CALIFORNIA FIRE SCIENCE CONSORTIUM

JOINT FIRE SCIENCE PROGRAM

Research Brief for Resource Managers

Release:	Contact:	Phone:	Email:
November 2013	Tim Kline	(510) 642-4934	tkline@berkeley.edu
	Lenya Quinn-Davidson	(707) 445-7351	lquinndavidson@ucanr.edu

California Fire Science Consortium | 137 Mulford Hall MC #3114, Berkeley CA 94720

Prescribed fire: Needs and challenges in North America

Ryan, Kevin C., Eric E. Knapp, and J. Morgan Varner. 2013. Prescribed fire in North American forests and woodlands: history, current practice, and challenges. Frontiers in Ecology and the Environment 11, no. s1: e15-e24. (Open access)
http://dx.doi.org/10.1890/120329

Prescribed fire and managed wildfires hold tremendous promise as land management tools, but there are many impediments to their widespread implementation. Social and political constraints, rather than ecological rationales, often determine decisions regarding when, where, and how prescribed burns occur. Infrequent favorable weather conditions increase competition for operational resources and air quality permits, limiting the ability of managers to use prescribed fire treatments. Similarly, certain regulatory restrictions and a lack of public and political support reduce managers' ability to use prescribed fire at levels that would approach the historical amount of fire in many fire-frequent ecosystems. Given these limitations, the expansion of prescribed fire use will require further efforts to integrate fire and ecological understanding into management and policy.

Highlights

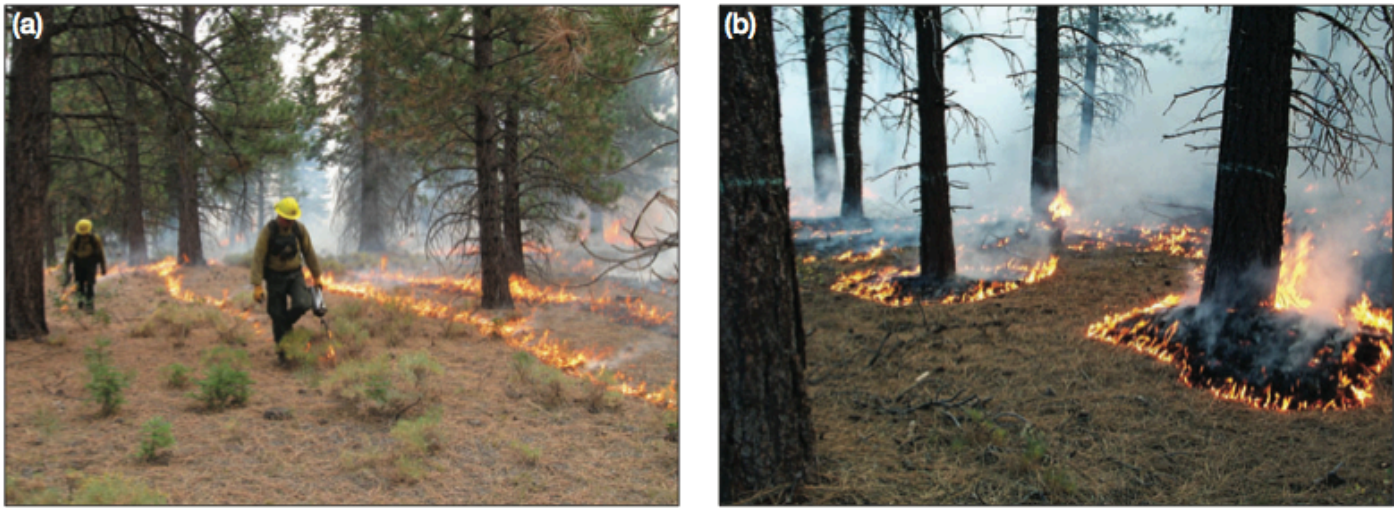
- Social and political challenges, such as regulations and public tolerance of prescribed fire, influence the timing and location of prescribed burning more than ecological considerations
- Current prescribed fire practices may have less heterogeneous effects and consume less forest fuels than historical/natural fires.
- The current use of prescribed and managed wildfire is far below historical levels of fire in most fire-frequent ecosystems.
- The ecological consequences of "no fire" may outweigh the short-term benefits of fire exclusion.

