

GAO

Report to the Subcommittee on Forests  
and Forest Health, Committee on  
Resources, House of Representatives

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April 1999

# WESTERN NATIONAL FORESTS

## A Cohesive Strategy is Needed to Address Catastrophic Wildfire Threats



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United States  
General Accounting Office  
Washington, D.C. 20548

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**Resources, Community, and  
Economic Development Division**

B-281890

April 2, 1999

The Honorable Helen Chenoweth  
Chairman, Subcommittee on Forests  
and Forest Health  
Committee on Resources  
House of Representative

Dear Madam Chairman:

In response to your request and as agreed with your office, this report describes (1) the extent and seriousness of problems related to the health of national forests in the interior West, (2) the status of efforts by the Department of Agriculture's Forest Service to address the most serious of these problems, and (3) barriers to successfully addressing these problems and options for overcoming them. The report contains a recommendation to the Secretary of Agriculture for developing a more cohesive strategy to address growing threats to national forest resources and nearby communities from catastrophic wildfires.

We are sending copies of this report to the appropriate congressional committees; the Honorable Dan Glickman, the Secretary of Agriculture; and the Honorable Michael Dombeck, the Chief of the Forest Service. We will also make copies available to others upon request.

Please call me at (202) 512-9775 if you or your staff have any questions about this report. Major contributors to this report are listed in appendix II.

Sincerely yours,

A handwritten signature in black ink that reads "Barry T. Hill". The signature is written in a cursive, flowing style.

Barry T. Hill,  
Associate Director, Energy Resources,  
and Science Issues

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# Executive Summary

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## Purpose

National forests of the dry, interior portion of the western United States that are managed by the Department of Agriculture's Forest Service have undergone significant changes over the last century and a half, becoming much denser, with fewer large trees and many more small, tightly spaced trees and underbrush. These changes have raised concerns about the current health of these forests and their continued ability to provide for sustained levels of uses, including timber and wildlife habitat, by future generations of Americans, as required by law. In response to a request from the Subcommittee on Forests and Forest Health, House Committee on Resources, GAO examined issues related to the health of these forests. In this report, GAO discusses (1) the extent and seriousness of forest-health-related problems on national forests of the interior West, (2) the status of efforts by the Forest Service to address the most serious of these problems, and (3) barriers to successfully addressing these problems and options for overcoming them.

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## Background

The Forest Service manages about 155 national forests covering 192 million acres of land—nearly 9 percent of the nation's total surface area. About 70 percent of these lands are located in the dry, interior portions of the western United States. Laws guiding the management of the national forests require them to be managed under the principles of multiple use and sustained yield to meet the diverse needs of the American people. Under the multiple-use principle, the Forest Service is required to plan for six renewable surface uses—outdoor recreation, rangeland, timber, watersheds and water flows, wilderness, and wildlife and fish. Under the sustained-yield principle, the agency is required to manage its lands to provide high levels of these uses to current users while sustaining undiminished the lands' ability to produce these uses for future generations.

To carry out this mission, the Forest Service has adopted a management approach that recognizes that ensuring the long-term productivity of the land for these uses requires sustaining forest health. Although definitions of forest health vary, scientists believe a useful method for assessing it is to compare the current ecological conditions of a forest—especially the conditions of its tree stands—with the range of past ecological conditions it has exhibited. This historical range indicates the variation over time in conditions that normally occur in response to common local, natural disturbances, such as fires, floods, windstorms, or droughts, and provides a basis for identifying the forest's capacity to provide for different uses over time.

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Historically, tree stands on the forests of the interior West have differed in composition and structure from those found elsewhere. These differences were largely attributable to the region's dry climate and varied elevations. In this setting, frequent low-intensity wildfires periodically removed undergrowth and smaller trees from many of the region's lower-elevation forests. In recent years, changes in the condition of these forests—including changes in tree stand density, species composition, and insect and disease infestation levels—have led some to call these forests unhealthy. The condition of these forests is of great public interest because their recreational and aesthetic values have led to population increases along their boundaries in recent years.

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## Results in Brief

The most extensive and serious problem related to the health of national forests in the interior West is the overaccumulation of vegetation, which has caused an increasing number of large, intense, uncontrollable, and catastrophically destructive wildfires. According to the Forest Service, 39 million acres on national forests in the interior West are at high risk of catastrophic wildfire. Past management practices, especially the Forest Service's decades-old policy of putting out wildfires on the national forests, disrupted the historical occurrence of frequent low-intensity fires, which had periodically removed flammable undergrowth without significantly damaging larger trees. Because this normal cycle of fire was disrupted, vegetation has accumulated, creating high levels of fuels for catastrophic wildfires and transforming much of the region into a tinderbox. The number of large wildfires, and of acres burned by them, has increased over the last decade, as have the costs of attempting to put them out. These fires not only compromise the forests' ability to provide timber, outdoor recreation, clean water, and other resources but they also pose increasingly grave risks to human health, safety, property, and infrastructure, especially along the boundaries of forests where population has grown significantly in recent years.

During the 1990s, the Forest Service began to address the unintended consequences of its policy of putting out wildfires. In 1997, it announced its goal to improve forest health by resolving the problems of uncontrollable, catastrophic wildfires on national forests by the end of fiscal year 2015. To accomplish this goal, it has (1) initiated a program to monitor forest health, (2) refocused its wildland fire management program to increase the number of acres on which it reduces the accumulated vegetation that forms excessive fuels; and (3) restructured its budget to better ensure that funds are available for reducing these fuels. The

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Congress has supported the agency's efforts by increasing the funds for reducing fuels and authorizing a multiyear program to better assess problems and solutions.

However, because it lacks adequate data, the Forest Service has not yet developed a cohesive strategy for addressing several factors that present significant barriers to improving the health of the national forests by reducing fuels. As a result, many acres of national forests in the interior West may remain at high risk of uncontrollable wildfire at the end of fiscal year 2015. Efforts to reduce accumulated fuels can adversely affect the Forest Service's achievement of other stewardship objectives. For example, controlled fires can be used to reduce fuels, but (1) such fires may get out of control, and (2) the smoke they produce can cause significant air pollution. As a result, mechanical methods, including commercial timber harvesting, will often be necessary to remove accumulated fuels. However, mechanical removals are problematic because the Forest Service's (1) incentives tend to focus efforts on areas that may not present the highest fire hazards and (2) timber sales and other contracting procedures are not designed for removing vast amounts of materials with little or no commercial value. As a result, removing accumulated fuels may cost the Forest Service hundreds of millions of dollars annually. But the problem is so extensive that even this level of effort may not be adequate to prevent many catastrophic fires over the next few decades. This report recommends the development of a cohesive strategy to reduce accumulated fuels on national forests of the interior West in an effort to limit the threat of catastrophic wildfire.

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## Principal Findings

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### Catastrophic Wildfires Threaten Forest Resources and Communities

Tree stands on national forests of the interior West have grown much denser in recent decades, have undergone shifts in species composition, and have experienced increases in some insect and disease infestations. These conditions, often considered indicators of poor forest health, jeopardize the ability of these forests to sustain wildlife habitat as well as timber production. In addition, they pose a more immediate problem—the threat of catastrophic wildfires. After declining fairly steadily for 75 years, the average number of acres burned by wildfires annually on national forests began to rise over the last decade, nearly quadrupling to about

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three-quarters of a million acres per year. Virtually all of this rise is attributable to the increasing number of very large fires.

Scientists and agency officials believe that this increase in large, intense, uncontrollable, and catastrophically destructive wildfires is in large part the result of the Forest Service's decades-old policy of putting out wildfires on national forests. This policy disrupted the historical occurrence of frequent, low-intensity fires in many areas of the interior West. Such fires periodically removed smaller live and downed vegetation, preventing accumulations that could result in larger fires. But as vegetation has accumulated, fires have become larger and more difficult and expensive to put out. The average annual costs of attempting to put out these fires grew by 150 percent, from \$134 million in fiscal year 1986 to \$335 million in fiscal year 1994 (in constant 1994 dollars). The costs of preparedness, including the costs of maintaining a readiness force to fight the fires, also rose, from \$189 million in fiscal year 1992 to \$326 million in fiscal year 1997—an increase of about 70 percent.

Outside experts and Forest Service officials generally agree that increased fire suppression efforts will not be successful because such inevitable, large, intense wildfires are generally impossible for firefighters to stop and are only extinguished by rainfall or when there is no more material to burn. They are concerned that, in the future, such fires will prevent the Forest Service from meeting its mission requirement to sustain the national forests' multiple uses because the fires will likely damage soils, habitat, and watershed functioning for many generations or even permanently.

In recent years, the number of people living along the boundaries of the national forests has grown significantly. As a result, the increasing numbers of larger, more intense fires pose grave hazards to human health, safety, property, and infrastructure in these areas, which are referred to as "wildland/urban interface" areas. Not only do the fires take lives, but also, because the smoke from them contains substantial amounts of fine particulate matter and other hazardous pollutants, they can pose substantial health risks to people living in the wildland/urban interface. In addition, the fires threaten to damage infrastructure, such as the reservoirs that provide water to these nearby populations. According to the Forest Service, maintaining current funding levels for preparedness, as is now planned, will result in increased risks of injuries and loss of life to firefighters and the public. Experts believe that the "window of

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opportunity” for taking management action is only about 10 to 25 years before catastrophic wildfires become widespread.

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## Recent Actions to Address Catastrophic Wildfires Are Important but May Be Too Little, Too Late

Besides increasing preparedness and suppression efforts over the last few years, the Forest Service has taken a number of important steps to address the growing threat of wildfires. In particular, in 1995, it refocused its fire management program to reduce accumulated fuels. In 1997, the Chief of the Forest Service adopted an internal agency recommendation to increase the number of acres on which fuels are reduced from about 570,000 acres to 3 million acres annually by fiscal year 2005 and to continue this level until the year 2015. However, GAO’s analysis of the agency’s initial plans and data indicate that even this level of effort may leave about 10 million acres of the current 39 million acres at high risk of catastrophic wildfire.

The Forest Service may not be able to address all of the acres needing attention for several reasons. First, although the agency has announced its intent to give priority to threats in the wildland/urban interface, its funds for reducing fuels are currently allocated substantially to maintaining low fuel levels on forests in other regions with less serious conditions so that conditions there do not become as hazardous as in the interior West. For this same reason, a significant portion of the future funds for reducing fuels will have to be allocated to those other regions. In addition, the agency is hampered in systematically implementing its priority for reducing fuels in the wildland/urban interface because it has only recently begun to define and map these areas. Finally, the agency’s fiscal year 2000 budget proposal provides the same level of funding for reducing fuels as the previous fiscal year’s budget, meaning that, with rising costs, the agency will reduce fuels on fewer, rather than more, acres as initially planned.

In 1998 and 1999, the Congress authorized two efforts supporting the Forest Service’s efforts—the Joint Fire Science Program and a set of “stewardship contracting demonstration projects.” The Joint Fire Science Program is responsible for developing consistent information on accumulated fuels and ways to reduce them. The data being developed under the program are being used initially to map the locations of existing risks from accumulated fuels. This and other research activities of the Joint Fire Science Program may take 10 years to complete. Several more years may be required to incorporate all the lessons learned into revised forest plans. The stewardship contracting demonstration projects are



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using alternative contracting procedures for working with nonfederal partners to demonstrate mechanical methods of removing materials (including timber harvesting) to reduce accumulated fuels. However, this program has also just begun. Lessons learned from the program can be incorporated into an agencywide strategic approach if a consistent method for evaluating the results of the demonstration projects is devised, but such an evaluation methodology has not yet been developed.

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## **A Cohesive Strategy Is Needed for Addressing Numerous Barriers to Effective Action**

Efforts to address catastrophic wildfires face several barriers, including the fact that most methods of reducing fuels can be difficult to reconcile with agencies' other responsibilities. For instance, many agency officials told GAO they do not believe it is possible to set controlled fires to reduce fuels on a scale replicating that of natural fires and still meet air quality standards under the Clean Air Act. The Forest Service and the Environmental Protection Agency are involved in a 3-year experiment to better determine whether and how it will be possible to reconcile controlled burning and these air quality standards. Moreover, because of climatic conditions and the density of tree stands, the danger of fire's escaping from such controlled burning is often too high in many areas for this method to be used. Mechanically removing fuels (through commercial timber harvesting and other means) can also have adverse effects on wildlife habitat and water quality in many areas. Officials told GAO that, because of these effects, a large-scale expansion of commercial timber harvesting alone for removing materials would not be feasible.

However, because the Forest Service relies on the timber program for funding many of its other activities, including reducing fuels, it has often used this program to address the wildfire problem. The difficulty with such an approach, however, is that the lands with commercially valuable timber are often not those with the greatest wildfire hazards. Additionally, there are problems with the incentives in the fuel reduction program. Currently, managers are rewarded for the number of acres on which they reduce fuels, not for reducing fuels on the lands with the highest fire hazards. Because reducing fuels in areas with greater hazards is often more expensive—meaning that fewer acres can be completed with the same funding level—managers have an incentive not to undertake efforts on such lands.

Moreover, the agency's current statutorily defined contracting procedures for commercial timber sales—as well as for service contracts that do not involve selling timber but are let simply for the service of removing excess

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fuels—were not designed to (1) facilitate the systematic removal of large volumes of low-value material over a number of years, (2) readily combine funds for conducting timber sales with funds for reducing accumulated fuels, or (3) allow contractors to retain this low-value material to partially offset the costs of its removal. Because of the combined (1) need to perform costly mechanical removals, (2) lack of value for the materials, and (3) lack of contracting procedures designed to facilitate their removal, GAO estimates that the cost to the Forest Service to reduce fuels on the 39 million acres at high risk could be as much as \$12 billion between now and the end of fiscal year 2015, or an average of about \$725 million annually. This is more than 10 times the current level of funding for reducing fuels, and the agency, contrary to its earlier plans, has requested no increase in this funding for fiscal year 2000.

The Forest Service has not yet devised a cohesive strategy to address these barriers to reducing excessive national forest fuel levels and associated catastrophic wildfires. It has not done so, in large part, because it lacks basic data on, for example, the (1) locations and levels of existing excessive fuel accumulations, (2) effects on other resources of different methods of reducing fuels, and (3) relative cost-effectiveness of these different methods, all of which are needed to identify quantitative measures and goals for fuels reducing fuels. Nor has the Forest Service identified a firm schedule for completing activities that will provide it with such data. The lack of such performance measures and goals, and of a cohesive strategy and schedule for developing and accomplishing them, makes it difficult for the agency to be held accountable for achieving its statutorily mandated mission of sustaining multiple uses.

