RESEARCH BRIEF

Prescribed fire in North American forests and woodlands: history, current practice, and challenges

Kevin C. Ryan, Eric E. Knapp, and J. Morgan Varner.
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In this paper the authors compare modern and historical fire occurrence in the woodlands and forests of North America and explore the challenges modern society faces in using fire as a management tool (prescribed fire). In this research brief, we focus on the information most relevant to oak woodlands and forests of the eastern United States.

Multiple lines of evidence supporting historical periodic burning can be found in the forests and woodlands of eastern North America. At least two conditions must be met for landscape-scale fire to occur: continuous fuel and an ignition. In eastern forests and woodlands, fuels are most prone to ignition during the spring and fall seasons. The combination of widespread Native American and lightning ignitions across the region resulted in open forests, woodlands, and savannas, all associated with high levels of species diversity. These characteristics are increasingly rare in eastern landscapes. European settlement led to vast changes to these ecosystems, including unregulated timber harvesting. This in turn led to elevated fuel levels (logging slash) and widespread wildfires in the 19th and early 20th centuries. In response to these fires, with the support of post-World War II technologies and road infrastructure, wildland fire occurrence greatly decreased. In fact, wildland fire issues spawned the formation of the United States Forest Service and state level land-management agencies.

Fire exclusion through much of the 20th century has led to many changes in formerly oak-dominated ecosystems, including an increase in the representation of fire-sensitive and shade-tolerant tree species. These changes in forest composition have led to other environmental changes, such as altered fuel characteristics and wetter microclimatic conditions, which further reduce the likelihood of the occurrence of fire. These changes, along with accumulations of somewhat less flammable leaf litter, have resulted in reduced herbaceous cover (also shown to affect animal communities) and diversity.

In the eastern United States, fire activity has begun to trend upward in recent years. This is due, at least in part, to recent strides in prescribed fire acceptance, research, and experience. Research has illuminated fire's role in supporting important ecological processes and maintaining "fire-dependent" communities. However, fire use is affected by inherent risks, which include danger to property, smoke inundation, and damage to residual trees. Important questions remain regarding prescribed fire's ability to act as a surrogate for historical fire regimes. Historical periodic fires led to spatial variability in fuel, which resulted in complex, patchy burns, and included unburned areas (fire refugia). Fire-sensitive flora/fauna could survive in these refugia to repopulate burned areas. Due to modern constraints, uniform ignitions (e.g., linear strips or

