

May 2005

NATURAL RESOURCES

Federal Agencies Are Engaged in Various Efforts to Promote the Utilization of Woody Biomass, but Significant Obstacles to Its Use Remain



G A O

Accountability * Integrity * Reliability

GAO
Accountability · Integrity · Reliability

Highlights

Highlights of [GAO-05-373](#), a report to the Chairman, Committee on Resources, House of Representatives

Why GAO Did This Study

In an effort to reduce the risk of wildland fires, many federal land managers—including the Forest Service and the Bureau of Land Management (BLM)—are placing greater emphasis on thinning forests and rangelands to help reduce the buildup of potentially hazardous fuels. These thinning efforts generate considerable quantities of woody material, including many smaller trees, limbs, and brush—referred to as woody biomass—that currently have little or no commercial value.

GAO was asked to determine (1) which federal agencies are involved in efforts to promote the use of woody biomass, and actions they are undertaking; (2) how these agencies are coordinating their activities; and (3) what agencies see as obstacles to increasing the use of woody biomass, and the extent to which they are addressing these obstacles.

What GAO Recommends

To improve the Forest Service's effectiveness in promoting woody biomass utilization, GAO recommends that the Secretary of Agriculture direct the Chief of the Forest Service to appoint an official or organization responsible for overseeing and coordinating the agency's woody biomass activities.

In responding to a draft of this report, USDA concurred with its findings and recommendation, while DOE had no comments. Interior provided no response.

www.gao.gov/cgi-bin/getrpt?GAO-05-373.

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.

NATURAL RESOURCES

Federal Agencies Are Engaged in Various Efforts to Promote the Utilization of Woody Biomass, but Significant Obstacles to Its Use Remain

What GAO Found

Most woody biomass utilization activities are implemented by the Departments of Agriculture (USDA), Energy (DOE), and the Interior, and include awarding grants to businesses, schools, Indian tribes, and others; conducting research; and providing education. Most of USDA's woody biomass utilization activities are undertaken by the Forest Service and include grants for woody biomass utilization, research into the use of woody biomass in wood products, and education on potential uses for woody biomass. DOE's woody biomass activities focus on research into using the material for renewable energy, while Interior's efforts consist primarily of education and outreach. Other agencies also provide technical assistance or fund research activities.

Federal agencies coordinate their woody biomass activities through formal and informal mechanisms. Although the agencies have established two interagency groups to coordinate their activities, most officials we spoke with emphasized informal communication—through e-mails, participation in conferences, and other means—as the primary vehicle for interagency coordination. To coordinate activities within their agencies, DOE and Interior have formal mechanisms—DOE coordinates its activities through its Office of Energy Efficiency and Renewable Energy, while Interior and BLM have appointed officials to oversee, and have issued guidance on, their woody biomass activities. In contrast, while the Forest Service recently issued a woody biomass policy, it has not assigned responsibility for overseeing and coordinating its various woody biomass activities, potentially leading to fragmented efforts and diluting the impact of these activities.

The obstacles to using woody biomass cited most often by agency officials were the difficulty of using woody biomass cost-effectively and the lack of a reliable supply of the material; agency activities generally are targeted toward addressing these obstacles. Some officials told us their agencies are limited in their ability to address these obstacles and that incentives—such as subsidies and tax credits—beyond the agencies' authority are needed. However, others disagreed with this approach for a variety of reasons.

Examples of Uses for Woody Biomass



Source: Forest Service.

Sign made from wood-plastic composite.



Power generator that uses woody biomass for fuel.

Contents

Letter

Results in Brief	1
Background	2
Most Woody Biomass Utilization Activities Are Implemented by the Departments of Agriculture, Energy, and the Interior, and Include Grants, Research, and Education	5
Woody Biomass Coordination Efforts among and within Federal Agencies Include Both Formal and Informal Mechanisms, but Unlike DOE and Interior, the Forest Service Has Not Assigned Responsibility for Overseeing Woody Biomass Activities	11
Most Officials Cited Economic Obstacles to Woody Biomass Utilization, and While Agencies Generally Targeted These Obstacles, Some Officials Believe Additional Steps beyond the Agencies' Authority Are Needed	30
Conclusions	36
Recommendation for Executive Action	44
Agency Comments and Our Evaluation	45

Appendixes

Appendix I: Objectives, Scope, and Methodology	46
Appendix II: Comments from the Department of Agriculture	50
Appendix III: GAO Contacts and Staff Acknowledgments	51

Figures

Figure 1: Before and After Photos of Thinning Project, Lassen National Forest, California	5
Figure 2: Chip Truck Being Emptied, California Power Plant	7
Figure 3: Wood Chips Being Conveyed to a Boiler, California Power Plant	8
Figure 4: The BioMax 15 Power Generator	14
Figure 5: Automated Wood Chip Conveyor, Darby School District Project, Darby, Montana	17
Figure 6: Signs Produced from Woody Biomass Mixed with Plastic	21
Figure 7: Kiosk Built from Roundwood and Small-Diameter Wood	22
Figure 8: Interior of Darby Community Library Built from Roundwood, Darby, Montana	23
Figure 9: Slash Bundler Processing Small-Diameter Trees	24

Abbreviations

BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
CSREES	Cooperative State Research, Education, and Extension Service
DOE	Department of Energy
EAP	Economic Action Programs
EERE	Office of Energy Efficiency and Renewable Energy
EPA	Environmental Protection Agency
FEMP	Federal Energy Management Program
FWS	Fish and Wildlife Service
NPS	National Park Service
NREL	National Renewable Energy Laboratory
TMU	Technology Marketing Unit
USDA	U.S. Department of Agriculture

This is a work of the U.S. government and is not subject to copyright protection in the United States. It may be reproduced and distributed in its entirety without further permission from GAO. However, because this work may contain copyrighted images or other material, permission from the copyright holder may be necessary if you wish to reproduce this material separately.



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

May 13, 2005

The Honorable Richard Pombo
Chairman
Committee on Resources
House of Representatives

Dear Mr. Chairman:

Much attention has been paid in recent years to the state of our nation's forests. Dense, dry forest conditions have fueled extensive wildland fires and have raised the specter of severe fires in the future. In an effort to reduce the risk of fire, federal land management agencies—including the Forest Service in the Department of Agriculture (USDA) and the Bureau of Land Management (BLM) in the Department of the Interior—are placing greater emphasis on thinning forests and rangelands to help reduce the buildup of potentially hazardous fuels.

These thinning efforts will generate considerable quantities of woody material, including some larger trees that are commercially valuable timber and many smaller trees, limbs, and brush that generally have little or no commercial value today. This low commercial value material is often referred to as woody biomass.¹ Unlike commercial timber, this material typically has been piled and burned, left in the forest, or deposited in landfills because there is often little or no demand for it.

Some industries make use of this woody biomass, however—for example, by burning it to generate electricity or turning it into products such as road signs or animal bedding. Using woody biomass in these or other ways can have several beneficial side effects, including stimulating local economies and potentially facilitating fuel reduction efforts by creating a demand for thinned material. However, the cost of harvesting and transporting the material, combined with the relatively low value of the products produced, has meant that woody biomass has not been widely utilized.

¹Although biomass can be considered any sort of organic material—including trees, grasses, agricultural crops, and animal wastes—the term woody biomass in this report refers to small-diameter trees and other traditionally noncommercial material cut as part of thinning, harvesting, or other activities on forests or rangelands. The term “woody” is used to distinguish this material from agricultural biomass such as corn stalks or sugar cane residue.

In this context, you asked us to determine (1) which federal agencies are involved in efforts to promote the use of woody biomass, and the actions they are undertaking; (2) how these federal agencies are coordinating their activities related to woody biomass; and (3) what these agencies see as the primary obstacles to increasing the use of woody biomass, and the extent to which they are addressing these obstacles.

In conducting our review, we used a structured interview guide to collect information from headquarters and field officials from the Departments of Agriculture, Energy, and the Interior, and the Environmental Protection Agency. In total, we interviewed 44 officials using this guide. We also met with officials from nonfederal organizations, including state governments, Indian tribes, academia, environmental organizations, and others. We reviewed agency policies, regulations, strategic plans, and other documents; federal and nonfederal studies regarding technological, economic, and other issues related to woody biomass utilization; and pertinent laws and other documents. We also toured the Forest Service's Forest Products Laboratory in Madison, Wisconsin; a woody biomass-heated community center in Nederland, Colorado; and a wood-fired power plant in Burney, California. Appendix I provides further details on the scope and methodology of our review. We conducted our work between June 2004 and March 2005 in accordance with generally accepted government auditing standards.

Results in Brief

Most woody biomass utilization activities within the federal government are being undertaken by USDA, the Department of Energy (DOE), and the Department of the Interior, and include awarding grants to businesses, schools, Indian tribes, and others; conducting research; and providing education and outreach. Some of these activities involve multiagency efforts—for example, the three departments signed an agreement in 2003 to support the utilization of woody biomass, and USDA and DOE jointly award grants for biomass research and development. Each department also carries out its own activities. Most of USDA's woody biomass utilization activities are undertaken by the Forest Service and include grants for woody biomass utilization, research into wood products by the Forest Products Laboratory, and outreach and technical assistance conducted by agency field staff. Most of DOE's woody biomass utilization activities focus on research into the use of woody biomass for renewable energy. DOE also is engaged in programs that assist federal agencies and tribal governments in switching to renewable energy, including woody biomass. Interior's woody biomass efforts generally consist of education and outreach, as well

as some grant programs; within Interior, BLM is expanding its efforts to conduct education and outreach and recently established a woody biomass utilization strategy that will provide a framework for future activities related to woody biomass. Other federal agencies, including the Environmental Protection Agency and the National Science Foundation, implement some activities indirectly related to woody biomass utilization.

Federal agency efforts to coordinate their woody biomass utilization activities, both among and within agencies, occur through both formal and informal mechanisms. Although the departments have established the interagency Woody Biomass Utilization Group to coordinate their activities, most agency officials we spoke with emphasized informal communication—such as telephone discussions, e-mails, participation in conferences, and other means—rather than this group as the primary vehicle for interagency coordination. To coordinate activities within their agencies, both DOE and Interior have formal mechanisms—DOE coordinates its activities through its Office of Energy Efficiency and Renewable Energy, while both Interior and BLM have appointed officials to oversee, and have issued guidance on, their woody biomass activities. In contrast, while the Forest Service issued a woody biomass policy in January 2005, the agency has not assigned a specific individual or office with responsibility for implementing this policy. As a result, the agency risks diluting the impact of its activities because different units within the Forest Service may be emphasizing different priorities—and indeed, some officials we interviewed told us that the Forest Service’s lack of a coordinated approach has resulted in poor coordination between headquarters and field units. Without assigning responsibility for overseeing the implementation of its new policy, the Forest Service cannot ensure that its multiple activities each contribute to its overall objectives. Therefore, to capitalize more fully on the Forest Service’s potential to promote greater woody biomass utilization, we are recommending that the Secretary of Agriculture direct the Chief of the Forest Service to assign responsibility for overseeing and coordinating the agency’s woody biomass utilization activities to a specific official or office within the agency.