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## **Recommendation to the Secretary of Agriculture**

We recommend that the Secretary of Agriculture direct the Chief of the Forest Service to develop, and formally communicate to the Congress, a cohesive strategy for reducing and maintaining accumulated fuels on national forests of the interior West at acceptable levels. We further recommend that this strategy include (1) specific steps for acquiring the data needed to establish meaningful performance measures and goals for fuel reduction, (b) identifying ways of better reconciling different fuel reduction approaches with other stewardship objectives, and (c) identifying changes in incentives and statutorily defined contracting procedures that would better facilitate the accomplishment of fuel reduction goals; (2) a schedule indicating dates for completing each of these steps; and (3) estimates of the potential and likely overall and annual

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costs of accomplishing this strategy based on different options identified in the strategy as being available for doing so.

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## Agency Comments

The Forest Service reviewed a draft of this report and generally agreed with GAO's findings, conclusions, and recommendation. In its comments, the agency stated that the report is very comprehensive, does a good job of covering the problem, and effectively portrays the conditions found on many national forest throughout the interior West. The agency agrees that it has not advanced a cohesive strategy to treat all 39 million acres of national forestlands at risk of catastrophic fire but says that it is committed to developing one in a timely manner and (1) has a general strategy for reducing wildfire threats, (2) is currently developing a more specific planning process and tools for completing this strategy, (3) will make significant progress in eliminating these threats, and (4) has realistic time frames for accomplishing these tasks. The agency also listed in its comments several initiatives that it has under way or planned to complete its more cohesive strategy. According to the agency, these initiatives will be important in reducing threats from catastrophic wildfires.

This report recognizes that the Forest Service has a general strategy and has undertaken and is planning several initiatives to develop a more cohesive strategy. However, GAO believes that the general strategy lacks cohesiveness because it does not address several barriers that the Forest Service faces in undertaking its planned fuel reduction activities. Nor is it clear from the Forest Service's comments how its current and planned initiatives, individually and collectively, will provide this cohesiveness. GAO also believes that the agency needs to be accountable for accomplishing the strategy. For these reasons, GAO believes that the agency's more cohesive strategy should include, as specific steps, those actions in its current and planned initiatives that it believes will enable it to address these barriers, as well as a schedule for completing them. GAO believes that this delineation of specific actions and a schedule will provide a practical framework and process for accomplishing the agency's intentions. The agency also provided a number of technical and clarifying comments. GAO revised the draft report where appropriate in response to the agency's comments. The agency's comments and GAO's responses to them are found in appendix I of this report.

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**Abbreviations**

USDA      U.S.Department of Agriculture

# Introduction

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## The Forest Service's Mission Is Multiple Use and Sustained Yield

The Forest Service, an agency in the U.S. Department of Agriculture (USDA), manages 155 national forests covering about 192 million acres of land, or about 9 percent of the nation's land surface, under the leadership of the Chief of the Forest Service, who reports to the Under Secretary of Agriculture for Natural Resources and Environment. National forests are managed under the principles of multiple use and sustained yield to meet the diverse needs of the American people. Under the multiple-use principle, the Forest Service is required to plan for six renewable surface uses—outdoor recreation, rangeland, timber, watersheds and water flows, wilderness, and wildlife and fish. Under the sustained-yield principle, the agency is required to manage its lands to provide high levels of these uses to current users while sustaining undiminished the lands' ability to produce these uses for future generations. It implements these principles using a planning mechanism mandated by the National Forest Management Act, which requires each forest or group of small forests to develop a plan for all uses. This plan must be revised at least every 15 years. This plan, together with the individual projects undertaken to implement it, must comply with various environmental laws establishing standards or procedures designed to protect individual resources, such as threatened and endangered species and water and air quality.<sup>1</sup>

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## Sustaining Ecosystems Is the Agency's Management Approach for Sustaining Multiple Uses

In 1992, the Forest Service adopted a management approach for sustaining multiple forest uses called ecosystem management. This management approach recognizes that protecting individual resources under the various environmental laws, as well as ensuring the long-term ability of the land to produce goods and services, requires sustaining the functioning of ecosystems.<sup>2</sup> Ecosystems comprise interdependent biological components (plants and animals, including humans), that interact with their physical environment (soil, water, and air) to form distinct ecological units that span both federal and nonfederal lands. Through these interactions, the components of ecosystems tend to become arranged in distinctive kinds of biological structures, such as different types of forest tree stands. These different ecosystem structures, in turn, are capable of providing different kinds and levels of resources for human use, including timber or water.

Natural disturbances, such as fires, floods, windstorms, or droughts, can temporarily affect ecosystem structures. However, these structures are

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<sup>1</sup>For a fuller description of the agency's decision-making process, see *Forest Service Decision-Making: A Framework for Improving Performance* (GAO/RCED-97-71, Apr. 29, 1997).

<sup>2</sup>For a fuller description of ecosystem management, see *Ecosystem Management: Additional Actions Needed to Adequately Test a Promising Approach* (GAO/RCED-94-111, Aug. 16, 1994).

generally resilient over time, recovering and persisting because they have evolved to survive the particular patterns of disturbance common to a given geographical area. Human technology, however, can create rapid, intense, or large-scale disruptions in ecosystem structures. A disruption, such as the elimination of an important biological component, can sometimes alter an ecosystem structure beyond its ability to recover quickly or at all, making the ecosystem unstable or unsustainable and ultimately transforming it into a different kind of ecosystem with different kinds of biological structures. Such a changed ecosystem will provide different kinds or levels of uses from those that humans previously enjoyed and expected. In 1997, the Forest Service identified, as a mission-related, strategic goal, achieving healthy and sustainable ecosystems through conserving and restoring ecosystem structures. A specific objective under this broad goal was restoring or protecting the ecological conditions of forested ecosystems to maintain their components and their capacity for self-renewal.

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## Controversies Exist Over the Health of Western National Forests

In recent years, several analyses of conditions on national forests of the interior West by agency and outside experts have cited evidence of increased levels of insect and disease infestations; changes in the composition of tree and other forest plant species, including invasion by nonnative plants; increases in the density of tree stands and undergrowth; and increases in the number of small trees.<sup>3</sup> These tree stand conditions have sometimes been referred to collectively as “forest health” problems. At the same time, the term “forest health” has been applied to concerns over declining species, habitat, and watershed conditions on national forests, and some environmental groups have argued that forest health should incorporate these concerns. Numerous administrative appeals and judicial actions have been filed by these groups out of concern that efforts to improve the health of tree stands—which would be implemented, in part, through timber harvesting—may exacerbate problems affecting species, habitat, or watersheds. The Forest Service has also noted a lack of scientific consensus on, or community awareness and acceptance of, the actions needed to address forest health problems, the size of the areas needing to be addressed, and the time frames for taking action. Thus, despite the widespread use of the term in recent years, there is little agreement on a definition of forest health, a standard for measuring it, the appropriate areas and time frames for addressing it, and the actions needed to achieve it. Many Forest Service staff and others feel that,

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<sup>3</sup>e.g., Task Force Report on Sustaining Long-Term Forest Health and Productivity, Society of American Foresters (Bethesda, Md.: 1993); and Forest Health and Fire Danger in Inland Western Forests: Proceedings of the Conference, Spokane, WA, September 8-9, 1994 (Spokane: Harman Press, 1995).

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because of its vagueness and subjectivity, the concept is often difficult to use effectively.

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## **Forest Health Can Be Assessed by Comparing Present to Past Forest Conditions**

Forest Service and outside scientists believe that a useful method of assessing a forest's health and functioning is to compare the current conditions of its components and structures to the range of conditions they have exhibited in the past. This range—within which conditions have varied over time in response to disturbance patterns common to a given area—is referred to by scientists as their historical range of variability.

Examining the historical range of variability of a forest's tree stands is believed to be an especially useful starting point for analyzing the forest's overall health and functioning because (1) tree stands are the defining biological structures of forested versus other kinds of ecosystems and (2) the conditions of these structures greatly determine the capacity of a forest not only to produce timber, but also to maintain soils, watershed conditions, and wildlife and fish habitats. The historical range of variability of a forest's tree stands is identified by examining historical and biological evidence—such as early pioneers' reports, old photographs, tree rings, and soil layers—to discover what biological components and structures have characterized the forested ecosystem at different times in its natural history.

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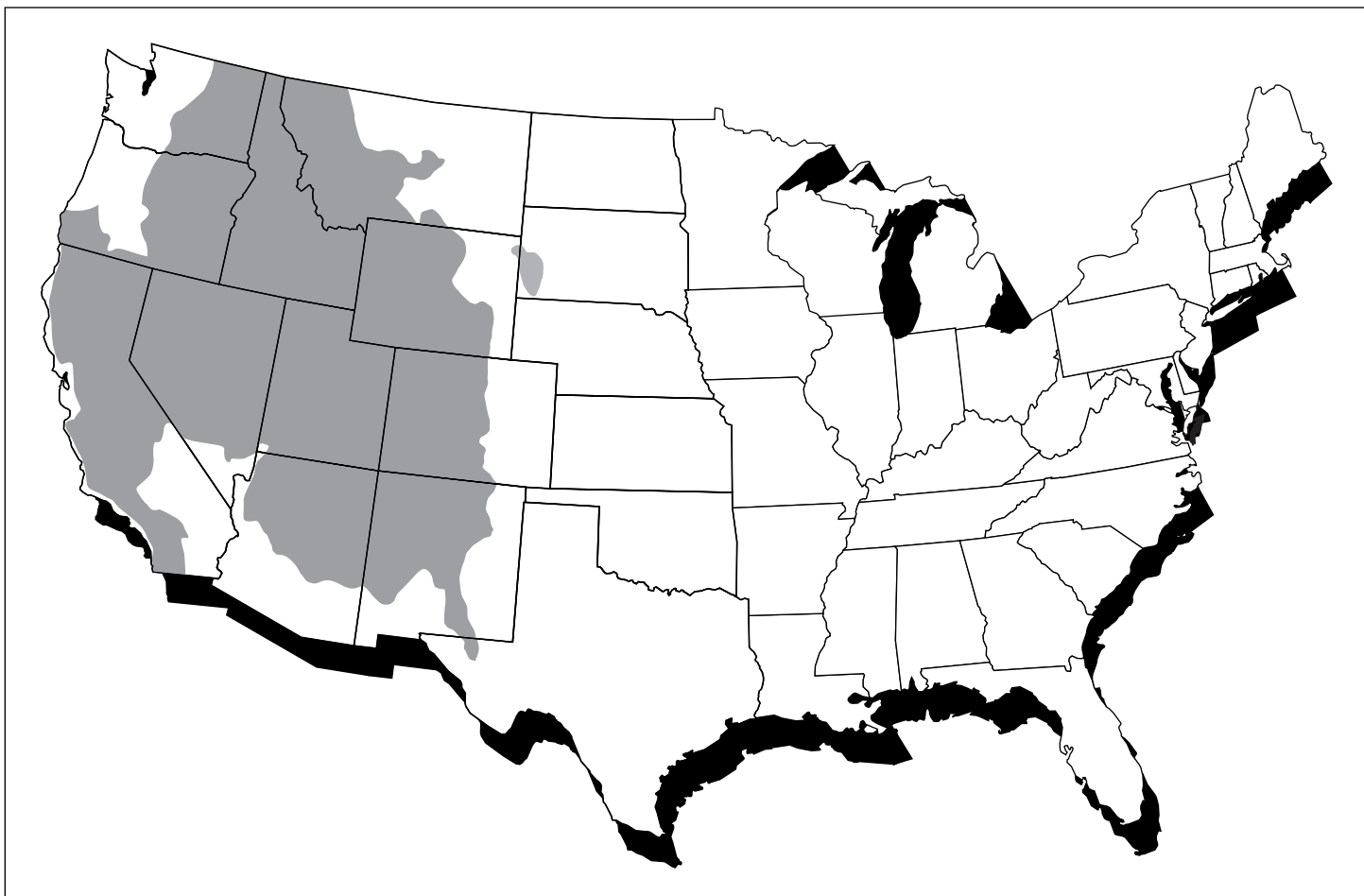
## **Forests of the Interior West Have Distinctive Ecological Characteristics**

About 60 percent of all national forests and about 70 percent of their total acreage are located in the dry, inland portion of the western United States (hereafter referred to as the "interior West"). This region of the country, depicted in figure 1.1, generally extends north and south from the Canadian to the Mexican border and east and west from the Black Hills in South Dakota to the Cascade mountain range in Washington and Oregon and to the southwestern deserts and the Coastal range in California.



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**Figure 1.1: The Interior West**



Source: Forest Service.

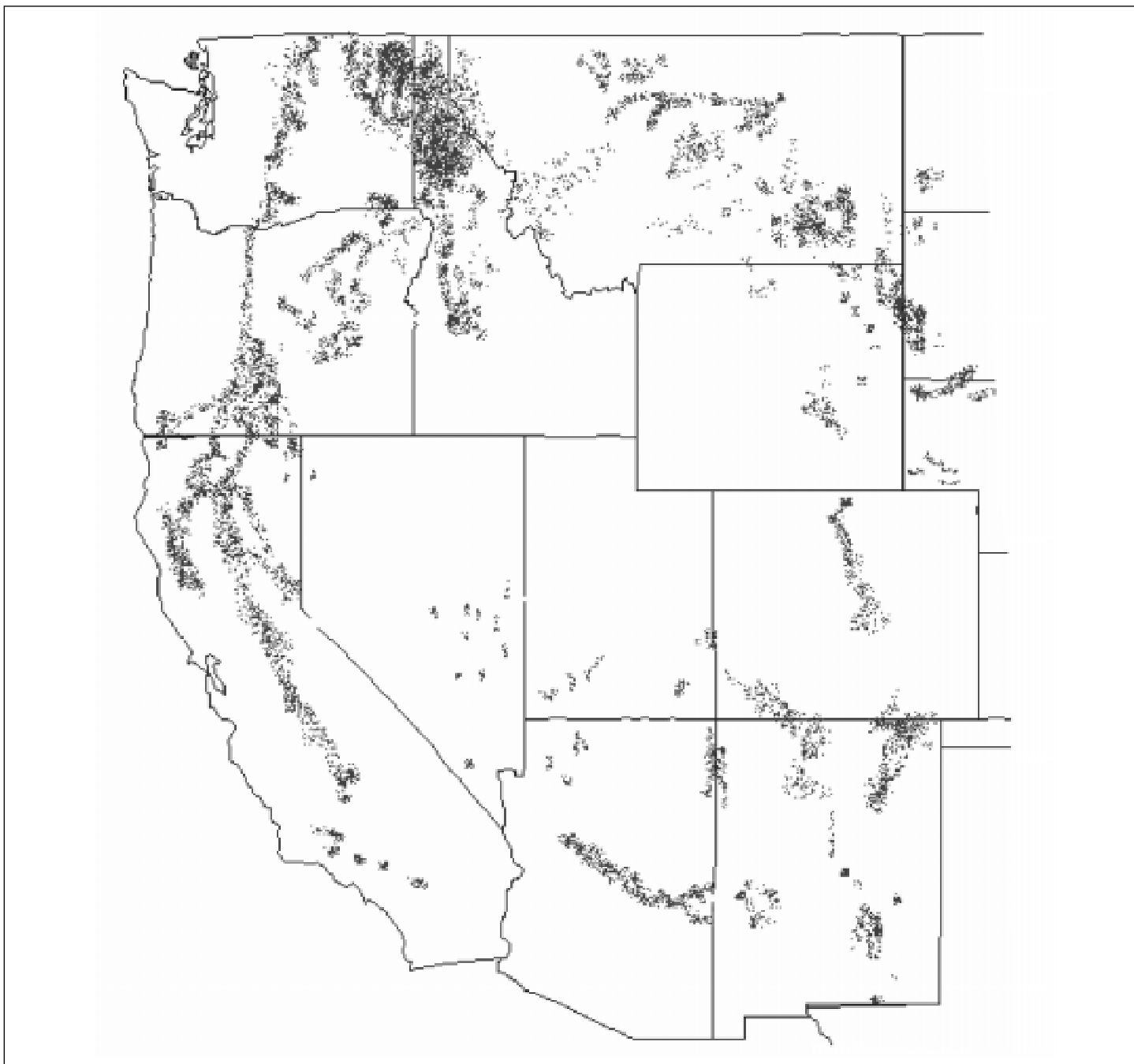
Distinct ecological processes—driven largely by climate and topography—shaped the forests of the interior West, producing tree stands that differed in composition and structure from those in other regions of the country. Historically, frequent, low-intensity wildfires played a major role in determining the dispersion and succession of tree stands in the interior West. A lack of rainfall across the interior West generally also

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slows the decomposition of dead and downed trees and woody material there.

