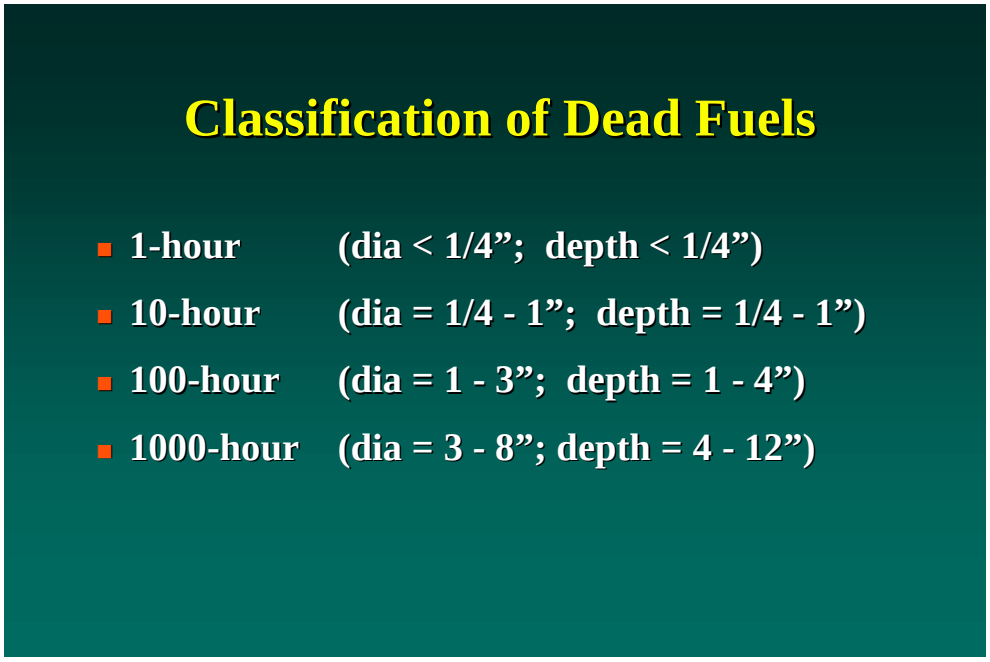
DEAD FUELS

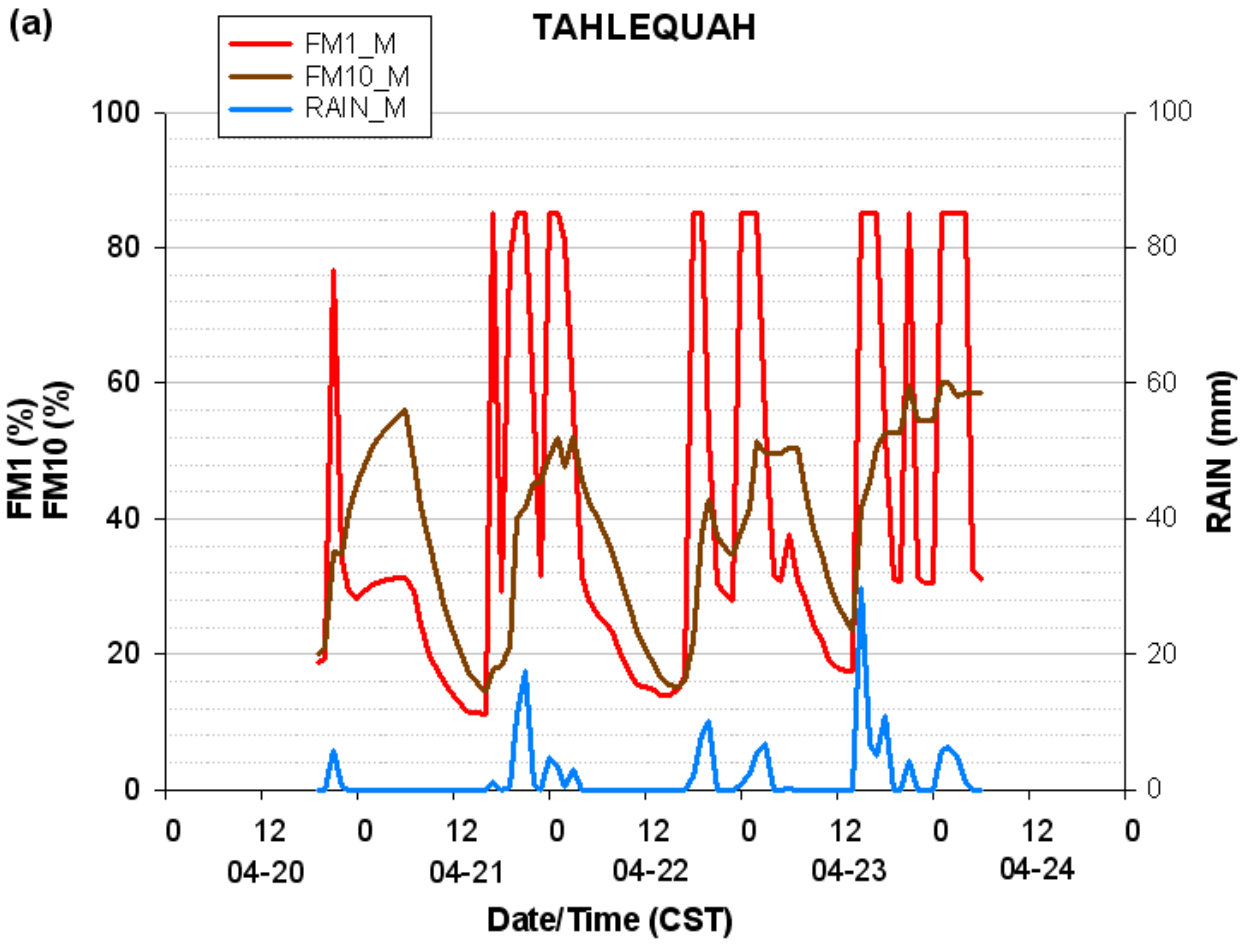
Dead fuels are those fuels whose moisture contents are controlled exclusively by changing environmental conditions, such as temperature, relative humidity, and rainfall. Examples include dead roundwood on the ground, fallen dead leaves and needles, dead leaves and twigs on shrubs, and the litter of the forest floor. For purposes of fire danger modeling, dead fuels are divided into four "timelag" categories: 1-hour, 10-hour, 100-hour, and 1000-hour. The figure below shows the approximate diameters or depths associated with the four timelag classes.



