

# Why Are the Forests Not Burning? Shortcomings of Fire Management in the Sierra Nevada

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*WRITER'S COMMENT: As a born-and-raised Californian, I'm both afraid of and fascinated by fire—especially lately, as huge wildfires ravage the state seemingly every year. When Dr. Hugh Safford guest-lectured in ESP 172 about how putting out wildfires ultimately results in these high-intensity burns, and the immensity of what this means for the forest ecosystem of the Sierra Nevada, I was intrigued. How was this allowed to happen? Professor Mark Lubell had tasked us with using the Natural Resources Regime Framework, a way of analyzing the interactions that influence land management decisions, to look at a controversial environmental issue. This essay is my attempt to explain why fire policies haven't been more effective at preventing destructive wildfires, and my argument for fighting fire with fire—especially in the Sierra Nevada. My focus is policy reform, but exploring this topic made me realize that even the best intentions in policy may not lead to good management without a change in our cultural attitude towards wildfire. I hope this paper makes readers consider the possibility that fire in California may not just be a problem, but also an opportunity.*

*INSTRUCTOR'S COMMENT: Fire management is one of the most important and controversial issues in Western public lands management. After decades of fire suppression in the name of protecting timber value and human communities, forest managers are increasingly recognizing the important ecological functions of fire and attempting to reintegrate fire as a land management tool. Kathryn Canepa's paper addresses this debate by asking the question of why prescribed fire*

*is not being used more frequently in forest management. She does an excellent job of describing the basic ecological and policy background that informs the debate. She then utilizes the theoretical framework from the class to identify how “policy paradoxes, ideas of acceptable risk, lack of public support, agency culture and level of expertise, and institutional structure” are barriers to ecological fire management. The essay concludes with a series of policy recommendations about how to accelerate the use of ecological fire management. Ms. Canepa’s paper utilizes a wide variety of research, including personal interviews with policy stakeholders. The paper is exceptional in addressing an interesting question from policy theory in the context of an important issue in natural resource management.*

—Mark Lubell, *Department of Environmental Science and Policy*

## Introduction

California’s Sierra Nevada mountain range is a fire-adapted ecosystem. However, for roughly a century, putting out wildfires has been the go-to strategy in forest management. This suppression has led to a severely disrupted ecosystem and an unnatural fire regime that brings infrequent, yet high-intensity and destructive, wildfires to a region with both high biodiversity and a large human population. Ecological fire management strategies such as prescribed burning have the potential to restore natural conditions and have been framed favorably in federal fire policy in recent years, but there is a disconnect between policy and on-the-ground management. This paper will explore how the history of federal fire policy, the current policy landscape, and pressures specific to the Sierra Nevada region interact to prevent wider adoption of fire as a management tool. There are economic and environmental reasons that prescribed fire should be implemented much more often, but conflicting values, budgetary structure, and distaste for risk have raised barriers to its widespread use.

## Background

The Sierra Nevada mountain range covers approximately 24,000 square miles in eastern California (Davis and Stoms 2017). Thirty-six

percent of the Sierra Nevada region is privately owned, most of which is within the wildland urban interface (WUI), a term for areas where development is interspersed with wildland (Davis and Stoms 2017). The rest of the land is publicly owned, mostly by the federal government with a small portion of state and local government landholdings (USGS 2016; Dunn 2012; Davis and Stoms 2017). Of the federally-owned land, 47% is controlled by the U.S. Forest Service (USFS), 10% by the National Park Service (NPS), and 5% by the Bureau of Land Management (BLM) (Davis and Stoms 2017). Because of the variety in ownership, the land in the Sierra Nevada is managed for many different purposes (e.g. roadless areas, national parks, multiple-use land, and private property) (Davis and Stoms 2017). However, wildfires don't heed jurisdictional boundaries, and fire management is something all these agencies contend with. The NPS, BLM, and USFS are the main federal fire management agencies, with jurisdiction over mainly undeveloped wildlands. As the state agency that manages fire risk to private property, CAL FIRE focuses on the wildland urban interface (Wildland Fire Executive Council 2009).