The most common type of forested lands on national forests of the interior West are at warm, dry, lower elevations and are generally dominated by ponderosa pine. These are known as “frequent fire interval” forests because, before pioneers settled in these areas, fire historically occurred in them about every 5 to 30 years. Because frequent fires kept these forests clear of undergrowth, fuels seldom accumulated, and the fires were generally of low intensity, largely consuming grasses and undergrowth and not igniting the highly combustible crowns, or tops, of large trees. Figure 1.2 shows the widespread distribution of these “frequent fire interval” forests.

Figure 1.2: Location of Frequent Fire Forests in the Interior West



(Figure notes on next page)

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Source: Forest Service.

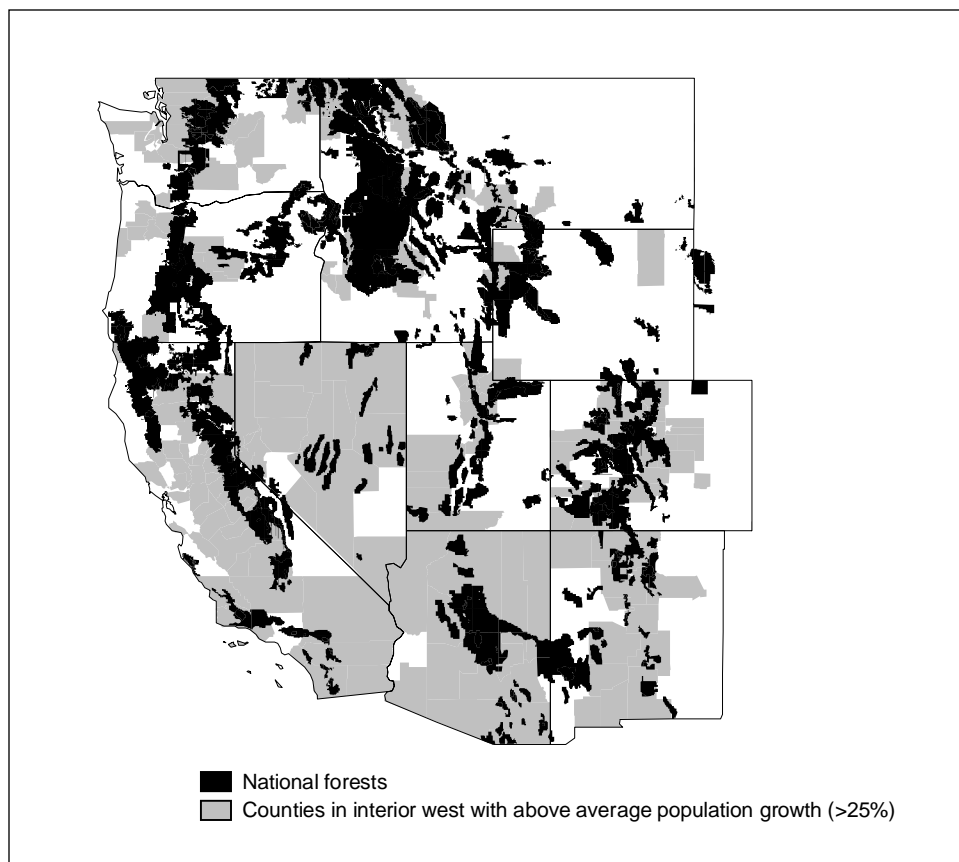
In contrast, fire historically occurred only about every 40 to 200 years in the cooler, moister, forests at higher elevations, such as those around Yellowstone National Park, which are generally dominated by lodgepole pine. These forests historically developed more dense stands, and fires there generally killed nearly all of the trees.

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**Recent Population  
Growth Near Interior  
Western National  
Forests Has Created a  
“Wildland/Urban  
Interface”**

Finally, because the national forests of the interior West are attractive for recreation and aesthetic enjoyment, population has grown rapidly along their boundaries in recent years, creating an area termed the “wildland/urban interface.” Figure 1.3 shows the location of areas in the interior West with recent high population growth in relation to the region’s national forests.

**Figure 1.3: Population Growth in Relation to National Forests, 1980-96**



Source: Forest Service and U.S. Department of Commerce, Bureau of the Census.

As figure 1.3 shows, areas with higher population growth rates in the interior West over the period are generally concentrated close to national forests.

## Objectives, Scope, and Methodology

In response to a request from the Chairman, Subcommittee on Forests and Forest Health, we examined (1) the extent and seriousness of problems related to the health of national forests in the interior West, (2) the status of efforts by the Department of Agriculture's Forest Service to address the most serious of these problems, and (3) barriers to successfully addressing these problems and options for overcoming them.

As agreed with the requester, to examine the extent and seriousness of problems related to the health of national forests in the interior West, we interviewed and obtained documents from agency officials at Forest Service headquarters, six regional offices with administrative responsibility for national forests located in the interior West, nine selected forests within these regions, and selected agency field research and analysis units. Our selection of agency field units was based on a judgmental sample, and the results may not always be representative of other agency units. The forests we visited included the Idaho Panhandle National Forest in Idaho, the Arapaho and Roosevelt National Forests in Colorado, the Lincoln National Forest in New Mexico, the Boise National Forest in Idaho, the Plumas National Forest in California, the Shasta-Trinity National Forest in California, the Tahoe National Forest in California, the Deschutes National Forest in Oregon, and the Umatilla National Forest in Oregon and Washington. At these forests, we visited numerous field locations in several ranger districts. We also visited the Tahoe Basin Management Unit, a unit that surrounds Lake Tahoe, straddling the California/Nevada border, and is managed separately.

At many locations, we also interviewed and obtained documents from representatives of national and local industry and environmental organizations; other federal agencies; state, local and tribal governments; and academic and professional forestry policy analysis and technical experts. We also interviewed and obtained documents from representatives of American Forests; the Pinchot Institute for Conservation; the Society of American Foresters; the American Forest and Paper Association; the Western Governor's Association; the Wilderness Society; the Sierra Club; Oregon State University; Colorado State University; the Universities of Arizona, Colorado, Idaho, Montana, and Northern Arizona; and the Ecological Society of America. We also examined numerous statutes, hearing records, regulations, and agency directives related to forest health issues, as well as legislative proposals, prior GAO reports, and studies by the Congressional Research Service. In our field visits, we sometimes also made visual inspections of, and queried agency officials about, forest conditions, their causes, and their significance, as well as obtained views on these issues from local outside parties active in forest issues.

To examine the status of the Forest Service's efforts to address the most serious problems related to forest health, we interviewed agency officials and outside parties, reviewed related agency program and budget data, and consulted numerous agency and outside studies of agency activities.

To obtain a better understanding of what was involved in some of these activities, we also visited several field sites where such activities were either under way or had recently been completed. We also reviewed agency technical models and planning documents to assess the adequacy of prospective agency efforts and strategies and consulted with other parties to obtain their views on these subjects. As also agreed with the requester's office, our review generally covered agency activities since 1993 and was focused on the role of tree stand conditions in forest health.

To examine barriers to successfully addressing problems related to forest health and options for overcoming them, we reviewed numerous recent and ongoing draft studies by executive branch, agency headquarters and field unit, legislative, and outside task forces and commissions, as well as academic and professional journals, and we interviewed and obtained documents from agency officials and outside parties. With respect to estimates of costs for addressing these conditions, we reviewed agency data, estimates from the Congressional Research Service, and documents related to the agency's fiscal year 1998, 1999, and 2000 budgets, as well as annual performance plan data prepared by the agency in conformance with the Government Performance and Results Act of 1993. During the course of our review, we periodically met with agency headquarters staff and discussed information we had obtained through our work.

Although we did not independently verify the accuracy of the data the agency provided to us on acreage, conditions, activities, and costs, we did compare these data with numerous outside analyses and estimates, as well as discussed factors affecting the data's accuracy with agency field and headquarters personnel. We found that those other sources generally corroborated the data the agency provided to us, and in no instances did any inconsistencies significantly affect or materially qualify any findings or conclusions that were based on the agency's data. Our review was conducted from October 1997 through March 1999 in accordance with generally accepted government accounting standards.

# Catastrophic Wildfires Threaten Resources and Communities

According to the Forest Service, about 39 million acres of tree stands on national forests of the interior West are at high risk of catastrophic fire, largely because the agency's decades-old policy of suppressing historically occurring, periodic, small wildfires has led to unprecedented accumulations of flammable materials. As a result, wildfires have increased in number and size over the last decade and are increasingly difficult and costly to fight. While these conditions threaten the sustainability of forest resources, they also increasingly threaten human health, lives, property, and infrastructure in nearby communities. The window of opportunity for taking corrective action is estimated to be only about 10 to 25 years before widespread, unstoppable wildfires with severe immediate and long-term consequences occur on an unprecedented scale.

## National Forests in the Interior West Have Several Health Problems

According to the Forest Service, large areas of national forests in the interior West are not healthy. A key symptom of their poor health is denser tree stands—i.e., stands with many more small trees, undergrowth, and accumulated dead materials on the ground than were found in the past. Additionally, the proportion of less fire-tolerant species in these tree stands has increased, as has the incidence of some disease and insect infestations. Increased stand densities are often related to these changes in tree species, as is the increased incidence of insects and diseases.

## Increased Tree Stand Density, Changing Species Composition, and Insect and Disease Infestations Indicate Poor Forest Health

According to the Forest Service, a significant symptom of poor health on national forests in the interior West is the much greater density of stands now than in the past. For example, officials in the Lincoln National Forest told us that high stand density conditions exist on an estimated 79,712 acres—or 35 percent—of its mixed conifer forest; 19,099 acres—or 22 percent—of its ponderosa pine forest; and 576,622 acres—or 55 percent—of its pinyon-juniper forest. The proportion of stands with densely growing, small and medium-sized trees on the Idaho Panhandle National Forest is reported by the agency to be about 50 percent above average historical levels. An estimated 35 to 50 percent of the 700,000 acres of mixed conifer and ponderosa pine on the Deschutes National Forest have more trees per acre than normal and are at risk according to agency officials.

A 1994 study of scientifically selected sites in Arizona indicated that the estimated density of trees on 70 sites in the Coconino National Forest had greatly increased (from 23 per acre in 1867 to 276 in 1990), as it had on 46 sites in the Kaibab National Forest (from 56 trees per acre in 1881 to 851 in



1990).<sup>4</sup> By another measure, the estimated total cross-sectional area of trees, measured at 4.5 feet above the ground surface, had grown from about 25 square feet per acre to about 150 square feet on the first forest and from about 50 square feet per acre to over 150 square feet on the other forest over the same time periods.

Figures 2.1 and 2.2, are photographs taken from the same spot on the Bitterroot National Forest in 1909 and 1989. They illustrate the dramatic change over the intervening 80 years from the historically more common, open, large tree structure of such forest stands to the more recent, typically denser structural conditions dominated by smaller trees.

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**Figure 2.1: 1909 Photograph of Typical Open Ponderosa Pine Stand in the Bitterroot National Forest in Idaho**



Source: Forest Service.

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<sup>4</sup>W.W. Covington and M.M. Moore, "Postsettlement Changes in Natural Fire Regimes" and "Forest Structure: Ecological Restoration of Old-Growth Ponderosa Pine Forests," copublished simultaneously in the *Journal of Sustainable Forestry*, Vol. 2, No. 1/2 (1994); and *Assessing Forest Ecosystem Health in the Inland West*, R. Neil Sampson and David L. Adams, eds. (Binghamton, N.Y.: The Haworth Press, 1994).

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**Figure 2.2: 1989 Photograph Taken  
From the Same Spot in the Bitterroot  
National Forest in the Same Direction**



Source: Forest Service.

A second major symptom of health problems on national forests in the interior West that we visited was a change in the historical composition of tree species, often to a greater proportion of trees of less fire-tolerant species. For example, the historically prominent western larch species has been lost and replaced by other species of trees on 211,000 acres—or 69 percent of its historical acreage—on the Idaho Panhandle National Forest. Likewise, the ponderosa pine has been replaced by other species on 76,000 acres—or 67 percent of its historical acreage—on this forest. In many parts of Oregon’s Deschutes National Forest, ponderosa pine has also been replaced by Douglas fir and mixed conifers over the last few decades.

A third major symptom of health problems on national forests in the interior West is the increase in some insect and disease infestations. For

example, on the Lincoln National Forest in New Mexico, round-headed pine beetles have infested 49,495 acres—or 57 percent—of the forest's ponderosa pine, while the western spruce budworm has infested 120,000 acres of its Englemann and blue spruce and Douglas and white fir. In addition, dwarf mistletoe disease has infested 55,563 acres—or 64 percent—of its ponderosa pine, and 113,875 acres—or about 50 percent—of its Douglas fir. The Douglas fir tussock moth damaged 250,000 acres on the Boise National Forest in Idaho, killing millions of trees. The Douglas-fir beetle and the fir engraver beetle killed many more trees in this same forest, and dwarf mistletoe is estimated to infest 119,012 acres—or 33 percent—of the Douglas fir; 78,636 acres—or 10 percent—of the ponderosa pine; and 43,376 acres—or 50 percent—of the lodgepole pine. Various defoliating insects infest about 20 percent of the Deschutes National Forest's mixed conifer and ponderosa pine forest, and dwarf mistletoe disease infects about 40 percent of its mixed conifer and ponderosa pine. Root disease also affects about 20 percent of this forest and, according to Forest Service officials, it is a major problem on the Idaho Panhandle National Forest, as it is elsewhere in the interior West.

