LIVE FUELS

Live fuels are typically divided into two categories: herbaceous and woody. Herbaceous fuels include grasses, forbs, and ferns as well as other herbaceous plants. Woody fuels, for purposes of the National Fire Danger Rating System (NFDRS), are divided into evergreen or deciduous, and refer to the leaves, needles, and twigs of woody shrubs and trees low enough to be considered surface fuels (NFDRS does not model canopy fires). In contrast to dead fuels, live fuels usually have some greenness showing and moisture content is controlled by physiological processes within the plant.

Annual herbaceous plants sprout, grow, produce seed, and die within a normal growing season (at which point they become totally "dead fuels"). They are also the first type of live fuels to be affected by drought. Perennial herbaceous fuels normally stay green throughout the growing season (unless there is drought) and then cure in the fall when temperatures are too low to sustain growth (at this point they also totally become "dead fuels"). Deciduous shrubs and trees also go through an annual growth cycle at the end of which the leaves and small twigs become "dead fuels" for purposes of fire danger modeling.

In an attempt to model these complex processes, the Oklahoma Fire Danger Model utilizes the relative greenness (RG) calculated from the weekly NDVI pixel values to partition the live fuel loads between 0% (all live herbaceous and woody deciduous fuels in that pixel behave as 1-hour dead fuels) and 100% (all live fuels are indeed "live"). There is always a residual 1-h dead fuel load, however, which stays constant throughout the year. Depending on the RG value, additional 1-h dead fuel amounts are added from the live fuel load partitioning. Thus, the fuel loadings (so many tons/acre) for both live and 1-hour dead fuels are dynamic and change from week to week. Between RG values of 20% and 80%, the herbaceous fuel load varies as a function of the weekly RG value, while the part not considered "live" is added to the fuel model's specified 1-hour dead fuel load. At RG <= 20%, the herbaceous fuels are considered fully cured (no live fuel), while at RG >= 80%, the herbaceous fuels are considered fully green (max live fuel load). The woody fuel load stays constant for evergreen fuels, but for deciduous fuels, the fuel load transfer is handled in the same way as with herbaceous fuels, with the remaining "non-live" portion of the woody load added to the 1-hour dead fuel load. Note that for pine forests (Model P), the lower RG threshold is 30% rather than 20%, since the pine canopy obscures surface fuels.

The fraction of the live fuel load which has been transferred to the 1-hour dead fuel class has a fuel moisture content calculated by the 1-hour dead fuel moisture model and, as such, is responsive to changing weather conditions rather than physiological processes within the plant. The fraction of the live fuel load still considered "live", however, has a fuel moisture content as calculated by the live fuel moisture model.

Live fuel moisture represents the % moisture content of the live fuel on an oven-dry weight basis (same as for dead fuels). Because live fuels consist mainly of water, the fuel moisture can go well over 100%. Herbaceous and woody live fuel moisture are also functions of RG and their ranges (when live fuel exists) within OK-FIRE are as follows:

Herbaceous Fuels: 60-200% Woody Fuels: 70-160%

The live fuel moisture maximum values occur when RG is 100%, and the minimum values occur when RG is 20% (herbaceous fuels) or 0% (woody fuels). Note that once RG reaches 20% or lower, all herbaceous fuels have converted to 1-hour dead fuels, so live herbaceous fuel moisture values, even though calculated and seen on OK-FIRE products, are not used by the fire danger model. For intermediate RG values, the live fuel moisture is scaled between the max and min live fuel moisture values as a function of RG.

The OK-FIRE web site offers maps, charts, and tables of the latest herbaceous and woody moisture. There is also site-specific fire danger data available, which includes live fuel moisture. Note, however, that live fuel moisture changes only once weekly as it is based on satellite greenness data. Also, since the value of live fuel moisture is based on RG, the live fuel moisture values calculated within "agricultural" pixel areas may not be similar to those of native vegetation unless the greenness of that vegetation is similar to the crops in that area at that time.

To access the most recent live fuel moisture maps, go to the FIRE section of the OK-FIRE web site, click on "CURRENT Fire Danger" and then on "Live Herbaceous Moisture" or "Live Woody Moisture". To get the latest site-specific values of live fuel moisture, click on "Site-Specific Fire Danger" and choose the Mesonet station of interest. Site-specific maps, charts, and tables of fuel moisture going back in time can be found in the "RECENT Fire Danger" section. Below are two examples of live fuel moisture maps from September 2012.