MANAGEMENT IMPLICATIONS

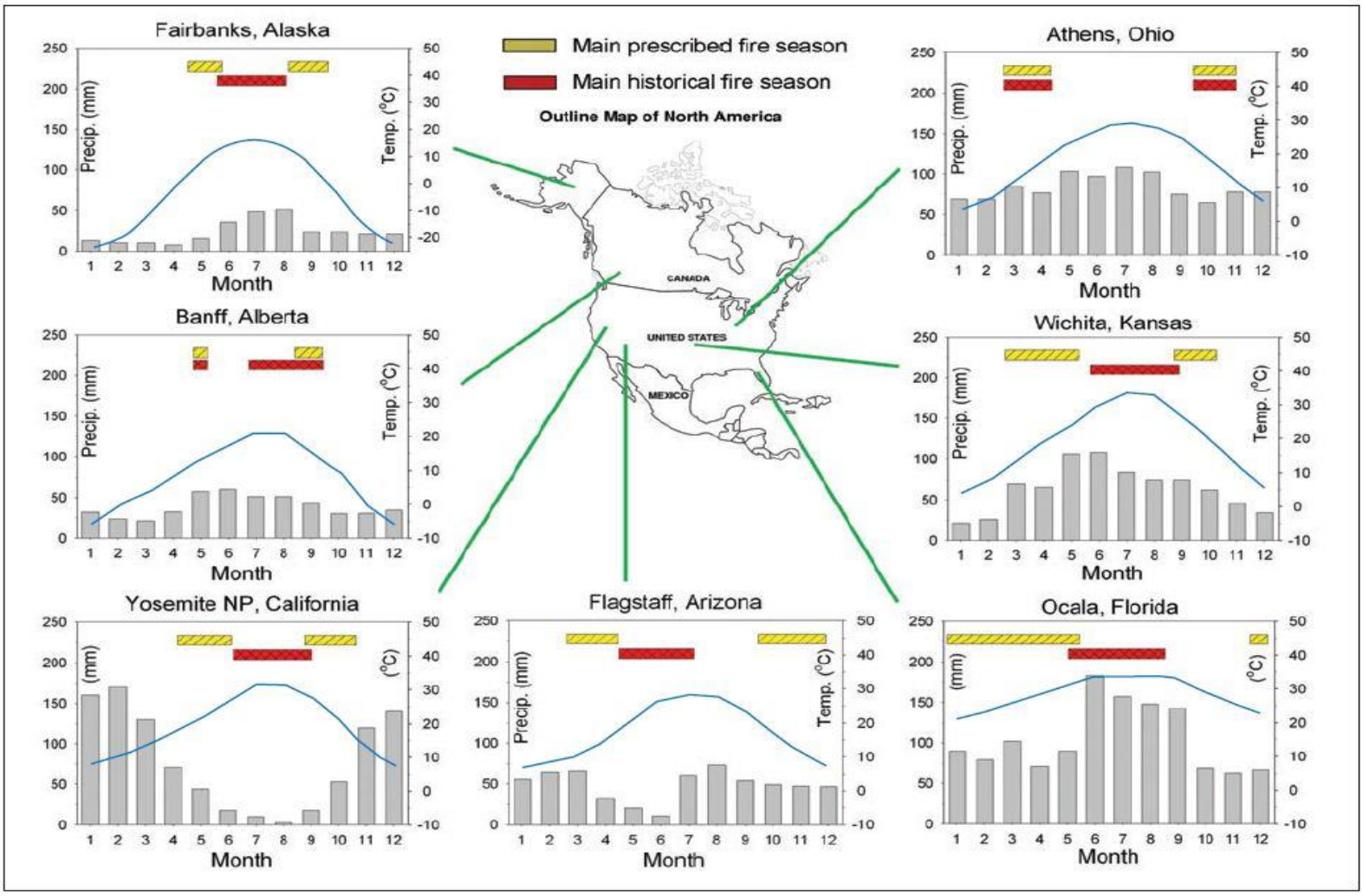
- Current and historical fire regimes often differ due to modern limitations in human resources and fire control needs, resulting in the supplemental use of mechanical and chemical treatments in order to meet burning objectives
- Uniform ignition techniques (e.g., linear strips or grid based) frequently used in prescribed fires today may deprive restoration sites of important variability in fire effects

Photos by C. Skinner

Historical periodic fires led to spatial variability in fuel, resulting in complex, patchy burns, and included areas not burned allowing for species to recuperate after a fire. Due to modern constraints, uniform ignitions (e.g., linear strips or grid based) are often employed for fire control and operational needs.

RESEARCH BRIEF

Prescribed fire: history, current practices, challenges



The approximate time of year of the peak historical fire seasons and current prescribed fire seasons often differ in the seven representative areas in North America with active prescribed fire programs. These climographs also show monthly average temperature (blue line) and precipitation (grey bars).

grid based) are often employed for fire control and operational needs. In addition, prescribed fires are frequently conducted outside of the historical fire season and conditions due to concerns for human safety and resource capacity as well as fire-control (see above image). Modern prescribed fires are now conducted during periods of higher fuel moistures; conditions which may be less likely to be meet burning objectives (i.e., fuel consumption and control of undesirable woody encroachment) and require supplemental mechanical or chemical treatments.

Though the understanding of prescribed fire's role in land management has increased greatly in recent years, the authors note that much is left to be investigated, especially in terms of how regimes and time/spatial scales affect stand level processes. Important as these ecological questions are, they are dwarfed by the legal, political, cultural, and operational challenges facing prescribed fire use in the oak woodlands of the eastern United States. Compliance with environmental laws (e.g., National Environmental Policy Act, the Clean Air Act, the Clean Water Act, and the Endangered Species Act), the complex issues surrounding public acceptance (such as smoke, visual impacts, and short-term risks), and securing adequate funding will remain the fundamental challenges for prescribed fire in the oak woodlands of North America.

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