In addition to these three symptoms of poor forest health, national forests in the interior West are facing invasions of nonnative plants and diseases that outcompete and displace native vegetation in many areas. For example, in the Lincoln National Forest, 12 aggressive nonnative plant species have been identified as occupying approximately 5,200 acres across two ranger districts. Forest officials saw such plants spread by 30 percent in the early 1990s and expect this trend to increase. Various noxious plants, such as knapweeds and thistles, were estimated in 1996 to cover at least 5,000 acres of the forests and grasslands of the Arapaho/Roosevelt National Forest, and are expected to nearly triple their coverage by the year 2000. On the Deschutes National Forest, native shrubs and plants associated with dominant tree species are being displaced by invasive nonnative noxious plants at a rate that forest officials estimate is tripling every year. Similarly, nonnative diseases, to which many native tree species have thus far evolved little resistance, have spread. For example, white pine blister rust, a disease accidentally introduced from Europe in 1910, primarily caused the loss of 656,000 acres—or 90 percent—of the western white pine forests on the Idaho Panhandle National Forest and 7,900 acres—or 64 percent—of the whitebark pine forests. The disease has also been found at every surveyed plot on the Boise National Forest, where the incidence of infection in tree stands varied and was as high as nearly 70 percent. This same disease was detected on the Lincoln National Forest in New Mexico in 1990.

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**Suppression of Historically  
Frequent Wildfires Is the  
Primary Cause of Many  
Current Tree Stand  
Conditions**

As early as the mid-19th century, European American settlers' activities began to affect the interior West's ecology, introducing changes that gradually weakened the health of the region's national forests. These changes occurred in response to several factors that have generally excluded fire from these forests, preventing it from playing its historical role of limiting the forests' density, clearing undergrowth and downed material, and influencing species composition. These factors include (1) extensive livestock grazing and changes in land use first introduced by European American settlers in the late 1800s, which not only eliminated much of the grass that historically carried fire through the forests' undergrowth but also ended Native Americans practice of setting such fires for hunting game and other purposes; (2) past timber-harvesting methods that selectively removed the larger, more valuable, and more accessible trees or removed all of the trees from a timber-harvesting site at one time (clear-cutting), allowing other species to increase; and (3) invasions by nonnative plants, insects, and diseases. However, while these factors generally laid the groundwork for and set in motion significant changes in these forests' ecologies, according to several studies, the primary factor currently contributing to unhealthy forests in the region has been the Forest Service's decades-old policy of suppressing fire on the national forests.<sup>5</sup>

Fire suppression was first practiced to protect early settlements from the risk of uncontrollable wildfires. Later, it was used as an agricultural technique to increase the number of trees available for timber harvesting. But without frequent fires, vegetation accumulated so that many stands have become denser, and less fire-tolerant tree species have become more prevalent. As the forests' density and composition have changed, stands have become more susceptible to drought and to the incidence of insects and disease, including native ones that have historically played an important role in the evolution—particularly in the decomposition and succession cycles—of forest tree stands. Native insects and diseases sustain the health of forest stands so long as their levels remain within their historical ranges of variability. But contiguous areas of dense stands provide opportunities for insects and diseases to exceed their historical ranges and spread across large areas. In addition, invasions by nonnative plants and diseases have sometimes exacerbated problems arising from the other causes.

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<sup>5</sup>For a fuller description of the role of Native American and European settlement in the evolution of interior western national forests and other forestlands in the United States, see Douglas W. MacCleery, *American Forests: A History of Resiliency and Recovery*, Forest Service and the Forest History Society, FS-540 (Durham, N.C.: 1993) and Stephen J. Pyne, *Fire in America: A Cultural History of Wildland and Rural Fire*, 1997 ed. (Seattle: University of Washington Press, 1982).

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**Tree Stand Conditions  
Threaten Forest Resources**

Current tree stand conditions and the continuing absence of historically occurring frequent wildfires threaten various national forest resources in the interior West. For example, according to a 1998 analysis by the Department of the Interior's Fish and Wildlife Service, of the 146 threatened, endangered, or rare plant species found in the coterminous states for which there is conclusive information on fire effects, 135 species benefit from wildfire or are found in fire-adapted ecosystems.<sup>6</sup>

Furthermore, according to a 1994 Northern Arizona University study, increases in density and changes in species composition alter soil moisture, as well as the availability of nutrients and water for plants and animals, watershed functioning and stream flow, and water quality, affecting both terrestrial and aquatic species. Experts have also expressed concern about the possibility that such changes will accelerate mortality among the remaining older ponderosa pines and other trees.

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**Catastrophic Wildfires  
Are a Serious  
Consequence of  
Current Tree Stand  
Conditions in the  
Interior Western  
National Forests**

The Forest Service estimates that 39 million acres of national forestlands in the interior West are at high risk of catastrophic wildfire because of denser stands and related conditions. As a result, the number and size of large, intense fires have grown over the last decade, resulting in higher fire suppression and preparedness costs and greater damage. Such fires, which are increasingly unstoppable, threaten not only the sustainability of national forest resources, but also human health, lives, property, and infrastructure in nearby communities. Experts have estimated that a window of only 10 to 25 years is available for taking effective action before widespread, long-term damage from such fires occurs.

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**Catastrophic Wildfires Are  
Increasing Because of  
Changing Tree Stand  
Conditions**

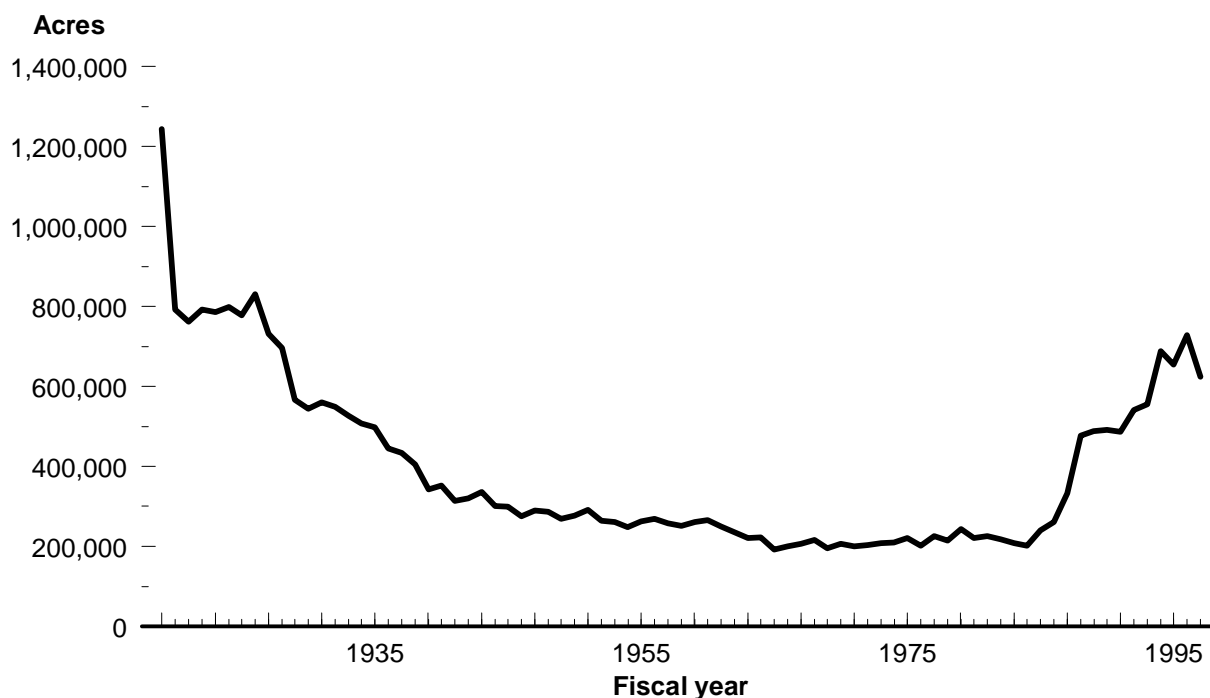
In the currently denser stands of the national forests in the interior West, where many smaller dead and dying trees now often form fuel "ladders" to the crowns of larger trees—and where such stands are often continuous rather than separated by stands that have recently been thinned by fire—wildfires have increasingly become large, intense, and catastrophic. Our analysis of the Forest Service's data shows that the agency was highly effective in suppressing fires on the national forests for about 75 years after 1910, reducing substantially the number of national forest acres burned annually, over 90 percent of which have been in the interior West.

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<sup>6</sup>Bill Leenhouts, "Assessment of Biomass Burning in the Coterminous United States," Fish and Wildlife Service, Conservation Ecology, Vol. 2, No. 1 (1998), citing analysis of data presented in Effects of Fire on Threatened and Endangered Plants: An Annotated Bibliography, U.S. Department of the Interior, National Biological Service, Information and Technology Report 2 (Washington, D.C.: 1995).

However, figure 2.3 shows that recently the agency's efforts have been less effective.

**Figure 2.3: Number of National Forest Acres Burned by Fire, 1910-97**

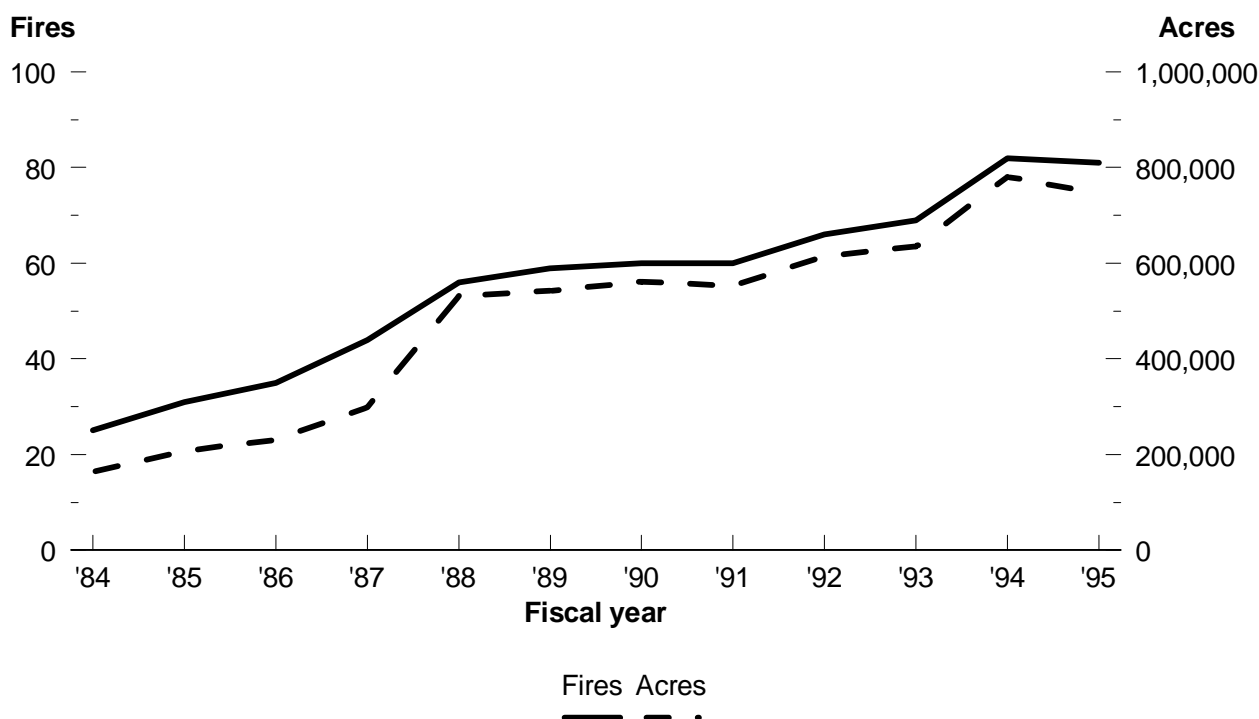


Note: The number of acres represents the 10-year rolling average at each point. Since 1990, 90 percent of national forest acres burned by fire were in the interior West.

Source: GAO's presentation of data from the Forest Service.

As figure 2.3 shows, over the last decade, the number of acres of national forestlands burned by wildfires has begun to increase, reversing the trend of the previous three-quarters of a century. This is because excessive accumulated fuels have made fires larger and more intense, as shown in figure 2.4.

Figure 2.4: Number and Total Acres Burned by Large Wildfires on All National Forests, 1984-95



Note: 10 year rolling average. Since 1990, 91 percent of the large fires (those burning 1,000 acres or more) and 96 percent of the acres burned were in the interior West.

Source: GAO's presentation of data from the Forest Service.

As shown in figure 2.4, since 1984, the average annual number of fires on national forests that burn 1,000 acres or more has increased from 25 to 80, and the number of total acres burned (including acres on nearby lands) by these fires has more than quadrupled, from 164,000 to 765,000. Since 1990, 91 percent of these large fires and 96 percent of the acres they burned were in the interior West.

