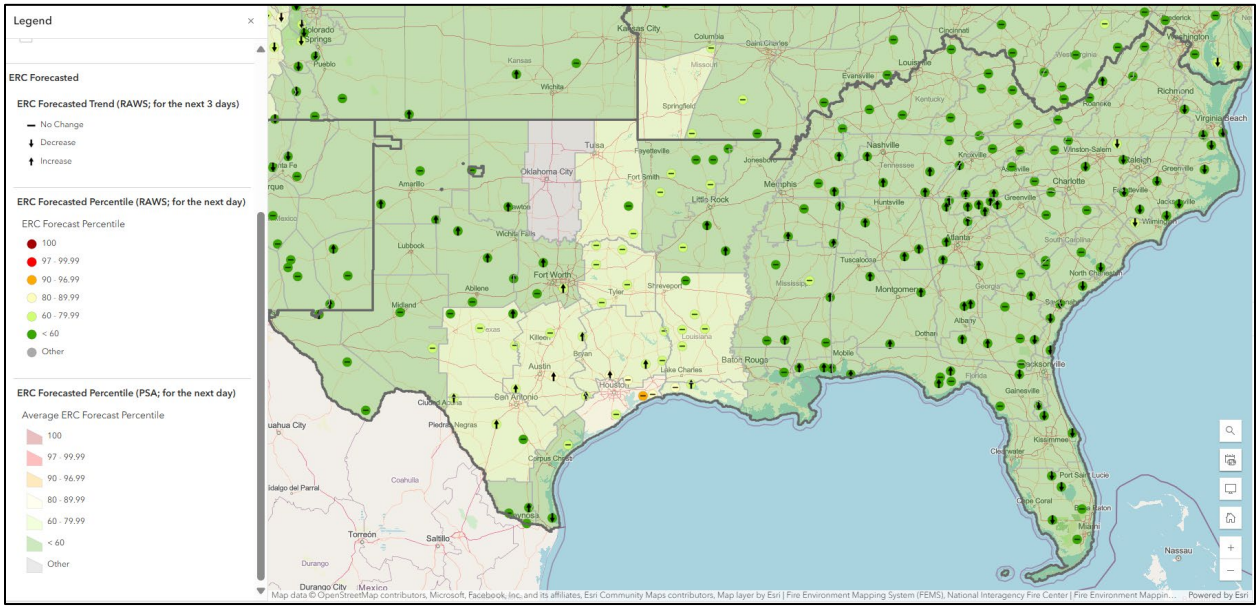
National Fire Danger Rating System (NFDRS) Climatological Analysis

NFDRS indices chosen for this assessment included ERC-Y and KBDI taken from FEMS which uses daily extreme values from gap-filled data with a period-of-record of 2005 - 2022. These indices provide a balanced mix of short- and near-term fire danger conditions when viewed in concert, and when displayed in a chart over the past calendar year, illustrate recent seasonal trends in fire danger. Although not true NFDRS indices, 100-hour fuel moisture and woody live fuel moisture were also selected to paint a fuller picture of fire danger trends throughout the past summer and up to current conditions. Here is a short description of each index or metric:

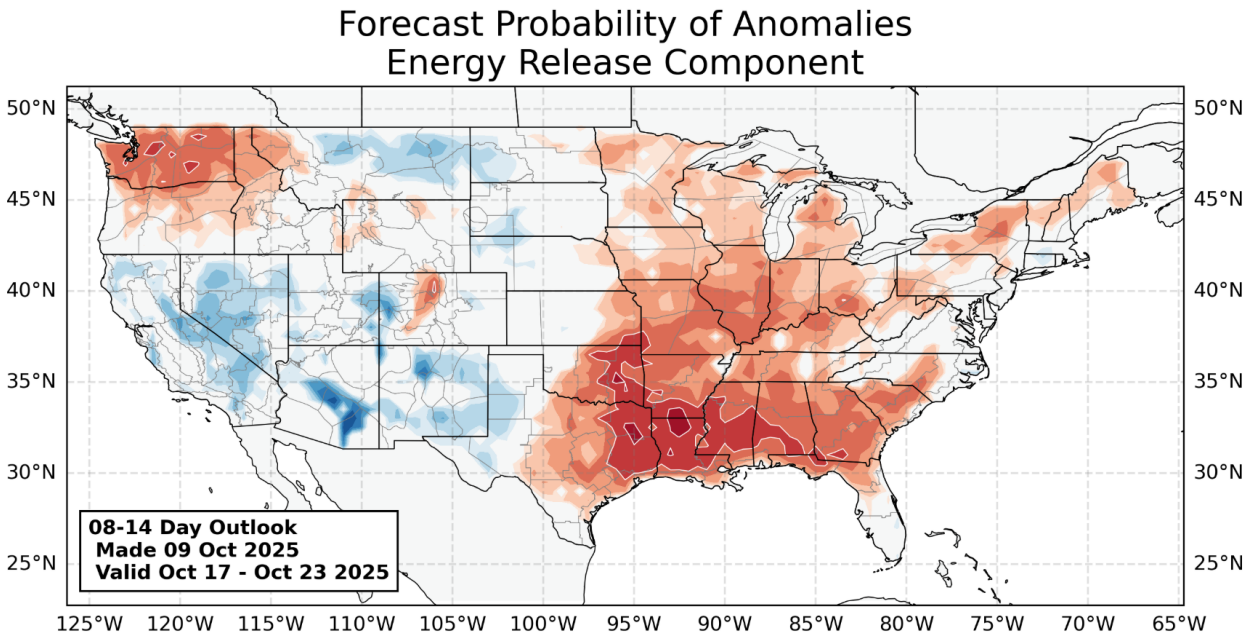
- **Energy Release Component (ERC)** provides an index that is correlated with flammability of live and dead fuels and difficulty of suppression. ERC is often referred to as an indicator of fuel dryness and is related to the available energy (BTU) per unit area (square foot) within the flaming front at the head of a fire. ERC values above the 90th percentile represent critical fire danger that is only experienced 10% or less of the time. 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. ERC-Y was used for this assessment to standardize across the geographic area.
- **Keetch-Byram Drought Index (KBDI)** is an estimate of the amount of precipitation (in 100ths of an inch) needed to bring the top 8 inches of soil back to saturation (value of 0 = complete saturation) and indicates the risk of fire based on the cumulative moisture deficiency within the soil layers.
- **100-hour fuel moisture** is a useful metric for assessing medium to longer-term fuel moisture trends, can be used as a rough estimate for the average moisture content of the forest floor (3/4” - 4” depth), and is a decent indicator of moisture excesses or deficits such as drought. Tracking 100-hour fuel moisture values moving into the fall transition can indicate longer-term fuel moisture trends, the potential onset or continuation of drought, and resistance to control as heavier fuels become available.
- **Woody live fuel moisture** is related to vapor pressure deficit, minimum temperatures, and daylength and a is a good indicator of both seasonal transitions in and out of dormancy as well as vegetative stress due to lack of precipitation, extreme temperatures

(hot or cold), and/or high evaporative demand from the atmosphere.

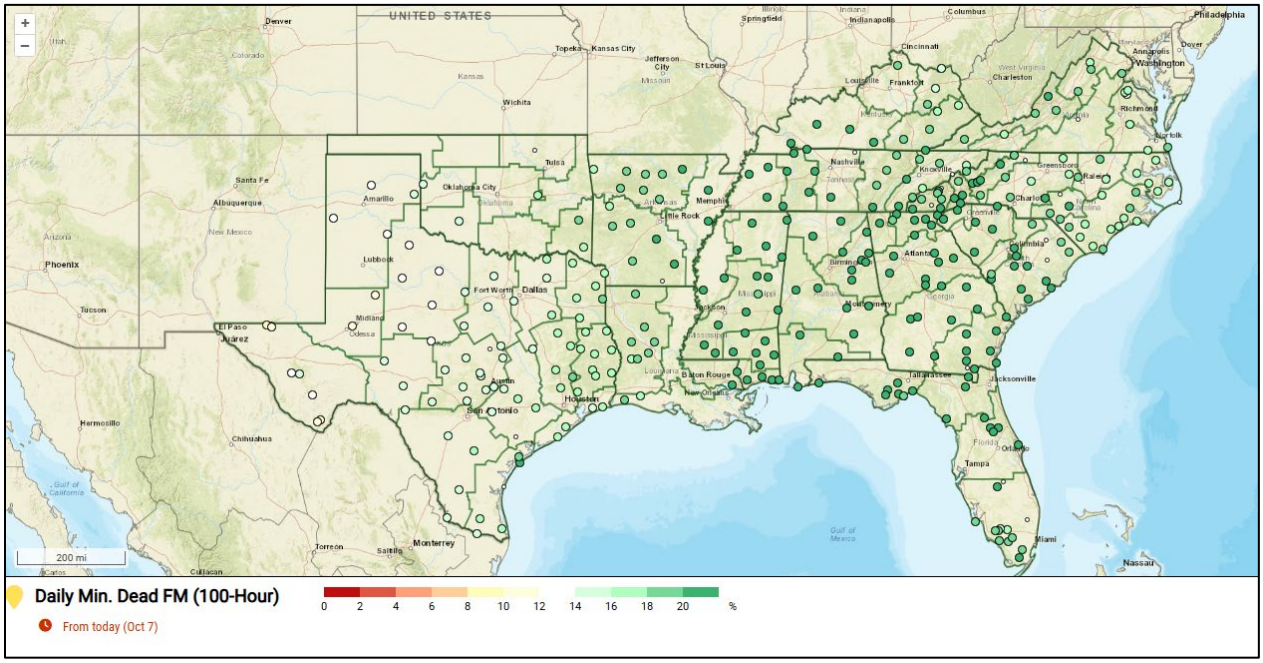
As worsening drought across most of the Southeastern U.S. in early October coincides with seasonal transition into dormancy at northern latitudes, select fire danger indices, and corresponding live and dead fuel availability, have been steadily increasing. Due to a recent humid and patchy wet weather pattern over most of the region, except for portions of Texas and Oklahoma, ERCs and 100-hour fuel moistures are hovering around normal for most stations (see figures below) and may not be the best indicators of near-term wildfire potential. The 8-14 day Forecast Probability of Anomalies for ERC figure below indicates high confidence in above normal ERCs for East Texas, eastern Oklahoma, and most of the Gulf Coastal Plain with lower confidence of above normal ERCs in Central Texas and the Interior Highlands.



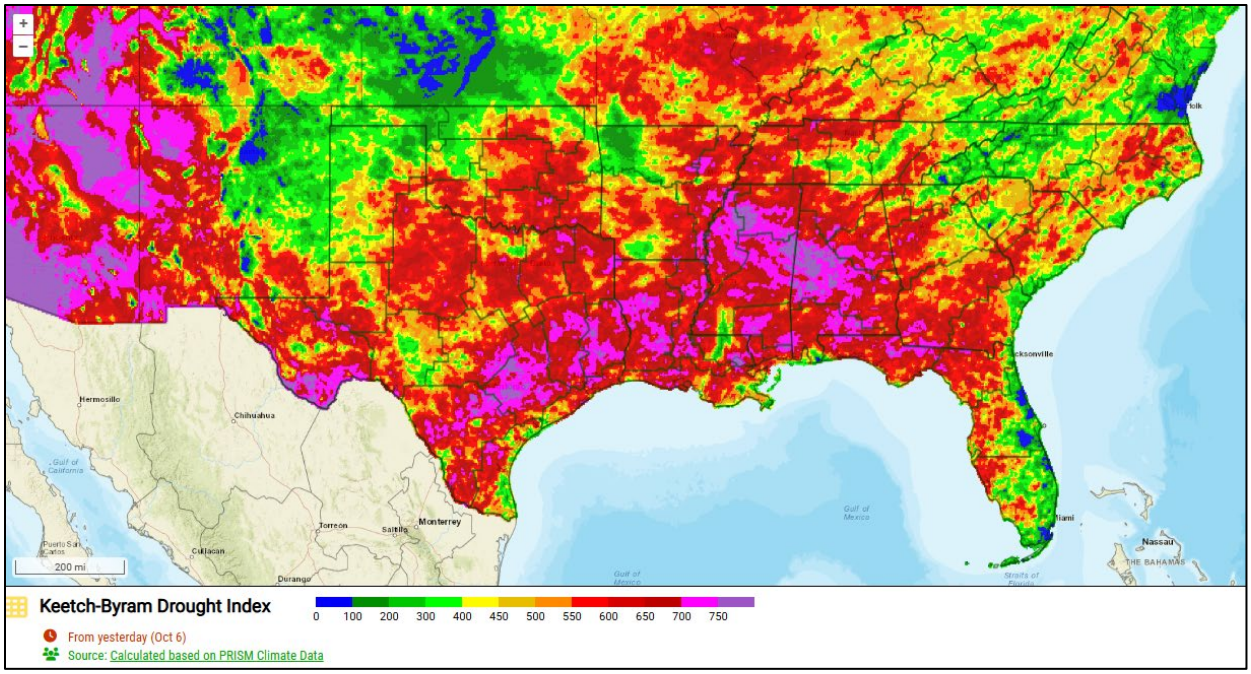
Graphical depiction of ERC forecasted percentiles (from FEMS) for Southern Area PSAs and RAWS stations as of October 9th (from the Risk Management Assistance Dashboard). The arrows depict forecasted trend in ERCs over the next three days.



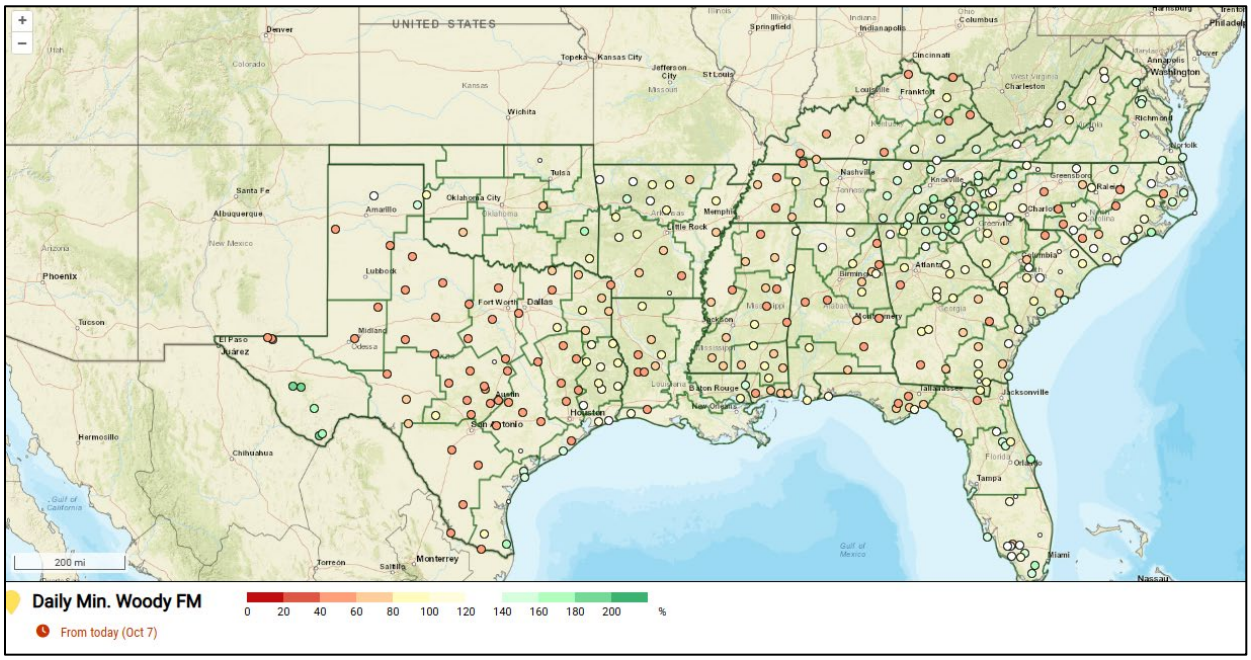
8–14-day probability of ERC anomalies for above normal (>= 66.66th percentile) and below-normal (<=33.33rd percentile) conditions for October 17 – October 23, 2025 (based on 2000-2019 climatology).



100-hour fuel moistures for Southern Area RAWS stations as of October 7th (from the North Carolina Fire Weather Intelligence Portal)



KBDIs across the Southern Area as of October 6th (from the NC Fire Weather Intelligence Portal).

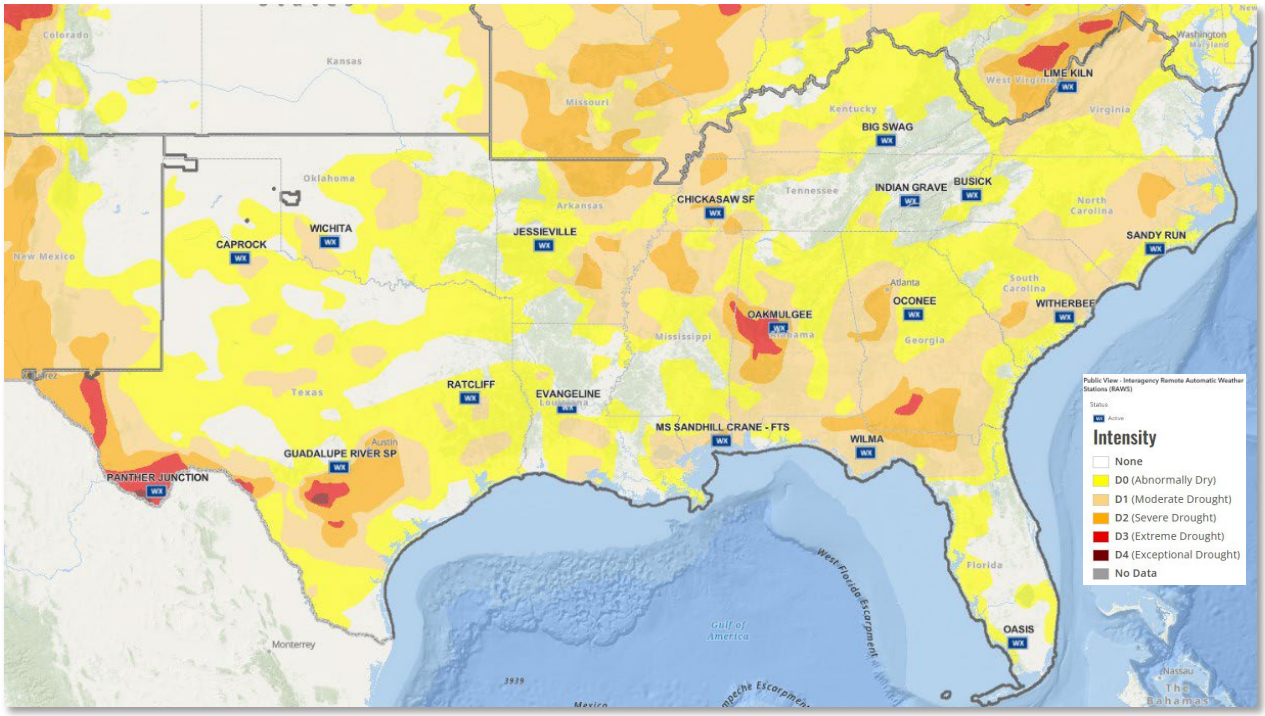


Daily minimum woody live fuel moisture values from RAWS across the Southern Area as of October 7th (from the NC Fire Weather Intelligence Portal). Note that the light pink color is indicating 60% woody live fuel moisture which is the minimum allowable woody live fuel moisture value reported in FEMS.

Currently, low live fuel moistures and elevated KBDIs appear to more accurately portray the underlying drought conditions across most of the geographic area aside from South Florida, the Southern Apps, and scattered portions of the Interior Highlands, Oklahoma, and Texas (see figures below). In most areas in which KBDI is over 600, live fuel moistures have reached critically low levels (30% for herbaceous LFM and 60% for woody LFM). It will be important to continue to track the potential drying and warming effects of La Niña and the timing and strength of precipitation events on fuels, using indicators such as ERCs and 100-hour fuel moistures, throughout the fall season to assess changes in significant fire potential across the Southern Area.

Remote Automated Weather Station (RAWS) Fire Danger Analysis

The climatological graphs below were taken directly from the Fire Environment Mapping System (FEMS) on October 8th using daily maximum values, without any additional manipulation and for a period of record historical dataset between 2005 – 2022. Individual stations were used, instead of Predictive Service Areas (PSAs), due to the transition to FEMS and current lack of functionality to quickly and easily create Special Interest Groups (SIGs) using FEMS data. An attempt was made to find a distribution of representative stations across the geographic area as referenced on the map below the current U.S. Drought Monitor overlaid with the selected Remote Automated Weather Stations (RAWS). Current 2025 observations are displayed with a black line with black dots representing the 7-day FEMS forecast. The red line is historical maximum values for the 2005-2022 period-of-record, the blue line is historical minimum values, and the green line is the historical average values.

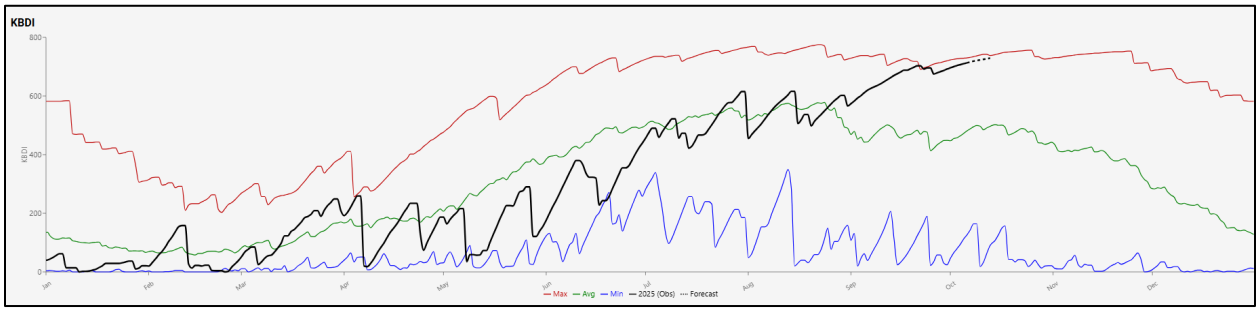


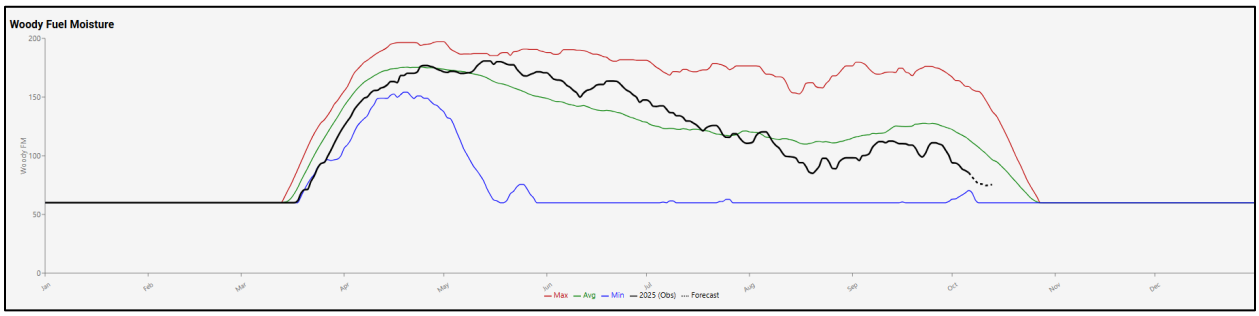
Map of the Southern Geographic Area with the current U.S. Drought Monitor (as of October 7th) overlaid with selected RAWS for geographic reference.

