

# MANAGING FIRE-PRONE FORESTS: ROOTS OF OUR DILEMMA\*



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The year 2002 again produced large, destructive wildfires in the Western United States. Not counting Alaska, more than 3 million acres (1.2 million ha) burned in the West, including more than 600 homes. Arizona, Colorado, and Oregon experienced their largest fires since records began.

Our dilemma is that in trying to protect forests from fire we have increased the hazard of severe wildfires as well as insect and disease epidemics and loss of historical biodiversity. The 90-year-old policy of trying to exclude fire from fire-prone forests without controlling the buildup of thickets of small trees, shrubs, dead wood, and leaf litter is at the root of this conundrum.

Strident voices dominated media coverage of the issue. Many foresters and loggers argued that the solution to saving western forests from destructive wildfires lies in thinning, selective logging, and slash disposal to open up the forest and reduce fuel accumulations. Environmental activists countered that past mismanagement is a source of our wildfire problems, and that now we must leave the forest alone and let it heal. In order to

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build broader understanding for achieving better management of fire, fuels, and the western forests themselves, it might be useful to review some key features in the century-old history behind our present predicament.

## Fire Regimes

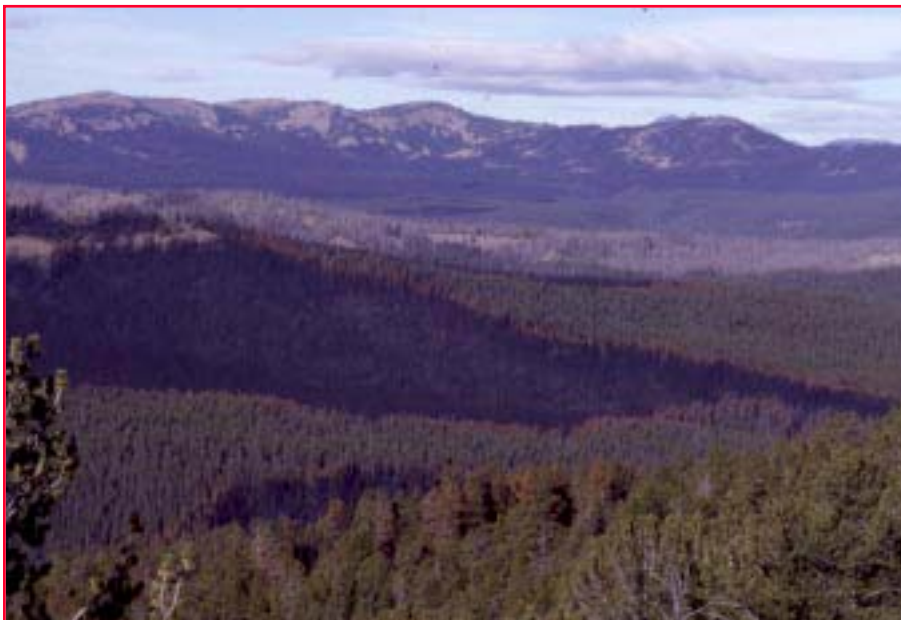
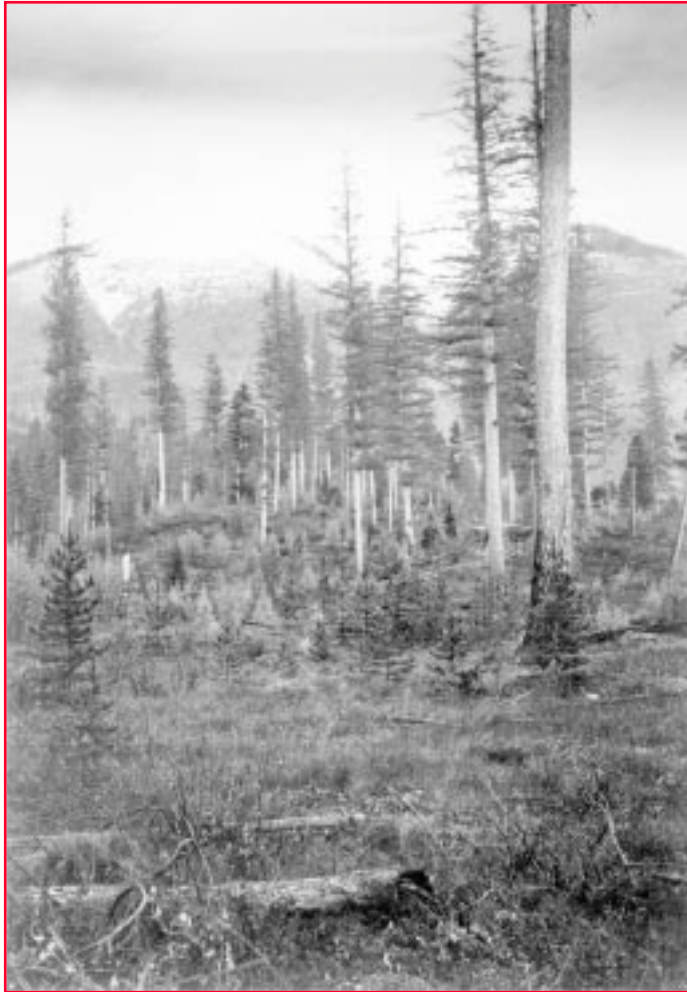
For thousands of years, western forests have been shaped by repeated patterns of burning (Arno 2000). The patterns include:

- An *understory fire regime* (fig. 1), in which frequent low-intensity fires kept forests of ponderosa pine and other species, along with oak woodlands, relatively open;
- A *mixed fire regime* (fig. 2), where fires of varying intensity killed a large proportion of fire-sensitive trees and allowed long-lived resistant trees to thrive, such as thick-barked pines, western larch, coastal Douglas-fir, and redwood; and



**Figure 1**—Ponderosa pine forest near Seeley Lake in western Montana in 1899, before logging and fire suppression. Frequent understory fires kept most ponderosa pine stands relatively open, with few understory trees and only small quantities of surface fuel. Photo: H. Ayres, USDI U.S. Geological Survey, 1899.

**Figure 2**—*Western larch–lodgepole pine forest north of Seeley Lake in western Montana in 1899, before logging and fire suppression. A mixed-severity fire about two decades earlier evidently killed some of the overstory trees and allowed vigorous regeneration of lodgepole pine (dark saplings) and some larch. Photo: H. Ayres, USDI U.S. Geological Survey, 1899.*



**Figure 3**—*Burn mosaic in a stand replacement fire regime. Fire-killed stands will regenerate, forming a much younger forest than in adjacent stands. Forests in the stand-replacement fire regime are often diverse patchworks of different age classes. Photo: USDA Forest Service, 1988.*

- A *stand replacement fire regime* (fig. 3) in some moist and high-elevation forests, where severe fires at intervals of one to four centuries left a mosaic of new and older stands.

Trying to eliminate fire from these ecosystems without effective surrogate treatments was a radical departure from natural conditions. It led to fuel accumulations and increasingly severe wildfires in the historical understory and mixed fire regimes that govern the largest portion of western forests, including most areas around homes and developments.

## Origins of Fire Exclusion

At the turn of the 20th century, Gifford Pinchot traveled widely while trying to establish a Federal forestry program to conserve American forests. In his travels, he observed that fire had played an important role in producing some of the most magnificent natural forests, such as the venerable Douglas-fir forests of western Washington. In an essay titled “The Relation of Forests and Forest Fires,” Pinchot (1899) urged that the role of fire in creating forests be studied to help in designing forest management. Pinchot wanted to prevent destructive fires, but he also wanted to understand fire’s role as an ecological force.

However, the initial concepts of forestry brought to this country were developed in humid regions of Europe, where foresters viewed fire in the forest as entirely unnecessary and destructive. Fires caused largely by human carelessness were indeed a serious threat to both watersheds and timber in the newly established forest reserves (later called national forests). Pinchot’s tiny new agency,

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the USDA Forest Service, needed to define and fund its mission to protect the reserves.

In 1908, the Forest Service found its mission when it was charged with preventing and controlling fires. A parsimonious Congress set up a unique system, like an open checkbook, to ensure payment for fire suppression efforts as needed (Pyne 1982). The political need to establish complete suppression of fire now overshadowed any scientific need to study fire's natural role in the forest (Pyne 2001). Although the Forest Service published a detailed report by pioneer ecologist Frederic Clements (1910) calling for the use of fire as a management tool in lodgepole pine forests, it ignored Clements's recommendations.

## Light Burning Controversy

Not everyone saw fire as the enemy. Several influential timberland owners in California advocated "light burning" to reduce the threat of wildfires (Hoxie 1910; Pyne 2001). Light burning involved informally setting fire to the forest floor litter across large areas during a "safe" season. Secretary of the Interior Richard Ballinger, whom Pinchot thoroughly disliked, supported the idea, stating that "we may find it necessary to revert to the old Indian method of burning over the forests annually at a seasonable period" (Pyne 1982).

In the summer of 1910, one of the California light burns got out of control (Pyne 1982). It burned 33,000 acres (13,000 ha) before finally being stopped at the boundary of a national forest. Then the disastrous 1910 wildfires in Idaho and Montana burned 3 million acres (1.2 million ha), mostly in a

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stand replacement fire regime, making a mockery of the Forest Service's assertion that it could control fires. Heated controversy in the aftermath of these events gave birth to the Forest Service's resolve to anchor its mission of forest protection to the exclusion of fire from the forest.

During the 1920s, the debate about the merits of light burning intensified. The Forest Service regarded the controversy as a serious threat to its mission (Biswell 1989; Pyne 1982). Light burning was unacceptable to the Forest Service because it was too difficult for its advocates to apply with any consistency. There

was no formal knowledge of the interrelationships among fuels, weather, and fire behavior, and foresters trained on the European model saw no value in such studies. Also, the Forest Service argued that light burning had to be detrimental to new timber because it killed seedlings and small trees.

## Timber Management: Fire Surrogate?

Government foresters did not realize that, without fire as a thinning agent, *too many* small trees would spring up and create problems. Selective harvesting removed large, fire-resistant trees and allowed small trees to proliferate.