The Sierra Nevada forests of today no longer look like the forests of a century ago because fire management practices that promoted rampant fire suppression have altered the fire-adapted ecosystem. Fire suppression became the status quo of western forest management in the early 1900s because fires were seen as antithetical to effective resource management (Donovan and Brown 2007). Early foresters in the Forest Service, hailing from eastern states, were loath to allow fires to burn young trees that would turn into big timber (Donovan and Brown 2007; Safford 2017). Resource concerns have continued to influence policy—for example, the 2003 Healthy Forests Restoration Act passed during the Bush administration claimed to reduce wildfire risk by streamlining the process of salvage logging (Driscoll et al. 2010). These resource priorities contributed to a system of fire policy and management where wildfire was essentially demonized—best symbolized by the classic federal agency standard of suppressing fires by 10 am the day after ignition, and Smokey the Bear's plea to prevent wildfires at all costs (Donovan and Brown 2007). The results of this kind of management on forest ecology have been dramatic.

Fire and forest ecologists have gradually come to understand that pine-dominated forests such as what once existed in the Sierra Nevada thrive under fire regimes with frequent, low-intensity fires that kill brush

and young trees but bypass mature trees (Miller et al. 2009). These fires are necessary to facilitate a heterogenous landscape with healthy plant competition and high biodiversity (Hessburg, Agee, and Franklin 2005; Collins et al. 2007). It has become widely accepted by scientists that in their most natural state, low-density stands of large, mature trees characterize these forests. Now, because the absence of fire enabled an ecosystem shift, forests in the Sierra are dominated by the much more fire-susceptible fir (Safford 2017). The absence of fire has also allowed the buildup of organic fuels, and the forests are denser than ever before. As a result, the size and intensity of wildfires that escape control have been steadily increasing. These new fires are more likely to kill mature trees, which impacts habitat, disrupts ecosystem function, and contributes to forest fragmentation (Miller et al. 2009; Safford 2017). Their greater areal footprint also increases the chances that they will reach developed areas (Safford 2017). These unnatural forest characteristics mean that the danger from wildfire to both humans and ecosystems in the Sierra Nevada is astronomically high.

Though the shift away from suppression as the dominant paradigm has been occurring incrementally since the 1970s (Goldstein and Butler 2009), the FLAME Act of 2009 ushered in a new, scientific era where fire is viewed as a tool rather than a disaster. Recognizing that fires do not respect borders, this legislation directed federal land agencies to work together on fire management policy. A collaborative task force created the National Cohesive Wildland Fire Management Strategy (NCWFMS), coordinating the fire policies of the Forest Service, National Park Service, BLM, Bureau of Indian Affairs, and Bureau of Reclamation (Forests and Rangelands 2017). In comparison to the policies that dominated for much of the 20th century, the NCWFMS emphasizes the need to reestablish natural fire regimes where possible, and advocates for ecological fuel management techniques—in other words, it explicitly considers ecosystems (Forests and Rangelands 2017). However, the policy clearly states that its primary directive is to protect human life, which provides a backdoor for fire managers to avoid these restoration efforts if a fire poses even the slightest risk.

One of the key management decisions given greater presence in the NCWFMS is the use of prescribed fire (Forests and Rangelands 2017). Prescribed fires are intentionally set fires controlled over a specified area, meant to reduce fuels and minimize the destructive power of wildfires.

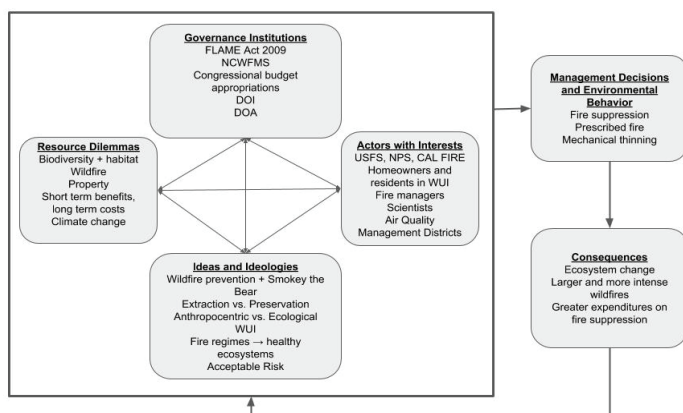


Figure 1. Actors, institutions, ideologies, and dilemmas that influence fire policy and management, categorized within the Natural Resources Regime Framework (adapted from Marc Eisner’s framework).