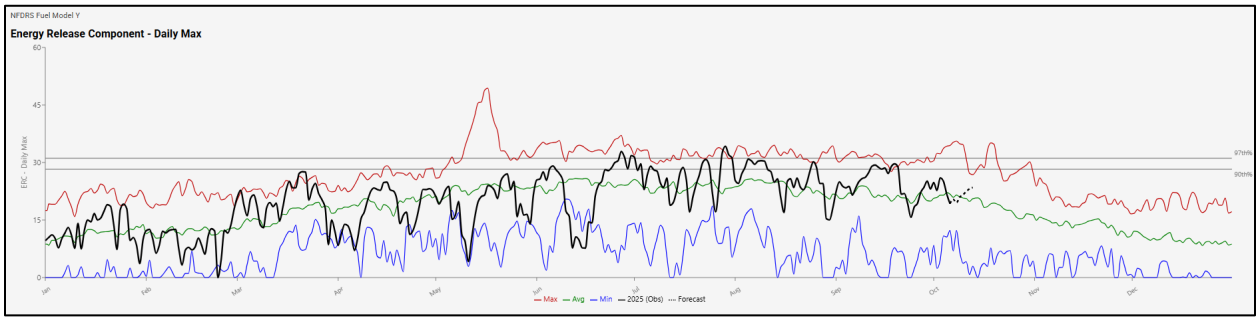
Gulf Coastal Plain

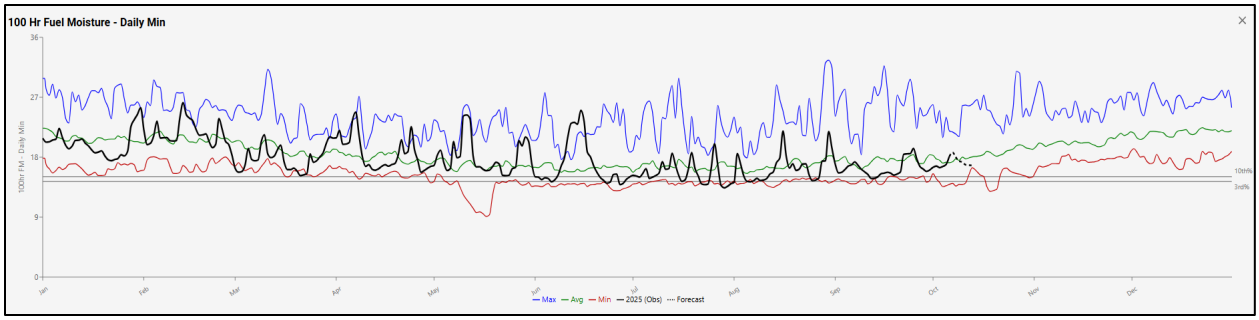
Although fluctuating and somewhat variable, stations along the Gulf Coastal Plain have reported higher than average ERC-Y and 100-hour fuel moisture values throughout most of the summer but are currently hovering near average. KBDIs have also been elevated in many locations along the Gulf Coast for much of the summer with most currently at or above 600 and some higher than 700. Woody live fuel moistures began dropping in concert with elevated KBDIs over the past month or so with some stations, such as the Wilma RAWS on Apalachicola NF tanking currently at 60%. Forecasted FEMS estimates show an upwards trend in fire danger over the next 7 days due to a drying trend moving into the sub-region.

Evangeline RAWS (162401) – Kisatchie NF, LA

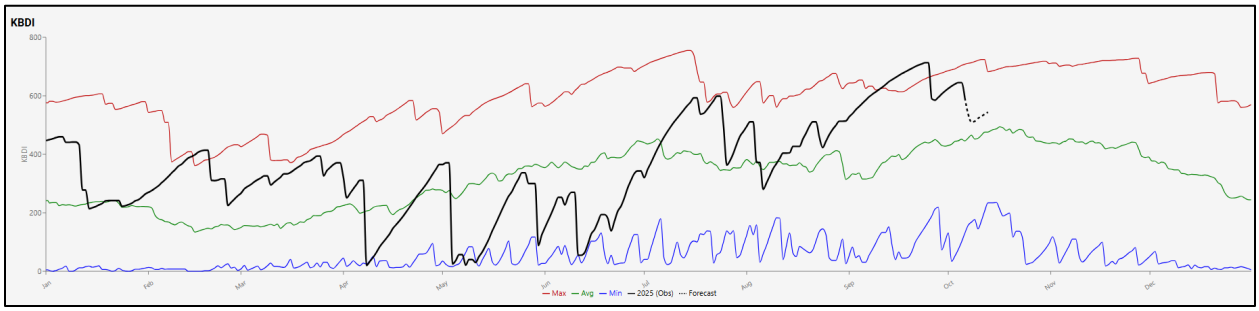


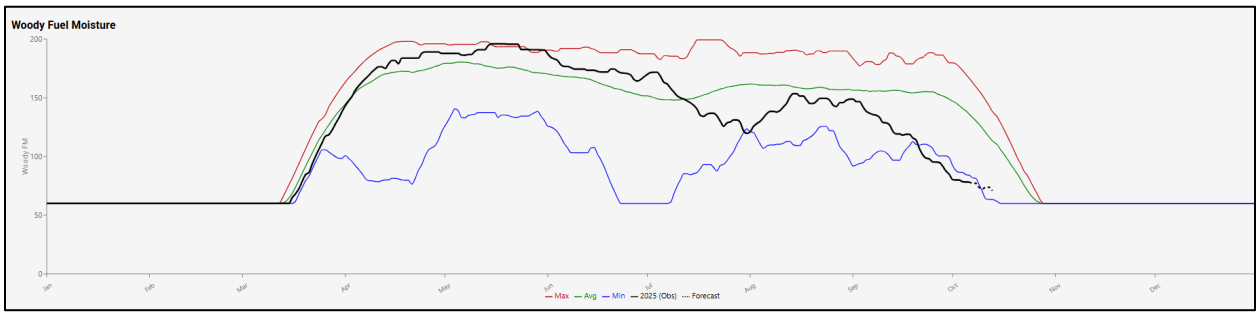


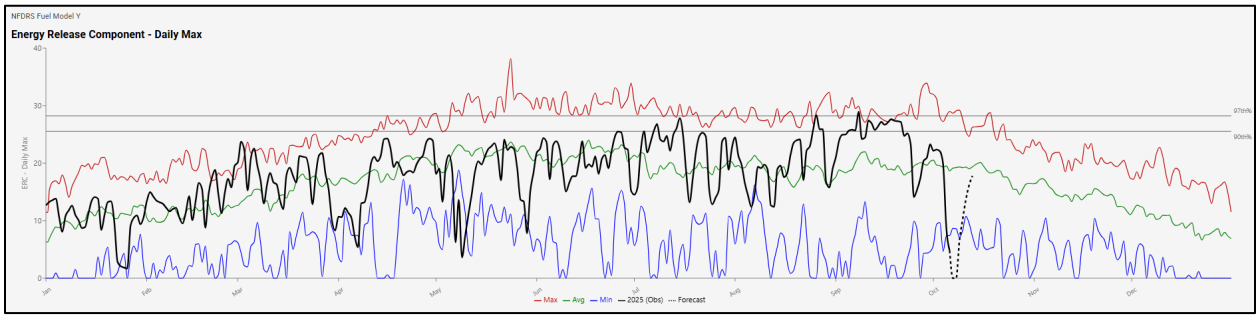


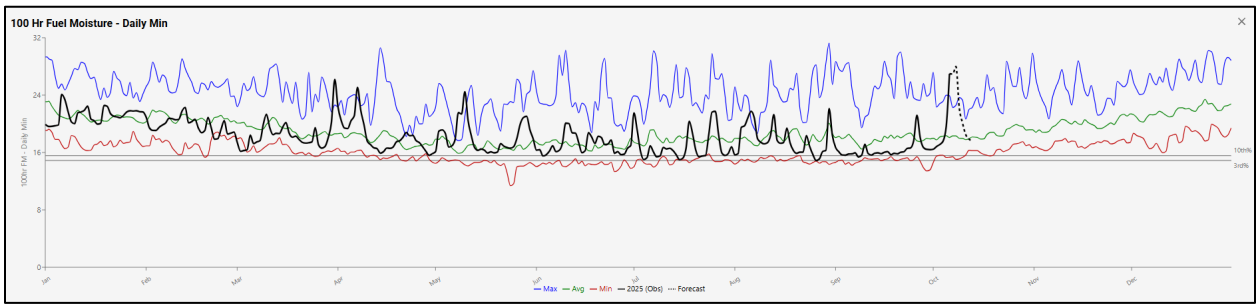


MS Sandhill Crane RAWS (228202) – South Mississippi

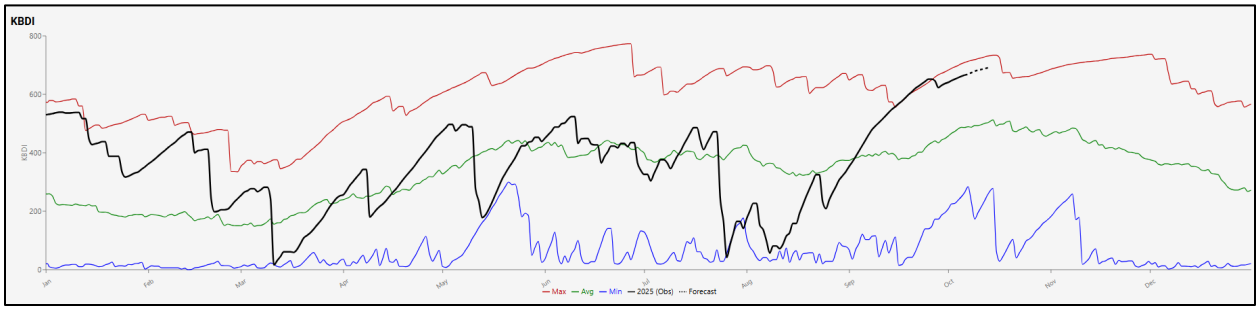


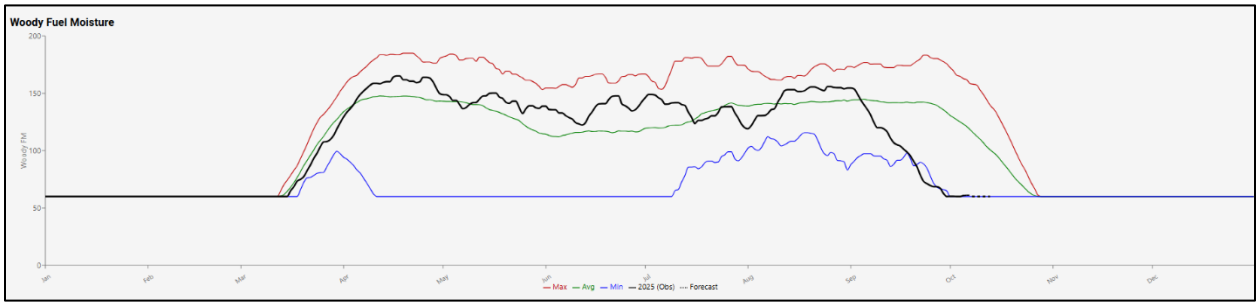


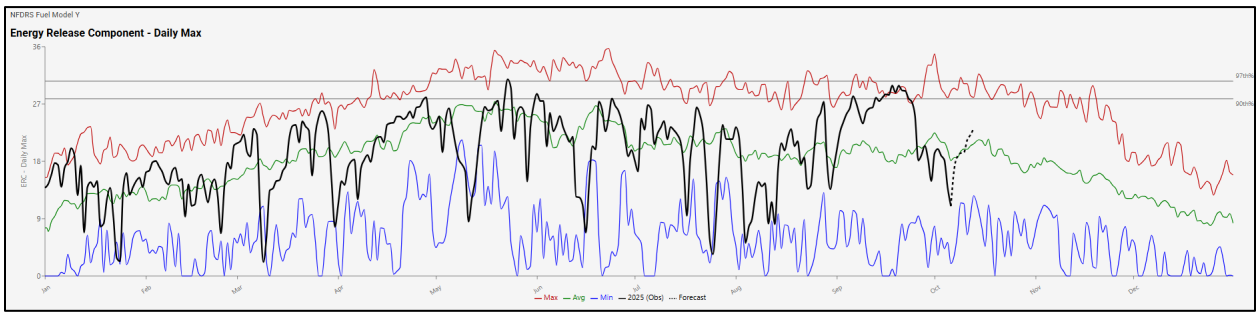


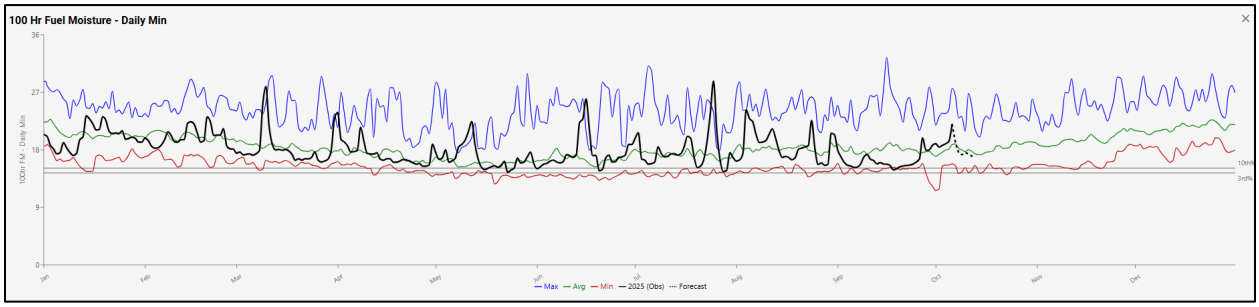


Wilma RAWS (082001) – Apalachicola NF, FL







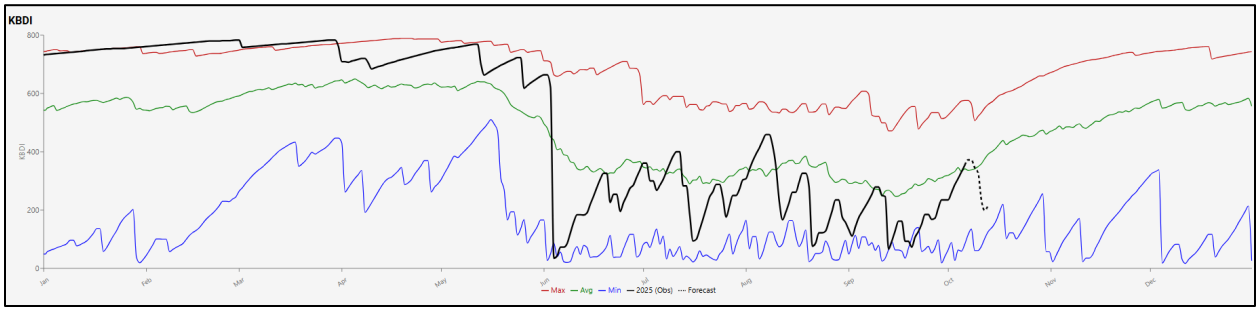


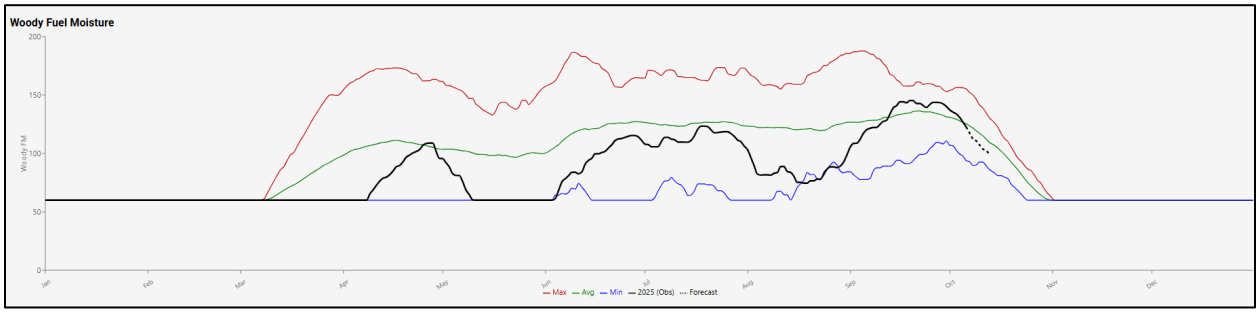
South Florida

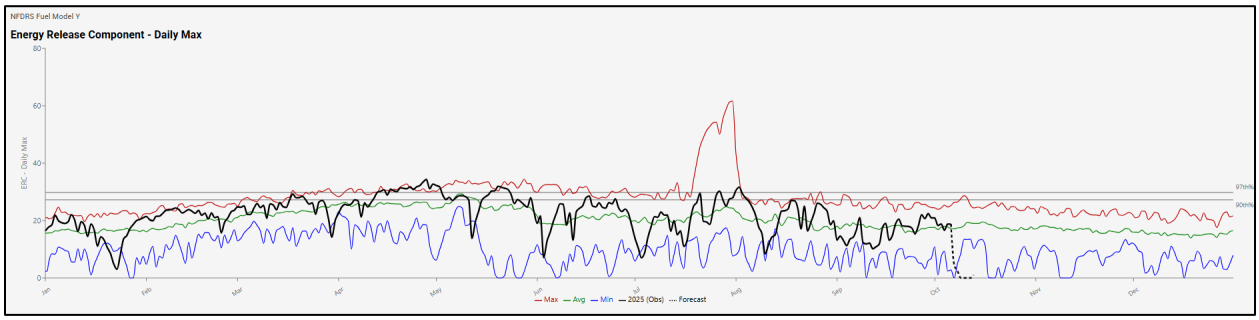
South Florida began summer with moderate to high wildfire activity associated with drought-stressed fuels, as indicated by high KBDIs, extremely low 100-hour and woody live fuel moistures, and elevated ERCs, accompanied by dry lightning storms. As convection thunderstorms blanketed the lower Florida Peninsula beginning in late June, all indices and metrics began to recover and are currently near average. Forecasted rain and humid conditions over the next 7 days are indicated by the black dotted line showing further improvement in short-

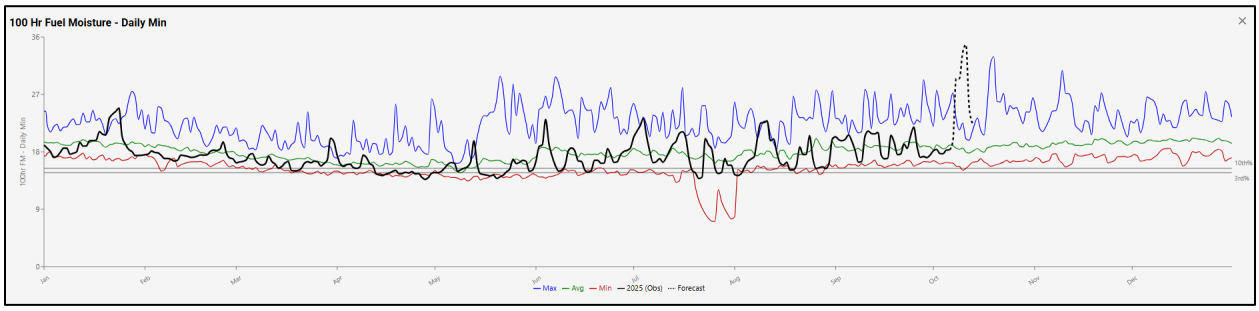
term conditions. Note that there are outliers in the FEMS dataset for Oasis RAWS in late July/early August as illustrated by the jump in the historic maximum trend line (red) around this time.

