

GAO

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

April 2005

FOREST SERVICE

Better Data Are Needed to Identify and Prioritize Reforestation and Timber Stand Improvement Needs



GAO

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Highlights of [GAO-05-374](#), a report to the Chairman, Subcommittee on Forests and Forest Health, Committee on Resources, House of Representatives

Why GAO Did This Study

In 2004, the Forest Service reported to the Congress that it had a backlog of nearly 900,000 acres of land needing reforestation—the planting and natural regeneration of trees. Reforestation and subsequent timber stand improvement treatments, such as thinning trees and removing competing vegetation, are critical to restoring and improving the health of our national forests after timber harvests or natural disturbances such as wildland fires.

GAO was asked to (1) examine the reported trends in federal lands needing reforestation and timber stand improvement, (2) identify the factors that have contributed to these trends, and (3) describe any potential effects of these trends that federal land managers have identified.

What GAO Recommends

GAO recommends that the Secretary of Agriculture direct the Chief of the Forest Service to take several actions to improve the agency's ability to identify and prioritize its reforestation and timber stand improvement needs.

In commenting on a draft of this report, the Forest Service on behalf of the Department of Agriculture agreed with GAO's findings and recommendations.

www.gao.gov/cgi-bin/getrpt?GAO-05-374.

To view the full product, including the scope and methodology, click on the link above. For more information, contact Robin M. Nazzaro at (202) 512-3841 or nazzaror@gao.gov.

FOREST SERVICE

Better Data Are Needed to Identify and Prioritize Reforestation and Timber Stand Improvement Needs

What GAO Found

The acreage of Forest Service lands needing reforestation and timber stand improvement generally has been increasing since 2000, according to Forest Service officials and data reported to the Congress, as well as other studies. While the Forest Service data are sufficiently reliable to identify this relative trend they are not sufficiently reliable to accurately quantify the agency's specific needs, establish priorities among treatments, or estimate a budget. The data's reliability is limited in part because some Forest Service regions and forests define their needs differently, and some do not systematically update the data to reflect current forest conditions or review the accuracy of the data. Forest Service officials acknowledge these problems, and the agency is implementing a new data system to better track its needs. While helpful, this action alone will not be sufficient to address the data problems GAO has identified.

According to Forest Service officials, reforestation needs have been increasing in spite of declining timber harvests because of the growing acreage of lands affected by natural disturbances such as wildland fires, insect infestation, and diseases. In the past, reforestation needs resulted primarily from timber harvests, whose sales produced sufficient revenue to fund most reforestation needs. Now needs are resulting mainly from natural causes, and funding sources for such needs have remained relatively constant rather than rising in step with increasing needs. For timber stand improvement, the acreage needing attention is growing in part because high-density planting practices, used in the past to replace harvested trees, are creating needs for thinning treatments today and because treatments have not kept pace with the growing needs.

Forest Service officials believe the agency's ability to achieve its forest management objectives may be impaired if future reforestation and timber stand improvement needs continue to outpace the agency's ability to meet these needs. For example, maintaining wildlife habitat—one forest management objective—could be hindered if brush grows to dominate an area formerly forested with tree species that provided forage, nesting, or other benefits to wildlife. Also, if treatments are delayed, costs could increase because competing vegetation—which must be removed to allow newly reforested stands to survive—grows larger over time and becomes more costly to remove. Further, without needed thinning treatments, agency officials said forests become dense, fueling wildland fires and creating competition among trees, leaving them stressed and vulnerable to insect attack. While agency officials expressed concern about these potential effects, the agency has not adjusted its policies and priorities for the reforestation and timber stand improvement program so that adverse effects can be minimized. Forest Service officials did, however, acknowledge the need to make such changes.

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Abbreviations

BLM	Bureau of Land Management
NFMA	National Forest Management Act

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United States Government Accountability Office
Washington, D.C. 20548

April 15, 2005

The Honorable Greg Walden
Chairman, Subcommittee on Forests and Forest Health
Committee on Resources
House of Representatives

Dear Mr. Chairman:

In March 2004, the Forest Service reported to the Congress that it had a backlog of about 900,000 acres of land needing reforestation. Reforestation—the planting and natural regeneration of trees—is critical to restoring and improving the health of our national forests after timber harvests, as well as after natural disturbances such as wildland fires, outbreaks of disease, or insect infestations. The success of reforestation, as well as the overall health of the forests, often depends upon subsequent timber stand improvement treatments, such as thinning trees and removing competing vegetation to allow seedlings to survive. In some parts of the country, without active intervention, it may take decades for disturbed land to return to a forested condition. In other parts, trees may naturally return soon after a disturbance, but the type of regrowth may not be consistent with Forest Service program objectives. Historically, the Forest Service’s reforestation and timber stand improvement program focused on maximizing timber production. Now, however, the program is intended to achieve a variety of objectives, such as improving wildlife habitat, enhancing recreational opportunities, maintaining water quality, and ensuring sustainable timber production. For example, reforestation can improve wildlife habitat by providing forest cover for species like the black-tailed deer and timber stand improvement can make forests less susceptible to wildland fires by removing brush that fuels the fires. The Forest Service in the Department of Agriculture has primary responsibility for both reforestation and timber stand improvement treatments in 155 national forests. The agency manages 192 million acres of federal land and has a stewardship responsibility to maintain the health, productivity, and diversity of the national forests on this land.

In 1974, the Forest Service reported a reforestation and timber stand improvement backlog that affected 3.3 million acres of forested lands. To address this backlog, the Congress included a provision in the National Forest Management Act of 1976 (NFMA) requiring the Forest Service to annually report the estimated funding needed to prevent the recurrence of a backlog on lands available for timber production.¹ The Forest Service primarily uses moneys generated from the sale of timber to reforest areas where timber has been harvested, whereas it relies primarily on annual appropriations to reforest areas affected by natural disturbances. In 1980, the Congress created the Reforestation Trust Fund, which is funded through tariffs on imported wood products, to provide dedicated funding for reforestation and timber stand improvement treatments and to help eliminate the backlog. In 1985, the Forest Service declared that it had virtually eliminated the backlog reported in 1974.

With the 2004 announcement of a new backlog, you asked us to (1) examine the reported trends in federal lands needing reforestation and timber stand improvement, (2) identify the factors that have contributed to these trends, and (3) describe any potential effects of these trends that federal land managers have identified. This report focuses primarily on the Forest Service's reforestation and timber stand improvement program because it is the largest one managed by a federal land management agency and covers the broadest cross section of the country. The Bureau of Land Management (BLM) in the Department of the Interior also has responsibility for reforestation and timber stand improvement on federal lands, but its program is much smaller than the Forest Service's. In 2003, for example, the Forest Service reported reforesting more than 160,000 acres of federal land nationwide, while BLM reported reforesting less than 11,000 acres, with the majority of this activity occurring in western Oregon. The results of our limited review of BLM's program are summarized in appendix I.

To examine the trends in federal lands needing reforestation and timber stand improvement, we reviewed and analyzed Forest Service data for the 10 years between 1995 and 2004, analyzed applicable statutes and agency regulations, and interviewed agency officials and other experts about these

¹Shortly after the Forest Service reported its backlog, the Congress enacted the Forest and Rangeland Renewable Resources Planning Act of 1974, requiring the Forest Service to annually request funds for an orderly program to eliminate backlogs in all Forest Service renewable resource programs. This act was amended by NFMA, which contains more specific direction to address the elimination of reforestation backlogs.

trends. In addition, we reviewed and analyzed Forest Service documents, including database manuals and agency-wide and regional procedures for gathering and reporting data related to reforestation and timber stand improvement. To identify factors that have contributed to reforestation and timber stand improvement trends and describe potential effects identified by federal land managers, we reviewed internal Forest Service reports, as well as other studies, and interviewed agency officials in both headquarters and selected regions. We also visited four regions with the largest reported reforestation and timber stand improvement needs and national forests within these regions. We conducted our work from June 2004 to March 2005 in accordance with generally accepted government auditing standards. Appendix II provides further details about the scope and methodology of our review.

Results in Brief

Forest Service officials and data reported to the Congress, as well as expert opinions and studies, point to recent increasing trends in the acreage of agency lands needing reforestation and timber stand improvement treatments. For the decade beginning in 1995, the Forest Service reported that the acreage of its lands needing reforestation at first declined steadily between 1995 and 1999 but then increased through 2004. Much of this increase occurred in regions located in western states, where reforestation needs associated with natural disturbances, such as wildland fires, began to increase dramatically in 2000. During the same 10-year period, the agency also reported that the acreage of its lands needing timber stand improvement generally increased, although trends within individual regions show considerable variation. The Forest Service data, when combined with other information, are sufficiently reliable for identifying these relative trends; however, we have concerns about the data's use in accurately quantifying the acreage of agency land needing reforestation and timber stand improvement treatments. These concerns arise because the agency's regions and forests define their needs differently and do not systematically update these data to reflect current forest conditions, nor do they review the accuracy of these data. Forest Service officials acknowledged these problems but explained that the agency focuses its efforts on undertaking reforestation and timber stand improvements and is less concerned about accurately collecting and reporting data on lands needing these treatments. Nonetheless, the Forest Service is implementing a new data system that will replace the individual regional systems with a single, agency-wide system. However, this change will standardize only the structure of regional reporting to headquarters and will not, on its own, make the data more consistent or accurate without changes to agency

policies and practices to standardize how reforestation and timber stand improvement needs are defined, reported, and validated. While we understand the Forest Service's desire to carry out reforestation and timber stand improvements as quickly as possible, without more reliable data, it is difficult for the Forest Service to accurately quantify its needs, establish priorities among treatment needs, and estimate a budget accordingly.

According to Forest Service officials, despite declining timber harvests, reforestation needs are accumulating because the acreage affected by natural disturbances has increased in recent years. Since 2000, wildland fires, insects and diseases have destroyed increasing amounts of forest lands. In the past, timber harvests created the majority of reforestation needs and generated revenue that helped pay for harvest-related reforestation. In contrast, reforestation needs are now arising largely from natural disturbances, and funding sources for such needs—annual appropriations and the Reforestation Trust Fund—have not risen in step with reported needs. Instead, they have remained relatively stable.

For timber stand improvement, agency officials said that changing management practices have been the primary factor contributing to the increase in acreage needing treatment. Specifically, managers in some Forest Service regions do not emphasize timber stand improvement treatments because they believe reforestation treatments are more important. This is in part because there is no legal deadline for completing timber stand improvement, whereas, by law, reforestation generally must be completed within 5 years after trees are harvested. Another reason for the reported increase is that agency officials have identified more timber stand improvement needs as they have expanded the scope of the program. Reported needs also have increased because previously favored high-density tree planting practices to replace harvested trees have led to increased needs for thinning today.

If future reforestation and timber stand improvement needs continue to outpace the Forest Service's ability to meet these needs and treatments are delayed, agency officials believe the agency's ability to achieve its forest management objectives may be impaired; treatment costs could increase; and forests could become more susceptible to fire, disease, and insect damage. Unmet needs could prevent the Forest Service from achieving its forest management objectives, such as protecting wildlife habitat or improving forest health. For example, an area previously dominated by forests could become dominated by shrub fields, compromising wildlife habitat, recreation, and timber value. Treatment costs also could increase if

projects are delayed. For example, competing vegetation often must be removed to allow newly reforested stands to survive; the larger the competing vegetation grows, the more costly it is to remove. Finally, forest susceptibility to severe wildland fires, disease, and insect damage could increase, according to officials, because without needed thinning treatments, forests become dense, fueling severe wildland fires and creating competition among trees, leaving them stressed and vulnerable to insect attack. Although agency officials expressed concern about the potential harmful effects of delaying some projects, the Forest Service has not clarified its policies, practices, and priorities for the reforestation and timber stand improvement program to reflect this concern and the current environment of constrained budgets. Forest Service officials acknowledged the need to make such changes. However, until they do so, it will be difficult to ensure that limited reforestation and timber stand improvement funds are targeted toward activities that will have the greatest impact in mitigating potential adverse effects.