In 1995, the Forest Service estimated that 39 million acres, or about one-third of all lands it manages in the interior West—more than ever known before and more than in all other regions of the country combined—are now at high risk of large, uncontrollable, catastrophic

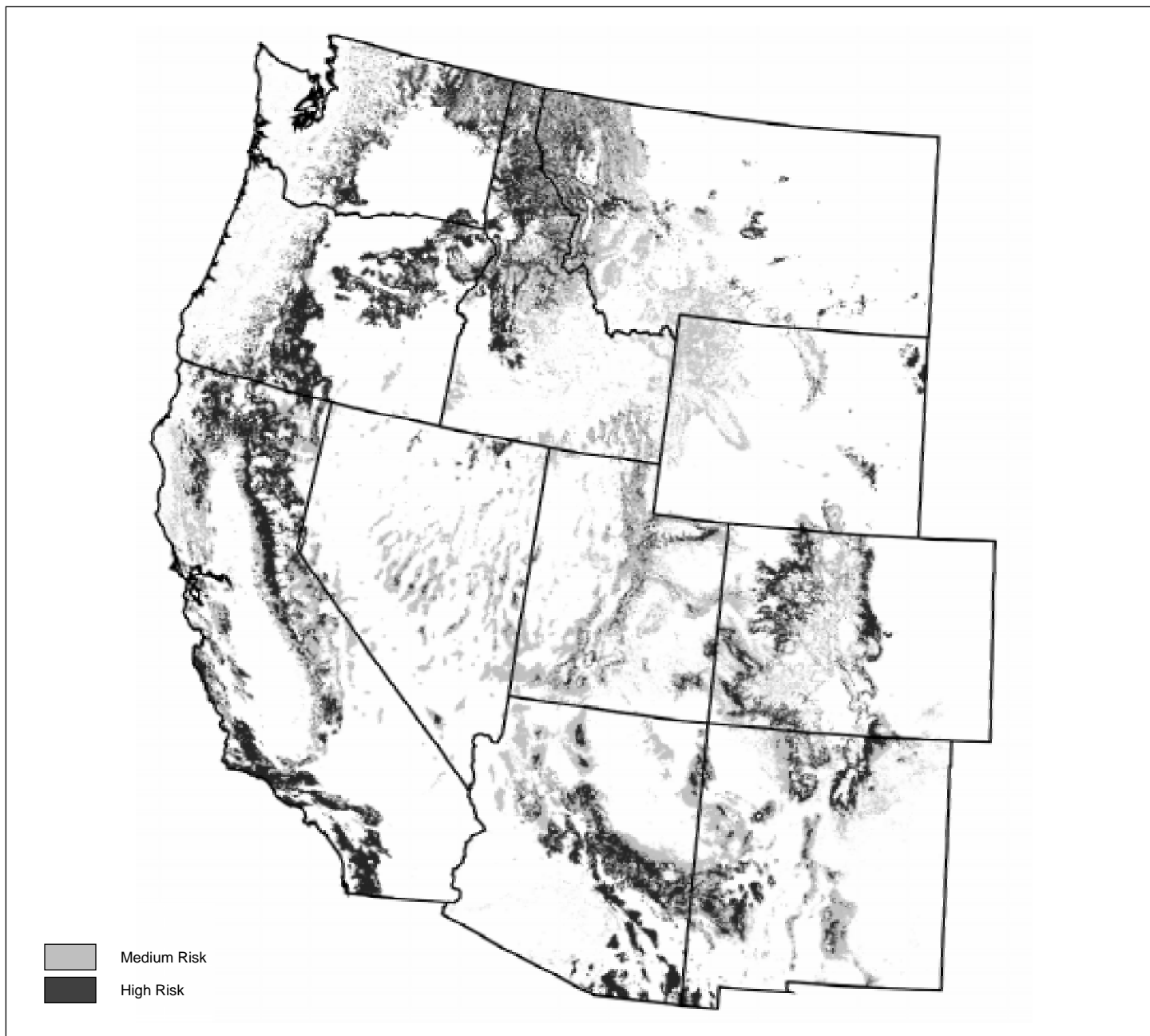
wildfire. According to agency officials, virtually all of these lands are located in the lower-elevation, frequent-fire forests of the interior West that have historically been dominated by ponderosa pine. These forests are particularly susceptible to such fires because, as stated in a 1995 internal agency report,<sup>7</sup> far more cycles of fire (up to 10) were suppressed in these forests than in the higher-elevation, lodgepole-pine-dominated forests—where generally only one or no fire cycle was suppressed. Figure 2.5 shows locations in the interior West identified by experts outside the Forest Service where the risks of fire have been rated medium or high. Areas currently at medium risk are included because fuels can further accumulate on them so that, over time, they may become high-risk areas.

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<sup>7</sup>Fire Economics Assessment Report, USDA, Forest Service (Washington, D.C.: 1995).



**Figure 2.5: Western Forestlands at Medium and High Risk of Catastrophic Fire**



Source: American Forests.

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**Catastrophic Wildfires  
Threaten the Sustainability  
of Forest Resources and  
People**

Compared with other forest fires, catastrophic wildfires burn many more acres, destroy much more timber and wildlife habitat, and subject exposed soils to substantial erosion during subsequent rains, damaging water quality. As a result, catastrophic wildfires compromise the forests' ability to sustain timber, outdoor recreation, clean water, and other uses.

These increasing numbers of larger, more intense fires also pose hazards to human health, safety, and property. For example, 14 firefighters lost their lives in the 1994 South Canyon Fire in Colorado, which—because of its size and intensity—was able to rapidly surround them. Although investigation reports of this fire did not identify fuel levels as a causal factor in the fatalities, they cited highly flammable and hazardous fuels as a contributing factor. This fire did not originate in a frequent-fire ponderosa stand, but in a stand of a different species, indicating that catastrophic wildfire hazards are not limited to stands dominated by ponderosa.

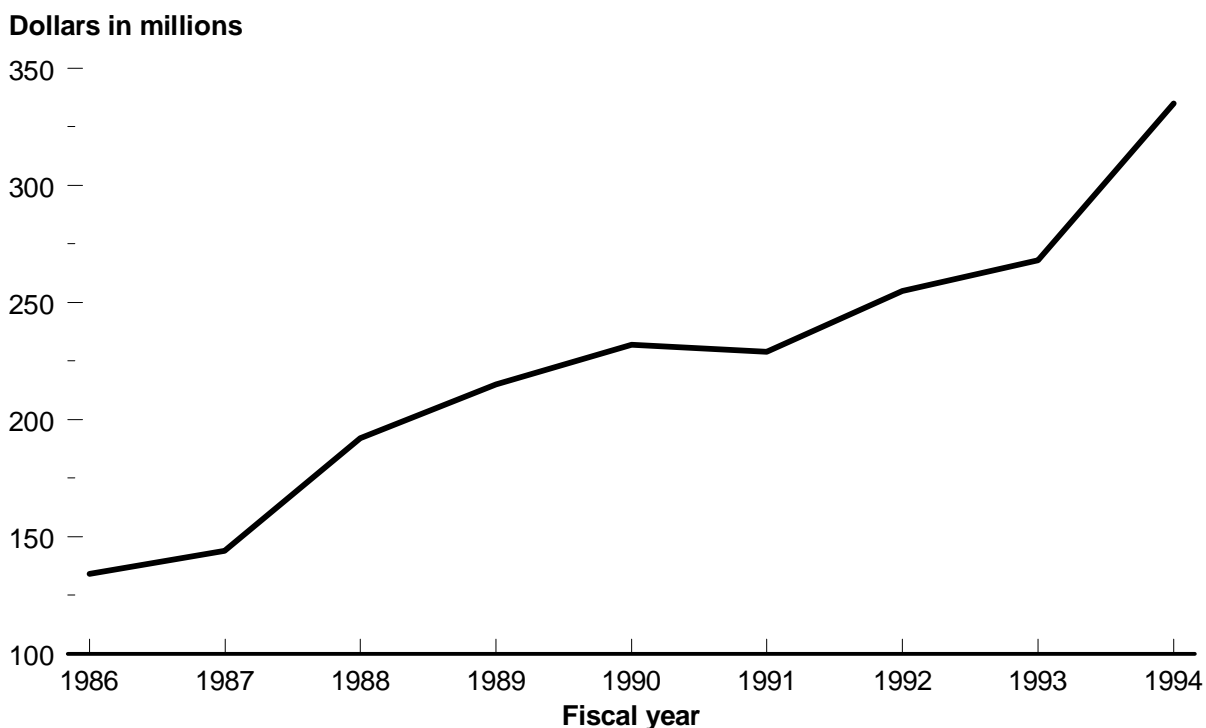
The hazards to human health, life, and property are especially acute along the national forests' boundaries, where population has grown rapidly in recent years—an area termed the “wildland/urban interface.” Because smoke from such fires contains substantial amounts of fine particulate matter and other hazardous pollutants, the fires can pose significant health risks to people living in this interface. Such fires also threaten infrastructure vital to nearby human communities. For example, the 1996 Buffalo Creek fire, which burned several thousand acres and threatened private property in the wildland/urban interface southwest of Denver, left forest soils subject to extreme erosion. Subsequent repeated rainstorms washed what ordinarily would have been several years' worth of sediment into a reservoir that supplies Denver with water. As a result, the Denver Water Board has estimated that it will incur several million dollars in ongoing expenses for dredging the reservoir and treating the water—an amount several times greater than the cost of fighting the fire.

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**Catastrophic Fires Are  
Increasingly Costly**

The growing number of large wildfires and acres burned—coupled with the increasing complexity of suppression in the wildland/urban interface—has greatly increased the Forest Service's costs of fighting fires, as shown in figure 2.6.

Figure 2.6: Forest Service's Expenditures for Wildfire Suppression, Fiscal Years 1986-94



Note: The expenditures for each year represent the 10-year rolling average in constant 1994 dollars. Since 1990, 95 percent of these expenditures have been in the interior West.

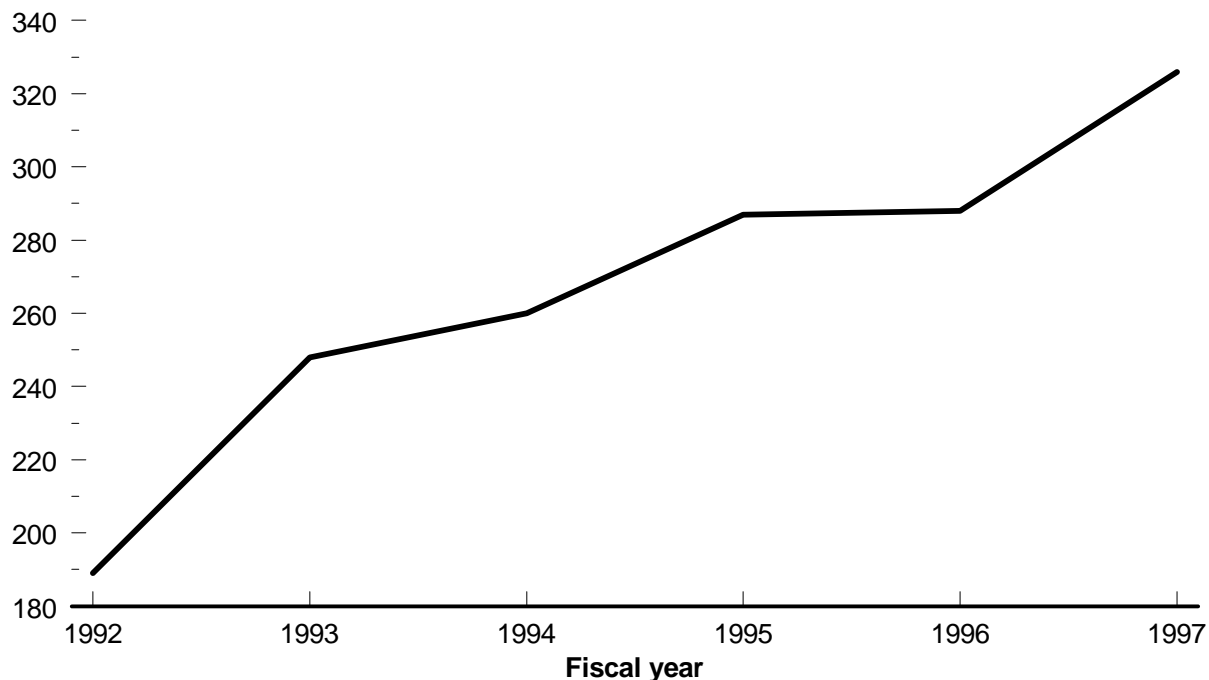
Source: GAO's presentation of the Forest Service's latest available data.

As figure 2.6 indicates, from fiscal year 1986 through fiscal year 1994, the 10-year rolling average of annual costs for fighting fires grew from \$134 million to \$335 million in constant 1994 dollars, a 150-percent increase. Since 1990, 95 percent of these costs were incurred in the interior West.

Moreover, as shown in figure 2.7, the costs associated with preparedness, including the costs of keeping equipment and personnel ready to fight fires, have also been increasing.

**Figure 2.7: Forest Service's Expenditures for Wildfire Preparedness, Fiscal Years 1992-97**

Dollars in millions



Note: For 1994, the last year for which figures by region were available, over 90 percent of these expenditures were in the interior West.

Source: Forest Service.

As figure 2.7 indicates, for the 6 fiscal years from 1992 through 1997, fire preparedness costs increased by 72 percent, from \$189 million to \$326 million.<sup>8</sup> However, even though expenditures for both suppression and preparedness have increased in recent years, the agency's fiscal year 2000 budget proposal calls for maintaining the current funding levels for both. Given the growing threats of catastrophic wildfire, the agency's budget proposal notes that maintaining the current funding level for

<sup>8</sup>Federal Lands: Information About Land Management Agencies' Wildfire Preparedness Activities (GAO/RCED-98-48R, Dec. 18, 1997) and Federal Lands: Wildfire Preparedness and Suppression Expenditures for Fiscal Years 1993 Through 1997 (GAO/T-RCED-98-247, Aug. 4, 1998).

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preparedness will result in increased risks of injury and loss of life to both the public and firefighters.<sup>9</sup>

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**Time Is Running Out for  
Addressing the  
Catastrophic Wildfire  
Problem**

Many experts believe that efforts to resolve the growing threats of catastrophic wildfires are in a race against time. According to a 1993 assessment of forest health in the interior West published in 1994, only a “brief window of opportunity” of perhaps 15 to 30 years exists for effective management intervention before damage from uncontrollable wildfires becomes widespread.<sup>10</sup> More than 5 of those years have already passed, leaving only about 10 to 25 years remaining. While some future catastrophic wildfires may be inevitable and the amount of time remaining to address this problem is uncertain, experts agree that the solution, like the causes, will be largely the result of human choice and public policy. As the Forest Service noted, citing the 1994 National Commission on Wildfire Disasters,

“Uncontrollable wildfire should be seen as a failure of land management and public policy, not as an unpredictable act of nature. The size, intensity, destructiveness and cost of . . . wildfires . . . is no accident. It is an outcome of our attitudes and priorities. . . . The fire situation will become worse rather than better unless there are changes in land management priority at all levels.”

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<sup>9</sup>FY 2000 Budget Justification for the Committee on Appropriations, USDA, Forest Service (Feb. 1999).

<sup>10</sup>Assessing Forest Ecosystem Health in the Inland West, Forest Policy Center (Washington, D.C.: 1994).

# Recent Agency Actions to Address Catastrophic Wildfires Are Important but May Be Too Little, Too Late

In the last decade, the Forest Service has undertaken several actions to better understand and reduce the threat of catastrophic wildfires on national forests in the interior West. The Congress has been increasingly supportive of these efforts. Nonetheless, the agency may not be able to achieve its announced goal of adequately resolving the problem by the end of fiscal year 2015. Our analysis of the agency's plans and data indicates that as many as 10 million acres may remain at high risk at that time because the agency will need to divide its planned efforts and resources between reducing accumulated fuels on high-risk areas in the interior West and maintaining current low-risk conditions on other national forestlands.

## The Agency Has Recently Taken Important Steps to Address Catastrophic Wildfires

In recent years, the Forest Service has taken steps to address the increasing threat of catastrophic wildfires on national forests. For instance, in 1990, the agency, along with other federal and state agencies, initiated a forest health monitoring program to better identify tree stand conditions, including outbreaks of insects and diseases and dead trees. In 1995, it announced its intention to refocus its fire management program on reducing accumulated fuels. Specifically, in a 1995 report, the agency recommended increasing the number of acres on which accumulated fuels are reduced annually from about 570,000 to about 3 million by fiscal year 2005.<sup>11</sup> In 1997, the Chief of the Forest Service said it was the agency's intention to implement this recommendation, and the agency plans to continue reducing fuels on 3 million acres per year through fiscal year 2015. By that time, the agency believes that it will have adequately reduced the current high risks to national forestlands of uncontrollable, highly destructive wildfires.

