Reforming the Fire Service

An Analysis of Federal Fire Budgets and Incentives

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Abstract

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The large fires of recent years are not due to accumulated fuels but to droughts. Forest Service firefighting strategies that emphasize firefighter safety over minimizing acres burned also contribute to larger fires. The high expense of recent fires is partly due to the increasing number of homes in the wildland-urban interface.

The most important factor increasing the cost of recent fires, however, is incentives. Since 1908, Congress has given the Forest Service a blank check to put out fires. But from the late 1970s through the late 1980s, Congress and the Office of Management and Budget succeeded in keeping fire costs down by pressuring the agency to adopt less costly strategies and by giving the Forest Service a fixed budget for firefighting each year. This worked until the great fires of 1987 and 1988 forced the Forest Service to borrow hundreds of millions of dollars from its Knutson-Vandenberg reforestation fund. When Congress reimbursed the fund in 1990, fire managers again began acting as though they had a blank check to put out fires.

Another factor is the decline in the national forest timber program, which left the Forest Service looking for a new "mission." Such a new mission was created when Congress reacted to the severe fires of 2000 by doubling federal land fire budgets, effectively increasing the Forest Service's budget by nearly 40 percent. The so-called National Fire Plan has given the Forest Service a virtual blank check for fire suppression and nearly a blank check for hazardous fuel treatments.

Yet if accumulated fuels are not the problem, then most of this money is being wasted. Even though most fire ecologists agree that ecosystem restoration on the federal lands requires more fire, the Forest Service still suppresses 99.7 percent of all fires. Even though Forest Service researchers agree that homes in the wildland-urban interface can best be protected by fireproofing the roofs and landscaping within 150 feet of the homes, the Forest Service is spending hundreds of millions of dollars a year treating fuels on federal lands. The National Fire Plan will not reduce long-run fire suppression costs; instead, costs will continue to rise as long as the Forest Service has a blank check.

Unfortunately, problems with fire budgets have been obscured by a needless debate between environmental and timber interests, each trying to blame the other for recent fires and direct some of the fire money to their preferred uses. Both sides are a little bit right but mostly wrong. Recent fires are not due to fuels accumulated after timber sales; they are not due to fuels accumulated after environmentalists stopped timber sales. They are due to droughts.

The real problem in this dispute is that the incentives facing timber managers are as bad as those facing fire managers. Fixing the timber incentives will allow the Forest Service to use some commercial timber sales to improve forest health and restore ecosystems. Fixing the incentives that encourage the Forest Service to needlessly suppress all fires will save taxpayers' money and lead to better forest management.

The best way for Congress to fix these incentives is to decentralize national forests and manage them as self-funding fiduciary trusts. Congress could experiment with pilot forest trusts on selected national forests as recommended by the Forest Options Group, whose report is available at www.ti.org/2c.html.

About the Thoreau Institute

The Thoreau Institute is a non-profit think tank dedicated to finding ways to protect the environment using incentives rather than bureaucracy, subsidies, and government regulation. The Institute works on a variety of issues including federal land management, wildlife conservation, and urban growth and transportation. For more information, see the Institute's web site at www.ti.org. For questions about this or any other Thoreau Institute publication, email rot@ti.org.

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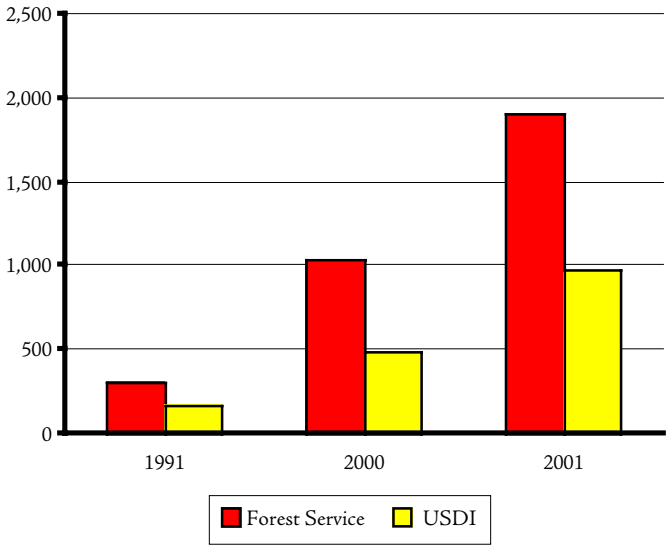
Front cover photograph: Backburning on the St. Mary's Mission Fire, part of the Virginia Lake Complex, Colville Indian Reservation, Washington in August, 2001. Photo by Karen Wattenmaker. Thanks to Karen Wattenmaker, www.kwphoto.com, for permission to use this photo.

Back cover photo: Torching a backfire at night. Photo by Sheri Ascherfeld, BLM, http://www.firepix.net/fireaviation/fi/000000d0.jpg.

Executive Summary

After the fires of 2000, Congress increased the Forest Service's budget by nearly 40 percent, from $3.6 to $5.1 billion a year. Three-fourths of this increase was related to fire. As chart one shows, fire budgets for the Forest Service and federal land agencies in the Department of the Interior have hextupled in the last decade and nearly doubled in just one year to nearly $3 billion per year.

Chart One
Forest Service and Department of the Interior Fire Budgets
(millions of dollars)



Fire budgets tripled in the nine years before 2000 and then they nearly doubled again in 2001. Source: Forest Service Budget Explanatory Notes 1993; *USDI* Budget in Brief F.Y. 1993 ; *http://www.fireplan.gov.*

These massive increases in spending are based on a new conventional wisdom about the role of fires in forests and wildlands. Whereas the old conventional wisdom called for suppressing every fire in a vain hope of eliminating fire from forests and range, the new wisdom says that total suppression has led to severe declines in forest health and a dangerous accumulation of fuels. The proof of this is supposed to be found in the severity of recent fires and the high costs of putting them out.

It would have been appropriate a century ago for the Forest Service to let more fires burn and to treat more acres with prescribed burning, the new wisdom continues. But the dangerous build up of fuels makes such a policy too risky today. So the Forest Service and other federal land agencies must spend well over a billion dollars a year suppressing fires while they simultaneously spend hundreds of millions each year carefully removing hazardous fuels from the federal lands.

Recent debates over fire have focused on the role commercial timber sales can play in fire prevention. Commodity interests blame fires on environmental groups who prevented or delayed such sales and other fuel treatment programs. Environmental groups in turn blame fires on the debris left behind after timber sales. Both sides accept the new conventional wisdom that accumulated fuels are the problem and that massive amounts of money must be spent to reduce fuels and/or restore ecosystems. They just differ on how exactly that money should be spent.

The implicit, if not explicit, assumptions behind the new wisdom are that all of this spending will save money and resources:

- Spending a billion dollars or so a year on fire suppression is supposed to save even more valuable resources from destruction;
- Hiring 50 percent more firefighters and spending more on other fire preparation efforts is expected to reduce annual fire suppression costs;
- Spending $400 million a year on fuel treatments is supposed to reduce future fire suppression costs, protect homes built near federal lands, and produce various ecological benefits; and
- Such fuel treatments are assumed to be a one-time only investment, after which annual fuel management costs will dramatically decline along with the costs of suppressing fires.

A close examination of fire policy and recent fires shows that all of these assumptions are wrong. The old wisdom demonized fires and promised enormous benefits by eliminating fires from the forests through ruthless suppression. The new wisdom demonizes fuel accumulations and promises enormous benefits and future savings by eliminating those fuels today. Yet the new conventional wisdom is just as wrong as the old one.

This paper will show that built-up fuels are *not* the main reason, or even a major reason, for recent severe fires or high fire suppression costs. The weather is the prime reason for widespread fires this year as well as in 2000, 1999, and other recent years. But the major reason for increased costs is institutional: The federal land agencies, and especially the Forest Service, have a blank check to put out fires and thus have no reason to control their costs.

If fuels are not the problem, then it isn't necessary to spend $400 million a year treating them. Nor is there any reason to spend billions of dollars on presuppression and suppression activities that cost only a few hundred million a year a decade ago.

While the new conventional wisdom calls for letting more fires burn, this paper will show that budgetary incentives have led the Forest Service and other agencies to suppress 99.7 percent of all fires. Federal fire policy and agency rules place so many obstacles in the way of letting fires burn that managers simply

find it easier to suppress almost every fire.

Instead of letting fires burn, Congress has given federal land agencies a huge increase in funding for presuppression on the Forest Service's promise that this will reduce suppression costs. Yet this promise has not been fulfilled: suppression costs have also increased several-fold. In 1994, which up until that time was the most expensive fire year on record, the Forest Service spent $548 million on suppression. By 2001, which was supposed to be a mild fire year, Forest Service fire suppression costs ballooned to $683 million.

This spending is almost entirely unnecessary. Once justified by the value of the timber that would be killed by fires, this excuse has wisped away with the past decade's 82 percent decline in national forest timber sales. Many other resources actually benefit from fire, and these benefits probably make up for any residual harm from fires.

The chief remaining justification for federal fire suppression is to protect structures and other property on adjacent private lands. Yet Forest Service researchers have shown that treating federal lands is the wrong way to protect private homes and other structures. Instead, all that is necessary to protect those structures is to insure they have fireproof roofs and landscaping for 140 feet or so around the structures—an average of less than 2 acres per home.

Proponents of fuel treatments point to the Southeast, where the Forest Service and private landowners burn hundreds of thousands of acres each year. Removing today's built-up fuels from western forests and placing those forests on a similar regime, say burning advocates, can significantly reduce future fire suppression and management costs.

Western forests, however, are not like southern forests. While most forests in the South are ecologically adapted to frequent, low-intensity fires, more than 80 percent of the West is adapted to mixed-intensity or stand-replacement fires. Just as the South partly achieved its current condition through type conversions from hardwoods to pines, the Forest Service could change the West to some degree through widespread type conversions. But much of the West isn't susceptible to such conversions, and environmentalists would naturally object to most such conversions as unnatural.

As long as the West has forests, it will have fires. As long as the Forest Service has a blank check for fire suppression, taxpayers will spend a lot putting those fires out.

If the new wisdom is wrong, how did get to be so widely accepted? The short answer is that most interest groups, and especially the federal agencies—which themselves must be considered interest groups—have a strong incentive to increase federal spending on the public lands.

This paper shows that poorly designed incentives—starting with the blank check Congress has historically given the Forest Service for fire suppression—are responsible for most of the problems created by past fire management. Though federal land managers have the best of intentions, a bureaucracy cannot be trusted not to abuse a blank check, and a bureaucracy with a blank check cannot be trusted to tell the truth about the need to spend that check. Yet the current policy, which combines a blank check for fire suppression with a near-blank check for other fire management, is hardly an improvement.

What should be done instead? This paper reviews a number of alternatives that have been proposed by various interest groups and policy analysts. The two most effective alternatives are for Congress to simply stop funding federal land fire suppression or for Congress to decentralize federal land management and let each management unit fund itself out of its own receipts.

Regardless of which alternative anyone supports, it is clear that Congress should consider a broader range of alternative policies before it gives the federal agencies another few billion dollars to burn. The big problem with any centrally driven policy is that no single solution fits lands as widely diverse as those found in the National Forest System, much less the federal land base as a whole. The challenge for Congress and other policy makers is to design a system that encourages federal land managers to make decisions in response to local conditions and not in response to the incentives created by a blank check.

Stories and Myths

"The West is Burning!" proclaims a dramatically illustrated popular book, echoing many news articles written during the fires of 2000.[1] The Yellowstone blazes of 1988 turned forest and range fire on federal lands into a major public policy issue. The debate would be vigorously renewed with the record fire years of 1994 and 2000 and the near-record 1996 and 1999 fire seasons.

At issue is the best way of treating forests that have supposedly been ecologically altered by decades of fire suppression. Should the Forest Service commercially sell timber as a way of treating such forests? Should Congress give the Forest Service and other agencies billions of dollars to treat millions of acres of land? Should the agencies let wildfires burn or suppress every fire? How can agencies best protect firefighters' lives and structures on private land adjacent to federal lands?

Fire historian Stephen Pyne observes that government fire policies are strongly influenced by the stories people tell about fire.[2] Ninety years ago, many of those stories were derived from the *Big Blowup*, the fires in Idaho and Montana that burned 2.5 million acres and killed at least 78 firefighters. The Forest Service used the story of this fire to convince Congress that the agency could eliminate destructive fires from the national forests if Congress would provide enough funds for the agency to suppress all fires.

As Pyne and others tell the story, the severity of the Big Blowup led to a religious anti-fire zealotry that caused the Forest Service to oppose prescribed burning and dismiss timber industry and academic advocates of "light burning" as kooks and heretics. This anti-fire religion paralleled a timber religion that historian David Clary and forestry Professor Richard Behan believe led the Forest Service to excessively clearcut the national forests.[3] With the help of Smokey the Bear, the Forest Service gained broad public acceptance for fire prevention and fire suppression.

Yet the conventional wisdom about fire began to break down in the 1970s as the Park Service began experimenting with controlled burning in selected parks and ecosystems. In the late 1970s, the Forest Service formally rescinded its long-standing policy of putting all fires out by 10 AM and allowed forests to let some fires burn.

For the most part, however, these changes were superficial and the Forest Service continued to suppress more than 99 percent of all fires. It took the Yellowstone fires of 1988 and other huge fires of 1994 and 2000 to dramatically change the conventional wisdom about fires and convince Congress to significantly boost agency fire budgets.

The new conventional wisdom is based on stories federal land officials tell about those fires. The lesson of these stories is that fire is a natural part of the landscape and should be restored by public land managers. But decades of fire suppression have led to a dangerous accumulation of fuels on at least 70 million acres of federal land. Federal land managers can't always treat those fuels with prescribed burning and often must use more expensive mechanical treatments of fuels.

Every fire expert and policy analyst in and out of government appears to have accepted the new conventional wisdom. Congress has responded by giving the Forest Service and other federal land agencies mammoth increases in their budgets. During the 1990s, the Forest Service's budget averaged $3.38 billion a year and reached a maximum of $3.50 billion in 1998. By 2001, fire had lifted the Forest Service's budget by more than 50 percent to $5.26 billion, and it appears likely to remain in the $5.0 billion range for the foreseeable future. The increased budgets are mainly for fire preparation, fire suppression, the treatment of fuels before they burn in wildfires, rehabilitation of burned areas, and other fire-related activities.

Among the major interest groups in Washington—environmentalists, the timber industry, ranchers, recreationists, and the Forest Service itself—there is no debate over this increase in budget. The only debate is whether commercial timber sales should be one of the treatments used to reduce forest fuels. But if the story on which this policy is based is wrong, this policy may prove unnecessarily expensive in dollars, firefighters' lives, and the ecological health of the forests.

In writing about wildfire management, University of Washington Professor Robert Lee makes "a distinction between overt and covert knowledge, with skillful manipulation of the latter by institutional gatekeepers."[4] The covert knowledge about wildfire reveals that the standard story is not just oversimplified but is deceptive in many respects, with the primary aim of securing more funding and power for the Forest Service.

It is strange, for example, that one of the sources most cited as evidence that a build-up of fuels has led to more severe fires is a report from the General Accounting Office.[5] With all due respect to the GAO, its staff consists of accountants, not fire ecologists. Yet scientific journals[6] and even the Forest Service[7] cite this GAO report as proof of the accumulated fuel hypothesis.

This paper presents a revised story of fire on federal lands that goes something like this. From 1910 through the early 1950s, fire suppression was the central mission of the Forest Service, so much so that many people thought of it as the Fire Service. Fire suppression provided the Forest Service with huge public relations benefits as the media portrayed individual firefighters and the agency in general as heroes. As a headline in *Newsweek* observed in 1952, "Fabulous Bear, Famous Service Fight Annual Billion-Dollar Fire."[8]

The public relations rewards were bolstered by the budgetary rewards from fire suppression. The Forest Service is one of the few agencies in the federal government to receive a blank check from Congress, to spend literally as much as it needs to put out wildfires.

This blank check made the Forest Service a true power in the pantheon of federal agencies. The 1924 Clarke-McNary Act, which gave the Forest Service some authority over private forestlands under the guise of fire protection, added to that power. Since the power came from suppressing fires, not starting them, the Forest Service actively abused its power for decades by opposing prescribed burning on fire-dependent forest types such as longleaf pine in the South and ponderosa pine in the West.

In the 1940s, the agency finally recognized the need for controlled burning of southern pines. But by the 1950s, timber was rapidly replacing fire as the Forest Service's big ticket. In the two decades before 1960, national forest timber sales grew from 1 billion to 11 billion board feet per year. By 1960, close to half of the Forest Service's budget for national forests was devoted to or derived from timber sales, reforestation, and other timber-related activities.

While timber underscored the need for fire protection, forest scientists in the West increasingly found that western as well as southern forests depended on fire and would benefit from occasional light burnings. But the real turnaround came in the mid-1970s when the Office of Management and Budget began pressing the Forest Service to control the growing costs of fire suppression. In 1978 Congress repealed the blank check law, leading the Forest Service to formally approve policies that would allow prescribed burning and let some natural fires burn throughout the National Forest System.

Despite these policy changes, agency incentives continued to encourage fire suppression and discourage prescribed fires other than to clean up the debris from timber sales. Although managers attempted to control costs, the severe fires of 1987 and 1988 led the Forest Service to borrow close to a billion dollars from its reforestation fund to pay for fire suppression. When Congress reimbursed the fund in 1990, forest officials realized that they still had a blank check even if it was no longer formally written into law.

Meanwhile, environmental pressures and concerns over timber sustainability inside the Forest Service led to an unexpected decline in national forest timber sales from 11 billion to less than 3 billion board feet per year in the early 1990s. This left the Forest Service wondering what to do with the tens of thousands of permanent employees on its staff. For a time it hoped that recreation would support those employees, but Congressional restrictions on recreation fee collection prevented recreation from replacing timber as a source of funds.

Instead, the answer has turned out to be fire. The seven years from 1994 through 2000 included four of the five most expensive fire years in Forest Service history. The Forest Service told Congress that the recent high costs of fire suppression were due to the heavy fuels built up over decades of past fire suppression. Rather than being embarrassed by its mistaken fire suppression policies of the past, the Forest Service turned the fuel build-up into a revenue generator as it insisted that Congress provide it with hundreds of millions of dollars of supplemental appropriations to treat or reduce the fuels.

Yet the truth is that the fuel build-up is not the only reason, or even the main reason, for the high cost of fire suppression in the 1990s. A more important reason is the weather, specifically hot droughty summers over much of the U.S., at least some of which have resulted from El Nino or La Nina events.

An even more important reason is the budgetary process, which allows and even encourages Forest Service fire commanders to spend huge amounts of money fighting fires. Perhaps inspired by the effective restoration of the blank check, the Forest Service seems to have changed firefighting tactics in ways that proved more expensive in both dollars and lives. The new tactics partly resulted from changes in firefighting technology. But they also reflected the fire managers' near-blind insistence on protecting the increasing number of homes and other structures in and near national forests no matter what the cost to taxpayers.

To some degree, these problems affect all of the major federal land management agencies, including the Bureau of Land Management, Park Service, Fish & Wildlife Service, and Bureau of Indian Affairs. But none of the other agencies have made fire such an important part of their missions as the Forest Service for the good reason that none have as big a fire budget as the Forest Service. From 1994 through 2000, for example, the Forest Service spent nearly three times as much on fire suppression as the other four agencies combined.[9]

There are several significant differences between the standard story and this revised story of federal land fire. First, where the standard story blames past fire suppression policies on ignorance, the revised story recognizes that scientists and managers both inside and outside of the Forest Service had supported prescribed burning as early as 1908. Nor was ignorance responsible for any mistakes in the Forest Service's timber sale program, as national forest managers knew even as they were laying out timber sales that those sales would lead to significant ecological changes in the forests.

Second, where the standard story blames fire policies on religious zealotry, the revised story reveals that such zealotry had little influence on fire suppression. It is easy for outsiders to blame apparently irrational policies on some fantasized religion, but to those on the inside, those policies appear perfectly rational. In fact, the Forest Service's policies in 1910 were very different from those in 1950, which again were different from those of 1990. True religious zealotry would not allow for such huge changes

in policy. Instead, the policy changes reflect the Forest Service's ability to learn in response to its environment.

Unfortunately, the main teacher in this learning experience was not on-the-ground science or management, but a top-down budgeting process that strongly (if unwittingly) favored certain policies over others regardless of their ecological or social consequences. It is likely that no one designed the budgeting process to favor those policies; instead, the policies were unintended consequences of incentives that were accidentally created by the budgeting process. These incentives favor fire suppression over prescribed burning. Although the Forest Service finally approved a policy of prescribed burning in the South in 1943 and in the West in 1971, in practice it did very little prescribed burning in the West until the late 1990s.

Current Congressional and administration attitudes and policies regarding the Forest Service and other federal land management agencies are heavily conditioned by the standard story; by the idea, in other words, that ignorance and zealotry were responsible for past flaws in federal land management. If the real cause of those flaws is perverse incentives in the budgeting process, then the current budgeting process may be creating similar perverse incentives. Indeed, those incentives are leading the agencies to promote policies that will greatly increase their budgets and power.

For example, the agencies' claims about the current conditions on federal lands may be suspect. Despite the large fires of 1988, 1994, and 2000, a close examination of fire data suggests that it is not necessary to spend billions of dollars mechanically treating millions of acres of land. The increase in acres burned and firefighter casualties appears to be due to causes other than the build up of fuels from decades of fire suppression. A better way to deal with fire may be to treat a far smaller number of acres near structures on private lands and then let fires burn on most of the remaining federal acres.

Letting fires burn would save hundreds of millions of dollars of fire suppression costs each year, not to mention the lives of dozens of firefighters. Contrary to the standard story, the ecological damage from such fires is likely to be small and confined to a small minority of the acres burned.

In formulating fire policy and funding the federal land agencies, Congress must at the very least consider alternatives to the current policy of simply rewarding the agencies' past mismanagement by giving them billions of dollars of additional funding. In designing those alternatives, Congress must accept the possibility that budgetary incentives, not scientific management or religious zealotry, are the prime factors motivating the agencies.

Given the proper incentives, the Forest Service and other federal agencies will find a proper combination of mechanical treatments, prescribed fire, and commercial timber sales. But given the current incentives, the agencies cannot be trusted to do the right thing because their can incentives push them to do things that could actually make the problems worse.

The West's fire problems won't be solved by making the Forest Service dependent on fuel treatment funds any more than they were solved by making the Forest Service dependent on fire suppression funds. The ecological solution will come only from an economic solution that recognizes the perverse incentives created by Congressional appropriations to natural resource agencies such as the Forest Service. Those perverse incentives are most obvious when an agency such as the Forest Service is given a blank check, but they exist even when Congress budgets in a more traditional manner.

For nearly a century, Congress has placed federal lands in the charge of professionally staffed agencies that are supposedly grounded in science, funded out of appropriations, and responsible for carrying out and obeying rapidly growing volumes of Congressional laws. This top-down model of land management has failed as the agencies quickly became more attuned to public relations, budgets, and pork-barrel appropriations than to actual on-the-ground needs. Fire is the best example of this failure as the Forest Service continues to suppress fires that it ought to let burn because of the budgetary rewards from suppression.

To create new incentives that result in better federal land management at lower costs, Congress must develop a new bottom-up model of federal land agency that does not rely on appropriations. Most national forests, national parks, and BLM districts could fund themselves out of their own receipts if Congress would allow them to do so. Self funding would encourage managers to find the most cost-effective solutions to fire and other ecological problems that reflect local conditions. This system would solve the fire problem and insure that federal lands are sustainably managed to produce the recreation, wildlife, and other resources that Americans want.

