



The Economic Case Against

NATIONAL FOREST LOGGING

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The Economic Case Against National Forest Logging

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Forest Conservation Council was founded in 1986 to promote sustainable forestry on federal, state, and private forests throughout the United States. FCC relies upon research, policy development, litigation, and public education to further its mission.

Forest Guardians was established in 1989 in Santa Fe, New Mexico to advocate for conservation of native biological diversity in the American Southwest through a variety of grassroots strategies including citizen mapping and monitoring of endangered ecosystems, development of legislative proposals, and outdoor education.

The National Forest Protection Alliance is a nationwide grassroots network seeking an end to commercial exploitation of public lands. The NFPA represents over 200 organizational and business members, and is directed by a governing council composed of state representatives.

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THE FUTURE OF OUR NATIONAL FORESTS

Commodity
or living legacy?

From a social and economic standpoint, national forests are far more valuable living, dying, and being reborn as natural ecosystems than they are when logged and converted into two by fours and paper products. This fact has been demonstrated over and over again by natural resource economists from both within and outside the Forest Service in studies of forest dependent communities and the values they place on national forests. This fact also makes sense from an historical standpoint.

National forests represent just 19% of all timberland in the United States, and were established after most of the nation's virgin forests had been logged. They represent the

unproductive remnants of forests left behind after settlers and timber companies grabbed the best lands. As such, they are generally too high in elevation, too steep, and too unproductive for commercial logging. However, because they are located at the headwaters of major rivers and are relatively inaccessible, national forests are extremely valuable for other uses such as water quality, recreation, and preservation of native species. This is especially true in light of

Forest Service programs must maximize the net social and economic contributions of national forests to the American people. The timber sale program is no exception.

the fact that the vast majority of the nation's forests, managed by private landowners and timber companies, are not managed for these values at all.

By law, the Forest Service must manage national forests for the highest and best use. Forest Service programs must maximize the net social and economic contributions of national forests to the

American people. The timber sale program is no exception. Before selecting any tract of national forest for logging, the Forest Service must demonstrate that the wood products yielded by the proposed timber sale are more valuable to the American people than the social and economic contributions associated with unlogged forests. In addition, the Forest Service must demonstrate that the benefits of the timber sale program outweigh costs, which include not only direct financial costs but costs to society as a whole.

National forests provide many important social and economic contributions to the nation, simply by existing as natural ecosystems. Natural resource economists have coined the term "ecosystem services," to describe such contributions, which include important **functions** such as flood control, nutrient cycling, soil production, purification of water, carbon sequestering, pollination, pest control, and waste recycling; **products** such as plants used in manufacturing of medicines, edible mushrooms, and floral greens; **uses** such as recreation, hunting, and fishing; and scenic, aesthetic, and cultural **values** that are important quality of life factors for forest dependent communities. Economists have recently

estimated that ecosystem services provided by natural forests worldwide are worth at least \$4.7 trillion per year.

Despite the Forest Service's clear duty to recognize the social and economic benefits of unlogged forests, these benefits are systematically ignored in timber sale program decisions. In addition, the Forest Service systematically ignores the externalized costs of logging, such as increased water filtration costs borne by municipalities downstream from heavily logged watersheds, or the "displacement" costs incurred by suppliers of non-wood fiber and building materials who must compete against a subsidized federal logging program. Economists have developed a number of analytical tools to quantify both standing forest values and externalized costs, yet the Forest Service consistently fails to use such techniques in its timber sale program decisions. If ecosystem service values and externalized costs of logging were incorporated into timber sale program decisions, it is likely that few, if any timber sales could be justified.

These two messages—that national forests are more important to the American people standing than logged, and that the timber sale program creates more social and economic harm

than good—form the backbone of a nationwide grassroots organizing effort coordinated by the National Forest Protection Alliance (NFPA). The NFPA's goal is to end commercial logging on federal public lands, and redirect subsidies for this program to support restoration and sustainable economic development in rural communities. The NFPA enjoys the support of over 200 conservation, scientific, religious, and community organizations from coast to coast.