To implement its increased emphasis on reducing accumulated fuels, the Forest Service restructured and redefined its fiscal year 1998 budget for wildland fire management to better ensure that funds are available for these activities.<sup>12</sup> In fiscal year 1998, it announced that the funds appropriated for reducing fuels would be allocated to (1) protect high-risk wildland/urban interfaces, with special emphasis on areas subject to frequent fires; (2) reduce accumulated fuels within and adjacent to wilderness areas; and (3) lower the expected long-term costs of suppressing wildfires by restoring and maintaining fire-adapted

<sup>11</sup>Course to the Future: Positioning Fire and Aviation Management, USDA, Forest Service (Washington, D.C.: 1995).

<sup>12</sup>FY 1998 Budget Explanatory Notes for the Committee on Appropriations, USDA, Forest Service (Feb. 1997).

ecosystems.<sup>13</sup> In addition, the Forest Service has identified reducing accumulated fuels on the national forests as a key measure of its performance in accomplishing its high-priority, long-term strategic goal of restoring and protecting forested ecosystems.<sup>14</sup>

In the past 5 years, the Forest Service—either alone or with the Department of the Interior and other federal agencies—has issued several reports (1) addressing the health of forests in the interior West as well as in other regions of the country, including the health effects of fire suppression and (2) proposing management approaches to more efficiently and effectively reduce accumulated fuels.<sup>15</sup> The agency has also (1) revised its wildland fire management policy to more clearly spell out its responsibilities and reimbursable costs so that nonfederal parties can understand the consequences of not working with the agency to reduce the risk of wildfire on their adjacent lands and (2) proposed a number of demonstration projects in collaboration with willing nonfederal partners to demonstrate the role of mechanical methods (including timber harvesting) of removing materials to reduce accumulated fuels.

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## The Congress Has Increasingly Supported the Agency's Efforts

The Congress has supported the Forest Service's efforts to reduce accumulated fuels by, among other things, increasing the funding for this activity. In addition, in acting on the agency's fiscal year 1998 budget, the House and Senate appropriations committees approved the Forest Service's budget restructuring to better ensure that funds are available for reducing accumulated fuels. The committees also earmarked \$8 million in fiscal year 1998 for the agency and the Department of the Interior to begin a multiyear program, called the Joint Fire Science Program, to gather consistent information on accumulated fuels and ways to reduce them. In January 1998, the agencies issued a plan for conducting this program.<sup>16</sup> This plan called for the Forest Service and Interior to conduct and sponsor

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<sup>13</sup>FY 1999 Budget Explanatory Notes for the Committee on Appropriations, USDA, Forest Service (Feb. 1998).

<sup>14</sup>USDA Strategic Plan 1997-2002: A Healthy and Productive Nation in Harmony With the Land, Forest Service Strategic Plan, USDA, Office of the Secretary (Sept. 30, 1997) and FY 1999 USDA Forest Service Annual GPRA Performance Plan, USDA, Forest Service (Feb. 4, 1998).

<sup>15</sup>Healthy Forests for America's Future: A Strategic Plan, USDA, Forest Service (Washington, D.C.: 1993); Fire Related Considerations and Strategies in Support of Ecosystem Management, USDA, Forest Service (Washington, D.C.: 1993); Western Forest Health Initiative, USDA, Forest Service (Washington, D.C.: 1994); Fire Economics Assessment Report, USDA, Forest Service (Washington, D.C.: 1995); and Federal Wildland Fire Management Policy and Program Review, Department of the Interior and USDA, Forest Service (Washington, D.C.: 1995 and 1996).

<sup>16</sup>Joint Fire Science Plan, Department of the Interior and USDA, Forest Service (Washington, D.C.: 1998).

research and analysis projects aimed at better understanding (1) the location and extent of problems with accumulated fuels, (2) the effects on other resources of different approaches to reducing these fuels, (3) the relative cost-effectiveness of these different approaches, and (4) the importance of compatible interagency approaches to monitoring and reporting efforts to reduce fuels. Recently, the initial projects under this multiyear program were authorized and begun. Additionally, the Congress, in its fiscal year 1999 appropriation to the Forest Service, approved the agency's request to conduct "stewardship contracting demonstration projects" in collaboration with willing nonfederal partners. These projects are intended to demonstrate the role of mechanical methods (including timber harvesting) of removing materials to reduce accumulated fuels. The Congress also authorized the Forest Service, in implementing these demonstration projects, to experiment with alternative contracting procedures.

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## **Actions Planned to Date May Not Be Sufficient or Timely Enough to Achieve Agency Goals**

Although the Forest Service, with the active support of the Congress, is taking steps to address the growing risks of catastrophic wildfires on the national forests, it may not be able to adequately resolve the problem by the end of fiscal year 2015. In particular, the agency's current plans may significantly underestimate the number of acres on which fuels must be reduced annually to adequately reduce fire hazards. Our analysis of the agency's initial plans and data indicates that as many as about 10 million acres in the interior West may still have excessive fuel levels and still be at high risk of uncontrollable, catastrophic wildfire at the end of fiscal year 2015.

This shortfall may occur largely because the Forest Service has not linked its criteria for allocating the funds appropriated to reduce accumulated fuels to its actual allocation of these funds. The current and planned allocations largely emphasize maintaining satisfactory conditions on lands outside the frequent-fire forests of the interior West that currently have low levels of accumulated fuels so that conditions on them do not also become hazardous. To maintain satisfactory conditions on these other forests, the Forest Service will need to continue reducing fuels on them, at a rate of about 1 million acres per year. Thus, the agency's plans to reduce fuels nationally on 3 million acres per year will provide for only about 2 million acres on national forests in the interior West. This level of accomplishment will likely fall short of the levels needed to meet the agency's goals for the interior West's frequent-fire forests. Moreover, despite budget allocation criteria emphasizing the restoration of high-risk



interface areas within the interior West's frequent fire forest ecosystems, such restoration activities will be limited by incomplete information. As the agency noted in February 1999, it has not yet mapped these interface areas with the precision needed to identify and design individual high-priority fuel reduction projects.

Additionally, despite earlier plans to steadily increase its fuel reduction efforts, the agency is now intending to scale back the work, according to its fiscal year 2000 budget proposal. Initially, it planned to increase its efforts nationwide from about 1.5 million acres in fiscal year 1999 to 1.8 million acres in fiscal year 2000, building toward 3 million acres per year by fiscal year 2005. However, in its recently proposed fiscal year 2000 budget, it called for reducing fuels on only 1.3 million acres, or on fewer acres than planned for the current fiscal year.<sup>17</sup>

However, it should be noted that the Forest Service could very likely substantially reduce fire hazards without reducing fuels on all 39 million acres currently at high risk of catastrophic fire. For example, it might be able to construct fuelbreaks—i.e., areas where excessive fuels have been removed in strategic locations to isolate areas that still have excessive fuels—and thus limit the spread of large fires. But the Forest Service has not yet developed a general strategy for selectively reducing fuels, nor for implementing any alternative strategic approach that would allow it to systematically assign priorities to areas and thus safely decide not to reduce fuels on some lower-priority areas. Until it develops such a strategy, it has no basis for eliminating any current high-risk areas from its fuel reduction efforts, nor can it adequately evaluate the relative effectiveness or efficiency of its current efforts.

The Forest Service stated in 1996 that its forest planning efforts did not adequately consider historical fire disturbance cycles. The purpose of the Joint Fire Science Program is to obtain information critical to planning and undertaking effective agency actions. However, an agency official involved in implementing the program said 10 years will be needed to complete it and that, as it is completed, national forests will use its findings to amend or revise current individual forest plans. Efforts to revise forest plans can take several years.

Progress to date in gathering data under the program has proved difficult. In September 1998, the agency said that under the Joint Fire Science Plan,

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<sup>17</sup>FY 2000 Budget Justification for the Committee on Appropriations, USDA, Forest Service (Feb. 1999).

it would complete an initial mapping of the locations and levels of existing hazardous conditions on national forests before the end of the year. However, in February 1999, the agency said that the results of initial efforts to map these conditions still needed additional review and that, even when the initial mapping was completed, the data would not yet be precise enough to provide a basis for ranking and designing site-specific fuel reduction projects. Although the Forest Service is experimenting with using this type of mapping information in conjunction with other, more local analyses to rank and design individual fuel reduction projects in the Idaho Panhandle area, it has not yet developed a consistent, agencywide mapping approach.

The recently approved stewardship contracting demonstration projects—for testing new partnership and contracting procedures for reducing fuels—are in the initial selection and analysis stage. Critical to the usefulness of these demonstration projects will be the Forest Service's development, at their outset, of a common framework for systematically evaluating their effectiveness. Such a framework is necessary for the agency to gather and summarize consistent information on the projects' implementation, results, and lessons learned so that the lessons can be applied more generally to the agency's future fuel reduction efforts. However, no common evaluation framework has been developed yet, even though many of the demonstration projects are soon to be implemented.

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# The Agency Lacks a Cohesive Strategy for Addressing Several Barriers to Effective Action

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Without adequate data, the Forest Service has not been able to develop a cohesive strategy for addressing numerous policy, programmatic, and budgetary factors that present significant barriers to the accomplishment of its fuel reduction goals. These factors include (1) difficulties in reconciling needed actions with other legislatively mandated stewardship objectives to protect resources, (2) program incentives that tend to focus on areas of that may not present the greatest wildfire hazards, (3) statutorily defined contracting mechanisms that do not facilitate the removal of many hazardous fuels, and (4) costs for reducing fuels on high-risk areas that may be as high as \$12 billion between now and the end of fiscal year 2015. The agency has not systematically identified the steps or activities to be undertaken in order overcome these barriers, nor has it developed a schedule for accomplishing them.

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## Several Barriers Exist to Effective Agency Action

Methods to reduce fuels can be difficult to reconcile with agencies' other responsibilities. In dense tree stands, fires are difficult to control and may escape. In addition, controlled burning on a scale consistent with that of historically frequent fires is difficult to use without violating air quality standards established under the Clean Air Act. However, mechanically removing fuels (through commercial timber harvesting, among other means), can also adversely affect wildlife habitat and water quality in many areas and, in any event, areas with commercially valuable timber are often not those where the greatest wildfire hazards exists. In addition, the agency's fuel reduction program rewards managers for the number of acres on which they reduce fuels, without taking into account the relative hazards on those acres; it does not reward managers for reducing fuels on the most hazardous acres. Finally, the agency's statutorily defined contracting mechanisms were primarily designed for removing high-value timber, not excess accumulated fuels that are generally low in value and can be costly to remove. As a result, the cost to the Forest Service for reducing fuels on the 39 million acres at high risk may be about \$12 billion between now and the end of fiscal year 2015, or an average of about \$725 million annually, and these costly activities will have to be repeated in the future.

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## Fuel Reduction Activities Are Sometimes Difficult to Reconcile With Other Stewardship Objectives

Activities for reducing accumulated fuels can sometimes be difficult to reconcile with other legislatively mandated stewardship objectives, including meeting clean water quality standards and protecting threatened and endangered species. According to an agency official, in the past, the Forest Service sometimes used chemicals (herbicides) to kill

undergrowth, which could then be burned. Combining these two methods was often less costly than mechanically removing the undergrowth. The agency has, however, largely stopped using herbicides because of concerns about their adverse effects on water quality and human health. Additionally, because large ponderosa pine trees were selectively harvested and fire was suppressed in the Deschutes National Forest in Oregon, ponderosa stands have largely been replaced by abnormally dense stands of Douglas fir. However, many of the Douglas fir stands cannot be removed because they now provide habitat for the threatened northern spotted owl, whose naturally occurring habitat on the western side of the Cascade mountain range has been significantly reduced by timber harvesting.

Many agency and outside experts believe that, ultimately, avoiding catastrophic wildfires and restoring forest health in the interior West will require reintroducing fire through burning under controlled conditions to reduce fuels. However, the use of controlled fire in the interior West has two limitations. First, winter snows limit the time available for burning, and dry summer weather creates a high risk that, given massive levels of accumulated fuels, controlled fires will escape and become uncontrollable, catastrophic wildfires. Second, several officials and experts we spoke with believe that emissions from controlled fires on the scale that is needed to adequately reduce fuels would violate federal air quality standards under the Clean Air Act. Hence, in their view, the act would not permit the desired level of burning either immediately or possibly even in the long term. The Forest Service and the Environmental Protection Agency, which administers the Clean Air Act, are currently conducting a 3-year experiment to better determine the impact of emissions from controlled fires.

For these reasons, many experts agree that fuels must be reduced in most areas of the interior West, at least initially, by mechanical means, including commercial timber harvesting, in conjunction with controlled burning. The Forest Service currently uses its timber sales management program to reduce accumulated fuels.<sup>18</sup> However, the use of timber harvesting to reduce fuels has been limited by concerns about its adverse effects on other stewardship objectives. Specifically, in fiscal year 1997, timber harvesting was used to reduce fuels on only about 95,000 acres, or fewer than 5 percent of the acres on which fuels will need to be reduced annually to achieve the agency's long-term goal. Forest Service officials

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<sup>18</sup>FY 1999 Budget Explanatory Notes for the Committee on Appropriations, USDA, Forest Service (Feb. 1998).

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told us that it was not likely that commercial timber harvesting could be increased enough to adequately reduce fuels on the vast acreage needing such reductions.

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**Incentives in the Timber  
and Fuel Reduction  
Programs Tend to Focus  
Efforts on Areas of Lesser  
Hazard**

Moreover, mechanical removals under both the timber sales management program and the fuel reduction program funded by appropriations currently involve incentives that tend to focus efforts on areas that may not present the greatest fire hazards. For example, under its fuel reduction program, the Forest Service's lone performance indicator measures the number of acres treated. Agency field staff told us that funding for forests often depends on their ability to contribute to the agency's acreage targets. As a result, forest staff often focus on areas where the costs of reducing fuels are low so that they can reduce fuels on more acres, rather than on those areas with the highest fire hazards, including especially the wildland/urban interfaces. These high-hazard areas often have significantly higher per-acre costs because of limitations on the use of less expensive controlled fires as a tool to reduce the accumulated fuels. Although the Forest Service is considering making changes to its current performance indicator, it has not yet done so.