We are making recommendations to help the Forest Service better identify and prioritize its reforestation and timber stand improvement needs and aid the Congress in making more informed funding decisions. In responding to a draft of this report, the Forest Service agreed with our findings and recommendations. The Forest Service's comments are reprinted in appendix III.

Background

The Forest Service's reforestation and timber stand improvement program shapes our national forests as well as their associated plant and animal communities through treatments that establish, develop, and care for trees over their lifetime. Under NFMA, each national forest is required to have a forest management plan describing the agency's objectives for the forest, including those related to reforestation and timber stand improvement.

To achieve these management objectives after a timber harvest or natural event that damages forests, Forest Service staff identify areas needing reforestation and visit forest locations to plan a specific sequence of treatments needed, known as a prescription. The prescription directs how many young trees must be reestablished and the proper mix of vegetation necessary to achieve specific objectives in the forest plan, such as maintaining wildlife habitat. Reforestation prescriptions may call for planting or natural regeneration, as outlined in table 1. To plant a site, Forest Service staff order seedlings from a nursery up to 3 years in advance of planting to allow enough time for them to grow, then plant the seedlings

when conditions are favorable. For natural regeneration, agency staff allow seeds from trees left on the site or nearby trees to germinate and grow, which sometimes requires removing unwanted vegetation and surface debris to improve the likelihood that the trees will survive or accelerate their growth.

As with reforestation, Forest Service staff identify areas of a forest needing timber stand improvement and prepare prescriptions. Timber stand improvement prescriptions are intended to improve growing conditions for trees in a stand and typically call for treatments such as release or thinning, as outlined in table 1. To conduct a release treatment, Forest Service staff remove competing vegetation to allow seedlings to grow; and to thin a stand, agency staff remove some trees to accelerate the growth of the remaining trees or to improve forest health.

Table 1: Forest Service Reforestation and Timber Stand Improvement Treatments

Forestry treatments	Treatment description
Reforestation	
Planting	Foresters collect or obtain seeds, and grow seedlings for 1 to 3 years in nurseries, then transplant the seedlings to the site when conditions are favorable.
Seeding	Foresters directly apply seed collected from known seed sources to prepared sites when conditions are favorable.
Natural regeneration with site preparation	Foresters remove vegetation that could compete with young seedlings, as well as other debris, then allow existing trees to naturally seed the area.
Natural regeneration without site preparation	Foresters rely on existing trees to naturally seed the area, and do not remove any vegetation or debris. This technique is sometimes used after wildland fires, which often create a site that is free of vegetation and debris.
Timber stand Improvement	
Release treatments	Foresters remove competing vegetation near seedlings or young trees to improve the chances of survival and health.
Precommercial thinning	Foresters remove trees from forests that are overly dense. In such treatments, the trees removed are too small to sell as commercial timber.
Fertilizing	Foresters apply nutrients to increase tree growth or to overcome a nutrient deficiency in the soil.
Pruning	Foresters remove side branches and multiple leaders from a standing tree to, among other things, reduce fuel ladders and associated wildland fire risk or to produce economically valuable wood.

Source: GAO interpretation of Forest Service information.

Reforestation and timber stand improvement treatments are funded by various sources, principally congressional appropriations and trust funds. Congressional appropriations that fund this work include moneys allocated from the National Forest System appropriation to the reforestation and timber stand improvement program² as well as to other Forest Service programs whose primary purposes include improving forest health, decreasing hazardous fuels, and rehabilitating burned areas. In addition to these moneys, the Knutson-Vandenberg Trust fund that collects receipts generated from timber sales helps pay for reforestation and timber stand improvement in areas harvested for timber.³ While Knutson-Vandenberg funds are a dedicated source of funding for reforesting harvested lands, work in areas destroyed by natural causes, such as wildland fire, is generally funded through the National Forest System appropriation and a portion of the Reforestation Trust Fund. Reforestation Trust Fund receipts are generated by tariffs on imported wood products, and by law, moneys transferred into this fund for the Forest Service's use are limited to \$30 million each fiscal year. Other sources of funds, such as gifts, bequests, and partnerships, also fund reforestation and timber stand improvement treatments.

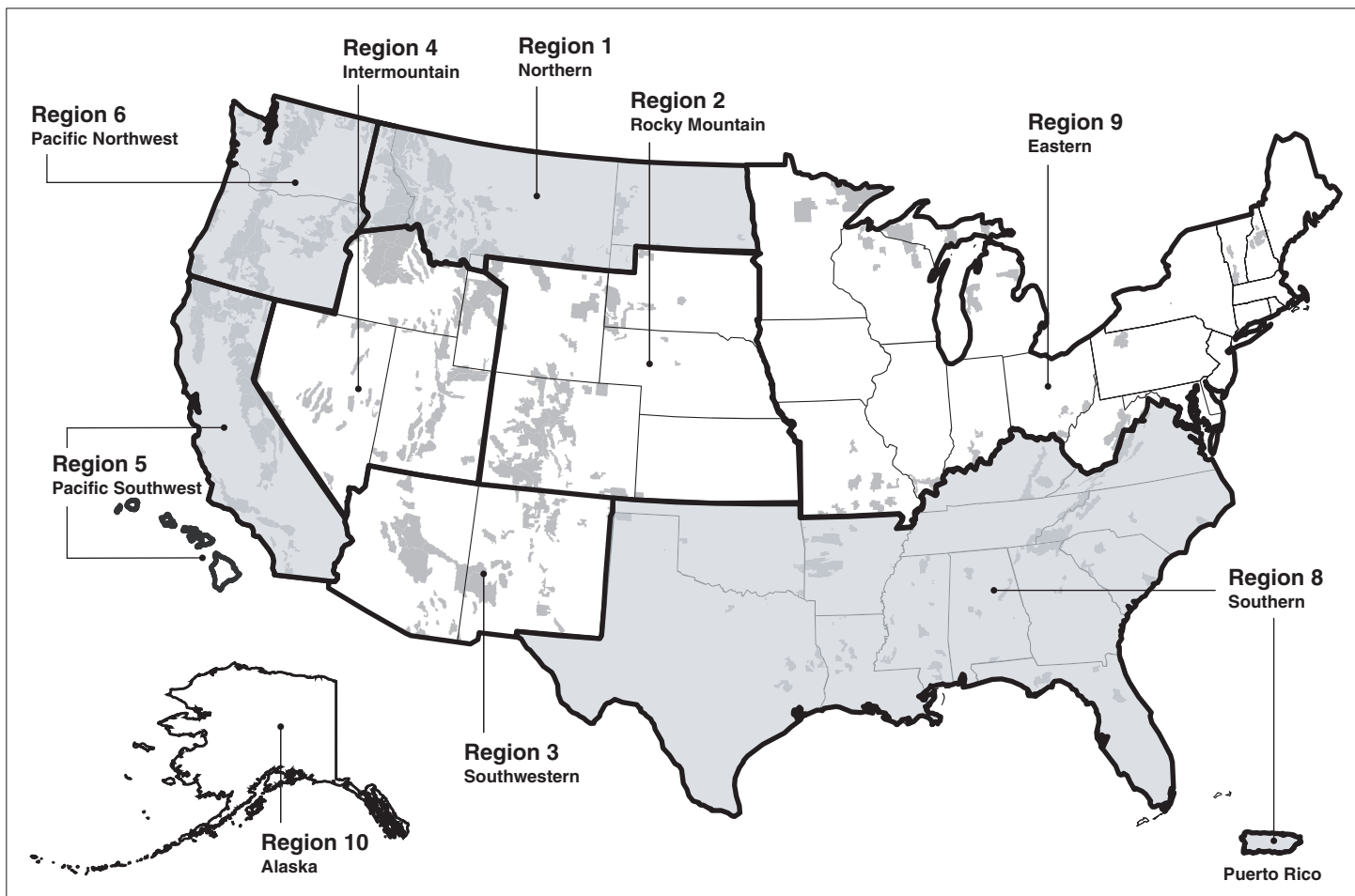
The Forest Service's implementation, management, and oversight of the reforestation and timber stand improvement program are decentralized. Forest Service headquarters and 9 regional offices establish policy and provide technical direction to 155 national forest offices on various aspects of the program. These national forest offices, in turn, provide general oversight to more than 600 district offices, several of which are located in each national forest. The district offices plan, fund, and manage reforestation and timber stand improvement projects, and the managers of these offices have considerable discretion in interpreting and applying the agency's policies and selecting projects to fund. District office staff are responsible for assessing reforestation and timber stand improvement needs, developing prescriptions to address these needs, and accomplishing

²The National Forest System appropriation provides the funds for the stewardship and management of Forest Service lands.

³The Knutson-Vandenberg Act of 1930 (16 U.S.C. 576-576b) established a trust fund to collect a portion of timber sale receipts to pay for reforesting areas from which timber is cut. The reforestation projects eligible for such funding include growing trees for planting, planting trees, sowing seeds, removing weeds and other competing vegetation, and preventing animals from damaging new trees. The act was amended in 1976 to allow the Forest Service to use these funds for other activities, such as creating wildlife habitat.

the work. Figure 1 shows a map of the Forest Service regions and highlights the regions we visited.

Figure 1: Map of Forest Service Regions Indicating Regions Visited by GAO



Source: Forest Service.

Note: The Forest Service does not have a region 7. Highlighted regions are those we visited.

The Forest Service's four organizational levels—its headquarters, regional, national forest, and district offices—share responsibility for reporting reforestation and timber stand improvement needs to the Congress. Although the Director of Forest Management in its headquarters is responsible for the agency-wide reporting of reforestation and timber stand improvement needs, much of the responsibility for establishing standards and procedures for collecting and reporting these data has been delegated to the regional, national forest, and district offices. Forest and district offices use automated systems to record their reforestation and timber stand improvement needs and accomplishments and each region collects the data in one of nine regional databases and transmits its total reforestation and timber stand improvement needs to a centralized data repository. Nationally, the Forest Service consolidates the regional data to produce agency-wide reports of reforestation and timber stand improvement needs and accomplishments by national forest. These reports are submitted annually to the Congress.

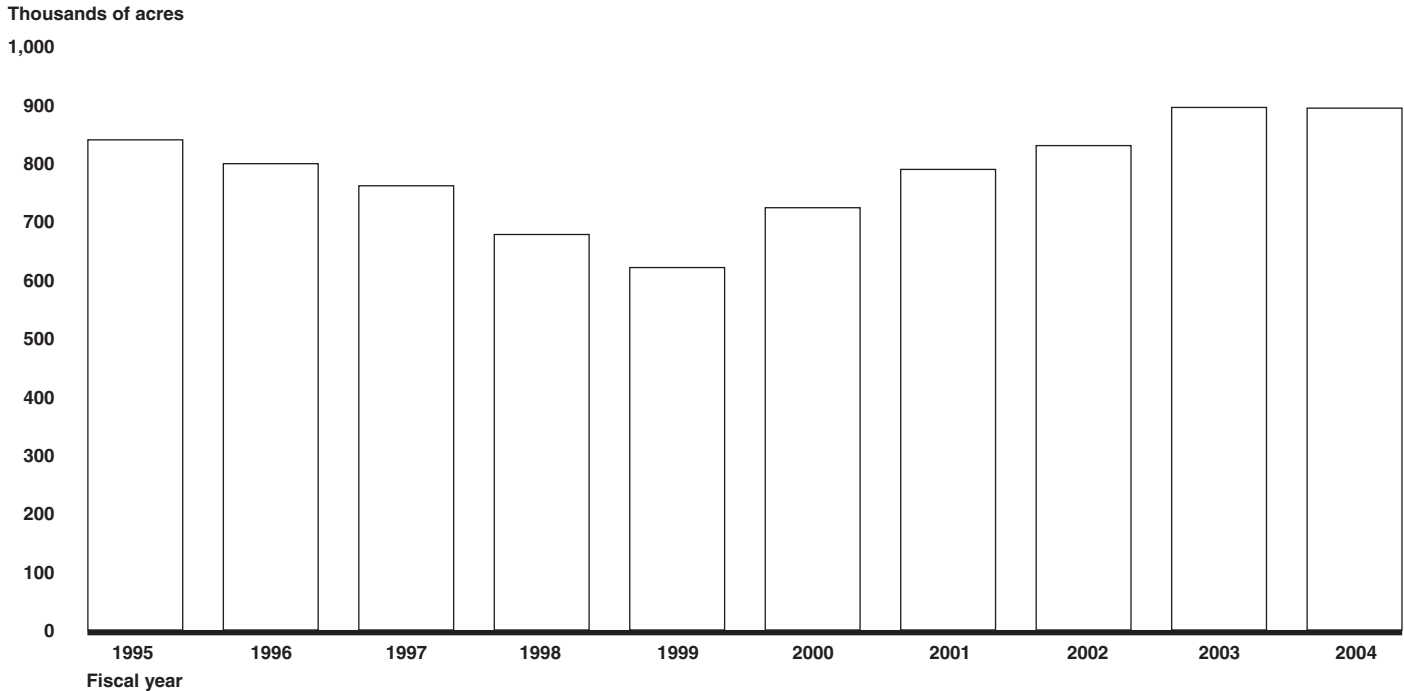
Forest Service Reports Increasing Reforestation and Timber Stand Improvement Needs, but Inconsistent Definitions and Data Make It Difficult to Accurately Quantify Its Needs

