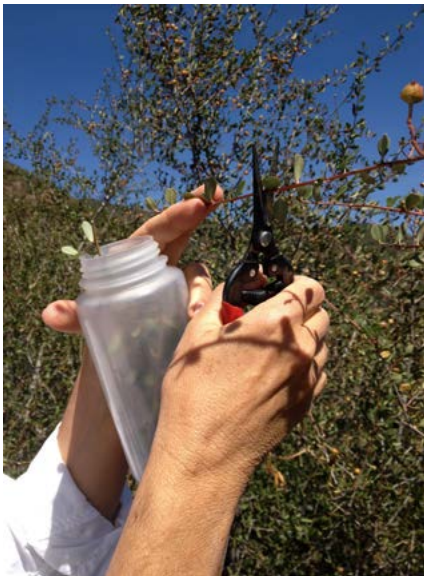
Live Fuel Moisture: Garden Volunteers Fill a Gap in Assessing Local Fire Danger

By Bob Muller, Garden Research Associate and Max Moritz, Environmental Science, Policy, & Management Department, U.C. Berkeley; U.C. Cooperative Extension, Santa Barbara County

Deb Moritz (no relation to Max) sampling big-pod ceanothus, (Ceanothus megacarpus).

Bottom right: samples being weighed

Photos: Kathy Castaneda



Until 2013, live fuel moisture (LFM), a key component of assessing fire danger, was not being measured in the foothills just above Santa Barbara. Thanks to a partnership between the University of California and the Garden, this critical data is now available through what may be the first "citizen science" LFM program in the country.

Understanding LFM

Fire agencies use various information sources to estimate the threat of wildfire including atmospheric temperature, humidity, and wind speed—the basic ingredients for a "Red Flag" alert day. Another key element is the water stress of the vegetation itself. Live fuel moisture (LFM) is the moisture content of green leaves and associated twigs in the chaparral. When moisture content is relatively high (usually in the spring) the risk of catastrophic fire is low. Fire agencies therefore monitor LFM trends throughout the dry fire season, using this metric to alert the public with the fire danger classification shown on Smokey Bear signs.

Determining moisture content of vegetation is quite straightforward. All that is required is an air-tight sampling container, a drying oven, and a balance. In the field, ~100 grams (3.5 oz) of green sprigs are clipped up to a maximum diameter of 3 mm (1/8 inch). Four such samples of each species of interest are collected at each site and returned to the lab, with lids on the containers tightly closed to avoid moisture loss in transit. Samples are then weighed, dried 100˚C (212˚F) for 24 hours, and re-weighed. The

moisture content of the sample is the difference between the wet and dry weights of the samples. LFM is the moisture content of the sample expressed as a percentage of the sample dry weight.

The Garden Program

The Santa Barbara Botanic Garden and the University of California Cooperative Extension have been collaborating on an LFM sampling program focused on the Santa Barbara front country since April 2013. Garden volunteers sample fuel moisture of two locally dominant chaparral species, chamise (*Adenostoma fasciculatum*) and big-pod ceanothus (*C. megacarpus*) at three locations: along Painted Cave Road, at the top of Tunnel Road, and at St. Mary's Seminary on Las Canoas Road. Following agency protocols, volunteers have traveled to the sites twice each month and have collected two years of data providing a clear picture of the wetting and drying cycle of local chaparral. Garden volunteers working under the direction of project managers, Bob Muller, Ph.D. and Max Moritz, Ph.D. include Deb Moritz (no relation to Max), Rob Romzick, Pat Kelly, Rick Zelazny, Colin Critchfield, Chris Kreutzkampf, and Neill De Clerq.