In the Sierra Nevada, they are a tool for returning parts of the landscape to pre-suppression conditions (U.S. Department of the Interior and U.S. Department of Agriculture 2008). Prescribed burning is cheaper than other fuel management procedures such as mechanical thinning of forest stands, but can be used only under safe, very specific conditions—which precludes their use in areas with extremely dense fuel buildup, during times of drought, or during hot weather (Donovan and Brown 2007; Knapp et al. 2005). Other ecological and human health factors, such as smoke dispersal from atmospheric circulation and breeding seasons for wildlife populations, make planning a prescribed fire even more complicated (Knapp et al. 2005). Fire managers must obtain permits, notify the public, and develop a burn plan, a process which can take years (Natural Resources Conservation Service 2009; Dickman 2016). Though prescribed burning is now considered a legitimate management option and is supported by national fire policy, in practice the effect has been minimal (Stephens et al. 2016). Especially in the Sierra Nevada, which has extensive WUI, the pressure on fire managers to minimize risk to humans and property may overpower the need to rebuild natural fire regimes. The following section will use the natural resources regime framework (see Figure 1) to analyze the reasons that prescribed burning has not been implemented more widely in the Sierra Nevada.

## Regime Analysis

It is no longer controversial that fire plays an important ecological role in forests. This scientific understanding has underscored federal fire policy since at least the mid-1990s, and as early as the 1970s for some agencies—thus, the lag between policy creation and changes in management cannot be attributed to a lack of knowledge (Forests and Rangelands 2017; U.S. Department of the Interior and U.S. Department of Agriculture 1995; Goldstein and Butler 2009). In the Sierra Nevada, land characteristics interact with policy shortcomings to cause this stagnation.

One reason for the disconnect between ideas and follow-through may be contradictory language within policy itself. For example, implementation guides for the fairly progressive National Cohesive Wildland Fire Management Strategy stress that human life will always be the predominant concern when managing fire, with ecological management second (Wildland Fire Executive Council 2009). Debating the morality of this value is pointless—the fact is that in California, where population growth is rapid, allowing enough fire to achieve ecological objectives while simultaneously protecting people and homes in the wildland urban interface is incredibly difficult. Almost all the housing in the Sierra Nevada is in the WUI, which means people’s homes are surrounded by brush and vegetation—and thus can easily spark from a nearby fire (Hammer et al. 2007). Though federal agencies technically don’t have jurisdiction over built areas—protection of structures is the responsibility of local, state, and tribal governments—they often contribute significant resources to fire protection in the wildland urban interface anyway (U.S. Department of the Interior and U.S. Department of Agriculture 1995). Fire suppression is enabled by policy priorities, and fire managers are incentivized to prevent fires because public fear of wildfire is widespread, and agencies thrive on support. This is a classic “ecosystem vs. people” dilemma: policy and management actions reflect the prioritization of anthropocentric interests over forest ecology.

This ideology appears specifically in relation to prescribed fire—no matter how carefully they are planned, prescribed burns can be dangerous, and this puts public pressure on fire managers to not use the technique. According to Hugh Safford, a regional ecologist from the Forest Service, the two risks of a prescribed fire that incite the most

public opposition are bad air quality and the threat of it escaping control. Air pollution from smoke can be a health hazard; therefore, a prescribed burn must comply with Air Quality Management District regulations and NEPA requirements before it is approved (Dickman 2016; Schweizer and Cisneros 2014), and will only be given the “go-ahead” under very specific weather conditions. The other concern, that a prescribed burn will turn into a full-blown, destructive wildfire, is a strong deterrent to public support for this practice. Both these factors play into the idea that there is no acceptable risk if there are people involved, and have erected bureaucratic roadblocks that prevent efficient implementation of prescribed burns (Safford 2017). But these risks pose a pay-now-or-pay-later dilemma. Smoke from prescribed fires is inevitable, but the effect on people can be mitigated with careful planning; smoke from high-intensity, large wildfires, which are not subject to air quality regulations, is more likely to be dangerous for public health (Schweizer and Cisneros 2014). And there may be risk inherent in planned burning, but allowing fuel build-up shunts the risk to another generation or even just a subsequent year. However, public wariness about prescribed fire persists, in part because of a lack of knowledge about fire regime restoration. One of the reasons fire suppression took such a cultural hold was because a unified message with little complexity (“Only you can prevent forest fires”) was presented to the public (Donovan and Brown 2007). There is no similarly cohesive message to the public about natural fire regime restoration (Goldstein and Butler 2009).