From fiscal years 1995 through 2004, the Forest Service reported to the Congress that the acreage of its lands needing reforestation initially declined and then increased during the last 5 years, with much of this increase occurring in regions in western states. During the 10-year period, the agency also reported that the acreage of its land needing timber stand improvement generally increased, though some regions reported slight decreases in these needs. These Forest Service data, when combined with other information, are sufficiently reliable to identify a general trend of increasing needs. Nonetheless, we have concerns about the usefulness of these data in quantifying the acreage of agency land needing reforestation and timber stand improvement. These concerns arise, in part, because the Forest Service's regions and forests define their needs differently, and they do not always systematically update the data to reflect current forest conditions or review the accuracy of the data. Agency officials acknowledge these problems but said the agency focuses its efforts on undertaking reforestation and timber stand improvements and is less concerned about accurately collecting and reporting data on lands needing these treatments. Although the Forest Service is developing a new national data system, the agency does not anticipate making significant changes to improve the quality of the data.

The Forest Service Reports Increasing Needs

The Forest Service reports that the acreage of its lands needing reforestation declined steadily between fiscal years 1995 and 1999 but then increased from 2000 through 2004, as shown in figure 2. During this 10-year period, the primary source of the Forest Service's reforestation needs changed. Specifically, the agency reports that its reforestation needs attributable to timber harvests decreased steadily, while needs associated with wildland fires and other natural disturbances were relatively stable until 2000, when such needs rose dramatically with the increase in wildland fires, particularly in western states. Reforestation needs reported by the Forest Service's Northern Region—covering all of Montana and North Dakota and portions of some adjacent states—followed the national pattern most closely. In addition to the Northern Region, other regions we visited (Pacific Northwest, Pacific Southwest) spanning western states, such as Washington, Oregon, and California, reported large reforestation needs. These regions expressed concern about the increasing level of their reforestation needs relative to their future ability to meet these needs.

Figure 2: Forest Service's Reported Reforestation Needs for Fiscal Years 1995 through 2004



Source: Forest Service data.

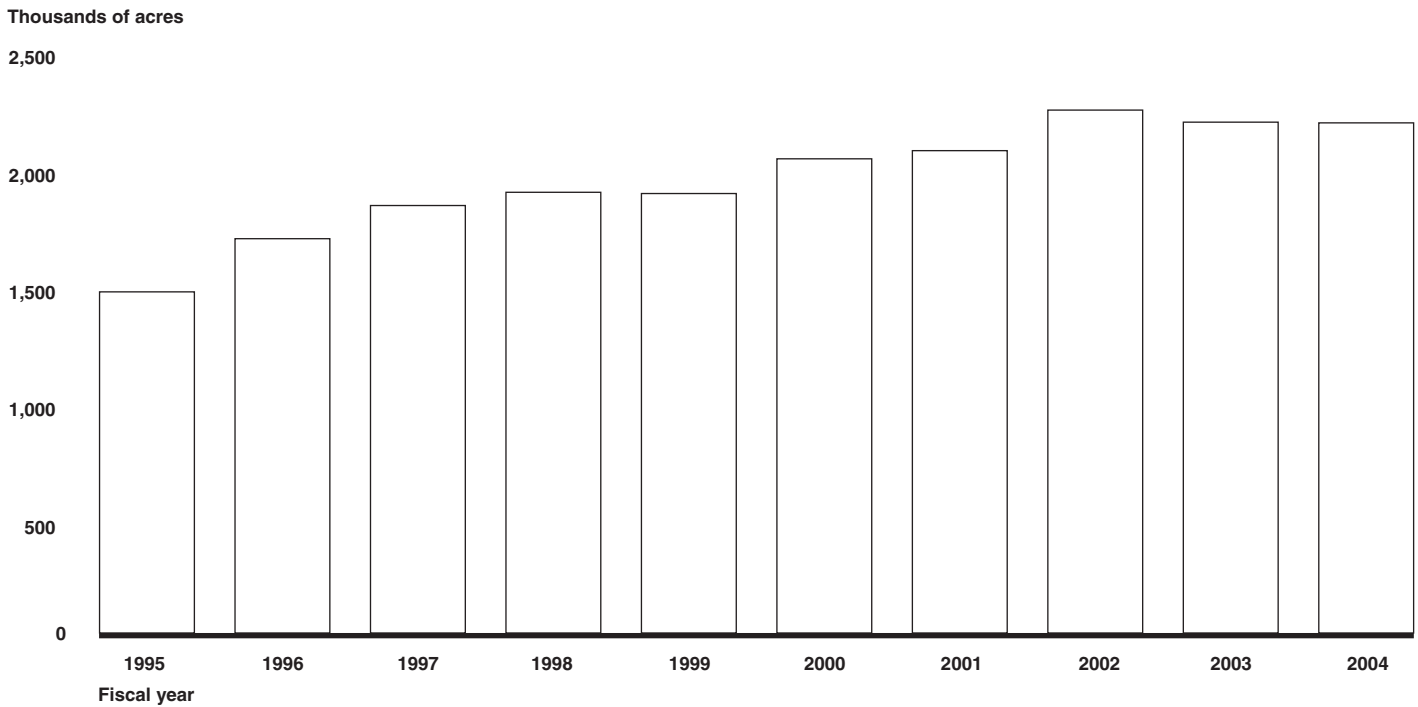
Note: This graph is presented only to illustrate trends in reforestation needs reported by the Forest Service. Although the Forest Service data, in combination with other information, are sufficiently reliable for this purpose, the data cannot be used to accurately quantify the Forest Service's reforestation needs.

With respect to timber stand improvement needs, the Forest Service reports that the acreage of its lands needing such treatments increased in most years following 1995, except for 1999, 2003, and 2004, when the reported needs declined slightly (as shown in fig. 3). The agency partially attributes the decline in needs during these years to an emphasis on thinning treatments and additional work associated with the National Fire Plan during 2003 and 2004.⁴ Officials at two of the four regions we visited,

⁴In 2001, the Departments of Agriculture and the Interior developed a National Fire Plan with state and local agencies and tribal governments to provide technical and financial resources to reduce the risk to communities and ecosystems from wildland fire, in part, by reducing hazardous fuels by thinning trees—one type of timber stand improvement treatment.

the Northern and Pacific Northwest Regions, told us they were concerned about the overall increasing level of their timber stand improvement needs. Timber stand improvement needs reported by the Forest Service's Pacific Northwest region—covering all of Washington and Oregon—were the highest of any region during 4 of the last 5 years. According to officials in the Pacific Northwest region, timber stand improvement needs have accumulated, in part, due to placing a lower priority on such treatments than on reforestation and because many stands in which high-density tree planting practices were used to replace harvested trees during the early 1990s are now in need of thinning. While nationwide timber stand improvement needs generally have been increasing over time, some regions have reported stable or decreasing trends. For example, in the Southern Region, reported timber stand improvement needs have been relatively stable over the last 10 years, while the Pacific Southwest Region has reported slightly decreasing needs since 1995. According to officials in the Pacific Southwest Region, they have less need for timber stand improvement projects because they plant fewer trees as the result of reduced timber harvests. They have increased their ability to meet these needs by emphasizing projects that are eligible for funding under the National Fire Plan because they contribute to hazardous fuels reduction goals.

Figure 3: Forest Service's Reported Timber Stand Improvement Needs for Fiscal Years 1995 through 2004



Source: Forest Service data.

Note: This graph is presented only to illustrate trends in timber stand improvement needs reported by the Forest Service. Although the Forest Service data, in combination with other information, are sufficiently reliable for this purpose, the data cannot be used to accurately quantify the Forest Service's timber stand improvement needs.

Forest Service Data Are Inconsistent Across Regions and Inadequate to Accurately Quantify Needs

The Forest Service data, when combined with other information from Forest Service officials and nongovernmental experts—as well as data on recent increases in natural disturbances such as wildland fire—are sufficiently reliable for identifying relative trend information. However, we have concerns about the use of these data in quantifying the acreage of Forest Service lands needing reforestation and timber stand improvement treatments because the reported data are inconsistent and insufficiently reliable for this purpose. These data are not sufficiently reliable because Forest Service regions define needs differently, influencing the volume of needs reported, and vary in their ability to link needs to forest locations, making it difficult to detect obsolete needs and update the data to reflect current on-the-ground conditions. Additionally, the data are a mixture of

actual needs and estimates and may not be routinely reviewed for accuracy. As a result, the needs reported at the regional level cannot be meaningfully aggregated at the national level. Many of these data problems are long standing and may not be adequately addressed when the Forest Service implements a new data system. Without better data, Forest Service officials said, it is difficult to provide the Congress with estimates of the funding needed to prevent a backlog of reforestation and timber stand improvement needs. Additionally, agency officials said that given constrained resources and competing priorities they focus more on performing the treatments than accurately identifying and reporting reforestation and timber stand improvement needs.

Regions Use Inconsistent Definitions of Need

The Forest Service's nine regions have independently developed their own data collection systems and do not all use the same definitions of need, influencing the volume of needs reported. As shown by the following examples from three of the four regions we visited, we found inconsistent criteria for assessing the need for reforestation or timber stand improvement between regions, among forests within regions, and over time.

- The Pacific Southwest Region reports a reforestation need in areas where it anticipates a timber harvest, even though the forest is still fully stocked with trees, while other regions we visited do not report a need until after timber is harvested and the last log has been removed from the sale area.
- In the Northern Region, forests share common definitions of need and do not report acres of burned land as needing reforestation if they plan to allow these areas to regenerate naturally without any site preparation. In the Pacific Northwest Region, however, because definitions of need vary from forest to forest, some report this condition as a need and some do not.
- Some forests in the Pacific Northwest Region define timber stand improvement needs as those projects they currently need, while other forests in this region include projects that will not be needed until a future time.
- Prior to 1996, the Northern Region reported, as timber stand improvement needs, only those projects that would be needed within 5 years. After 1996, however, the region expanded its definition to include all projects identified within the past 20 years. At the same time, the

region redefined the methods for justifying a timber stand improvement need.⁵ According to Northern Region Forest Service officials, these changes largely were responsible for more than doubling the timber stand improvement needs reported by this region from 1995 to 1996.

Regions Vary in Their Ability to Link Needs to Forest Locations

Forest Service regions and national forests within regions vary in the quality of the source data they collect and report. Specifically, some regions are able to link reported needs to distinct forest locations, while others cannot. In the Northern Region, for example, all forests use a common reporting system that links reforestation and timber stand improvement needs to particular stands of trees by their mapped locations. Officials in the Pacific Northwest Region, however, indicated they had difficulty linking reported needs to specific geographic locations because national forests within their regions use different, independently developed reporting systems. Like the Pacific Southwest and Southern Regions, these officials indicated that they do not always include information describing the locations of reported needs. In the Pacific Southwest Region, for example, a regional official told us that some districts link needs to “dummy stands,” or records that do not include information about where a need for treatment is geographically located. He noted that this practice speeds data entry but impairs data quality. Officials we interviewed throughout the Forest Service also acknowledge that the data include some obsolete needs and exclude some actual needs, in part because not knowing the location of all reported needs prevents the detection and removal of obsolete or erroneous needs.