Early Findings

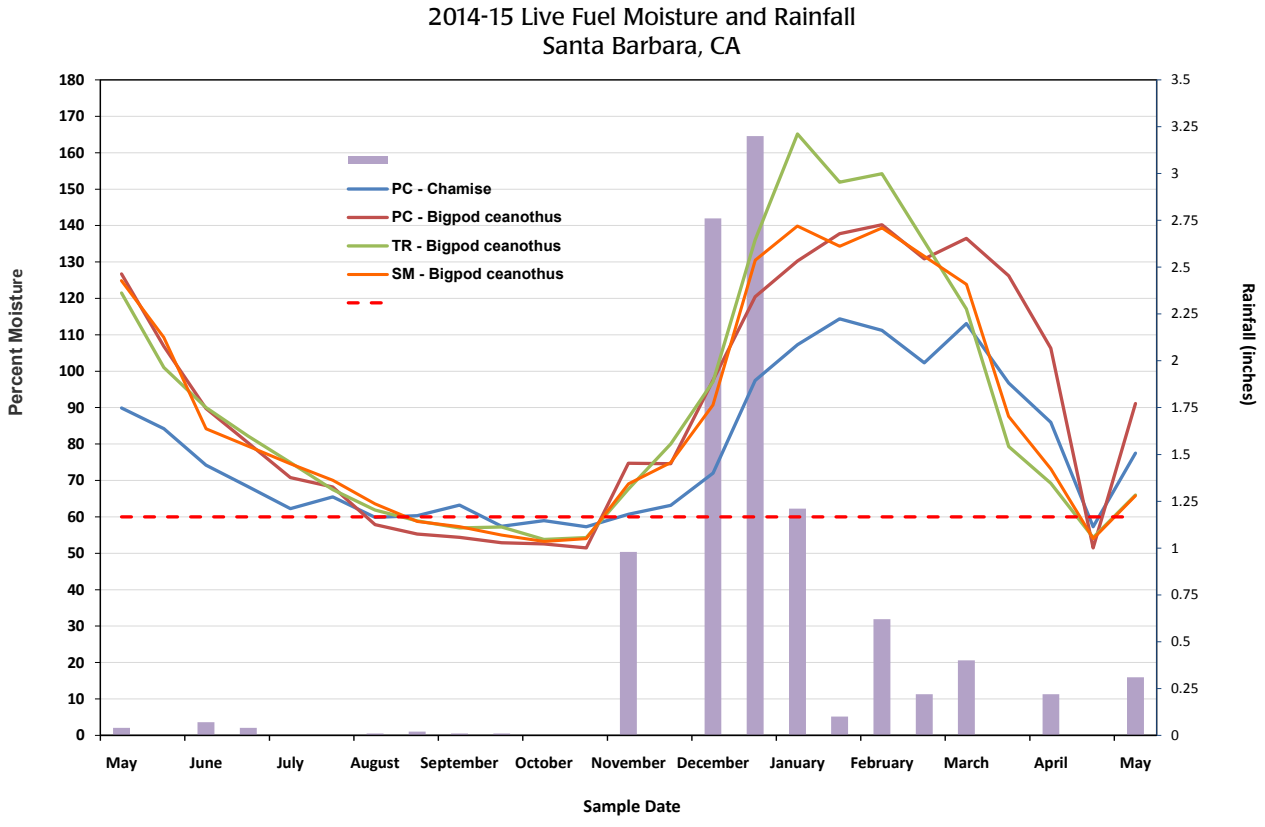
Immediately after the onset of fall rains, fuel moisture begins to increase for several weeks, largely due to new growth in each successive sample. Dry down of the vegetation begins usually in late spring and continues until the following fall rains.

Many fire agencies utilize 60% LFM of *A. fasciculatum* as a critical threshold in fire danger. In the past two years that 60% mark has been reached in late July or early August, much earlier than the typical late August-early September time frame in this area.

We have also learned that *C. megacarpus*, which is widespread along the front country, is more sensitive to environmental fluctuations (i.e., stronger moisture responses to both precipitation pulses and episodes of hot and dry weather).

This information is helpful for characterizing fire danger at a given point in the fire season, but it must be remembered that large areas can still burn before LFM reaches "critical" levels. This is because extreme fire weather, such as our notorious sundowner winds, can drive fires through vegetation that might not otherwise burn. We must all remain aware of both the beauties and the hazards of our natural environment, taking the precautions necessary to live safely and sustainably in fire-prone landscapes.

Visit the Live Fuel Moisture web page at
www.sbbg.org/about/onsite-weather-station-live-fuel-moisture



Data collected by the Garden's volunteer citizen scientists shows at what point the LFM dips below the critical 60% level at each of the three locations surveyed.