Timber harvesting may make useful contributions to reducing accumulated fuels in many circumstances. However, reducing fuels with the funds allocated for timber sales management may also provide an incentive for forests to focus on less critical areas. The Forest Service stresses that its timber sales management program is increasingly being used for efforts to improve forest health, including efforts to prevent catastrophic fires.<sup>19</sup> The agency relies on timber production to fund many of its programs and activities, and all three of its budget allocation criteria for timber activities relate solely to the volume of timber produced or offered. As a result, as forest officials told us, they tend to (1) focus on areas with high-value commercial timber rather than on areas with high fire hazards or (2) include more large, commercially valuable trees in a timber sale than are necessary to reduce the accumulated fuels. Similarly, an interagency team that reviewed the implementation of the Emergency Salvage Timber Sale Program observed that some Forest Service personnel focused more on harvesting timber than on protecting forested ecosystems.<sup>20</sup> This tendency of some agency personnel was further

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<sup>19</sup>National Summary: Forest Management Program Report for Fiscal Year 1997, USDA, Forest Service, FS-627 (July 1998).

<sup>20</sup>Interagency Salvage Program Review, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (Silver Spring, Md., Oct. 8, 1996).

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documented in a 1999 report by the Department of Agriculture's Office of Inspector General.<sup>21</sup>

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**Statutorily Defined  
Contracting Mechanisms  
Do Not Facilitate the  
Removal of Many  
Hazardous Fuels**

Most of the trees that need to be removed to reduce accumulated fuels are small in diameter and have little or no commercial value. For example, to return experimental forest plots near Flagstaff, Arizona, to historical conditions, 37 tons per acre of nonmarketable trees and vegetation had to be disposed of by being placed in a pit and burned. However, the agency's largely statutorily defined contracting procedures were not designed to (1) facilitate the systematic removal of large volumes of low-value material over a number of years, (2) readily combine funds for conducting timber sales with funds for reducing accumulated fuels, or (3) allow contractors to retain this low-value material to partially offset the costs of its removal.

More specifically, the agency's two principal contracting procedures for removing materials from national forests are (1) competitively bid timber sale contracts under which the party removing the material purchases it at fair market value and expects to sell it for a profit and (2) service contracts, funded by appropriations, which do not involve selling the material, but merely paying a contractor for removing it. The National Forest Management Act of 1976 generally does not allow materials worth more than \$10,000 to be removed from national forests under service contracts; instead, such materials must generally be removed under competitively bid timber sale contracts.<sup>22</sup> However, low-value materials are unattractive to timber purchasers. As a result, the value of this contracting procedure for reducing low-value fuels is quite limited.

While the materials to be removed may not be valuable enough for contractors to make a profit by purchasing them, the materials often have some lesser value. If purchasers could keep this material, they could apply its lesser value to offset at least part of their costs for removing it. They could then charge the Forest Service less for removal, saving the government money while reducing fuels on more acres for any given level of appropriated funding. However, the agency generally does not have the authority to trade goods (in the form of low-value forest materials) for a service (such as removing them).<sup>23</sup> Because of these restrictions, in 1998,

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<sup>21</sup>Forest Service Timber Sale Environmental Analysis Requirements, Evaluation Report No. 08801-10-AI, USDA, Office of Inspector General (Washington, D.C.: Jan. 1999).

<sup>22</sup>16 U.S.C. 472a.

<sup>23</sup>See Paul C. Ringgold, Land Stewardship Contracting in the National Forests: A Community Guide to Existing Authorities, Pinchot Institute for Conservation (Washington, D.C.: 1998).

Agriculture's Office of General Counsel determined that only 6 of 23 projects proposed by the Forest Service to demonstrate, among other things, the role of timber harvesting in reducing accumulated fuels, could proceed under the agency's existing statutory authority. The remaining projects would, among other things, have involved removing material of greater total value than is allowed under service contracts or letting contractors keep some material in exchange for removing it. In the Fiscal Year 1999 Omnibus Consolidated and Emergency Supplemental Appropriations Act, the Congress authorized the Forest Service, through fiscal year 2002, to enter into 28 individual demonstration project contracts under which (1) the value of the material removed may be used by the contractor to offset the costs of removal, and (2) there is no limitation on the value of the material to be removed. However, the more general authority temporarily granted to the agency in the early 1990s to enter into "land stewardship contracts"—under which contractors were allowed to retain material they removed in exchange for achieving desired conditions on the national forests—has not been renewed.<sup>24</sup>

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### **Costs for Removing Hazardous Fuels Will Be Very High**

Because the materials removed through fuel reduction efforts often have low or no value, the revenue they generate will not cover the costs of their removal. Consequently, agency officials and outside analysts agree that reducing accumulated fuels in the interior West is likely to require hundreds of millions of dollars a year in appropriated funds. Our preliminary analysis of the Forest Service's fuel reduction costs—which, according to the agency's data average about \$320 per acre for the combination of burning and mechanical removal that is necessary in the interior West—indicates that as much as \$12 billion, or about \$725 million a year, may be needed to treat the 39 million acres at high risk of uncontrollable wildfire by the end of fiscal year 2015. These costs might be less if the agency reduced current hazards on the 39 million acres selectively, in accordance with a systematic strategy and set of priorities.

For fiscal year 1999, the agency requested and received \$65 million to reduce accumulated fuels—or less than one-tenth of the annual level that may be needed to accomplish its goal. At that time, it projected that it would increase its request to \$102 million for fiscal year 2000, in keeping with its announced intention to increase its fuel reduction efforts through fiscal year 2015. However, in its recently released fiscal year 2000 budget

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<sup>24</sup>See Forest Service Timber Sale Practices and Procedures: Analysis of Alternative Systems, Congressional Research Service, 95-1077 ENR (Washington, D.C.: 1995) and M. Mitsos, *Improving Administrative Flexibility and Efficiency in the National Forest Timber Sale Program: Scoping Session Summary*, Pinchot Institute (Washington, D.C.: 1996).

request, the agency instead asked for the same \$65 million it received for fiscal year 1999. The agency stated that, because fuels have already been reduced on the least costly areas, this funding level will provide for even fewer acres than it did in the previous year.

Moreover, our analysis of the costs to reduce fuels on national forest acres identified as being at high risk examined only the “first-time” costs of reducing fuels on them. Fuels will have to be reduced periodically in order to maintain forest health. For example, in 1998, the Wenatchee National Forest in Washington stated that it would have to begin reducing fuels on areas treated only 10 to 15 years ago because undergrowth had accumulated in the interim, posing new fire hazards. Forest Service officials we spoke with agreed with a 1997 observation by the Secretary of the Interior that substantial efforts to reduce fuels will have to be repeated three to five times or more on these lands over many decades, although the later repetitions may be less costly.

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## **The Agency Lacks a Cohesive Strategy for Addressing Barriers**

We have previously noted that the Forest Service lacks accountability in implementing its ecosystem management approach to ensure sustainable multiple uses of the national forests. Specifically, we noted that (1) its goals and objectives under this approach are not linked to performance measures to ensure their accomplishment and (2) it lacks a goal or schedule for achieving accountability for its performance.<sup>25</sup> This observation applies equally to the agency’s efforts to address the threat posed by catastrophic wildfires to ensuring sustainable multiple uses. For instance, as noted in this report, the incentive implicit in its current performance measure for fuel reduction tends not to focus activities on the most hazardous areas. Thus, the agency has no meaningful performance measure and goal related to reducing catastrophic wildfire hazards. Such a meaningful performance measure and goal are critical if the agency is to develop a cohesive strategy for reducing accumulated fuels and be held accountable for accomplishing this strategy.

According to Forest Service officials, the agency has not established such a meaningful performance measure and goal for reducing fuels because it lacks sufficient data on the location of acres in national forests at high risk of catastrophic fire, as well as on the cost-effectiveness and effects on other resources of methods for reducing them. Our observations at the forests we visited confirmed this lack of data. Forest officials could only

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<sup>25</sup>Forest Service: Lack of Financial and Performance Accountability Has Resulted in Inefficiency and Waste (GAO/T-RCED/AIMD-98-135, Mar. 26, 1998).



estimate or tell us in general terms how many acres they believed were at such risk, but could not identify particular high-risk locations or high-priority areas with any significant precision. Agency officials believe that having such data, which the Joint Fire Science Program is intended to identify, will better enable them both to develop a meaningful performance goal and measure and to better reconcile different fuel reduction approaches with other stewardship objectives. Similarly, they believe that data from the stewardship contracting demonstration projects will help them identify changes in statutorily defined contracting procedures that would better facilitate the accomplishment of fuel reduction goals.

However, the agency has not systematically identified a cohesive set of activities or steps that it will undertake to obtain needed data, better reconcile objectives, or identify desirable changes in contracting procedures. Nor has it outlined a schedule for accomplishing these tasks.

# Conclusions and Recommendation

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## Conclusions

We believe that the threats and costs associated with increasingly uncontrollable, catastrophic wildfires, together with the urgent need for action to avoid them, make them the most serious immediate problem related to the health of national forests in the interior West. We also believe that the activities planned by the Forest Service may not be sufficient and may not be completed during the estimated 10- to 25-year “window of opportunity” remaining for effective action before damage from uncontrollable wildfires becomes widespread. The tinderbox that is now the interior West likely cannot wait that long for a cohesive strategy to be implemented. Simply allowing nature to take its inevitable course may cost more—not only for fire suppression, but also in human lives and damage to natural resources, human health, property, and infrastructure—than would undertaking strategic actions now.

The increasing number of uncontrollable and often catastrophic wildfires in the interior West, as well as the significant costs to reduce growing hazards to natural resources and human health, safety, property, and infrastructure, present difficult policy decisions for the Forest Service and the Congress: Does the agency request, and does the Congress appropriate, the hundreds of millions of dollars a year that may be required to fund an aggressive fuel reduction program? If enough is not appropriated, what priorities should be established? How can the need for reintroducing fire into frequent-fire forests and mechanical removals best be reconciled with meeting air quality standards and other stewardship objectives? What incentives and changes in statutorily defined contracting procedures are needed to facilitate the mechanical removal of low-value materials?

Such decisions should be based on a sound strategy that, in turn, depends in large part on data being gathered under the Forest Service and Interior’s Joint Fire Science Program and the Forest Service’s stewardship contracting demonstration projects. With these data, the agency will be able to establish more meaningful performance measures, priorities, and goals for reducing fuels. It will also be better able to (1) reconcile different fuel reduction approaches with its other stewardship objectives, (2) identify changes in incentives and statutorily defined contracting procedures that will better facilitate the accomplishment of fuel reduction goals, and (3) determine the associated costs of different options for doing so. All of these elements will be essential in the more cohesive agency strategy needed to address the problem of catastrophic wildfires now threatening the sustainability of multiple national forest uses and the security of human life, health, property, and infrastructure in communities

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near those forests. However, because of concerns about the agency's accountability, we believe that the credibility of its efforts to devise such a strategy hinge upon the establishment of a clearly understood schedule for expeditiously developing and implementing this strategy.

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## **Recommendation to the Secretary of Agriculture**

We recommend that the Secretary of Agriculture direct the Chief of the Forest Service to develop, and formally communicate to the Congress, a cohesive strategy for reducing and maintaining accumulated fuels on national forests of the interior West at acceptable levels. We further recommend that this strategy include (1) specific steps for (a) acquiring the data needed to establish meaningful performance measures and goals for reducing fuels, (b) identifying ways of better reconciling different fuel reduction approaches with other stewardship objectives, and (c) identifying changes in incentives and statutorily defined contracting procedures that would better facilitate the accomplishment of fuel reduction goals; (2) a schedule indicating dates for completing each of these steps; and (3) estimates of the potential and likely overall and annual costs of accomplishing this strategy based on different options identified in the strategy as being available for doing so.

# Comments From the Forest Service



United States  
Department of  
Agriculture

Forest  
Service

Washington  
Office

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P. O. Box 96090  
Washington, DC 20090-6090

File Code: 1430

Date: March 22, 1999

Victor S. Rezendes, Director  
RCED-Energy, Resources, and Science Issues  
U.S. General Accounting Office  
441 G Street, NW  
Washington, D.C. 20548

Forest Service response to GAO Draft Report (GAO/RCED-99-65) "Western National Forests: A cohesive strategy for catastrophic wildfire threats."

## DISCUSSION:

We have reviewed the draft GAO report entitled, "Western National Forests: A Cohesive Strategy is Needed to Address Catastrophic Wildfire Threats" (GAO/RCED-99-65). We feel that the GAO report is very comprehensive and does a good job of covering the problem. The GAO has effectively portrayed the existing forest conditions that exist throughout much of the interior West forests. We agree with the principal findings of the report: 1) catastrophic wildfires threaten forest resources and communities; 2) recent actions to address catastrophic wildfires are important but may be too little, too late; and 3) the need for a cohesive strategy for addressing numerous barriers to effective action. We accept the recommendations of the report regarding the development of a cohesive strategy for reducing and maintaining accumulated fuels on national forests of the interior West at acceptable levels. The Forest Service has not advanced a cohesive strategy to treat all 39 million acres of high risk acres by the year 2015. However, we do have a general strategy for reducing the threat of catastrophic fire that will build upon the findings of the Joint Fire Science Program, provides land management planning direction to forests, projects budget and accomplishments through 2005, considers other resource management activities, and continues to provide a high level of prevention and protection.

While we generally agree with the report, we do think that our time frames are realistic, and that we can expect positive benefits from the hazard fuels reduction program by 2015. There are several instances in the report where we feel the data may be misleading and we have provided general comments for your consideration.

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**Appendix I**  
**Comments From the Forest Service**

The Forest Service agrees with the findings and the recommendation for a cohesive strategy of the GAO draft report. The Forest Service feels that significant progress will be made toward eliminating the threat of catastrophic wildfire in the interior West by 2015. The Forest Service has recognized the need to develop a more specific planning process for forest health and hazard fuels. The Forest Service is currently developing the tools, such as risk mapping, that are needed to complete this strategy.