Burning Money: The National Fire Plan

After the Cerro Grande fire of 2000 burned hundreds of homes in Los Alamos, Congress asked the Forest Service and Bureau of Land Management to write a *National Fire Plan*. This plan is supposed to strategically look at wildfire problems on federal land. Instead of considering a strategy, however, the National Fire Plan is basically a wish-list of all the things the agencies want to spend money on: hiring more staff, building more facilities, buying more fire trucks, flying more aircraft, treating more acres on the ground. So far, Congress is paying more than $2 billion per year, but the agencies would welcome even more.

The explicit assumption of the Forest Service and other federal land agencies is that fuels are the primary problem and fuel treatment is the primary solution. "As a result of fire exclusion, the condition of fire-adapted ecosystems continues to deteriorate," wrote an interagency fire work group in 2002; "the fire hazard situation in these areas is worse than previously understood." The statement adds, "The fire hazard situation in the Wildland Urban Interface is more complex and extensive than [previously] understood."[10]

The interagency work group found that existing fire policies were "generally sound," but that "implementation [of those policies] has been incomplete."[11] The implicit, if not explicit, assumption in the *National Fire Plan* is that the way to complete implementation is for Congress to spend more money. So the National Fire Plan has five major elements:

1. Firefighting—The agencies have boosted the number of firefighters on their payrolls by 50 percent, from about 12,000 in 2000 to more than 18,000 in 2002.
2. Rehabilitation and restoration following fires—The agencies rehabilitated 2.5 million burned acres in 2001 and plan to rehab 2.3 million acres in 2002.
3. Treating hazardous fuels before they turn into catastrophic fires—The agencies wanted to treat 3.2 million acres in 2001 but only managed 2.3 million. Their 2002 goal is to treat 2.4 million acres.
4. Research—including roughly 120 different research projects on various aspects of wildfire and prescribed burning.
5. Community assistance—including grants to state forest agencies, rural fire departments, and local communities.

All of these things cost money: a total of $2.9 billion in 2001 and a planned $2.3 billion (but probably much more) in 2002 (table one). The Forest Service gets more than two out of three of these dollars, which turns out to be more than four times the Forest Service's average annual fire management budget in the early 1990s (table two). USDI fire budgets have increased by similar amounts, from under $200 million a year in the early 1990s to nearly a billion in 2001.[12]

Table One
National Fire Plan Budget for 2001
(millions)

	USDI	FS	Total
Presuppression	$315	$611	$926
Suppression	353	744	1,097
Rehabilitation	105	142	246
Fuel Treatment	195	205	400
Research	0	16	16
Community assistance	10	150	160
Total	$977	$1,913	$2,890

Source: http://www.fireplan.gov/02_interagency_budget_summary_1_28_02.cfm. Suppression includes emergency contingency fund.

Given this huge influx of money, the General Accounting Office has questioned whether the agencies have made much of an effort to prioritize spending.[13] Is a 50-percent increase in firefighters really necessary? If protection of structures in the wildland-urban interface is so important, why are only a third of the acres treated for hazardous fuels in that wildland-urban interface? And why are less than 4 percent of the funds dedicated to community assistance?

Table Two
Forest Service Fire Budgets
(millions)

Item	Early 90s	Early 00s
Fuel treatment	$9	$216
Presuppression	176	620
Suppression	230	1,000
Total	$415	$1,836

Fuel treatment and presuppression costs are based on 1991-1993 and 2001-2003, with 2003 based on the president's proposed budget. Suppression is based on actual costs in 1990–1992 and 2000–2002 with 2002 estimated based on costs to date this year. Source: Forest Service Budget Explanatory Notes *for various budget years.*

One reason to doubt the wisdom of the National Fire Plan is that it contains no alternatives to spending billions of dollars a year. This is peculiar because almost every other plan written by the Forest Service or other federal land agency in the last thirty years contains alternatives. Even firefighters are required to consider alternatives when preparing a plan for putting out a fire that resisted initial suppression efforts. But the National Fire Plan contains no alternatives.

With its centralized budgeting and centralized targeting of "outputs" (really, inputs), such as numbers of firefighters and numbers of acres treated, the National Fire Plan is prone to all of the faults that previously beset timber and other national forest programs. As the General Accounting Office points out,

managers rated for their abilities to achieve acreage targets are more likely to treat the easy acres first, when it is the most difficult acres that are most in need of treatment.[14]

One of the implicit promises of the National Fire Plan is that the huge increase in fire funding is only temporary. As soon as the agencies treat all of the priority acres, the cost of both fire suppression and hazardous fuel treatment will drastically decline. Thus, the costs today are more of investment aimed at reducing future costs than an expectation that the agencies will forever receive $2 to $3 billion more per year than they were getting just a couple of years ago.

Yet if the National Fire Plan is implemented as the agencies hope, this implicit promise almost certainly will not be kept. The agencies have identified 70 million acres of land currently in *condition class 3* (high fire risk). At current rates of treatment, it will take nearly thirty years to treat all of those lands. By that time, many of the 141 million *condition class 2* acres will have "degraded" to condition class 3 and need treatment.[15]

Even if the agencies ever reach a point that all of their lands no longer pose a high fire risk, they will still need to practice prescribed burning on millions of acres each year to insure that they do not return to condition class 3. The agencies estimate that 200 million acres "were historically subject to frequent fire regimes with fire return intervals of less than 35 years."[16] Assuming an average interval of 25 years, this means that 8 million acres a year must be burned. Another 215 million acres are on fire intervals of more than 35 years. Assuming an average interval of 70 years, this means another 3 million acres of burning a year.

Between 1994 and 1999, the agencies spent an average of $34 an acre burning no more than 2.2 million acres a year. Burning 11 million acres a year will cost at least $375 million, which is 17 percent more than the agencies spent on hazardous fuel reductions in 2001. To support this burning will require a massive increase in the agencies' bureaucracies and infrastructure, which will increase costs still further.

Yet a large share of federal lands are not ecologically adapted to the low-intensity fires that the Forest Service hopes to replicate with prescribed burning. One Forest Service study groups land into five categories: high-frequency fires at low severity; high-frequency fires at stand-replacement severity; moderate-frequency fires at mixed severity; moderate-frequency fires at stand-replacement severity; and low-frequency fires at stand-replacement severity.[17]

Only the first category can effectively be treated with prescribed fire to reduce the severity of natural fires. As the map of historical fire regimes shows, pine forests in the South fall into this category, which is why prescribed fire has worked there. But this category includes only about a third of forests nationwide and about 38 percent of the national forests in the eleven western states. Only 41 percent of those forests are in condition class 3, meaning just 15.5 percent, or under 24 million acres, of western national forests are in need of treatments.

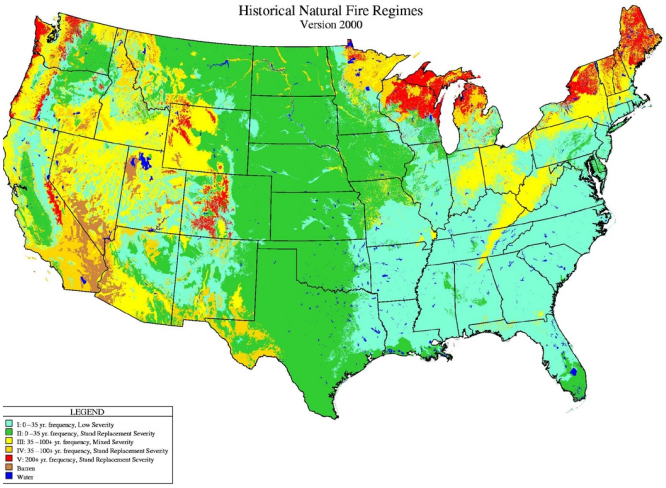


Figure One: Historical Natural Fire Regimes. Only the light green areas are ecologically adapted to high-frequency, low-intensity fires. Source: Kirsten M. Schmidt, James P. Menakis, Colin C. Hardy, Wendel J. Hann, David L. Bunnell, Development of Coarse-Scale Spatial Data for Wildland Fire and Fuel Management *(Ft. Collins, CO: Forest Service, 2002), p. 36.*

Western forests adapted to low-intensity, high-frequency fires include ponderosa pine forests in the interior West and mixed conifer forests in the Sierra Nevada. But western Douglas-fir, hemlock, spruce, fir, lodgepole pine, and hardwood (chaparral) forests are in the mixed severity and stand-replacement severity groups. Unless the Forest Service converts those forests to different forest types—which is probably not possible in most areas and would be very controversial where it could be done—prescribed fires will not immunize them from severe fires.

When combining these with other data, the researchers concluded that just 424,000 of federal lands have a high risk of igniting structures in the wildland-urban interface.[18] That is just 0.6 percent of the acres that the Forest Service and other federal agencies want to treat for hazardous fuels.

Nor will the National Fire Plan reduce the danger to homes in the wildland-urban interface or reduce the costs of protecting those homes. Forest Service fire researcher Jack Cohen points out that fuel conditions threaten structures only if the structures have flammable roofs or the fuels are located closer than about 40 meters (130 feet) from the walls.

Homes will ignite only if *firebrands* (burning embers) land on flammable roofing materials or if the walls are exposed to intense heat. Replacing flammable roofs with metal or other non-flammable materials will solve the first problem. The second problem can be solved by reducing or eliminating burnables, such as woodpiles or vegetation, near the structures. A standard, regularly mowed lawn, for example, is relatively non-flammable and replacing natural vegetation with one can be an excellent way to fireproof a property.

Cohen calculates that the hottest wildfires cannot ignite structure walls if the fires cannot get closer than 40 meters (130 feet) to the walls.[19] A building with a 2,500-square-foot footprint, which is typical for a modern home and garage, requires treatment of just under 2 acres.

This means that hazard reduction efforts should focus on structures, not on the wildlands located near those structures. "Wildland fuel reduction for reducing home losses may be inefficient and ineffective," says Cohen; "inefficient because wildland fuel reduction for several 100 meters or more around homes is greater than necessary for reducing ignition from flames; ineffective because it does not sufficiently reduce firebrand ignitions."[20] Cohen particularly says that the federal government's 1995 wildland fire policy—and, by extension, the National Fire Plan—is costly, ineffective, and unnecessary.

Cohen adds that Forest Service and agency mapping of high-risk fire areas are identifying the wrong thing. "The term 'wildland-urban interface'" says Cohen, "misrepresents the physical nature of the wildland fire threat to homes. The wildland fire threat to homes is not where it happens related to wildlands (a location) but how it happens related to home ignitability (a combustion process). Therefore, to reliably map W-UI home fire loss potential, home ignitability must be the principal mapping characteristic."[21]

As long as the Forest Service and other agencies have a blank check, there is little reason to expect that the National Fire Plan will lead to a huge reduction in future fire suppression costs. The future will still have droughts and La Niñas. The number of homes built near federal lands will continue to increase. The blank check will still encourage fire managers to use expensive methods of suppression. A coalition of contractors and service providers will continue to lobby Congress to release more funds for fire fighting.

Tax expenditure on fire suppression is only one of the costs of the current direction. Another is the lives of firefighters, which cost has doubled in recent decades due to the Forest Service use of aerial and other newer technologies.

Another cost is the ecological damage caused by a centralized program responding to perverse incentives. While the Forest Service claims this is not a problem, promising to use "adaptive management" to do "ecological restoration" and insure "sustainable forest production," these are just buzzwords that have little meaning on the ground. What counts on the ground is what can be funded and what managers have incentives to do or not do.

Despite its promise of "scientific management," the Forest Service fought hard for nearly forty years against a broad range of scientific opinion that supported prescribed burning of southern forests. The Forest Service's 10 AM policy continued to warp western forests for another twenty to thirty years. Despite its promise of "multiple-use management," and over strong protests from people all over the nation, the Forest Service emphasized clearcutting and maximum timber yields for close to forty years.

These dead-end policies that proved so difficult to change do not bode well for adaptive management, which requires managers to frequently and rapidly change course in response to new information. Instead, it is more likely that "ecological restoration" will turn out to be whatever Congress is willing to fund and that policy and management changes will respond more to Congressional whims than to new data or research.

One possible danger is that forest managers will become fixated on historic fire intervals and plan massive regimes of prescribed burning aimed at burning every stand of trees every ten, fifteen, or however many years some researcher said was the average interval for that forest type.[22] In fact, an "average interval" of, say, thirty years is only an average, and may represent actual intervals of anywhere from five to one hundred years. Regular prescribed burning will have the effect of reducing forest diversity by imposing the same average fire interval on all stands in the same forest type when past diversity depended on a variety of intervals.

Whatever forest managers try to do, an implicit assumption is that they can or should produce some "right" ecosystem condition in the forests. Should that condition be the condition the forests were in before 1900? Before 1492? Before humans arrived in North America approximately 10,000 years ago? Even if we can accurately describe what any of those conditions were really like, why is one period "right" and the others wrong? How can ecosystem health or ecosystem correctness be measured?

The truth is that it cannot. Any management regime is arbitrary without reference to human values or human needs. It may be appropriate to manage for a park-like old-growth ponderosa pine forest instead of dense thickets of "doghair" if people value the aesthetics, wildlife, or timber that can be produced from the old growth. But the benefits must be compared with the costs of producing such conditions. A prescription that requires burning of every acre of federal land at designated intervals combined with aggressive suppression of 96 to 99 percent of all wildfires is not likely to produce enough benefits to justify its high cost.

In sum, the National Fire Plan will not reduce the severity of future fires, future fire suppression costs, or the costs of protecting homes and other structures in the wildland-urban interface. Nor will it lead to some perfect ecological condition in the forests. The only benefits of the plan will be to the bureaucracies.

Fuels Are Not the Problem

According to the standard story, fifty to one hundred years of aggressive fire suppression have dramatically changed western forest ecosystems. One major change is that fine fuels—fallen leaves, needles, twigs, and branches of trees and bushes—that might have burned in small fires have significantly increased on most forest acres. Another change is fire intolerant species such as true firs have grown beneath, and sometimes replaced, the fire tolerant species such as ponderosa pine.

Both these changes mean that the forests are far more flammable than ever before. "One of the great paradoxes of fire suppression," says a fire ecologist, is "that the more effective we are at fire suppression, the more fuels accumulate and the more intense the next fire will be."[23]

The Forest Service claims that this accumulation of fuels is the main reason why fire suppression costs have been so high and why so many homes have been lost to wildfire in the past decade. "The policy of aggressive fire suppression appeared to be successful," says a 2000 report from the secretaries of agriculture and the interior to the President, but "it set the stage for the intense fires that we see today."[24]

The accumulated fuels story convinced Congress to fund the National Fire Plan, which is the largest budgetary increase in the Forest Service's history and significant increases for Interior agencies as well.

While there is no doubt that forests are different today than they were a hundred years ago, it is less clear that these changes are the sole, or even the main, cause of the large fires in the last few years. If some other reasons are the cause of recent fires, then giving the Forest Service more billions to suppress fires and treat fuels may not be the right answer. To find out, we need to examine available data for fire costs, burned acres, property damage, and firefighter fatalities.

Any attempt to gather and analyze fire data is complicated by the fact that recordkeeping has been poor and various sources of data often conflict with one another. For example, the Forest Service's annual budget requests to Congress report how much Congress appropriated in the previous year on presuppression, fuels treatments, and other line items.[25] But Forest Service economist Ervin Schuster painstakingly tracked down how much the Forest Service actually spent on various fire line items from 1970 through 1998, and his numbers only vaguely resemble those reported by the Forest Service in its budget reports.[26]

Accounting is particularly a problem for fire because as many as six federal agencies may cooperatively work together to suppress fires on federal lands and each pays for employees and equipment out of its own budget without getting reimbursed by the agency whose land is burning. Some Forest Service fire funds are used to put out fires on Bureau of Land Management lands, and many Forest Service fires are suppressed with the help of BLM funds.

This paper makes every attempt to use the best data available. In the event of conflicting data, this paper relies on the most recent source or the source closest to the raw data.

Fire Suppression Costs

On September 7, 2001, the chief of the Forest Service sent an unprecedented memo to field offices. Even though 2001 was a relatively mild record fire season, the agency was running out of money to fight fires—or, as the chief put it, "The fire season is once again stretching our resources to the limit." So the chief directed the agency to stop land acquisitions, construction projects, and purchases of motor vehicles, computers, and other items so that the money dedicated to those programs could be spent fighting fires instead.[27]

The slightly desperate tone of this memo suggests that the costs of fire suppression are rapidly rising. In fact, there are other factors involved. Traditionally, the Forest Service pays for emergency fire suppression by borrowing from the Knutson-Vandenberg (K-V) fund, which in turn is derived from timber sale receipts. Congress later reimburses these monies. But with national forest timber sales down by more than 80 percent since 1990, K-V revenues have fallen by more than 50 percent. Because of this decline, 2001 was the first year that the Forest Service had to turn to other funds to pay for firefighters and firefighting equipment and supplies.

Firefighting costs are rising, but they may not be rising as fast as it appears at first glance. After 1994's record fire season, Forest Service researchers looked at the trends in national forest fire fighting costs from 1970 through 1995. After adjusting for inflation, they discovered that, if 1994 were excluded, average firefighting costs had not increased over that time period. The average annual cost from 1971 through 1975 was $268 million (in 1995 dollars), while the average from 1989 through 1993 was $266 million.

Costs in 1994, of course, reached record levels. Then, 1996 proved to be another severe fire season. But another Forest Service analysis of fire suppression costs from 1970 through 1998 found "no statistically significant trend can be discerned" after adjusting for inflation.[28] The paper did suggest that "the variability in annual Fire Operations expenditures is increasing," which would explain why costs in some recent years are so high.

Still, 2000 proved to be even more expensive than in 1994, and 1999 and 2001 were the fourth and fifth most expensive fire years in federal land history. When those years are counted, there does appear to be an increasing trend—if the next few years do

not prove to be significantly less costly.

However, these high costs are not solely or even primarily due to accumulated fuels. Numerous sources agree that the weather was the primary reason for the severe fires of 1994, 1999, and 2000. "The first and foremost" factor influencing the severity of 2000 fires, says the Forest Service, "was the weather." The second factor "was extraordinarily dry vegetation," which is a function of the weather.[29]

In particular, 1999 and 2000 saw the "longest La Niña in history." A La Niña is a movement of cool water in the Pacific Ocean that leads to a drought in the southern half of the United States. By 2000, the La Niña had lasted so long that the drought extended to the northern Rockies.[30]

In addition to the weather, Forest Service fire manager Richard Mangan cites several reasons for increased costs, including:

- The growing political nature of fire and the public and media attention and expectations paid to firefighting;
- Changes in the fire camp environment to meet the needs and expectations of the 1990's workforce; and
- Changes in the federal workforce.[31]

Timothy Ingalsbee of the Western Fire Ecology Center adds that in the 1980s the Forest Service shifted from using in-house crews and services to using more contract crews and services. This was supposed to save money, but Ingalsbee says that it actually increased costs.[32]

Other reasons for increased costs include:

- Changes in firefighting technology, including increased use of aircraft and ground vehicles;
- Changes in firefighting techniques, including the increased use of backfiring (which might increase or reduce costs but could certainly increase acres burned);
- An increase in the number of homes near federal lands, the protection of which has led firefighters to expend extraordinary amounts of money and effort; and
- Changes within the Forest Service itself that may have given employees new incentives to spend money on fire suppression.

Identifying the real reasons for the increased costs in the late 1990s is important for determining the best policy response. The Forest Service and other federal land agencies want Congress to continue giving them billions of dollars to reduce fuels built up in the national forests and other federal lands. But if these other reasons are primarily responsible for the increased costs, then fuels treatment on federal lands may be the wrong prescription.

Acres Burned and Costs Per Acre

About 8.4 million acres burned in 2000, more than any of the previous forty years. Yet the average number of acres burned hasn't appreciably increased since the early 1960s. The first five years of the 1960s saw 4.6 million acres burn per year; the five years ending in 2001 saw an average of 4.7 million acres burn.

Even 8.4 million acres is a tiny percent of the landscape, amounting to less than 0.4 percent of the continental United States (48 states plus Alaska). While most of the acres burned are in the West, less than 0.6 percent of the West burned in 2000. The 70 million acres of federal lands that are estimated to be under severe risk of fire encompass just 8 percent of the eleven western states plus Alaska.[33]

In the past forty-two years, the number of acres burned in any five-year period has fluctuated from 2.7 million in the early 1970s to just under 5.4 million in the five years ending in 2000. Another low of 2.8 million acres was reached in 1995. Between these lows was a high of 4.7 million acres in the five years ending in 1990. These fluctuations are not the result of changing volumes of fuels in the woods; instead, they follow climatic wet-dry cycles.

Forest Service fire managers say that drought is more responsible than the accumulation of fuels for the large number of acres burned in 2000. Back-to-back La Niña events took place during 1999 and 2000. A La Niña is a movement of cool water in the Pacific Ocean that brings dry weather to the southern half of the United States. The length of this La Niña extended the 2000 drought to the Northern Rockies. Because of the weather, the fire agencies knew early in 2000 that "the 2000 fire season has the potential to be one of the worst ever."[34]

Another explanation for the increased number of acres burned since the 1970s is a change in Forest Service firefighting strategy. Through most of the 1970s, the Forest Service had a goal of putting all fires out by 10 AM and keep all fires smaller than 10 acres. When that policy was abandoned, the Forest Service adopted a *confine-contain-control* strategy that was driven by safety, economics, and other factors more than by acres. This often led fire managers to allow more acres burn to save money and protect firefighters.[35]

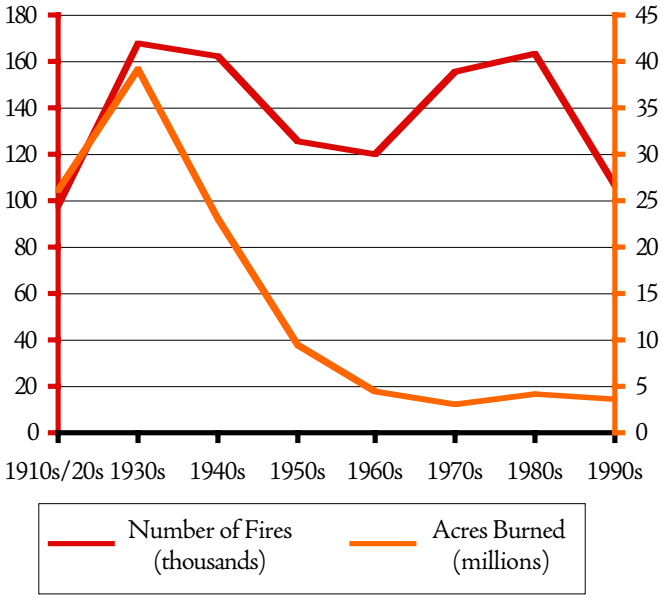
The fluctuating trends since 1960 are very different from Forest Service reports of acres burned before 1960. The agency says 26 million acres burned per year in the 1920s and 39 million per year in the 1930s (chart two). From the 1930s to the 1960s acres burned steadily declined to less than 5 million acres per year. The Forest Service has long taken credit for the 90 percent decline in annual acres burned since the 1930s, but several other factors are probably more important.