Oasis RAWS (086401) – Big Cypress NP, FL







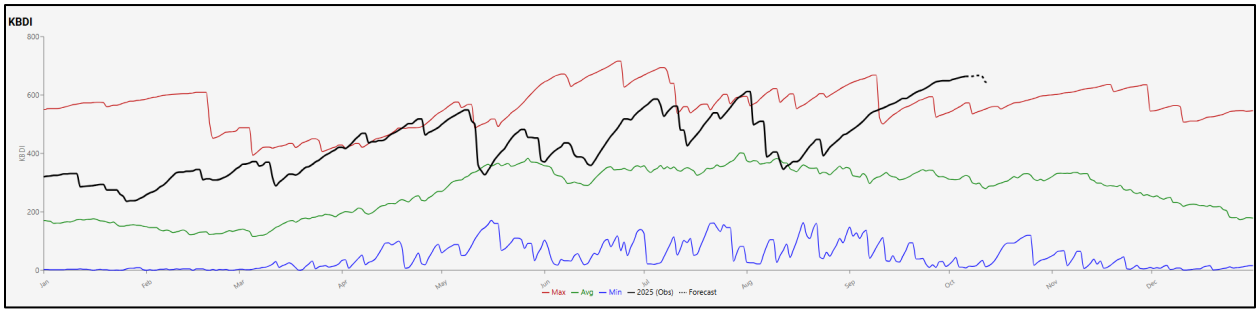


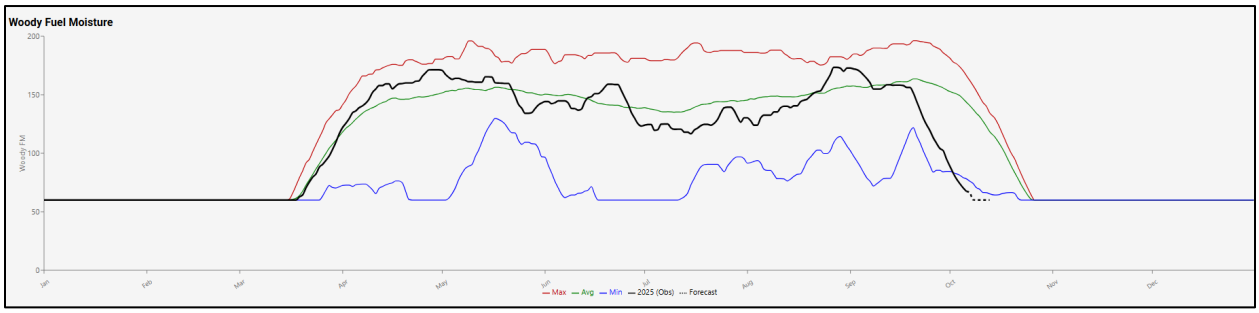
Atlantic Coastal Plain

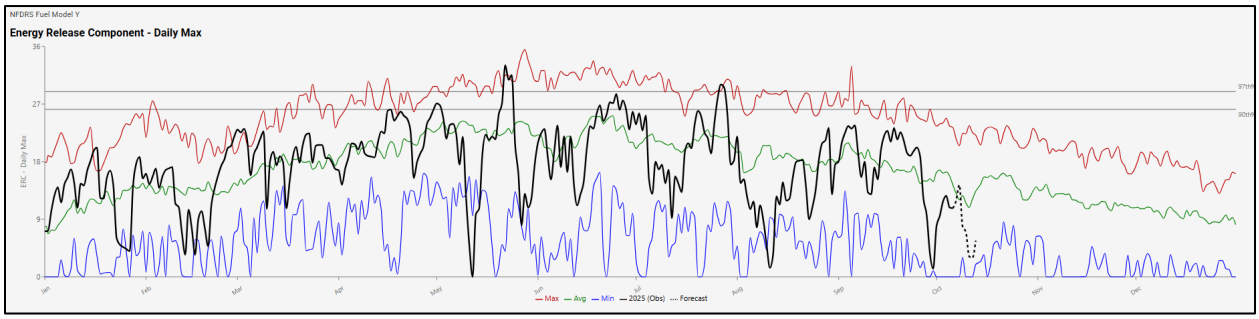
Selected NFDRS indices and metrics fluctuated throughout the summer in the Atlantic Coastal Plain with rain patterns, with some reaching historic maximums or minimums at times, and fire danger remained high in areas that missed the rain. Currently, KBDIs range from 300-500 in

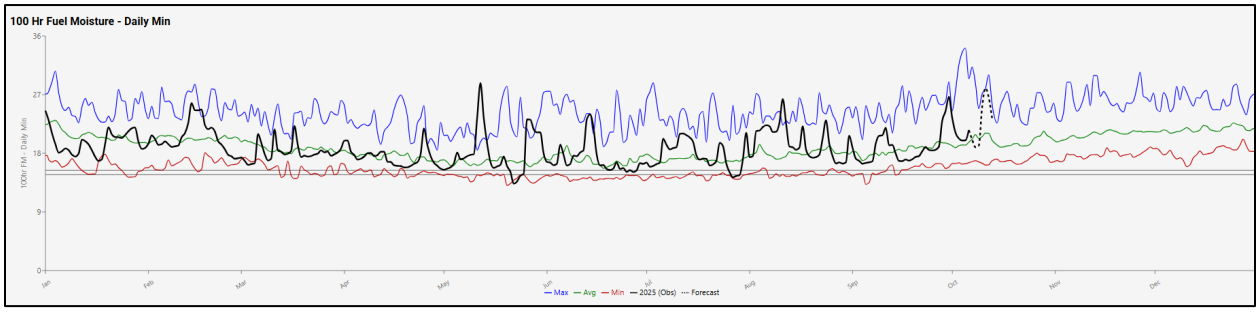
areas right along the Atlantic Coast due to afternoon sea breezes and legacy precipitation from Hurricane Erin, which approached the Carolinas in mid-August, while KBDIs are elevated further inland and in excess of 600 in some areas. Woody live fuel moistures are generally tracking with average seasonal trends, but some stations, such as the Witherbee RAWS in South Carolina, were setting historic records for low live woody fuel moisture at the end of last week. Currently, a nor'easter that just moved northward along the Atlantic coast blanketed coastal areas with rainfall which should moderate near-term fire potential.

Witherbee RAWS (384002) – Francis Marion NF, SC

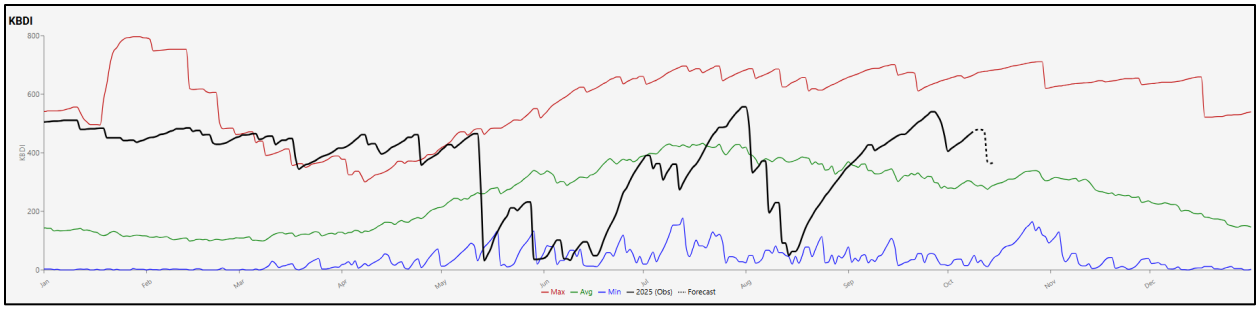


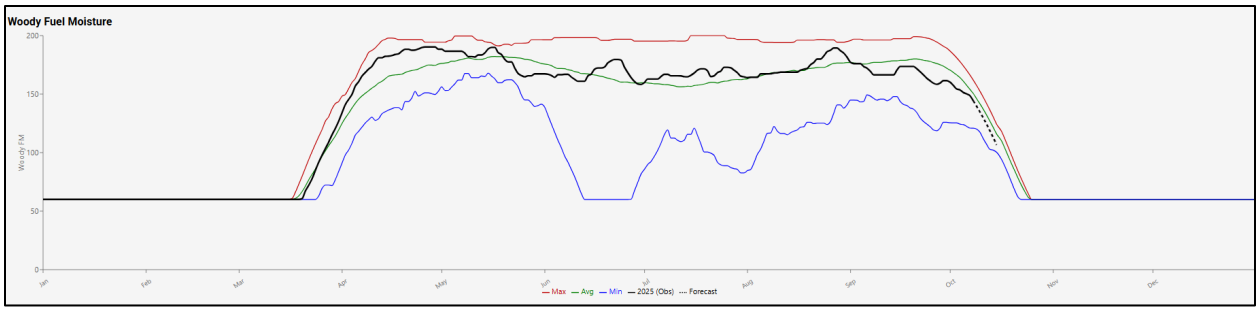


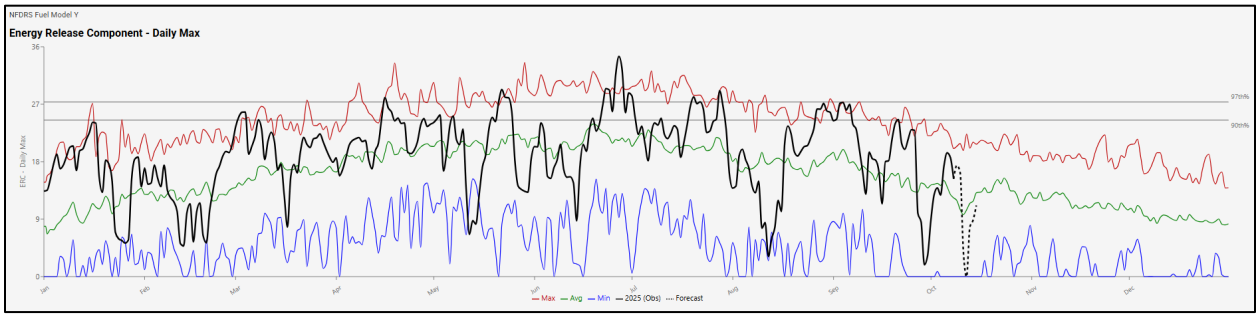


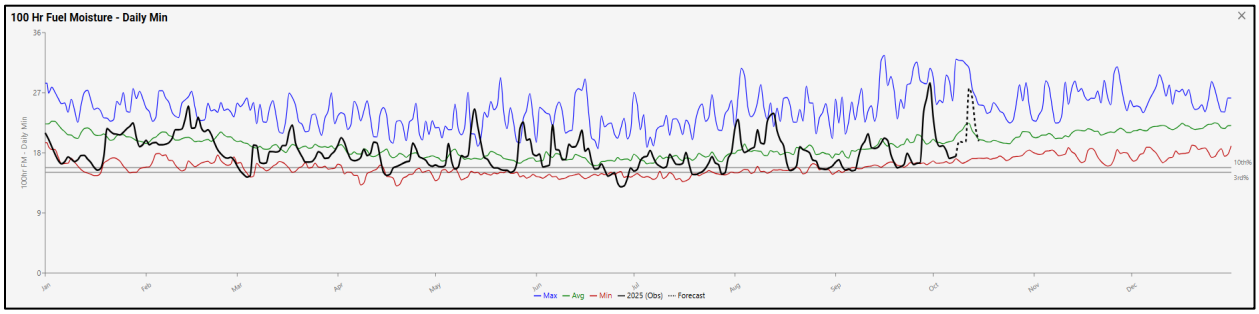


Sandy Run RAWS (319505) – Camp Lejeune, NC







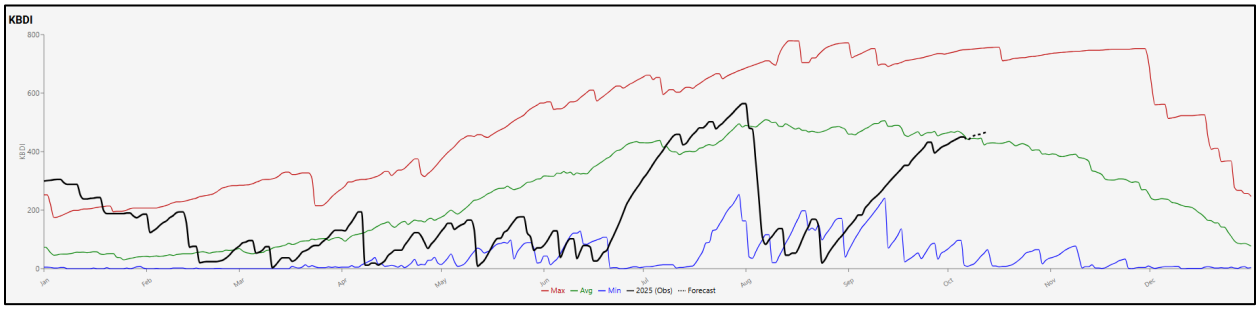


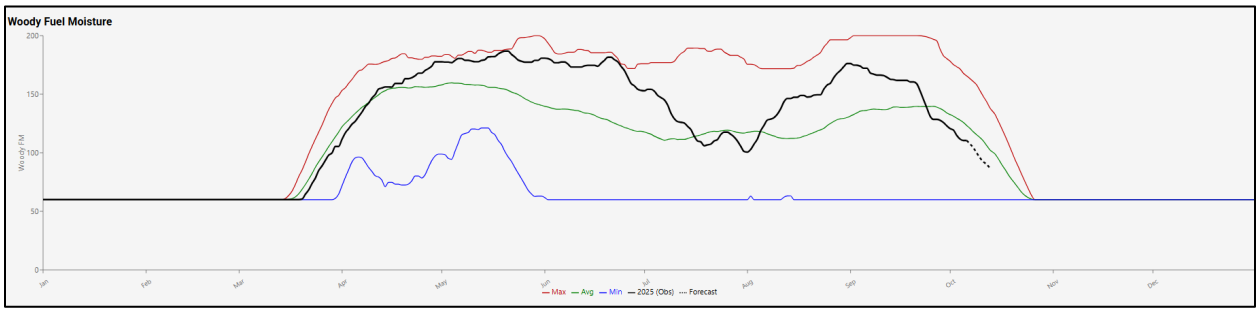
Piedmont

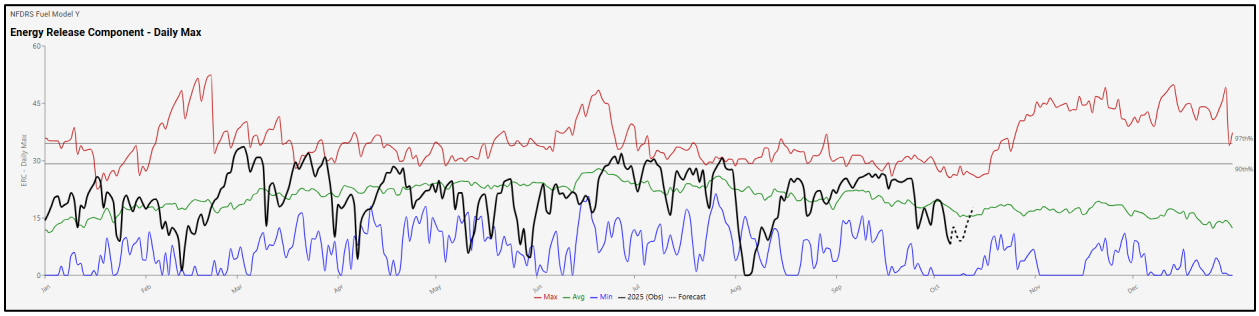
Fire danger across the Piedmont has been highly variable over the summer depending on geography with Oconee RAWS in Georgia showing elevated KBDIs and ERC-Ys and lower than average 100-hour and woody live fuel moistures from mid-June through early August, improvement in these indicators for most of August, and then an uptick in fire danger in September. KBDIs and ERC-Ys at Oakmulgee RAWS in Alabama were near or below normal, and fuel moistures were elevated, early in the summer, and then in August, all indices began to worsen with lack of appreciable precipitation. Currently, KBDIs are highest and woody live fuel moistures are lowest in the western Piedmont and improve moving east, while ERCs and 100-

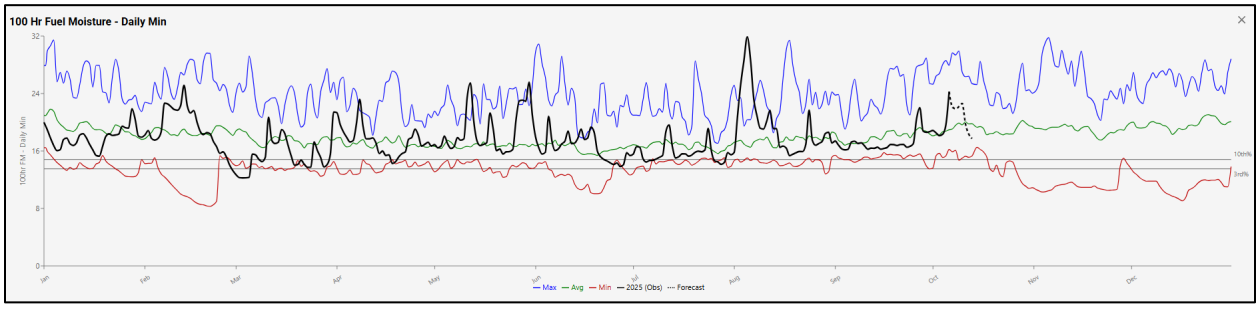
hour fuel moistures are hovering around average. Forecasted values from FEMS indicate increasing fire danger over the next 7 days.