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These messages are also the core arguments in litigation filed on behalf of a broad alliance of outdoor recreation organizations, tourism businesses, small woodlot owners, alternative fiber companies, and environmental groups by Forest Conservation Council, Forest Guardians, and Friends of the Earth in December of 1998. The lawsuit, *Friends of*

the Earth v. U.S. Forest Service seeks to suspend the national forest logging program until the Forest Service demonstrates that the program can be justified from an economic and social standpoint.

This report presents some of the legal, economic, and technical research that has been prepared for the lawsuit and NFPA's organizing efforts. The report begins with an overview of the issues, then discusses the legal framework governing timber sale program decisions on national forests in Chapter 1. Chapter 2 contains an overview of the analytical framework the Forest Service must operate within in order to justify timber sale program decisions from a social standpoint. In Chapter 2, the winners and losers from timber sale program decisions are identified. In Chapter 3, we present evidence from the literature and other sources of data documenting ecosystem service values of unlogged national forests, and externalized costs of logging. In Chapter 4, a critique of national, forest, and project level timber sale program decision and analysis documents is provided. This review, along with the research discussed in earlier chapters, leads us to conclude that the national forest timber sale program cannot be justified from a socioeconomic standpoint.

NATIONAL FOREST LOGGING

Can we afford it?

In February and again in November of 1996, the Pacific Northwest was visited by an unusual weather phenomenon dubbed the “pineapple express,” which injects copious amounts of tropical moisture into the region’s normal rainy pattern. The result: steady downpours of biblical proportions. Over the millenium, the giant forests of the Pacific Northwest have evolved to absorb such rains by soaking up enormous quantities of water and releasing this water over long periods of time in streams and rivers naturally endowed with structures such as massive fallen logs and dense streamside vegetation which filter sediments and stabilize streambanks. However, by 1996, much of the Northwest’s

forested landscape had been logged and replaced with a labyrinth of logging roads, clearcuts, simplified tree plantations, and denuded streambanks which could not handle the torrents. The catastrophic floods and landslides that followed the rains will be talked about for decades.¹

The social and economic costs of the 1996 Pacific Northwest floods were staggering. Water utilities, overloaded with the tremendous surge in sediments bleeding from logging roads and clearcuts, were forced to spend tens of millions of dollars on emergency water filtration systems.² Lives were lost. Property damage was extensive, including the loss of prime agricultural lands. Public agencies were forced to spend enormous sums repairing roads and bridges damaged by landslides. The Forest Service spent over \$100 million on this alone.³ Yet this litany of damage to life and property are just a few of the many costs of logging our national forests that are externalized onto communities, businesses, and society as a whole, but which are never considered by the U.S. Forest Service in evaluating whether or not national forest logging is worthwhile from a social and economic standpoint.

Logging our national forests puts people out of work by dis-

placing logging on private lands and by competing against producers of recycled or non-wood fiber and building materials. Logging reduces the value of private property located within and near national forests. Logging national forests destroys commercial and sport fisheries, recreation opportunities, hunting territories, and scenery, costing jobs and revenues for businesses tied to these forest values. National forest logging decreases the hydro-electric generating potential of downstream reservoirs. National forest logging results in wildfires that destroy life, property, and forests. National forest logging, among the most dangerous economic



National forest logging has damaged Northwest watersheds and cost hundreds of millions of dollars in flood damage.

activities in the United States, results in death and injury not only to workers but to other forests users who happen to be in the way of falling trees and log trucks.

Such costs are not just abstractions cooked up by economists, they are well documented consequences of national forest logging which translate into direct economic harm to communities, businesses, and individuals who rely upon the unique economic values associated with unlogged forests.