Data Are a Mixture of Actual Needs and Estimates

Differences in Forest Service data among locations are compounded because the reforestation and timber stand improvement needs reported are a mixture of actual needs diagnosed through site visits and estimates, due in part to agency guidance and variations in regional reporting practices. Although agency guidance generally requires that needs be diagnosed for a specific site and linked to a prescription for treatment, it also directs staff to estimate reforestation needs following a wildland fire or other natural disturbance and revise these estimates within the year. We found in our visits to four regions that they vary in the extent to which they

⁵Prior to 1996, the Northern Region allowed use of only a single type of site examination—timber stand improvement pretreatment examination—to prescribe a timber stand improvement treatment. In 1996, the region changed its policy to allow the use of other, less rigorous examinations.

report needs based on a site-specific diagnosis or an estimate, and consequently may understate or overstate needs.

Forest Service guidance sets different standards for reporting reforestation needs that arise from timber harvest rather than those created by fires or other natural disturbances, in part, to promote timely reporting. For example, after a clear-cut harvest, the guidance directs regions to determine reforestation needs using a site-specific diagnosis and prescription for regenerating the acreage. In contrast, after fires or other natural disturbances, this guidance encourages staff to immediately estimate the acres in need of reforestation before they have visited forest locations to develop a site-specific prescription and refine their estimate while performing restoration activities. Forest Service officials commented that at times it is difficult to balance the timely reporting of needs created by natural disturbances with data accuracy.

Regions we visited varied in the extent to which they used site-specific prescriptions or estimates as a basis for reporting needs. For example, although a Forest Service official in the Southern Region told us that over 100,000 acres of land there may need reforestation, in part due to insect damage, he said none of this acreage will be reported as needing reforestation until staff diagnose the needs through site visits and prescribe treatments. In contrast, forests in wildland fire-prone regions, such as the Pacific Southwest Region, report needs based on gross estimates after natural disturbances. In cases where reforestation or timber stand improvement needs are based on gross estimates, the reported needs may not always be adjusted after the actual needs are known, according to Forest Service officials. For example, an official from the Pacific Southwest Region indicated that the moist climate in some areas of the region causes vegetation to grow quickly, so that when an area initially needs to be reforested, staff generously estimate all possible treatments needed to remove unwanted vegetation and are unlikely to update these reforestation needs, even if subsequent treatments are deemed unnecessary. On the other hand, this official indicated that staff are likely to understate the need to thin trees in some areas because they do not expect sufficient funding to address all of the timber stand improvement needs. They therefore concentrate their efforts on meeting the needs rather than diagnosing and precisely reporting them. Officials in other regions also noted that they emphasize addressing needs rather than accurately identifying and reporting them, in part because incentives are focused on accomplishments and meeting treatment goals established by headquarters.

Data Are Not Reviewed for Accuracy

The Forest Service cannot attest that the reported data on needs reflect actual forest conditions nationwide because the data are not reviewed for accuracy and when errors are found they are not always corrected. Forest Service officials at headquarters and in the regions we visited told us that data may be overstated or understated because, with the exception of the Northern Region, they have not conducted comprehensive reviews of data accuracy in recent years and because controls over data are decentralized. Some regions do not consistently update or review their data for substantive errors before reporting them. Although Forest Service headquarters staff conduct high-level checks to ensure that some data are reported consistently, they have not conducted reviews in the last decade to ensure that the data reflect on-the-ground conditions. Consequently, an official in the Pacific Southwest Region speculated that there is an error rate of approximately 20 percent in the reforestation and timber stand improvement needs reported within the region. Even when errors are detected, there is no assurance that data will be corrected. For example, according to an official in the Pacific Northwest Region, an error of 10,000 acres dating from 2002 remains uncorrected. We also found during our visit to this region that another error in reporting reforestation needs in 2002, compounded by an attempt to correct the error, resulted in the erroneous reporting of more than 6,000 acres of reforestation needs in one district.

Data Problems Are Long Standing and May Not Be Resolved with New System

The problems we identified with the Forest Service's data on reported needs are not new. In 1985, a congressional study of the Forest Service's reforestation and timber stand improvement program found that numbers used to report both the reforestation and timber stand improvement backlogs were unreliable because backlogged needs were not linked to specific forest locations and because data at different organizational levels could not be reconciled.⁶ This study attributed these shortcomings to a lack of centralized program management to standardize definitions of need and establish consistent reporting criteria. Subsequent reviews of the program, including a GAO review in 1991, found similar problems and recommended

⁶Surveys and Investigations Staff of House Committee on Appropriations, 99th Cong., *A Report to the Committee on Appropriations U.S. House of Representatives on the 10-Year Reforestation Backlog Elimination Program of the U.S. Forest Service* (1985).

additional standardization.⁷ The Forest Service recognizes these problems and has acknowledged it has not provided the Congress estimates on funding needed to prevent a backlog, in part, because needs data are a mixture of actual needs, estimates, and obsolete needs. Instead, the Forest Service provides the Congress with a proposed program of work, outlining the amount of reforestation and timber stand improvement needs it will address within certain budget limits.

In an attempt to improve its data and integrate its reporting between regions and headquarters, the Forest Service is introducing a new agency-wide system for collecting and reporting data on reforestation and timber stand improvement needs. The Forest Service intends to implement the new system by the end of fiscal year 2005. When the new system replaces individual district, forest, and regional systems for reporting needs with a single, agency-wide database, it will standardize how reforestation and timber stand improvement activities are tracked as well as modernize data entry, system maintenance, and security activities. However, the agency acknowledges these changes will not, in and of themselves, address the data reliability issues that we have identified since the Forest Service intends to transfer regional data from the current systems to the new system without altering how reforestation and timber stand improvement needs are defined, interpreted, and reported from the initial needs assessment onward. Since this system does not introduce any new procedures to standardize how needs are defined or to check for and correct errors, the consistency and accuracy of the data will still be determined at the local level. Forest Service officials told us they do not anticipate making significant changes to current agency policies and practices that make regions individually responsible for developing data collection and reporting standards and ensuring that data are accurate. Therefore, it is likely that present data deficiencies will persist in the new system if existing data are incorporated into it without additional efforts being made to improve the data. Officials acknowledge that improving the data will require a significant investment of resources and also

⁷See Department of Agriculture, *Performance and Accountability Report for FY 2003: Appendix A- Management Challenges*, (Washington, D.C.: September 2003), p. 264; Department of Agriculture, Forest Service Pacific Northwest Region, *Forest Density Management: Recent History and Trends for the Pacific Northwest Region*, R6-NR-TM-TP-05-01 (Portland, Oregon, 2001); and GAO, *Forest Service: Better Reporting Needed on Reforestation and Timber Stand Improvement*, [GAO/RCED-91-71](#) (Washington, D.C.: March 15, 1991).

acknowledge that unless the work is done, data reliability issues will persist.

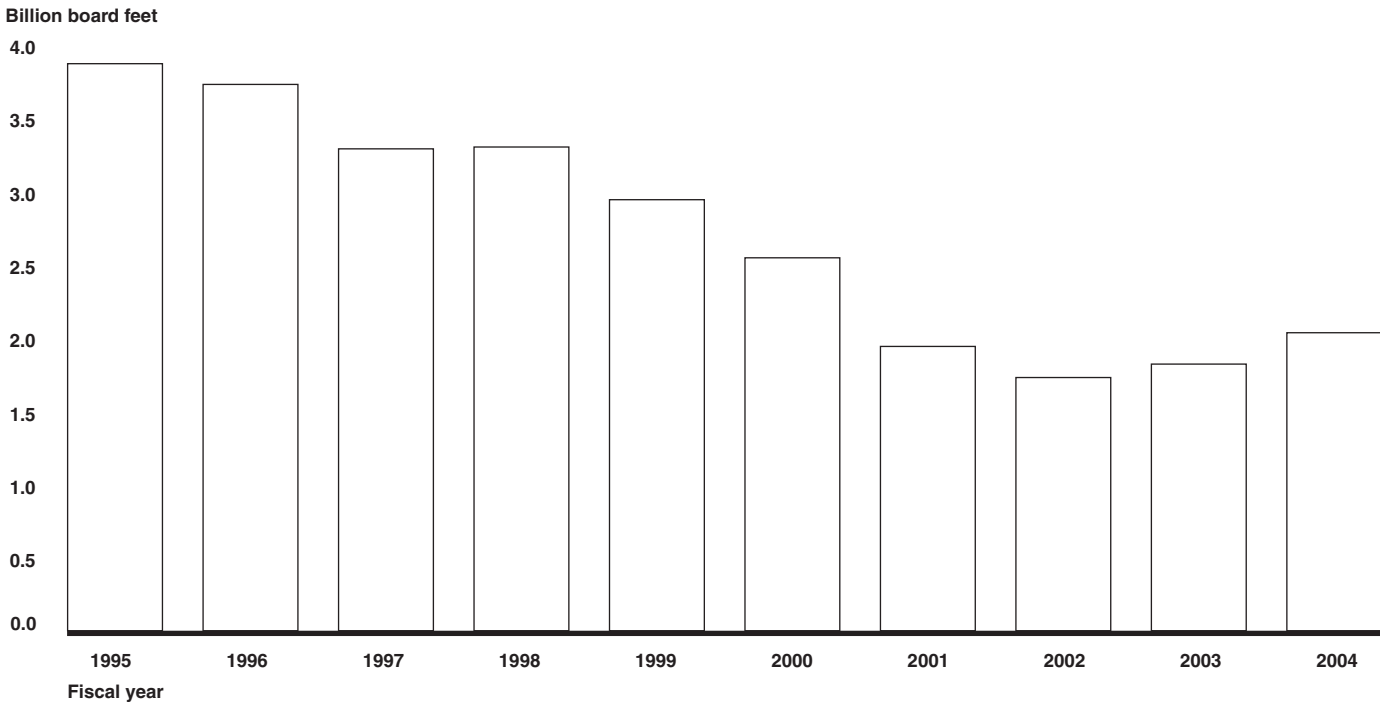
Agency Officials Link Natural Causes and Management Decisions to Increasing Reforestation and Timber Stand Improvement Needs

Natural disturbances, such as wildland fires or insect infestations, and management decisions are the major factors contributing to the recent increase in reforestation and timber stand improvement needs, according to Forest Service officials. The officials said that reforestation needs are accumulating primarily because a recent increase in natural disturbances has created more needs, and funding to pay for such needs is limited. Other factors, such as reforestation failures, also have contributed to increasing reforestation needs, according to agency officials. Timber stand improvement needs have accumulated, in part, because some regions do not emphasize these projects and consequently, treatments have not kept pace with growing needs. At the same time, agency officials have been identifying more timber stand improvement needs as they have expanded the scope of work included in the program. In addition, timber stand improvement needs have been increasing because, in the 1980s and 1990s, the Forest Service used reforestation techniques that favored planting trees densely, creating stands that now need thinning.

Agency Officials Link Rising Reforestation Needs to Natural Causes Rather Than Timber Harvests

Forest Service officials told us that reforestation needs have been rising largely because such needs have increasingly been generated by causes other than timber harvests, and funding to address these needs has not kept pace. During the early 1990s, the agency shifted its management emphasis from timber production to enhancing forest ecosystem health and, as a result, began harvesting less timber. With the reduction in harvests, revenue from timber sales decreased. As shown in figure 4, nearly 4 billion board feet of timber were harvested from Forest Service lands in 1995, whereas about 2 billion board feet were harvested in 2004. Similarly, according to the Forest Service, the timber harvested on its lands in 1995 was worth about \$616 million, whereas timber harvested in 2004 was worth about \$217 million. As timber harvests and revenue have decreased, related reforestation needs also have decreased, and so the Forest Service has generally been able to meet these needs by using timber sale revenue to help pay for reforestation. Forest Service officials also noted that the value of the wood they are now selling is typically much lower than it was a decade ago.