Oconee RAWS (093701) – Oconee NF, GA

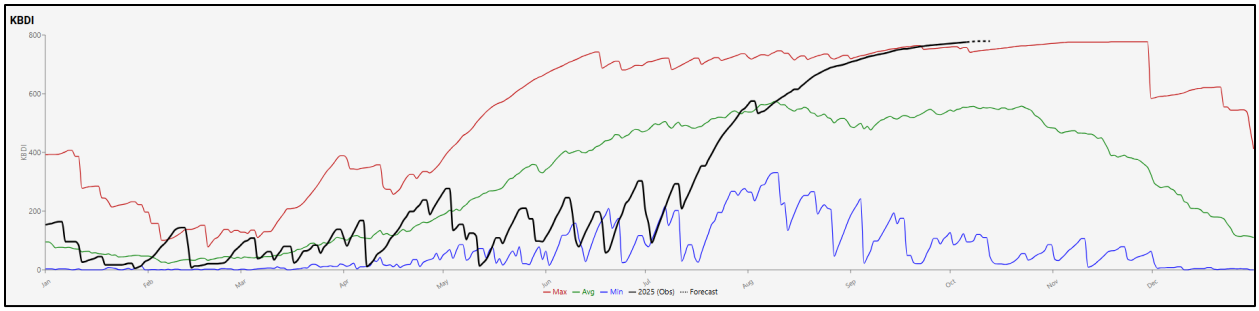


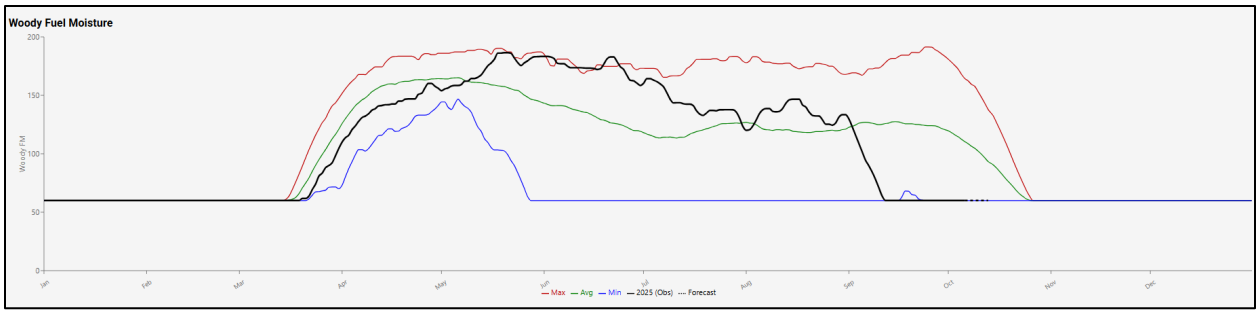


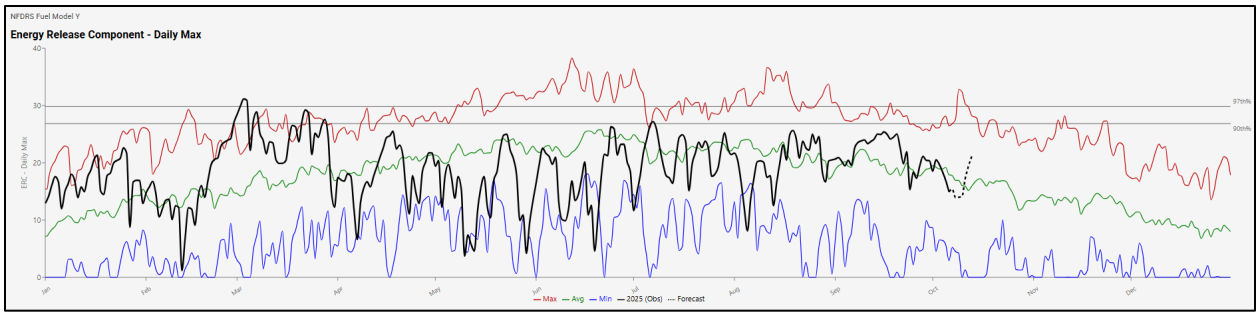


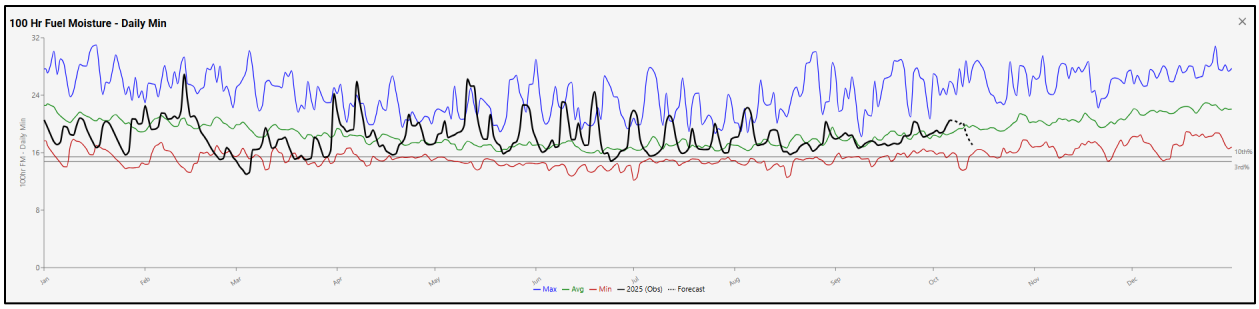


Oakmulgee RAWS (013201) – Oakmulgee NF, AL





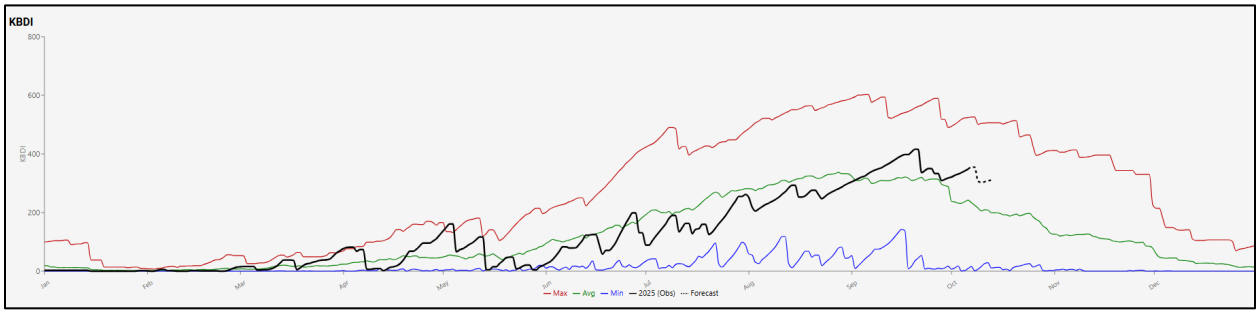


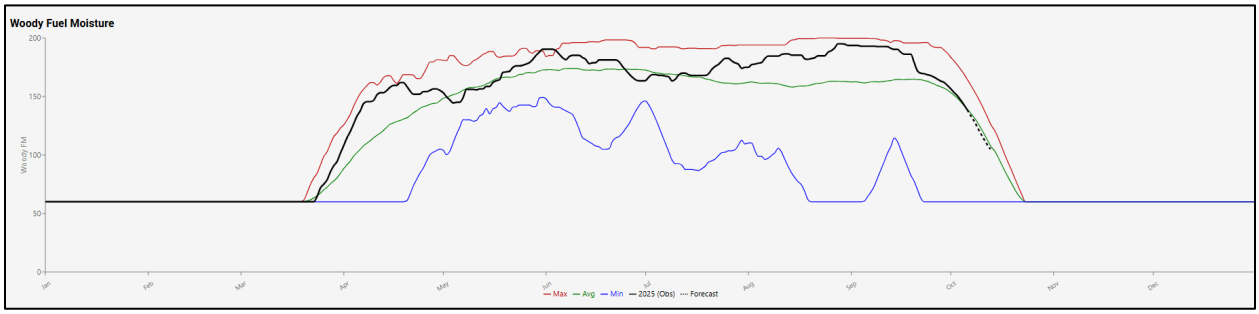


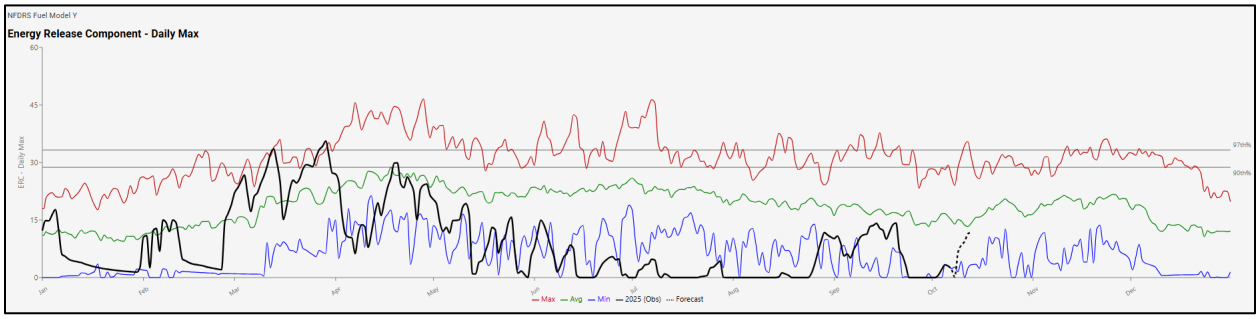
Southern Appalachians

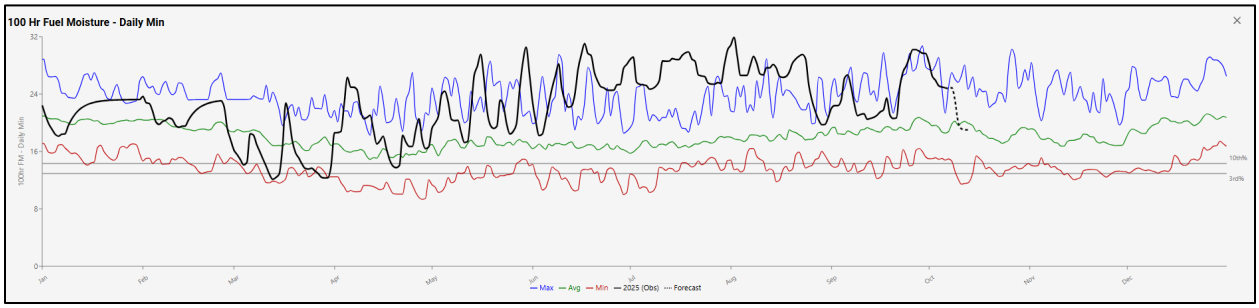
Most stations in the Southern Appalachians reported below normal fire danger throughout most of the summer with KBDIs and ERC-Ys remaining low and fuel moistures trending higher. The exception among the RAWS selected here was Big Swag RAWS which tended to indicate much higher than average KBDIs and ERCs and lower than average live and dead fuel moistures. More recently, eastern Kentucky has seen a recovery in fire danger conditions associated with rain events and cooler conditions with some indication of drier conditions over the next 7-days across the Southern Apps.

Lime Kiln RAWS (441801) – Warm Springs RD, VA

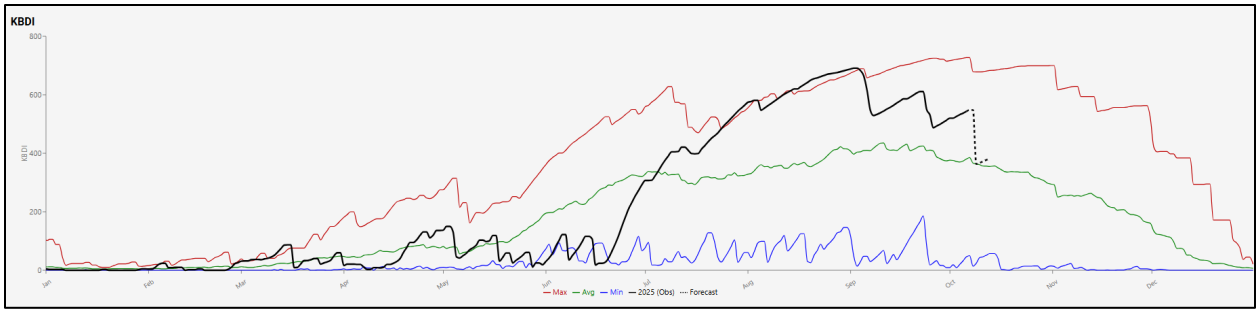


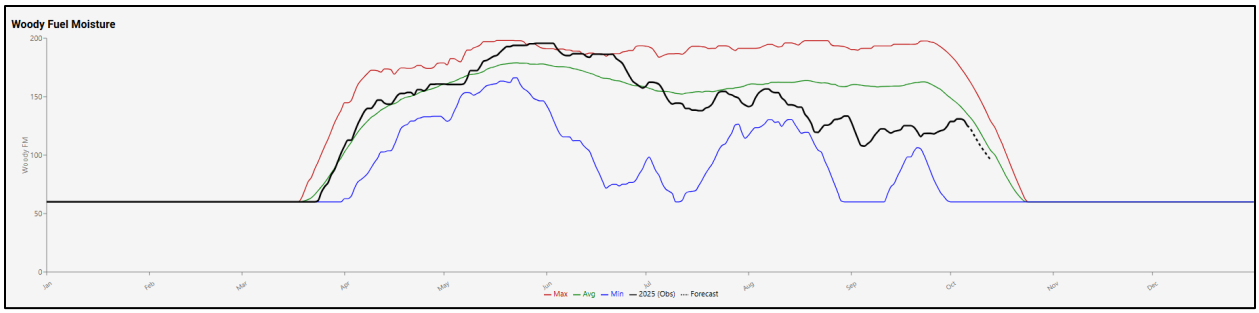


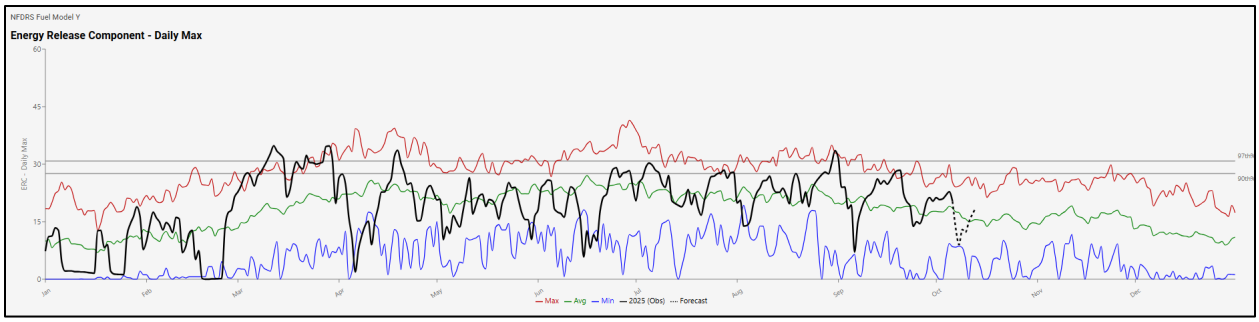


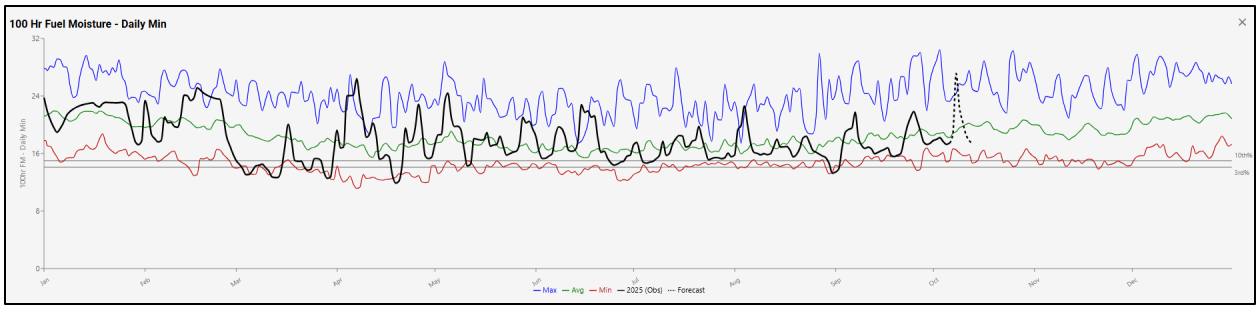


Big Swag RAWS (157002) – Somerset RD, KY

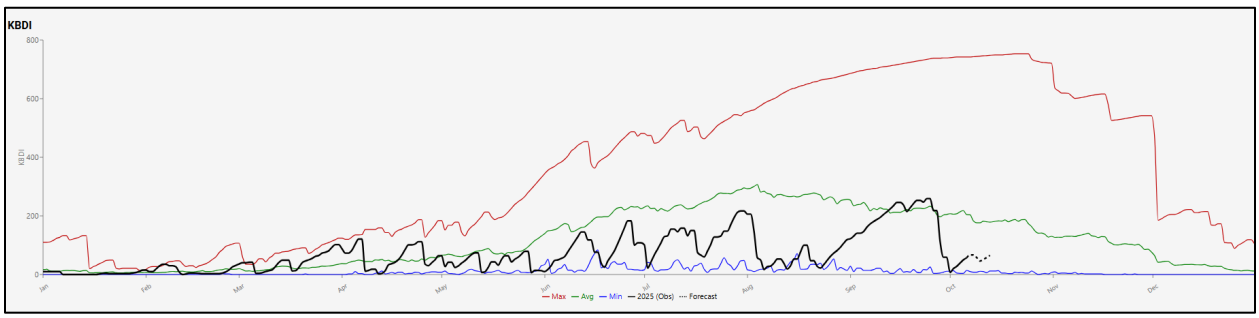


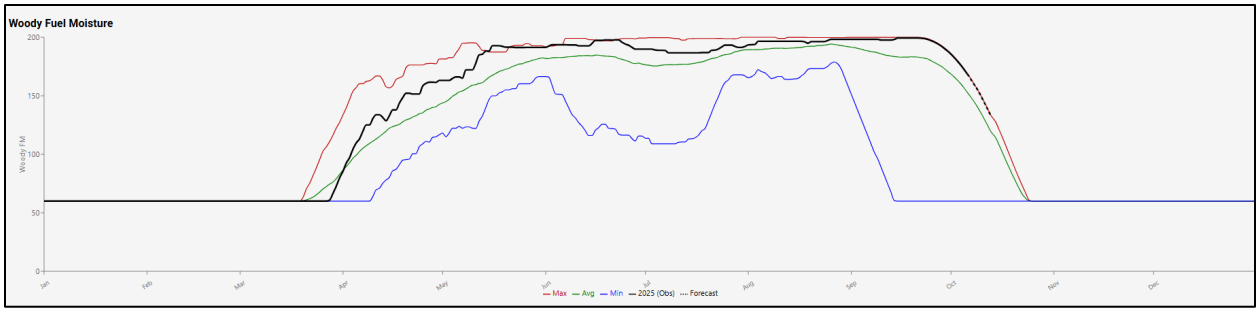


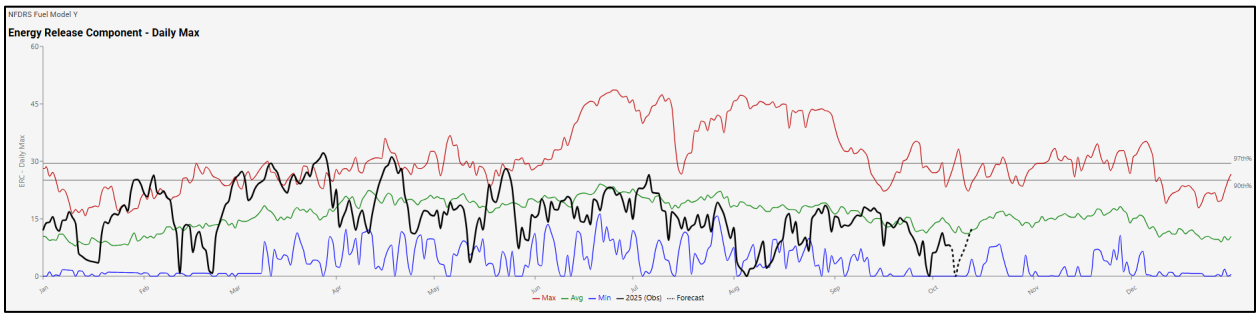


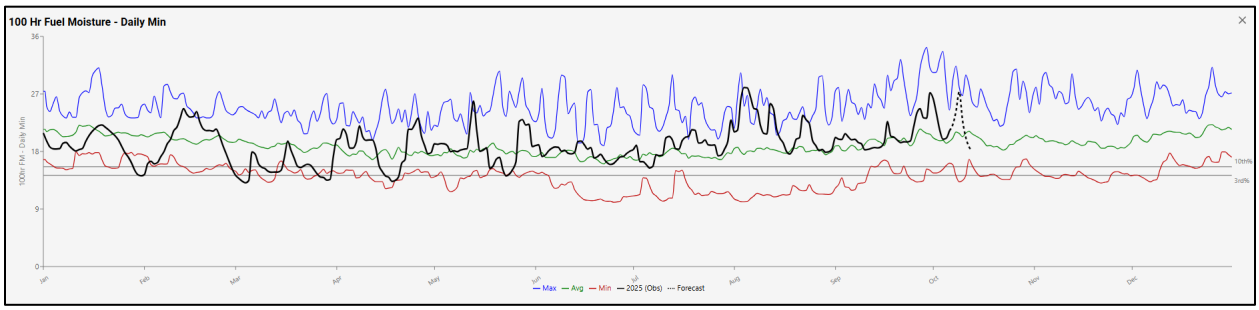


Busick RAWS (313402) – Appalachian RD, NC





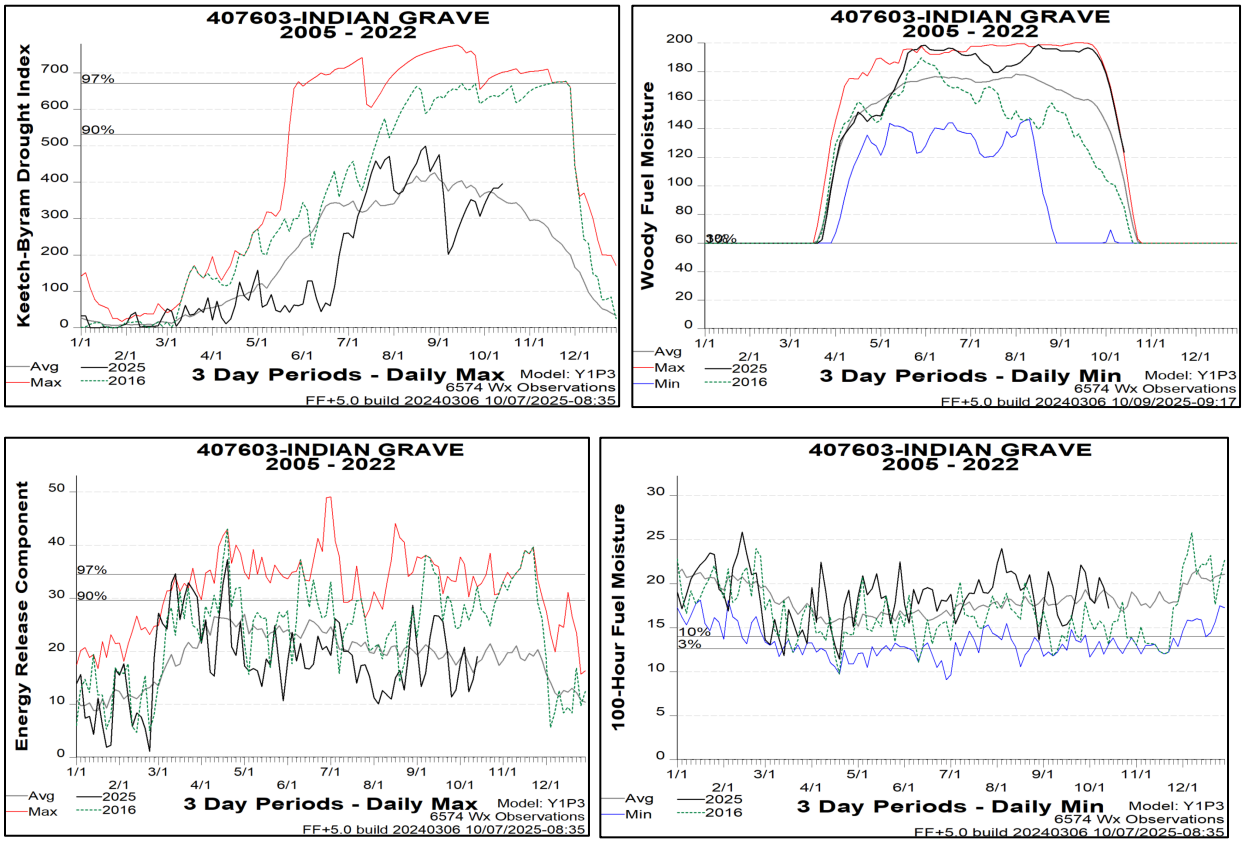




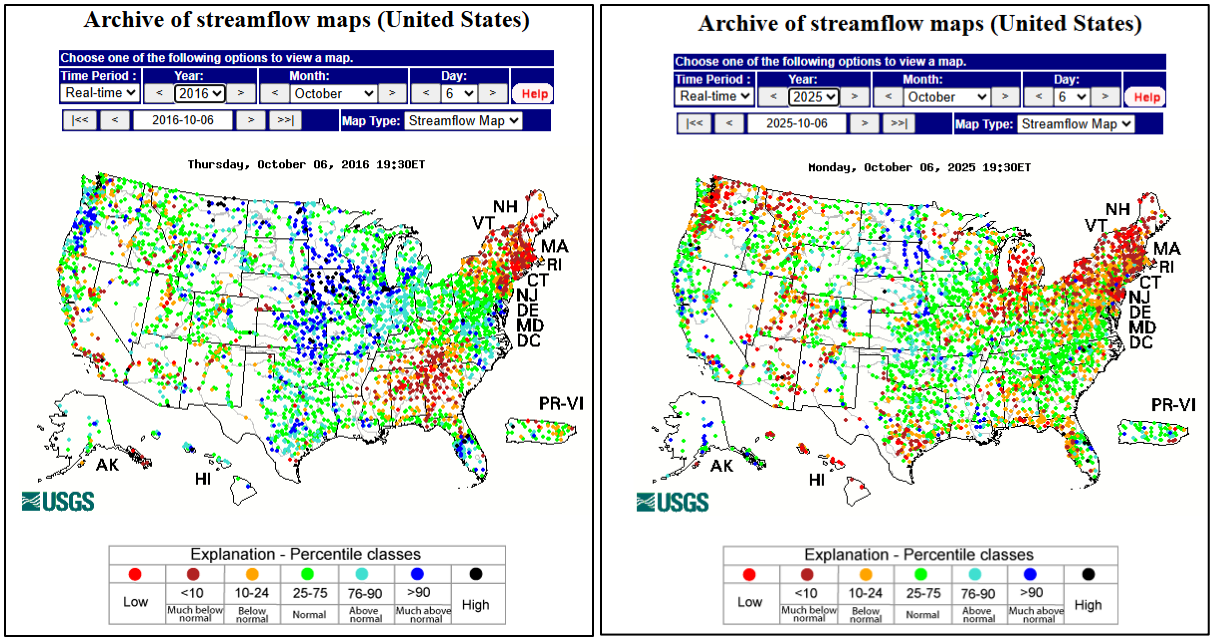
Since the Southern Apps are an historical hotspot for fall fire activity in the Southern Area and forested fuels over large portions of the Southern Apps were damaged by Hurricane Helene, custom analyses were conducted in FireFamilyPlus 5.0 (build Mar 6, 2024) using daily extremes from FEMS data to compare 2025 trends and current conditions with 2016, the most memorable fall fire season for the Southern Apps in the recent past due to a wildfire outbreak which came to be known as the "Gatlinburg Wildfires". These fires, which began in late November 2016, claimed at least 14 lives, injured close to 200 people, and damaged or destroyed over 2,000 structures.

The graphs below from Indian Grave RAWS at Great Smoky Mountains National Park are similar to the graphs previously presented from FEMS, but the average trend line is in light gray, and the 2016 trend line is a dotted green line. Fortunately, the late summer trend in fire danger appears significantly less severe in 2025 than it did in 2016. In 2016, KBDIs above the 90th percentile starting in late August were accompanied by below average woody live fuel moistures, well above average ERC-Y values, and below average 100-hour fuel moistures throughout most of the fall fire season. For comparison in 2025, KBDIs have been near or below average, woody live fuel moistures have remained well above average, ERC-Ys have fluctuated but currently near average, and 100-hour fuel moistures have tracked similarly to ERC-Y.

