



## Research Brief for Resource Managers

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**Contact:**  
Chris Lee

**Phone:**  
(479) 739-1484

**Email:**  
cale@ucdavis.edu

Northern California Fire Science Delivery Consortium, 5630 South Broadway, Eureka, CA 95503

### Ecology of mixed-severity fire regimes

*Perry, D.A., P.F. Hessburg, C.N. Skinner, T.A. Spies, S.L. Stephens, A.H. Taylor, J.F. Franklin, B. McComb, G. Riegel. 2011. The ecology of mixed severity fire regimes in Washington, Oregon, and northern California. Forest Ecology and Management 262: 703-717.*  
<http://www.treearch.fs.fed.us/pubs/38955>

This review paper describes geographical variation of mixed severity fire regimes in Pacific temperate forests and summarizes known information about fire effects and ecology in relation to the vegetation types characterized by such regimes.

#### **What is a mixed severity fire regime?**

Mixed-severity fire regimes are defined by what they are not: they are not typified by surface fire behavior, on the one hand, or by stand-replacing fire behavior, on the other. In Washington, Oregon, and northern California, they are found in various combinations of Douglas-fir, Douglas-fir/western hemlock, lodgepole pine, mixed conifer, and mixed conifer/hardwood forest types.

Mixed-severity regimes are characterized by varying proportions of high- and low-severity patches, and this variety in turn provides forests with a great deal of habitat and biodiversity value.

Mixed-severity fire regimes are controlled both by what the authors call “top-down” forces and what they call “bottom-up” forces. The former refers to climatic factors, including the pronounced annual summer drought of the Mediterranean climate in California and southwest Oregon, as well as precipitation patterns and larger-scale

#### **Management Implications**

- Managing mixed-severity fire regimes to provide beneficial outcomes for biodiversity, habitat, and human uses must usually be undertaken at large landscape scales to be effective.
- Reducing surface fuels and lowering stand density will likely reduce fire intensity, behavior, and severity in many of these forests.
- The presence of hardwood trees can help reduce fire severity, while sclerophyllous shrubs can increase fire severity.
- Fire severity is greatly influenced by the history of wildfires and management activities in forest types characterized by mixed-severity fire regimes.
- Fuels treatments are important for reducing fire behavior and fire severity following management activities.

atmospheric drivers, like the El Niño-Southern Oscillation and the Pacific Decadal Oscillation. “Bottom-up” refers to local factors that influence fire regimes, such as local biotic factors, local topography, and moisture regimes that vary from region to region.

The following are some important interactions between vegetation types and fire behavior, as summarized in the paper:

- Typically, forests with tall, fire-tolerant tree species tend to burn with less

severity, although this is not always the case.

- The presence of hardwood tree species often depresses fire severity for several reasons relating to tree size, position, and crown characteristics.
- Early successional stands, except for those less than 10 years old, are typically more flammable than older stands.
- Slash treatment is especially crucial for ameliorating fire behavior in plantations located in regions typified by mixed-severity fire regimes.
- Within the areas under discussion, the severity of a given fire may be greatly influenced by “inherited” landscape characteristics. These include the condition of the surrounding landscape (are there barriers to fire propagation or corridors for it?); the influence of earlier fires (e.g., chaparral communities often regenerate after severe fires and then self-perpetuate without trees being able to gain a foothold); and changing climatic patterns, which may override all local factors.

The paper emphasizes the currently changing nature of mixed-severity fire regimes in Pacific temperate forests as a result of both management and top-down climatic issues. A reduction in the extent of older, fire-resistant forests, as well as the success of fire suppression efforts, may lead to more high-severity fire in many areas. In general, increased forest density will probably do the same, although the effects of increased density vary by species (e.g., dense stands of deciduous hardwoods do not increase the probability of crown fire as do dense stands of true fir).

Finally, the paper concludes with a reiteration of a theme that runs throughout: regardless of how landscape factors may shift or human management may alter the nature of mixed-severity fire regimes throughout this region, large-scale climate changes will probably do the most to dictate the nature of future fire regimes.



*Areas in Washington, Oregon, and California with mixed-severity fire regimes (labeled with alphanumeric codes – see full paper for code definitions).*