Consider the case of Rex Cullum, an elementary school teacher in Arizona who is also one of thousands of hunters in the West who has seen prime hunting territories destroyed by reckless logging on national forests. According to Mr. Cullum, hunting is a national forest use that “generates millions of dollars to local and regional economies through guiding and outfitting services to non-residents and residents alike, as well as the sale of licenses and purchases of equipment and supplies.”⁴ Hunting also is important to low income families “who depend on meat from annual elk and deer hunts to supplement income generated provender.” However, in states such as Idaho, Arizona, Wyoming, and Colorado, Mr. Cullum has witnessed the decimation of

prime hunting territories through road building and logging on national forests. As a result, hunting opportunities have dwindled, outfitting guides have lost business, and state license revenues have declined.⁵

Or take the case of Olivia Robinson, who was driven from

“Our guests return from such hikes, not restored, inspired, or refreshed, but rather shocked, anxious, and sorrowful.”

Timothy McDevitt, on the effects of logging on trails near the Breitenbush resort in western Oregon.

her home in Washington when floodwaters destroyed her property. The floods were directly linked to Forest Service logging roads upstream and the accumulation of years of logging debris.⁶ Ms. Robinson incurred over \$1,000,000 in property damage, and has yet to receive any compensation from the Forest Service.

Breitenbush, a wilderness retreat center located in the heart of the Cascade Mountains in western Oregon provides another example. Breitenbush is completely surrounded by the

Willamette National Forest.

According to Timothy McDevitt, a cooperative owner, Breitenbush “depends absolutely upon pristine national forests in our watershed.”⁷ Unfortunately, Breitenbush is increasingly surrounded by Forest Service clearcuts, and such clearcuts strike at the heart of the services the resort provides, which include hikes into the remaining stands of old growth forests nearby. As Mr. McDevitt states, “Our guests return from such hikes, not restored, inspired, or refreshed, but rather shocked, anxious, and sorrowful.”⁸ Because of the adverse effects of logging on national forests around Breitenbush, guests have left early and canceled reservations, costing the resort many thousands of dollars.

Taken together, these externalized costs of national forest logging are astounding. However, such costs are even more alarming when added to the tremendous financial losses incurred by the U.S. taxpayer through national forest logging subsidies. Such losses have been estimated in one recent study sanctioned by the Congressional Research Service as nearly \$800 million in 1996,⁹ and at least \$1.7 billion over a three year period in another study completed by the General Accounting Office.¹⁰ Despite the magnitude of economic damage

created by the national forest logging program, the Forest Service simply ignores the vast majority of these costs in preparing, implementing, and justifying the annual timber sale program to Congress and the American people. The only costs even considered by the Forest Service in timber sale program decisions are the direct financial costs of timber management activities incurred by the agency and by logging companies.

In similar fashion, the Forest Service ignores the vast socioeconomic values of forests as natural ecosystems. When preparing timber sales, the Forest Service places no economic value whatsoever on unlogged forests, a common sense step that is necessary for determining whether or not a particular timber sale is economically beneficial.

National forests provide many important social and economic contributions to the nation, simply by existing as natural ecosystems. Natural resource economists have coined the term “ecosystem services,” to describe such contributions, which include important **functions** such as flood control, nutrient cycling, soil production, purification of water, carbon sequestering, pollination, pest control, and waste recycling; **products** such as plants used in manufacturing of medicines, edi-

ble mushrooms, and floral greens; **uses** such as recreation, hunting, and fishing; and scenic, aesthetic, and cultural **values** that are important quality of life factors for forest dependent communities. Economists have recently estimated that ecosystem services provided by forests worldwide are worth at least \$4.7 trillion per year.¹¹ The value of these services is leaps and bounds greater than the value of forests for timber.¹²

National forests provide many important social and economic contributions to the nation, simply by existing as natural ecosystems.