*Logs being loaded for power and telephone poles, Routt National Forest, CO. After World War II, large clearcuts were seen as the answer to fuel management problems. However, extensive clearcutting fed public dissatisfaction with harvesting practices and did little to prevent severe fires. Photo: Courtesy of National Agricultural Library, Special Collections, Forest Service Photograph Collection, Beltsville, MD (Crozer, 1966; 515477).*

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ate, especially shade-tolerant species such as firs. Foresters counted on timber management as a benign replacement for historical fires. However, selective harvesting could not control the increase in small trees, which eventually developed into understory layers and thickets of ladder fuels susceptible to crown fire.

After World War II, large clearcuts were seen as the answer to fuel management problems. After a few decades, however, clearcuts gave rise to dense stands of small trees with branches reaching to the ground, accompanied by aging tall shrubs that included many dead branches. These even-aged stands were more vulnerable to severe wildfires than many of the historical stands in the understory and mixed fire regimes, which formed mixtures of trees of many sizes kept relatively open by periodic fires.

Also, extensive clearcutting fueled public dissatisfaction with harvesting practices. By the year 2000, public opposition put the entire timber management program on national forest land in danger of being abandoned.

## Alternative Approaches

An alternative approach to fuels management was beginning to develop. By the 1960s, foresters Harold Weaver of the USDI Bureau of Indian Affairs and Harold Biswell of the University of California at Berkeley were attracting support for their techniques of controlled burning in conjunction with

selective harvesting to maintain open, multiaged stands in ponderosa pine forests (Biswell and others 1973).

At about the same time, several scientists in the emerging field of ecology concluded that attempts to eliminate fire on national forests, national parks, and other western wildlands were a grave mistake. A committee of prominent wildlife biologists recommended to the Secretary of the Interior that fire be reintroduced in the national parks (Leopold and others 1963). By the 1970s, “natural fire programs” were allowing some lightning fires to burn in western national parks and national forest wilderness areas (Kilgore and Briggs 1972; Pyne 1982).

Still, not until the 1990s did the Forest Service adopt ecosystem-based management on western forest lands (Salwasser and Pfister 1994). Ecosystem-based approaches, like those advanced by Weaver and Biswell, are designed to restore and maintain natural forest structure and biodiversity. Where appropriate, they incorporate the use of fire.

## Fire and Fuels Management

In the late 1970s, Federal land management agencies changed their mission from fire control to a broader program called “fire management.” Fire management includes reducing forest fuels, using prescribed fire, allowing some lightning fires to burn, and con-

ducting limited suppression on some wildfires while fully suppressing others (Kilgore 1976; Nelson 1979).

However, Federal agencies have had difficulty replacing the “war on wildfire” with fire management. Public sentiment and modern environmental regulations are more aligned with forestry’s traditional credo that fire is bad, unnecessary, and subject to elimination. Although agencies have made great strides in developing and implementing prescribed burning techniques, the scale of burning and fuel treatments is only a tiny fraction of what is needed in most forest types to maintain historical ecological conditions or to reduce excessive fuels.

Prescribed fire and fuels management are funded at much lower levels than suppression. Over the decades, professional and institutional rewards and incentives have been linked to fire suppression. Policy revisions to integrate preventive fuels management and prescribed fire into fire management did not include changes in rewards and incentives (Czech 1996; GAO 1999; Mutch 2001). Those who suppress fires are regarded as heroes, whereas those who conduct prescribed burns might be perceived as doing harm by creating smoke, scorching green trees, and risking an escaped burn.

## Challenges Ahead

The next few years offer us a chance to finally adapt to living with fire-dependent forests and to shape fire to suit our needs. The Federal Government has supported a great expansion of fuels management and fire use in western forests, while at the same time markedly increasing suppression efforts. It will be



*Prescribed fire, Lewis and Clark National Forest, MT. In recent years, the Federal Government has supported a great expansion of fuels management and fire use in western forests. However, much more will be needed. Photo: Jill Bauermeister, USDA Forest Service, 1990.*

challenging, and require considerable public support, to achieve fire management goals. In contrast, it will be easy to escalate suppression efforts, even though the corresponding increases in spending might be largely ineffective.

Forest managers have lost credibility with many members of the public. Often, the public is concerned about preserving the forest but does not understand the forest's dependence on historical fires that cannot be recreated or even simulated without proactive management. Some people object to any commercial use of trees on public lands without recognizing the compelling reasons for making use of the enormous quantity of small and medium-sized trees that need to be removed. Many people believe that it is unnecessary to remove any of the trees killed in wildfires, despite the eventual danger of severe double burns (Arno 2000; Brown and others 2001).

One way to win support has been by conducting well-managed fuel reduction projects in forests near residential areas. Another has been to lead field trips to areas recently burned by wildfires, including those previously treated for fuels. The forestry profession is taking its lumps for having charged ahead with management that was not well suited to the needs of naturally fire-prone forests. Now we need to earnestly and patiently develop and demonstrate more suitable management practices.

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