Indian Grave RAWS (313402) – Great Smoky Mountains NP, TN



The USGS streamflow maps provided below paint a similar picture of more favorable soil moisture and hydrological conditions coming into fall 2025 as compared to the same timeframe in 2016 ahead of a severe fall wildfire outbreak in the Southern Apps. Although these trends are optimistic coming into 2025 fall fire season in the Southern Apps, longer-term outlooks for above normal temps, below normal precipitation, and significant fire potential for the eastern side of the Southern Apps according to NIFC Predictive Services will require monitoring of these indices and conditions well into the fall and perhaps winter. This is particularly true in forested areas impacted by Hurricane Helene in late September 2024 that are now wide swaths of blown down and damaged canopy fuels that have become more available after a year of curing.

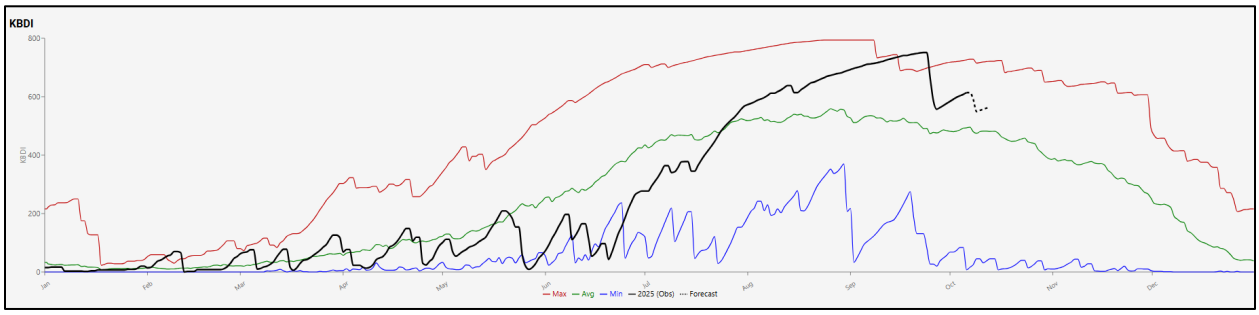


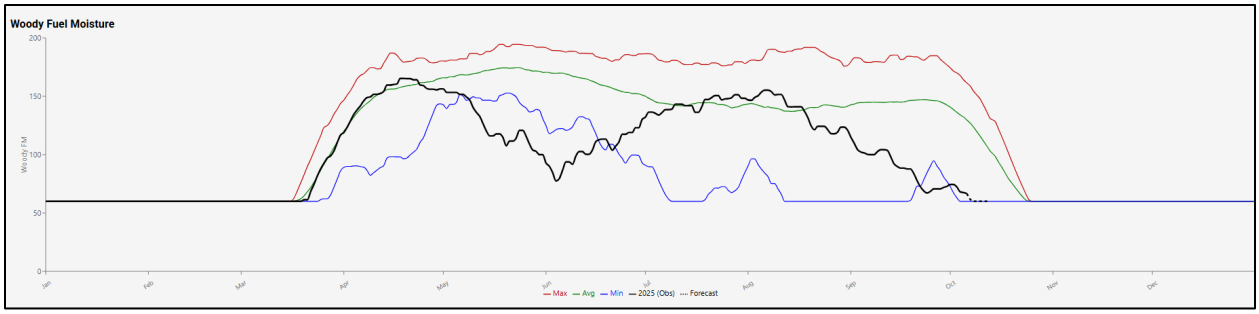
USGS stream flow maps for October 6th in 2016 compared to the same date in 2025 illustrating current streamflow levels as favorable in the Piedmont and Southern Apps, coming into Fall in comparison to the same timeframe in 2016 (https://waterwatch.usgs.gov/?id=ww_current).

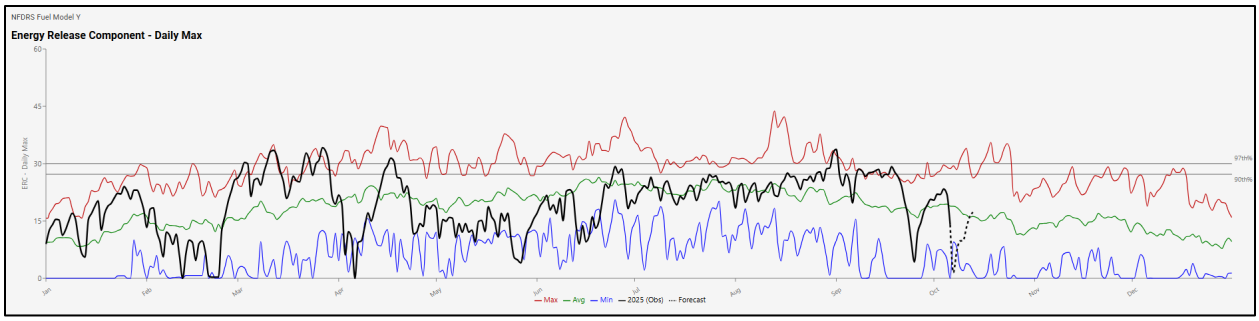
Interior Highlands

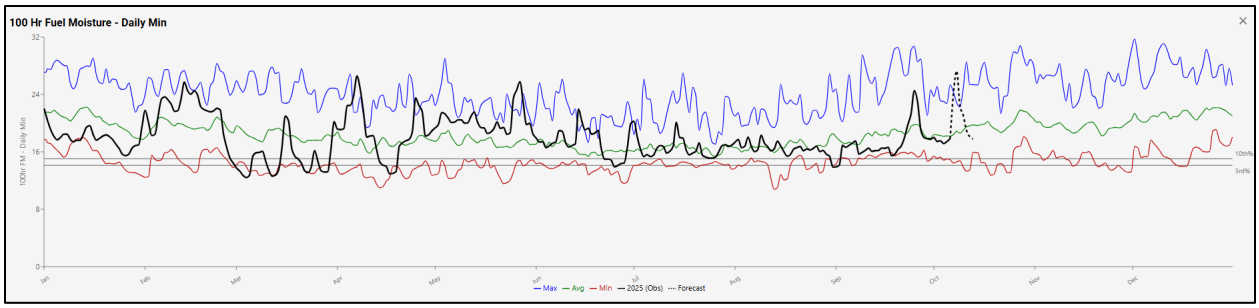
Although variable across the sub-region, the Interior Highlands began summer with normal to below average fire danger as indicated by mostly below average ERC-Ys and KBDIs and variable fuel moistures. Chickasaw SF RAWS in western Tennessee did show a dip in woody live fuel moistures in late May through mid-June, but 100-hour fuel moistures were largely above average. Fuel moistures at Jessieville RAWS in central Arkansas remained near or above normal all summer. Beginning in August, KBDIs began to rise across the Interior Highlands, along with ERC-Ys, and fuel moistures began to drop with significant improvement in live fuel moisture at Jessieville RAWS in September. Currently, KBDIs are elevated across most of the Interior Highlands except for the north and southwest corners of Arkansas and central Tennessee. ERC-Ys are near normal at both selected stations. Woody live fuel moistures at Chickasaw SF RAWS are approaching absolute minimums near 60%, while woody live fuel moisture is trending average at Jessieville RAWS.

Chickasaw SF RAWS (408001) – Western Tennessee

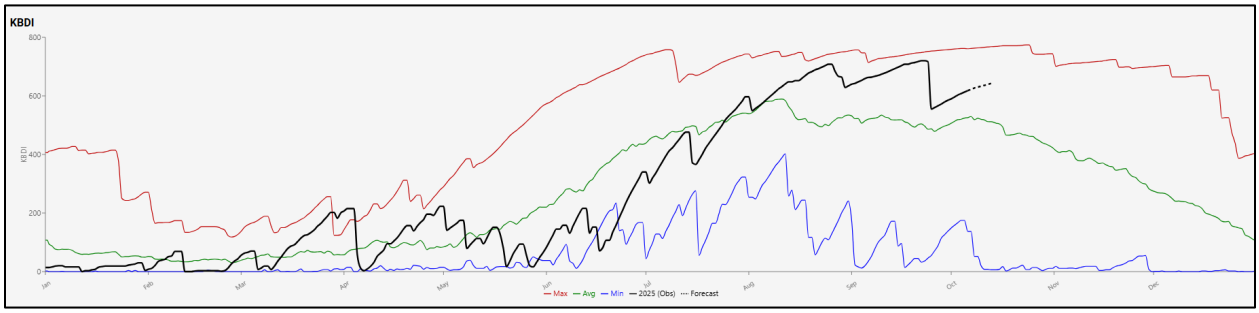


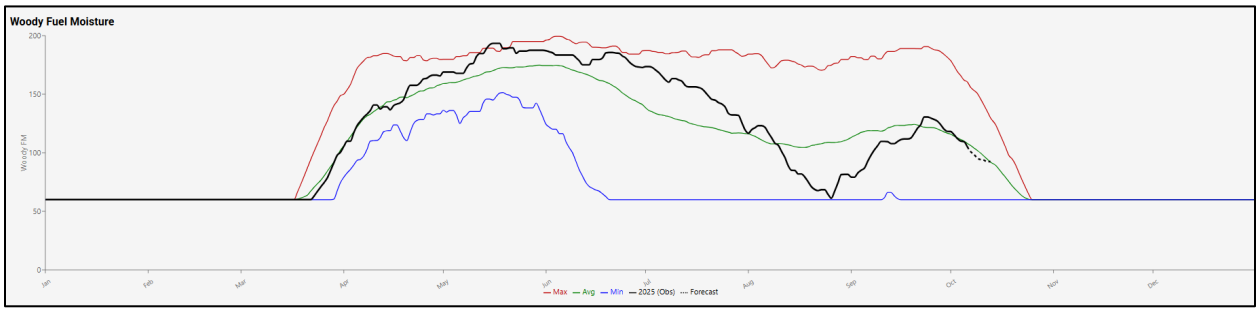


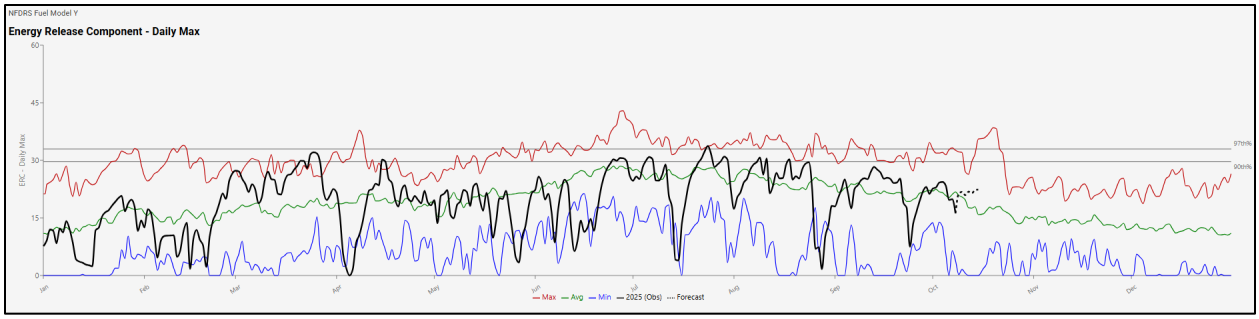


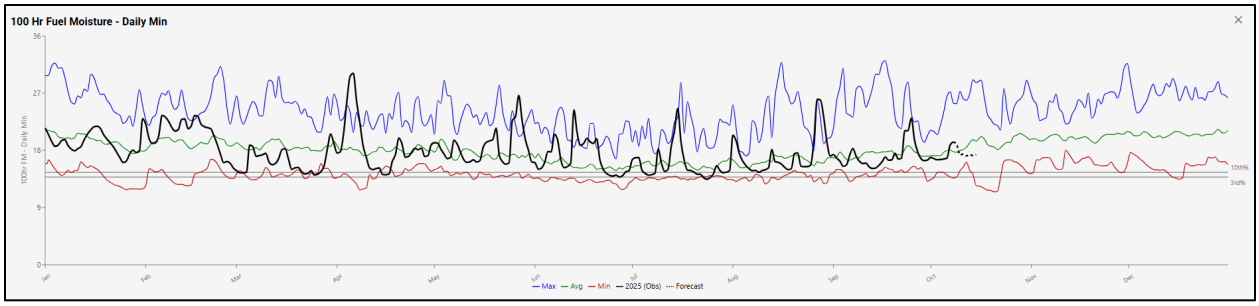


Jessieville RAWS (034802) – Ouachita NF, AR









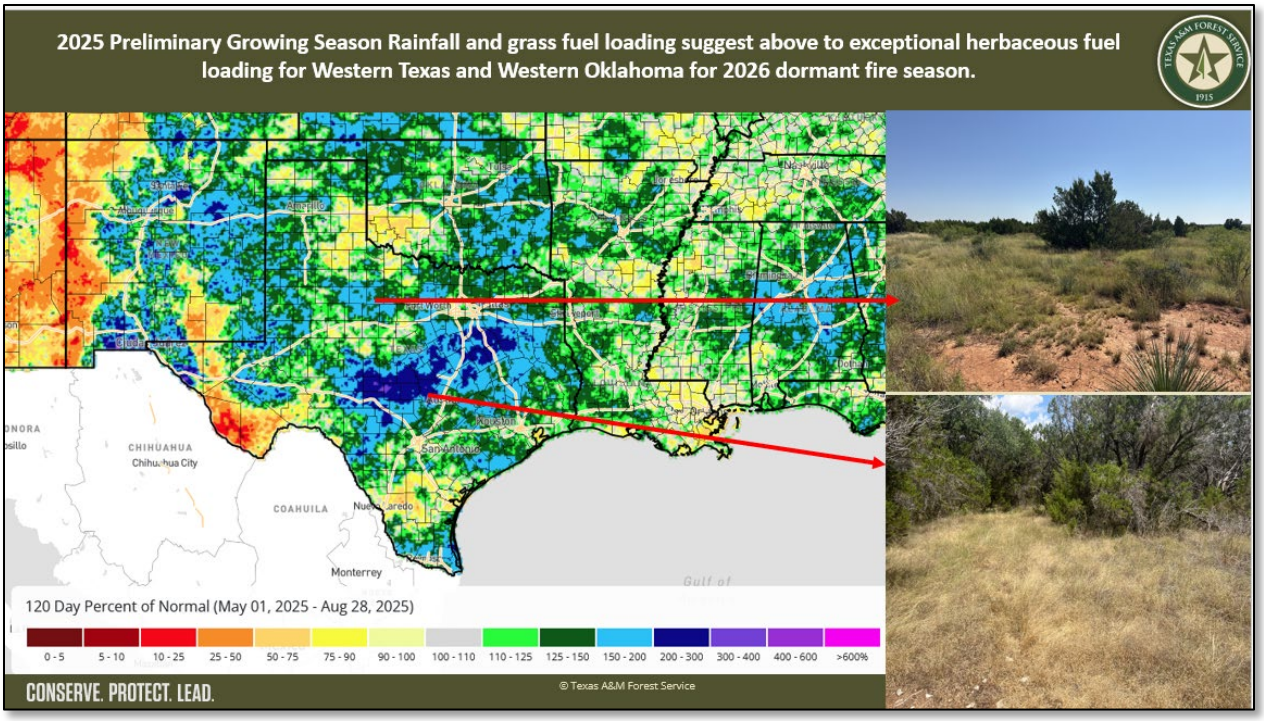
Texas/Oklahoma

The following was provided by Luke Kanclerz, Predictive Services Department Head, at Texas A&M Forest Service for assessment of fuels and fire danger in Texas:

"After an abnormally wet spring and early summer, most of Texas has pivoted to unusually dry conditions for September and early October. The Climate Prediction Center (NOAA) is forecasting the rest of October is to trend warmer and drier than normal. This trend of below normal precipitation and above normal temperatures will likely carry through at least mid-November. The epicenter of drought and underlying dryness is greatest across Central and Southeast Texas where high-risk pine timber fuel can support a large fire that has high resistance to control is exposed to a broader wind trigger surrounding a cold front passage.

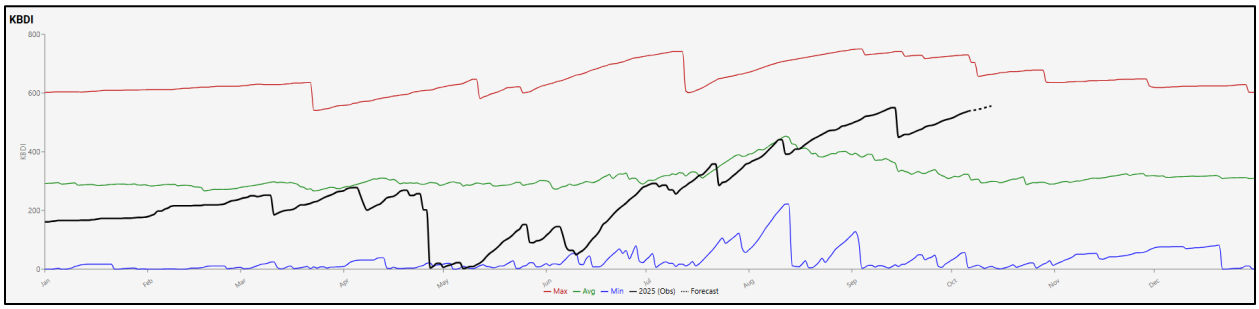
Surplus growing season rainfall (150-300% of normal between May-September) produced a robust grass crop where grass loading is characterized as above normal to exceptional west of I-35. Fire activity west of I-35 in late September and early October has shown that the high grass loading that is drought cured, can support increased fire activity, and produce fires with increased resistance to control with lower thresholds of fuel dryness and fire weather conditions.

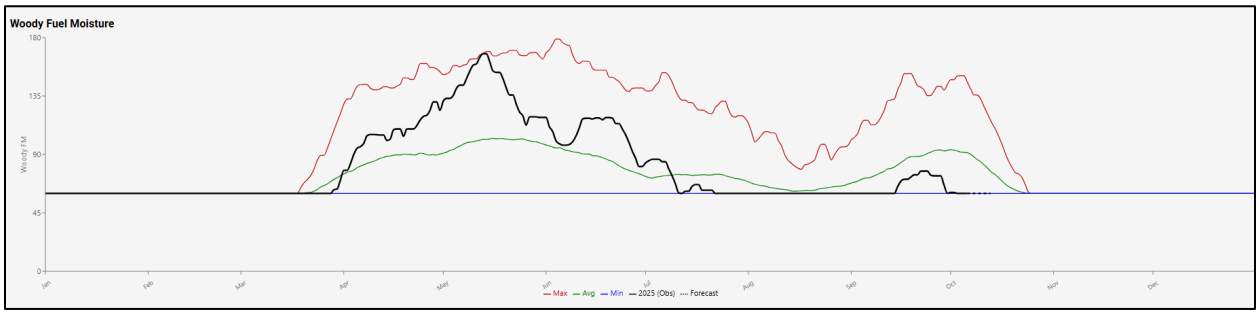
Overall, fire activity is expected to trend above normal for the eastern two-thirds of Texas through at least mid-November. Shorter days and cooler temperatures should decrease fire activity for late November and early December. An early freeze could extend an active fall fire season into December. A strong, dry cold front passage could serve as a trigger for several large fires this fall."

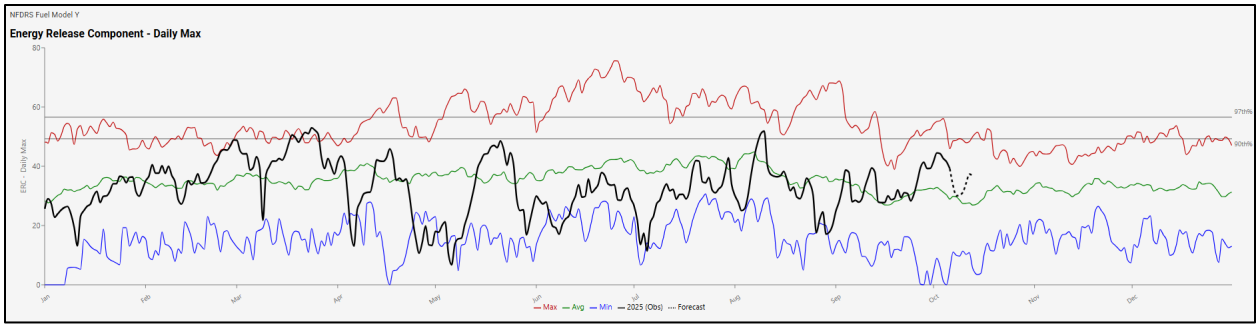


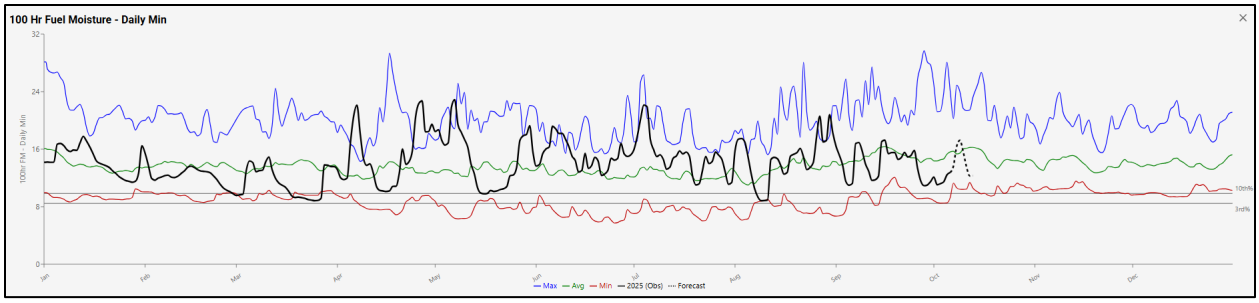
Growing season rainfall and grass fuel loading graphic courtesy of Luke Kanclerz, Texas A&M Forest Service Predictive Services.

