

Western Ecological Research Center

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A Different Perspective on Global Fire

Wildland fires are commonly treated as an ecosystem disturbance, but in the July issue of the journal *Trends in Ecology and Evolution*, USGS scientist Dr. Jon E. Keeley co-authors a paper with colleague Dr. William J. Bond from the University of Cape Town, South Africa, that suggests a somewhat different perspective. They argue that fire is more akin to trophic processes such as herbivory, and that there has been a reluctance by ecologists to incorporate the process of fire into general theories of community development and assembly.

In this review paper the authors draw attention to the limited reference to fire in textbooks on ecology, conservation, or biogeography, in spite of the fact that a) large parts of the world burn on a regular basis, and b) considerable literature exists on the ecology of fire and its use for managing ecosystems. Ecologists and biogeographers generally assume that plant distribution and abundance, and therefore community composition, structure and biomass, are determined largely by climate and soils. This assumption is implicit in current attempts to model species range shifts in response to climate change. But fire has been burning ecosystems for hundreds of millions of years, helping to shape global biome distribution and to maintain the structure and function of fire-prone communities. Fire is also a potent evolutionary force, and is one of the first tools humans used to re-shape their world.

To draw attention to the critical role fire plays throughout the world, Bond and Keeley draw parallels between fire and herbivores as alternative consumers of vegetation. Although usually treated as a disturbance, fire differs from other disturbances such as cyclones or floods in that it “feeds” on complex organic molecules (as do herbivores) and converts them to organic and mineral products. It takes irregular “bites” of varying size, severity and frequency. Fire differs from herbivory

Management Implications:

- Fire is more than a disturbance but a natural ecosystem process much like herbivory, and as such is critical to the proper functioning of many systems.
- Models that attempt to understand global vegetation distribution based solely on climate and soils are likely to misjudge some landscapes that owe their vegetation distribution to historical patterns of burning.

in that it regularly consumes both dead and living material and, with no protein needed for its growth, has broad dietary preferences. Plants that are inedible for herbivores commonly fuel fires. To reduce semantic confusion, the authors use the term “consumer control” for ecosystems in which fire or herbivores significantly alter biomass, the mix of plant growth forms, and species composition in ecosystems.

The authors used published studies that model the potential biomass for different regions of the globe with Dynamic Global Vegetation Models, complex models analogous to global climate models, which “grow” plants according to physiological principles using climate and soil physical properties. According to these simulations, vast areas of grasslands in Africa and South America, and smaller areas on all vegetated continents, have the climate potential to form forests, and the authors contend this is prevented by fire. The authors suggest that in flammable ecosystems, the assumption of a close link between climate and plant distribution is wrong. Furthermore, past or future changes in the extent of these ecosystems, or species within them, cannot be understood without understanding the ecology of fire.

Bond, W. J. and J. E. Keeley. 2005. Fire as a global ‘herbivore’: the ecology and evolution of flammable ecosystems. Trends in Ecology and Evolution 20:387–394.