Figure 4: Volume of Timber Harvested from Forest Service Lands for Fiscal Years 1995 through 2004

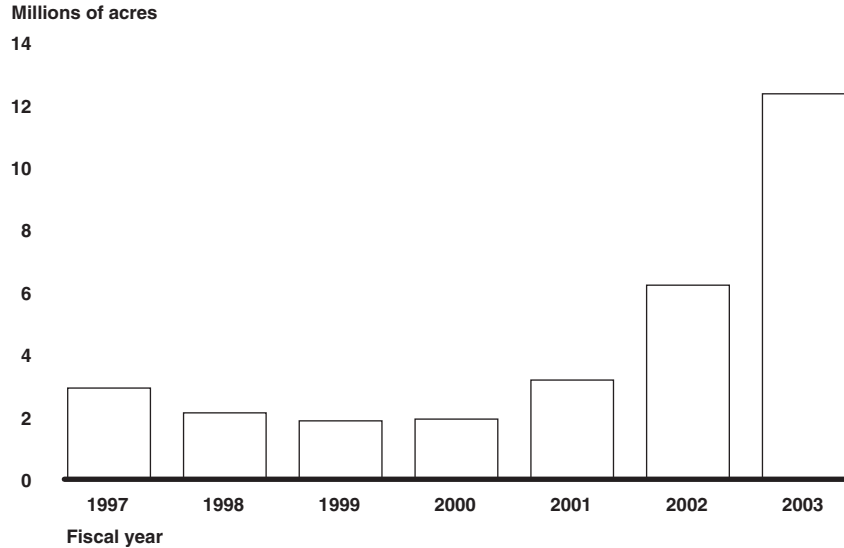


Source: Forest Service data.

According to Forest Service reports, as timber harvests and related reforestation needs were decreasing, the acreage burned in wildland fires and damaged by insects and diseases annually began to increase significantly around 2000, leaving thousands of acres needing reforestation. Nationally, wildland fires burned over 8 million acres in 2000, compared with less than 6 million acres in 1999 and about 2.3 million acres in 1998.⁸ In 2002, Colorado, Arizona, and Oregon recorded their largest fires in the last century. Similarly, figure 5 shows that the amount of land damaged by insects and diseases has increased significantly, with over 12 million acres of forest affected in 2003, compared with less than 2 million acres in 1999. As the acreage affected by these natural disturbances increased, so did reforestation needs. However, funding allocated to pay for reforestation did not increase at the same rate, so needs began to accumulate.

⁸These numbers include lands under federal and state ownership, not just Forest Service land.

Figure 5: Acres of Tree Mortality Caused by Insects and Disease on Forested Lands Nationwide for Fiscal Years 1997 through 2003



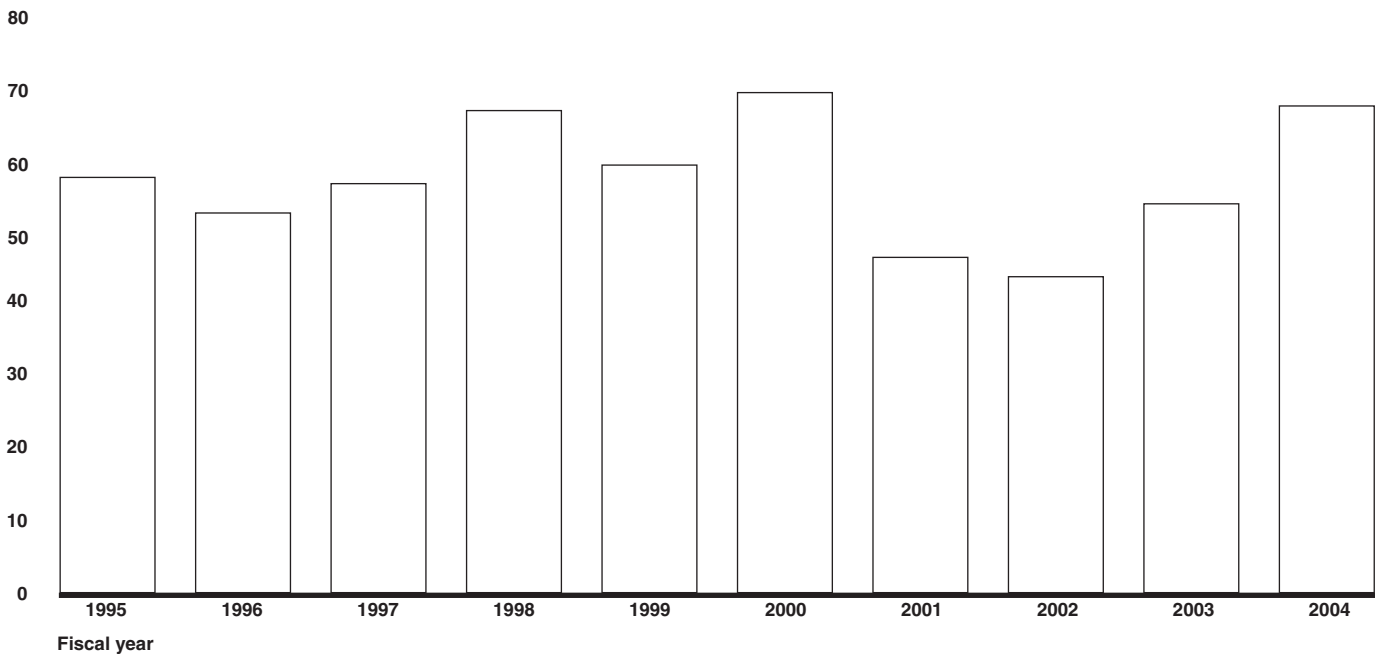
Source: Forest Service.

Note: These numbers include all forested lands under federal, state, and other ownership, not just Forest Service land.

While reported reforestation needs have been rising, funding allocated for reforestation and timber stand improvement has been relatively constant (as shown in fig. 6). In addition, pressure on limited funding was magnified in fiscal year 2001, as the Forest Service combined under one budget multiple programs including reforestation and timber stand improvement as well as range, watershed improvement, and noxious weed management programs, among others. Once these programs were combined, agency officials had to balance reforestation and timber stand improvement needs against priorities in the other programs. On a broader scale, a Forest Service official said they must balance reforestation needs against other competing priorities when requesting a budget from the Congress, so they did not request more funding to help pay for reforestation needs during the last decade. Officials did, however, request additional funding for fiscal year 2006, according to an agency official.

Figure 6: Forest Service Appropriations Allocated to Reforestation and Timber Stand Improvement for Fiscal Years 1995 through 2004

Dollars in millions



Source: Forest Service data.

Note: The Forest Service allocates funds from its National Forest System appropriation to pay for reforestation and timber stand improvement. Amounts presented for 1995 through 2000 are amounts allocated from enacted appropriation levels. Because the reforestation and timber stand improvement program was combined with several other programs under one budget beginning in 2001, the amounts presented for 2001 through 2004 are estimates provided by the Forest Service.

In addition to natural causes, several other factors have contributed to the reported increase in reforestation needs, according to Forest Service officials. In some areas, reforestation attempts have failed, creating needs where agency officials will try again to reforest the same lands.

Reforestation efforts can fail for a variety of reasons, such as insufficient moisture, improper planting techniques, or animal damage to young seedlings. Ongoing drought conditions in the West, as well as the retirement of experienced foresters, may have played a role in recent reforestation failures, according to Forest Service officials. Another factor that has contributed to the reported increase in reforestation needs is that some national forests have recently acquired lands through purchase or exchange that need reforestation. For example, the Ozark-St. Francis

National Forest in Arkansas acquired about 11,000 acres of land in 1993 and 1994 that had been harvested, and much of it needed reforestation. About 4,000 acres of the land have yet to be reforested.

Changing Management Practices Have Contributed to Reported Increase in Timber Stand Improvement Needs

Nationally, timber stand improvement needs have generally been increasing for the 10-year period we reviewed because (1) some Forest Service regions emphasize reforestation over timber stand improvement; (2) agency officials have identified increasingly more needs as they have expanded the scope of timber stand improvement to include work needed to meet a wider range of objectives; and (3) past forestry practices called for dense planting, leaving a legacy of thinning needs to be addressed in the timber stand improvement program, particularly on forests that had large reforestation programs within the past 2 decades. While these circumstances have contributed to nationwide increases in timber stand improvement needs, they have not always led to increases in individual regions.

Some Regions Emphasize Reforestation Needs over Timber Stand Improvement Needs

According to Forest Service officials, one reason nationwide timber stand improvement needs are accumulating is that some regions prioritize funding for reforestation treatments over timber stand improvement treatments. These regions do so in part because they are required to complete reforestation treatments within 5 years of harvesting, whereas for timber stand improvement, there is no such requirement. In addition, agency officials said that, generally, lands needing reforestation change more quickly than lands needing timber stand improvement, so the opportunity cost of deferring reforestation treatments is higher than that of deferring timber stand improvement projects. For example, an official in the Pacific Southwest Region estimated that if they did not reforest an area immediately after a fire, brush would likely become established within a few years, and removing the brush could add as much as \$400 per acre to the costs of reforestation. In contrast, deferring a thinning treatment for 1 or 2 years has little effect on forest conditions and treatment requirements, agency officials said, although deferring these projects for longer periods can create problems, as discussed later.

Forest Service Has Expanded Scope of Timber Stand Improvement

Another reason national timber stand improvement needs are increasing is that the Forest Service has expanded the scope of the program, now identifying lands where timber stand improvement work is needed to meet objectives beyond maximizing timber yield, such as improving wildlife habitats or thinning hazardous fuels to reduce fire danger. As the objectives

of timber stand improvement have expanded, needs have expanded accordingly. For example, the Southwestern region has identified fuels reduction as a regional priority and consequently dedicates most of its reforestation and timber stand improvement program funding to timber stand improvement, using only moneys from the Reforestation Trust Fund—about 4 percent of the region’s 2003 program funds—to pay for reforestation projects. However, the region’s increased emphasis on fuels reduction has added to timber stand improvement needs rather than reducing them, because as the scope of timber stand improvement expands to include lands that need fuels reduction, officials are identifying many more needs than they can meet each year.

Forest Service Favored Dense Tree Planting in the 1980s and 1990s

In addition, nationwide timber stand improvement needs are increasing because reforestation techniques favored in the 1980s and 1990s recommended planting trees much more densely than may be currently recommended. Consequently, many stands that were planted 15 to 20 years ago now need thinning, according to agency officials. For example, during the 1970s, 1980s, and early 1990s, the Idaho-Panhandle National Forest had an active timber production program, clear-cutting and harvesting thousands of acres each year, and replanting densely. During that period, officials deliberately planted seedlings densely so that as the trees grew, they could keep the largest and healthiest of them for cultivating, and thin out the others. Although the Forest Service has now reduced its emphasis on timber production, thinning is still needed in these areas to maintain forest health, according to agency officials.

Some Regions’ Trends in Timber Stand Improvement Needs Deviate from National Trends for Various Reasons

The circumstances causing the nationwide trend of increasing timber stand improvement needs have not always led to increases in individual regions. For example, the Pacific Southwest region has reported decreasing needs since 1994. According to agency officials, the decrease is largely a result of the decrease in timber harvests and associated planting. In some parts of the country, such as Idaho, timber stand improvement projects may not be needed until 20 or 30 years after planting. However, the moist climate in some areas of the Pacific Southwest region causes vegetation to grow quickly, so timber stand improvement projects are typically needed much sooner—between 2 and 10 years after planting. Consequently, many of the region’s harvest-related timber stand improvement needs have already been addressed and total needs have been decreasing. In addition, like the Southwestern region, the Pacific Southwest region has begun to give priority to timber stand improvement projects that contribute to fuels reduction goals. According to agency officials in the region, this emphasis has helped finance timber stand improvement work and reduce needs. In

the Southern region, agency officials reported that timber stand improvement needs have been relatively stable during the period we reviewed, in part because the timber program in that region is still active, and timber revenues can help pay for timber stand improvement needs.