Caprock RAWS (418901) – TX Panhandle

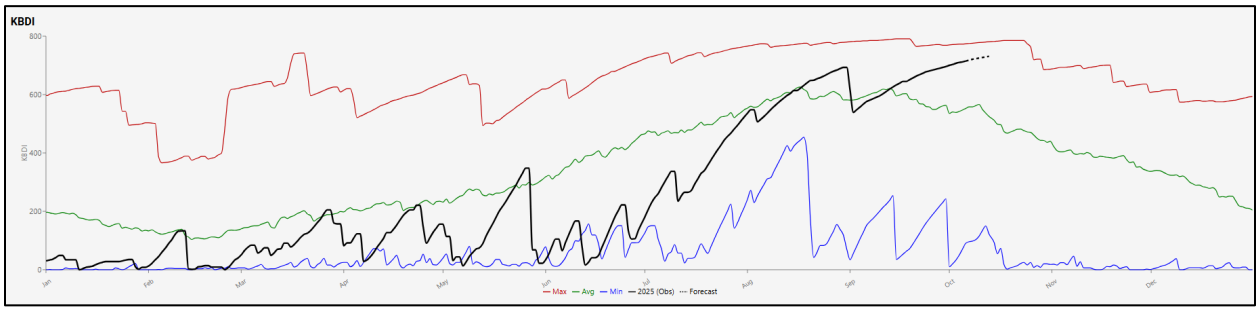


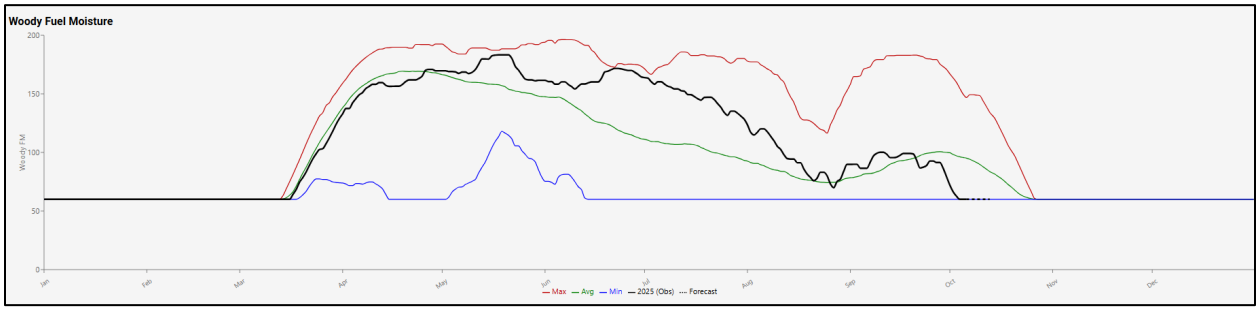


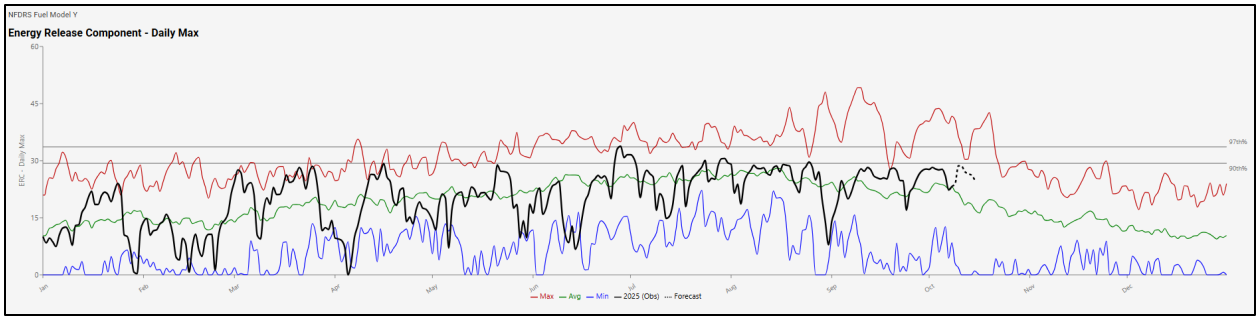


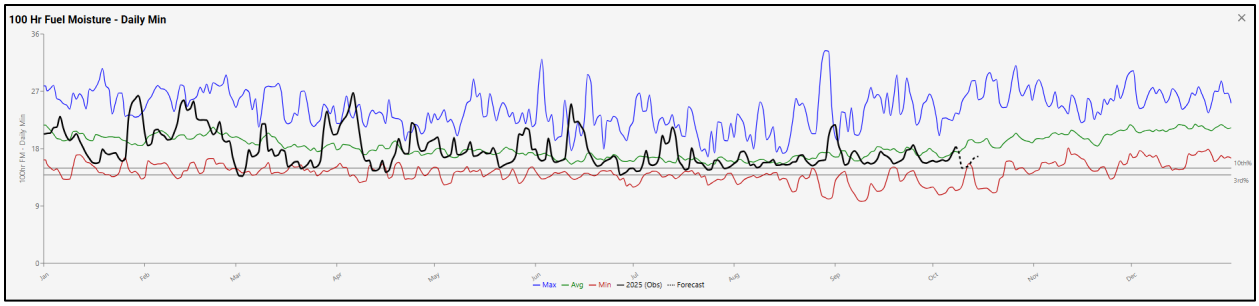


Ratcliff RAWS (413302) – Davy Crockett NF, TX

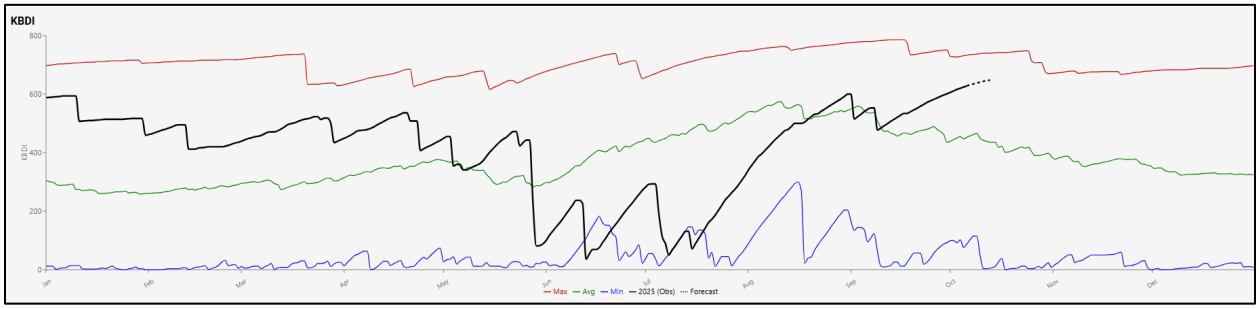


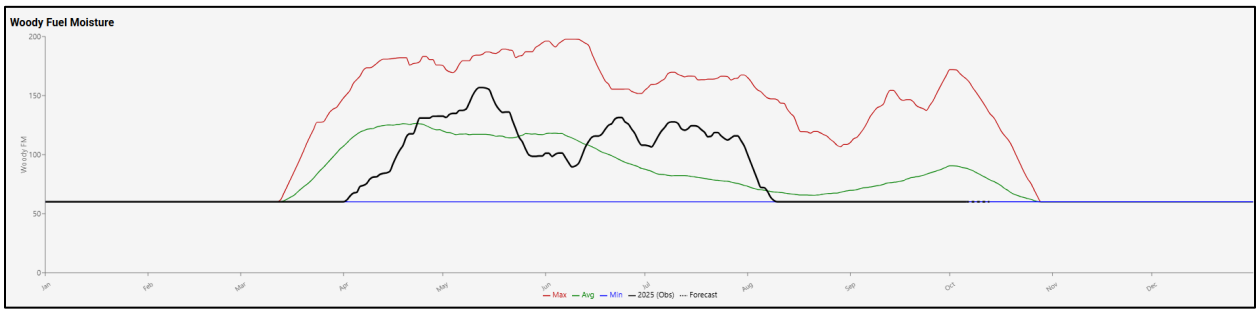


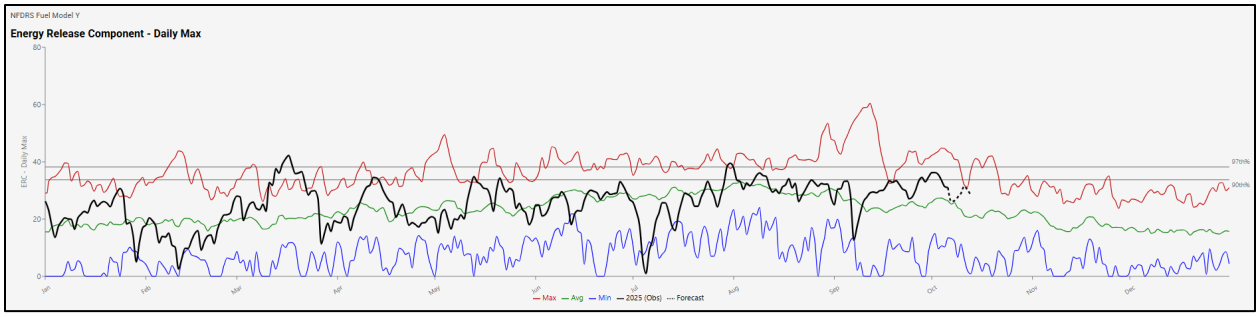


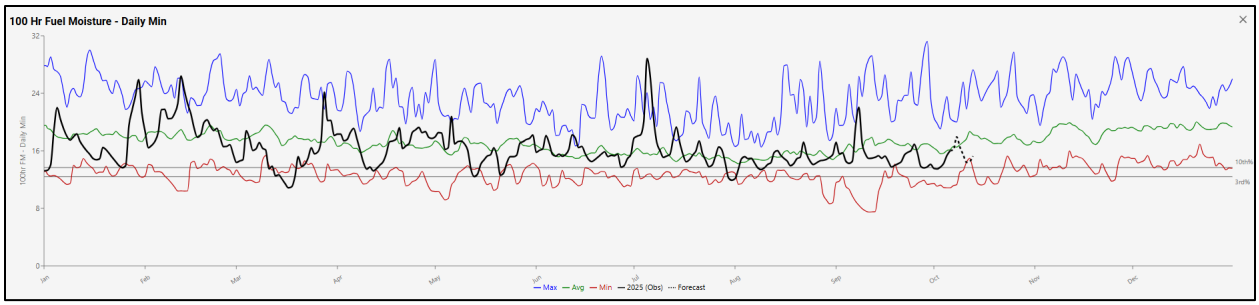


Guadalupe River SP RAWS (413302) – Central TX

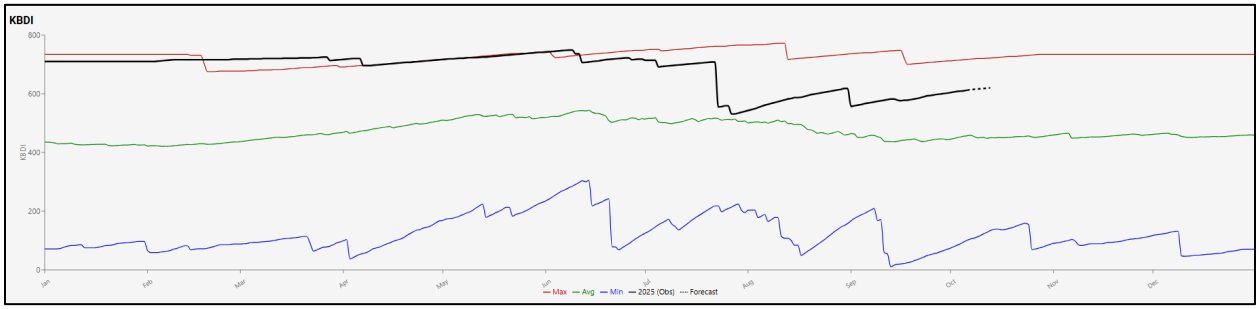


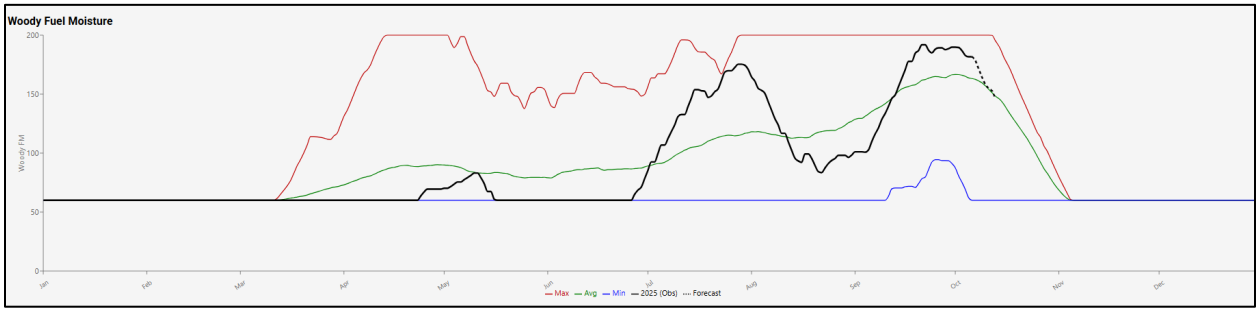


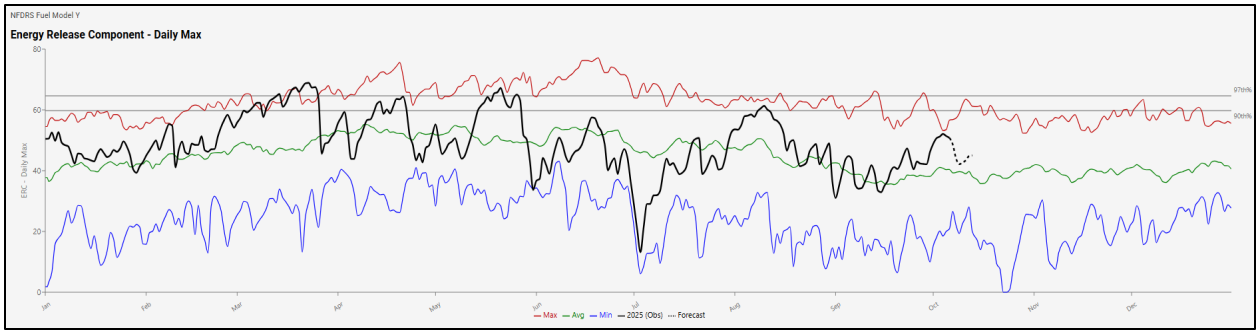


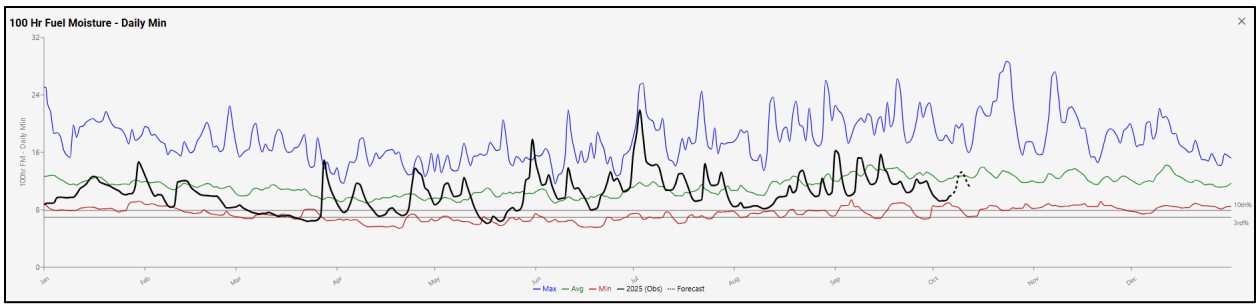


Panther Junction RAWS (417401) – Big Bend NP, TX





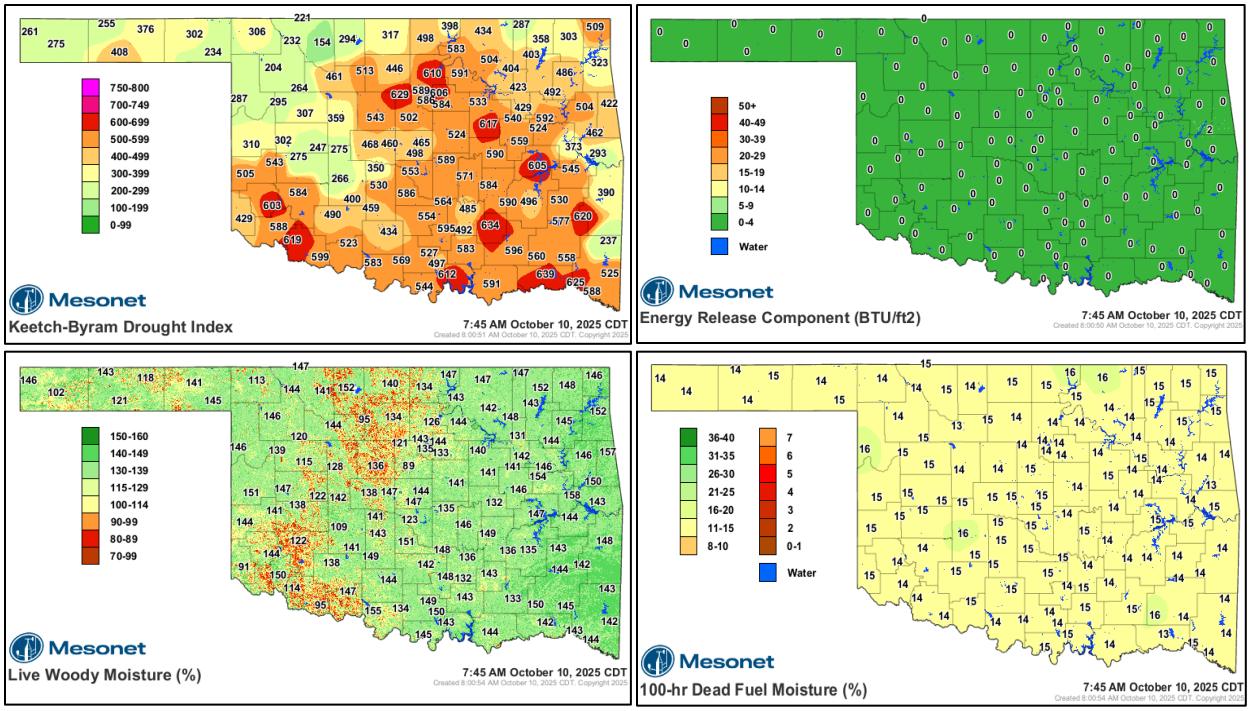




Oklahoma followed a similar pattern to Texas with above normal precipitation in early summer, contributing to increased grass loading, and then transitioned into drier than normal conditions beginning in mid-August. Much of this surplus grass and herbaceous biomass have cured within areas experiencing recent rainfall deficits. Oklahoma, like Texas, is forecast to experience warmer and drier conditions into the fall which will likely contribute to increased fire activity until cooler temperatures arrive.

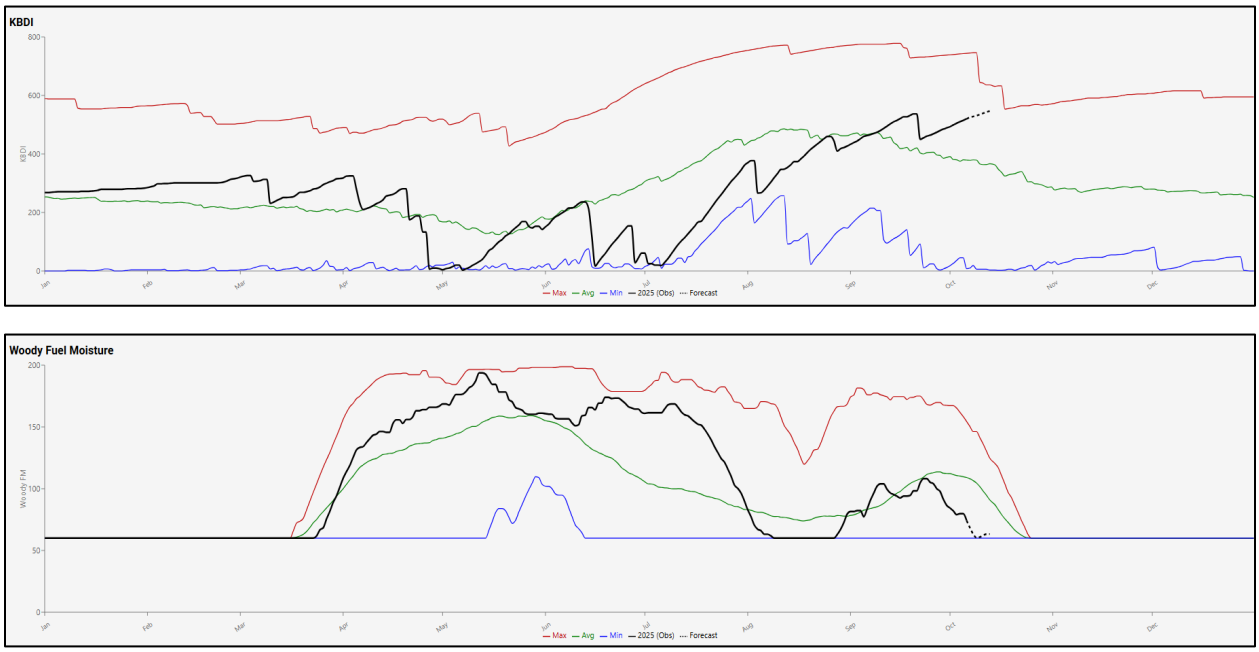
Wichita RAWS in southwestern OK depicts the wetter than normal conditions in early summer that gave way to a dry trend beginning in August accompanied by a rise in KBDIs and ERC-Ys full recovery of 100-hour fuel moistures with slight recovery in woody live fuel moisture in September.

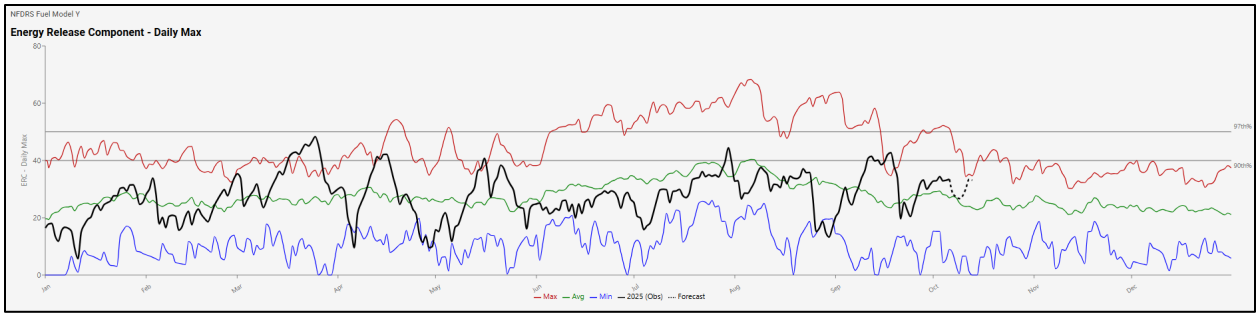
Currently, KBDIs are elevated in most of Oklahoma aside from the Panhandle and northwest portion of the state while ERCs are bottomed out. 100-hour and woody live fuel moistures are fairly moderate, but woody live fuel moistures are pointing to signs of vegetative drought stress in north-central and southwestern portions of the state.