Agency officials cited two principal obstacles to increasing the use of woody biomass: the inherent difficulty in using woody biomass cost-effectively and the lack of a reliable supply of the material. Although agency activities are generally targeted toward these obstacles and others identified by agency officials, some officials told us that additional steps beyond the agencies’ authority to implement are needed. Most importantly, officials with whom we spoke cited the relatively high costs of converting

woody biomass into marketable products as a primary challenge to increasing the utilization of woody biomass—in other words, using woody biomass is often not cost-effective given the price that can be obtained for the products produced. For example, a Forest Service researcher estimated the cost of producing electricity from woody biomass at about 7.5 cents per kilowatt hour but noted that this electricity could be sold for only about 5.3 cents per kilowatt hour in the wholesale market. The costs cited most frequently were those for harvesting and transporting the material. Additional costs can be involved as well, such as exit fees charged by electrical utilities to customers seeking to disconnect from the electrical grid and rely on their own woody biomass-generated electricity. The other major obstacle agencies cited was the lack of a reliable long-term supply of woody biomass from federal lands, which inhibits potential investment in woody biomass utilization projects because investors are reluctant to commit to projects without assurances of a steady supply of raw material. The agency activities we identified are generally targeted at overcoming the obstacles identified—for example, working to reduce woody biomass processing costs by conducting research into less expensive ways to convert woody biomass into wood products or energy.

Some agency officials believe that their agencies are limited in their ability to fully address these obstacles, and that additional steps beyond the agencies' authorities will be required to increase woody biomass utilization. Such steps include subsidies or tax credits to offset the costs involved in using woody biomass and federal or state policies requiring the use of renewable energy sources, including woody biomass, in generating electricity. Other officials disagreed with this view, stating that neither subsidies nor tax credits were appropriate mechanisms for promoting the use of woody biomass and that such incentives could have adverse, unintended consequences on the ecological health of the national forests. In responding to a draft of this report, USDA concurred with our findings and recommendation, while DOE officials stated that they had no comments. We requested, but did not receive, comments from Interior. USDA's comments appear in appendix II.

Background

The Forest Service and Interior manage about 700 million acres of federal land between them, much of which is considered to be at high risk of fire. Federal researchers estimate that from 90 million to 200 million acres of federal lands in the contiguous United States are at an elevated risk of fire because of abnormally dense accumulations of vegetation, and that these conditions also exist on many nonfederal lands.² Addressing this fire risk has become a priority for the federal government, which in recent years has significantly increased funding for fuels reduction. Fuels reduction is generally done through prescribed burning, in which fires are deliberately lit in order to burn excess vegetation, and mechanical treatments, in which mechanical equipment is used to cut vegetation. Figure 1 shows before and after photos of a site that was thinned to reduce the risk of fire.

Figure 1: Before and After Photos of Thinning Project, Lassen National Forest, California



Source: Forest Service.

²For more information about the risks and effects of wildland fire, see GAO, *Wildland Fires: Forest Service and BLM Need Better Information and a Systematic Approach for Assessing the Risks of Environmental Effects*, [GAO-04-705](#) (Washington, D.C.: June 24, 2004).

Although prescribed burning is generally less expensive than mechanical treatment, prescribed fire may not always be the most appropriate method for accomplishing land management objectives—and in many locations it is not an option, either because of concerns about smoke pollution or because vegetation is so dense that agency officials fear that a prescribed fire could escape and burn out of control. In such situations, mechanical treatments are required, generating large amounts of wood—particularly small-diameter trees, limbs, brush, and other material that serve as fuel for wildland fires.³

Woody biomass can be put to many uses. Small logs can be peeled and used as fence posts, or can be joined together with specialized hardware to construct pole-frame buildings. Trees also can be milled into structural lumber. Using computer-operated equipment, some mills can manufacture lumber from logs as small as 4 inches in diameter. Other wood products such as furniture, flooring, and paneling can be produced. Woody biomass also can be chipped for use in paper pulp production and other uses—for example, a New Mexico company combines juniper chips with plastic to create a composite material used to make road signs.

Woody biomass also can be converted into other products, including liquid fuels such as ethanol and other products such as adhesives. Finally, woody biomass can be chipped or ground for energy production—for example, to fire power plants, or produce steam or hot water heat for manufacturing processes or buildings. Figure 2 shows a trailer full of wood chips being emptied into a container at a California power plant fueled by woody biomass; figure 3 shows chips ready to be fed into a boiler.

³Fuel reduction efforts are not the only source of this material. Woody biomass can result from a variety of activities related to improving or maintaining forest and rangeland health, as well as forest management activities such as timber harvests. Further, according to Forest Service officials and others, millions of acres of pine trees in the southeastern United States face a depressed market because of the closure of pulp mills. These trees thus constitute another potential source of woody biomass.

Figure 2: Chip Truck Being Emptied, California Power Plant



Source: GAO.

Figure 3: Wood Chips Being Conveyed to a Boiler, California Power Plant



Source: GAO.

Citing biomass's potential to serve as a source of electricity, fuel, chemicals, and other materials, the President and the Congress have encouraged federal activities regarding biomass utilization—but until recently, woody biomass received relatively little emphasis. A list of major congressional direction follows:

The Biomass Research and Development Act of 2000⁴

- directed the Secretaries of Agriculture and Energy to coordinate their research and development efforts, leading to the production of biobased industrial products,⁵

⁴Pub. L. No. 106-224, Title III, 114 Stat. 428, as amended (2000).

⁵The act defined biobased industrial products to include fuels, chemicals, building materials, electric power, or heat produced from biomass, but did not specify the type of biomass—agricultural, woody, or other—to be used.

-
- created the interagency Biomass Research and Development Board, supported by a Biomass Research and Development Technical Advisory Committee;⁶
 - directed the Secretaries of Agriculture and Energy to implement a “Biomass Research and Development Initiative” under which the agencies would provide grants, contracts, and financial assistance for research on biobased industrial products; and
 - authorized an appropriation of \$49 million for each of fiscal years 2000 through 2005 to carry out the act’s provisions.

The Farm Security and Rural Investment Act of 2002⁷

- established a federal procurement preference for biobased products requiring federal agencies purchasing items costing more than \$10,000 to give preference to biobased products;⁸
- directed the Secretary of Agriculture to award grants for developing and constructing biorefineries (equipment and processes that convert biomass into fuels and chemicals and that may produce electricity);

⁶These groups replaced interagency groups created by Executive Order 13134, “Developing and Promoting Biobased Products and Bioenergy.” See 64 *Fed. Reg.* 44639 (Aug. 16, 1999). Executive Order 13134 directed the establishment of the Interagency Council on Biobased Products and Bioenergy, as well as an Advisory Committee on Biobased Products and Bioenergy, to provide information and advice for consideration by the council.

⁷Pub. L. No. 107-171, Title IX, 116 Stat. 475 (2002).

⁸Specifically, the statute requires the Secretary of Agriculture to develop a list of items that are or can be produced with biobased products and whose procurement by federal agencies will carry out the statute’s objectives. Federal agencies then must generally give preference to such items composed of the highest percentage of biobased products practicable, consistent with maintaining a satisfactory level of competition. Procurement preference is to be given to biobased products for items costing more than \$10,000 or “where the quantity of such items or of functionally equivalent items purchased or acquired in the course of the preceding fiscal year was \$10,000 or more.”

-
- directed the Secretary of Agriculture to provide grants, loans, and loan guarantees to farmers, ranchers, and rural small businesses to purchase renewable energy systems and make energy efficiency improvements, and to make available from the Commodity Credit Corporation \$23 million for these activities for each of fiscal years 2003 through 2007;⁹ and
 - directed the Secretary of Agriculture to make available from the Commodity Credit Corporation \$5 million in fiscal year 2002 and \$14 million for each of fiscal years 2003 through 2007 to carry out the provisions of the Biomass Research and Development Act of 2000, and extended through fiscal year 2007 the Biomass Research and Development Act's authorization of \$49 million each fiscal year.

The Healthy Forests Restoration Act of 2003¹⁰

- authorized appropriations of \$5 million for each of fiscal years 2004 through 2008 for each of two grant programs—a Forest Service program focusing on community-based enterprises and small businesses using biomass, and a USDA program providing grants to offset the costs of purchasing biomass by facilities that use it for wood-based products or other commercial purposes; and
- increased the authorization contained in the Biomass Research and Development Act of 2000 from \$49 million to \$54 million for each of fiscal years 2002 through 2007.

The American Jobs Creation Act of 2004 contained tax incentives promoting the use of woody biomass to generate electricity.¹¹

⁹The Commodity Credit Corporation is a government-owned corporation within USDA.

¹⁰Pub. L. No. 108-148, Title II, 117 Stat. 1901 (2003).

¹¹Pub. L. No. 108-357, § 710, 118 Stat. 1552 (2004).

Utilization of woody biomass also is emphasized in the federal government's National Fire Plan, a strategy for planning and implementing agency activities related to wildland fire management. For example, a National Fire Plan strategy document cites biomass utilization as one of its guiding principles, recommending that the agencies "employ all appropriate means to stimulate industries that will utilize small-diameter, woody material resulting from hazardous fuel reduction activities."¹² Federal agencies also are carrying out research concerning the utilization of small diameter wood products as part of the Healthy Forests Initiative, the administration's initiative for wildland fire prevention.

Most Woody Biomass Utilization Activities Are Implemented by the Departments of Agriculture, Energy, and the Interior, and Include Grants, Research, and Education

Most of the federal government's woody biomass utilization efforts are being undertaken by USDA, DOE, and Interior. Some activities are performed jointly. For example, USDA, DOE, and Interior signed a Memorandum of Understanding to promote the utilization of woody biomass, and USDA and DOE conduct a joint biomass grant program. Each department also conducts its own woody biomass activities, which generally involve grants for small-scale woody biomass projects, research on woody biomass uses, and education, outreach, and technical assistance aimed at woody biomass users.

Some Woody Biomass Activities Are Performed Jointly by Multiple Agencies

USDA, DOE and Interior have undertaken a number of joint efforts related to woody biomass. In June 2003, the three departments signed a Memorandum of Understanding on Policy Principles for Woody Biomass Utilization for Restoration and Fuel Treatments on Forests, Woodlands, and Rangelands. The purpose of the memorandum is "to demonstrate a

¹²Departments of Agriculture and the Interior and the Western Governors' Association, *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: A 10-Year Comprehensive Strategy* (Washington, D.C.; August 2001). Note that the National Fire Plan is not a single document. Rather, it is composed of several strategic documents that set forth a priority to reduce wildland fire risks to communities. The various documents that make up the National Fire Plan include (1) a September 2000 report from the Secretaries of Agriculture and the Interior to the President in response to the wildland fires of 2000, (2) congressional direction accompanying substantial new appropriations in fiscal year 2001, and (3) several approved and draft strategies to implement all or parts of the plan.

commitment to develop and apply consistent and complementary policies and procedures across three federal departments to encourage utilization of woody biomass.” The departments also sponsored a 3-day conference on woody biomass in January 2004. To discuss woody biomass developments and to coordinate their efforts, the departments established an interagency Woody Biomass Utilization Group, which meets quarterly.