First, many of the acres burned as "wildfires" in the 1920s through the 1940s may actually have been fires lit by local residents who had traditionally burned private lands and the public domain for decades. The Forest Service demonized this practice as vandalism, but today it would be called prescribed burning. After the 1940s, the agency came to accept controlled burning as a legitimate management tool, so burns it once classed as wildfires it now classes as prescribed.

Acres burned can be deceptive because it doesn't reflect the

severity of the burns. Hot burns can cause long-term damage to soils; crown fires can kill entire stands of trees. Yet most acres do not crown out or burn so hot as to harm soils.

Chart Two
Number of Fires and Acres Burned by Decade



Source: National Interagency Fire Center, http://www.nifc.gov/stats/wildlandfirestats.html#Fires%20by%20Decade.

Every list of terrible wildfires includes the Tillamook burn, which burned 236,000 acres (according to one source[36]) or 311,000 acres (according to another source[37]) in Oregon in 1933. Other major fires in the 1930s were the 1932 Matalija fire in California (220,000 acres),[38] the 1936 Bandon, Oregon, fire (143,000 acres),[39] and the 1937 Blackwater fire in Wyoming (unknown acres). These add up to roughly a million acres.

But if these were the major historic fires of the 1930s, the ones that crowned out and burned entire forests, then where were the rest of the 391 million acres that supposedly burned during the 1930s? Apparently, the other 390 million acres were not so hot or so serious to merit a page in the various history books. I suspect that many of those acres were fires lit by people in the South and elsewhere and that they did little damage to the forests they burned.

Another change that reduced the acres burned after the 1940s was the railroads' rapid transition from steam to Diesel locomotives. As Henry Graves, Gifford Pinchot's successor as Chief of the Forest Service, noted in 1911, "Railroads in many cases are the most prolific source of fires."[40] The Region 2 (then called District 2, covering Colorado, Nebraska, and eastern Wyoming) forester observed in 1918, "More fires are started by railroad locomotives in the national forest of this district than from any other cause."[41] The Minnesota State Forester reported in 1920 that 55 percent of the fires in that state were of railroad origin.[42] Unlike steam locomotives, Diesels produced no burning embers that could start fires alongside the tracks.

A third factor that may contribute to the decline is natural changes in people's attitudes toward fire as a result of urbanization and technology. Half of all Americans lived in rural areas in 1920; by 2000 it was less than a quarter, and many of those were exurbanites—people with urban attitudes and experiences who have moved out of urban areas.

"As urbanites' personal experience of fire waned, so did their tolerance of its consequences," observes Pyne. Not only are city residents unfamiliar with the uses of fire in fields and forests, electricity and other technologies separate them from the traditional uses of fire for heating and cooking. Thus, they come to view fire only as a destroyer, not a creator. "They saw fire as social horror," continues Pyne. "Fire's demands for fuel they considered exorbitant. Its smoke they condemned as a health hazard. If they could banish it, they would."[43]

The result is that America naturally became fire phobic. Smokey the Bear may not have converted as much as he preached to the converted. The point is that the Forest Service has had much less of an effect on fire than it would like us to believe.

Increasing costs are also a poor indication of the seriousness of fires. The year 1999 was the fourth-most expensive fire year in history and had the fifth-most number of acres burned since 1970. In terms of acres, the four largest fires of 1999, and six of the top ten, were on Bureau of Land Management (BLM) grasslands in Nevada. "At one point, 75 percent of all wildland firefighting resources were in" Nevada, says a BLM official. Two others in the top ten were on BLM lands elsewhere; only two of the top ten were on national forests.

Yet the BLM spends relatively little to put out its fires, since many of them are on grasslands and range, not forests, or are in remote areas such as Alaska. A review of more than 100 major fires in 2000 indicates that the Forest Service, Park Service, Bureau of Indian Affairs, and state forest agencies all spend an average of more than $200 on suppression per acre burned. The BLM, by comparison, spends less than $50 per acre burned.

Cost per acre burned is not necessarily a very good measure, since the goal of fire suppression is to prevent acres from burning, not to burn them. If fire managers wanted to reduce the cost per acre burned, they could let more acres burn. This is partly why BLM fires cost less. Particularly in Alaska (but also in Nevada), "there are massive areas that do not present risk to life and property, and present no unacceptable environmental issues," says BLM fire analyst Gardner Ferry. "The appropriate action for these fires is surveillance and letting fire play its natural role. Where isolated structures exist, specific protection is taken just around those structures."[44]

Yet the Forest Service sometimes spends extraordinary amounts of money on fire suppression. The Twin Creek fire on the Salmon-Challis forests in Idaho cost more than $8,000 an acre. The Helen Creek fire on Montana's Flathead National

Forest cost nearly $6,000 an acre. Ten more national forest fires in 2000 cost $1,600 an acre or more, which is about ten times the average cost that year of $162 an acre. Though two state fires, one in California and one in Montana, were in this price range, no other federal agency had fires this expensive. It appears that the cost of fire suppression is at least partly related to the agency whose land is burning.

The Loss of Human Lives

Like firefighting costs, firefighter fatalities have steadily increased over the years. In the 1930s, an average of 4 people a year lost their lives fighting forest fires. By the 1950s, this had doubled to 8, and by the 1990s it doubled again to nearly 17. One conclusion is that fires have become more dangerous than they were in the 1930s or 1960s.

A closer examination suggests that the increase in fatalities is due to factors other than the severity of fires. From the 1950s through the 1990s, the number of firefighters who died each year from burnovers, entrapments, asphyxiation, falling snags, or other ground-related fire accidents declined slightly from about 6.5 to 5.5 per year. (A few of these, such as drownings and falls, may not be strictly fire-related, but the vast majority is.) Despite the tragic loss of fourteen firefighters in Colorado in 1994, fire-related deaths in the 1990s were actually lower than in the 1950s, 1960s, or 1980s (table three).

The main increases in fatalities were in other areas. Aircraft-related fatalities increased from nearly none in the 1950s to 3 per year in the 1990s. Ground vehicle fatalities increased from 0.5 per year in the 1950s through 1970s to 3 per year in the 1990s.

Table Three
Causes of Firefighter Deaths by Decade

	Fire	Aircraft	Vehicles	Health	Other	Total
1940s	39	0	6	2	0	39
1950s	65	3	7	5	1	82
1960s	56	15	4	6	1	82
1970s	43	23	6	15	3	90
1980s	58	26	23	22	1	130
1990s	54	30	32	49	3	168

Fire *includes burnovers, entrapments, snags, asphyxiation, electrocutions, falls, rockslides, drownings, and flying debris.*
Aircraft *includes air tanker, helicopter, and smokejumper accidents.*
Vehicles *includes engine, vehicle, and ATV collisions and rollovers.*
Health *includes heart attacks, strokes, heat stroke, and pneumonia.*
Other *includes toxic chemicals, murder, suicide, and unknown.*

This suggests that much of the increase in fatalities is due to changes in tactics, not the size or severity of fires. Clearly the increased use of air tankers and helicopters led to the increase in aircraft accidents. The quadrupling of vehicle accidents after 1980 also suggests that the federal firefighters are relying more on vehicles than they were before 1980. An increase in the use of aircraft and ground vehicles would help explain why costs have increased.

The biggest increase is in heart attacks, strokes, and other health-related fatalities, which grew from 0.5 per year in the 1950s and 1960s to 5 per year in the 1990s. The growing number of health-related fatalities suggests an aging workforce. This could be a result of the Forest Service putting more of its permanent staff, who might previously have worked on timber sales, on fire duty. These people might not be directly fighting fires, but working in "overhead" positions that can be equally stressful due to long hours and intense pressure to make the best decisions.

Property Losses

A major reason for the increasing costs of fire suppression is the growing number of homes built near federal lands in what is called the *wildland-urban interface*. As early as 1987, top Forest Service officials admitted, "our fire fighting costs continue to climb because of the need for more equipment and personnel to save structures." Fire commanders say that they sometimes "have to sacrifice control of the wildfire to defend buildings."[45]

Until very recently, no one kept track of the number of homes lost to wildfire each year. From what little data are available, however, it appears that the problem is greatly exaggerated outside of California and a few other places.

In 1999, for example, 90 percent of the 817 homes lost to wildfire were in California.[46] Of the nearly 7,500 homes destroyed in twenty-two major wildfires in the urban interface between 1961 and 1995, nearly 90 percent were in California, 6 percent in New Jersey, and 1 to 2 percent each in Washington, New York, and Florida.[47]

Homes were lost in other states as well, but generally no more than a handful in any given year in any state. In 1999, for example, California lost 743 homes, another state lost nineteen homes, two states lost fifteen, and ten other states lost one to seven homes each.

Even counting California losses, less than 0.2 percent of the structures damaged or destroyed by fire each year are due to wildland fires. This is one reason why the insurance industry doesn't worry too much about whether owners of homes in the interface fireproof their roofs and landscapes.

Despite inadequate data, the National Fire Protection Association estimates that the number of homes lost to wildfire in the 1990s was six times that of the 1980s.[48] This at least partly reflects an increase in the number of homes being built near federal lands. The West is the fastest growing region in the U.S., and according to one estimate, 38 percent of new homes built in the West today are in or adjacent to the wildland-urban interface.[49]

Another report estimates that the wildland-urban interface includes 10 to 15 million homes. Fewer than 0.007 percent of those homes are burned by wildfires each year. By comparison, out of the total 115 million residences in the U.S., about 380,000 suffered from fires in 2000, a rate of about 0.33 percent.[50] That is about fifty times greater than the rate of house fires burned by wildland fires in the wildland-urban interface.

Considering the dominance of California losses, the image conveyed by the term *wildland-urban interface* might be misleading. Most homes lost to wildland fire are not second-homes or retirement homes tucked away on someone's forty-acre tract surrounded by federal lands on three sides. Instead, they are conventional suburban homes in Oakland, Los Angeles, San Bernardino, Ventura, Malibu, Santa Barbara, and other cities. The wildlands adjacent to these homes may be national forests, but often they are regional parks or private lands. The forests may be tall stands of ponderosa pine, but more often they are chaparral—dense thickets of oaks and other small trees and shrubs.

Another California trend is the increased value of homes in the wildland-urban interface. Insurance claims for homes and property lost in three California fires in the 1970s averaged $203,000 per home lost (adjusted for inflation to 1997 dollars). Claims for homes and property lost in four California fires in the early 1990s averaged $823,000, more than four times as much.[51]

The 2000 Cerro Grande fire, which destroyed around 200 homes in Los Alamos, New Mexico, was unusual in that it was outside of California. Yet it was typical in that most of the home losses could have been prevented if homeowners had kept their grounds relatively free of pine needles and other burnables.[52] "The high ignitability of Los Alamos," says Forest Service fire researcher Jack Cohen, "was principally due to the abundance and ubiquity of pine needles, dead leaves, cured vegetation, flammable shrubs, wood piles, etc. adjacent to, touching and/or covering the homes."

This fire helped convince Congress to add more than $1.5 billion a year to Forest Service and USDI fire budgets. Yet most of this money is not being spent in California, where most homes burn from wildland fire. Nor is most of it spent fireproofing homes in the wildland-urban interface by replacing wooden roofs and removing pine needles and other flammable materials. Instead, 70 percent is being on presuppression and suppression and 15 percent on treating fuels on federal lands. Only about 5 percent is assistance to local areas and most of that will go for presuppression and suppression equipment.

Conclusions

A close scrutiny of fire data indicates that factors other than an accumulation of fuels are the major contributors to recent dramatic fire years. First, the 1990s actually saw fewer acres burn than the 1980s or 1960s. While an unusually large number of acres burned in 2000, this can be credited to the rare La Niña weather of 1999 and 2000.

Second, the number of firefighter deaths due to fire burnovers and entrapments was also less than in the 1950s, 1960s, and 1980s. Increases in firefighter deaths in the 1990s are due more to changes in firefighting technologies and an aging workforce than to the severity of fires.

Third, an increase in the number of structures burned in and near federal lands is due more to the increase in the number of structures built in this area than to fuel accumulations. This increase is also responsible for the use of more costly firefighting technologies and tactics. These more costly tactics are partly responsible for the record amounts spent on firefighting in 1988, 1994, and 2000 and the near records in 1996 and 1999. The increased use of large backfires to protect structures may also help explain the large numbers of acres burned in 1996, 1999, and 2000.

In sum, increases in firefighting costs and acres burned are due more to the weather and changes in firefighting strategies and tactics than to accumulated fuels. In the late 1970s, the Forest Service from a strategy of minimizing acres burned to a containment strategy that allowed more acres to burn for reasons of safety and economy. But this strategy failed because at the same time the Forest Service shifted to increased use of aircraft and other expensive firefighting equipment and supplies, which cost far more dollars and firefighters lives than the new strategy saved. The result is more acres burned at higher costs and reduced safety.

One more factor must be considered that may explain this paradox: changes in Forest Service incentives. As will be described in detail below, the Forest Service was under pressure in the 1970s and 1980s to reign in fire suppression costs, which is the main reason why it replaced the minimum-acres-burned strategy with a containment strategy. But that pressure ended in the aftermath of the Yellowstone fires. This allowed the agency to spend huge amounts on fires in 1994 despite the fact that the number of acres burned in that year was not particularly high.

At the same time, the decline in the national forest timber sale program, which paid for much of the Forest Service's overhead, led the agency to search for a new mission that could keep it fully funded. Fire turned out to be that mission. Instead of being punished for wasting money on fire suppression, the Forest Service used the high suppression costs of the 1990s and 2000 to justify huge increases in funding for presuppression and fuel treatments.

Incentives Are the Problem

"Wildfires are big business," wrote Forest Service fire manager Richard Mangan in 1999. "Numerous contractors, hundreds of aircraft, and tens of thousands of firefighters suppress the fires at a cost of hundreds of millions of dollars." If he had written this a year or so later, he could have upped "hundreds of millions" to "billions of dollars." Any activity that spends this much money and relies on this many people is bound to create enormous incentives for the people involved.

As it is taught in thousands of dull college courses across the land, economics is a dry subject dealing with supply and demand curves, elasticities, and other confusing concepts that have little clear relationship with reality. But the most important lesson in economics is extraordinarily simple and useful: *Incentives count*.

In the post-cold-war age, this lesson is so obvious that it would seem to be not worth mentioning. Yet few of the numerous reports and studies of fire written in the last ten years even mention, much less analyze, the incentives facing fire managers.

A survey of the incident commanders of major 1994 fires found that most agreed that the factor that had the greatest effect on the cost of fire suppression was the weather during the fire.[53] Indeed, even though the weather "cannot be influenced by Forest Service actions," fire researchers in the Forest Service and elsewhere have spent hundreds of person-years studying the effects of the weather on fire.

Yet in the long run, incentives have had a far greater effect on fire costs than the weather. While Congress and other makers of fire policy can do nothing about the weather, they can have a major influence on incentives. Yet neither the *1995 Federal Wildland Fire Management Policy & Program Review*, nor the 2001 update to that review, nor the Forest Service's *Cohesive Strategy* of 2000, nor the USDI/USDA *Report to the President in Response to the Wildfires of 2000*, nor the *National Fire Plan* either mention incentives or propose to change them in any way.

Some agency reports do briefly mention incentives. A 1995 Forest Service report, *Fire Suppression Costs on Large Fires*, observes, "there are few incentives to take risks that could lead to reductions in large fire suppression costs." The report adds that a survey of forest managers revealed that many "would have fought fires differently, and at lower cost, if the money had come from the forest's allocated budget." However, it doesn't analyze the incentives in detail.[54]

It is possible that the Forest Service and other federal agencies don't look at incentives because they don't want to. If they benefit from the status quo, they may have no incentive to change it or to even acknowledge that it is possible to change it.

Yet most outsiders have a similar blind spot when it comes to incentives. The cover of a popular book on forest fires promises to provide "all the information you need to participate in influencing public policy concerning wildland fire control," yet the book never mentions incentives.[55] Nor do most other books on forest fires or most reports by critics of federal fire policy.

The General Accounting Office has written many reports critiquing the Forest Service's fire policies and programs, but I can only find one that mentions incentives. It does so only in the narrow context of fuel reduction programs, noting that the Forest Service's "incentives tend to focus efforts on areas that may not present the highest fire hazards."[56] While this is a useful observation, it is hardly represents all the incentives revolving around wildfire.

Stephen Pyne, the preeminent historian of fire, documents many of the results of bad incentives in a historic context. Being a historian rather than a policy analyst, he does not offer any suggestions about how those incentives could be improved.

The major significant policy analyses that cover incentives are *Money to Burn*, by Timothy Ingalsbee of the Western Fire Ecology Center[57] and *A Burning Issue* by Robert Nelson of the University of Maryland.[58] Both do an excellent job of analyzing incentives, but they have been largely ignored, at least in part because their recommendations—one wants to halt all commercial timber cutting on the national forests, the other to give the national forests to the states—are so extreme and are not clearly related to their analysis of incentives.

With these few exceptions, it appears that most people, including most leading policy makers, aren't aware that incentives influence fire policies or that changing those incentives will change fire management. Incentives drive an economic system in the same way that energy drives an ecosystem, and just as creatures in an ecosystem aren't really aware that their ultimate source of food is the sun, people in an economic system often are not aware of the incentives that influence their decisions. To put it another way, incentives are so pervasive that most people simply take them for granted as immutable.

Many people are curiously surprised to realize that incentives influence government agencies. We know that economic incentives influence private enterprise and markets, and many people regard *economics* and *markets* as synonymous. Government, by contrast, is supposed to above such things. Government agencies usually exist to fill some gap that is not filled by the market, and most members of Congress, federal judges, and even many policy analysts presume that agency officials will altruistically make decisions in the public interest. The Supreme Court, for example, has directed federal courts to defer to the wisdom of federal land managers so long as they are not clearly violating the law.[59]

Many regard a suggestion that public land managers respond to incentives as the same as saying they are corrupt. In fact, all it

really says is that they are human. To make all their decisions with perfect altruism regardless of their incentives, managers would have to be superhumans or saints.

Many different kinds of incentives influence a public agency. The most important, both because they are easy to measure, easy to change, and strongly influence other incentives, are budgetary incentives.

Nearly everyone, whether they are a wildlife manager working for the Forest Service or a factory manager working for General Motors, thinks that they could do a better job if they had more money. If a particular action yields more funds for wildlife or the factory, the manager will be inclined to take that action.

On the other hand, an incentive to cut costs is found mainly in the private sector. If a plant manager can produce the same (or more) revenue at lower costs, the result is more profits. This can raise the price of the company's stock, get the attention of the CEO, and possibly increase the manager's pay and likelihood of promotion.

The incentives are different in a public agency. Reduced costs means reduced budgets, and lower budgets means fewer resources for the agency to manage. The appropriations subcommittee that funds the agency, the assistant secretary who oversees the agency, and the entire agency hierarchy all shudder at the thought that the agency's budget might be reduced, for that would mean that some other subcommittee, assistant secretary, or agency would get control of those funds.

Private companies can develop bureaucracies that hoard budgets, make foolish investments, and waste money as well. But, as Enron and WorldCom learned, in the long run the pressure to produce profits will eliminate either the bureaucratic waste or the company. By comparison, the Forest Service for years practiced many of the same, shady accounting techniques that sank Enron and WorldCom, including counting fictitious receipts as revenues and amortizing operating costs over long periods of time—even, in some cases, over eternity. Yet Congress never held it accountable for its losses.

Another kind of incentive is a career incentive. Certain actions tend to lead to promotions and increased pay; other actions are more risky or likely to lead to demotion, dismissal, or transfer to a dead-end job. Career incentives are often tied in with budgets. Someone who finds a way to increase their budget also, in effect, increases the budget of their superiors. Such people are regarded with favor as "can-do" employees.

Some pay grades also depend on how many people you have working under you. A Forest Service official once told me that when he took a new job he found that half the people working for him were just pushing paper. But instead of transferring those people to some more productive job, he left them alone because his pay scale would be reduced if the number of people working for him were cut in half.

Power is also an incentive. In a bureaucracy, at least, power is often tied in with budgets. Especially important are discretionary funds, as they offer more power than non-discretionary funds.

Good public relations are also relevant to power. In 1952, *Newsweek* observed, "The Forest Service is one Washington agency that doesn't have to worry about next fall's election," meaning that the agency at that time was so popular it was immune to administrative meddling. "Most congressmen would as soon abuse their own mothers as be unkind to the Forest Service," added the magazine in a sharp contrast to today's situation.[60]

In a bureaucracy, red tape creates its own incentive. Given a choice between an action that requires a lot of red tape and one that does not, anyone would be inclined to favor the action that avoids the red tape. In general, the path of least resistance has an advantage over paths with greater complications or red tape.

Recognizing all of these incentives, the challenge for Congress and other policymakers is to align the incentives they can influence with the outcomes they desire. Idaho's former Senator James McClure, for example, once convinced Congress to pass legislation that automatically increased the budgets of the timber, recreation, wildlife, watershed, and other resource staffs of any forest that met the timber sale targets McClure wanted them to achieve. But few members of Congress understand incentives, so the incentives created by most legislation and policy tend to be haphazard—which often means that they achieve the opposite of the goals desired by the policymakers.

Forest fire policy is no exception. Before examining fire incentives, it is worth looking at Forest Service timber incentives, both to show how incentives influence agency policy and because timber and fire incentives are interrelated in many ways.

Timber Incentives

The national forest's today sell less than 20 percent of the timber they sold just a dozen years ago, but most people still think of the Forest Service as the "timber service." Yet the truth is that timber was "king" on the national forests for just a third of the Forest Service's history, from roughly the mid 1950s to the late 1980s.

In 1940, the Forest Service was thirty-five years old and was still selling less than one billion board feet of timber a year. By 1960, national forest timber sales had zoomed to eleven billion board feet a year, around which they hovered for the next thirty years. In the course of this transition, the Forest Service sacrificed some its most cherished principles.

The most visible change was in cutting methods. In 1950, most national forests were proud of the fact that they used only selection cutting to remove timber. By 1960, most national forests had switched to clearcutting, and virtually all forests would do so by 1970.

In the National Agricultural Library in Beltsville, Maryland, the Forest Service maintains a huge file of eight-by-ten black-and-white photos, mostly taken in the 1930s through the 1960s. One large file category is called "improper cutting practices," and the 1930s-era photos in this file show clearcutting on private lands adjacent to national forests. Another file presents "proper cutting practices," namely selection cutting on national forests.

Up until 1950, at least, the Forest Service knew that clearcutting was ugly and that the public hated it. Forest Service officials told the public that private timber companies practiced timber cutting because they were greedy and didn't care about the future. The agency's anti-clearcutting rhetoric aimed to build support for the Forest Service's long-term goals of acquiring more national forest lands in the East and gaining legal control over the cutting methods and cutting rates of private landowners—a goal that seemed feasible during the New Deal years.

With the 1952 election of Dwight Eisenhower as president, Forest Service Chief Richard McArdle told his staff that the agency had no chance of getting regulatory control of private forestlands during a Republican administration, and the agency should forget about that goal. (So much for *Newsweek*'s claim that the Forest Service didn't worry about the results of the 1952 election.) Similarly, funding for Weeks Act purchases of eastern national forests was winding down. An ironic by-product of these changes was that the Forest Service no longer had to practice selection cutting to maintain its image as the agency that used only "proper cutting practices."

From a silvicultural point of view, clearcutting has its place. Although Forest Service researchers Jerry Franklin and Dean DeBell say, "biologically, no types or species appear to require large [10 acres or more] clearcuttings for successful regeneration,"[61] some forest species, such as lodgepole pine, may do best under clearcutting. But by the 1960s, national forest managers applied this claim to all sorts of species and forest types, including Douglas-fir and ponderosa pine, which in fact probably did better under shelterwood or selection cutting than under clearcutting.