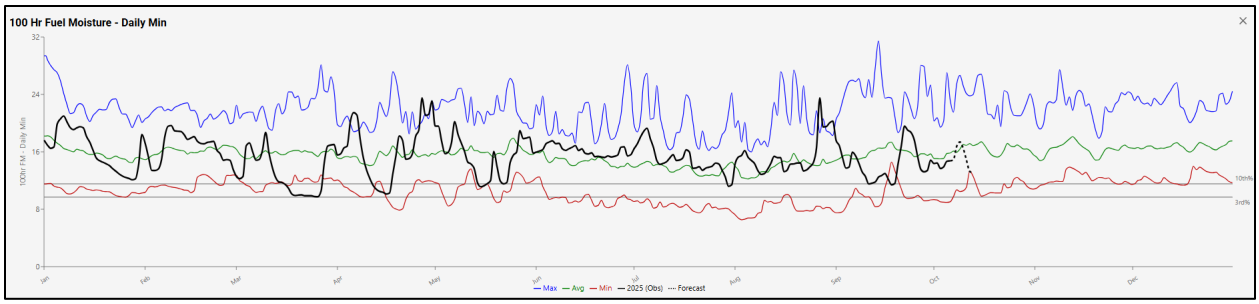


KBDI, ERC, live woody moisture and 100-hour dead fuel moisture maps taken from Mesonet website. The Mesonet network we designed and implemented through a joint effort of University of Oklahoma and Oklahoma State University. (https://www.mesonet.org/).

Wichita RAWS (345801) – Wichita Mountains NWR, OK





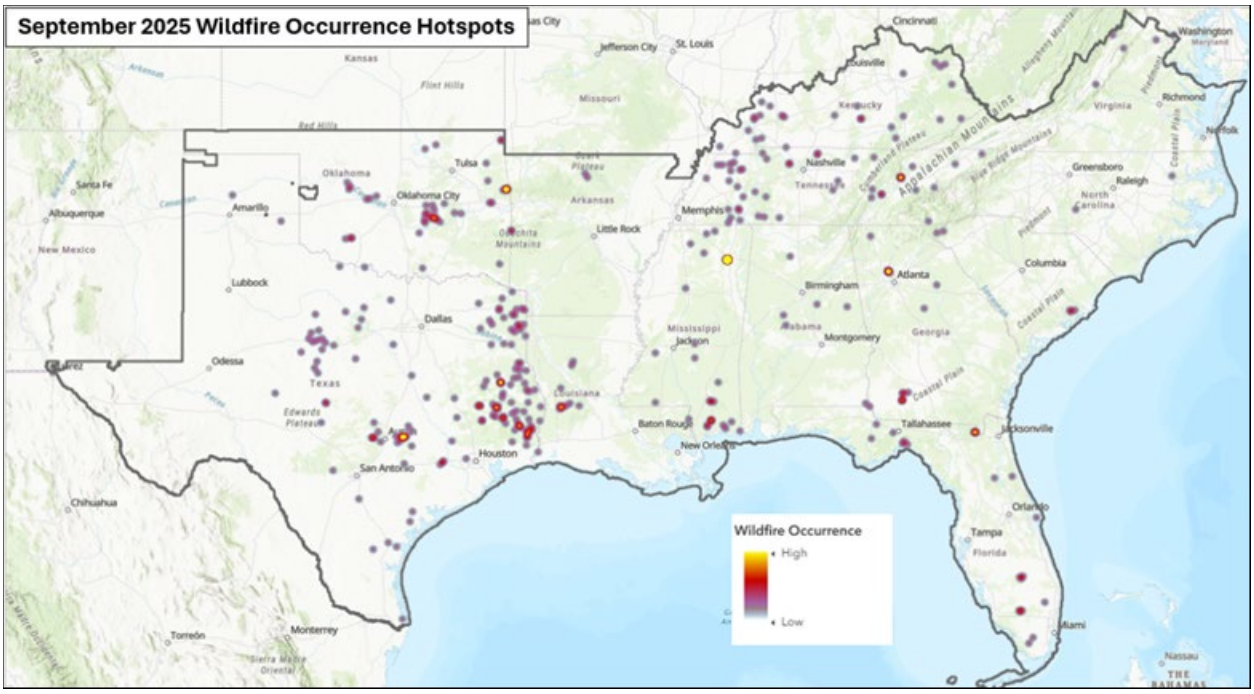


Fire Occurrence

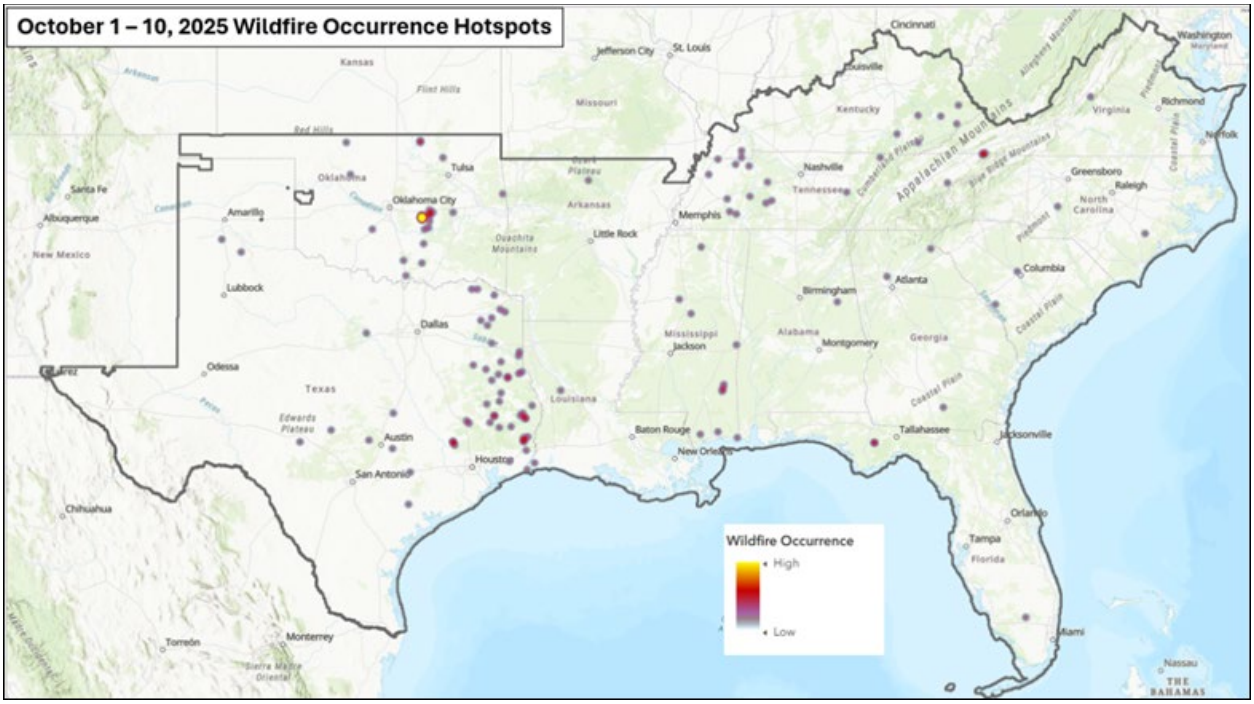
Late Summer and Early Fall Wildfire Activity

The maps below represent wildfire occurrence hotspots across the Southern Area in September and early October 2025 based on fire occurrence data from the Wildland Fire Interagency Geospatial Services (WFIGS) hosted in NIFC ArcGIS Online (AGOL). This service contains all wildland fire incidents from the Integrated Reporting of Wildland Fire Information (IRWIN) only, so it does not account for state and other fires not reported in IRWIN. Additionally, these data only account for fire occurrence and do not consider fire size.

According to the National Significant Wildland Fire Potential Outlook from NIFC Predictive Services for October – January 2025, "persistent dryness in much of the eastern US in September resulted in an unusual modest increase in initial attack activity in portions of the Eastern and Southern Areas." By September, fire activity in South Florida had largely subsided from elevated levels in June/July, while moderate fire activity continued along Florida and Mississippi portions of the Gulf Coast, expanded in Kentucky, and remained steady in portions of Tennessee, Oklahoma, and Texas.



Coming into October, fire activity generally declined across most of the eastern portion of the Southern Area due to a widespread pattern of scattered precipitation, cloudy/humid conditions, and lighter winds. Fire occurrence in Texas and Oklahoma remained steady as the western portion of the region remained dry and warm.



Historic Seasonal Wildfire Activity

The following seasonal fire density map was created in ArcGIS Online by Mike Keys, USFS Fire Planner for National Forests in Florida, using ESRI's Calculate Density tool which calculates kernel density of features utilizing a specified search radius. The datasets used included a combination of the Spatial wildfire occurrence data for the United States, 1992-2020 [FPA_FOD_20221014] (6th Edition) (Short, 2022) for fire years 1992-2020 and INFORM fire incident records for 2021-September 7, 2023, filtered to fires of 100 acres or greater. For the large summer fires, records were further filtered to 8,909 fire location points occurring within the months of May, June, July, August and September, spanning May 1, 1992 – Sept 7, 2023. For the large fall fires, records were filtered to 4,519 fire location points occurring within the months of October, November, and December, spanning October 1, 1992 – December 31, 2022. The density analyses were run with a search radius of 50 miles for both the spring and fall density maps and the resulting values, density of fires per square mile over the time period, were classified into 7 categories using natural breaks (Jenks) Of these, the first category was intentionally not displayed in order to visually focus on the next six highest density categories. It should be noted that the resulting density layer class values offer a representative index of large fire frequency by season, but the categories themselves do not directly express actual values in terms of fires per square mile.

The occurrence and proximity of large wildfires across the Geographic Area typically progresses from the states within the Coastal Plain, Interior Plains, and Highlands in the summer months, to the Appalachian Mountains through the fall. Large fire occurrence remains fairly high in eastern Oklahoma and western Arkansas in the fall as well. The following map displays fire season progression from early-May to the end of December, using data compiled from 1992-2020. It is evident that while large fires have historically occurred anywhere in the Geographic Area, in both the summer and fall seasons, the bulk density of these large fire footprints follows this summer to fall progression.

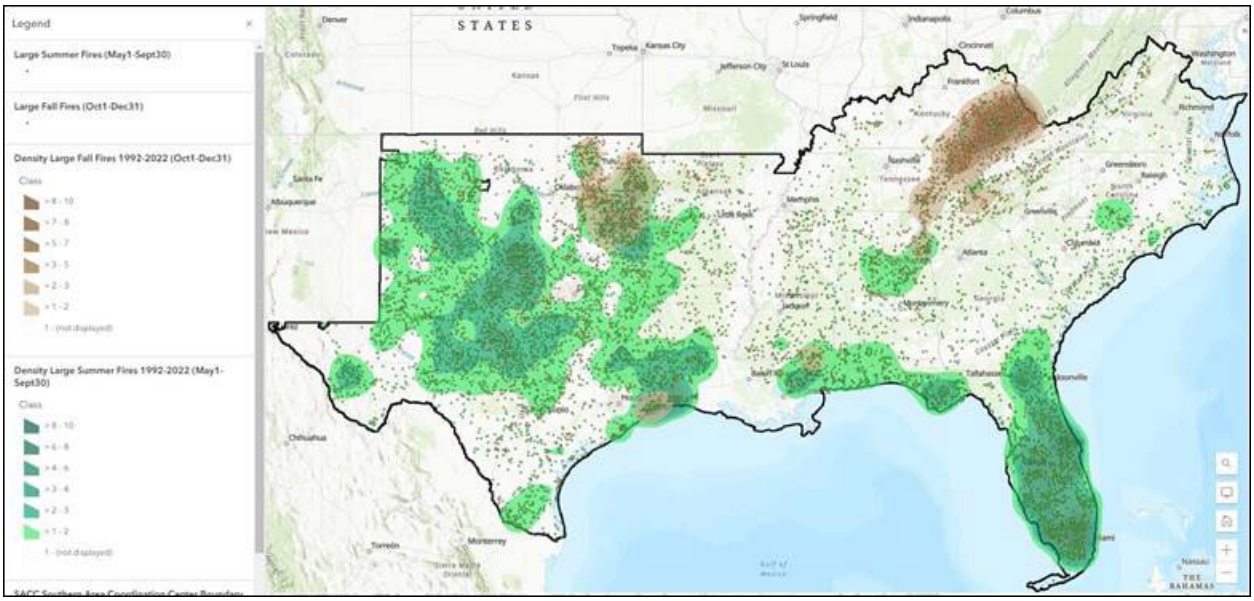
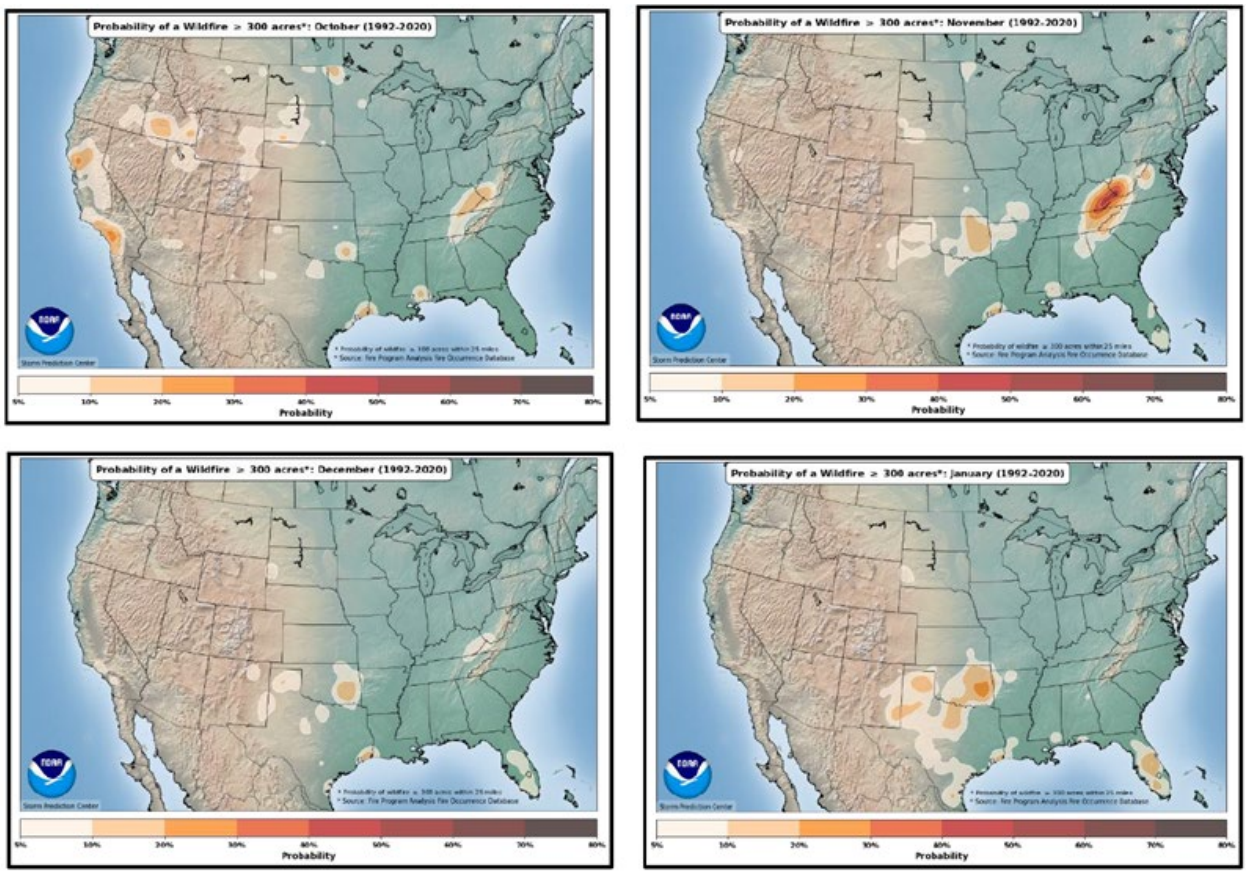


Figure 25: Map of Southern Area historical summer vs. fall large fire occurrence density (1992-2022, courtesy of Mike Keys, NFs in FL).

Similar to the map above, the following maps from the NOAA Storm Prediction Center display the probability of a wildfire >= 300 acres by month for October - January (1992-2020). Historically, wildfire activity in the Southern Area begins with increased probability across the Southern Apps, southeast Oklahoma, portions of Texas, and coastal Louisiana/Mississippi in October, expands in area and with higher probabilities in Oklahoma and peaks the Southern Apps in November. Wildfire occurrence dissipates in the Southern Apps with colder weather in December while persisting in eastern Oklahoma and beginning to appear in South Florida with transition into the dry season. January sees similar probability of wildfire occurrence to December with activity expanding in Oklahoma, Texas, and Florida.



Monthly wildfire occurrence hotspot maps for fires greater than or equal to 300 acres in size within 25 miles. Fire severity can not be inferred from this analysis (based on 1992-2020 FPA-FOD data) provided by the NOAA Storm Prediction Center (https://www.spc.noaa.gov/new/FWclimo/climo.php?parm=300ac).

Predictions concerning fall fire occurrence are uncertain, but we can look to long-term historical trends coupled with current conditions to make inferences.

Historically, early fall coincides with a substantial decrease in fire activity throughout Texas, Arkansas, and Louisiana but a corresponding uptick in activity from Mississippi eastward into the Southern Appalachians. The Southern Area fall fire season is typically dominated by many wildfire starts in the Cumberland Mountains of eastern Kentucky and Tennessee, portions of southern Mississippi and the Texas Gulf Coast and a broad swath of eastern Oklahoma.

Despite a typical decrease in overall activity, Texas leads the region in the number of starts during much of the fall most years. Oklahoma has the highest average fire size in the fall historically, but Mississippi, Kentucky and Virginia are frequently close behind in these categories.

[Charts were developed from a combination of the Spatial wildfire occurrence data for the United States, 1992-2020 [FPA_FOD_20221014] (6th Edition) (Short, 2022) for fire years 1992-2020 and INFORM fire incident records for 2021-September 7, 2023, where applicable. Because of missing records for fires under 100 acres in the INFORM dataset, periods of analysis excluded

those years when indicated in the chart titles. In all cases, records were filtered to only include fires of 1 acre or greater.]

The chart below shows monthly cumulative fires (over 1 acre) by year between 1992 and 2020 to illustrate years and months with elevated fire activity across the Southern Area. Elevated August fire occurrence was followed by high fire occurrence in either September or October, or both, in some years including 1999, 2000, and 2011. Conversely, fire activity in August of 2016 was low prior to an active fall fire season in October and November.

2017-2020 did not contain any of the top 5 monthly records and activity across the Southern area appeared to enter a multi-year lull, change in activity from 2021-2023 cannot be compared to past periods in the Fire Occurrence Dataset because of incomplete entries in the INFORM database.

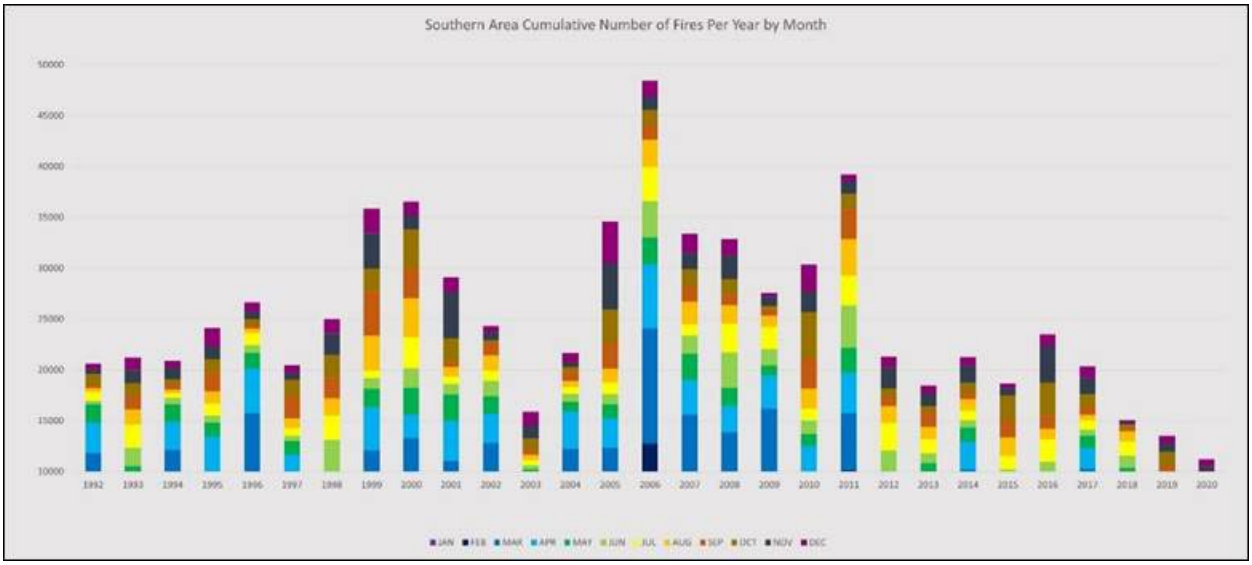


Figure 21: Southern Area cumulative number of fires per year by month. Examining fire activity trends during fall months in past years may inform expectations for fire occurrence in fall 2025 (Courtesy of Mike Keys, NFs in FL).

On an annual basis, the Southern Area experiences a weak bimodal pattern in fire occurrence with the largest peak during February through March, followed by a decline in all states other than Florida into May. The early summer is dominated by declining but still numerous Florida fires and increasing Texas fires. As the peak of the Texas summer fire season wanes, the fall fire season returns, sweeping eastward with time from Mississippi into the Cumberland Plateau and to a lesser extent the east side of the Appalachians through the Carolinas.