Another interdepartmental collaboration effort is the Joint Biomass Research and Development Initiative, a joint USDA and DOE grant program authorized under the Biomass Research and Development Act of 2000. The program provides funds for research on biobased products. In fiscal year 2004, the two departments awarded \$25 million to 22 projects, and cost sharing by private sector partners raised the value of the projects to nearly \$38 million. While the program generally promotes all forms of biomass rather than targeting woody biomass, in 2004 the grant solicitation included woody biomass as an area of emphasis and, according to a USDA official, 10 projects emphasizing or incorporating woody biomass were funded that year, for a total of about \$7.7 million. For example, the Hayfork Biomass Utilization and Value Added Model for Rural Development project in California received about \$503,000 to support the design and early implementation phases of a biomass utilization facility, including a log sort yard, small log processor, and wood-fired electrical generation plant. Another California project, the Small-Scale, Biomass-Fired Gas Turbine Plants Suitable for Distributed and Mobile Power Generation, received about \$242,000 to evaluate the economic benefits of using forestry residues for generating power in small-scale power plants. USDA and DOE also have collaborated on an assessment of biomass availability, including woody biomass, and have prepared a report summarizing their findings.¹³

¹³Oak Ridge National Laboratory, *Biomass as Feedstock for a Bioenergy and Bioproducts Industry: The Technical Feasibility of a Billion-Ton Annual Supply* (Oak Ridge, Tennessee; April 2005).

In another interagency effort, BLM worked with DOE's National Renewable Energy Laboratory (NREL) to identify and evaluate renewable energy resources—including biomass—on public lands, resulting in a February 2003 report titled "Assessing the Potential for Renewable Energy on Public Lands." More recently, USDA and Interior entered into a cooperative agreement with the National Association of Conservation Districts in 2004 to promote woody biomass utilization.¹⁴ Activities to be performed by the association under the agreement include organizing national and regional workshops on woody biomass utilization and developing outreach materials to stimulate investment in small wood industries and bioenergy.

USDA, DOE, and Interior also participate in joint activities at the field level. NREL and the Forest Service have collaborated in developing and demonstrating small power generators that use woody biomass for fuel. These generators, known as BioMax units, are being demonstrated at several sites, including a high school in Walden, Colorado, and a furniture-making business at the Zuni Pueblo in New Mexico. Figure 4 shows the BioMax 15 power generator.

¹⁴The National Association of Conservation Districts is a nonprofit organization that represents the nation's 3,000 conservation districts—local units of government established under state law to carry out natural resource management programs at the local level.

Figure 4: The BioMax 15 Power Generator



Source: Forest Service.

The Forest Service also collaborates with Interior in awarding and funding grants under the Fuels Utilization and Marketing program, a jointly funded grant program targeting woody biomass utilization efforts in the Pacific Northwest. Another collaborative effort at the field level involves a Forest Service rural community assistance coordinator specialist in the Southwest Region and includes officials from BLM and the state of New Mexico, as well as environmental group and utility company representatives. In addition to studying woody biomass availability and conducting market assessments, this biomass working group is proposing policy changes favorable to woody biomass. It also has studied barriers to biomass use and provided input on project designs so that projects are less likely to be challenged.

The agencies also are collaborating with state and local governments to promote the use of woody biomass. The Forest Service, NREL, and BLM entered into a Memorandum of Understanding with Jefferson County, Colorado, in 2004 to study the feasibility of developing an electricity generating facility using woody biomass from forest thinning projects intended to reduce the risk of wildland fire. In addition to the agencies and Jefferson County, the agreement included the Colorado State Forest Service and a local energy utility. In its January 2005 feasibility study, the partnership reported that about 166,000 tons of biomass would be available each year from forest thinnings and new construction waste. With this development, the local energy utility announced that it would consider converting a boiler at one of its plants to burn biomass to generate steam heat for downtown Denver buildings.

Another example of federal agencies working with local governments involves a power plant in Canon City, Colorado, that uses coal and wood chips to fire its boilers. The power plant announced in January 2005 that it plans to sell renewable energy certificates to help recover costs associated with introducing the renewable fuel source.¹⁵ The wood chips used in the power plant are produced by forest-thinning operations conducted by BLM, the Forest Service, and state and local governments, while the environmental and market analysis for the project was co-funded by DOE.

Yet another example of local cooperation involves a January 2005 “declaration of cooperation” signed in central Oregon by officials from the Forest Service, BLM, state and tribal government, the timber industry, and environmental groups. The groups have agreed to work together to stabilize the supply of woody biomass as a way of helping create a market for the material.

¹⁵Renewable energy certificates represent the environmental attributes of renewable energy generation and can be sold separately from the underlying commodity electricity. Because the certificates are sold separately from electricity, they can be purchased from locations anywhere, enabling organizations to purchase renewable energy even if their local utility or power marketer does not offer a renewable energy product. Customers do not need to switch from their current electricity supplier to purchase certificates, and they can buy certificates based on any fixed amount of electricity.

USDA's Efforts Related to Woody Biomass Utilization Are Concentrated in the Forest Service, with Some Efforts Under Way in Other USDA Agencies

Most of USDA's woody biomass utilization activities are undertaken by the Forest Service, with other USDA services playing a smaller role. USDA's activities involve grants, research and development, and education, outreach, and technical assistance.

Grants

USDA implements several grant programs related to woody biomass. The Forest Service provides grants through its Economic Action Programs (EAP), created to help rural communities and businesses dependent on natural resources become sustainable and self-sufficient. In 2003, according to Forest Service officials, the Forest Service funded 73 projects related to woody biomass utilization; grants ranged from \$5,000 to \$225,000, for a total of about \$3.5 million.¹⁶ A Forest Service official told us that similar levels of effort existed in 2001 and 2002, but that the level of effort in 2004 declined because of reduced funding levels. The Forest Service currently is preparing a report summarizing the activities carried out under EAP grants nationwide.

Forest Service officials told us that EAP grant funds are distributed among Forest Service regional and national units, which in turn allocate the funds according to regional or national priorities, respectively. For example, the Northern and Intermountain Regions decided to use their regional EAP allocations not only to fund Economic Recovery—a Forest Service program providing financial and technical assistance to improve the economic, environmental, and social conditions of rural communities—but also to fund two regional woody biomass grant programs, one focusing on using small-diameter wood to create specialty products such as flooring, paneling, and wood-plastic composites and the other focusing on biomass utilization for energy production.¹⁷ This second program, known as the Fuels for Schools program, provides grant funds to help public schools retrofit their fuel and gas heating systems to woody biomass heating

¹⁶Forest Service officials noted that the data do not include grants made by the Forest Service's Southern Region or Northeast Area Office because these units did not provide information on their EAP grant programs.

¹⁷The Northern and Intermountain Regions administer national forests and grasslands in all of Idaho, Montana, Nevada, North Dakota, and Utah, and in parts of South Dakota, Washington, and Wyoming.

systems that reduce heating costs. The Darby School District in Montana, for example, provides heat to three schools with wood burning boilers; this conversion reduced its fuel bill by about 43 percent during the first year of operation. The project requires about 500 tons of woody biomass per year, the byproduct of about 50 acres' worth of fuel reduction treatments, according to project officials. As of December 2004, according to Forest Service officials, three Fuels for Schools projects (including the Darby School District) had been completed, and about 20 schools had completed engineering analyses and were preparing to apply for grant funds. Figure 5 shows the automated wood chip conveyor installed to provide fuel to the boiler as part of the Darby School District project.

Figure 5: Automated Wood Chip Conveyor, Darby School District Project, Darby, Montana



Source: Forest Service.

The Forest Service has created an additional grant program in response to a provision in the Consolidated Appropriations Act for Fiscal Year 2005,¹⁸ authorizing up to \$5 million for grants to create incentives for increased use of biomass from national forest lands. A congressional committee report accompanying the act directed the Forest Service “to develop this program with the clear intent to make grants that will result in increased commercial use of biomass products, and which will thereby result in reduced overall hazardous fuels program costs.” Specific Forest Service goals for the grant program are to (1) help reduce management costs by increasing the value of biomass and other forest products generated by hazardous fuel treatments, (2) create incentives and reduce the business risk for increased use of biomass from national forest lands, and (3) institute projects that target and help remove economic and market barriers to using small-diameter trees and woody biomass. Grants will be awarded for up to 3 years in amounts from \$50,000 to \$250,000, and will require a 20 percent match on the part of grantees; applications are due May 16, 2005, with awards to be announced by June 1, 2005.

Two other USDA agencies—the Cooperative State Research, Education, and Extension Service (CSREES) and USDA Rural Development—maintain grant programs that potentially include woody biomass utilization activities.¹⁹ CSREES oversees the Biobased Products and Bioenergy Production Research grant program, under which a total of \$5.4 million is available to support research into the use of agricultural materials—including woody biomass—for fuels or products. CSREES also provides grants to states for research under the McIntyre-Stennis Act of 1962, which was enacted to promote forestry research by state colleges and universities. Projects can fall into one of eight areas listed in the act, one of which is the utilization of wood and other forest products. However, this grant program does not emphasize wood products over the other areas, and a CSREES official told us that most funded projects address issues other than woody biomass.

¹⁸Pub. L. No. 108-447.

¹⁹CSREES’s mission is to advance knowledge for agriculture, the environment, human health and well-being, and communities by supporting research, education, and extension programs. CSREES does not perform actual research, education, and extension, but rather helps fund it at the state and local level and provides program leadership in these areas. USDA Rural Development assists rural individuals, communities, and businesses in obtaining financial and technical assistance to address their needs.

USDA Rural Development oversees grant and loan programs targeting renewable energy, potentially providing support to woody biomass utilization activities. Within Rural Development, the Rural Business-Cooperative Service oversees the renewable energy grant program authorized by the Farm Security and Rural Investment Act of 2002, emphasizing renewable energy systems and energy efficiency among rural small businesses, farmers, and ranchers. In September 2004, \$22.8 million was awarded to a total of 167 recipients; however, most grants were directed toward projects using wind power or agricultural biomass rather than woody biomass. Also within Rural Development, the Rural Utilities Service maintains a loan program for renewable energy projects. A Rural Utilities Service official told us that none of the \$119 million loaned under this program since fiscal year 2000 has gone toward woody biomass, although the program would welcome such projects.

Research and Development

Forest Service researchers are conducting research into a variety of woody biomass issues. Researchers have conducted assessments of the woody biomass potentially available through land management projects—for example, in 2003, Forest Service researchers prepared an assessment of the land suitable for mechanical treatment in the western states and the woody biomass that could potentially be produced.²⁰ Researchers also have developed models of the costs and revenues associated with thinning projects, such as the Fuel Treatment Evaluator. In using this model, users can input the specific area to be treated (by state or county), the desired end condition of the area to be treated, and so forth. Users also can enter prices for forest products—sawtimber, small-diameter biomass, and the like. The tool then estimates the amount of material in each of various size classes that would have to be removed to achieve the desired end condition, the project cost, and the likely revenues from the project. Researchers also are studying the economics of woody biomass use in other ways; one researcher, for example, is beginning an assessment of the economic, environmental, and energy-related impacts of using woody biomass for power generation.