Land Managers Cite Adverse Effects That Could Result If Reforestation and Timber Stand Improvement Needs Are Not Addressed

If reforestation and timber stand improvement needs continue to accumulate in the future, the Forest Service will likely have to postpone some projects. According to agency officials, the agency's ability to achieve forest management objectives may consequently be impaired; treatment costs could increase; and forests could become more susceptible to fire, disease, and insect damage. While Forest Service officials expressed concern about the potential harmful effects of delaying projects, the agency has not clarified priorities for the reforestation and timber stand improvement program that reflect this concern and the current context in which the program operates. Instead, regions and forests rely mainly on decision-making practices initiated when the agency's primary focus was timber production, and timber revenues allowed them to fund reforestation and timber stand improvement needs with fewer constraints. Forest Service headquarters officials acknowledged this circumstance and noted that field staff could benefit from clarified, updated national policy.

Forest Service's Ability to Meet Forest Management Objectives Could Be Impaired

The Forest Service's ability to meet the management objectives defined in its forest plans—such as maintaining a variety of tree species in a forest or appropriate habitat for certain wildlife—could be impaired if reforestation or timber stand improvement treatments are delayed. For example, at the Bitterroot National Forest in Montana and Idaho, agency officials have identified a management objective of establishing or maintaining ponderosa pine forests, which populated the area historically and are well-adapted to high-frequency, low-intensity wildland fires. Currently, the Bitterroot National Forest has thousands of acres that need reforestation because of wildland fires in 2000. If these needs are left unattended, douglas fir forests will likely become established instead of ponderosa pine; and, according to agency officials, douglas fir tends to grow into crowded stands that officials believe will perpetuate the cycle of dense forests, fueling severe fires. In addition, agency officials prefer ponderosa pine forests because they provide habitat for certain wildlife species, such as pileated woodpeckers. In other cases, an area previously dominated by forests could become dominated by shrubfields, compromising wildlife habitat, recreation, and timber value. In the Shasta-Trinity National Forest,

an area that was cleared by logging and wildland fires at the turn of the century left a brushfield that persisted for over 60 years and only became forested when the Forest Service actively planted the area. Similarly, about 750 acres in the Tahoe National Forest were cleared by a 1924 wildland fire and replaced by shrubs (shown in fig. 7) that remained until agency officials replanted the area in 1964—40 years later. One Forest Service official expressed particular concern about leaving reforestation needs unattended because, as these needs are increasingly created by natural causes such as wildland fires that burn vast areas, adverse effects have the potential to occur on a large scale. Furthermore, an agency official said that if they cannot meet the management objectives defined in their forest management plans, it will be difficult to fulfill their mission “to sustain the health, diversity, and productivity of the nation’s forests.”

Figure 7: Shrubfields Persisted 40 Years after a Wildland Fire in Tahoe National Forest



Source: USDA Forest Service Research Paper PSW-RP-248, 2003.

Similarly, if timber stand improvement needs are not addressed, it also will be difficult to meet forest management objectives. For example, if competing vegetation is not removed, the success of recently completed reforestation treatments can be jeopardized, hindering agency efforts to meet objectives such as maintaining an area in a forested condition or reintroducing certain species of trees. If thinning needs are left unattended, forest management objectives can be thwarted as well. For example, some forests have identified areas where timber production is an objective, and thinning treatments are used to increase timber productivity by removing trees with the least potential for growth and leaving those with the greatest potential. When these treatments are delayed, trees grow more slowly and may not reach the desired size, slowing progress in meeting timber production objectives.

Project Costs Could Increase

If reforestation and timber stand improvement needs are not addressed in a timely manner, treatment costs also could increase because removing vegetation, which is required for most reforestation and timber stand improvement projects, will become more costly as the vegetation grows. For example, at the Ozark-St. Francis National Forest in Arkansas, insects have destroyed thousands of acres of red oak forests since 1999, leaving large areas that need to be reforested. As the Forest Service has left these areas unattended, brush that must be removed before new seedlings are planted is becoming established, and removing it will be more costly as time passes. When the brush was young and small, it could have been removed with inexpensive methods such as hand spraying herbicides; but now it will require a more expensive method such as cutting the brush with a chainsaw, according to agency officials. If these areas are left indefinitely, trees may become established, but a different mix of species will probably replace the red oak forests, which are desirable both for their commercial value and the habitat they provide for wildlife, such as large game.

In addition, some Forest Service officials said that because there has been recent controversy over salvage timber sales—the selling of dead or dying trees—the sales have been delayed, adding costs to reforestation projects done following salvage sales. The Forest Service could not, however, quantify such costs. Although salvage sales do not always precede reforestation, any salvage harvesting that is done is generally completed before reforestation begins because logging activities and equipment can damage young seedlings. Consequently, when salvage sales are delayed, reforestation projects are delayed as well, causing reforestation costs to increase as vegetation grows that must be removed before reforestation.

Also, when salvage sales are delayed, revenue declines because over time the value of the salvage timber decreases as the wood decays. According to agency officials, revenue from salvage sales was once enough to cover administrative costs of the sale and also help pay for reforestation in some cases, but now it is not typically enough to pay for any reforestation. However, data are not readily available to show how common it is for salvage sales to delay reforestation projects or the extent to which revenues for salvage timber have declined, and why.

Forest Susceptibility to Wildland Fire, Insects, and Disease Could Increase

If reforestation and timber stand improvement needs are not addressed, forests will be more susceptible to severe wildland fires and damage from insects and disease, according to agency officials. When reforestation needs are left unattended, brush can grow in place of forests, providing dense, continuous fuel for wildland fires. Alternatively, exotic plant species may become established, some of which are more susceptible to wildland fires than native species. Once such invasive species become established, it is difficult to eradicate them. In addition, wildland fires may weaken some trees without killing them, leaving them susceptible to insect attack and diseases; and if reforestation needs are left unattended, an insect infestation can grow to epidemic proportions. In contrast, when the Forest Service reforests such an area, agency officials typically will first remove infested trees, which can serve as carriers for insects and disease, and then plant healthy seedlings that are more resistant.

Leaving timber stand improvement needs unattended also can increase forest susceptibility to wildland fire, insects, and disease. Forests that are densely populated and need thinning tend to be stressed because the trees compete with one another for sunlight, water, and nutrients. Experts believe that when wildland fires start in such forests, they are fueled by the tightly spaced trees, causing the fires to spread rapidly and increasing the likelihood of unusually large fires, resulting in widespread destruction. Similarly, when insects or diseases infect such forests—especially when the trees are of a uniform species and age rather than a variety of species and ages—they can spread rapidly because of the stressed condition of the trees and because the trees are close together and of the same species.

Forest Service Is Not Well Positioned to Manage Potential Effects of Increasing Needs

Although Forest Service officials expressed concern about the potential effects of leaving reforestation and timber stand improvement needs unattended, the agency has not made sufficient adjustments to address these concerns and adapt to changes in the context in which the program operates. The Forest Service has shifted its management emphasis from timber production to ecosystem management, sources of reforestation needs have shifted from timber harvests to natural causes, and budgets have become increasingly constrained. However, the agency has not adjusted the program's direction, policies, practices, and priorities in keeping with these changes, although agency officials acknowledged the need to do so. Until they do, it will be difficult to ensure that reforestation and timber stand improvement funds are targeted toward activities that will have the greatest impact in mitigating potential adverse effects.

While the Forest Service formally shifted its management emphasis from timber production to ecosystem management in the early 1990s, there remains a general lack of clarity about agency mission and goals, and more specifically, a lack of clarity about the direction and goals for the reforestation and timber stand improvement program, according to agency officials. When timber production was the emphasis, the direction for the reforestation and timber stand improvement program was clearly focused around maximizing timber production, whereas in the current environment, it is less clear. Reforestation and timber stand improvement projects now are done for multiple purposes—such as improving wildlife habitat, protecting streams and water quality, and reducing susceptibility to wildland fires—but it is unclear which of these purposes are more important, if any, and how to allocate limited funds to support such diverse purposes. The lack of clarity is apparent in forest management plans, where management objectives are expressed in language that may be vague or contradictory, according to agency officials. For example, one objective in a Montana forest's management plan calls for providing “a pleasing and healthy environment, including clean air, clean water, and diverse ecosystems.” The forest management plans are intended to help guide management decisions, such as deciding which reforestation and timber stand improvement techniques to use, but agency officials said it can be difficult to interpret the plans when making such decisions because of the vague language, conflicting management objectives, or a combination of these factors. A 2004 study in the Pacific Southwest Region found that many agency officials believe forest management plans are too generic and lack clear priorities.

In the absence of program direction that is consistent with the current management emphasis, reforestation and timber stand improvement policies remain in place that reflect outdated direction and management emphasis. For example, some reforestation policies written in the 1980s call for tight spacing between trees consistent with the agency's timber focus at the time. Dense planting can increase timber production and decrease competing vegetation, but it is more expensive than sparser planting and can add costs later because dense stands need to be thinned. Agency officials acknowledged that in many cases, these standards are outdated and reflect neither the current emphasis on ecosystem management, nor the current environment of constrained budgets. Nevertheless, officials explained that they have not changed the standards because they are not required to comply with them. Rather, they have the discretion to determine the appropriate spacing for trees on a site-specific basis and to write a prescription that deviates from the standards by relying on their professional judgment. While reliance on professional judgment may result in actions that are more closely aligned with the current management emphasis, there is no assurance that it will have such results without clear direction and policies consistent with the direction.

In some places, regional culture that reflects a former management emphasis and budgetary situation influences current practices. For example, when reforesting an area, officials in the Pacific Southwest region almost always rely on planting—a more expensive method than natural regeneration—because they have always done so and, according to agency officials, this practice has been reinforced by the regional culture. When the agency-wide management emphasis was timber production, reforestation standards called for prompt reforestation and tightly spaced trees to maximize timber volume; so officials rarely relied on natural regeneration, which does not necessarily ensure rapid reforestation or result in tightly spaced trees. In addition, when timber revenues were higher and reforestation efforts centered on harvested areas, the region could always afford to plant. Now, as the agency's management emphasis has shifted to ecosystem and forest health, and as budgets have become increasingly strained, officials in the Pacific Southwest region said they are beginning to encourage greater reliance on natural regeneration, but it remains to be seen whether forests and districts will adjust their practices, accordingly.

Priorities for the reforestation and timber stand improvement program also reflect a lack of clarity about program direction in the context of the current management emphasis, and a continued reliance on former

program direction. For example, among agency officials we talked with, there was disagreement on how funding should be allocated between reforestation and timber stand improvement work and on whether one ought to be higher priority than the other. In the Pacific Northwest region, agency officials wrote a 2001 report recommending that the region divert some of its reforestation funds to pay for additional timber stand improvement. The report stated that doing so is justified, because (1) many of the current timber stand improvement needs resulted from reforestation projects several decades ago that favored high density planting and (2) without thinning to help reduce the impacts of wildland fire, reforestation will continue to be needed after wildland fires. Nevertheless, regional officials we talked with did not all agree with the recommendation, and the region has not implemented it. Instead, the region has continued to prioritize reforestation over timber stand improvement, as it has done since the inception of the timber program. According to one regional official, the Forest Service's history of timber production permeates current thinking, and many procedures do not reflect the current management emphasis on ecosystem health.

Without clear program direction, not only is it difficult to determine priorities between reforestation and timber stand improvement, but it is also difficult to do so for work within each. For the most part, the regions and forests we visited have not established clear criteria for prioritizing funding decisions, and officials do not always agree with one another about such decisions. For example, at a forest in the Pacific Southwest region, after district officials replanted most of an area burned by a 1996 wildland fire, regional officials thought replanting the remaining burned area was a low priority because of the high per-acre cost. District and forest-level staff, however, believed it was a high priority because the area was harvested in a salvage sale after the fire, and the Forest Service is required to reforest all harvested lands within 5 years. The forest has continued to fund projects to replant the remaining area. Without clear program direction that reflects the current management emphasis and budget environment, it is difficult to identify the highest priority investments to minimize the potential adverse effects of accumulating reforestation and timber stand improvement needs.