Historical fire frequency

Many ecosystems, including the fire-frequent forests of California, have long evolutionary histories with fire and require periodic fire to maintain biodiversity and stand structure. Prior to Euro-American settlement in western North America, dry season lightning and anthropogenic burning by Native Americans were the primary sources of ignition for the regular fires that shaped fire-frequent ecosystems. The public and legal responses to wildfires in the late 19th and early 20th century made wildland fire suppression a priority of federal and state land management agencies, with total area burned reaching its minimum in the US during the 1970's.

Ecological consequences of fire exclusion

In the fire-frequent forests of western North America, fire exclusion typically leads to increases in forest fuels and tree density. As a result forests become more homogenous in structure and more susceptible to fires that are larger and more severe than historically seen. Another result of exclusion is increased "infilling" of stand gaps by shade-tolerant plant species that, along with high forest litter accumulation, can contribute to lost



Prescribed fire ignition patterns in Klamath National Forest, California. Ignition patterns can influence fire effects. Some common patterns include: (a) strip head fire, with evenly spaced strips placed sequentially from higher to lower elevations within the unit; and (b) tree-centered spot firing, with the objective of minimizing flame lengths under desired trees and producing variable flame lengths elsewhere. Photo: Carl Skinner

habitat for some species while benefitting others. Combined with the effects of climate change, fire exclusion and increased fuel loads have been a major factor in the increasing size and severity of fires and the decreasing effectiveness of fire suppression.

Restoring fire as a landscape process

The public recognition of the ecologic benefits and necessity of fire as an ecosystem process in various North American landscapes has grown, but it is complicated by the fact that contemporary fires are higher in severity than past fires and present more risks to property, infrastructure, and ecosystem health. Approximately 1 million hectares are currently treated annually with prescribed fire in the US. Despite this recognition and the growth of prescribed fire use, there are very few locations where the use of fire has approached historical levels. Some of the causes of this "fire deficit" are listed below.

Can prescribed fire mimic historical fires?

When trying to reintroduce fire as a natural ecosystem process, land managers are faced with much higher fuel loads than what existed in pre-suppression forests. As a result, initial restoration burns after long fire-free periods can burn at higher severities and have some undesirable effects, such as killing or stressing large remnant trees of normally fire-adapted species.

Operational practices designed to limit prescribed fire escape, such as linear strip ignition patterns, can produce more uniform fire effects that lack the residual unburned patches that act as refugia for fire-sensitive flora and fauna. In the western US, prescribed fires are typically implemented in the spring and fall to take advantage of fire crew availability and more manageable fire weather. These "cool season" burns may not consume as much fuel or mimic all the effects of historical fires, which mostly burned in the summer under warmer and drier conditions. This disjuncture between prescribed fire season and the historical fire season is also common in other regions of North America, and could have implications for the effectiveness and ecological appropriateness of prescribed fire operations.

Regulatory challenges

In addition to operational challenges, many policies present difficulties for proactive management practices that reintroduce fire. The Clean Air Act, a regulation primarily designed to limit emissions from industry and automobiles, designates smoke from prescribed fires as a pollutant. This creates a paradox for managers and the public, as smoke from wildfires becomes increasingly inevitable, yet prescribed fire use—which reduces the likelihood of future wildfires—is hampered by air quality regulations. The infrequency of favorable weather conditions and

air quality windows can create competition among managers for burn permits and other resources, decreasing the use of prescribed fire.

The Endangered Species Act requires managers to analyze and account for short-term impacts to species, but doesn't take the longer term consequences of inaction (no fire) into account. While providing essential protections for some species, the law can have the unintended effect of discouraging forest restoration actions intended to benefit a wide variety of species through the recreation of heterogeneous conditions.

Public and political acceptance of prescribed fire

The success of fire suppression efforts through much of the 20th century has contributed to a lack of public understanding and acceptance of fire's natural role in certain ecosystems. Similarly, high-profile prescribed fires that escaped perimeters have contributed to public mistrust of prescribed fire as a management tool, while in actuality more than 99% of prescribed fires are held within their perimeters. The societal intolerance of risk and policy focus on short-term planning lead to decisions that minimize immediate risks from fire, such as smoke impacts to local communities or harm to a certain species.

Conclusion

The long-term risks and ecological consequences associated with fire exclusion don't receive as much public and decision-making attention as they merit. Managers should not only seek to protect species, but to restore biophysical processes through fire use. Uncertain future climate conditions, and related vegetation and fuels changes, may limit the understanding of these systems and the ability to respond appropriately. The expansion of prescribed fire programs will necessitate an increased effort to integrate fire and ecological sciences into management and policy decisions.

Suggestions for further reading:

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