The shorter the timelag, the more responsive the fuel to changing weather conditions. The timelag value represents the approximate time that size (or depth) of fuel would take to come to equilibrium under static weather conditions (with no precipitation occurring). Thus, 1-hour fuels only take on the order of an hour to respond, which explains why fire danger can be extremely high even after a heavy rain if the subsequent weather conditions cause 1-hour fuels to dry out.

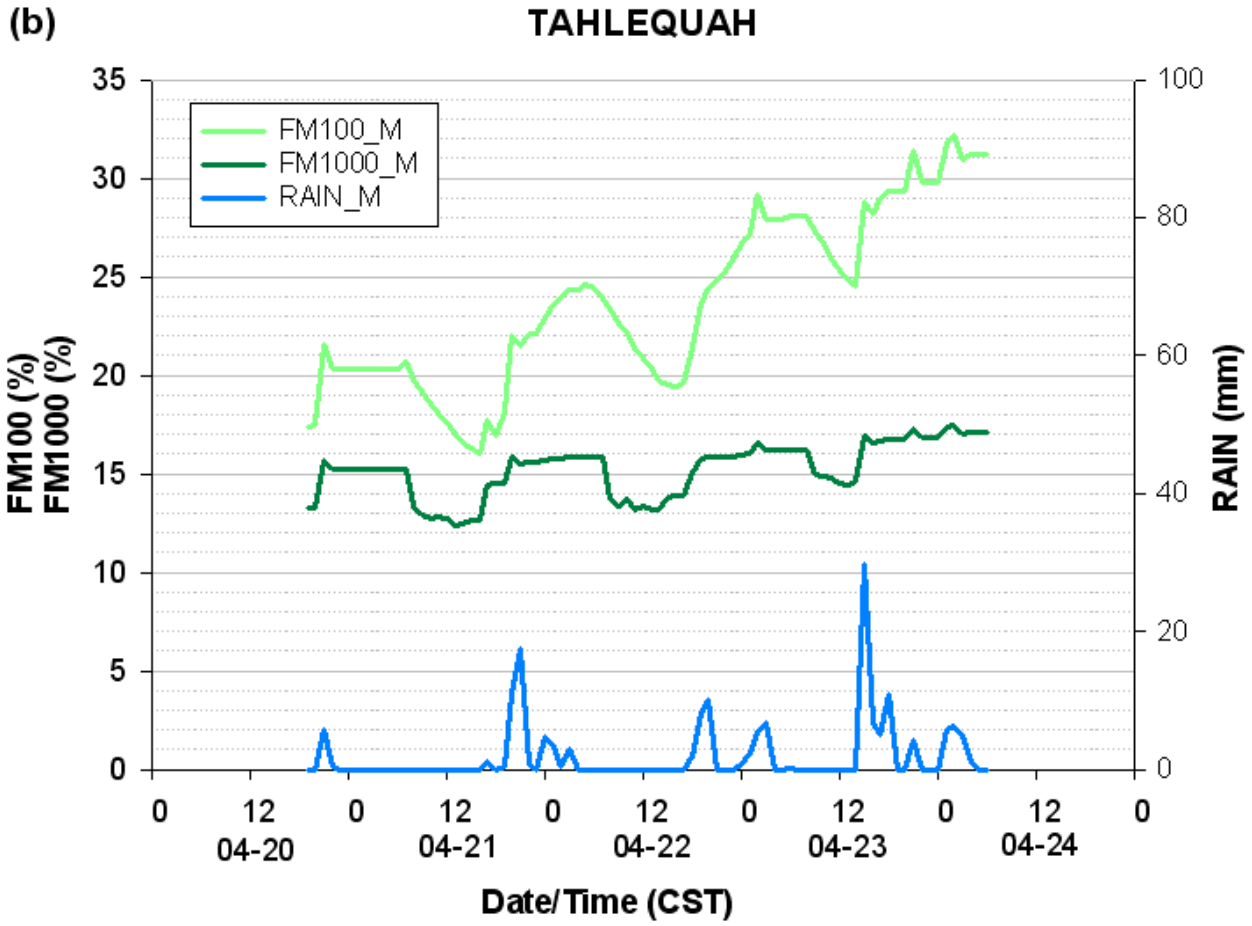
To calculate fuel moisture, the Oklahoma Fire Danger Model in OK-FIRE utilizes a next-generation dead fuel moisture model called the "Nelson model". It runs on 15-minute Mesonet data (temperature, relative humidity, solar radiation, and precipitation) and, in the forecast mode, on hourly forecast data (same variables). There are separate model parameters for each timelag fuel.