Aside from the silvicultural debate, the real question is: Why did the Forest Service sacrifice its public image on the alter of clearcutting? The agency that in 1952 was (again quoting *Newsweek*) "one of Uncle Sam's soundest and most businesslike investments" had turned by 1970 into one of the most controversial agencies in the nation. Congress investigated clearcutting in West Virginia, Montana, and Wyoming, the fledgling Natural Resources Defense Council (NRDC) filed lawsuits against the practice, and anyone who wanted to start an environmental group could get hundreds of members by merely taking a stand against national forest clearcutting.

To make matters worse, the Forest Service was no longer making a profit, as it did when *Newsweek* put Smokey the Bear on its cover in the 1950s. Although the Forest Service claimed that clearcutting was economically efficient, by the end of the 1970s Tom Barlow of the NRDC was proving that most national forests were losing money on their timber sale programs.[62]

Between them, clearcutting and below-cost timber sales destroyed the credibility and reputation of the Forest Service. So why did the Forest Service shift from a profitable program of selection cutting in the early 1950s to an unprofitable program of clearcutting in the 1960s?

The short answer, of course, is incentives. In 1916, Congress authorized the Forest Service to keep a share of timber receipts to spend on "brush disposal" after the timber sale. In 1930, the Knutson-Vandenberg (K-V) Act authorized the Forest Service to keep timber receipts for reforestation. These two laws, and primarily the K-V Act, led the Forest Service down the wrong path.

Congress funds the cost of arranging and administering timber sales and engineering the roads needed to access the timber. Roads are built by the timber purchasers, who naturally deduct the cost of the roads from the timber value before bidding on the timber. The purchasers pay for the timber and the Forest Service keeps what it needs for brush disposal and reforestation. The rest of the money goes to the U.S. Treasury.

In 1930, when Congress passed the K-V Act, the Forest Service spent an average of 50 cents a thousand board feet arranging and administering timber sales. So the agency wrote a rule stating that timber managers had to return at least 50 cents a thousand to the Treasury. Of course, if timber values were high enough, they would return a lot more.

In a private enterprise, money left over after costs is profit, and most private enterprises have to earn at least enough profits to keep stockholders happy. But national forest managers, who were proud to earn a profit in the early 1950s, soon began to think of money returned to the Treasury as "losses," because they lost control of the money. "I'd rather keep the money here where I know I can spend it effectively than have it go to Congress, which will probably spend it on bombs," one manager told me in the 1980s.

In this situation, clearcutting had two huge advantages over selection cutting. First, the cost of arranging a clearcut was less, since managers only had to mark the boundaries of the sale, and not every tree. Since Congress appropriated a fixed level of sale preparation funds, clearcutting allowed managers to stretch those funds as far as possible.

Second, clearcutting created the harshest environment for reforestation, giving managers the opportunity to spend K-V dollars on artificial reforestation—initially seeding, later hand planting. As timber prices increased, providing more K-V funds, these practices were supplemented by herbicide spraying to protect seedlings from competition, plastic fencing to protect them from deer, shade cards to protect them from the sun, and in a few extreme cases, irrigation. Most if not all of these expenses could have been avoided had the Forest Service continued to use selection or shelterwood cutting.

The economics of timber cutting is complex, and many researchers backed up the Forest Service with studies showing that, even with these added expenses, clearcutting was more profitable than shelterwood or selection cutting, which posed added costs to protect the residual trees. But none of these studies counted the costs to the Forest Service's public image when it began extensively clearcutting in forests where for decades it had promised to use only selection cutting.

More devastating to the case for clearcutting was the discovery that most national forests lost money on timber. The reason was simple: Forest managers had come to regard potential profits—that is, returns to the Treasury—as losses. So as not to incur such losses, they designed timber sales to return as little as possible to the Treasury. The most important technique was the cross-subsidization of timber sales (table four).

Most national forests included some valuable timber and some worthless timber—that is, timber whose value was so low the Forest Service would have to pay purchasers to take it away. Selling just the valuable timber might earn profits for the Treasury. But a forest could enhance its own budget by combining the valuable timber in the same sales with worthless timber. The valuable timber would be sold for less than it was really worth to compensate purchasers for having to cut the worthless timber.

Such sales were common enough that purchasers called the worthless timber units "punishment units" because cutting them was their punishment for getting the valuable timber at less than below-market prices. Cross-subsidies cost taxpayers millions and did nothing for purchasers. The only winner was the Forest Service, which got to keep more money for reforesting more acres of land.[63]

Table Four
Hypothetical Cross-Subsidized Timber Sale

	Ponderosa	Lodgepole	Combined
Volume (mbf)	1,000	1,000	2,000
Appraised value per mbf	$100	–$80	$10
K-V deposit per mbf	9.50	9.50	9.50
Total appraised value	100,000	0	20,000
Retained by forest	9,500	0	19,000
Returned to Treasury	90,000	0	1,000

If the Forest Service sells ponderosa pine alone, then forest managers will get $10,000 for the K-V reforestation fund and the Treasury will get the remaining $90,000. Lodgepole pine has a negative value so cannot be sold by itself. But if the ponderosa and lodgepole are combined in one sale, the ponderosa can be sold for $90 less than its true value to compensate purchasers for having to cut the lodgepole. The result is that the Forest Service doubles its budget, but the Treasury ends up collecting $89,000 less. Since the Forest Service spends money out of the Treasury for sale preparation, the combined sale is a below-cost timber sale. Source: Randal O'Toole, Reforming the Forest Service, *p. 119. MBF is thousand board feet.*

Even without cross-subsidization, the Forest Service's treatment of K-V funds meant that many sales would be below cost. Although sale preparation costs grew well beyond the 50 cents per thousand board feet of 1930, the rule that managers must return 50 cents a thousand to the Treasury was never updated. By the 1980s, sale costs on many forests exceeded $50 a thousand, so sales that returned only 50 cents a thousand automatically lost at least $49.50 per thousand.

This funding system led to many other controversial practices. Managers of many national forests routinely sprayed herbicides on all their clearcuts at least two times—before and after tree planting—whether spraying was needed or not. Why bother to evaluate if spraying was needed when the cost of spraying was paid for out of timber sale receipts?

The rewards of bigger reforestation budgets were spread throughout the agency. Although the Knutson-Vandenberg Act specified that all retained receipts were to be spent on the ground, in the mid 1950s the Forest Service started keeping a share of receipts for overhead. Every level of the Forest Service hierarchy—the Washington office, regional offices, supervisors' offices, and ranger districts—gets a share of this overhead, giving every level an incentive to promote timber sales and clearcutting. By the 1980s, a third of the quarter of a billion dollars worth of Knutson-Vandenberg funds collected each year went into overhead.[64]

Since overhead money was released to the bureaucracy only after money was spent on the ground, managers who didn't spray herbicides were pressured to do so by higher levels that expected their share of the take. In a famous case in California, numerous

on-the-ground managers reported that they often sprayed herbicides at the wrong time of the year, planted acres that didn't need it, or did other unnecessary practices to meet their targets and release overhead funds for the higher levels of the bureaucracy.[65]

Congress made the incentives worse in 1964 when it authorized the Forest Service to keep a share of timber receipts for road maintenance. This had the effect of encouraging forest managers to build high-impact, high-cost permanent roads when low-impact temporary roads would have often been sufficient. Since ever-increasing timber prices paid for both road construction and road maintenance, managers saw no need to be cautious about road costs and claimed that the roads were providing all sorts of recreation and other multiple-use benefits. Yet behind the scenes, engineering soon became the number two profession in the Forest Service, as forest engineers funded out of appropriations made a practice of overengineering almost every road on the forests.

The 1964 law also saw the creation of "purchaser road credits," which let the Forest Service include permanent road costs as a part of the bids for timber and then let purchasers credit the cost of the road against the price they bid for timber. While subject to some abuse, purchaser credits had little effect on incentives, and it was an empty victory when environmentalists convinced the Clinton administration and Congress to repeal purchaser road credits in 199?.

In the 1970s, the Forest Service responded to the clearcutting debate by hiring wildlife biologists, hydrologists, and other specialists. This, however, created the danger that such "ologists," as they were called, would dissent against the timber sale program. This danger was most acute when NRDC's lawsuit against clearcutting proved successful and everyone—the timber industry, the Forest Service, and environmentalists—expected Congress to pass legislation that would either legalize clearcutting, reform the Forest Service, or both.

Timber companies had their bill to simply legalize clearcutting, but it was a non-starter. The two other bills in contention were the Randolph bill, supported by environmentalists, and the Humphrey bill, supported by the Forest Service. Wildlife organizations were on the fence between the two bills, and the Forest Service offered them a deal: Support the Humphrey bill, and the Forest Service would support an amendment to the K-V Act that would allow timber receipts to be spent on wildlife and other resources.

Since then, about 10 percent of K-V funds have been spent on wildlife, with smaller percentages going for watershed, range, and recreation. Some of the things paid for by K-V funds were truly comical. One national forest started using K-V funds to put up signs explaining to recreationists why clearcutting was good for them. When these signs were vandalized, the forest rewrote its K-V plans to double the money for such signs so that the first ones could be replaced.

The effect of this amendment, of course, was not only to buy the support of the wildlife lobby for the National Forest Management Act but to buy the support of the ologists within the Forest Service for the timber sale program. So K-V now not only contributed to every level of the Forest Service hierarchy but to every resource manager in the agency. This change also gave managers enormous discretion in their use K-V funds, and such discretionary funds are far more valuable to bureaucracies than preallocated funds.

The National Forest Management Act created another fund that created an incentive for a new kind of timber sale: the salvage sale. Receipts from salvage sales would go into the salvage sale fund, which could then pay for more salvage sales.[66] Congress seeded the fund with $6 million.

Initially, the Forest Service kept from each salvage sale the actual cost of that sale. But soon managers realized that some salvage sales could not be sold above their cost, so they began keeping a premium from above-cost salvage sales in order to maintain enough funds in the salvage sale fund for future sales.

At first, the premium was 50 percent, which allowed annual spending out of the fund to grow to about $15 million from 1979 through the mid 1980s. Then major fires in 1987 led to an increased need for salvage sales. To pump up the fund, managers started keeping as much as 450 percent of the costs of each sale. This boosted salvage sale receipts to $163 million by 1990 and a peak of $194 million in 1992. This increase was not reflected by an equal increase in salvage volumes; between 1987 and 1994, a five-year average of salvage sale revenues increased by ten times, but a similar average of salvage volumes only doubled. Meanwhile, many salvage sales returned no money to the Treasury—not even 50 cents per thousand, as the Forest Service exempted salvage sales from that rule.

Salvage sales did not provide as direct an incentive as K-V funds. While K-V funds could be spent only by the ranger districts that collected those funds, salvage sale funds went into a national pool. But the rapid growth of the fund after 1987 encouraged a free-spending attitude, and average salvage sale costs leapt from $15 per thousand in the early 1980s to more than $100 per thousand in the 1990s. As with K-V, a share of salvage sale funds also went into the overhead budgets of the agency hierarchy.

Moreover, salvage sales provided managers with a path of least resistance. No one likes to see something go to waste, and the salvage of dead and dying trees was less controversial than the cutting of green trees. Though environmentalists challenged salvage sales, especially those that included many green trees, the salvage sale program is the one component of the Forest Service's timber sale program that didn't substantially decline through most of the 1990s. Sales have fallen since 1999, but revenues still exceed $100 million per year.

All of these incentives led the Forest Service to overshoot the National Forest System's capacity for producing timber while still providing other multiple-use resources. Growing pressure from environmentalists combined with the post-Earth Day generation of foresters—who were mainly urbanites with strong environmental attitudes as opposed to pre-1970 foresters who were mainly ruralites with strong commodity attitudes—convinced many on-the-ground Forest Service officials that they were cutting too much timber.

In 1989, forest supervisors from Oregon and Washington national forests prepared a video for the Chief of the Forest Service pleading for a reduction in timber goals. "I understand the importance of timber targets and their relationship to the budget," said one in the video, "but I can't meet those targets and still be the steward of the land that you want me to be."[67] The video inspired forest supervisors from every other western forest to write and sign on to letters to the Chief endorsing this view.

National forest timber sales have declined since then, but the incentives remain in place. One measure of those incentives is the status of the Knutson-Vandenberg fund. Although sales have declined by 70 to 80 percent, increased prices allow forest managers to keep more money from each sale, so annual K-V and brush disposal receipts have declined by only 50 to 60 percent. Salvage sale receipts continue to average around $100 million per year, several times more than their pre-1989 levels.

Despite the decline in timber sales, timber incentives continue to influence fire policy. Although Congress has increased fuel treatment funds, forest managers still must sometimes turn to timber sales to treat fuels. "The only way the forest could finance fuels treatment was through a commercial timber sale that generated enough funds to finance other treatments, such as prescribed fire," said the Six Rivers National Forest about a controversial timber sale.[68] And salvage sales are a natural choice for post-fire rehabilitation because sale revenues can be used for reforestation, erosion control, and other activities.

A recent Forest Service report observed, "Line officers have cited the budget structure as a major impediment to the cooperative, integrated development of plans and projects."[69] In other words, managers may want to do one thing, but are forced or at least encouraged by the budget to do something else.

Such incentives justify a measure of caution when considering Forest Service proposals to use commercial timber sales to treat the fuels built up from decades of fire suppression. While commercial timber sales may play an important role in such treatments, the incentives encourage the Forest Service to greatly exaggerate that role. So long as incentives exist to lose money on timber, the Forest Service cannot be trusted to plan or carry out commercial timber sales for forest health or other purposes.

Fire Budgeting Incentives

Fire Budgets

Congress appropriated $1.1 billion to the Forest Service for national forest management in 2000. But that year the agency ended up spending another $1 billion on fire suppression. In effect, fire almost doubled national forest budgets.

As BLM budget analyst Gardner Ferry observes, a billion dollars is a lot of money, and that much money "has a high risk factor for waste, fraud, and abuse."[70] But the problem with fire is not the amount of money involved but that Congress created a budgeting process that practically *insures* waste, fraud, and abuse.

For most governmental functions, Congress approves spending in advance and closely monitors agencies to insure that they do not spend more than Congress authorized. But fire is different. Ever since 1908, Congress has allowed the Forest Service and other agencies to spend whatever it takes to put out forest fires. In practice, the agencies have a blank check for fire suppression.

Congress gives the Forest Service and other agencies a budget for fire. But when fire conditions get bad enough—and the agencies themselves decide when that happens—they can start spending "emergency fire suppression funds." This creates "a double system of accounting," says historian (and ex-firefighter) Stephen Pyne: "one set of economic criteria applied to normal fire seasons, subject to budgetary constraints; another set applied to catastrophic seasons, subject only to the perceived needs at the scene."[71]

"The secret to creative financing," Pyne writes elsewhere, "is to transfer as many costs as possible from the budgeted account to the non-budgeted, 'emergency' accounts, of which there are two. One, the emergency suppression account, covers expenses attributable to actual fires. The other, the emergency presuppression account, pays for personal services and rentals during selective periods of high fire danger." In this case, Pyne is writing about the Park Service, but what he says holds true of the Forest Service, Bureau of Land Management, and other agencies given "blank checks" to fight fire.

"What happens, of course, is that everything imaginable is charged to fires, and the determination of 'high fire danger' becomes more and more loosely interpreted," continues Pyne. "At its extreme the regular fire crew budget is actually abolished—expended for road chips and other visitor-dependent services—and all fire operations are charged to the emergency accounts. Short of this is the practice of over-ordering under the provision for 'replacement' of materials used up or damaged during a fire. Though charged to a fire, the supplies often end up in the ranger caches" (as opposed to fire caches).[72]

The blank check for fire budgeting forms the heart of all the problems with fire today. The incentives it creates act on all levels of the agencies in all ways: budgetary, career, power, bureaucracy.

"Emergency funding for firefighting lacks the rigor, discipline, and incentives for more efficient decision making," admits an internal Forest Service report. "The Forest Service manages emergency firefighting funds as if they are unbudgeted, unlimited, unallocated, and without benchmarks on acceptable spending levels."[73]

"There are few incentives to control costs on wildland fire incidents," says Park Service fire planner Stephen Botti. "For this reason, those costs have averaged . . . eight times the average cost of prescribed fires."[74] While it is not exactly fair to compare the cost per acre of wildfire with prescribed fire—one is a cost of putting out fires, the other the cost of setting fires—the point is that agencies spend a lot on fire suppression simply because they can.

Aerial firefighting in particular can be extremely expensive, with individual aircraft sometimes costing thousands of dollars per hour and individual loads of fire retardant costing several thousand more. When it began using planes in the 1950s, the Forest Service relied mainly on surplus World War II aircraft that dumped water on fires. By it soon underwent "an almost insidious metamorphosis," relates Forest Service fire planner Richard Chase, relying on newer (and more expensive) aircraft dumping expensive fire retardant instead of plain water. This led Chase to "wonder what kind of return we were getting for our money."[75]

Chase felt in 1987 that the Forest Service had gotten aerial costs under control, yet aerial suppression costs remains a major issue today. A Forest Service report published in 2000 notes that "the high costs of airtankers and helicopters are sensitive issues with cooperators," meaning other federal and state land agencies.[76]

"Mr. Mud" was the nickname of an air attack supervisor who "had a well-deserved reputation for initiating and sustaining extremely aggressive air assaults," says firefighter Peter Leschak. "His personal record was 22,000 gallons of fire retardant dumped on a five-acre fire," which is about a gallon every ten square feet or (as Leschak puts it) a twelve-ounce bottle of beer on every square foot.[77]

Firefighters such as Leschak all tell stories of profligate spending on fires. "The Forest Service tries to put out fires by dumping money on them," firefighters commonly say. One Forest Service employee confided to me that his district had enough funds to pay its staff only 11 to 11.5 months of the year—and relied on fires to fill in the two- to four-week gap.

Firefighters don't mind spending money on fires, since that is

the source of their pay; Leschak notes that firefighters call clouds of smoke *money bubbles* because they are "ensuring more paychecks for somebody."[78] But firefighters are acutely aware that the cost of fire suppression is sometimes paid for in lives as well as dollars.

Most of the money is spent fighting the biggest fires. Former firefighter, and director of the Western Fire Ecology Center, Timothy Ingalsbee notes that 97 percent of the money is spent on just 2 percent of the fires which cover 94 percent of the burned acres.[79] That means the big fires cost about twice as much per acre as small ones.

That may not be out of line since big fires are by definition more difficult to control than small ones—otherwise they wouldn't have gotten so big. Yet it is also sometimes true that when big fires can't be controlled at all, the agencies go on spending millions of dollars pretending to fight the fires anyway. Such fires, says Ingalsbee, "are sometimes dubbed 'political shows' by experienced firefighters who know when their labors will have no effect on fire behavior."

A 1995 study of expensive fires by Forest Service fire planner Denny Truesdale observed that the agency often selected "aggressive fire suppression strategies" that "were minimally successful and very costly."[80] When Truesdale interviewed fire commanders, "several said they would have fought fires differently, and at lower cost, if the money had come from the forest's allocated budget" instead of emergency suppression funds.[81]

In addition to boosting national forest budgets, fire gave the Forest Service power and prestige, and provided career paths for its employees. Fire control "helped to bring political power to the Forest Service," says Pyne.[82] "As that power grew, the Service found itself subtly corrupted in spirit and imagination."[83]

Much of that power came from the Forest Service's control of fire suppression funds on both federal and private lands. Through these funds, says Pyne, "the Forest Service sought to extend its policies and solutions to its cooperators."[84] Ashley Schiff's 1962 book, *Fire and Water*, shows how the Forest Service attempted to use fire control funds to manipulate private forest management.

In the early days of the Forest Service, timber and other resource outputs from the national forests were relatively insignificant. So "fire control advertised and dramatized forest conservation—and the Forest Service role—as no other public message could have done," observes Pyne, who calls this era "the Heroic Age." But even during the time when timber was dominant, Smokey the Bear brought a friendly Forest Service face to generations of young Americans.

The agency's need for positive public relations and individual employee's ambition to get ahead helped reinforce the agency's preference for total fire suppression over prescribed burning. Being known as the person who burned down Los Alamos isn't exactly a career booster.

All of these factors—budgets, power, public relations, and individual career goals—can be seen at work in the history of Forest Service firefighting, especially when that history is viewed through an incentive-based lens.

Budget History

Every history of national forest fire policy begins with the great 1910 Selway-Bitterroot fires in Idaho and Montana. As these fires swept across more than three million acres and killed 85 people—78 of them firefighters—they "left a burned swath across the memory of a generation of foresters," writes Stephen Pyne. "The holocausts gave fire protection an overbearing role within the U.S. Forest Service and brought the Service unexcelled power in the field of national fire policy."[85]

Pyne considers it ironic that these fires should be so influential, since "their historical impact far exceeded the values at risk."[86] The Northern Rockies were still an undeveloped frontier. "Other regions have higher fuel loads. Most have higher values at risk."[87] Pyne seems to be suggesting that if the South, where forests demand prescribed burning every two to four years, had been the region where the Forest Service first fought fires, fire history would be very different.

In reality, however, the Northern Rockies fires were not so much influential in themselves as that they provided an excuse for policies that were primarily influenced by the blank check Congress had given the Forest Service for fire suppression.

Pyne's 1982 book, *Fire in America*, divides the Forest Service's fire history into four periods (see table five). Twenty years later, we can add a fifth period extending from roughly 1990 to the present. Each period, says Pyne, can be characterized "as a response to certain types of abundances that became suddenly available to fire protection." These abundances were not simply the "acquisition of new means: the means at hand were often so powerful as to dictate to some degree the ends to which they might be applied," continues Pyne. "This upset an evolving equilibrium between policy and programs, problems and opportunities."[88] This continues into the fifth period.

Table Five
Five Periods in Forest Service Fire History

Period	Name	Abundances
1910–1929	Frontier fire	Land and money
1930–1949	Backcountry fire	Manpower and money
1950–1969	Mass fire	Surplus war eqt. (& money)
1970–1989	Wilderness fire	Information and research
1990–Present	Expensive fire	Staff and money

After Pyne, Fire in America, p. 261.

The first period, which Pyne labels *frontier fire*, began with the Idaho-Montana fires of 1910, which were also the first test of the blank check law. The Forest Service spent more than $1.1

million trying to suppress the fires of 1910, which Pyne calls a "staggering" amount. Though it is only about $20 million in 2002 dollars, it was 20 percent of the Forest Service's budget for that year. Agency officials might have been nervous that Congress would fail to reimburse the agency, but Congress did so, setting a precedent for every major fire season since that time.

Pyne says that the blank check fund "produced a profound ambivalence among professional foresters."[89] Major fires in 1917, 1919, 1924, 1926, 1931, and 1934 required the Forest Service to use the blank check law, and it is likely that some foresters worried more than others about having to call upon those funds. In the long run, "of course, the money was irresistible," says Pyne. "Whatever else the fire establishment did or wanted to do, actual firefighting paid the freight." As a result, "fire agencies will follow the money."[90]

Fire is a classic case of incentives influencing outcomes, but the process was a little more complicated than just "following the money." Early forest managers were not ignorant or naïve about fire, as the standard story claims. As Robert Lee points out, there was a "diversity of scientific opinion" in the Forest Service, and "early in this century agency leaders had begun to discuss the limitations of aggressive fire control policies."[91] Some officials, often those closest to the land, believed in "light burning"; others wanted to put every fire out.

