Second, wet fuel does not burn. Thus less moisture means more dead plant material, drier fuel, and greater fire potential.

It follows that the best way to get fire is to have a climate that oscillates between wet and dry. If it is dry all the time, there will be no fuel. If it is wet all the time, there will be lots of fuel, but it will never get dry enough to burn. If it is wet for a period, and then suddenly turns dry, vegetation will die back, leaving plenty of material for combustion.

ENSO, by providing alteration between El Niño and La Niña regimes, in general provide just such an oscillating force. Whether the main effect of ENSO on fire is on the wet side, by pushing fuel vegetative amount up above what can be sustained in an arid climate--or on the dry side, by bringing drought which kills back and dries normally-high biomass loadings depends on the system. In arid and semi-arid systems, combustion if often restricted by fuel availability, and wet events tend to lead to fire. In moist systems--particularly forest--dry events may result on fire. Fire responses to fuel wetness tend to be highly non-linear. When vegetation approaches the wilting point, it ceases to transpire and begins to loose leaves. Leaf loss simultaneously makes the canopy more open to the drying effects of wind and sunshine and adds to fuel loads. Thus, past certain thresholds, fire danger tends to become explosive. How dry and how long a period must be before the vegetation becomes "dry as a tinder box" is site specific. Shallow-rooted plants in soils with little storage capacity may dry down in periods of weeks to months; trees that root to 10 m or more, and whose roots penetrate an aquifer may survive long periods without rain. In some such systems, more than one year of drought may be needed to create high fire danger.

Management Needs

In theory fire needs no management. Natural systems have evolved under climate anomalies and generally withstand them, and associated fire events quite well. In managed ecosystems, the effects of burning is often less benign, and there are many circumstances where foresight on emerging fire weather and fuels buildup has potential value. These tend, however, to be locally specific, depending on what is at risk as well as the fire regime.

A burn that is ecologically beneficial may ruin harvestable timber or destroy browsable forage. The tendency of some cultures to build expensive homes in the middle of fire prone forest or bushland systems is another problem. Protected ecosystems may end up with high-costs events. May lose species or recreation value seriously. In short, fire can be costly, but the nature of the costs it imposes are likely to vary considerably from place to place.

This local variability of fire risks, and attendant variable management needs is amplified by the impact of human intervention on fuel dynamics and fire regimes. Fire suppression has led to fuels buildup in many regions of the US--with the result that when fire comes, it is likely to be ecologically severe. In other regions, however, In systems where human there is little human activity, such as Canadian boreal forest, most fires are ignited by dry lightning. In human-influenced system the secondary dynamic is critical, such as massive fire suppression or control which leads to build up of fuel. There is need for management and understanding. Management needs are also conditioned by the decisionmakers circumstances. Short-term management has been for a long time heavy user of meteorological information; such as fire danger warning systems. Tactical use of weather information is extremely wide spread. Long-term is exactly opposite. This may have political reasons. With a fire in progress, if fire manager needs funding, he gets it carte blanche. But if you say that in the next couple of years there will be fires, you have to go through political process.

In sum it is not clear that the ENSO signal is strong enough in North America as a whole to warrant the institutional effort required to use the information. There are probably regions where fire risks are high and the combination of climatology and ecology means that ENSO events are likely to trigger latent fire potential. The details of such cases are likely to be region-specific, and it is probably better to leave the design for use of ENSO information to local decisionmakers.

Timeliness of information is another concern. Because in most of North America, the worst fires are in the summer and autumn, medium-term weather forecasts are most useful for July through October. As these are difficult months for which to develop ENSO forecasts, the best use of ENSO information is likely to be that of using historical data to develop a reasonable, integrated perspective on the sorts of events to which the system is prone. For example, the understanding that El Niño and La Niña tend to alternate may prevent people from becoming blasé about fire risk after a run of low-fire-danger years. Likewise, if the trend of the last 15-or-so years for El Niño to be strong and La Niña weak does turn out to be a pattern associated with climate change, understanding the spatial distribution of this pattern in relation to fire regimes and fire risks would be of considerable management value.

A last place where information on ENSO-fire relationships is of management value is in the management of Global Change research planning. I have been watching trace gas emissions from biomass burning. In this area, as in many areas of the study of global biogeochemical cycles, there is no comprehension of climate variability. It is not uncommon to see global baselines being estimated based on data from a field campaigns or satellite missions done in an exceptionally dry or exceptional wet years. Understanding of the patterns of variability--as provided by study of the geography and climatology of ENSO--might prevent both drawing unwarranted conclusions, and bad research design in these areas.

Reference

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