Additional complexity is introduced by the fact that several federal and state agencies with different goals manage fire in the Sierra Nevada. The largest barrier identified by Goldstein and Butler (2009) to a solid adoption of ecological fire management is a lack of coordination between stakeholders. However, interagency efforts to standardize wildfire policy haven’t been absent; as early as 1995, the main federal agencies in charge of fire were attempting to coordinate their policy objectives with a comprehensive review of fire policy, and the recent creation of the NCWFMS was a big step forward (U.S. Department of the Interior and U.S. Department of Agriculture 1995; Forests and Rangelands 2017). Regardless, agency culture differs. In the last 40 years, the National Park Service has been much more open to the use of prescribed fire than the U.S. Forest Service, which has focused more on suppression (H.S., personal communication). This may be a result of the

underlying preservation ideology of the Park Service versus the multiple-use mandate of the Forest Service. The outcome is greater expertise with prescribed fire within the ranks of the NPS. CAL FIRE, the state fire agency, has been solely focused on fire suppression and has only recently taken a more open-minded position on the benefits of prescribed fire (Safford 2017). The federal agencies prove that ideas take a long time to translate to action, but evidence of the effectiveness of prescribed fire may accelerate the shift. In Kings Canyon National Park, one of the few places where prescribed burning has been used frequently in the Sierra, the high-intensity Rough Fire fizzled out when it hit park boundaries in 2015 (Nichols 2016).

The final factor in why prescribed fire is not being adopted more widely is the administrative structure of budgets, which has incentivized fire suppression and resulted in massive amounts of resources being directed towards it (USDA Press Office 2017a). Fire suppression budgets are “flexible” because money from emergency and prevention funds can be appropriated by Congress as needed. In contrast, the budget for proactive management options like prescribed fire is fixed and small (North et al. 2015). The Secretary of Agriculture has advocated for some policy reform, such as ending the use of wildfire prevention funds for suppression (USDA Press Office 2017b), but this fails to address the problem of low allocation for ecological management, and still would allow dipping into emergency funds once the suppression budget ran dry. Furthermore, even funds specially designated for fuel management may not be utilized for prescribed burning. For example, the NPS—the agency most likely to use the strategy—is limited by DOI allocations that direct more funding to protection of the WUI rather than isolated locations (Nichols 2016). Therefore, rather than go towards prescribed burning, the funds are applied towards more expensive mechanical treatments because of the proximity to developed areas.

Taken together in the context of the highly-populated Sierra Nevada, policy paradoxes, ideas of acceptable risk, lack of public support, agency culture and level of expertise, and institutional structure, result in two outcomes: most fires are still suppressed, and when prescribed fires do burn, they do so at a small, inadequate scale. The consequence? There is no significant shift to restoring the natural fire regime of the Sierra, ecosystem integrity suffers, and the danger to people builds.



## Policy Recommendations

One of the main issues with current fire policy is that two goals—ecological management and human safety—are framed as distinct, if not mutually exclusive. Though fire policy has evolved substantially in the last 30 years, the implied separation between anthropocentric and ecological concerns is a relic of the suppression era. It is evident in policy language and leaks into administrative and management decisions—especially surrounding prescribed fire, which has not been prioritized because it carries risk to people and property. (Under the current system, the ecological risks of *not* doing it don't carry enough weight.) One way to address this issue is to revise the policy language itself to frame ecological and anthropocentric interests as the same. It would not be disingenuous to acknowledge that restoration of natural fire regimes through expanded use of fire might mean small risks in the short term, but would result in huge gains in human safety in the future—especially considering the inevitability of climate change and the hotter temperatures and longer fire seasons it is already ushering in (Safford 2017). In practice, requiring managers to justify suppression in their management plans rather than prescribed fire would reduce the length of time needed to make a prescribed burn happen (Stephens et al. 2016). This would implicitly redefine agency priorities and the kind of management considered to be beneficial for humans.

By enabling and incentivizing fire suppression, policy has ensured that there is little motivation to cultivate expertise within agencies for prescribed fire techniques (Safford 2017). Policy reforms could put greater emphasis on training fire managers to administer prescribed fires, and increase requirements for reporting and communication between agencies. Though this strategy carries the risk of further bureaucratic slow-downs, it would give prescribed fire greater visibility and make its application seem more feasible to fire managers. Requiring more public outreach as well could make prescribed fire more palatable to people living in the WUI (Nichols 2016).

