CALIFORNIA FIRE SCIENCE CONSORTIUM

JOINT FIRE SCIENCE PROGRAM

Wildland Fire Fact Sheet for the Public and Media

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Background and Strategies for Managing Fires in California Forests

Highlights

- Fire has a natural and essential role in many California ecosystems.
- Historical fire suppression and climate change are contributing to larger, more severe fires in the western U.S.
- Increased fuels reduction through prescribed fire, managed wildfire, and mechanical thinning is needed to improve ecosystem restoration and resilience to uncharacteristically high-severity wildfires.

Natural role of fire in California ecosystems

Wildland fires caused by lightning ignitions and Native American burning were much more common before 1800 and the European settlement of California. These fires burned approximately 1.8 million hectares (or about 4% of the state) every summer and fall, and the skies in many parts of the state were consistently smoky during the fire season.[i] Because wildland fires were much more common, they were also generally smaller and produced a mosaic pattern of mixed burn severities and intensities across the landscape. These fires burned at a lower severity than many fires seen today, although patches of moderate and high-severity fires (which kill a greater proportion of trees) were also normal. This is because there was less time in between fires for highly flammable forest “fuels” (dead branches, leaf/needle litter, and small trees) to accumulate. Additionally, the effects of climate change, which today contribute to hotter and drier weather conditions and a longer fire season, had not yet occurred.

Mixed-severity fires continue to play necessary roles in many ecosystems in California, and particularly in the mixed conifer forests of the Sierra Nevada and mountain ranges of northern California. In addition to periodically reducing surface fuels, fires create habitat for certain “fire-dependent” species of plants and animals.[ii] Giant sequoia and ponderosa pine are two examples of tree species that regenerate more successfully in open patches caused by higher severity fires.

Fuels buildup and large high-severity fires

Successful fire-suppression efforts by government agencies began in the early 1900s and increased following World War II, and have ironically been one of the greatest contributors to the growing number of large, high-severity fires today. Without smaller and regularly occurring low to mixed-severity fires creating a mosaic of fuel loads and forest densities across the landscape, many forests have become more uniform, grown denser, and have abnormally high amounts of surface fuels. These conditions, combined with warmer and drier weather patterns from climate change, have contributed to larger and more severe fires that have become more common in the present.[iii] When these fires kill most to all of the trees in a large landscape, it can lead to environmental harm such as widespread erosion and habitat loss for some species.

Wildland fire use is used in the Illilouette Basin in Yosemite National Park, and contributes to a mosaic of forest stands and fuel loads. Photo: Marc Meyer, USFS

Fuels reduction strategies: Prescribed burning, wildland fire use, thinning

The primary method used to increase the resiliency of forests to high-severity wildfires and the effects of climate change is through fuel reduction treatments.[iv] These treatments include the use of prescribed fires, managed wildfire, and mechanical thinning:

1. **Prescribed fire** is the application of fire to a pre-identified area of a landscape. Prescribed fires are generally low to moderate-severity and can sometimes have patches of high-severity.
2. **Wildland fire use** is the skillful monitoring and managing of naturally ignited fires. These are allowed to burn when they pose little risk to communities and property, and usually burn at low to moderate intensities.
3. **Mechanical thinning** is the removal of trees and/or shrubs through hand thinning with chainsaws, mechanical harvesters, mastication, or other mechanical methods.

Each treatment type has advantages and disadvantages. While prescribed and managed wildfires are better at achieving ecosystem restoration over larger landscapes, while also removing more surface fuels, it can be difficult to re-introduce fire safely into heavily-loaded, dense forests. Fire use also poses challenges in terms of short-term air quality impacts and land managers' potential liabilities for any property damage that may occur.

While thinning treatments can sometimes generate revenue to cover treatment costs, they can be much more expensive when harvesting timber is not an option. The large size of landscapes currently in need of fuels reduction also poses challenges to the use of thinning treatments, which are difficult and sometimes impossible to implement over large and steep terrain. Fire use is the only fuel reduction treatment allowed in certain areas where thinning is restricted, such as riparian zones and protectected wildlife areas. Ultimately, a combination of fire use and thinning treatments may be needed to address the large amount of areas in need of fuels reduction.

Limited scale of current fuels reductions and opportunities for "scaling up"

Given the growing size and severity of wildfires in the West, fuels reduction treatments have been prioritized by land management agencies. Despite efforts, only about 20% of the current landscape in need of treatment in California has received some form of fuels reduction treatment to restore the forest to a more resilient condition.[v] As agency budgets decline and must be used for wildfire suppression, the amount of funding and resources available to prevent large, uncharacteristically high-severity fires through fuels reductions may also decrease.

This had led some researchers and managers to call for a greater use of fuel reduction treatments through new strategies. One of these strategies is to increase use of managed fire in areas where there is minimal risk to communities, property, and infrastructure. In addition to having the potential to treat large areas, this option can greatly reduce fire suppression costs as the beneficial fires are tailored and allowed to burn at low to moderate-severity.[vi] Another proposed strategy is to identify large areas as "firesheds" (similar to watersheds), implement some mechanical thinning for revenue and initial fuels reduction, and then treat the area into the future with regular prescribed and managed wildfire. The later may be a good fit for areas with more roads, as are more easily accessible to harvesting equipment.

One example of an area where managed wildfire has been used successfully is the Illilouette Basin in Yosemite National Park. Managed wildfire has been taking place in the basin since 1974. One result of this has been that natural fires started by lightning strikes remain relatively small in size, and rarely spread into nearby areas that had burned within the last 9 years.[vii] This suggests that similar methods of reintroducing a natural fire regime to wildland areas can be used successfully.

Suggestions for further information:

California Fire Science Consortium

> The CFSC website has many resources, including short research "briefs" and recorded webinars, on different fire ecology and management topics in California ecosystems and the wildland-urban interface.

The Northern California Prescribed Fire Council and the Southern Sierra Prescribed Fire Council

> These two open-membership organizations help organize individuals from a variety of public land management agencies, tribes, private companies, NGOs, and citizens in support of prescribed and managed wildfire use.

Joint Fire Sciences Program

> The JFSP is a national interagency organization that funds fire science research and provides research summaries and highlights.

References and suggestions for further reading

[i] Stephens, Scott L., Robert E. Martin, and Nicholas E. Clinton. 2007. Prehistoric fire area and emissions from California's forests, woodlands, shrublands, and grasslands. Forest Ecology and Management 251(3):205-216.

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[iii] Miller, J. D., H. D. Safford, M. Crimmins, and A. E. Thode. Quantitative evidence for increasing forest fire severity in the Sierra Nevada and southern Cascade Mountains, California and Nevada, USA. Ecosystems 12(1):16-32.

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[v] North, M.P., B.M. Collins, and S.L. Stephens. 2012. Using fire to increase the scale, benefits and future maintenance of fuels treatments. Journal of Forestry 110(7):392-401.

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[vii] Collins B.M., Miller J.D., Thode A.E., Kelly M., van Wagtendonk J.W., Stephens S.L. 2009. Interactions among wildland fires in a long-established Sierra Nevada natural fire area. Ecosystems 12:114-128.