The Forest Service also conducts extensive research into uses for woody biomass, primarily at its Forest Products Laboratory. The laboratory's strategic plan includes the goal of developing new and improved technologies to use low-value, underutilized forest resources, including

²⁰USDA Forest Service, *A Strategic Assessment of Forest Biomass and Fuel Reduction Treatments in Western States* (April 2003).

thinnings and small-diameter timber, and the laboratory Director told us the laboratory has changed its research approach over the past several years to focus more on the issue of small-diameter trees. Woody biomass-related research at the laboratory includes research into a variety of potential uses for the material, including wood-plastic composites; structures made from small-diameter roundwood; improved paper pulping processes that can accommodate small-diameter trees; water filtration systems using woody biomass fibers; flooring, paneling, and laminated wood beams made from small-diameter trees; and others. For example, one scientist we met with told us that the laboratory is using woody biomass to make water filters that can remove heavy metals, oils, phosphates, and pesticides from water. The laboratory is currently testing the use of these filters to remove heavy metal contaminants from mining site runoff. Another scientist we met with described his efforts to develop techniques for using sound waves to test the strength of small-diameter timber in order to assess its suitability for particular applications. Still other officials are working on less expensive ways of converting woody biomass to liquid fuels; researchers at the laboratory told us they are working on new ways of separating wood into its constituent components—lignin, hemicellulose, and cellulose—in order to improve the conversion process.

Education, Outreach, and Technical Assistance

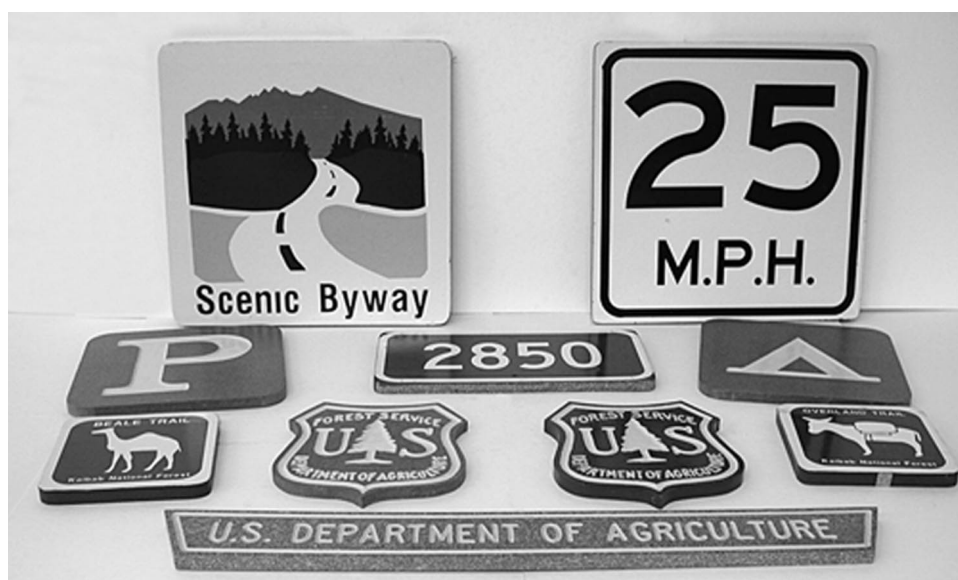
The Forest Service conducts extensive education, outreach, and technical assistance activities through a variety of staff—small-diameter utilization specialists, rural development program managers, regional EAP coordinators, and others. Much of this activity is conducted by the Technology Marketing Unit (TMU) at the Forest Products Laboratory,²¹ which provides technical assistance and expertise in wood products utilization and marketing. TMU has produced an extensive array of publications conveying information about specific aspects of small-diameter wood utilization and marketing—for example, publications on biomass for small-scale heat and power, structural grading of logs from small-diameter trees, and the economic feasibility of making wood products from small-diameter trees—and issues a bimonthly newsletter titled *Forest Products Conservation & Recycling Review*.

TMU staff also provide direct technical assistance to individuals or companies seeking information or assistance. One such user in New

²¹Although TMU is located at the Forest Products Laboratory, it is funded by the Forest Service's State and Private Forestry branch—in contrast to other activities at the laboratory, which are funded by the Forest Service's Research and Development branch.

Mexico was interested in finding a use for local woody biomass. TMU staff worked with the individual to develop a wood-plastic composite using juniper fibers that could be made into road signs; the composite signs, unlike wooden signs, are not chewed on by animals—and are thus favored by the Forest Service because they do not have to be replaced as frequently. The individual now operates a 15-employee sign-making business utilizing low-value woody biomass. Figure 6 shows signs made from woody biomass mixed with plastic.

Figure 6: Signs Produced from Woody Biomass Mixed with Plastic



Source: Forest Service.

Similarly, TMU has worked with businesses in Montana to find uses for roundwood, including roundwood buildings and bridges. Roundwood structures developed with TMU assistance include wood kiosks displayed at the 2002 Winter Olympics in Utah; a roundwood community pavilion in Westcliffe, Colorado; and the Darby Community Library in Darby, Montana. In addition, a 165-foot suspension bridge designed with TMU assistance and being built primarily with 6-inch diameter lodgepole pine is currently under construction in Lolo, Montana. Figure 7 shows a roundwood kiosk made from small-diameter wood; figure 8 shows the interior of the library in Darby, Montana, which was constructed from roundwood.

Figure 7: Kiosk Built from Roundwood and Small-Diameter Wood



Source: Forest Service.

Figure 8: Interior of Darby Community Library Built from Roundwood, Darby, Montana



Source: Forest Service.

The Forest Service also has partnerships with state and regional entities that provide a link between scientific and institutional knowledge and local users. One such group, the Colorado Wood Utilization and Marketing Assistance Center, housed at Colorado State University, provides small grants in Colorado and assists communities in identifying technologies that will utilize forest thinnings to heat buildings and generate electricity. Another such partnership is through the Forest Service's Wood Education and Resource Center in West Virginia, which assists constituents in addressing economic, environmental, technological, and social challenges through training, technology transfer, and applied research. Yet another partnership with state and regional entities involves the Forest Service and the Greater Flagstaff Partnership in Arizona, an alliance of 27 environmental and governmental organizations that researches and demonstrates approaches to forest ecosystem restoration in the ponderosa pine forests surrounding Flagstaff, Arizona.

Staff in Forest Service field offices also provide education, outreach, and technical assistance. Each region has an EAP coordinator, and coordinators we spoke with provided numerous examples of their involvement in woody biomass. For example, one EAP coordinator organized a “Sawmill Improvement Short Course” designed to provide information to small sawmill owners regarding how to better handle and use small-diameter material, how to find small-diameter markets, and so forth. EAP coordinators also have conducted demonstrations of equipment for handling woody biomass cost-effectively, including several demonstrations of a “slash bundler” that can bundle and compress woody biomass for more efficient transportation.²² Figure 9 shows the slash bundler in operation.

Figure 9: Slash Bundler Processing Small-Diameter Trees



Source: Forest Service.

²²A Forest Service official told us that the slash bundler was the result of a research effort led by the Forest Service’s Research and Development branch.

Other field staff also provide technical assistance; for example, the Fremont-Winema National Forest in Oregon employs a Forest Products and Economic Development Specialist, who told us he provides general information about new technologies and economic issues to entities looking to engage in woody biomass-related activities; provides assistance in assessing the woody biomass harvesting, processing, and utilization infrastructure; and works with potential grant applicants to help them develop appropriate projects with defined goals and outcomes, which are more likely to be funded. An EAP official told us that the assistance provided to small groups or businesses is critical to getting them established and making them competitive for other assistance, such as USDA Rural Development grants; the official stated that many small businesses lack the expertise to prepare a competitive business plan or to adequately estimate future costs and revenues.

Until November 2004, the Forest Service employed a small-diameter utilization specialist who served as a national resource to provide education and technical assistance. This specialist told us he conducted frequent presentations to both agency and nonagency audiences on using woody biomass and worked as a liaison between parties interested in using woody biomass and agency officials or private companies that can assist them. He also maintained a small-diameter utilization Web site. However, in November 2004 he transferred out of the position, and the position has not yet been refilled.

DOE Is Primarily Engaged in Biomass Research and Development Activities

Although DOE maintains some grant programs and provides technical assistance to assist federal, state, and tribal agencies in switching to renewable energy, most of its activities focus on research and development. Following a recent reorganization, most of DOE's woody biomass activities are overseen by its Office of the Biomass Program, although some activities also are conducted within the Federal Energy Management Program and the Tribal Energy Program.

Grants

DOE maintains several grant programs that emphasize renewable energy, potentially including woody biomass. DOE's Golden Field Office in Colorado administers the National Biomass State and Regional Partnership, which provides grants for biomass-related activities through five regional partners: the Coalition of Northeastern Governors Policy Research Center, the Council of Great Lakes Governors, the Southern States Energy Board, the Western Governors' Association, and DOE's Western Regional Office. DOE provides funds to each regional partner; the

partners, in turn, provide grants to states. Although the overall DOE partnership does not emphasize woody biomass over other types of biomass, the Western Governors' Association is directing its DOE funds toward projects involving woody biomass, according to an official with the association.

Another DOE grant program that potentially involves woody biomass is the State Energy Program, which provides grants to states to design and carry out their own renewable energy and energy efficiency programs. States manage the funds and are required to match 20 percent of the DOE grants. In 2004, about \$44 million was directed in grants to the states, and another \$16 million was directed to special state projects. While the grant program does not emphasize woody biomass over other energy sources, woody biomass projects may be included among those funded, depending on state priorities.

The Tribal Energy Program promotes tribal energy sufficiency, economic development, and employment on tribal lands through renewable energy and energy efficiency technologies. Over the past 2 years, DOE has funded a total of 45 tribal energy projects, for a total of \$8.4 million; the projects are primarily for energy and electricity, with some specifically targeting the utilization of woody biomass. A DOE-funded study involving the Yavapai-Apache Reservation in Arizona, for example, will examine the feasibility of a proposed power generation facility using woody biomass, while another study involving the Red Lake Band of the Chippewa Indians in Minnesota will examine the use of woody biomass for producing power, fuels, and products.