Managing risk at an acceptable threshold in the WUI will require greater collaboration between federal agencies and CAL FIRE. Though the National Cohesive Strategy states the importance of collaborating with state agencies (Wildland Fire Executive Council 2009), a step further would be to create state-federal partnerships at the regional

scale. In the Sierra Nevada, this could help unify strategies towards fuels in the WUI. The state-federal partnerships could work with regional Air Quality Management Districts to establish zones of progressively “natural” fire management as the distance from homes increases (North et al. 2015). Having a blueprint for where prescribed fire is acceptable, with agreement from many different knowledgeable stakeholders, could streamline the administrative side of prescribed burning and thus lower that barrier to ecological management. Another option for streamlining is to reduce the air quality regulations that prescribed fires must comply with—though measuring air quality impacts of fires is complex, research indicates that lower intensity fires have fewer health impacts, and wildfires aren’t regulated at all (Schweizer and Cisneros 2014).

Finally, budget allocation practices should be reformed so that suppression is no longer incentivized by the ability to redirect funds from ecological fire management coffers. One option would be to create a dedicated, untouchable fund for prescribed burning and other fuel management and restoration-related fire activities (North et al. 2015). Even more radical would be to put a cap on the percentage of federal agency budgets that can be spent on suppression—motivating agency leaders to take a hard look at other options that would reduce wildfire risk, and would cost less money in the long term. Money talks; redirecting funds would demonstrate shifting priorities in a very persuasive way, and these new priorities would in turn influence policy.

## Conclusion

Using fire as a tool to return an ecosystem to its natural, often-burned state is politically and administratively difficult. Ecological reasons to use prescribed fire, though adopted in federal forest fire policy after a long history of suppression-only ideology, have not proven enough of an incentive to adopt the strategy on a widespread scale. The intersection of explicit and implicit policy priorities, administrative barriers, and risk aversion within the highly populated, flammable Sierra Nevada has made ecological fire management challenging. However, reframing the problem could help. Unifying anthropocentric and ecological concerns in policy, accepting a little risk to people and property now to prevent higher risk in the future, and showing that proactive management is valued by directing money towards it would point the matchstick in the

right direction. With every year that passes, the need to address wildfire issues in California increases in urgency. More fires, carefully set now, means burning will be less dangerous and less disruptive in the future.

## References

- Collins, Brandon M, Maggi Kelly, Jan W. van Wagtendonk, and Scott L. Stephens. 2007. "Spatial Patterns of Large Natural Fires in Sierra Nevada Wilderness Areas." *Landscape Ecology* 22 (4): 545-57. doi:10.1007/s10980-006-9047-5.
- Davis, Frank, and David Stoms. 2017. "Appendix SN. The Sierra Nevada Region." [https://www.webcitation.org/5yfLHKOZu?url=http://www.biogeog.ucsb.edu/projects/gap/report/sn\\_rep.html](https://www.webcitation.org/5yfLHKOZu?url=http://www.biogeog.ucsb.edu/projects/gap/report/sn_rep.html).
- Dickman, Kyle. 2016. "Fighting Fire with Fire." *TakePart*, August. <http://www.takepart.com/feature/2016/08/19/prescribed-fire>.
- Donovan, Geoffrey H., and Thomas C. Brown. 2007. "Be Careful What You Wish for: The Legacy of Smokey Bear." *Frontiers in Ecology and the Environment* 5 (2). WileyEcological Society of America: 73-79. doi:10.2307/20440582.
- Driscoll, Don A., David B. Lindenmayer, Andrew F. Bennett, Michael Bode, Ross A. Bradstock, Geoffrey J. Cary, Michael F. Clarke, et al. 2010. "Resolving Conflicts in Fire Management Using Decision Theory: Asset-Protection versus Biodiversity Conservation." *Conservation Letters* 3 (4). Blackwell Publishing Inc: 215-23. doi:10.1111/j.1755-263X.2010.00115.x.
- Dunn, Anthony. 2012. "Sierra Nevada Geography." *Sierra Nevada Photos*. <http://www.sierranavadaphotos.com/geography/index.asp>.
- Forests and Rangelands. 2017. "National Cohesive Wildland Fire Management Strategy." <https://www.forestsandrangelands.gov/strategy/>.
- Goldstein, Bruce Evan, and William Hale Butler. 2009. "The Network Imaginary: Coherence and Creativity within a Multiscalar Collaborative Effort to Reform US Fire Management." *Journal*