Conclusions

The Forest Service needs a more accurate assessment of its reforestation and timber stand improvement needs to reflect the condition of our national forests. Although emphasizing data accuracy may take away from resources to carry out reforestation and timber stand improvements in the short-term, this investment is a critical foundation for providing a credible

picture of these needs to Forest Service managers and the Congress. If the agency does not have accurate data, it cannot clearly define the extent or severity of its reforestation and timber stand improvement needs or effectively channel efforts and resources to meet the most important needs. Currently, the Forest Service has difficulty estimating how much it would cost to meet all of its reforestation and timber stand improvement needs because Forest Service data are inconsistent across regions and are not sufficiently reliable to accurately quantify needs. With the advent of a new agency-wide data collection system, the Forest Service has the opportunity to improve the accuracy of its data. However, the new system will only be as good as the data that are entered into it. The Forest Service should take this opportunity to address the data reliability problems by standardizing procedures, developing a common definition of need, and validating the data—verifying that reported needs accurately reflect conditions on the ground—so that it can build a well-founded budget case for funding reforestation and timber stand improvement needs. To seize this opportunity and minimize the potential adverse effects of unmet needs, it is important for the Forest Service to act soon. While it may not be possible for the agency to make all the necessary changes in time for its fiscal year 2006 appropriations request, it should aim to do so in time to support its fiscal year 2007 request.

The Forest Service also must recognize, however, that in the current, fiscally constrained environment, even well-supported budget needs may not always be funded. The shift in management emphasis from timber production to ecosystem management, combined with constrained budgets and changing sources of reforestation needs, has changed the context in which the reforestation and timber stand improvement program operates. However, the Forest Service has not updated its goals and policies for the program to reflect this change. Until the agency does so, it will be difficult to establish criteria for prioritizing the use of reforestation and timber stand improvement funds. In the current budget environment, such criteria are crucial for identifying the best investments to minimize possible adverse effects so that the Forest Service can fulfill its stewardship responsibility and ensure the lasting health and productivity of our national forests.

Recommendations for Executive Action

To enhance the ability of the Forest Service to identify its reforestation and timber stand improvement needs and ensure funding for its most critical projects, we recommend that the Secretary of Agriculture direct the Chief of the Forest Service to take the following actions:

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- standardize collection, reporting, and review procedures for data on reforestation and timber stand improvement needs by clarifying agency-wide guidance and developing a standard definition of need;
 - require all regions to validate their reforestation and timber stand improvement data in time for congressional deliberation of the Forest Service's fiscal year 2007 appropriations request;
 - clarify the direction and policies for the reforestation and timber stand improvement program to be consistent with the agency's current emphasis on ecosystem management and appropriate for the current constrained budget environment, and
 - require regions and forests to establish criteria for prioritizing the use of their reforestation and timber stand improvement funds in the current budget environment.

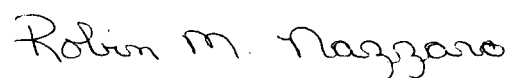
Agency Comments and Our Evaluation

We received written comments on a draft of this report from the Forest Service on behalf of Agriculture and from Interior. The Forest Service concurred with our findings and recommendations. Interior also concurred with our findings related to the Bureau of Land Management's reforestation and growth enhancement program discussed in appendix I and provided a technical suggestion that we have incorporated into the report. The Forest Service's and Interior's letters are included in appendixes III and IV, respectively.

As arranged with your office, unless you publicly announce the contents earlier, we plan no further distribution of this report until 30 days after the date of this letter. At that time, we will send copies of this report to other interested congressional committees. We also will send copies to the Secretaries of Agriculture and the Interior and the Chief of the Forest Service. We will make copies available to others upon request. In addition, this report will be available at no charge on the GAO Web site at <http://www.gao.gov>.

If you or your staff have questions about this report, please contact me at (202) 512-3841. Key contributors to this report are listed in appendix V.

Sincerely yours,

A handwritten signature in black ink that reads "Robin M. Nazzaro". The signature is written in a cursive style with a large initial 'R' and 'N'.

Robin M. Nazzaro
Director, Natural Resources
and Environment

Bureau of Land Management's Reforestation and Related Forest Health Trends in Western Oregon

The Bureau of Land Management (BLM) manages about 261 million acres of land nationwide, including about 55 million acres of forest and woodlands, which are administered under two management programs—one for about 2.4 million acres in western Oregon,¹ and another for the remaining 53 million acres of public domain lands, located mostly in the West. BLM's western Oregon lands include both lands managed primarily for timber and reserve forests, which are managed primarily to meet wildlife habitat and other objectives. The public domain lands consist mainly of woodlands, with some commercial forests. We confined our review of BLM to its western Oregon lands because the majority of BLM's reforestation and related efforts are focused there and because BLM records for its public domain lands are not in a centralized, automated database. (For more information on the scope and methodology of our review, see app. II.)

Regarding trends, BLM reports that it had backlogs of acres needing reforestation and growth enhancement treatments² in western Oregon in 1993, but that such needs decreased until 2002 when the backlogs were eliminated. Since then, BLM reports that it has kept pace with these needs. According to BLM officials, the backlogs—defined by BLM as needs delayed 5 years or more—developed mainly because BLM was harvesting large volumes of timber, which created reforestation needs. The backlogs were eliminated through a combination of factors, including reduced harvest levels, increased funding, and management actions taken by BLM. Agency officials believe that because they are keeping pace with their current reforestation and growth enhancement needs, they are minimizing any potential adverse effects that could result from carrying a backlog of unattended needs.

¹BLM manages approximately 2.1 million acres of Oregon and California (O&C) lands, 75,000 acres of revested Coos Bay Wagon Road lands, and additional intermingled public domain lands in western Oregon. The Forest Service manages another 492,399 acres of O&C lands in Oregon.

²BLM's growth enhancement activities are similar to the Forest Service's timber stand improvement activities. BLM includes thinning, pruning, fertilization, and one type of release treatment under the heading of growth enhancement, but another type of release treatment—one that is essential for seedling survival—is included under BLM's reforestation program.

Background

BLM is required to administer its western Oregon lands in accordance with the Oregon and California Grant Lands Act of 1937. The act called for permanent forest production and protection of watersheds, among other things, on BLM's western Oregon lands. It also established an initial upper limit of 500 million board feet of timber that could be sold annually from these lands and directed BLM to adjust the limit, based on the capacity of the land. Accordingly, BLM has adjusted the limit several times—to 1,185 million board feet per year in 1983, 211 million board feet per year in 1995 with the advent of the Northwest Forest Plan, and 203 million board feet per year in 1999, where it remains today.³ To fund reforestation and growth enhancement work, BLM relies mainly on funds it has allocated for its reforestation and growth enhancement program—about \$25 million in 2004. In addition, a small portion of such work is funded through other sources, such as appropriations allocated for wildland fire rehabilitation and the forest ecosystem health recovery fund.⁴

BLM Reports Eliminating Reforestation and Growth Enhancement Backlogs in 2002

For the 10-year period between 1995 and 2004, BLM reports that its annual reforestation and growth enhancement needs on its western Oregon lands generally decreased until 2002, after which annual treatments kept pace with such needs, as shown in figure 8. A 1994 Interior Inspector General report found that at the end of fiscal year 1993, BLM had a backlog of over 50,000 acres of reforestation needs and over 220,000 acres of growth enhancement needs.⁵ According to a BLM official, after the backlogs were identified, needs generally decreased (for reasons noted in

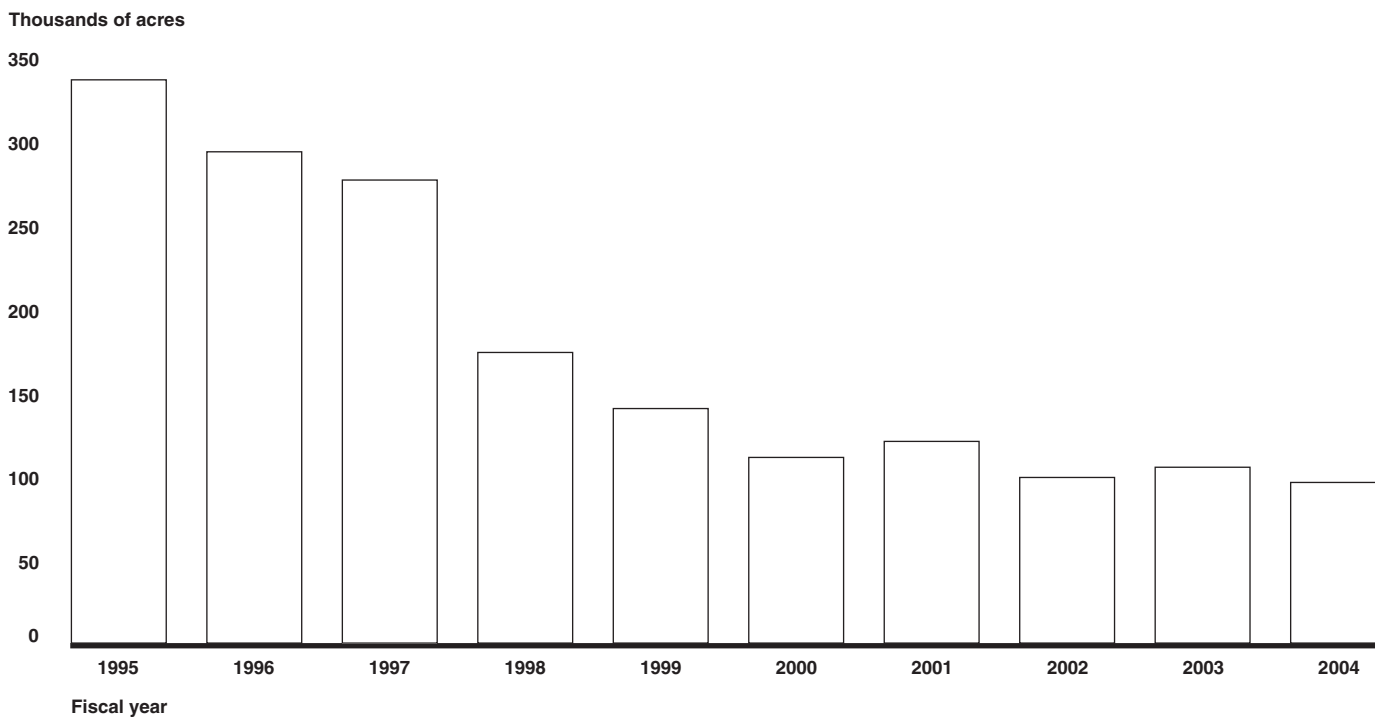
³The Northwest Forest Plan is a long-term management plan designed to provide a stable supply of timber while also protecting fish and wildlife habitat for 22.1 million acres of federal forest in western Oregon, western Washington, and northern California (including 2.7 million acres of BLM-administered forests and 19.4 million acres of Forest Service-administered forest).

⁴The forest ecosystem health recovery fund is a permanent operating account that collects revenues from timber sales held for forest health reasons, such as removing dead and down timber or thinning a forest to reduce hazardous fuels.

⁵See Department of the Interior Office of Inspector General, *Audit Report: Forestry Operations in Western Oregon, Bureau of Land Management*, Report No. 94-I-359 (Washington, D.C.: February 1994).

the following section) until both backlogs were eliminated in 2002.⁶ Since 2002, BLM has kept pace with its reforestation and growth enhancement needs on its western Oregon lands, agency officials said.

Figure 8: BLM Western Oregon Reforestation and Growth Enhancement Needs for Fiscal Years 1995 through 2004



Source: BLM.

Agency Officials Link Past Backlogs to Timber Harvests and Funding Shortfall

BLM's past backlogs developed primarily because timber harvests on its western Oregon lands had risen sharply, causing related reforestation and growth enhancement needs to increase, while funding allocated to address the needs decreased rather than increasing in step with the needs. Timber harvests on BLM's western Oregon lands were at their peak in the late

⁶According to a BLM official, there are still some deferred fertilization needs, but the needs cannot be addressed because the agency is prohibited from conducting such activities by a judicial stay related to restrictions on the use of fertilizer.