Research and Development

DOE's woody biomass research and development activities are managed by its Office of the Biomass Program, which has overall responsibility for managing DOE's research activities relating to the use of biomass for fuels, chemicals, and power. Many woody biomass research and development activities within DOE are carried out by the National Bioenergy Center, a "virtual center" intended to unify DOE's efforts to advance technology for producing fuels, chemicals, materials, and power from biomass. These activities generally encompass research into the conversion of biomass, including woody biomass, to liquid fuels, power, chemicals, or heat. In addition, a new biomass laboratory—the Biomass Surface Characterization Laboratory—was dedicated at NREL in January 2005. An NREL official told us that DOE does not have an effort specific to woody biomass, though its activities can be applied to the material. DOE also supports research into woody biomass through partnerships with industry and academia. Program

management activities for these partnerships are conducted by DOE headquarters, and project management through DOE field offices.

Education, Outreach, and Technical Assistance

In addition to its research activities, the National Bioenergy Center provides information and guidance to industry, stakeholder groups, and users through presentations and lectures, according to DOE officials. Information also is made available through the DOE Web site. DOE also provides outreach and technical assistance through its State and Regional Partnership, Federal Energy Management Program (FEMP), and Tribal Energy Program. FEMP provides assistance to federal agencies seeking to implement renewable energy and energy efficiency projects, including assistance in designing renewable energy systems and obtaining private-sector financing. Among these efforts is a program focused on using biomass and alternative methane fuels in energy projects at federal facilities, and although the program does not focus specifically on woody biomass, a FEMP official told us that military and civilian agencies (including the Forest Service) across the country are increasingly contemplating projects in which woody biomass would be used to heat and power federal installations. In addition to grants, the Tribal Energy Program also provides technical assistance to tribes, including strategic planning and energy options analysis.

Interior's Woody Biomass Activities Include Education, Outreach, and Grant Programs

Interior's activities include limited grant programs and education and outreach; department agencies do not conduct research and development into woody biomass utilization issues. Interior also works with its land management agencies to develop policy and direction regarding woody biomass activities. Interior now requires that the agencies' land management service contracts include an option allowing contractors to remove woody biomass generated through the contracts where ecologically appropriate, and has directed the agencies to develop contract mechanisms to include biomass removal in timber sale contracts.

Many of Interior's woody biomass activities are implemented by BLM, which recently established a woody biomass utilization strategy that will provide a framework for future agency activities and allow it to expand its biomass utilization efforts. The strategy, made final in July 2004, includes overall goals related to increasing the utilization of biomass from treatments on BLM lands, and individual action items within three substrategies: developing tools, building expertise within BLM and building networks with other agencies and organizations, and increasing the percentage of acres treated from which harvested biomass is

subsequently used. Individual action items include developing contract specifications for appraising biomass and guidelines for estimating biomass volume; training BLM staff in the use of biomass guidance and tools; facilitating technology transfer with key partners such as governments, tribes, and contractors; and increasing funding available for biomass projects. BLM also is contemplating a small-scale preferred procurement initiative for woody biomass products, similar to the preferred procurement program for biobased products established in the Farm Security and Rural Investment Act of 2002.

In addition to BLM, three other Interior agencies—the Bureau of Indian Affairs (BIA), the Fish and Wildlife Service (FWS), and National Park Service (NPS)—conduct activities related to woody biomass. An official from the U.S. Geological Survey told us that her agency does not conduct activities to promote woody biomass utilization.

Grants

Interior generally does not have grant programs specifically targeted toward woody biomass. However, BIA has provided a limited number of grants to Indian tribes, including a 2004 grant to the Confederated Tribes of the Warm Springs Reservation in Oregon to conduct a feasibility study for updating and expanding a woody biomass-fueled power plant.

Education, Outreach, and Technical Assistance

Interior agencies conduct education, outreach, and technical assistance, but not to the same degree as the Forest Service. The primary BLM official responsible for woody biomass activities told us that BLM does not have staff at field locations assigned to identify community resources and to build community capacity, as does the Forest Service. According to this official, BLM's community outreach is conducted primarily through its land use and management planning activities, which include interaction with environmentalists, community leaders, and others. This official said that BLM is making a concerted effort to promote woody biomass utilization, has hired new forest management staff, and is studying the possibility of engaging in outreach activities through proposed demonstration projects called "incubators," which would serve as examples of successful woody biomass utilization. Funding has not yet been appropriated for these projects, according to this official. Interior also will use the National Association of Conservation Districts, with whom it signed a cooperative agreement, to conduct outreach activities related to woody biomass.

BIA provides technical assistance to tribes seeking to implement renewable energy projects; specifically, the agency works with tribes to determine appropriate management activities and offers technical

assistance in marketing forest products. Tribal projects include a proposal by the Northern Cheyenne Tribe in Montana to use woody biomass to provide steam and electricity for a manufacturing plant and a study by the Confederated Tribes of the Warm Springs Reservation of the feasibility of producing energy from forest thinning projects. BIA also sponsored a renewable energy conference, including an emphasis on woody biomass, in September 2004. Interior's primary woody biomass official told us that tribal officials are very interested in biomass.

Although FWS and NPS conduct relatively few woody biomass utilization activities, according to agency officials, in some cases the agencies will work to find a woody biomass user nearby if a market exists for the material. After a 2004 thinning project in Denali National Park, for example, NPS used some cut trees in cabin restoration projects and for firewood for backcountry cabins; however, the bulk of the biomass generated was provided to a nearby coal mine, which wanted material for use in a reclamation project at the mine site. NPS officials told us that their agency did not charge the mine for the material, but that the arrangement saved NPS several hundred thousand dollars in transportation and disposal fees because the material would otherwise have been sent to a landfill. The officials stated that finding a market for this material "represented a lot of time and effort on the part of local Park Service planners." Both FWS and NPS officials told us that the agencies' woody biomass activities are limited because the agencies produce only modest amounts of the material; most FWS and NPS fuel reduction activities use fire rather than mechanical thinning. Further, according to agency officials, in those instances where woody biomass is generated, the agencies often use the material for their own purposes—for example, using chipped biomass to stabilize soils during restoration projects.

Several Other Federal Agencies Implement or Participate in Woody Biomass Activities

Aside from USDA, DOE, and Interior, several other federal agencies also are engaged in woody biomass activities through their advisory or research activities. The Environmental Protection Agency (EPA) provides technical assistance through its Combined Heat and Power Partnership to power plants that generate combined heat and power from various sources, including woody biomass and other sources of renewable energy. An EPA official told us that the partnership is fuel neutral, meaning that it does not promote the use of one fuel over another when producing combined heat and power. EPA also has a Green Power Partnership Program to assist federal agencies and companies in procuring power for their facilities from renewable sources.

Three other agencies also have limited involvement in biomass activities through their membership on the Biomass Research and Development Board, created by the Biomass Research and Development Act of 2000. The board, which is intended to focus on all biomass issues, not solely woody biomass, is responsible for coordinating federal activities for the purpose of promoting the use of biobased industrial products. The board consists of membership from USDA, DOE, Interior, and EPA, as well as the National Science Foundation, the Office of the Federal Environmental Executive, and the Office of Science and Technology Policy (both within the Executive Office of the President). Officials we spoke with from the National Science Foundation, Office of Science and Technology Policy, and the Office of the Federal Environmental Executive told us that their involvement in issues specifically related to woody biomass is minimal.

We also contacted officials from the Departments of Commerce and Transportation. Officials from both told us their departments do not conduct woody biomass utilization activities.

Woody Biomass Coordination Efforts among and within Federal Agencies Include Both Formal and Informal Mechanisms, but Unlike DOE and Interior, the Forest Service Has Not Assigned Responsibility for Overseeing Woody Biomass Activities

Federal agency efforts to coordinate their woody biomass utilization activities, both among and within agencies, occurred through both formal and informal mechanisms. Formal coordination between agencies occurs through both the Woody Biomass Utilization Group and the Biomass Research and Development Board, although most agency officials we spoke with emphasized informal communication—through telephone discussions, e-mails, participation in conferences, and other means—rather than these groups as the primary vehicle for interagency coordination. To coordinate internal activities, both DOE and Interior have formal mechanisms—DOE coordinates its activities through the Office of Energy Efficiency and Renewable Energy (EERE), while both Interior and BLM have appointed officials to lead their woody biomass efforts; further, Interior’s woody biomass policy and BLM’s woody biomass strategy guide these organizations’ efforts. In contrast, the Forest Service—the USDA agency with the most woody biomass activities—has not assigned responsibility for coordinating its woody biomass activities, potentially leading to fragmentation of effort and diluting the impact of these activities.

Coordination among Agencies Includes Formal Groups, but Officials Often Cited Informal Coordination Efforts as More Common

Two groups serve as formal vehicles for coordinating federal agency activities related to woody biomass utilization. The Woody Biomass Utilization Group, open to all national, regional, and field-level staff across numerous agencies, is a multiagency group that meets quarterly on woody biomass utilization issues. According to the group's draft charter (which has not been made final), the group's objectives are to (1) implement the policy principles of the June 2003 Memorandum of Understanding between USDA, DOE, and Interior; (2) coordinate, plan, and encourage woody biomass utilization; (3) serve as technical and policy advisers on woody biomass utilization; and (4) function as an information clearing house to help identify relevant woody biomass utilization technologies, foster joint demonstrations and pilot projects, identify research and development needs, and highlight successful woody biomass projects. The draft charter calls for a chair position to be rotated on an annual basis, generally between USDA, DOE, and Interior.

The other formal group is the Biomass Research and Development Board, which is responsible for coordinating federal activities to promote the use of biobased industrial products. The board consists of membership from USDA, DOE, and Interior, as well as EPA, the National Science Foundation, the Office of the Federal Environmental Executive, and Office of Science and Technology Policy, and is co-chaired by USDA's Under Secretary for Natural Resources and Environment and DOE's Assistant Secretary for Energy Efficiency and Renewable Energy. The board is supported by the Biomass Research and Development Technical Advisory Committee, which includes representatives of nonfederal groups such as industry, academia, trade associations, and the like.

When discussing coordination among agencies, however, agency officials more frequently cited using informal mechanisms for coordination than the formal groups described above. For example, two officials we spoke with in the Forest Service's Northwest Region told us that although they were aware of the interagency Woody Biomass Utilization Group, they were not aware of any of the group's activities—or even whether the group has a charter. Several officials told us that informal communication among networks of individuals was essential to coordination among agencies; one Forest Service field official told us that, in contrast to formal groups, the more common method for coordinating among agencies is frequent, informal communication through e-mail, telephone calls, and discussions at regional or local conferences or workshops. Another Forest Service field official emphasized that his informal network of officials—both within and outside the agency and with whom he converses by telephone and e-mail

regularly—helps him keep abreast of woody biomass developments by providing reports, documents, and other information. Similarly, a headquarters official in another agency described a network of individuals—both within and outside of the agency—with whom he remains in frequent e-mail and telephone contact. These individuals exchange information regarding projects, policies, potential impacts of legislation, success stories, and the like. In each case, the officials stated that they relied much more upon informal means of coordination than on formal interagency groups.