Pyne observes, "the critical divide was . . . between those who resided on the land and those who lived in urban areas, between those who grew up with their hand on a torch and those who knew fire only in stoves or through books."[92] What tipped the balance between suppressionists and light burners was not science or reason but a budgetary process that rewarded supporters of fire suppression more than it rewarded supporters of less costly policies.

This is illustrated by two early debates over fire, one in the West and one in the South. In the unsettled West, where most of the national forests were unroaded and remote, many forest officials argued that it would be best to allow fires to burn, if only because the cost of suppression could be so much greater than the value of the resources consumed by flames. "But the national forests were a political institution, not an economic one," comments Pyne, "and fire control successfully resisted efforts to apply strictly economic criteria for its conduct."[93] Of course, as one Forest Service official observed, "As long as the money is plentiful, it is not necessary to worry about values."[94]

Pyne shows that many Forest Service officials were critical of waste in fire suppression efforts. Lolo National Forest Supervisor Elers Koch concluded that thousands of firefighters in 1934 had proven little more effective than crews of thirty or forty men working on fires in 1910. "After years of experience I have come to the considered conclusion that control of fire in the backcountry of the Selway and Lochsa drainage is a practical impossibility," Koch wrote. "I firmly believe that if the Forest Service had never expended a dollar in the country since 1900 there would have been no appreciable difference in the area burned over."[95]

Despite internal critics, says Pyne, "throughout the 1930s, federal fire control became increasingly dominated by emergency funding programs existing outside regular, budgeted appropriations,"[96] in other words, by the blank check. This no doubt contributed to the victory of the suppress-fires-at-all-costs point of view, which was made into a hard-and-fast policy when the Chief of the Forest Service issued the 10 AM rule. This rule directed forest managers to do "fast, energetic, and thorough suppression of all fires in all locations, during possibly dangerous fire weather." If a fire was not suppressed on the day it was detected, "the attack each succeeding day will be planned and executed with the aim, without reservation, of obtaining control before 10 o'clock of the next morning."[97]

The Chief's 1935 memo also heralded another change in policy: Instead of being limited to fire suppression, the blank check could now be spent on presuppression activities during periods of extreme fire danger.[98] Instead of controlling costs, this opened the floodgates to further abuse.

Pyne attributes this policy, in part, to the New Deal. Major fires in the early 1930s were "to forestry what the Dust Bowl was to farming," suggests Pyne. "The response in fire control was not so different from those programs frantically rushed into being to cope with the blighting drought on farmlands in the East, with the Dust Bowl and soil erosion in the Great Plains."

The labor provided by the Civilian Conservation Corps in building roads and trails certainly gave the Forest Service the confidence that it could successfully implement a 10 AM policy. But the policy itself is a natural outgrowth of the blank check law. Without the plentiful money provided by a blank check for fire suppression, the Forest Service would have to have let many fires burn.

As documented in Ashley Schiff's 1962 book, *Fire and Water*, the blank check law had more immediately dire consequences in the South. Southern forests are much more productive than many in the arid West, and the forest floor quickly builds up a layer of needles, leaves, and other litter known as *rough*. Native Americans and early settlers traditionally burned this rough every few years. Less than a decade of fire suppression can have dire consequences for the forests.

As early as 1908, Yale forestry Professor H. H. Chapman published research indicating that longleaf pine, the most valuable softwood species in the South, depended on frequent fires for propagation and growth.[99] To provide good regeneration, Chapman recommended burning longleaf stands in the fall. Then, after two years, seedlings could survive another fire that would eliminate competition and burn the duff that, if allowed to accumulate, would provide the fuel for a catastrophic fire.

Fires every two or three years after that would keep the fuels

down. Such small fires would not harm the longleaf pines except in their first year. But if fuels were allowed to accumulate for eight years or more, fires would burn so hot that they would kill many of the trees. Later Chapman suggested that managers go so far as to burn the needles of longleaf pines infected with brown-spot disease. The trees would survive, but without that treatment the disease could spread and wipe out entire forests of longleaf.[100] Even later, in 1942, Chapman recommended that fires be used in loblolly as well as longleaf pine forests.[101]

When Chapman first published in 1908, the national forests were located entirely in the West. But the 1910 Weeks Act, which Congress passed just a few weeks after the Idaho-Montana fires, gave the Forest Service the authority to buy lands in the eastern part of the U.S. Soon it owned hundreds of thousands of acres of land in Florida, Georgia, and other states where private owners routinely burned their forests.

In response to these recommendations from Chapman and others both inside and outside of the Forest Service, the agency began a few research projects on fire. But some projects were poorly designed, and the agency suppressed the results when research found that fire might be good for the forests.[102] For example, a report urging that "thick mats of grass or leaf litter be burned to prepare soil for natural reforestation" was innocuously changed to "thick mats of grass or leaf litter may have to be broken so that the pine seed may fall directly on the soil."[103] The agency also used its muscle to prevent other federal agencies from publishing reports favoring fire.[104]

The agency was motivated not only by its blank check for suppression but by the 1924 Clarke-McNary Act, which made the Forest Service the lead federal agency for distributing fire suppression funds on private as well as federal lands. Forest Service officials feared that prescribed burning would weaken their case against "indiscriminate burning" by local farmers and residents, who the Forest Service considered ignorant and "a disadvantaged cultural group."[105]

Local national forest managers in the South soon learned that fires were an essential part of their management activities. By the 1930s, many southern national forests were doing prescribed burning on thousands of acres each year. Yet the Washington office of the Forest Service continued to preach against fire. While agency leaders tolerated controlled burning on southern national forests, provided the forests kept it a secret, they told private landowners that their lands would receive no protection from fire using Clarke-McNary funds if they used prescribed burning.

The predictable result was a series of catastrophic fires in the early 1940s. In 1943, Forest Service leaders finally approved the use of prescribed fire in the South. Yet astonishingly, the agency refused to make public its reversal or to publicly advocate prescribed burning on private forests.[106] The Forest Service would not publicly support burning in southern pine stands for several more years.

Today southern forests include millions of acres of former longleaf stands now converted to less valuable pines, and millions more of former loblolly stands converted to even less valuable hardwoods. There are many reasons for these changes, but one is certainly the Forest Service's intransigence regarding fire.

The Forest Service's initial resistance to controlled burning may have come from the agency's experiences in the northern Rockies. But its long opposition to prescribed burning on private lands, even as it practiced such burning on its own land, came from somewhere else.

Forest Service leaders had long set a goal of gaining regulatory control of all U.S. forestlands, both public and private. They clearly saw the 1924 Clarke-McNary Act as the first step in this direction. The 1933 National Industrial Recovery Act actually gave the Forest Service such control, but the Supreme Court struck down the law.

To keep momentum going for such control, the Forest Service had to portray private landowners as ignorant and liable to use destructive forest practices, while the Forest Service used only scientifically sound practices. For example, Forest Service photo files at the National Agricultural Library in Beltway, Maryland, include numerous photos from the 1930s of "improper timber cutting" on private lands compared with "proper timber cutting" on nearby national forests. The improper cutting was clearcutting; proper cutting was selection cutting.

Fire was a part of this campaign. The Forest Service today is proud its efforts reduced the amount of land burned in wildfires each year from more than 22 million acres a year before 1950 to less than 10 million acres per year in the 1950s and less than 5 million acres per year after 1960. But it is likely that most of the acres burned before 1950 were not wildfires but traditional fires set by local landowners who the Forest Service treated as ignorant vandals.

It took more than twenty-five years to go from Chapman's 1908 paper about the need for fire in longleaf pines to the Forest Service's complete acceptance of such fire. As much as anything else, this delay was caused by the fire suppression mentality created by the blank check law and the Forest Service's hunger for power that was whetted by the Clarke-McNary Act.

After the Forest Service finally approved of fire in the South, it took another thirty years for the agency to give the nod to fire in the West. During this time, there were essentially two Forest Services, at least with respect to fire. Southern forests routinely burned hundreds of thousands of acres each year using appropriated funds. Western forests, meanwhile, burned only in very limited circumstances using what are known as the *brush control fund*.

Created by Congress in 1916, the brush control fund provided a model for the 1930 Knutson-Vandenberg fund. The law allowed the Forest Service to require timber purchasers "to de-

posit the estimated cost to the United States of disposing of brush and other debris resulting from their cutting operations."[107] In practice, the Forest Service didn't treat brush disposal as an extra charge to timber purchasers but simply deducted the cost from timber receipts. "Disposing of brush and other debris" could mean several things, but in most cases it meant either broadcast burning (burning of all debris on the acres) or piling and burning (pushing the debris into piles with a bulldozer and then burning the piles). Yet brush disposal funds failed to burn anywhere near as many acres as had burned before 1900. During the 1980s, brush disposal funds were typically used to burn a little more than 300,000 acres a year.

Today, University of Washington fire ecologist James Agee estimates that the Forest Service should burn as much as 800,000 acres a year in the arid West.[108] But this is not exactly new information. As environmental historian Nancy Langston found after reviewing decades of records of national forests in the Blue Mountains of eastern Oregon and Washington, Forest Service officials were fully aware that their fire suppression policies would greatly alter forest ecosystems. "Early foresters knew that the thickets of young trees that fire suppression and logging created were not an ideal situation," says Langston.[109] Over the decades, forest managers witnessed huge changes in western forests as a result of their policies. For one thing, fire suppression tended to favor less valuable firs instead of the more valuable pines. "On the Wallowa-Whitman National Forest in 1906," says Langston, "57 percent of the timber by volume was ponderosa pine, and in 1991 it was less than 20 percent."[110]

The problem was that brush disposal funds could only be spent on the actual acres cut. When the Forest Service was selection cutting, as it did on most national forests through the early 1950s, this could mean a lot of acres—though in practice it didn't because so little national forest timber was sold before 1950. But when forest sales increased after 1950, the Forest Service switched to clearcutting, so a relatively small percentage of the forests were cut each year. This meant that fire frequencies were dramatically less than they had been before 1900.

The constraints built into the brush disposal fund led to one of the saddest episodes in Forest Service history on the Sequoia National Forest. In the 1970s, Sequoia National Park pioneered the practice of prescribed burning on public lands in the Sequoia Nevada range. The giant sequoia trees that the park was created to protect are fire dependent. On one hand, their thick bark is extremely fire resistant. On the other hand, their seeds germinate only after exposure to a fire hot enough to prepare the seed bed by removing the leaves, needles, and other materials that could smother a seedling. Worried that sequoia were not naturally reproducing, the park found that prescribed fires led to thousands of seedlings germinating on each acre.

Next-door neighbor Sequoia National Forest actually has more acres of giant sequoia trees than the park. Inspired by the park's success, the forest wanted to do some prescribed burning on its own in the 1980s. Because appropriated dollars were not available for such burning, the forest wanted to use brush disposal funds. Since brush disposal funds could only be used on the actual acres cut, the forest began arranging timber sales in all of its giant sequoia groves. The sequoia grew in stands mixed with ponderosa pine, sugar pine, incense-cedar, and other species, many of them giants in their own right. So the forest invited timber purchasers to clearcut all of the trees in the sequoia groves except for the giant sequoias. They called this "sequoia grove enhancements."

The result was both an ecological and public relations disaster. While a small fire that would burn off the duff would still leave plenty of trees to shade sequoia seedlings, the clearcut left most of the ground exposed to the hot summer sun. The result was that almost no sequoia seedlings survived, while the giant sequoia trees left behind were vulnerable to windfall. Meanwhile the sight of a few giant sequoia trees surrounded by ugly clearcuts outraged local environmentalists, who drew national attention to the spectacle of the Forest Service apparently destroying some of the largest trees in the world.

Aside from the special case of "enhancing" sequoia groves, national forest managers in the West generally viewed timber sales as a part of their fire control programs. Yet this too was conditioned by the brush disposal fund. In fact, timber cutters who removed the big (and less flammable) pieces of wood and left behind the needles, twigs, branches, and other "fine" (i.e., more flammable) materials left the forest more fire prone than before the cutting. Brush disposal was needed to reduce the fire hazard created by timber cutting. But since it was the only hazard-reduction tool available to western national forests, managers came to think of timber cutting as a primary way of reducing fire hazards.

As the Forest Service switched from selection to clearcutting in the 1950s, it also adopted new firefighting techniques. Pyne lists "money" as one of the abundances in the first and second periods, and it continued to be abundant in the third period as well. The third period also saw a revolution in firefighting techniques as fire managers used war-surplus C-130s (military versions of DC-3s) for smokejumpers and B-17s and various other ex-bombers to drop water onto fires.

The romance of smokejumping and the drama of bombers dropping water on a fire provided public relations benefits that far outweighed the effectiveness of these techniques in fighting fires. The Forest Service found itself forced to use aerial tools even when they weren't effective or face criticism from members of the press who were more interested in getting exciting front-page news photos than in seeing tax dollars spent effectively.

If low-cost war-surplus aircraft were only marginally effective in the 1950s and 1960s, the cost effectiveness of aerial firefighting plummeted in the 1970s when the Forest Service

had to replace worn-out vintage warplanes with newer and more expensive equipment. Fire retardant replaced water because retardant was more effective, but a single load could cost thousands of dollars. With a blank check, the expense wasn't a problem, and the attitude was "If some retardant was good, lots apparently was better."[111]

Pyne's fourth period, 1970 to 1990, was the first (and so far the only) one in which the Forest Service worried that money might no longer be abundant. The period started in 1971 when the Forest Service cautiously suggested it might allow some natural fires to burn in wilderness areas. But it also supplemented the 10 AM policy with an ambitious goal of containing all fires within ten acres. "Like other efforts to control spending by spending more," comments Pyne, "the 10 Acre policy proved a costly failure."[112]

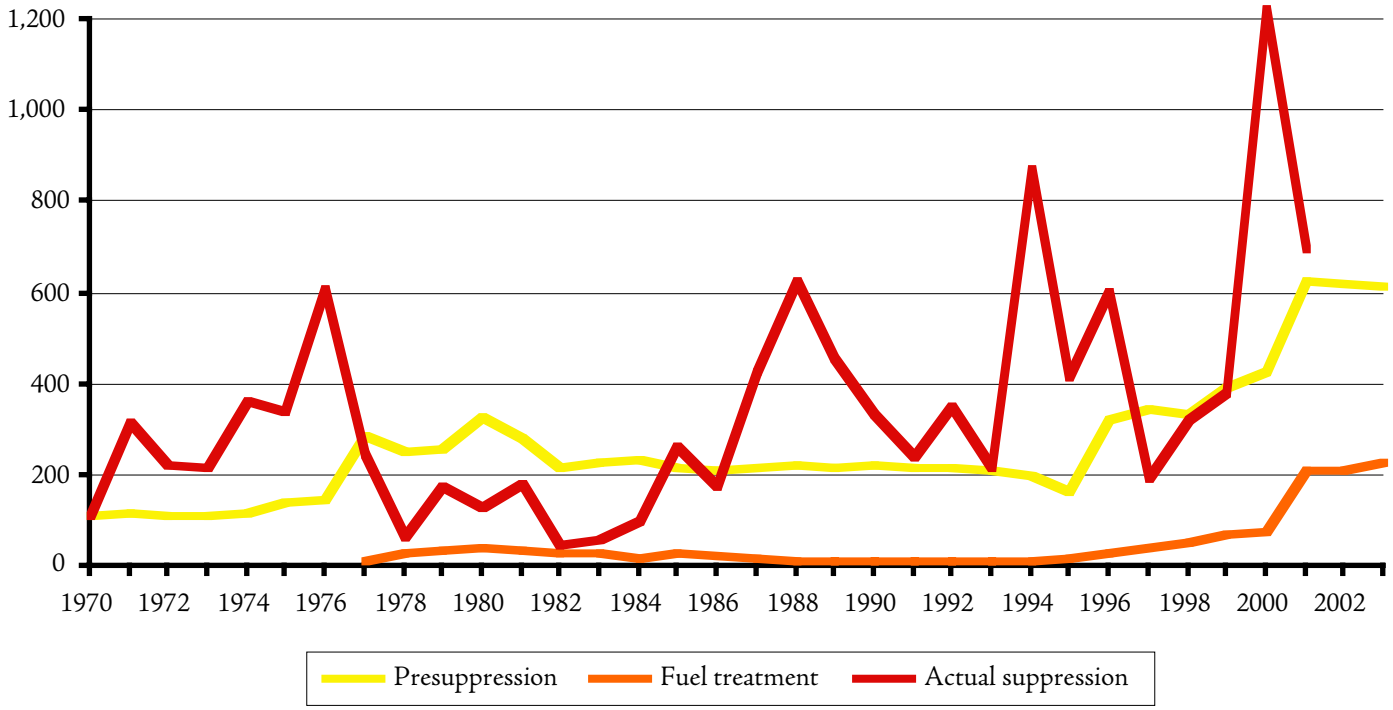
Rising fire suppression and aircraft costs led the Office of Management and Budget (OMB) in 1975 "to wonder what kind of return we were getting for our money."[113] The Chief ordered a review of fire planning methods, which concluded that they were "basically sound and rational."[114] That didn't satisfy either OMB or Congress, so in 1977 the Forest Service ended the 10 AM and ten-acre policies and endorsed more prescribed burning in the West.

In 1978, in what appeared to be the most dramatic change in fire policy in seventy years, Congress repealed the blank check law. Starting in the 1980s, Congress tried to appropriate fire suppression funds like any other line item. It gave the Forest Service a fixed budget for suppression, usually around $110 to $125 million a year. If costs in one year exceeded that amount, the Forest Service was expected to pay for them out of the Knutson-Vandenberg reforestation fund—which typically had hundreds of millions of dollars at any given time—and then repay the K-V fund in later years when costs were lower than $125 million.

These policy shifts led to some subtle yet significant changes on the ground. Rather than try to minimize the number of acres burned at any cost, Forest Service fire managers focused suppression strategies on containment within natural boundaries. This led to more acres of fire but was supposed to reduce costs and increase firefighter safety. Some forests eagerly began to experiment with letting fires burn—mainly in wilderness areas—but because of various restrictions the Forest Service continued to aggressively suppress more than 99 percent of all fires.

With a little help from mild weather, cost-cutting pressures from Congress and the OMB succeeded in reducing Forest Ser-

Chart Three
Appropriated Presuppression and Fuel Treatment Funds and Actual Suppression Costs
(millions of 2002 dollars)



In the late 1970s, Congress substantially increased funding for presuppression. Suppression costs dropped until 1985, which was partly due to pressures from Congress and the OMB to keep costs down. Congress again increased presuppression funding in the late 1990s, but suppression costs increased, partly because the pressure to keep costs down had faded. Source: Ervin Schuster, "Analysis of Forest Service Wildland Fire Management Expenditures: An Update," in González-Cabán, Proceedings of the Symposium on Fire Economics, Planning, and Policy *(Albany, CA: Forest Service, 1999), p. 44, and Forest Service,* Budget Explanatory Notes *for various years. Dollars adjusted for inflation to 2002 dollars using GNP price deflators.*

vice fire suppression costs. Actual suppression costs fell from an average of $125 million a year in the mid-1970s to an average of just $61 million from 1977 to 1984. Costs reached $167 million in 1985, which wouldn't have been a problem since costs dropped to $115 million in 1986.

If costs had remained below $125 million for a couple more years, the Forest Service would have quickly repaid any deficit from 1985. But they did not: the great California fires of 1987 and Yellowstone and Alaska fires of 1988 cost the Forest Service a total of $722 million, which was $472 million more than the $250 million Congress had given the agency for fire suppression in those two years.

It is well known that the 1988 Yellowstone fires dealt a setback to the Forest Service's hesitant let-burn policy, as the secretaries of agriculture and the interior directed federal agencies to suppress all fires until after they completed fire management plans that carefully described the conditions under which fires would be allowed to burn. What is less well known is that the 1987 and 1988 fires dealt an even more severe setback to efforts to controll fire suppression costs.

If the 1910 fires tested Congress' willingness to sign a blank check, the 1987 and 1999 fires tested Congress' willingness to restrain fire suppression in a normal budget. After paying the $472 million deficit out of the Knutson-Vandenberg fund, the Forest Service pleaded with Congress to restore the fund so that the agency would not run out of money for reforestation and other K-V activities.

Congress responded by tripling the Forest Service's annual firefighting appropriation to $375 million in 1989. But no end was in sight: 1989 costs were $335 million and 1990 costs were $254 million. The Forest Service publicly fretted that it would run out of reforestation dollars, so Congress finally gave the agency a supplemental appropriation of nearly $280 million in 1990 to repay the K-V fund.

In failing this test, Congress started the fifth period, which I call the *expensive fire* period, in 1990. Even though the blank check law was no longer on the books, the reimbursement of the K-V fund told the Forest Service that Congress would reimburse fire suppression costs when they exceeded budgeted levels. Money was abundant once again and forest managers no longer felt pressured to constrain costs.

Technically, Congress still gives the Forest Service a fixed amount of money for fire fighting. But if costs exceed that amount, the president can let the Forest Service spend more out of an emergency contingency fund. Of course, the president rarely says "no" to the Forest Service, which has drawn on this contingency fund every year since 1993. In the decade ending in 2001, Congress has given the Forest Service $3.0 billion for presuppression, $2.3 billion for suppression, and $2.4 billion in contingency funds—nearly two-and-one-half times the amount provided for the same activities in the previous decade.

As timber sales declined after 1989, the other abundant Forest Service resource was its staff. Despite a decline in timber sale offerings from 11 billion board feet in 1990 to 4.5 billion in 1993, Forest Service full-time equivalents actually increased from 41,100 to 41,900. After that, staffing levels did decline to a low of just over 34,000 in 2000, though this may have been more due to the Clinton administration's reinventing government program (which directed agencies to shed 12 percent of their staff[115]) than to any changes in the timber program.

By 2000, timber sales had fallen below 2 billion board feet a year, and the question on everyone's mind was how the Forest Service could justify its large staff. The answer proved to be fire. The Forest Service convinced Congress that a build up of fuels due to past fire suppression created conditions for catastrophic fire throughout the West, conditions that could only be corrected by giving the Forest Service lots of money for fuels management and fire suppression.

Congress responded with a firestorm of spending, including increasing the Forest Service fuels treatment budgets from less than $10 million a year in the early 1990s to well over $200 million a year in the early 2000s and presuppression budgets from $175 million a year in the early 1990s to more than $600 million a year in the early 2000s. This helped boost Forest Service staffing levels to more than 35,000 people in 2001.[116]

It seems the Forest Service can't lose. If it puts out fires, it is a hero for saving people's homes and the public's forests. If fires get away and burn the forests and homes, Congress writes a blank check for suppression and increases fuels treatment funding by twenty times. The only danger for the Forest Service is that the weather might enter a wet period, dampening Congress' enthusiasm for spending on fire.

Forest Service v. Park Service

Stephen Pyne observes that, when Congress turned the forest reserves over to Pinchot's Bureau of Forestry, it could just as easily given them to one of a dozen other agencies engaged in federal resource management. The most pretigious of those agencies, the only one that holds a better claim than the Forest Service to be considered the founder of conservation, was the Geological Survey. Pyne considers it "surprising that the reserves were not given to the Geological Survey: no other scientific bureau at the time was so well equipped to assess resources and offer policy decisions."[117]

John Wesley Powell, the founder of the Geological Survey, was an early proponent of prescribed fire in the arid West. So, speculates Pyne, "Had the Geological Survey been given the reserves or had they remained with the GLO [Government Land Office], a different policy and a different attitude toward fire would have been the likely result."[118]

This view is apparently confirmed by the Park Service, whose

attitude towards fire is very different from that of the Forest Service. The Park Service adopted policies favoring prescribed natural fire in the 1960s. While the Forest Service adopted similar policies in the 1970s, the difference was that the Park Service actually followed them while the Forest Service continued in practice to suppress nearly all fires. Tensions between the two agencies different policies were seen in Yellowstone in 1988 and more recently on the Cerro Grande fire that burned hundreds of homes in Los Alamos in 2000.