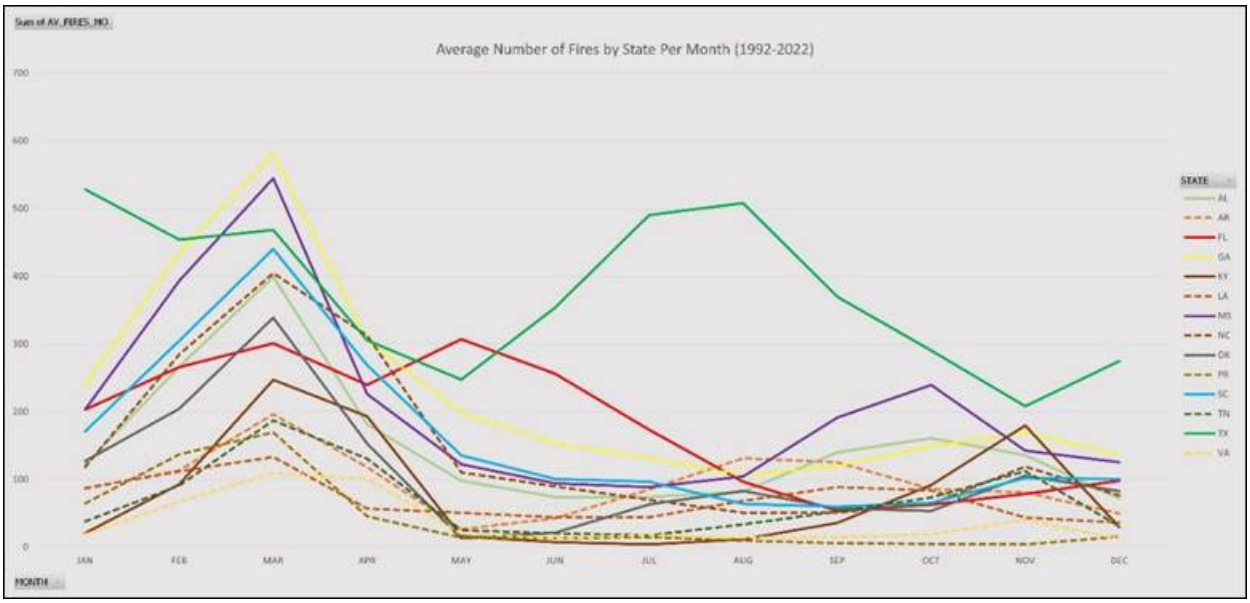


Figure 22: Average number of fires by state per month for all months (1992-2022, courtesy of Mike Keys, NFs in FL).

During the early fall, fires per month (1 acre or larger) are typically on the decline, but still significant in Texas until rebounding between Nov-Dec. Mississippi often has the most active early fall season in the region, peaking in October, followed by Georgia and Kentucky in November with lesser peaks for Tennessee, North Carolina, and Oklahoma, all of which decline after November 1st. The drought years of 2000, 2006, and 2011 were preceded by dry fall fire seasons in 1999, 2005, and 2010 respectively. This pattern did not repeat in the last active fall fire season on record in 2016.

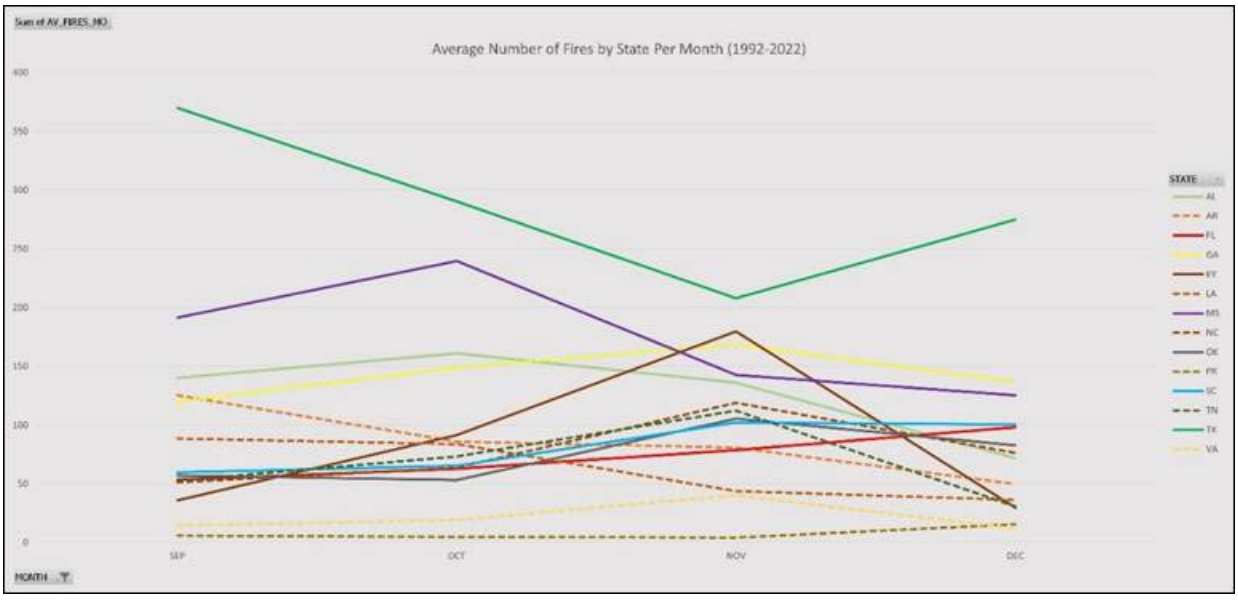


Figure 23: Average number of fires by state per month in the fall (1992-2022, courtesy of Mike Keys, NFs in FL).

Appendix A. Critical Fire Weather and Environmental Conditions

The four critical weather elements that produce extreme fire behavior are **low relative humidity, strong surface wind, unstable air, and drought**. The critical fire weather patterns that support these conditions can be separated into two primary categories: those that produce strong surface winds, and those that produce atmospheric instability. In both cases, an unusually dry air mass for the region and season must also occur. In brush and timber fuels, drought becomes an important precursor by increasing fuel availability. It's necessary for firefighters to recognize the conditions that contribute to large fire growth because critical fire weather patterns may not be identified by name in the weather forecast.

Drought

Wildfires are complex events and influenced by multiple factors, including weather, fuel availability, and topography. However, one of the most critical drivers of wildfire behavior is drought. Drought affects the moisture content of dead fuel, live vegetation, and soil making the landscape more susceptible to ignition and more challenging to control once a fire begins. This relationship between drought and wildfire danger is particularly important for fire managers, as it can inform fire preparedness, response strategies, and resource allocation.

Because drought can significantly alter the fire environment, monitoring drought conditions is an essential part of fire management. Drought indices provide a quantitative way to assess drought severity, helping fire managers anticipate potential fire risks and allocate resources accordingly. However, not all drought indices are created equal, and understanding their specific applications is critical for accurate fire prediction.

Key Drought Indicators

There are two classes of drought indices, Timescale Aggregated and Point-in-Time, represent different approaches to understanding drought conditions based on temporal flexibility. Time-scale aggregated indices, such as the Evaporative Demand Drought Index (EDDI) and Standardized Precipitation Index (SPI), allow for analysis over different periods (e.g., weeks to months), offering insights into how short- and long-term conditions develop and evolve. These indices are particularly useful for monitoring trends over time, such as identifying "flash droughts" or prolonged dry spells that may impact wildfire risk, agriculture, or water resources differently based on the duration of drought stress. In contrast, point-in-time indices, like the U.S. Drought Monitor (USDM), provide a snapshot of drought conditions at a specific moment, combining multiple data sources for a comprehensive current assessment. The time scale of an index is crucial, as short-term indicators can signal emerging risks like wildfire danger, while longer-term averages may highlight broader, more persistent drought patterns that influence long-term planning. Understanding the appropriate timeframe for each index helps tailor drought assessments to specific risks and decision-making needs.

Timescale Aggregated

1. **Precipitation Anomalies – Percent of Normal**
    a. Lack of rainfall and days since rain are proven indicators of fire danger.
    b. Season and other factors are needed to interpret the impact of rainfall deficits or percent of normal.
    c. Rainfall deficit amounts can provide perspective and provide how much precipitation is required to return to normal.
2. **Standardized Precipitation Index (SPI)**
    a. Evaluates precipitation deficits over various time scales.
    b. Where SPI considers precipitation only, SPEI or Standardized Precipitation Evapotranspiration Index is precipitation minus potential evaporation.
3. **Evaporative Demand Drought Index (EDDI)**
    a. Measures atmospheric moisture demand or thirst of the atmosphere rather than rainfall.
    b. Useful for detecting flash droughts for early drought warning (2–4-week time frame).
4. **Vapor Pressure Deficit (VPD)**
    a. Unlike SPEI or EDDI, which rely on precipitation and evapotranspiration balances, VPD is a direct measure of atmospheric dryness representing the difference between saturated and actual water vapor pressure in the air.
    b. VPD is calculated using temperature and humidity.
    c. VPD is a component of the Growing Season Index (GSI).
    d. Captures rapid (days to weeks) fluctuations in the drying power of the atmosphere.
    e. High VPD accelerates fuel moisture loss, increasing fire risk.

Point-in-Time indicators

5. **Keetch-Byram Drought Index (KBDI)**
    a. Estimates soil moisture depletion and fire risk.
    b. Responsive to precipitation and temperature changes.
    c. Best for near-term fire monitoring (1-2 weeks).
6. **Energy Release Component (ERC)**
    a. Tracks potential fire intensity based on long-term drying.
    b. Slow to change but highly indicative of fire season severity.
    c. The ERC percentiles are used as a fire danger threshold. ERC values are relative to a particular location, and the same value can mean something different in each FDRA
7. **100- and 1000-Hour Fuel Moisture**
    a. Measures how available fuels are to burn.
    b. Critical fuel moisture values can vary across the region. They're often identified on pocket cards issued for each fire danger rating area (FDRA).
8. **U.S. Drought Monitor (USDM)**
    a. Provides a broad drought classification.
    b. Useful for long-term strategic planning.

9. **Soil Moisture**
    a. Satellite-based soil moisture monitoring.
    b. Helps assess near-surface moisture availability

The **Keetch-Byram Drought Index (KBDI)** and the **U.S. Drought Monitor (USDM)** serve different purposes and operate on different timescales, which can lead to divergence, particularly in the winter months in the South. **KBDI is a short-term fire risk indicator**, measuring **surface soil moisture depletion** and its impact on wildfire potential. It responds quickly to **rainfall and temperature changes**, meaning that a single heavy rain event or a period of cool, wet weather can significantly reduce KBDI values in a matter of **days to weeks**. However, this drop does not necessarily mean that deeper moisture reserves have recovered.

In contrast, **the U.S. Drought Monitor captures long-term hydrological and ecological drought conditions,** incorporating **precipitation trends over months to years, streamflow, groundwater levels, and soil moisture at deeper depths.** Even if KBDI decreases due to short-term rain, **long-term drought conditions can persist**, keeping an area classified under **moderate to severe drought (D1–D4).** This is especially true if the preceding months were drier than normal, and deeper moisture sources—such as **subsurface soil layers and groundwater**—have not fully recharged.

The key difference in **temporal recovery** is that **KBDI can return to low levels in weeks** with consistent rain, whereas **the U.S. Drought Monitor may take months or even years** to fully reflect recovery, especially after extended dry periods. This seasonal discrepancy is common in the Southeast, where winter rainfall can temporarily lower KBDI but may not fully erase long-term drought deficits. As temperatures rise in spring and evapotranspiration increases, **KBDI can rapidly climb again**, often aligning more closely with the Drought Monitor's long-term drought classifications. This highlights the importance of using both indices together—KBDI for **short-term fire risk** and USDM for **long-term drought monitoring**—to gain a full picture of drought and wildfire potential

Fire Activity During La Niña Years in the Okefenokee National Wildlife Refuge

Historically, La Niña conditions have contributed to significant wildfire activity in the Okefenokee and surrounding areas, where prolonged dry spells heighten fire risk in wetland ecosystems. Three notable wildfires illustrate this pattern, occurring in the early green up period, during prolonged drought, when vegetation pulled the last moisture from already depleted soil:

- 2007 Bugaboo Scrub Fire – Ignited by lightning on May 5, this fire merged with another fire, ultimately consuming over 564,000 acres across Georgia and Florida, making it the largest wildfire in Georgia's history.
- 2011 Honey Prairie Fire – Also started by lightning on April 28, this fire burned approximately 309,200 acres within the Okefenokee Swamp and smoldered for nearly a year before being fully extinguished in April 2012.

- 2017 West Mims Fire – A lightning fire beginning in the south end of the refuge on April 6, this fire grew to 152,000 acres burning through never before compromised natural holding features.

These fires highlight the vulnerability of wetlands and marsh ecosystems during periods of low rainfall. While normally saturated, these areas become highly flammable when extended dry conditions lower water levels, exposing peat and organic soils that can sustain long-duration fires. In La Niña years, reduced precipitation and increased evaporation create ideal conditions for large-scale wildfires, underscoring the importance of fire management and monitoring in these sensitive landscapes

Critical Wind Events

Dry Cold Fronts and Post-Frontal Winds

One of the most dangerous fire weather scenarios in the Southeast occurs after the passage of a dry cold front. These fronts, which are most common in March and April, can bring strong, gusty winds (15–25 mph, gusts of 30–40 mph) and very low humidity (as low as 8–15%). These conditions rapidly dry fuels, particularly hardwood leaf litter, increasing wildfire potential.

1. **How It Develops:**
    a. A cold front moves through the region, displacing warm, humid air.
    b. Instead of bringing rain, the front is followed by a surge of dry, polar air with strong northwesterly or westerly winds.
    c. Relative humidity drops significantly, sometimes staying below 20% for multiple days.
2. **Fire Behavior Impact:**
    a. Rapid drying of 10-hour fuels (small branches and leaf litter) to critically low moisture levels (3–5%).
    b. Increased spotting potential and extreme fire spread due to strong post-frontal winds.
    c. A period of elevated fire danger for 24–36 hours, with lingering dryness for 4–5 days.

Upper Ridge Breakdown and Pre-Frontal Warming

Another key fire weather pattern in the Southeast involves the breakdown of an upper-level ridge, which progresses through three stages:

1. **Pre-frontal warming**: Sunny, warm, and breezy conditions lead to very low relative humidity and fuel drying.
2. **Strong winds ahead of the front**: Winds increase significantly, enhancing fire spread potential.
3. **Cold front passage:** This can be dry or produce little precipitation, failing to alleviate fire danger.

Fire activity in the Southeast often peaks during or after the third stage, when post-frontal instability, gusty winds, and low humidity combine to create critical fire conditions.

Thunderstorm Outflows and Downbursts

Springtime thunderstorms, even those that do not directly produce rainfall at the surface, can pose sudden wildfire hazards through outflow winds and downbursts. These phenomena can:

- Rapidly change wind direction and speed, making fire behavior unpredictable.
- Cause fire flank runs or sudden shifts that endanger crews and structures.
- Create erratic fire spread over a short time, making initial attack efforts more difficult.

Any precipitation aloft (virga) or nearby thunderstorm activity should be closely monitored, as it may indicate the potential for strong outflow winds near an active fire.

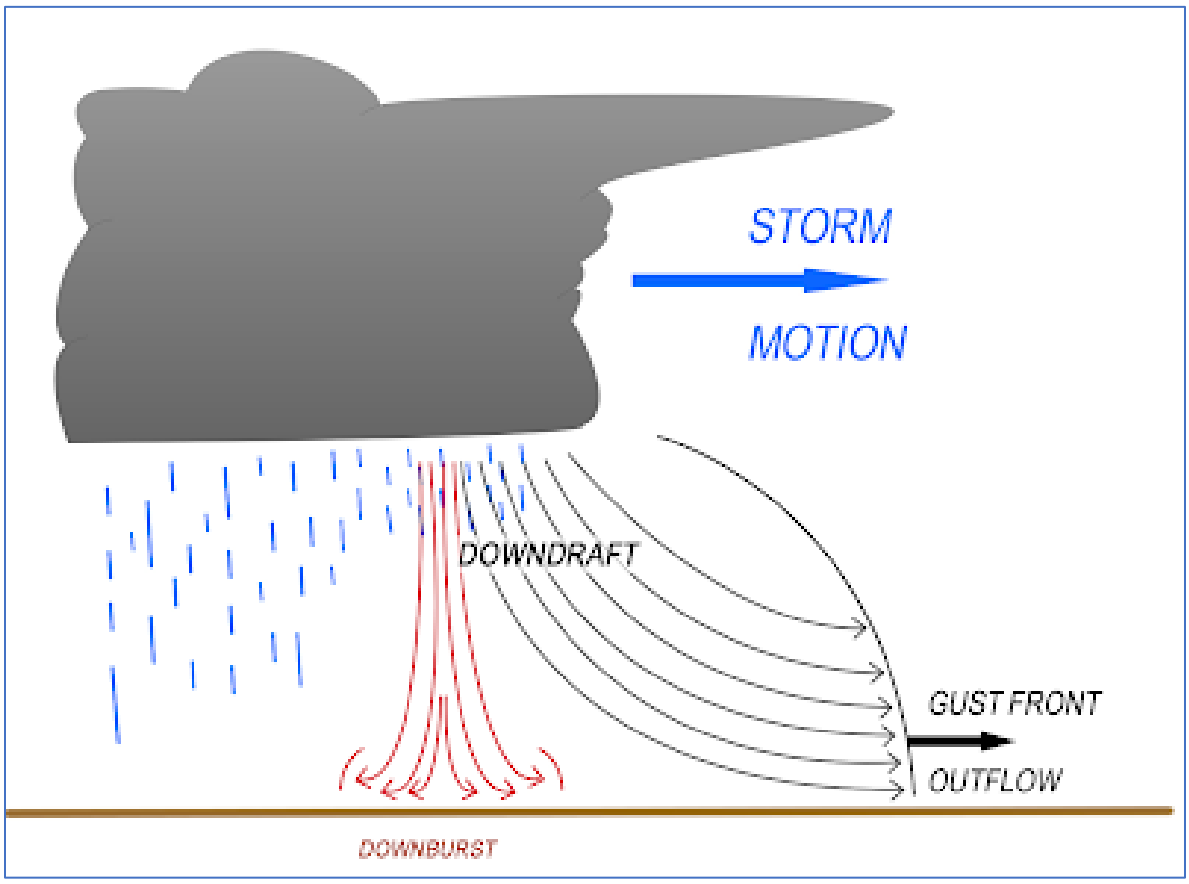


Figure 28: Illustration of wind events associated with thunderstorms

Sea Breeze Fronts and Coastal Fire Behavior

Along coastal areas and near large lakes, sea breezes can create unique fire weather challenges by:

- Bringing gusty, shifting winds as cool marine air pushes inland.
- Lowering humidity levels before the front arrives, increasing fire intensity.
- Occurring during the warmest and driest part of the day, when fuels are most receptive to ignition.

In areas like Florida, where sea breezes can converge from both coasts, complex wind interactions can lead to erratic fire spread and sudden changes in fire intensity.

Hot, Dry, and Unstable Events

Periods of above-normal temperatures, strong surface heating, and atmospheric instability can also contribute to rapid wildfire growth, even without strong winds.

- Key Characteristics:
    - Strong mid-level dry air intrusions, leading to critically low humidity (single digits possible).
    - Formation of heat bubbles, which destabilize the atmosphere and allow surface fires to transition into crown fires.
    - High temperatures combined with deep vertical mixing, leading to unexpectedly high fire intensity and rapid rates of spread.

These conditions are particularly dangerous because fires can exhibit extreme behavior even in the absence of high surface winds.

Additional Fire Danger and Fire Weather References

Texas A&M Forest Service

Predictive Services: Offers daily fire danger forecasts, fuel dryness maps, and other predictive services.
TICC
Texas Fire Potential Update: Provides regular updates on fire potential across the state.
texas_fire_potential_update.pdf

Oklahoma Forestry Services

Fire Weather and Fuels Conditions: Delivers current fire weather forecasts and fuel condition reports.
Fire Weather and Fuel Conditions – ODAFF
Oklahoma Mesonet Portal: A collaborative project that offers real-time weather data, including fire weather parameters.
Home | Mesonet

North Carolina Forest Service

Fire Weather: Provides fire weather forecasts and related information.
N.C. Forest Service - Fire Weather Reports | NC Agriculture
Fire Weather Intelligence Portal: An interactive platform offering detailed fire weather data.
Fire Weather Intelligence Portal

Florida Department of Agriculture and Consumer Services

Wildland Fire: Shares information on current wildfires and fire management.
Florida Forest Service Reporting System
Fire Weather Outlook: Offers forecasts and outlooks pertinent to fire weather conditions.
Forecasts / Fire Weather / Wildland Fire / Forest & Wildfire / Home - Florida Department of Agriculture & Consumer Services

South Carolina Forestry Commission

Fire and Burning Information: Provides guidelines and information on safe burning practices.
Fire & Burning - South Carolina Forestry Commission
Current Wildfires: Updates on active wildfires within the state.
South Carolina Current Wildfires

Mississippi Forestry Commission

Fire Weather: Offers fire weather forecasts and related resources.
Fire Weather - Mississippi Forestry Commission

Louisiana Department of Agriculture and Forestry

Daily Fire Weather: Provides daily updates on fire weather conditions.
Fire conditions and burn bans | Louisiana Department of Agriculture and Forestry
Louisiana Current Wildfires

Kentucky Energy and Environment Cabinet

Wildland Fire Management: Shares information on fire management practices and current conditions.
Wildland Fire Management - Kentucky Energy and Environment Cabinet

Georgia Forestry Commission

Fire Weather: Provides area-specific fire weather forecasts and related tools.
gatrees.org
Fire Weather Forecast: Offers detailed forecasts and maps for fire weather conditions.
Fire Weather

Virginia Department of Forestry

Wildfire Information: Shares updates on current fire conditions and safety guidelines.
Wildfire in Virginia : Virginia Department of Forestry
Virginia Current Wildfires

Arkansas Department of Agriculture – Forestry Division

Fire Weather: Provides fire weather forecasts and information on current fire danger levels.
Arkansas Current Wildfires
Burn Bans, Wildfire Danger & Prescribed Burns : Arkansas Forestry Division

Alabama Forestry Commission

Fire Weather: Offers daily fire weather forecasts and related resources.
AFC - Burn Weather
Alabama Forestry Commission

Puerto Rico

National Weather Service
NWS San Juan Fire WX