Officials also described other forms of coordination. Two officials described a regional grant application review team that included Forest Service, BLM, BIA, and FWS staff that jointly reviewed applications for fuels treatment grants. Although the main emphasis of the grants was not woody biomass, there was discussion within the review team about biomass issues that ensue from fuels treatment projects. Another program that involves interagency coordination is the joint review of applications by USDA and DOE for renewable energy projects authorized by the Biomass Research and Development Act of 2000. In addition, two officials told us that the Forest Service was trying to organize a multiagency team to collaborate on woody biomass efforts within the agency's Northwest Region. Other officials mentioned state-level interagency working groups focusing on fire and fuels reduction issues and consisting of representatives from the Forest Service, Interior agencies, and nonfederal entities. These groups are primarily concerned with fire suppression capacity, fuel reduction treatments, and community wildland fire planning efforts, not with woody biomass. However, according to these officials, the woody biomass issue is interwoven with these other issues and is often discussed. Further, the networks established by these interagency groups facilitate communication on a variety of issues, including woody biomass, among the states and agencies involved.

While DOE and Interior Have Formal Mechanisms for Coordinating Internal Activities, the Forest Service Does Not

DOE's woody biomass utilization activities are coordinated through EERE. Within this office, the Office of the Biomass Program directs biomass research at DOE national laboratories and contract research organizations, while a small number of woody biomass activities are undertaken within two other programs, the Federal Energy Management Program and the Tribal Energy Program.

Interior has appointed a single official to oversee its woody biomass activities and is operating under a woody biomass policy in the form of an

April 2004 memorandum from the Assistant Secretary for Policy, Management and Budget. This memorandum directs all Interior bureaus and offices to implement the policy principles of the June 2003 Memorandum of Understanding between USDA, DOE, and Interior. According to the official responsible for overseeing Interior's woody biomass efforts, this memo serves as departmental policy until a departmental manual can be updated. Interior also has appointed a Renewable Energy Ombudsman to coordinate all of the department's renewable energy activities, including woody biomass. Similarly, BLM has appointed a single official to oversee woody biomass efforts, and, as noted, has developed a woody biomass utilization strategy to guide its activities, including overall goals related to increasing the utilization of biomass from treatments on BLM lands.

In contrast, although the Forest Service developed a woody biomass policy in January 2005, unlike DOE and Interior, it has not assigned a specific individual or office with responsibility for overseeing its woody biomass activities. The agency does have an internal group—the Woody Biomass Utilization Team—that meets to discuss woody biomass issues, but this group does not have responsibility for implementing the policy. And according to some Forest Service officials we spoke with, agency woody biomass activities have been opportunistic, arising from local awareness of and interest in the issue rather than from a national strategy for approaching the issue. One Forest Service headquarters official told us that the agency's woody biomass activities have been “a grassroots effort on the part of those who have a real burning passion for improving utilization.” However, according to this official, individuals who do not share that passion have not been involved in woody biomass because there has been no central requirement or strategy for addressing the woody biomass issue. Another headquarters official told us that the extent to which woody biomass has been addressed has depended on the knowledge, interest, and availability of the local forest staff and the presence of local markets for woody biomass. Several field officials we spoke with share this view; one field official told us that there is a great deal of interest in woody biomass technology on the part of field staff, but not much coordination and no formal strategy, while another noted that woody biomass activities are “largely dependent on local risk taking.” Yet another field official told us that there is no coordinated approach within the Forest Service to woody biomass; instead, determining what activities to undertake is left up to the forests and ranger districts, and depends on local leadership.

The Forest Service does have an individual, located within the agency's State and Private Forestry branch, who generally serves as the agency's primary point of contact for woody biomass utilization. However, two officials noted that this individual serves primarily as a consultant, with no influence over budgets or activities. They also stated that, because this official works within the State and Private Forestry branch, he has no influence over agency activities regarding public lands and no influence over the Forest Service's National Forest System or Research and Development branches, with their associated land bases or budgets. One headquarters official within the agency stated that without stronger central authority or a stronger woody biomass policy, the Forest Service will find it difficult to effect change because while the agency's primary woody biomass official can discuss technology, innovation, supply, and other issues, he lacks the authority to influence land management practices.

Two officials attributed the Forest Service's lack of a coordinated woody biomass effort to the agency's decentralized culture, with autonomy at the ranger district, national forest, and regional level. One official told us that this culture serves the agency well for some purposes but works against the agency when it tries to promote an idea or issue—such as woody biomass utilization—that has not been widely emphasized. Another official noted that each region in the Forest Service has considerable autonomy in developing its own policies, setting its own priorities, and establishing its own procedures, and that, while there is often value in having ideas originate from the field, a more formalized structure is often more effective at accomplishing overall agency objectives. According to this official, the woody biomass issue has reached the stage where a formalized, coordinated national strategy is appropriate.

One official told us that the Forest Service's emphasis on fuel reduction planning and implementation efforts under the National Fire Plan had focused the agency's attention away from woody biomass. The 10-year comprehensive strategy for implementing the National Fire Plan contains four overall goals: (1) improving fire prevention and suppression, (2) reducing hazardous fuels, (3) restoring fire-adapted ecosystems, and (4) promoting community assistance, which includes woody biomass utilization. This official told us that the Forest Service's emphasis on goals 1 and 2 has reduced its ability to focus on the other goals, and "now that the biomass is starting to pile up," it is time for the Forest Service to begin focusing on woody biomass. The Western Governors' Association issued a report in November 2004 concurring with this view, stating "Goal 4 must be given the same emphasis Goals 1 and 2 have received in order for its action items—and the 10-Year Strategy as a whole—to be accomplished."²³

Without an individual or office with responsibility for overseeing woody biomass activities within the agency, the Forest Service risks diluting the effects of its activities because individual units within the agency may undertake woody biomass activities that are not consistent with the activities of other units—or they may choose to undertake no woody biomass activities at all. Further, given the magnitude of the woody biomass issue and the finite funds available to the agency, it is important that the Forest Service ensure that activities on which it places a high priority are undertaken so that it can maximize its accomplishments within its budget.

²³Western Governors' Association Forest Health Advisory Committee, *Report to the Western Governors on the Implementation of the 10-Year Comprehensive Strategy* (Denver, November 2004).

Most Officials Cited Economic Obstacles to Woody Biomass Utilization, and While Agencies Generally Targeted These Obstacles, Some Officials Believe Additional Steps beyond the Agencies' Authority Are Needed

Agency officials cited two principal obstacles to increasing the use of woody biomass: the difficulty in using woody biomass cost-effectively—particularly the obstacles posed by the high cost of harvesting and transporting woody biomass—and the lack of a reliable supply of the material. Agency activities—grants, education and outreach, and research and development—are generally targeted toward the obstacles identified by agency officials. Many officials, however, told us that their agencies are limited in their ability to fully address these obstacles and that additional steps—such as subsidies and tax credits—beyond the agencies' authority to implement are needed. But agency officials generally did not specify the level of subsidies or tax credits they believe would be necessary, and not all agree that such additional steps are appropriate.

Most Officials Noted the Difficulty in Using Woody Biomass Cost-Effectively, and Many Also Cited the Lack of a Reliable Woody Biomass Supply

Most officials we spoke with cited the difficulty in using woody biomass cost-effectively—that is, in using the material to create products that generate more revenue than is required for their creation. Other obstacles cited include the lack of a reliable supply of woody biomass; internal agency barriers to effectively promoting woody biomass, including the lack of agency commitment to the issue; and the lack of a local infrastructure to harvest, transport, and process woody biomass.

Most Officials Cited Economic Factors, Particularly the High Cost of Harvesting and Transporting Woody Biomass Relative to Its Value, as Primary Obstacles to Increasing Woody Biomass Utilization

The obstacle most commonly cited by officials we spoke with (30 of 44 officials) is the difficulty of using woody biomass cost-effectively. Officials told us that the products that can be created from woody biomass—whether wood products, liquid fuels, or energy—often do not generate sufficient income to overcome the costs of acquiring and processing the raw material. For example, a Forest Service researcher in California estimated that the cost of generating electricity from woody biomass was about 7.5 cents per kilowatt hour, including costs to harvest, transport, and process the material, as well as operations, maintenance, and capital amortization costs. However, the same researcher noted that at the time of his study, the wholesale price paid for power in California was 5.3 cents per kilowatt hour—meaning that, without receiving additional income for their electricity, producers of woody biomass-generated electricity would lose about 2.2 cents for each kilowatt hour generated if they sold their electricity on the wholesale power market.²⁴

One factor contributing to the difficulty in using woody biomass cost-effectively, according to 23 officials, is the cost incurred in harvesting and transporting woody biomass. For example, one Forest Service official pointed out that while a single 18-inch-diameter tree of a given height contains the same volume as 20 4-inch-diameter trees of the same height, it is much more expensive to harvest 20 trees than 1. Two officials told us that when the end use for woody biomass calls for chipped or ground material—for example, for use in power plants—it is often more efficient to chip the material in the forest and haul the chips to the plant rather than hauling the unprocessed woody biomass. However, these officials noted that the vehicles typically used to haul chips—known as chip vans—cannot navigate many forest roads, which were designed for logging trucks. Because hauling material in smaller vehicles is more costly, this adds to the difficulty in using the material cost-effectively. Officials pointed out that small installations located close to woody biomass sources will have lower transportation costs, enhancing their ability to use the material cost-effectively. Schools and other buildings located in communities near forests are thus particularly well-positioned for woody biomass use, according to officials—especially if these buildings are heated with natural gas or fuel oil, because once buildings convert their heating infrastructure to accept woody biomass, they can be heated at a lower cost by using

²⁴Officials pointed out that some power plants, particularly in California, are able to burn woody biomass cost-effectively. However, these officials stated that this is in part due to economic incentives offered by the state.

woody biomass than by using natural gas or fuel oil. However, officials also noted that such installations consume relatively small amounts of woody biomass.

Five officials primarily involved in research and development noted the costs involved in converting woody biomass to liquid fuels such as ethanol. For example, the chemical makeup of wood makes it more difficult and expensive to convert into ethanol than other substances such as corn, according to officials.²⁵ Thus, although ethanol represents a potentially large opportunity for utilizing woody biomass (because of the demand for transportation fuels), the availability of cheaper raw materials such as corn presents an obstacle to its use.

Other Obstacles Cited Include the Lack of a Reliable Supply of Woody Biomass from Federal Lands and Internal Barriers to Effective Promotion of Woody Biomass

Of the 44 officials we spoke with, 22 told us that even if cost-effective means of using woody biomass were found, the lack of a reliable supply of woody biomass from federal lands presents an obstacle because business owners or investors will not establish businesses without assurances of a dependable supply of material. Officials identified several factors contributing to the lack of a reliable supply, including the lack of widely available long-term contracts for forest products, environmental opposition to federal projects, and the shortage of agency staff to conduct activities. Regarding long-term contracts, projects that use stewardship contracting authority may include contracts of up to 10 years—potentially stabilizing the long-term supply of woody biomass—whereas projects conducted outside of this authority must use contracts of a shorter duration.²⁶ Agency officials cited one stewardship project—the White Mountain project in Arizona, which has a 10-year duration and is expected to treat 50,000 to 250,000 acres—as an example of the benefits of stewardship contracting in stabilizing supply. An official told us that two manufacturers are negotiating with the contractor to establish manufacturing plants using woody biomass removed as part of the project. According to this official, without the assurance of supply offered by a

²⁵Officials told us that corn is higher in starches, which can be converted into sugar and then fermented into ethanol. In contrast, wood contains lower amounts of starch and also contains lignin, which cannot be converted into ethanol.