Many observers attribute the difference between Forest Service and Park Service policies to "the different purposes" of the two agencies.[119] But Pyne explains it a little differently, noting that the Forest Service is run by natural resource managers while the Park Service is run by visitor managers. Thus, most Park Service have little knowledge of fire.

"The Forest ranger evolved out of a professional class, foresters, educated to understand and deal with natural resources. The Park ranger has never had an equivalent professional stature," says Pyne. "Unlike the Park ranger, too, the Forest ranger knows fire. Fire experience saturates the Forest, fire is a part of the genetic heritage of the Forest Service."[120]

When Grand Canyon National Park decided to institute a let-burn policy in a portion of the park known as "The Dragon," Pyne notes that "None of the architects of the new policy has ever been to The Dragon; most have never worked in fire." In fact, they "never complete the paperwork that would put The Dragon officially and finally into a natural fire zone. Instead, they philosophize and manipulate Park politics and they talk."[121]

As people managers, park rangers are out of touch with the land. Rather than manage the land, Pyne cynically comment, "the job of a Park ranger is to project the image of a Park ranger."[122] Pyne illustrates this with a story of a debate over ranger uniforms. Should rangers, who are basically "white-collar managers, cops in patrol cars, and ambulance attendants," wear boots? The Park Service decides they should because "the real purpose of a ranger was to project the Ranger Image. . . ; the ranger image is of someone who wears boots."

The "ranger image" regarding fire was shaped by the famous Leopold Report of 1965?. A committee chaired by A. Starker Leopold, son of Aldo Leopold and a well-known ecologist in his own right at the University of California at Berkeley recommended to the Park Service that its goal should be to maintain and recreate in the parks the natural ecosystems as they existed before European settlement. Supposedly to comply with this, the Park Service in 1968 adopted a policy of "natural regulation," including letting natural fires burn.[123]

The real origin of the natural regulation policy is a little different. In 1968, the director of the Park Service was George Hartzog, and one of the controversies he faced dealt with elk hunting in Grand Teton National Park. Hunting in the area had been common before it was made a park, and hunters resented the fact that the Park Service had a no-hunting policy. Their resentment grew in the 1960s because the Park Service believed there were too many elk in Yellowstone and Teton parks, so the parks hired people to kill thousands of elk.

Why, asked Wyoming Senator Gale McGee, should only Park Service employees, not ordinary citizens, be allowed to shoot elk? The night before a hearing that McGee was to hold in Jackson, Wyoming, Hartzog met with McGee and agreed: To protect the "no-hunt" purity of the National Park System, Hartzog would order the parks to temporarily stop shooting elk.[124]

The temporary ban quickly became permanent as the Park Service learned a valuable lesson in image management: If you take an action, and something goes wrong, you get blamed; but if you do nothing, and something goes wrong, you can blame nature. The natural regulation policy allowed park managers who are largely ignorant about the land to make no decisions (i.e., to decide to do nothing) and blame any problems on nature. When nearly half of Yellowstone Park burned in 1988, Park Service managers could close their eyes and say it was "a natural event beyond human control."[125]

The Congressional budgeting process also affects the different ways the Park Service and Forest Service view fire. Park Service budgets specify exactly how much money each park can spend, but give park managers only a few vague line items such as "ranger services" and "visitor services." This gives park managers the flexibility to use funds for prescribed burning or other innovative practices.

In contrast, Forest Service budgets are do not specify how much each forest gets but instead break down funding into roughly seventy to a hundred different line items. This places strict limits on how national forest managers can use their funds. Until recently, the only source of funds for prescribed burning in the West was the brush control fund, which as noted above could only be used in the cutting units of commercial timber sales.

Fire Planning Incentives

National Planning

The National Fire Management Analysis System (NFMAS) is a program that the Forest Service uses to prepare "long-range budget requests" for national forests, regions, and the nation as a whole and to "show Congress and the Office of Management and Budget (OMB) the value of financing the Fire and Aviation Management program."[126] A close examination of NFMAS reveals that it contains such serious faults that it is next to useless for anything except to give a patina of scientific cover for agency budget requests.

The Forest Service uses NFMAS to show Congress that it has identified the "optimal level" of fire funding, one that minimizes the cost of fire; that is, the sum of the cost of suppression plus the losses from fire.[127] Fire planners refer to this as "cost plus loss" or, more bureaucratically, "cost plus net value change" (C+NVC). Yet NFMAS is based on flawed assumptions that prevent that optimum funding level from ever being found.

"A guiding principle in fire planning," says Stewart Lundgren, the Forest Service's chief fire planner, "is that there is a point at which additional expenditures in preparedness do not return a net savings in suppression expenditures plus natural resource loss."[128] This sounds reassuring, but notice that *suppression expenditures* are assumed to depend on the *expenditures in preparedness*. Statisticians would say that *preparedness* is the *independent variable* while *suppression* is the *dependent variable*.

The Forest Service would naturally think this way because of the budgeting process. Congress gives the agency money for preparedness (otherwise known as *presuppression*): for hiring firefighters, buying fire engines, and having aircraft standing by in case of fire. If the Forest Service has enough firefighters and equipment, it can put out fires almost as soon as they start. But if there aren't enough, the fires get away and the agency must draw on emergency suppression funds—the blank check—to control the fires.

This is illustrated by figure one, which shows that as preparedness funds increase, suppression costs decline as do the loss of natural resources to fire (net value change). At some point, however, an extra dollar spent on preparedness yields less than a dollar's worth of savings in suppression costs and net value change. This point is called the "most efficient level" or MEL.

The problem is that suppression is not truly a dependent variable because the Forest Service can choose not to put out fires. If the agency decides not to put all fires out, then it can save money on suppression and may also not need to spend as much money on preparedness. If the savings on suppression and preparedness are greater than the additional resource losses that result from letting fires burn, then the optimal level of funding

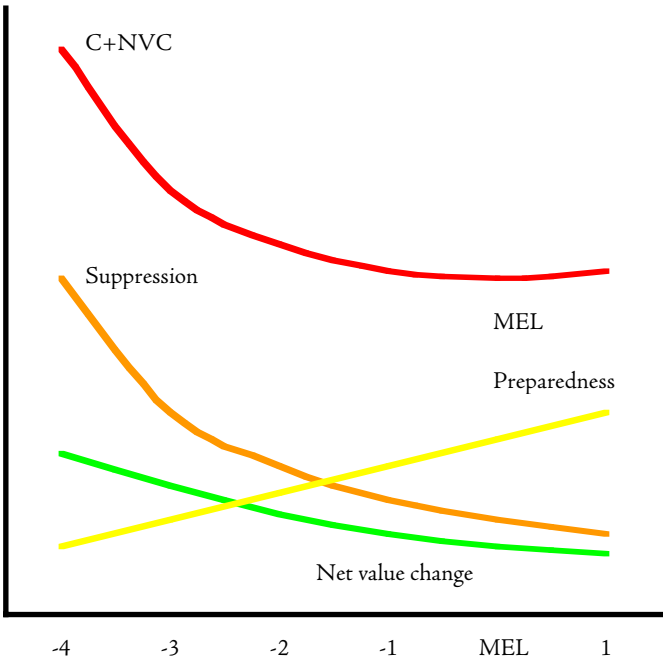


Figure Two: National Fire Management Analysis Model. Source: Stewart Lundgren, "The National Fire Management Analysis System (NFMAS) Past 2000: A New Horizon," in Armando González-Cabán and Philip N. Omi, eds., Proceedings of the Symposium on Fire Economics, Planning, and Policy: Bottom Lines *(Albany, CA: Forest Service, 1999), p. 74.*

could be very different from that calculated by NFMAS.

This is illustrated by figure two. Moving on the x axis from left to right indicates increased spending on preparedness, moving on the z axis from front to back indicates increased spending on suppression, with the highest level of suppression spending being equal to that shown in figure one. The lowest total C+NVC on this hypothetical example is represented by the lowest level of suppression and the second-lowest level of preparedness.

Notice that, in figure one, the cost of resource losses (net value change) does not change as dramatically as the cost of suppression. This is, in fact, the finding of the NFMAS, and several observers have commented that the planning model is not particularly sensitive to resource values.[129] In fact, taking resource values completely out of the model (i.e., assuming them to be zero) can sometimes have little effect on the calculated optimal level of spending on preparedness. As reviewers from Colorado State University note, if "neither presuppression nor suppression expenditure can reduce the damages of wildfire, then the optimal level of both is zero."[130] Of course, the model never reaches this conclusion because only the presuppression costs are independent. In other words, it assumes that all fires must be put out.

The model has a number of other flaws. First, it does not

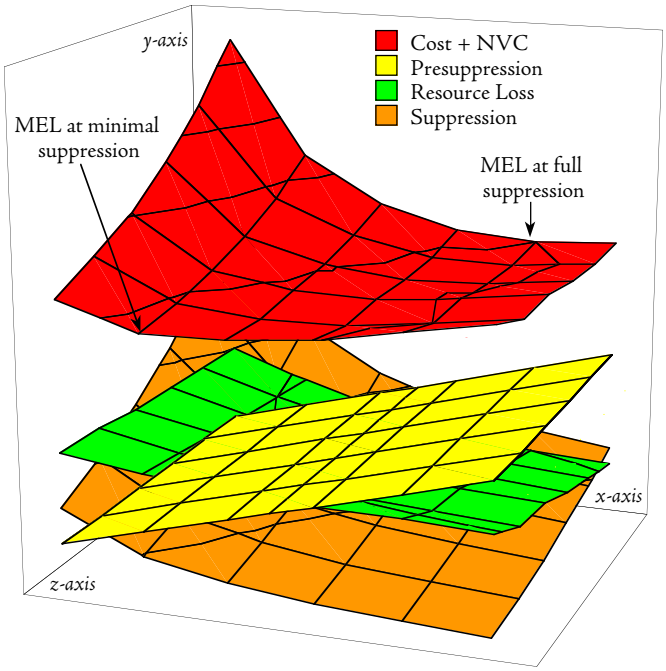


Figure Three: Varying Suppression in the National Fire Analysis Model. The data represented by the rearmost row on the z axis is equal to figure one. Suppression expenditures are assumed to decline by 20 percent with each increment forward. The resulting net value changes are assumed to increase by varying amounts depending on the combination of preparedness and suppression costs. The optimal MEL, or level of presuppression funding, is much lower at lower levels of suppression than at full suppression.

consider annual variations in the weather. It is likely that the optimal level of expenditure would be different in a particularly dry year than in a moist one, and the level of dryness can be determined fairly early in a fire season. But budget preparation begins years before a given fire season when weather predictions are no more than guesses. Valuable information is left out of the planning process because of its slow and cumbersome nature.

Second, the NFMAS model does not take into consideration the effect that suppression in one year has on suppression costs in future years. If suppression truly is leading to a build up flammable materials that can fuel future catastrophic fires, then lower levels of suppression today can save money and resources in the future. The model ignores this possibility.

Third, the model fails to include non-market resource values. The resources values or net value change included in the model are mainly timber values. Many non-market values today are more valuable than much national forest timber, and these values respond to fire differently from timber values. Some, indeed, are enhanced by fire, so building them into the model would produce quite different results.

Researchers at western universities are attempting to build more complicated models that correct these deficiencies. Some are trying to include non-market values in the analysis.[131] Others are incorporating the effects of suppression and fuels-reduction activities on future firefighting costs.[132] "Rather than generating annual estimates for fire management activities" as NFMAS does, say the researchers, their model "will provide the optimal paths for fire management activities over a specified rotation."[133]

Improving the model sounds good at first glance, but the futility of doing so is illustrated by the Forest Service's experience with timber models. Eighty years ago, national forest timber models were about where fire models are today. Forest managers tried to determine how much timber they could cut each year based solely on how fast their forest grew. This meant they only had to figure out how fast trees were growing and not worry about long-term considerations.

Forest Service officials soon realized, however, that growth in old-growth forests was much slower than in the second-growth forests that would replace them. If cutting were limited to growth, it might take hundreds of years to convert old-growth forests to productive forests. Since foresters of that time fretted continually over future timber famines, that wasn't fast enough.

Forest Service researcher Edward Hanzlik proposed the solution in 1922, suggesting that the volume of timber to be cut each year should equal growth plus the total volume of all old growth divided by the planned rotation age.[134] The Hanzlik formula—cut = growth + old growth/rotation—or some variation ruled the national forests for nearly fifty years.

At least on the Pacific Coast, most three-hundred-year-old old-growth forests contain far more wood than a second-growth forest can grow in the 100-year rotations typically planned by the Forest Service. Forest managers intuitively knew that this meant that harvests would decline when the old growth ran out. That was so far in the future that no one gave it much thought until 1969, when researchers in the Pacific Northwest used the first timber planning computer models to look ahead more than one rotation.[135]

The *falldown* in harvests that they predicted would take place in another forty or fifty years was shocking to many who had heard the Forest Service repeatedly promise it would never cut more today that it could cut in the future. After due consideration, the Chief of the Forest Service issued an emergency order directing all national forests to use computer models to insure that they practiced "non-declining even flow"—even if it meant reducing harvests today and thus effectively sacrificing wood that could be cut over the next few decades.[136]

While the Forest Service made every effort to hold the moral high ground, it was in fact merely another budget-seeking gambit. If old-growth cutting rates today were limited by the second-growth growth rates, then anything that could increase future growth would allow an increase in today's cutting—a phenomenon known as the "allowable cut effect."[137] Even as it warned of immediate falldowns in cutting rates, the Forest Service told Congress that these falldowns could be avoided if Congress gave the agency funds for fertilizers, thinnings, herbicides, genetic

"supertree" programs, and other intensive-management practices that could made the second-growth forests grow faster.

Congress could have rejected the Forest Service's logic and ordered the agency to stick with the Hanzlik formula. That would have pleased the timber industry but angered the growing environmental movement. Or Congress could have refused to knuckle under the Forest Service's blackmail and not put up the money for intensive management. That would have pleased environmentalists but angered the still-powerful timber industry. So Congress sought a middle ground—ground that just happened to boost the Forest Service's budget.

To insure non-declining even flow, the Forest Service used a computer model called Timber Resource Allocation Model, or RAM. RAM allowed the Forest Service to project cutting rates with and without intensive management. If doing a thousand acres of thinnings each year boosted cutting rates by, say, 10 million board feet, then the Forest Service attributed 10,000 board feet to each acre of thinning. To keep appropriators on their best behavior, timber management plans written in the 1970s included provisions to increase or reduce cutting rates depending on how many acres of thinnings and other practices Congress funded each year.

Environmentalists remained unhappy about the conflicts between timber and recreation, wildlife, and other resources. So when the Forest Service began writing comprehensive forest plans under the National Forest Management Act of 1976, it used a new program known as FORPLAN that allowed managers to include a few non-timber resources. FORPLAN was economically driven, so if economic values for all resources were included, planners could theoretically find the optimal level of timber cutting that maximized the total value of all resources.

FORPLAN failed of its promise. To start with, the first version of FORPLAN allowed planners to include only ten resources other than timber. Since each species of wildlife and each kind of recreation had different interactions with timber, each was effectively a different resource, so ten wasn't enough. But even the second version of FORPLAN, which allowed planners to include many more resources in the mix, had serious problems.

Inventories of most resources were non-existent. Even timber inventories were often decades old and of questionable accuracy on many forests, but in their haste to write their plans, few forests had time to do new inventories. The relationships between timber and other resources were also often unknown. Planners might suspect that timber cutting benefits deer and harms spotted owls, but they had no idea exactly how many deer or owls would be produced by various amounts of timber cutting.

Lacking all this information, planners resorted to best estimates and rules of thumb—which is a nice way of saying that they fabricated the data. The slogan used by Forest Service computer modelers was "garbage in, gospel out."

Before forest planning began, the Forest Service gave Congress estimates of how much timber it thought each forest could produce. The agency denied that these estimates were targets, but most forest supervisors felt that it would not be a good career move to approve a plan that failed to meet the estimates. This led to an interesting interaction between the supervisors and the computer modelers. When the modelers proposed something in the FORPLAN model that might increase timber cutting, they were rewarded with smiles, pats on the back, and in some cases promises of bonuses for getting their plans done on time. When they proposed something that might reduce timber cutting, they were told to go back and check their data. Some planners had their own career ambitions within the Forest Service, but even those who didn't soon learned it was easier to support timber than to oppose it.

Most FORPLAN models thus ended up with bizarre assumptions about timber and other resources. One common technique was to tell the computer that more timber cutting led to more recreation—even more wilderness recreation. Other forests told the computer that timber cutting produced water and assigned a high dollar value to that water. The negative effects of timber cutting on recreation, water quality, or certain species of wildlife were rarely included in FORPLAN models—and when they were, no economic values were assigned to the resource that conflicted with timber, which meant that it had little effect on the outcome.[138]

One can foresee similarly bizarre assumptions going into Forest Service fire models. For example, some researchers estimate that "the amount that an average person living around the national forest would pay each year to reduce 1,000 acres of crown or catastrophic fire in northern or California spotted owl habitat" is $25. They calculate that this makes it worth $25,000 to save any single old-growth acre from fire.[139] Note that this has nothing to do with whether the fire will actually help or hurt spotted owl habitat; nor does anyone in their survey actually expect to pay $25 to the Forest Service to fight fires.

"Specialized knowledge, especially if clouded in technical jargon, or reports of extraordinary experience, tend to elicit deference from the unknowing," observes University of Washington forestry Professor Robert Lee. "Prophets and futurists (and, in the Forest Service, econometricians responsible for FORPLAN) rely on such deferential behavior to legitimate their pronouncements."[140]

Outside of Forest Service computer analysts, academic researchers, and few timber industry lobbyists, the members of the public who could actually read and understand FORPLAN runs numbered approximately two. That turned out to be almost enough to discredit the entire planning process, and it did force many forests to completely revise their plans with more conservative assumptions.

Yet the problems with timber and fire modeling can't be corrected with honesty, oversight, or other simple processes. First, far too many things are simply unpredictable. Who knew when the Forest Service began forest planning in 1980 that the spotted owl would put a severe crimp in the timber program by 1990? Who knows what the effects of global warming will be, if any, on fire management? There are simply far too many factors to consider to build them all into a computer model.

Second, long-term planning is built around averages, yet there is no real average year any more than there is a real average tree. Some years provide excellent conditions for reforestation; in other years, every seedling dies. Some years produce deadly fire weather; in other years, it rains all summer. Averages are meaningless under realistic conditions such as these.

Third, planning presumes linear relationships when in fact most relationships in nature are nonlinear. Nonlinear relationships invoke the first law of chaos theory: Small changes in initial conditions lead to large changes in outcomes. Sometimes known as the *butterfly effect*—a butterfly flapping its wings in Beijing influences the weather in New York City—this means no amount of data gathering and precision will be enough to build a successful long-term model of timber or fire on a national forest.

Fourth, the most powerful computer model in the world, now or anytime in the future, will still be subject to the first law of human nature: Incentives count. The more complicated the computer model, the easier it will be for someone to jigger the model so that it produces the budgetary or other recommendations that managers want. Wildfire is good for many forms of wildlife; suppression is harmful to some forms of wildlife.[141] But if people motivated by incentives to suppress fires get to design the fire models, they will tend to include mainly those forms of wildlife harmed by fire, not those that can benefit.

Fifth, no matter how good the model or how honest the modelers, a centralized planning process is simply too slow and cumbersome to respond to new information and changing public preferences. As the Colorado State reviews of NFMAS point out,"consider the amount of time the 10:00 AM policy was considered to be economically efficient" and how long it took for the Forest Service to end that policy even after it was discredited—if indeed it is ended yet.[142]

Finally, both forest planning and fire planning must be recognized as attempts by the bureaucracy to manipulate Congress and the administration into giving it more money and power. The Forest Service was only marginally successful in enhancing its budget through forest planning, but with the help of recent fires its work with fire planning has been hugely successful.

After the development of the National Fire Management Analysis System, the Forest Service reported its calculations of the most efficient level of presuppression funding in each year's annual budget. The administration usually cut the proposed budget to around 70 to 80 percent of this level, and the Forest Service would always warn that this would lead to higher fire fighting costs. For example, the Fiscal Year 1982 budget warned "decreases in fire protection activities will result in a lower level of protection which may cause higher suppression costs for the statistically expected fire year."[143] The administration and Congress, both of which had an incentive to control the immediate budget and little incentive to worry about future budgets, typically ignored these warnings.

Starting in 1993, Congress allowed the Forest Service to use suppression funds to augment its presuppression budget to the most efficient level. This slight of hand recognized that, as when the blank check law was in effect, the Forest Service would later ask for emergency funds when fire costs exceeded the remaining suppression funds. Such emergency funds have been granted in every year since 1993.

Total presuppression and suppression costs rose from an average of $343 million a year in the nine years before this change to $813 million a year in the nine years after this change. This didn't exactly confirm the theory that the most efficient level of presuppression spending would reduce overall costs.[144] Yet Congress continues to throw money at presuppression (now called preparedness), suppression (now called operations – suppression), and hazardous fuel treatments (now included in operations – other). The only clear beneficiary of all this money is the Forest Service bureaucracy.

National Forest Fire Planning

After the Yellowstone fires of 1988, the secretaries of agriculture and the interior directed the land management agencies to stop all prescribed burning and to suppress all wildfires until forests, parks, and other land units had completed *fire management plans*. In 1995, the agencies issued a new policy for these plans.

While the Park Service and BLM quickly wrote fire management plans for most of their lands, the Forest Service dragged its feet, saying it didn't have the funds to write them. In the meantime, it continued to suppress all fires because the 1989 directive prevented it from letting any fires burn.

It should be noted that the term "let burn" is frowned upon by federal land managers. Until recently, they used instead the phrase "prescribed natural fire." Today, they use the even longer phrase, "managing wildland fires to achieve resource benefits." At the risk of offending those bureaucrats who come up with these phrases, this paper will often use the popular phrase, "let burn."

According to the General Accounting Office, as of September 30, 2001, the Forest Service has written fire management plans that comply with the 1995 policy for only half of its burnable acres. By comparison, the BLM has written plans for all of

its acres and the Park Service for two-thirds of its acres. When the GAO asked forest officials why fire management plans were nonexistent or out of date, "they most often told us that higher priorities precluded them from providing the necessary resources to prepare and update the plans."[145]

Of the fire management plans that have been prepared, most do not allow fires to burn outside of large wilderness areas. The plan for the Siskiyou National Forest, for example, would allow fires to burn inside the 180,000-acre Kalmiopsis Wilderness Area, but not in the 26,000-acre Wild Rogue Wilderness Area.

Even in wilderness areas, fires are only allowed to burn under strict conditions. Fires are not allowed to burn if they are likely to escape the wilderness; if they threaten private land or improvements; if the fires ignite during a high or extreme fire danger period; if the smoke is likely to blow into nearby communities; or other complications exist. Nor, by national policy, may managers let human-caused fires burn.[146]

When managers decide to let a fire burn, they must set a *maximum manageable area* for the fire. Even if the fire achieving resource benefits and the risk of blow up is low, forest managers are not allowed under any circumstances to change this maximum area; they must suppress the fire when it reaches that size.