1980s with over 1 billion board feet of timber sold annually; causing a spike in reforestation and related needs. However, unlike the Forest Service, BLM does not have the authority to use timber revenues from standard timber sales for reforestation and growth enhancement treatments. Instead, BLM relies on annual appropriations from the Congress to fund such treatments. According to the Inspector General's report, BLM had backlogs in its reforestation and growth enhancement program because it did not request or receive sufficient funding through the budget process to eliminate these backlogs and because it used about \$5.4 million of its forest program funds for overhead costs not related to forestry. In addition, large wildland fires in the late 1980s and early 1990s added to BLM's growing reforestation needs, according to agency officials.

Agency Officials Attribute Elimination of Backlogs to Declining Timber Harvests, Increased Funding, and Management Actions

Declining timber harvests, increased funding, and actions taken by BLM combined to help eliminate the reforestation and growth enhancement backlogs, according to agency officials. In the late 1980s and early 1990s, the volume of timber sold annually on BLM's western Oregon lands decreased considerably—from a peak of 1,583 million board feet in 1986 to a low of 14 million board feet in 1994—and associated reforestation needs decreased in parallel. According to BLM officials, the declining timber harvests were largely a result of growing controversy surrounding timber harvests and the protection of endangered species on public land. Related litigation and judicial decisions hindered BLM from harvesting timber on its lands. The controversy was addressed in the Northwest Forest Plan, adopted in 1994, which reduced the portion of BLM's western Oregon lands to be managed primarily for timber. After adoption of the plan, BLM reduced the upper limit on annual timber sales from these lands to 211 million board feet. At the same time, BLM modified its harvesting methods to rely less on clear-cutting and more on thinning. Unlike clear-cut forests, the thinned forests did not need to be reforested and required fewer growth enhancement treatments, resulting in a further reduction of needs. While reforestation needs were decreasing, BLM increased the funding it allocated for reforestation and growth enhancement from about \$23 million in 1995 to about \$26.5 million in 1996—an increase of about 15 percent. According to agency officials, increased funding in 1996 and subsequent years enabled BLM to treat more acres annually than it had done previously, thereby reducing the backlogs.

In addition to declining timber harvests and increased funding, BLM took several actions to help reduce its reforestation and growth enhancement backlogs in response to the 1994 Inspector General's report. First, officials

in the reforestation and growth enhancement program instituted measures to improve their data collection and tracking so that they could accurately quantify the size of the backlogs, locate the source of the backlogs, and track progress in eliminating them. Second, BLM shifted its priorities, funding, and resources to target the areas where the need was greatest. BLM officials from all of the districts in western Oregon, as well as the state office, came together to agree on a list of priorities for the program, then targeted available funding and resources to the highest priority needs. For example, they decided to place a higher priority on maintaining existing timber stands than on planting new stands, because maintenance needs made up the greatest portion of the backlog. Adhering to the prioritization scheme helped address the backlog, according to an agency official, but required staff to have fluid roles. Finally, BLM officials analyzed treatment costs per acre in each district and identified best practices to optimize their investments of scarce resources. For example, one district identified cost-saving forestry techniques for thinning, while another identified lower-cost contracting procedures. BLM then standardized these practices across all western Oregon districts.

BLM Reports
Preventing Adverse
Effects by Keeping
Pace with
Reforestation and
Growth Enhancement
Needs

Because BLM has been keeping pace with its reforestation and growth enhancement needs on its western Oregon lands since 2002, it is preventing any adverse effects that could result from a backlog of needs, according to agency officials.

Objectives, Scope, and Methodology

To examine the trends in federal lands needing reforestation and timber stand improvement, we reviewed the Forest Service and BLM programs because most of the nation's reforestation and timber stand improvement activities are managed by these two agencies. We focused our work primarily on the Forest Service's program because it is larger than BLM's and its forests cover a broader cross-section of the country. During 2004, we visited the following four Forest Service regions and one national forest in each region: Northern, Pacific Northwest, Pacific Southwest, and Southern. These regions were selected because they had the highest reported reforestation or timber stand improvement needs for fiscal years 2000 to 2003.¹ We obtained and analyzed 10 years of national data, from fiscal years 1995 through 2004, on the Forest Service's reforestation and timber stand improvement needs and treatments from the agency's Timber Activity Control System for Silvicultural Activities (TRACS-SILVA).² We assessed the reliability of the data by examining the TRACS-SILVA system as well as the regional data systems of the four regions we visited, which provide the source data for the national TRACS-SILVA system. To understand what standards, procedures, and internal controls are in place for collecting, reporting, and verifying needs—and to assess the accuracy and completeness of the TRACS-SILVA data—we conducted structured interviews with headquarters, regional, and forest-level officials who enter data into the data systems, maintain the systems, and prepare reports using data from the systems. We performed basic electronic testing on some of the data and reviewed manuals and other documents describing the systems, such as flowcharts and data dictionaries. To obtain information about the new agency-wide data system, known as the Forest Service Activity Tracking System (FACTS), we interviewed agency officials involved in its implementation and reviewed information on the system's data management functions, procedures, and applications.

To corroborate the TRACS-SILVA data, we obtained information about trends in the Forest Service's reforestation and timber stand improvement needs from additional sources. Specifically, we interviewed agency program officials and data experts in headquarters as well as in each regional and forest office that we visited to discuss the trends in reforestation and timber stand improvement needs, and we visited sites

¹At the time we began our review, 2003 data were the most current available.

²Our review of the TRACS-SILVA system was limited to the portion of the system that reports reforestation and timber stand improvement needs and accomplishments.

where reforestation and timber stand improvement treatments were needed. In addition, we reviewed agency reports and testimony written by foresters, budget officials, and researchers. We also reviewed nongovernmental studies and contacted outside experts to discuss these trends. Based on our review, we determined that the Forest Service data—when combined with other information we examined—are sufficiently reliable to identify general trend information, but we have concerns about whether these data accurately quantify the acreage of land needing reforestation and timber stand improvement.

To identify the factors that have contributed to reforestation and timber stand improvement trends, we interviewed Forest Service officials in headquarters and the regional and national forest offices we visited. We also contacted an agency official in the Southwestern Region. We reviewed headquarters and regional reports on factors contributing to reforestation and timber stand improvement trends as well as reports from the Forest Service’s research station in the Rocky Mountain region and supplemented this information by interviewing researchers there. We obtained Forest Service data on timber harvests, wildland fires, and insect infestations during the last decade and conducted limited reliability assessments on these data. We also interviewed experts from nongovernmental organizations and reviewed publications from the organizations.

To determine the potential effects of the Forest Service’s reforestation and timber stand improvement trends identified by the agency’s land managers, we interviewed agency officials (including ecologists and silviculturists) in headquarters, regional, and national forest offices. We visited the sites of ongoing and completed reforestation and timber stand improvement projects in four national forests and discussed the potential effects of delaying treatments with local Forest Service officials. We interviewed Forest Service research program officials as well as scientific and technical experts at Forest Service research stations in Arizona and Montana and at nongovernmental organizations. We also reviewed select governmental and nongovernmental publications, including scientific studies that discuss potential effects of delaying reforestation and timber stand improvement treatments and interviewed some of the authors.

We limited our review of BLM to its western Oregon lands because they are central to the agency’s forest development program and because BLM does not systematically track reforestation data for its other lands. We obtained and analyzed 10 years of data, from 1995 through 2004, on the BLM’s reforestation and growth enhancement needs in western Oregon. We

performed a limited reliability assessment of these data and BLM's reporting system through discussions with BLM headquarters officials and a structured interview with officials at BLM's state office in Portland, Oregon, which oversees BLM's western Oregon lands. We supplemented these efforts by gathering other relevant documents and reports issued by the department of the Interior's Inspector General. We determined that the BLM data were sufficiently reliable to use them descriptively in appendix 1 of this report. To determine the factors contributing to BLM's reforestation and forest development trends and to identify potential effects of the trends identified by the agency's land managers, we interviewed BLM officials in Oregon and reviewed relevant BLM and Inspector General reports.

We conducted our work from June 2004 through March 2005 in accordance with generally accepted government auditing standards.

Comments from the Department of Agriculture



United States
Department of
Agriculture

Forest
Service

Washington
Office

1400 Independence Avenue, SW
Washington, DC 20250

File Code: 1420

Date: MAR 25 2005

Ms. Robin M. Nazzaro
Director, Natural Resources and the Environment
U.S. Government Accountability Office
441 G Street, NW
Washington, DC 20548

Dear Ms. Nazzaro:

Thank you for the opportunity to review and comment on the draft Government Accountability Office (GAO) Report, GAO-05-374, "Forest Service: Better Data Are Needed to Identify and Prioritize Reforestation and Timber Stand Improvement Needs." The report recognizes that reforestation and timber stand improvement data, when combined with other information, are sufficiently reliable to portray a general trend of increasing needs. The report acknowledges the influence of recent severe wildfires on reforestation needs and the expanded scope of timber stand improvement work needed to meet objectives beyond maximizing timber yield, such as improving wildlife habitat or thinning to reduce the risk of losses from future wildfires.

The report also identifies the agency's need to standardize collection, reporting and review procedures, and to clarify agency-wide guidance to standardize the definition of needs. It also identified the need to require Forest Service regions to validate their reforestation and timber stand improvement data in time for the agency's fiscal year 2007 appropriations request; clarify reforestation and timber stand improvement program direction as it relates to the agency's emphasis on ecosystem management under a constrained budget environment; and to require Forest Service regions to establish criteria for prioritizing the use of funds for reforestation and timber stand improvement work. Thus, the Forest Service concurs with the audit findings and recommendations. Preparation of an action plan to address GAO's recommendations is in progress.

If you have any technical questions regarding this audit, please contact Frank Burch, Ecosystem and Planning Team, at (202) 205-0946. For general questions regarding the audit, please contact Sandy T. Coleman, Agency Audit Liaison, at (703) 605-4940.

Sincerely,

DALE N. BOSWORTH
Chief

cc: Christine Roye



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Comments from the Department of the Interior



United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, D.C. 20240

MAR 31 2005

Ms. Robin M. Nazzaro
Director, Natural Resources and Environment
Government Accountability Office
441 G Street, N.W.
Washington, D.C. 20548-0001

Dear Ms. Nazzaro:

Thank you for the opportunity to review and comment on the draft report entitled Forest Service: Better Data Are Needed to Identify and Prioritize Reforestation and Timber Stand Improvement Needs (GAO-05-374).

Although the report focuses on the Forest Service and has recommendations for the Secretary of Agriculture, the Bureau of Land Management (BLM) is discussed in Appendix 1. The BLM has the following general and specific comments.

General Comment

The BLM agrees with the findings and recommendations, as they relate to the BLM.

Specific Comment

Page 1 of Appendix 1: The sentence, "We confined our review of BLM to its O&C lands because the majority of BLM's reforestation and related forest health efforts are focused there", could be clarified to reflect that the BLM's forest health efforts encompass both the Oregon and California Grant Lands in western Oregon and the public domain forestry program on 53 million acres of BLM-managed forests and woodlands outside of western Oregon. The sentence could be revised by striking "related forest health" or replacing that phrase with "related forest development treatment." Either approach would clarify the sentence and recognize the BLM's forest health efforts outside of western Oregon.

Appendix IV
Comments from the Department of the
Interior

2

The BLM and the Department of the Interior appreciate the work that you do to improve the management of the public land and mineral resources. Thank you for the opportunity to provide comments.

If you have any questions, please contact Andrea Nygren, BLM Audit Liaison Officer, on 202-452-5153, or Kenny McDaniel, Senior Forester, on 202-452-5097.

Sincerely,

A handwritten signature in black ink that reads "Rebecca W. Watson" followed by a stylized flourish.

Rebecca W. Watson
Assistant Secretary
Land and Minerals Management

GAO Contacts and Staff Acknowledgments

GAO Contacts

Robin M. Nazzaro, (202) 512-3841
David P. Bixler, (202) 512-7201

Staff Acknowledgments

Other individuals making key contributions to this report were Bill Bates, Christy Colburn, Sandy Davis, Sandra Edwards, Omari Norman, Cynthia Norris, and Jay Smale.

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