²⁶Stewardship contracting involves the use of any of several contracting authorities first authorized in 1998, including the ability to enter into contracts of up to 10 years in length. For a description of the agencies' use of stewardship contracting authority, see GAO, *Federal Land Management: Additional Guidance on Community Involvement Could Enhance Effectiveness of Stewardship Contracting*, GAO-04-652 (Washington, D.C.: June 14, 2004).

long-term contract, these manufacturers would not have shown interest. However, another official pointed out that Forest Service stewardship contracts must be approved at the regional level, making their use more cumbersome than other contract types.

Adding further to the uncertainty of supply, 10 officials told us that environmental opposition poses an obstacle—for example, in the form of appeals and litigation that delay planned projects. Finally, according to five officials, staffing constraints make accomplishing projects in a timely manner difficult even without external opposition; two Forest Service officials told us that even if long-term contracts were available and environmental opposition were not a factor, the lack of staff still hampers the agency’s ability to implement projects.

Six officials cited internal agency barriers that hamper agency effectiveness in promoting woody biomass utilization. Prior to the Forest Service’s January policy statement on woody biomass, one Forest Service official told us that the lack of a strong policy stating that using woody biomass is preferable to piling and burning it hampered the agency because no incentive existed for “field staff to think creatively about how to move [woody biomass] to potential users.” This official told us that even if the Forest Service received no payment for the material, putting it to use was better than piling and burning it—which also brings no revenue—and this preference should be embedded in policy. Two Forest Service officials also noted that the agency’s mechanisms for designing and implementing projects were still geared toward larger, merchantable timber to the detriment of woody biomass. One official stated that “the Forest Service needs to improve its capabilities to design treatments, contracts, and agreements that will encourage utilization of smaller diameter material,” while another official echoed this view by stating that “timber operations [in contrast to woody biomass] account for the bulk of institutional knowledge about material removal.” Finally, several officials stated that federal agencies have not been effective in communicating the potential benefits of fuel reduction. According to the officials, fuel reduction would reduce fire suppression and rehabilitation costs, avoid damage to watersheds, avoid smoke pollution, and the like. Officials told us that communicating these benefits could reduce opposition to fuel reduction projects, which was cited as a factor in the uncertainty of woody biomass supply.

Other officials cited the lack of agency commitment to the issue. For example, a BIA official told us that BIA has not provided the resources and

structure required for promoting and developing woody biomass utilization projects. Six officials told us that more funds should be devoted to researching new or less expensive ways to use woody biomass in order to overcome economic obstacles to its use. And two Forest Service officials cited that agency's lack of a woody biomass policy as an obstacle to effective agency promotion of woody biomass utilization.

A variety of other obstacles were noted as well. One official told us that some large facilities such as prisons could use woody biomass to generate their own electricity for less than the cost of electricity sold by electrical utilities. However, such facilities generally would need to have electricity available from the grid in the event that their own generators were unavailable—and, according to this official, utilities can charge rates for this electricity (known as standby power) that are equal to the rates charged for electricity that is actually delivered. In other words, for every hour the utility is prepared to deliver electricity to the facility, the utility charges a fixed portion of the rate that would have been charged had the electricity actually been delivered—100 percent of the rate in some cases, according to this official. As a result, installations would pay not only the costs of generating their own electricity but also the standby power rates charged by the utility—costs that, when combined, may exceed the cost of simply purchasing electricity from the utility. Withdrawing from the electricity grid entirely can be problematic as well; this official stated that utilities can charge fees—known as exit fees—for doing so.

Another obstacle cited by officials is the lack of a local infrastructure for harvesting, transporting, and processing woody biomass, including loggers, mills, and appropriate equipment for treating small-diameter material. Three Forest Service officials we spoke with told us that in some cases the decline in federal logging has left areas without any infrastructure at all, while in other cases the infrastructure that is left is equipped to handle large trees rather than woody biomass. According to officials, contractors need equipment designed for handling woody biomass rather than larger trees in order to cost-effectively harvest and transport the material. However, contractors may not have the capital to purchase this new equipment, and may be unable to obtain loans without assurances of a long-term supply of woody biomass.

Agency Efforts Are Generally Targeted toward the Obstacles Identified, but Officials Cited the Need for Additional Actions Such As Subsidies and Tax Credits

The agency activities we identified were generally targeted toward the obstacles agency officials cited. Agencies provided grants, engaged in outreach, and conducted research aimed at overcoming economic obstacles to woody biomass use, and conducted activities to address other obstacles as well. However, several officials believe that additional steps beyond the agencies' authorities are needed to fully address the woody biomass issue.

Agency Activities Are Generally Targeted at Overcoming the Challenges Identified

Agency activities related to woody biomass were generally aimed at overcoming the obstacles agency officials identified, including many aimed at overcoming economic obstacles. For example, staff at the Forest Service's TMU have worked with potential users of woody biomass to develop products whose value is sufficient to overcome the costs involved in harvesting and transporting the material; EAP coordinators have worked with potential woody biomass users to overcome economic obstacles; and Forest Products Laboratory researchers are working with NREL to increase the yield of ethanol from woody biomass, making wood-to-ethanol conversion more cost-effective.

Some agency activities also are targeted at providing more certainty of supply. A Forest Service official in New Mexico has been meeting with environmental groups to try to obtain consensus on the need for forest-thinning activities. Obtaining consensus can reduce the likelihood of environmental opposition, making Forest Service projects easier to accomplish and allowing a steadier supply of biomass. Although not all groups will support the projects, according to this official, obtaining agreement from major groups can blunt opposition from other groups. Other officials are working on models to predict the amount of woody biomass potentially available, giving users a better sense of the supply of raw materials.

Some Officials Stated That Additional Actions beyond the Agencies' Authorities, Such As Subsidies and Tax Credits, Are Needed to Stimulate the Market for Woody Biomass

Despite ongoing agency activities, 14 officials told us that additional steps—such as subsidies or tax credits—that are beyond the agencies' authorities are necessary to develop a market for woody biomass. According to several officials, the obstacles to using woody biomass cost-effectively are simply too great to overcome by using the tools—grants, outreach and education, and so forth—at the agencies' disposal. One official stated that “in many areas the economic return from smaller-diameter trees is less than production costs. Without some form of market intervention, such as tax incentives or other forms of subsidy, there is little short-term opportunity to increase utilization of such material.” Three

officials stated that subsidies have the potential to reduce the per-acre cost of thinning, because if there is a market for woody biomass, contractors will be willing to harvest the material for a lower fee, knowing that they can recoup some of their costs by selling the material. According to these officials, subsidies thereby create an important benefit—reduced fire risk through hazardous fuels reduction—if they promote additional thinning activities by stimulating the woody biomass market.

Officials told us that tax incentives, subsidies, and low-interest loans may serve to stimulate infrastructure for harvesting, processing, and transporting woody biomass, and that such assistance should target not only larger plants and facilities but smaller operators as well. Harvesters and loggers, for example, could use the assistance to purchase the expensive equipment and machinery required to treat woody biomass and thus help to build the required infrastructure.

It is not only federal officials who hold this view. In testimony before the Congress, the owner of a sawmill that uses woody biomass to generate electricity for the mill stated that woody biomass-to-energy does not work as a stand-alone enterprise. According to this individual, “The cost structure associated with removing woody biomass from the forest, hauling the material to a facility and converting the fiber into a product suitable for electricity production is prohibitive without massive subsidization.”

Others see a need for state requirements that utilities procure or generate a portion of their electricity by using renewable resources, known as renewable portfolio standards.²⁷ Forest Service officials in the Southwest Region are encouraging states in the region to enact renewable portfolio standards that include a woody biomass component. These officials are urging states to go beyond simply requiring electricity from renewable resources and require, or provide favorable treatment of, electricity generated from woody biomass produced as part of forest restoration projects. The official primarily responsible for this effort stated that “using this biomass source will help lower costs and allow restoration activities to occur on many more thousands of acres than present budgets allow.”

²⁷According to the Database of State Incentives for Renewable Energy, a DOE-funded project, 19 states and the District of Columbia had renewable portfolio standards as of February 2005.

Agency officials generally did not specify the level of subsidies or tax credits they thought necessary, and not all officials believe that these additional steps are efficient or appropriate. One official told us that, although he supports these activities, the creation of tax incentives and subsidies would create enormous administrative and monitoring requirements. Another official stated that although federal policy changes such as increased subsidies could address obstacles to woody biomass utilization, he does not believe they should be made. Rather, he believes that research and development efforts, combined with market forces, will eventually result in “equilibrium”—in other words, in woody biomass utilization finding its appropriate level. If cost-effective uses of woody biomass can be found, its utilization will increase. Yet another official stated that while production tax credits or subsidies may be successful in getting businesses or industries started, he does not believe they are sustainable over the long term. In addition, he is reluctant to create credit- or subsidy-dependent businesses that would be at the mercy of the annual appropriations cycle. Instead, market-driven solutions are more appropriate—for example, providing information to exploit the existing market, or developing requirements or incentives (such as renewable portfolio standards) that create a market on their own.

Further, not all agree with the assumption that the market for woody biomass should be expanded. One agency official told us he is concerned that developing a market for woody biomass may result in overuse of mechanical treatment (rather than prescribed burning) as the market begins to drive the preferred treatment. In other words, given a choice between mechanical thinning and prescribed burning, a forest manager might choose mechanical thinning not because it was the most appropriate tool for the project at hand but to satisfy the demand for woody biomass. This official stated that “if we do that, we are not being good stewards of the land.”

Environmental group representatives also have urged caution in taking any steps that expand the market for woody biomass. Representatives of one national environmental group told us that relying on woody biomass as a renewable energy source will lead to overthinning, as demand for woody biomass exceeds the supply that is generated through responsible thinning. They also questioned the incentive to create or reconstruct roads in the forests to facilitate inexpensive transportation of woody biomass because they believe doing so introduces unwanted side effects—increased erosion and sedimentation, increased access to areas of the forest that previously had no roads, and increased maintenance and enforcement costs for the

federal agencies. Finally, the representatives questioned the true energy gain of using woody biomass—that is, whether the energy involved in harvesting, transporting, and processing woody biomass exceeds the energy contained in the biomass—stating that “it doesn’t make economic sense to burn expensive gasoline to get cheap biomass.” However, they stated that the benefits gained by using the biomass rather than piling it in landfills or leaving it in the forest where in some locations it would continue to pose a significant fire risk may justify any net energy loss.