This means that fire management planning is hardly the panacea for natural burning that some people want to see in the future. A Forest Service guide to fire managers notes that managers might expect to suppress "over 90 percent of all wildland fires" even after the fire management plans are finished.[147] Yet "over 99 percent" is conservative; "over 99 percent" is more realistic.

Only 18 percent of national forest acres are in wilderness areas. Only 12 percent of fires have natural causes.[148] This means that managers could allow, at most, only about 2 percent (12 percent times 18 percent) of all fires to burn—and until the fire management plans are done they can only let half that many burn. Since many of those fires will be ignited near national forest boundaries, during periods of high fire danger, or fail to meet other tests required to let a fire burn, the actual percentage will be even smaller.

Restrictions such as these mean that the Forest Service will never be able to allow as many fires to burn as burned prior to 1900. For example, before 1900 the 3.3 million acre Gila National Forest experienced about 100,000 acres of fires each year, most set by Native Americans or early settlers. Since 1975, the forest has allowed many natural fires to burn, but these covered only about 1,000 acres a year.[149]

Most large fires before 1900 were probably started by humans and burned during periods that would be described today as high fire danger. If federal land managers continue to suppress all such fires, they will never be able to replicate any pre-1900 fire regime even in the wilderness areas where their plans say they can let fires burn.

Firefighting Incentives

Deciding What and How to Fight

When a fire is detected, the Forest Service gives its land managers two hours to make a "go/no go" decision of whether to suppress the fire or to "monitor" it, meaning let it burn. However, the decision-making process is heavily biased to suppression.

As noted above, federal managers cannot let fires burn until they have written approved fire management plans for their lands. So far such plans cover only about half the national forests. Even after plans are written, it is likely that managers could allow no more than about 2 percent of all fires.

Considering all of these factors, it is not surprising that the Forest Service and other federal land agencies let few fires burn. In 1999, for example, 335 fires were allowed to burn less than 76,000 acres. That's about 0.3 percent of the more than 106,000 wildland fires and 2 percent of the 3.6 million acres that burned that year. By comparison, prescribed burning in 1999 covered 1.8 million acres, more than half of them in the South.[150]

On top of these restrictions are numerous paper barriers to letting fires burn. Other than the go/no go document, no paperwork is required to suppress a fire unless the fire resists initial attack—which is much less than 10 percent of the time.

By contrast, says the *Wildland and Prescribed Fire Implementation Guide*, "Stricter planning and documentation requirements exist for management of wildland fires where resource benefits are a primary objective." Managers who decide to let a fire burn must prepare a *wildland fire implementation plan* (WFIP), which actually includes numerous different documents, including a short-term risk assessment, a complexity analysis, a needs assessment, fire behavior predictions, and a long-term risk assessment. This makes it a lot easier to simply suppress fires than to let them burn.

As illustrated by the Cerro Grande fire that burnt homes in Los Alamos, setting fires burn creates another problem for managers. If a prescribed fire or a natural fire that is allowed to burn escapes and causes damage, the managers are immediately blamed. If a wildfire causes damage, managers can successfully blame nature. A wildfire, "regardless of the cost. . . is not likely to jeopardize career aspirations," say Gila Forest employees Steve Servis and Paul Boucher. "Unfortunately, the same cannot be said about agencies or individuals and their reputations if they are questioned because of political or public criticism dealing with a wildland or prescribed fire."[151]

On the few fires where immediate suppression fails, as well as when a natural or prescribed fire burns more acres than planned, managers must prepare a *wildland fire situation analysis* (WFSA). A WFSA is, in essence, a mini-environmental impact statement, since it includes alternatives, an estimate of the costs and environmental effects of each alternative, and qualitative weighting system for scoring each alternative.

Many Forest Service employees question the value of WFSAs. "Some people question the utility of the WFSA process," says a Forest Service report on large fires. "It does seem that only a few use its full potential to display the tradeoff between cost and risk." Yet the report concludes "that the WFSA is an essential tool to be used if suppression tactics are to be cost effective and cost-efficient."[152]

Considering how much strain is involved in writing Forest Service environmental assessments when there are no tight deadlines, it seems remarkable that the agency would impose this stress on people who are already under the pressure of fighting an escaped fire. So it is not surprising that two fire researchers, one with the Forest Service and one on the outside, present a darker view of WFSAs. They note that:

- Because WFSAs are prepared only after a fire has escaped, "the WFSA is often conducted in an atmosphere of defeat."
- Because it usually becomes obvious that initial suppression efforts have failed only late in the day, "the WFSA is prepared either late at night or in the early hours of the morning" when the people who do it "are severely fatigued."
- Moreover, many of the people who are best qualified to contribute to the WFSA "are on the fire site" and thus not available to help.
- The people writing the WFSAs have often not trained to do so.
- The data needed to write the WFSAs is often not readily available.
- A survey of fire management personnel revealed that many believe that the WFSA process "is cumbersome and takes too long to perform under the time-pressure conditions of an ongoing large wildfire."[153]

I have reviewed WFSAs prepared by three national forests. They considered anywhere from one to four alternatives. The phrase "one alternative" is a contradiction in terms, and the WFSAs that contained only one alternative probably violated Forest Service requirements.[154] These WFSAs did evaluate several possible outcomes, including the *target*, *fallback*, and *worst-case* outcomes. But outcomes such as these should be evaluated for several alternatives, not just one.

Of the WFSAs that do consider more than one alternative, most were some variation of "direct attack," "indirect attack," and "direct/indirect." *Direct attack* means trying to stop the fire where it is at; *indirect* means using backfires ahead of the fire so that the fire dies when it reaches an already-burned area. A few used other types of alternatives, such as minimize acreage vs. minimize sup-

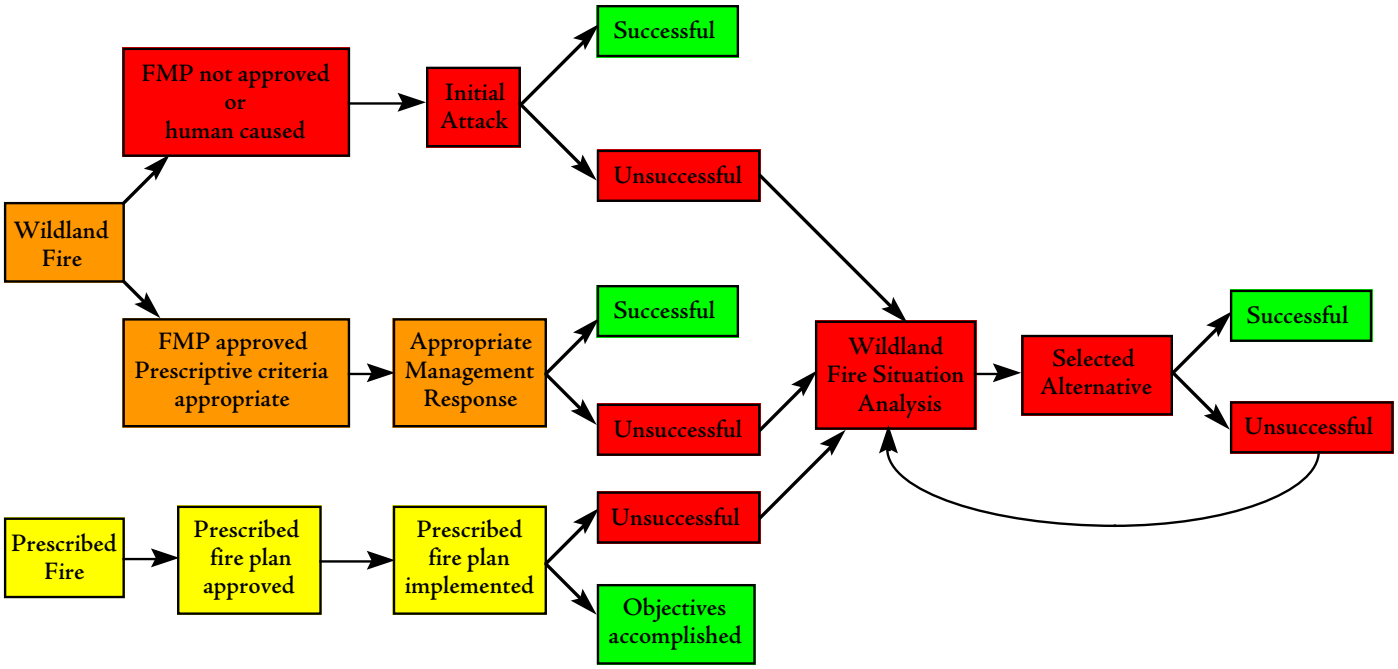


Figure four: This illustrates the federal process for deciding whether to fight a fire. Managers are to fight a wildfire unless the fire management plan (FMP) is done, the fire had natural causes, the FMP allows fires to burn, and the fire meets other requirements of the FMP such as low fire danger and it does not threaten private property. Source: National Interagency Fire Center, Wildland and Prescribed Fire Management Policy: Implementation Procedures Reference Guide, *p. 13.*

pression damage or minimize fire size vs. minimize firefighter risk.

For each alternative, managers are supposed to estimate:

- The number of acres burned;
- The cost of suppression;
- The time required to contain and control the file; and
- The value of the resources (mainly timber but sometimes wildlife, recreation, fisheries, and other resources) lost to the fire.

Moreover, they are supposed to do this for each of the three possible outcomes: target, fallback, and worst case. On top of this, they are to estimate the probability of each possible outcome for each alternative. Many of the WFSAs I reviewed considered only two outcomes (target and worst case) or even only one outcome (target); like WFSAs with only one alternative, these failed to use the "full potential" of the WFSA process.

Perhaps managers expect an alternative to have, say, a 60 percent chance of meeting its target, a 30 percent chance of resorting to the fallback, and a 10 percent chance of the worst-case outcome. If the target outcome is estimated to cost $1 million, the fallback $5 million, and the worst case $10 million, then the weighted cost is (0.6 x 1) + (0.3 x 5) + (0.1 x 10) = $4.1 million. A similar calculation would be done for the expected resource losses and for all of the other alternatives.

Obviously, a large amount of guesswork is required to come up with these numbers. But that's not all. The WFSA also requires managers to write safety, economic, environmental, and social objectives. Separate safety objectives are written for firefighters, aviation, and the public. Economic objectives depend on the resources at risk and may include forage, recreation, timber, water, wildlife, and improvements. Environmental objectives are written for air, visual, and threatened & endangered species. Social objectives can include employment, public concern, and cultural.

For each objective, managers must assign a *priority* from 1 to 10 and a *weight* from 0.01 to 1.0. The weights for each objective (safety, economic, environmental, and social) must add up to 1. The priority times the weight is the *contribution* of the objective. Then they must give each alternative (and each outcome of each alternative) a point score, from 1 to 10, for how well it meets each objective. The scores are multiplied by the contributions and, for different outcomes, probabilities. The results are summed to get a total score for each alternative. Obviously, these numbers are even more subjective than the estimates of suppression costs and resource losses.

The WFSA thus presents managers with two different numbers for each alternative: The estimated cost of suppression plus resource losses and the score. Often, these will conflict: the alternative with the highest score also has the highest cost and vice versa. Thus, after doing an analysis that requires hundreds of subjective estimates or guesses, the results still do not clearly indicate which alternative is best.

To be fair, some incident commanders find WFSAs useful enough to do a second one midway through the fire fight if events have rendered the first one moot, even though they are not required to do so. But this is rare.

At the same time, WFSAs can provide some clues to how fire managers think. For example, as noted above, some—though certainly not all—WFSAs include employment as one of the social criteria. An alternative that employs more firefighters gets a higher score. The clear implication is that it is better to spend more money than to spend less.

This attitude is apparent in other ways as well. The WFSA for the Craggie fire on the Siskiyou National Forest considered one alternative that put one smokejumper crew, one airtanker, and one helicopter on the job, and another alternative that put 41 crews, a dozen aircraft, and fourteen ground vehicles on the job. The latter alternative was expected to burn fewer acres, but its overall suppression plus resource cost was expected to be eight times as much as the first alternative. Yet it scored higher on firefighter safety and was selected mainly on those grounds. In fact, it was called the "firefighter safety" alternative. Since more firefighters die today in aircraft and vehicle accidents than from the fires themselves, the first alternative was probably the safer one.

Fire managers do not always pick the most expensive alternative, and in fact the Craggie WFSA included another alternative that was even more expensive than the one selected. Curiously, however, whenever an alternative is labeled "firefighter safety," that seems to be one selected even though it usually requires putting more firefighters in danger than other alternatives.

This suggests that at least some of the people who prepare WFSAs have a preferred alternative in mind and include other alternatives only because they are required to do so. This further suggests that they may score the alternatives in a way that makes their preferred alternative look best. Such tendencies are natural with a process that is so completely subjective.

All of this shows that the WFSA process is not a sound decision-making tool. While it can document the decision-making process, it can just as easily mislead decision makers. WFSAs are necessarily so subjective that anyone would have to be foolish to base a decision on one, yet it appears that they sometimes do so. At best, WFSAs do little more than force additional red tape on the fire managers; at worst, they can lead to bad decisions that result in more expensive fires.

Incident Command System

After some particularly disastrous California fires in 1970, where suppression efforts were impeded by miscommunications between the various government agencies working on the fires, the Forest Service developed an *incident command system*. Under this system, people are rated for various jobs, ranging from firefighting crew boss to human relations specialists to accountants to overall incident commander, based on their firefighting experience. Every person who expects to work on fire carries a *red card* which gives their rating at various tasks.

Every fire has an incident commander. A single fire crew of twenty working on a small fire has a leader who is formally that fire's incident commander. When fires get larger, they are designated *type I* or *type II* fires. Type II fires generally involve fewer than 200 personnel and are handled by people who are local—in the same or an adjacent state—to the fire.

When a fire gets even larger, it requires people who are type I qualified. The Forest Service and other fire agencies have eighteen different type I crews. Over a given fire season, a single type I crew may handle fires in Virginia, Colorado, Washington, and several other states.

Most of these people, from crew boss on up, are known as *overhead*, since they usually aren't actually fighting the fires themselves. On escaped fires, overhead can account for about 20 percent of total fire costs.

The incident command system is an elegant solution to the problem of dealing with emergencies across many different jurisdictions. All federal land agencies, most state forest agencies, and many large timber companies use the system. What this means is that anyone with a qualified rating can easily step into a position and take over. Since fire staff and crews generally work for no more than 21 days at a time, the incident command system allows people to relieve a tired crew with confidence that they can handle the problems.

At the same time, the system effectively divorces land management from fire suppression, particularly on large fires where the incident commander does not normally work on the land where the fire is being fought. This can lead to irresponsible decision-making. On one hand, land managers can ignore the effects of their actions on future fire problems because the fires will be taken care of by the firefighting program. On the other hand, the fire commanders may decide to use short-term fire fighting strategies that create or exacerbate long-term management problems.

This division has contributed to tension between the land managers and fire fighters. An internal Forest Service report described a "chasm" between land managers and fire managers, noting that each perceives the other to be a "club" which the others cannot join. When land managers try to become involved in fire management, "they are frequently criticized for it by fire managers."

"Incident commanders can, and sometimes do, supplant line officer decision making when fighting fire," says the report. "They sometimes do not communicate effectively with the line officer responsible for the" land which is burning." As a result, "there is a disconnect in communications and support for each other."[155]

Even if these problems were solved, the command system creates its own incentives. Since higher ratings mean more pay and more prestige, and the way to get those ratings is through experience, agency personnel are as eager to work on fires as

military officers are to fight in a war. Given that the decisions of whether to fight or not fight a fire and how many resources to use when fighting it are so subjective, the people who make those decisions can't help but consider the effects of their decisions on their fire ratings and the ratings of other people they know.

Fire Accounting

For an activity that costs taxpayers hundreds of millions or, lately, more than a billion dollars a year, fire suffers from disappointingly poor accounting. This is partly because of the complexity. A fire may cross over several different jurisdictions and be fought using crews from several different agencies. How much of the money spent by the Forest Service fighting a particular fire should be counted as a national forest fire cost when the fire crosses onto BLM land?

Yet these questions can be handled using generally accepted accounting practices. The real problem is that, when you are drawing from a blank check, few have an incentive to monitor how you spend money and so you have little incentive to document it.

The Forest Service reports the costs of major fires each day using the *incident cost accounting and reporting system* (ICARS). The reported numbers may be precise to the nearest dollar: On July 19, 2000, for example, the agency announced that the Bircher Fire had cost $5,041,146. But *precision* is not the same as *accuracy*, and these numbers are, in fact, only rough estimates.

In 2000, for example, the Forest Service's Region 6 (Oregon and Washington) directed fire managers to assume that handcrews of twenty people would cost $4,500 a day ($5,300 under hazardous duty), overhead personnel would cost $340 a day ($400 under hazardous duty), fire engines would cost $750 a day ($875 under hazardous duty)—and the list goes on to include dozers, fallers, water tenders, pickup trucks, fuel trucks, and many more items. Some of these costs may be accurate, but many are only estimates. Overhead staff, for example, may actually get paid anywhere from $19 to $30 an hour, so a fixed daily rate for all staff is going to be wrong. Yet the costs reported for individual fires assume that fixed daily rate.

The accounting is even murkier on a national scale. When the Forest Service asked its own researchers to find out if fire costs had increased since 1970, they found that "available accounting records were not always complete." Only three of the nine Forest Service regions had complete records. Ironically, "by far, the worst" recordkeeping was by the Washington office. [156]

Researchers also found errors when looking at situation reports for individual fires (which are based on ICARS data). The researchers were seeking costs by month. But the monthly totals in the situation reports are cumulative, so they had to subtract the costs of the previous month from the current month. Sometimes, this led to impossibly negative numbers due to errors in earlier months that were corrected in later months.[157]

Reforms

The most important point in this paper is simple: Incentives count. Congress has given the Forest Service the wrong incentives on fire, and those incentives have led to the costly forest health problems we face today. Congress' current policy of giving the Forest Service and other federal agencies even more money to treat those problems is not only unnecessarily costly, it perpetuates the perverse incentives in the budgeting process.

The second most important point in this paper is that the forest health problems and fuels accumulated from decades of fire control are not as serious as the Forest Service and other agencies claim. It is in their interest to exaggerate these problems to boost funding for land management. The Forest Service in particular is seeking a new, lucrative mission now that its timber program is a mere shadow of its former self.

A close look at the evidence, however, indicates that other factors, including the weather, new firefighting technologies and techniques, replacement of in-house services with services contracted out, more homes in the wildland-urban interface, not to mention the unleashing of the blank-check policy after 1990, are more responsible for the increase in fire fighting costs than a build up of fuels.

While fuels have accumulated, treating those fuels is neither necessary nor sufficient to solve the problem of high fire suppression costs. It is not necessary because they can be naturally treated at minimal cost by letting them burn. It is not sufficient because even after they have all been treated fire suppression costs will continue to be exorbitant due to blank-check incentives and the other factors pushing up costs today.

To reduce costs and improve on-the-ground management, Congress must consider alternative reforms that will encourage managers to efficiently focus on on-the-ground needs. Bureaucracies will always tend to maximize their budgets, so the goal should be to align budgetary incentives with desired outcomes. Those desired outcomes should include reduced costs to taxpayers, the production of goods and services that are desired by the public, and the protection of non-market resource values such as endangered species habitat.

A review of both the scientific and the political literature regarding fire reveals six distinct alternatives:

- Internal policies that create new incentives;
- End commercial activities;
- Turn fire protection on federal lands over to the states;
- Turn federal lands over to the states;
- Minimize suppression costs;
- Self-funding forests or trusts.

Alternative 1: Internal Reforms

Several Forest Service reports have suggested that the agency can reform itself by giving managers incentives to reduce costs. It is clear that, without such incentives, we can't rely on the goodwill of fire managers to simply reduce costs.

Forest Service fire manager Richard Mangan observes that past attempts to get the Forest Service to cut costs "fail to produce significant savings." Such attempts including recommendations ranging from the trivial ("No bottled water—use canteens with water from large potable water trucks") to significant ("It is inefficient and dangerous to fly tankers and water-dropping helicopters during extreme fire conditions. They should be left on the ground.").[158]

These sorts of recommendations cannot be considered hard-and-fast rules. Firefighters will want bottled water when they are working in remote areas that can't be reached by water trucks. Extreme fire conditions often require aerial drops of water or fire retardants to protect of firefighters on the ground. As long as there are no hard-and-fast rules, there will be discretion, and as long as there is a blank check, that discretion will lead to more spending.

Mangan also notes, "the 1990's have seen the introduction of the 'comptroller' position on the Incident Management Team (IMT) to advise responsible line officers on cost issues specific to a single fire."[159] But as Timothy Ingalsbee points out, "it is a rare accountant who will second-guess the operational decisions of fire incident command teams."[160]

A 2000 report title *An Agency Strategy for Fire Management* admits that "Emergency funding for firefighting lacks the rigor, discipline, and incentives for more efficient decision making."[161] But its recommendation for fixing the problem is frustratingly vague. Rather than identify possible new incentives, the report's recommendations focused on resolving the conflicts between land managers and fire managers. While these conflicts may be serious, their resolution is not going to significant reduce costs as long as whoever is in charge of fire management has a blank check.

With regard to incentives, the report passively recommends, "Incentives, through funding, will be provided for initial attack success and prevention success."[162] Who will provide those incentives? How can you reward managers with more funding for "initial attack success and prevention success" when initial attack and prevention failure demands more funding for suppression?

A 1995 report on large fire costs by Forest Service fire analyst Denny Truesdale offers some answers to these questions. Truesdale suggested three ways of giving the firefighting organization incentives to reduce costs:

1. Allocate a fixed level of fire suppression funds to each region and then require the regions to submit formal requests for additional funding.
2. Establish regional thresholds for fire suppression spending and trigger a Washington office review when a region exceeds its threshold.
3. Allocate fire suppression funds to the individual forests and let them carry over unspent funds or deficits from year to year.

Truesdale notes that there are several drawbacks to each of these ideas. The first two proposals could fail to reduce costs but instead create "another paper impediment to actual fire suppression" or "simply increase the burden on overtaxed field units." The third proposal is a little more promising, but it is similar to what Congress tried to do to the Forest Service as a whole in the 1980s, which failed when Congress relieved the deep deficit created by the 1987 and 1988 fire years. As Truesdale notes, "unless there was a national willingness to deny requests" for supplemental funding, "granting them would become automatic rendering them a meaningless and unnecessary burden."[163]

Ultimately, as Truesdale recognized, new incentives will be possible only if some method of funding can be found other than a blank check. Unfortunately, no other major report on fire policy by the Forest Service or any interior agency has followed up on or tried to improve Truesdale's ideas. In any case, there doesn't seem to be much hope for internal cost-controls so long as Congress throws more money at fire every time the weather turns dry.