/s/ Vincette L Goerl  
VINCETTE L. GOERL  
,Chief Financial Officer  
Deputy Chief, Office of Finance

Enclosures

**FOREST SERVICE'S GENERAL COMMENTS ON GAO DRAFT REPORT (GAO/RCED-99-65)  
"WESTERN NATIONAL FORESTS: A COHESIVE STRATEGY FOR CATASTROPHIC  
WILDFIRE THREATS":**

1. We agree that a cohesive strategy specifically designed to reduce and maintain accumulated fuels on national forests at acceptable levels is needed. We are committed to complete such a strategy in a timely manner. This strategy will provide general, broad scale program objectives based on local forest and subregional plans, regional assessments, current knowledge and techniques, and new information such, as the risk mapping effort from the Joint Fire Science Program. The strategy will include direction to the regions for strategy development, funding and implementation, monitoring, and accomplishment reporting. In addition, the strategy must provide for periodic updates and revisions, based on the fuel treatment activities or other management actions and the effects of wildfires. We envision this strategy to be fully integrated with all of the Forest Service missions and program areas, not just a strategy for the Hazardous Fuel Treatment Program.
2. The development of a cohesive strategy will do little to resolve the lack of a broad based consensus on what constitutes forest health and the lack of public support for aggressive large scale fuels reduction programs. For example, some communities may oppose mechanical fuels treatment activities, prescribed fire or other fuels reduction treatments next to their homes. Other communities may mistakenly perceive that the risk of catastrophic fire is low because an area has not burned within recent memory. These issues must be addressed in the development of a cohesive strategy. The strategy's success will be dependent on community awareness of successfully planned and implemented fire reduction projects and their willingness to adapt these projects to other areas.
3. The Forest Service plans to use risk maps to identify broad regions of the United States at risk to catastrophic fire and use this information at the national level to develop strategies to reduce this risk. Risk maps for catastrophic fire and fire in the urban wildland interface (between 1 house per 20 acres to 1 house per 1 acre) that are scientifically sound and based on the consensus of users from multiple agencies will be available in 18 months.
4. The insect and disease risk maps are currently available and provide an example of how risk maps can be used for strategic planning. These maps identify broad regions of the United States where trees are at future risk of dying (at levels 25 percent or more) from insects and diseases within the next 15 years. An abundance of dead trees may predispose an area to catastrophic fire. While the insect and disease risk maps were not available when the FY 2000 budget was developed, this budget addresses several of the areas at risk to insect and disease mortality. In FY 2000, the identification of areas where action is effective and efficient for prevention of mortality due to insects and diseases will be emphasized. The national office and field units will jointly develop treatment estimates as part of the FY 2001 budget process and address some of this risk within the current program. States and other partners will be involved in a dialogue of how to best identify and manage at risk acres.

See GAO comment 1.

5. The Forest Health Monitoring and Forest Inventory and Analysis Programs provide data needed for strategic planning, and implementation of national forest health policies. Outputs from these programs can be used by internal and external partners to establish current forest health conditions and to develop consensus on forest health and fuels issues and policies. Indicator for coarse woody debris are under development that will be used to monitor trends.

See GAO comment 2.

6. The draft report largely presumes that there is broad scientific consensus surrounding appropriate methods for dealing with fuel build-up, appropriate techniques to effectively deal with the problem, and agreement on the spatial and temporal scales at which these techniques should be applied. In point of fact, there is disagreement on these issues and some may use this disparity of scientific opinion to undermine even the best-laid implementation plans.

7. The draft report acknowledges that the use of controlled burning as a tool to reduce fuel build-ups on a widespread basis is severely constrained by the provisions of the Clean Air Act, Clean Water Act and other logistical considerations. The inability to rely upon controlled burning increases the dependency on achieving these objectives through mechanical removal. To the degree that this removed material has value in the marketplace, the Forest Service is collaborating with State Foresters and forest-based communities to implement a complementary, aggressive program to market this material consistent with statutory authorities.

See GAO comment 3.

8. The report focuses on fuels reductions activities and overlooks insect and disease, salvage, and other forest management activities that contribute to overall forest health while impacting acres at risk of wildfire. These activities include detection, suppression and prevention of insects and diseases, threatened and endangered species habitat maintenance, wildlife habitat improvement, range improvement, salvage, bio-prospecting, and small diameter utilization for sustainable forestry.

FOREST SERVICE FIRE AND AVIATION STAFF NOTES ON GAO DRAFT REPORT  
(GAO/RCED-99-65) "WESTERN NATIONAL FORESTS: A COHESIVE STRATEGY FOR  
CATASTROPHIC WILDFIRE THREATS:"

*EXECUTIVE SUMMARY: Results in Brief*

1) Page 4, end of paragraph 1, "But the problem is so extensive that..." \* The level of effort by the Forest Service to reduce excessive fuels and improve forest health will have a profound effect on reducing the size and intensity of catastrophic fires. As the Forest Service's fuels treatment program expands through the next few decades, the risk of high intensity fire spread will be significantly reduced allowing for successful wildland fire suppression, if needed, in treated areas of the national forest system. Many examples exist where high intensity fires have burned into already treated blocks resulting in substantial reduction of fire intensity.

2) Page 5, paragraph 1, "Outside experts and Forest Service Officials...." We support the contention that increased fire suppression efforts will not solve the fuels problem; it is important to maintain or increase the level of support for suppression to maintain initial attack efficiency. Only 2% of the fire create the majority of the acres burned. If 2% of all fires account for 800,000 acres per year burned, an decrease in Initial Attack efficiency to 97%, only a 1% decline, may increase acres burned by 400,000 each year.

*Recent Actions to Address Catastrophic Wildfires Are Important but May be Too Little, Too Late*

3) Page 6, end of paragraph 1, "However, GAO's analysis of the Agency's initial plans..." \* Not every forest acre requires treatment when reducing overall risk of catastrophic wildfire. When treating blocks of forests at risk through vegetative manipulation, mechanical or fire, the treated blocks act as barriers, or fire breaks, and prevent fires from reaching high intensity and large size. Treating blocks, in essence, significantly reduces the risk of catastrophic wildfires across entire landscapes.

Moreover, many acres are treated for resource objectives other than for fuels reduction. Range improvement, timber thinning and harvest, watershed health, riparian stability and viability, wildlife and big game habitats, etc., may require burning or other tools for vegetative manipulation. These areas not counted as fuels reduction, but the activity will reduce hazardous fuels in high risk areas.

Additionally, some of the acres that remain at high risk will be affected by wildland fires during the course of the fire season. Figure 2.4 on page 37 identifies nearly 800,000 acres that have burned annually in the last several years by large wildfires on all national forest from 1984-1995 - many acres of which are in the interior western short fire interval, long needle pine forests.

4) Page 6, paragraph 2. \* The paragraph is misleading and implies that fuels funding is devoted to other regions with less serious conditions, i.e. the Southern Region. That region receives only 21 percent of the fuels funding and treats 68 percent of national forests acres for FY99. Burning in the region keeps the area from getting worst because this prescribed fire maintenance program has essentially stabilized the acres at risk. By FY00, Region 8 will receive 17 percent of funding, and less each year as the west builds the fuels treatment program and total accomplishment increases.



**Appendix I**  
**Comments From the Forest Service**

See GAO comment 9.

5) Page 6, paragraph 3, sentence 4, "The research activities of the Joint Fire Science Program may take 10 years to complete..." \* The Joint Fire Science Program (JFSP) projects are planned for completion over the next 3-5 years and a series of products are coming out continually. A preliminary JFSP risk map is currently available for risk planning.

Now on p. 27.

*CATASTROPHIC WILDFIRES ARE A SERIOUS CONSEQUENCE OF CURRENT TREE STAND CONDITIONS IN THE INTERIOR WESTERN NATIONAL FORESTS*

6) Page 33, paragraph 3. \* See comments above #6.

Now on pp. 27-28.  
See GAO comment 10.

*Catastrophic Wildfires Are Increasing Because of Changing Tree Stand Conditions*

7) Page 34-36, paragraph 1 and figure 2.3. \* Part of the reasons for the increase in western fire acres burned are a result of moving away from the 10 am policy of fire suppression. In the mid-1970's, the policy shifted to confine-contain-control (CCC) strategies that allowed flexibility with suppression strategies (confine, contain, or control). The objectives of CCC strategies were not acreage driven. Rather, objectives integrating safety, economics, geography, topography, resource availability etc., were incorporated with decision-making and management strategies resulting in larger acres burned at reduced costs and with a higher degree of firefighter and public safety.

Now on p. 32.  
See GAO comment 11.

*Catastrophic Wildfires Threaten Both Forest Resource Sustainability and People*

8) Page 40, paragraph 2, "For example..." \* Please delete this statement. The South Canyon Fire was in oak/brush type vegetation and is not representative of the short fire interval, long needle pine vegetation of the interior western forests. Excessive fuel loading on the South Canyon Fire was not a causal factor of the fatalities based on the investigation report.

Now on p. 36.

*CHAPTER 3: RECENT AGENCY ACTIONS TO ADDRESS CATASTROPHIC WILDFIRES ARE IMPORTANT, BUT MAY BE TOO LITTLE, TOO LATE*

9) Page 46, paragraph 1. \* See comments above #6.

Now on p. 38.

*Actions Planned to Date May Not Be Sufficient or Timely Enough to Achieve Agency Goals*

10) Page 49, second paragraph. \* See comments above #6.

Now on p. 39.

11) Page 50, second paragraph. "But the Forest Service has not yet developed a general strategy..." \* See comments above, #9, & #11.

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The following are GAO's comments on the Forest Service's letter dated March 22, 1999.

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## **GAO's Comments**

1. Our report notes that there is a lack of consensus on what constitutes forest health. We have added language in our report to incorporate the agency's observation that greater community awareness and acceptance of needed actions are important elements in implementing a successful fuel reduction strategy. Moreover, we believe that the agency, through improving the cohesiveness of its strategy, may provide communities and those concerned about forest health with a clearer basis for both reaching consensus on and accepting needed actions.
2. We do not presume that there is a broad scientific consensus surrounding appropriate methods or techniques for dealing with fuel build-up or agreement on the size of the areas where, and the time frames when, such methods or techniques should be applied. Our report recognizes that the agency is currently pursuing better answers to these questions through the Joint Fire Science Program and other efforts, and we have added clarifying language in our report to incorporate the agency's observation.
3. We agree that the other forest management activities, identified by the Forest Service as contributing to overall forest health and as having an impact on acres at risk of wildfire, should not be overlooked and can be important elements in the agency's more cohesive strategy. For instance, our report notes important interrelationships that the agency must consider when balancing fuel reduction goals with other stewardship objectives, such as preserving air and water quality.
4. We agree that expanding the Forest Service's fuel reduction program over the next few decades could significantly reduce the risk of high-intensity fire and allow for the successful suppression of wildland fire in areas where fuels have been reduced. However, as noted in our report, the agency's planned expansion of this program is not on schedule, and its fiscal year 2000 budget request, compared with its fiscal year 1999 appropriation, will provide for reducing fuel on fewer acres, rather than on more, as originally planned. We believe this change demonstrates the need for the agency to better identify estimates of potential and likely costs to accomplish a more cohesive strategy as recommended in our report.

5. We did not evaluate the relationship between specific funding levels for the Forest Service's initial responses to wildfires and the resulting likelihood of acreage lost to catastrophic wildfire. However, our report notes that the agency's fiscal year 2000 budget request will only maintain current funding level for preparedness, not increase the funding for it. According to the agency, maintaining the current funding level will increase the risks of injuries and loss of life to the public and firefighters next year. We believe this statement further supports our recommendation that the agency needs to better identify estimates of potential and likely costs to accomplish a more cohesive strategy.

6. Our report notes that fuel reduction is not required on every national forest acre currently at high risk of catastrophic wildfire and that blocks where fuels have been reduced, called fire breaks or fuel breaks, may prevent fires from reaching high intensity or large size. However, we also note that the Forest Service has not yet developed a general strategy for constructing such fire breaks, nor for implementing any alternative strategic approach that would allow it to systematically assign priorities to areas and thus safely avoid reducing fuels on some of them. Until the agency develops such a strategy, it has no basis for eliminating any current high-risk areas from its fuel reduction efforts, nor can it adequately evaluate the relative effectiveness or efficiency of its current efforts.

7. We agree that some of the acres at high risk will burn in the interior West, thereby reducing fuels on them and lowering the total number of acres remaining at high risk. However, as we point out in our report, in many areas fuels will have to be reduced repeatedly. Moreover, as our report points out, the concern about catastrophic wildfires is not just how many acres they burn, but where those acres are located. In particular, future catastrophic wildfires that (1) burn many acres in the wildland/urban interface, taking lives and damaging human health, property, or infrastructure; (2) destroy critical terrestrial or aquatic habitat; or (3) needlessly destroy timber available for harvest should be considered as part of the problem rather than as contributions to reducing it.

8. We agree with the agency that it is important to maintain current satisfactory conditions in regions other than the frequent-fire forests of the interior West, including the Forest Service's Southern Region, so that fire risks in these areas do not also become hazardous to resources or people, as many areas in the interior West are now. We also do not question the level of funding for fuel reduction efforts in these other regions. Our report

states, instead, that the acres in these other regions on which it plans to maintain the current lower fuel levels must be taken into account when determining the adequacy of the agency's plans to reduce fuels on a total of 3 million acres nationally each year.

9. We do not disagree that Joint Fire Science Program's projects are currently planned to be completed in 3 to 5 years. Instead, our report notes an agency official's estimate of how long they may actually take. In our view, the project's experience to date with mapping fire risks suggests that tasks under this program may, in fact, take longer than currently planned. This task, which was originally scheduled for completion in November 1998, is now, according to the agency's comments on our draft report, not projected to be completed until September 2000. Finally, we note that the plan adopted in 1998 for carrying out the program provides for members of its governing board to serve for 10 years.

10. We did not assess the extent to which the increase in the acreage burned in the interior West over the last few years can be partly attributed to more flexible suppression strategies. Nor do we question whether such strategies may be an important element in the agency's overall strategy to reduce fuels. However, regardless of the reasons for the increases in the acreage burned, substantially more acres are now burning unintentionally, with increasing costs and threats to resources and people. The agency has on several occasions concurred that this is a serious problem. For instance, as we note in our report, the agency has stated in its fiscal year 2000 budget request that the risks of injuries and loss of life to the public and firefighters will increase next year. Finally, we agree that these more flexible suppression strategies are not acreage driven, but hazard based. However, as we point out in our report, current incentives in the agency's main fuel reduction program are acreage driven, not hazard based, and incentives in its timber program are largely driven by commercial rather than safety considerations. Our report urges the development of a more cohesive fuel reduction strategy that addresses ways to better integrate these incentives around hazard reduction.

11. The Forest Service is correct in pointing out that the level of fuels was not specifically identified as a cause of the fatalities in the investigative reports on this fire and that the predominant vegetation type was not, in this case, long-needle pine. However, according to the investigative reports we reviewed, this was a very large, intense fire that spread to the canopy (i.e., crowns of the trees), and highly flammable and hazardous

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fuels were a significant contributor to the fatalities.<sup>26</sup> While our report notes that long-needle pines such as ponderosa are a predominant forest type at lower elevations in the interior West, the example serves to point out that catastrophic wildfire hazards on national forests of the interior West are not limited to this forest type. Our report considers all wildfire hazards in the region and is not limited to fire hazards associated with any specific type of tree stand or vegetation. Our purpose in citing this example was simply to demonstrate that large, intense fires occurring on the interior Western national forests can be life threatening, irrespective of all of their causes and sources. We have added the language in the report to reflect the agency's comment about the fire and clarify the scope of our report.

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<sup>26</sup>Report of the South Canyon Fire Accident Investigation Team, Bureau of Land Management and Forest Service (Aug. 17, 1994); and Fire Behavior Associated With the 1994 South Canyon Fire on Storm King Mountain, Colorado, USDA, Forest Service, Research Paper RMRS-RP-9 (Ogden, Utah: 1998).

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