Rethinking How We Live With Fire[1]

Max A. Moritz[2]

Fire has been an important and necessary ecological process in much of California for many thousands of years, and it will remain so for many more. Wildfires, like other natural hazards on the landscapes we inhabit, are therefore phenomena we must learn to live with. After decades of suppressing wildfires, we now struggle to reintroduce them safely. At the most basic level, however, the current "fire problem" exists primarily because we have developed in ways and in locations that are vulnerable to this natural hazard. Fortunately, we have learned enough about floods and earthquakes to start incorporating them into our building guidelines and our urban planning. Unfortunately, we have been slow in making that leap with wildfire. Long-term droughts and changing climates appear even farther off in our collective consciousness, but they too may need to be accommodated eventually. Right now, we need to rethink how we live with fire.

Research about fire behavior and natural fire regimes *should* provide useful information for policy and management decisions. That linkage is part of what makes this line of work interesting. Research questions and findings, however, are typically put in terms of hypotheses and probabilities. Many scientists approach complex systems in terms of gradients and correlations and mechanisms. These concepts and terms are not always easy for the rest of the world to use in making decisions, but they are necessary for scientific work. In contrast, most people try to understand a situation or problem by categorizing things, by putting names on recognizable patterns or associations. In this attempt to reduce and classify, we often end up with simple models of how the world works. We tend toward discrete and "binary" choices (e.g., right versus wrong, us versus them), and we want one-size-fits-all solutions to our problems.

The desire for simple explanations and solutions is one reason for the current debate over whether shrubland fire regimes are fuel-driven or weather-driven systems. This statement itself is an over-simplification, because: 1) a fire regime is really a description of a cyclical process with multiple parameters (e.g., fire frequency, intensity, size, season); 2) it can be measured over different periods of time and/or spatial extents; 3) it can involve a statistical characterization (e.g., mean and variance) of parameters and how they interact; and 4) there are other factors, such as topography and ignition patterns, that affect fire regime dynamics. Regardless, by continuing to argue over whether fuel treatments can or cannot solve the "fire problem," we are dooming ourselves to an endless debate without resolution. This is because the terms and underlying assumptions of the argument are not well-defined, and binary causes or outcomes simply do not exist.

Fire spread is a physical process affected by many factors. Different combinations of these factors can produce different fire behaviors and varying rates of propagation across the landscape. As "fire weather" gets worse (i.e., higher temperatures, lower humidities, and greater wind speeds), characteristics of fuels (i.e., amounts and spatial patterns of biomass) become less important in controlling how and where a fire may spread. When winds are so strong that long-range "spotting" occurs, blowing burning embers far ahead of a wildfire, the influence of fuel-related factors is greatly diminished. Thus, there is a natural tradeoff between the importance of fuels characteristics and weather conditions; not surprisingly, a similar tradeoff occurs between topography and varying weather conditions. All of these factors will still impact how a wildfire spreads in a given situation, but their relative importances can vary greatly.

Given an understanding of the different controls on fire spread, we can begin to assess the usefulness of fuel treatments on the landscape, whether through prescribed burning to reduce biomass levels or by some other means. A general conclusion is that the effectiveness of treated patches of vegetation will vary, depending on weather conditions. Under the mildest weather conditions, a fire might reach such a treated area and simply go out, due to a lack of flammable material. Even in more hazardous weather conditions, this part of the landscape might still be used by suppression forces, as fire intensities could be low enough to safely work there. Under extreme fire weather conditions, such as the Santa Ana winds that occur each fall, these treatments may only constrain fire spread in a minimal way – if at all – and they are not safe locations for fire suppression forces.

What does the above assessment tell us about the "fuels vs. weather" debate? It means that extreme viewpoints ignore many details that are crucial to pragmatic decision making. This insight may not provide any simple answers, but it should at least allow for a refocused discussion about what we are trying to accomplish.

Landscape-scale fuel treatments must be evaluated according to what the goal is and under what weather conditions this goal can be achieved. These treatments are not cheap, either, so their effectiveness should be weighed against other hazard reduction efforts that could be achieved with the same funds. There can also be negative ecological consequences of vegetation treatments, such as the establishment and spread of non-native invasive species.

Hopefully people will move away from simple models of how the world works and scientific information will eventually be communicated more clearly, despite the fact that fire regimes are inherently complex systems. This shift could be facilitated by considering a fuel treatment's cost in terms of variables and probabilities, such as the following: A given treatment may reduce fire intensity or fire likelihood by ***X*** %, under the worst ***Y*** % of fire weather conditions, with ***Z*** % certainty … Is it worth the cost, given this level of risk and the other possible uses of the money? Each of us already thinks somewhat like this in deciding how much insurance coverage we want and what deductible we feel comfortable with, given how unlikely we estimate some catastrophic event to be.

Ultimately, in a world of scarce resources, complicated environmental regulations, and sprawling development, the variable effectiveness of fuel treatments will probably limit them to very strategic locations on the landscape. Such locations may be at or near urban-wildland interfaces, where they can be the last line of defense in suppressing a wildfire. As we rethink further how to live with fire, we will require more retrofits to existing homes and neighborhoods. This will involve alterations to vegetation around structures, updates to certain building materials and designs, and better development of evacuation procedures. These fixes are necessary steps and in the right direction. The general approach, however, may only be as effective as the weakest link in the system. If you live in a fire-prone location and do all of the hazard mitigation you can, but your neighbor does not, what has really been accomplished?

A deeper and more difficult transition is ahead of us, because the "fire problem" is truly one of *where* we build, in addition to *how* it is done. There are lessons to be learned from other natural hazards, which have resulted in limited or specialized development in disaster-prone locations. Californians must engage our policy makers and urban planners to create safe and sustainable communities, so that fire can continue to play its inevitable and necessary role on whatever natural landscapes we manage to leave for future generations.

---

[1] Appeared as a chapter (pp 103-105) in *Fire, Chaparral, and Survival in Southern California*, Richard W. Halsey (2005), Sunbelt Publications, San Diego.

[2] Environmental Science, Policy, and Management Department, University of California at Berkeley; Center for Fire Research and Outreach.