- of Environmental Planning and Management* 52 (8): 1013-33.  
doi:10.1080/09640560903327443.
- Hammer, Roger B, Volker C Radeloff, Jeremy S. Fried, and Susan I. Stewart. 2007. "Wildland–urban Interface Housing Growth during the 1990s in California, Oregon, and Washington." *International Journal of Wildland Fire* 16: 255–65. doi:10.1071/WF05077.
- Hessburg, Paul F., James K. Agee, and Jerry F. Franklin. 2005. "Dry Forests and Wildland Fires of the Inland Northwest USA: Contrasting the Landscape Ecology of the Pre-Settlement and Modern Eras." *Forest Ecology and Management* 211: 117-39. <https://www.fs.usda.gov/treearch/pubs/24863>.
- Knapp, Eric E., Jon E. Keeley, Elizabeth A. Ballenger, and Teresa J. Brennan. 2005. "Fuel Reduction and Coarse Woody Debris Dynamics with Early Season and Late Season Prescribed Fire in a Sierra Nevada Mixed Conifer Forest." *Forest Ecology and Management* 208 (April). Elsevier: 383-97. doi:10.1016/J.FORECO.2005.01.016.
- Miller, J D, H D Safford, M Crimmins, and A E Thode. 2009. "Quantitative Evidence for Increasing Forest Fire Severity in the Sierra Nevada and Southern Cascade Mountains, California and Nevada, USA." *Ecosystems* 12 (1): 16-32. doi:10.1007/s10021-008-9201-9.
- Natural Resources Conservation Service. 2009. "Prescribed Burning: Iowa Job Sheet, Conservation Practice 338." [https://www.nrcs.usda.gov/Internet/FSE\\_DOCUMENTS/stelprdb1077267.pdf](https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1077267.pdf).
- Nichols, Tom. 2016. "The Fire Management Program of the National Park Service: Stall and Descent." *National Parks Traveler*, November. <https://www.nationalparkstraveler.org/2016/11/fire-management-program-national-park-service-stall-and-descent>.
- North, M P, S L Stephens, B M Collins, J K Agee, G Aplet, J F Franklin, and P Z Fulé. 2015. "ENVIRONMENTAL SCIENCE. Reform Forest Fire Management." *Science (New York, N.Y.)* 349 (6254). American Association for the Advancement of Science: 1280-81. doi:10.1126/science.aab2356.
- Safford, Hugh. 2017. "ESP 172: National Forests Lecture." Davis, CA: University of California, Davis.

- Schweizer, Don, and Ricardo Cisneros. 2014. "Wildland Fire Management and Air Quality in the Southern Sierra Nevada: Using the Lion Fire as a Case Study with a Multi-Year Perspective on PM2.5 Impacts and Fire Policy." *Journal of Environmental Management* 144. Elsevier Ltd: 265–78. doi:10.1016/j.jenvman.2014.06.007.
- Stephens, Scott L., Brandon M. Collins, Eric Biber, and Peter Z. Fulé. 2016. "U.S. Federal Fire and Forest Policy: Emphasizing Resilience in Dry Forests." *Ecosphere* 7 (11). doi:10.1002/ecs2.1584.
- U.S. Department of the Interior, and U.S. Department of Agriculture. 1995. "Federal Wildland Fire Management Policy & Program Review: Draft Report." Washington, D.C.
- . 2008. "Interagency Prescribed Fire: Planning and Implementation Procedures Guide."
- USDA Press Office. 2017a. "Forest Service Wildland Fire Suppression Costs Exceed \$2 Billion." Washington, D.C.: U.S. Department of Agriculture. <https://www.usda.gov/media/press-releases/2017/09/14/forest-service-wildland-fire-suppression-costs-exceed-2-billion>.
- . 2017b. "Perdue Calls on Congress to Fix Forest Service Fire Funding Problem." Washington, D.C.: U.S. Department of Agriculture. <https://www.usda.gov/media/press-releases/2017/09/08/perdue-calls-congress-fix-forest-service-fire-funding-problem>.
- USGS. 2016. "Protected Areas Database of the U.S." United States Geological Survey. <https://maps.usgs.gov/padus/>.
- Wildland Fire Executive Council. 2009. "Guidance for Implementation of Federal Wildland Fire Management Policy." Department of the Interior, Department of Agriculture. [https://www.nifc.gov/policies/policies\\_documents/GIFWFMP.pdf](https://www.nifc.gov/policies/policies_documents/GIFWFMP.pdf).