Conclusions

The amount of woody biomass resulting from increased thinning activities could be substantial, adding urgency to the search for ways to use the material cost-effectively rather than simply disposing of it. The use of woody biomass, however, will become commonplace only when users—whether small forest businesses or large utilities—can gain an economic advantage by putting it to use. Federal agencies are targeting their activities toward overcoming this and other obstacles—for example, by providing technical assistance and grant funds to businesses facing economic challenges in using woody biomass. But some agency officials believe that these efforts alone will not be sufficient to stimulate a market that can accommodate the vast quantities of material expected.

While additional key steps may be necessary at the federal and state levels, we believe the agencies will continue to play an important role in stimulating woody biomass use. However, while both DOE and Interior have designated individuals or offices for coordinating woody biomass activities, no individual or office within the Forest Service has been similarly designated. Without an individual or office with responsibility for overseeing and coordinating woody biomass activities within the agency, the Forest Service can neither ensure its multiple activities contribute to the agency’s overall objectives nor assess the effectiveness of individual activities. Further, by taking a piecemeal approach to the issue, the agency risks diluting the impact of its activities because different agency units may be emphasizing different priorities. Some local variation may be appropriate—to account for regional differences in infrastructure, for example, or in forest type. Nevertheless, a coordinated approach is essential if the Forest Service is to capitalize fully on its potential to increase woody biomass utilization.

Recommendation for Executive Action

To improve the Forest Service's effectiveness in promoting woody biomass utilization, we recommend that the Secretary of Agriculture direct the Chief of the Forest Service to assign responsibility for overseeing and coordinating the agency's woody biomass utilization activities to a specific official or office within the agency.

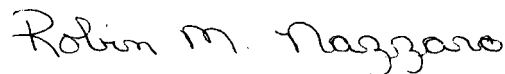
Agency Comments and Our Evaluation

We provided a draft of this report to the Secretaries of Agriculture, Energy, and the Interior for review and comment. USDA concurred with our findings and recommendation, and the department's comment letter is presented in appendix II. DOE officials stated they had no comments on the report, while Interior did not provide comments.

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

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

Sincerely yours,



Robin M. Nazzaro
Director, Natural Resources and Environment

Objectives, Scope, and Methodology

The objectives of our review were to determine (1) which federal agencies are involved in efforts to promote the use of woody biomass, and the actions they are undertaking; (2) how these federal agencies coordinate their activities related to woody biomass; and (3) what these agencies see as the primary obstacles to increasing the use of woody biomass and the extent to which they are addressing these obstacles. To get a better understanding of woody biomass issues, we initially met with officials at the Forest Service and Office of the Chief Economist within the Department of Agriculture (USDA), the Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy, the Department of the Interior, the Bureau of Indian Affairs, the Bureau of Land Management (BLM), the Fish and Wildlife Service, and the National Park Service. We also met with representatives from nonfederal organizations, including the Western Governors' Association, Colorado State University, the state of New Mexico, the state of California, the Santa Ana Pueblo, the Wilderness Society, the Nature Conservancy, Public Service Company of New Mexico, and others. We also visited the Forest Service's Forest Products Laboratory in Madison, Wisconsin; a woody biomass-heated community center in Nederland, Colorado; and a wood-fired power plant in Burney, California.

We subsequently developed a structured interview guide to collect information on woody biomass utilization activities, coordination efforts, and challenges to utilizing woody biomass. Because the practical difficulties of developing and administering a structured interview guide may introduce errors—resulting from how a particular question is interpreted, for example, or from differences in the sources of information available to respondents in answering a question—we included steps in the development and administration of the structured interview guide for the purpose of minimizing such errors. We pretested the instrument at two locations by telephone and modified it to reflect questions and comments received during the pretests.

To determine whom to interview, we began with agency headquarters officials who had been identified by the agencies as points of contact for woody biomass activities. As part of these interviews, we asked for the names of additional officials—regardless of location or agency affiliation—who could provide additional information on, or insights into, woody biomass issues. We continued this expert referral technique until the references we received became repetitive. In all, we used our structured interview guide to interview a nonprobability sample of 44 officials in

various agencies and geographic locations.¹ Our sample included officials at various levels within the agencies, including agency headquarters; Forest Service regional, national forest, and ranger district offices; Forest Service research facilities, including regional research stations and the Forest Products Laboratory; a BLM district office; DOE national laboratories; and others. Our structured interviews were conducted with officials from the following departments and agencies:

USDA

- Cooperative State Research, Education, and Extension Service.
- Forest Service (including the National Forest System, Research and Development, and State and Private Forestry branches).
- Natural Resources Conservation Service.

DOE

- Golden Field Office.
- National Energy Technology Laboratory.
- National Renewable Energy Laboratory.
- Office of Energy Efficiency and Renewable Energy (including the Federal Energy Management Program, the Office of the Biomass Program, the FreedomCAR and Vehicle Technologies Program, and the Tribal Energy Program).

Interior

- Department of the Interior.
- Bureau of Indian Affairs.
- Bureau of Land Management.

¹Results from nonprobability samples cannot be used to make inferences about a population, because in a nonprobability sample, some elements of the population being studied have no chance or an unknown chance of being selected as part of the sample.

- Fish and Wildlife Service.
- National Park Service.
- U.S. Geological Survey.

Other agencies

- Environmental Protection Agency.
- National Science Foundation.
- Office of Federal Environmental Executive, Executive Office of the President.
- Office of Science and Technology Policy, Executive Office of the President.

We also contacted officials from the Departments of Commerce and Transportation, who told us their departments have no activities related to woody biomass utilization.

Federal Agency Woody Biomass Utilization Activities

To collect information on federal agency woody biomass utilization activities, we used our structured interview guide to ask officials to identify individuals or organizations responsible for biomass utilization activities within their agencies and to identify other federal agencies involved in such activities. We also asked them to provide information about the activities their agencies had under way as well as policies, strategic plans, and goals related to woody biomass. We also reviewed agency policies, strategic plans, and other documents; federal and nonfederal studies regarding technological, economic, and other issues related to woody biomass utilization; and pertinent laws and other documents. To corroborate the information we gathered through interviews, we compared interviewees' responses with other information we reviewed. Because the documentary evidence we reviewed generally agreed with the information provided by key agency officials involved in woody biomass efforts, we believe the data are sufficiently reliable to be used in providing descriptive information on federal agency woody biomass utilization activities.

Federal Agency
Coordination of Woody
Biomass Activities

To determine how agencies coordinate their woody biomass activities, we asked officials to provide information on individuals or organizations responsible for coordinating activities within their agencies and those responsible for coordinating activities involving other agencies, as well as on the types of formal and informal activities they undertook. We also reviewed agency documentation regarding coordination issues, including draft and final coordinating team charters and notes from coordinating team meetings. We then compared the information provided by agency officials with this documentation. Because the documentary evidence we reviewed generally agreed with the information provided by key agency officials involved in woody biomass efforts, we believe the data are sufficiently reliable to be used in providing descriptive information on agency woody biomass coordination efforts.

Obstacles to Increasing the
Use of Woody Biomass

To obtain information on obstacles that federal agencies face in their efforts to increase the use of woody biomass, we asked agency officials to identify and provide their opinions on the major obstacles to increasing the use of woody biomass, describe agency efforts that target the obstacles they identified, and discuss additional steps they believe are necessary to address these obstacles. Because we asked only for opinions about obstacles to woody biomass utilization and additional steps needed to overcome them, we made no attempt to corroborate these responses. To corroborate responses regarding agency efforts to target the obstacles identified, we compared interviewees' responses with the documentary evidence we gathered regarding the agencies' woody biomass utilization activities. Because the documentary evidence we reviewed generally supported the information provided by interviewees, we believe the data are sufficiently reliable to be used in providing information about the extent to which the agencies are addressing these obstacles.

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

Comments from the Department of Agriculture



DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20250

APR 12 2005

File Code: 1430
Date:

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

Dear Ms. Nazzaro:

The Department of Agriculture has reviewed the GAO Report, GAO-05-373, "Natural Resources: Federal Agencies Are Engaged in Various Efforts to Promote the Utilization of Woody Biomass, but Significant Obstacles to its Use Remain." The report recognizes the Forest Service's progress toward addressing the woody biomass utilization issue and working with the departments of Interior and Energy from 2004 through 2005. The report also identifies the Agency's need to develop a stronger leadership role and strategic plan that defines management goals, obstacles, corrective actions, responsible parties, and target dates and resources. It also prioritizes improvement initiatives and provides additional woody biomass utilization details. The Forest Service concurs with the audit findings and recommendations.

The Forest Service has created the Staff Directors Biomass Utilization Steering Committee in its Washington Office. The committee leads are Chuck Myers, Director, Forest Management, and Ed Gee, Forest Management. The woody biomass strategic/business plan is being prepared.

If you have any technical questions regarding this audit, please contact Ed Gee, Forest Management, at (202) 205-1787. For general questions regarding the audit, please contact Sandy T. Coleman, Agency Audit Liaison, at (703) 605-4940.

Sincerely,

A handwritten signature in black ink that reads "Mark Rey".

Mark Rey
Under Secretary
Natural Resources and Environment

GAO Contacts and Staff Acknowledgments

GAO Contacts

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

Staff Acknowledgments

In addition to those named above, James Espinoza, Steve Gaty, Richard Johnson, and Judy Pagano made key contributions to this report.

GAO's Mission

The Government Accountability Office, the audit, evaluation and investigative arm of Congress, exists to support Congress in meeting its constitutional responsibilities and to help improve the performance and accountability of the federal government for the American people. GAO examines the use of public funds; evaluates federal programs and policies; and provides analyses, recommendations, and other assistance to help Congress make informed oversight, policy, and funding decisions. GAO's commitment to good government is reflected in its core values of accountability, integrity, and reliability.

Obtaining Copies of GAO Reports and Testimony

The fastest and easiest way to obtain copies of GAO documents at no cost is through GAO's Web site (www.gao.gov). Each weekday, GAO posts newly released reports, testimony, and correspondence on its Web site. To have GAO e-mail you a list of newly posted products every afternoon, go to www.gao.gov and select "Subscribe to Updates."

Order by Mail or Phone

The first copy of each printed report is free. Additional copies are \$2 each. A check or money order should be made out to the Superintendent of Documents. GAO also accepts VISA and Mastercard. Orders for 100 or more copies mailed to a single address are discounted 25 percent. Orders should be sent to:

U.S. Government Accountability Office
441 G Street NW, Room LM
Washington, D.C. 20548

To order by Phone: Voice: (202) 512-6000
TDD: (202) 512-2537
Fax: (202) 512-6061

To Report Fraud, Waste, and Abuse in Federal Programs

Contact:

Web site: www.gao.gov/fraudnet/fraudnet.htm

E-mail: fraudnet@gao.gov

Automated answering system: (800) 424-5454 or (202) 512-7470

Congressional Relations

Gloria Jarmon, Managing Director, JarmonG@gao.gov (202) 512-4400
U.S. Government Accountability Office, 441 G Street NW, Room 7125
Washington, D.C. 20548

Public Affairs

Paul Anderson, Managing Director, AndersonP1@gao.gov (202) 512-4800
U.S. Government Accountability Office, 441 G Street NW, Room 7149
Washington, D.C. 20548