Alternative 2: End Commercial Activities

Several major environmental groups have raised the fire issue in support of their call for ending commercial timber cutting and many other commercial activities on the national forests and other federal lands. Timothy Ingalsbee, who is affiliated with the group known as American Lands (and formerly known as the Western Ancient Forest Campaign), has produced an excellent analysis of fire suppression incentives in his paper titled *Money to Burn*. The conclusion of this report describes the basic ideas supported by many major environmental groups:

1.End commercial logging on the public lands;
2.Use prescribed burning on millions of acres each year;
3.Let most natural fires burn.[164]

Except for the end to commercial logging, this isn't very different from the National Fire Policy. Indeed, Ingalsbee encourages environmentalists to support "the [2001] Fire Policy and becom[e] vocal advocates of its timely implementation."[165]

Despite Ingalsbee's analysis of the existing incentives, neither the environmental group he represents, nor any other major environmental group, has developed an incentive-based solution to the fire problem. Instead, environmental concerns focus more on ending commercial timber sales than on doing anything about the costs of fire. Many environmentalists recognize the perverse incentives inherent in the current timber program, but rather than deal with complexities of fixing those incentives, they just want to end the program.

Environmental opposition to timber sales has become a major issue in public fire debates. Environmentalists argue that timber purchasers remove large pieces of wood, such as the trunks of trees, which aren't very flammable, and leave behind a higher concentration of fine woody debris, thus making the forest even more vulnerable to fire than before. Opponents blame recent fires on the reduction in timber cutting and environmental opposition to many hazardous fuel treatment projects.

Both sides are partly right and mostly wrong. Reductions in timber sales have been too recent to have any effect on the inflammability of the federal lands. Congress provided minimal funding for hazardous fuel treatment before 2001, and the treatments of the last two years would have little effect on the fires of 2002. As the Pacific Discovery Institute has shown, the huge Rodeo-Chedisky fires in Arizona were on areas that had been heavily managed for timber and fuels.[166]

On the other hand, commercial timber sales, if they are done right, can play a role in reducing hazardous fuels. The problem is that the incentives facing Forest Service timber managers are no better than the incentives facing Forest Service fire managers. Ideally, rather than simply banning commercial timber cutting or any other activity, Congress could reform the Forest Service in ways that improved both timber and fire incentives.

Commercial timber sales form a negligible part of the National Fire Plan. While there is a connection between commercial timber sales and fire, there is no reason to suspect that ending commercial activities will solve the high dollar and ecological costs of that plan. At best, ending commercial sales will do nothing at all; at worst, it will make the economic costs of the fire plan a bit higher since taxpayers will have to pay for some activities that might have been funded by timber sales.

Ingalsbee himself identifies one of the major problems with the National Fire Plan, with or without timber sales: Any solution that relies on Congressional funding will follow a "'boom-and-bust' cycle of crisis response and systemic neglect.'" "The historical pattern of federal fire policy changes since the early 1970s," says Ingalsbee, "has been to have a severe fire season provoke Congress into massive funding increases into federal fire agencies, followed shortly thereafter by major policy reviews and reforms, but then as fire activity has historically declined following those severe fire seasons, Congressional funding has decreased and the policies have languished on paper for want of

implementation on the ground."[167]

Congress has its own incentives, and relying on Congress to "do the right thing" counter to those incentives is as unrealistic as relying on the Forest Service to altruistically ignore its own incentives. One of Congress' incentives is to promote commercial activities that can help members of Congress get re-elected. Such commercial activities make better pork barrel than non-commercial programs such as prescribed burning.

The no-commercial-activities platform therefore puts environmentalists in the disadvantageous position of fighting against programs that Congress tends to favor and fighting for programs that stir little interest in Congress. Environmentalists should recognize instead that Congress is the wrong place to fight these battles and that the federal lands will be better off if Congress takes itself out of day-to-day management.

Alternative 3: State Fire Protection

Robert Nelson's book, *A Burning Issue: The Case for Abolishing the Forest Service*, effectively contains two different proposals, considered here as alternatives 3 and 4. Nelson, a seventeen-year veteran of the Department of the Interior Office of Policy Analysis and current Professor in the School of Public Affairs at the University of Maryland, suggests that the Forest Service is broken and the best way to take care of the national forests is to turn them or some of their functions over to the states.

His first proposal is to transfer the firefighting function of the Forest Service and other federal agencies to state agencies. Under this idea, the federal government would manage most of its lands "to achieve some past 'natural' condition of the forest ecology." This will mean letting most fires burn. The danger is that the fires will burn onto state or private land—and Nelson suggests that the state and local fire protection districts are the most appropriate entities for dealing with these dangers.[168]

Nelson's idea has some merit. The states have fire protection responsibilities on more than a billion acres of land, and they have carried out these responsibilities for decades without a blank check.[169] They have done this despite the fact that annual fire suppression costs can fluctuate tremendously. In Oregon, for example, annual suppression costs in the past fifteen years averaged $10.6 million a year, but they ranged from $1.2 to $32 million.[170]

To finance fire protection and fire suppression, the states charge landowners a variety of fees. For example, Oregon charges private forest landowners roughly a dollar an acre, with a minimum $18 for owners of small acreages. Most of this money, along with matching amounts provided by the state out of general funds, is spent on fire preparation.

The state also charges forest homeowners $37 per year and timber owners 50 cents for every thousand board feet they cut. This money goes into an emergency suppression fund. To deal with fluctuating fire suppression costs, the Department of Forestry is allowed to carry unspent emergency fire suppression funds from year to year up to a maximum of $15 million. If in any given year this maximum is reached, homeowners and timber cutters are not assessed their $37 and 50 cents per thousand board feet for that year.

As another way of dealing with fluctuating fire suppression costs, the state purchases insurance from Lloyds of London. This insurance has a multi-million dollar deductible, so it only is called upon during especially severe fire years. The state relied on insurance in four of the past fifteen years.[171]

To stay within its available budget, the state has an incentive to suppress fires as efficiently as possible. While the state can make an insurance claim when it needs to, its desire to keep insurance premiums low will still keep it from overspending. None of these incentives apply to the Forest Service with its blank check.

Participation in the state fire protection program is not limited to private landowners. The Bureau of Land Management pays the state for fire protection on roughly 3 million acres of land in Western Oregon. Unlike private landowners, BLM's per acre payments are not matched by the state, so the BLM has to pay double what private landowners pay. However, its charge per thousand board feet is the same.

According to the Association of State Foresters, state fire protection costs are highest in California, where numerous homes have encroached upon hot, dry forests and chaparral. California spent $8 an acre on fire protection in 1998. But costs averaged less than $1.40 an acre in every other state except Oregon, with a national average of just 71 cents an acre.

Nelson suggests that Congress give the states "most of the existing federal fire funding to the Western states in a block grant for firefighting use."[172] However, it would probably be more efficient for national forests and other federal land entities to simply contract with the states as the BLM does in Western Oregon. The agencies could probably negotiate discounts for acres where fires would be allowed to burn that were distant from any state or private lands.

On the other hand, turning federal land fire protection over to the states would place a huge burden on most state fire agencies. Oregon current protects about 15.8 million acres from fire; adding national forests would nearly double that. Arizona, Idaho, Nevada, Washington, and Wyoming would also face a huge increase in their responsibilities. National forest fire protection would also cost the states more than they are spending to protect lands today. National forests tend to be more remote and have fewer roads than the lands currently protected by the states, which is one reason why the Forest Service spends more on fire suppression than the states.

Most states also still have out-by-10-AM policies and have no provision for letting fires burn under appropriate circumstances.

They are thus no more ready to deal with large expanses of wilderness and wildlands than the Forest Service.

Alternative 4: Give Federal Lands to States

Nelson's second proposal is to turn the national forests themselves over to the states. Nelson argues that the whole idea of the Forest Service is based on the myth of the *scientific manager*, that is, that well-trained experts working for the government will automatically make decisions in the public interest. The Forest Service has proven time and time again, particularly with respect to fire, that this isn't true. No matter how much scientific expertise they have, government workers respond to the same sorts of incentives that motivate everyone else, including, among other things: funding, prestige, power, opportunities for advancement, and a desire to avoid red tape and other frustrating work.

So far so good. But the proposal in Nelson's book—to abolish the Forest Service and turn the national forests (along with most other federal lands) over to the states—doesn't necessarily follow. After all, state employees are still government employees and there is no theoretical reason why scientific management work any better at the state level than at the federal level.

Nelson points to the fact that some state forest agencies seem to operate efficiently—even earning a profit in some cases—while still sustainably managing a variety of market and nonmarket resources. But with fifty states, it is easy to find some positive examples, such as profitable state forest management in Oregon and Washington. It is just as easy to find others, such as Alaska and Missouri, which lose as much money per acre as many national forests.

Rather than advocate a wholesale dumping of national forests onto the states, it is worth asking what makes some states work better than others and whether the positive attributes of some states can be applied to the federal lands. With respect to profitability, for example, it turns out that the state forest agencies that are most profitable earn those profits for the simple reason that they have incentives to do so.

State forest managers in Washington, for example, are funded almost exclusively out of 25 percent of the revenues they collect. No revenues, no funds. Thus, it should be no surprise that $60 million in expenditures earned the state $295 million in revenues, for a net profit of $235 million, in 1998.[173] By comparison, state forest managers in Missouri get most of their funds from a sales tax dedicated to their programs. Thus, like national forest managers, they have little incentive to earn a profit.

State forest management can, but will not necessarily, lead to better ecological outcomes as well. As support developed for noncommercial uses of state forests in the 1980s, the Washington Department of Natural Resources recognized that it didn't matter whether someone who paid for trees cut them or left them behind. Since the profits (after the agency's 25 percent cut) went to schools and other state institutions, all the state was interested in was the revenue. So the state has willingly sold cutting rights to environmental groups that plan to leave the trees for wildlife habitat.

Those same environmental groups offered to buy, and leave uncut, national forest timber, but the Forest Service turned them down. Nor have all states have been so willing to work with environmentalists who prefer non-extractive uses. The Idaho state land agency, which is funded partly out of receipts but partly out of legislative appropriations, has opposed selling grazing permits to environmentalists who will outbid livestock owners and who plan to leave the lands ungrazed.

Instead of turning lands over to the states, it is worthwhile considering ways to apply to the federal lands those policies that state and private landowners have successfully developed. These policies include funding fire management out of forest revenues, allowing managers to retain and carry over fire funds from year to year, and the use of insurance to cover severe fire years.

Alternative 5: Minimize Suppression Costs

The traditional goal of fire management is to minimize the combined cost of fire suppression and resource losses due to fire. But the main resource that is counted as lost due to fire is the commercial timber value. Since national forest timber sales have declined by 85 percent in the last fifteen years, and national forests lose money on most of the remaining timber they sell, commercial timber values are rarely relevant.

Fire imposes other resource costs, but these are difficult to estimate and have often been exaggerated. While hot-burning fires can damage soils as well as vegetation, most fires leave behind a mosaic of conditions, including patches where few trees are killed, patches were most trees are killed but some remain living, and patches where all vegetation is killed. Even in the latter patches, the seeds of fire-dependent species quickly germinate and grow.

The largest cost by far is the cost of suppression. So one alternative is to simply minimize suppression costs by letting most fires burn. The obstacle to this policy is the increasing number of homes and other structures located in or near federal forests in the zone known as the *wildland-urban interface*.

Some people have proposed that local governments use zoning, similar to floodplain zoning, to limit the construction of homes near federal forests."If you can identify private lands that are at high risk for catastrophic fires," says Mark Haggerty of the Greater Yellowstone Coalition,"we would recommend that there not be any homes at all."[174] But this unfairly imposes the cost of the Forest Service's historic management mistakes on private landowners.

The Forest Service's 2003 budget proposes to purchase "fire plain" easements from private landowners whose land is adja-

cent to fire-prone federal lands. Such easements might allow the Forest Service to treat the private lands or even to let fires burn on that land. This could be useful for lands completely enclosed by federal lands, but will not help on lands bordered by federal lands on one side and private lands on the other.

Fortunately, there is another way. Instead of treating hundreds of millions of acres of federal land, we could treat only those lands immediately surrounding homes and other structures in the wildland-urban interface. As previously noted, Forest Service fire researcher Jack Cohen suggests that homes can be protected by insuring they have non-flammable roofs and that land is treated within 130 feet of those homes. This means an average of about 2 acres per structure.

Some analysts have estimated that there are as many as 15 million residents in the wildland-urban interface, which would suggest about 6 million homes.[175] Many of these, however, are in small towns located adjacent to national forests. There is no need to treat every single home in every town, only those homes immediately adjacent to federal lands. If five million homes need to be treated, this represents at most 10 million acres, not the 70 million high-risk acres targeted by the federal agencies. While it costs more to treat acres in the wildland-urban interface, the federal government can offer to cost share with private owners, paying half the costs of new roofing and landscaping while the owners pay the other half.

Private owners can be given an additional incentive if insurance companies are prompted to charge people more if they don't treat their lands (or offer discounts to those who do). Currently, insurance companies offer no such differential pricing, perhaps because they are effectively subsidized by the federal government's policy of saving structures no matter what the cost.

The Forest Service itself is the landlord to the owners of about 10,000 summer homes located on national forest lands. Ironically, the agency actually forbids the homeowners from landscaping around their structures to proof them from fire. It does allow, but doesn't particularly encourage, metal roofs. Insurance companies ask the owners of these cabins only how far they are from the nearest fire hydrants and fire stations, not how fireproof their property is.

At the moment,"there aren't enough wildfires to generate statistical data to justify rate changes," says an underwriter for State Farm Insurance. "Even though intuitively we know fire-retardant roofs save homes, we can't prove it statistically."[176] This suggests, among other things, that the risk to homes in the wildland-urban interface has been greatly exaggerated.

The insurance companies' data shortage would be corrected in the first fire season after the federal government simply let most or all its fires burn. This could take place on individual forests, parks, and districts as soon as adjacent structure owners treated their properties. To immunize the government against lawsuits, Congress could pass a law declaring that property owners who fail to take advantage of the federal government's cost-sharing program to fireproof their properties would not be able to seek damages if their building is subsequently lost to a fire that started on federal lands.

Once all homeowners have been given the opportunity to treat their lands, the federal agencies should greatly shrink their fire suppression programs. No direct suppression of fires would take place, thus greatly reducing the hazard to fire fighters. Suppression efforts would be limited to indirect suppression, i.e., backfiring, at federal boundaries to minimize the chance of federal fires burning on private lands. No effort would be made to treat lands away from federal land boundaries or to suppress fires that do not threaten borders, whether natural or human caused.

When no fires are burning, the fire fighters remaining on federal payrolls would be engaged in creating defensible fire perimeters along high-priority federal boundaries and in rehabilitating lands that had previously been seriously burned. Most fire-damaged lands would be allowed to naturally regenerate.
This policy has been endorsed by University of Maryland Professor Robert Nelson. "Resource-wise," writes Nelson,"the economic answer today is simple: Let the fires burn. Overall, it is beginning to cost more to try to manage and suppress them than the future timber revenue gained as a result of any such fire control efforts."[177]

The main drawback to this alternative is that it is still a top-down policy. Just as the current policy of suppressing nearly all fires is inappropriate in many aras, a near- complete let-burn policy may not work in some national forests and other federal lands because of high resource values, checkerboard land ownership, or other factors. As Nelson says,"It might be economical to let fires burn in particular areas. . . . However, it might be economical to put out the fires in other forest areas."[178]

Yet there is no easy way for Congress to identify which forests have resource values that justify suppression and which should allow fires to burn. If Congress attempts to fund suppression on some forests and not on others, suppression will turn into pork barrel with funds mostly going to forests in states and congressional districts whose senators and representatives are on the appropriations committees.

Given a choice between two strategies—too much suppression vs. too much burning—a strategy of minimizing suppression costs should result in lower dollar costs as well as lower ecological costs in the long run. But there is a way to find the appropriate balance between suppression and burning on each land unit: decentralization and funding of federal lands out of their own receipts rather than out of tax dollars.

Alternative 6: Decentralized Trusts

The fundamental problem with federal fire suppression, as well

as many other aspects of federal land management, is that setting fire and land policy in Washington, DC, naturally leads to one-size-fits-all solutions. A centralized budgeting, policy, and management program cannot deal effectively with the diverse conditions found on hundreds of millions of acres of land.

Decentralization can give managers the opportunity to focus on on-the-ground conditions and issues. Decentralization doesn't necessarily mean local control. A variety of governance mechanisms are available to insure that national, regional, and local interests are all considered. But decentralization does mean that managers can make on-the-ground decisions without worrying about interference from Congress or the administration.

Like anything, decentralization can be done poorly and if not done right it can create perverse incentives and unintended consequences. The Forest Options Group, which included a number of interest group leaders and Forest Service officials, developed a process in 1999 that aimed to experiment with various decentralization ideas, including replacing the current Forest Service hierarchy with boards of directors, funding forests out of their own receipts, and managing forests as fiduciary trusts.

Realistically, decentralization is only possible if federal lands have a source of revenues other than Congressional appropriations. As long as land managers rely on appropriators for funding, they will have to respond to appropriators wants. At the same time, they will be able to manipulate appropriators into giving them more funding for certain activities, such as fire suppression, than really should be spent on those activities.

User fees, including fees for timber, recreation, grazing, minerals, and other resources, are an alternate source of funds that should be sufficient to cover the costs of managing most, if not all, federal lands. Funding management out of a specific percentage of all fees will give managers incentives to balance all of the multiple uses represented by those fees. Ideally, mangers should be funded out of a percentage of *net* income, so they will have an incentive to maximize net benefits and not to cross-subsidize below-cost resources with profitable ones.

The objection to relying on user fees is that some resources, such as endangered species habitat, cannot be marketed, and user fees would fail to provide for these resources. Yet the appropriations process hasn't proven itself able to protect such non-marketable resources either. One solution to this conundrum is to manage forests as fiduciary trusts and make the production of non-market goods one of the goals of the trust.

A fiduciary trust is a legal concept that places important obligations on the trustees or managers. Under traditional federal land management, the Supreme Court has held that federal courts must defer to the wisdom of federal land managers so long as they are not clearly violating the law.[179] In contrast, courts assume that managers of fiduciary trusts will be tempted to steal from the trusts, so the courts placed a number of requirements on trustees. Among other things, the trustees must strictly follow the goals listed in the trust instrument, must have undivided loyalty to the beneficiary, must provide clear records of assets, costs, receipts, and other information, and in the case of perpetual trusts must preserve the *corpus* of the trust.[180]

Unfortunately, the term *trust* has been loosely applied to many entities that are not true fiduciary trusts. A fiduciary trust must have a trust instrument defining the purposes of the trust, trust assets, a trustee or trustees, and a beneficiary or beneficiaries. The Valles Caldera Trust, Presidio Trust, and other trusts created by Congress usually lack a beneficiary and so are not true fiduciary trusts.

Even trustees are not immune to incentives, and trust management of both market and non-market resources can create a conflict of interest. If the trustee is to sell marketable goods to raise funds to manage non-market resources, what happens when the market and non-market resources conflict? The trustee will be tempted to ignore any conflict so as to provide maximum revenues.

The solution to this problem is to create a dual trust. The first trust manages the marketable resources of the forest to produce maximum revenues for the beneficiary. The beneficiary is the second trust, whose goal is to use its resources to maximize the non-market resource values of the forest. For example, it could use the funds it receives from the first trust to buy timber and not cut it, to pay managers to use or avoid certain practices such as selection cutting or clearcutting, or to buy easements. This dual structure will insure that the marketable resources are managed as efficiently as possible while the non-market resources also receive appropriate protection and emphasis.

Whatever structure is tested or adopted, for the sake of efficient fire management, it should be self-funded. Such self-funded forests are likely to join with state forest protection associations and/or use some form of insurance similar to that states. Only self-funded forests will have an incentive to minimize fire protection costs while protecting those resources that are more valuable than the cost of protection.

Evaluation of Alternatives

None of these alternatives are perfect, but some are less imperfect than others. Expecting the Forest Service to reform itself or to reduce costs in the face of incentives to spend money, as alternative 1 does, is unrealistic. Ending commercial activities creates more problems for fire managers than it solves. Turning federal lands over to the states is a political non-starter. Turning fire management over to the states might help, but if it is accompanied by a wholesale shift of tax dollars from federal agencies to state agencies, as Nelson proposes, it will merely replace one set of pork-driven agencies with another.

That leaves alternatives 5 and 6. Alternative 5 maintains the current centralized structure of the Forest Service and other

agencies and requires Congress to slash forest budgets and direct the agencies to focus their hazardous fuel programs on private lands, while otherwise cutting costs by letting most fires burn. Like any centralized alternative, this suffers from the defect that no single prescription can fit all federal lands. Yet allowing any variation, such as letting some forests suppress fires because of high resource values, opens the door for pork-barreling members of Congress to fund their favorite forests.

Alternative 6 has the advantage of allowing for solutions tailored to local conditions. It also fixes the incentives for timber and other resources as well as for fire. However, it could turn out to be almost as controversial as turning federal lands over to the states. To mitigate such controversies, the Forest Options Group—a group of environmental, timber, and agency leaders—recommended that Congress experiment with decentralized self-funding forest trusts, along with other reform ideas, on selected national forests.[181] This is similar to a proposal for *charter forests* that was included in the Forest Service's 2003 budget.[182]

Regardless of which alternative anyone supports, it is clear that Congress should consider a broader range of alternative policies before if gives the federal agencies another few billion dollars to burn. The big problem with any centrally driven policy is that no single solution exists for lands as widely diverse as those found in the National Forest System, much less the federal land base as a whole. The challenge for Congress and other policy makers is to design a system that encourages federal land managers to make decisions in response to local conditions and not in response to the incentives created by a blank check.

Conclusions

The incentive to spend money, not a fuel build up, is the main reason for increasing fire costs and fire sizes. Forest Service suppression costs have increased sixfold in the last decade not because fires are more expensive to suppress but because the Forest Service has figured out that it can get away with spending that money.

Droughts and the increasing number of homes in the wildland-urban interface contribute to rising costs. Yet federal agencies spent more on fire suppression in 2001, a mild fire year, than in the drought year of 1999, when nearly 60 percent more acres burned. This suggests that incentives play the major role in recent fire cost increases. Fuel accumulations, if they are a factor at all, are less important than these other factors and are probably important only in special situations.

The Forest Service has used the popular belief in built-up fuels to get Congress to greatly increase funding for fire suppression, presuppression, and fuel treatment. This successful effort has increased the Forest Service's annual budget from $3.5 to $5 billion and has nearly doubled federal fire spending from $1.5 to nearly $3.0 billion per year. This money is largely wasted since it only feeds the misincentives and does nothing about the droughts and very little about homes in the wildland-urban interface.

Two things have obscured the true reasons for the recent outrageous increases in fire costs. First is the debate over commercial timber sales between environmental and timber interests. Forest managers and commodity interests are correct that timber cutting can be a useful fire prevention tool. But environmentalists are correct that, given its current incentives, the Forest Service cannot be trusted with a timber sales program. The solution is to change the incentives, not ban all timber sales.

The second source of misdirection is the fact that both timber and environmental interests hope to use fire to get their share of the pork—one in the form of timber sales and jobs for rural community residents, the other in the form of ecosystem restoration. But neither of these things should depend on pork. Timber sales should pay their way and much ecosystem restoration can be done passively or at low cost and funded out of timber, recreation, and other receipts. As with fuel treatments, funding restoration out of tax dollars creates a perverse incentive by rewarding agencies for past mismanagement.

In a perfect world, environmental and commodity interests would overcome their differences and work together to get better and more efficient federal land management. In the real world, both sides believe polarization can achieve their goals better than cooperation, and fire is just too good a source of polarization for either to ignore. Members of Congress and other policymakers must learn to look beyond the polarization and misdirection to see the real problems.

Congress must realize that it cannot solve problems with a blank check and that it must consider the incentives it creates for federal managers. Until it does, fire will continue to cost taxpayers billions of dollars a year while it threatens ecosystems, public and private property, and human lives.

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