The following graphs indicate the behavior of the Nelson model for the four timelag categories during a heavy rain event at Tahlequah in April 2004. During the 84-hour period shown, 6.33" of rainfall fell. The first graph, labeled (a), shows the behavior of 1- (red) and 10-hr (brown) dead fuel moisture (DFM). The Nelson model calculations were based on Mesonet data. Hourly Mesonet-measured rainfall in mm is plotted in blue.



Notice how responsive the 1-hour dead fuels are to rainfall occurrence, often hitting the 1-hour Nelson model DFM maximum of 85% upon the receipt of rainfall, but also quickly drying out during dry periods. The 10-hour also is responsive, but note how it takes longer for that size fuel to reach its relative peaks (highs) and valleys (lows) with respect to the 1-hour size fuel. Also note that the average trend in the 10-hour is slowly upward during this wet period. The 10-hour DFM model maximum of 60% is reached at the end of the period.

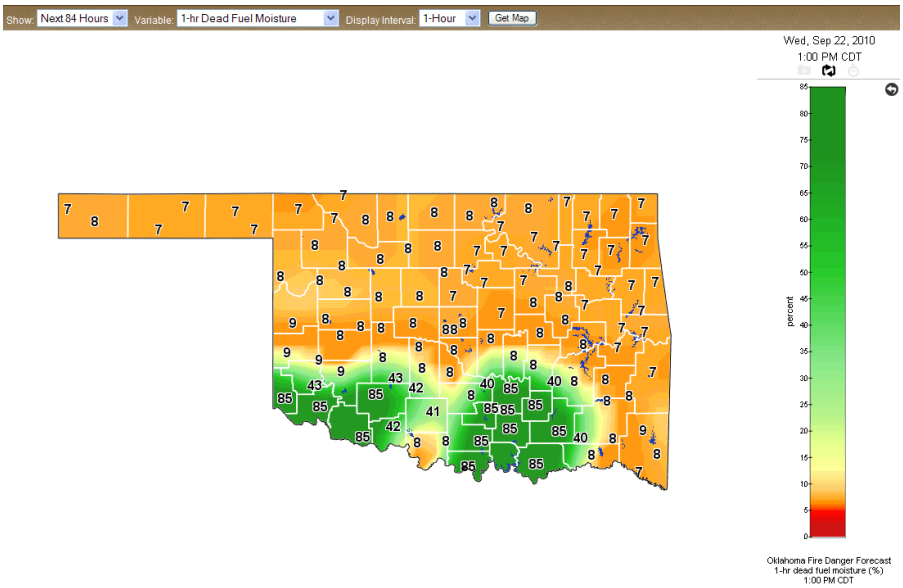
The second graph, labeled (b), shows the behavior of 100-hr (light green) and 1000-hr (dark green) dead fuel moisture. The Nelson model calculations were based on Mesonet data. Hourly Mesonet-measured rainfall in mm is again plotted in blue.



Note that the trend in both size fuels is a general increase in fuel moisture during the period, but that the 1000-hour fuel rises the least amount. The 100-hour DFM model maximum of 40% is not reached during this period, but values as high as 32% are attained. The 1000-hour fuel only rises (on the average) about 3% during this heavy rain period (the 1000-hour DFM model maximum is 32%).

With respect to the OK-FIRE web site, there are numerous locations within the FIRE section where one can access current, past, and forecast 1-, 10-, 100-, and 1000-hr dead fuel moisture. Current and past dead fuel moisture can be found under “CURRENT Fire Danger” and “RECENT Fire Danger”. Site-specific current values, as well as maps, tables, and charts (“firegrams”) going back in time up to 30 days are available. Forecast dead fuel moisture, using the 84-hour NAM forecast model, can be found under “FORECAST Fire Danger”. Here also the products take the form of maps, tables, and charts.

Below is an example of a forecast map (1 p.m. Sept. 22, 2010) for 1-hr dead fuel moisture. One can see high moisture values over much of southern Oklahoma.



The next example is a site-specific "firegram" for Medicine Park (southwest Oklahoma) of 1- and 10-hr dead fuel moisture over the 84-hour forecast period. Both 1- and 10-hr DFM are forecast to rise at various periods throughout the period.