The preponderance of scientific evidence indicates that this is also the case for national forests in the United States. National forests make up a little less than 19% of all timberlands.¹³ As shown in Table 1, they represent a small fraction of the forested landscape in most states. National forests were established on lands that were the “leftovers” after the timber industry and settlers grabbed the best lands.¹⁴ They are generally located on areas that are too steep, too

inaccessible, and too unproductive for profitable logging. However, these attributes make national forests especially important for rare species that cannot tolerate human activities, for primitive recreation opportunities, as well as for water quality and water flows. This is especially true in light of the fact that most forests managed by private landowners are not managed for these values. For example, only six state forest practices acts contain legal requirements for preservation of wildlife habitat.¹⁵

The unique economic values of national forests generate thousands of jobs in sectors of the economy that benefit from forest protection. In many states where the timber industry complains most vociferously about reductions in national forest logging, employment in forest protection sectors far outnumbers employment in wood products. This fact is reflected well in a special Bureau of Labor Statistics (BLS) compilation of employment and income figures requested by Congresswoman Cynthia McKinney (D-GA) and Forest Conservation Council in 1997. The compilation analyzes two broad employment groups: (1) jobs related to logging, which include wood and paper products manufacturing and timber man-

agement, and; (2) jobs related to forest protection and environmental quality, which include recreation, tourism, hunting, fishing, and ecological research. The data compare the number of businesses, number of jobs, and income for these groups between 1988 and 1996, and are available for each state. A sample of this data for selected states is provided in Table 2 and Table 3.

These data can be used to help debunk some of the enduring myths about the economic importance of national forest logging. For example, the congressional delegations from Alaska and Idaho regularly claim that these states are heavily timber dependent. However, in Alaska, less than one percent of employment is related to wood products, and in Idaho, wood products accounts for only a 3.2% share of the workforce. In both states, jobs related to environmental quality outnumber wood products jobs. In Alaska, environmental quality related jobs outdistance wood products jobs by a ratio of 15:1.

Moreover, in many states, jobs related to environmental quality are increasing rapidly, while the wood products sector is shrinking. In all ten states identified in Table 2, environmental quality related jobs increased

between 1988 and 1996. In Idaho, such jobs expanded by over 85%. The wood products sector, on the other hand, is shrinking in some states where the Forest Service is investing considerable public resources into planning future timber sales. In Alaska, for example, wood product jobs shrunk by 31% between 1988 and 1996. This shrinkage is indicative of fewer demands for national forest timber. In 1998, the Forest Service could only sell 22% of the timber put on the auction block in Alaska, and a regional economist estimated that much of the timber put up for sale in 1999 will remain unsold.¹⁶ Considering how important forest protection related jobs are in Alaska, how fast they are growing, and how they suffer when national forests are logged, does it make sense to continue investing in timber sales, especially when there is no demand?

These kinds of questions must be answered by the Forest Service when the agency justifies its timber sale program before Congress and the American people. Fortunately, the Forest Service has in its possession numerous analytical tools and data, such as the BLS data, that can be relied upon to quantify the socioeconomic values of

Table 1

NATIONAL FOREST LAND AREA			
State	Forested Acres	Nat'l Forest Acres	% Nat'l Forest
Alabama	21,974	648	2.95%
Alaska	129,131	11,250	8.71%
Arizona	19,595	8,873	45.28%
Arkansas	17,864	2,488	13.93%
California	37,263	15,588	41.83%
Colorado	21,338	10,028	47.00%
Connecticut	1,819	0	0.00%
Delaware	389	0	0.00%
Florida	16,549	1,063	6.42%
Georgia	24,137	855	3.54%
Hawaii	1,748	0	0.00%
Idaho	21,621	16,100	74.46%
Illinois	4,266	247	5.79%
Indiana	4,439	178	4.01%
Iowa	2,050	0	0.00%
Kansas	1,359	0	0.00%
Kentucky	12,714	670	5.27%
Louisiana	13,864	577	4.16%
Maine	17,533	52	0.30%
Maryland	2,700	0	0.00%
Mass.	3,203	0	0.00%
Michigan	18,253	2,459	13.47%
Minnesota	16,718	2,625	15.70%
Mississippi	17,000	1,149	6.76%
Missouri	14,007	1,443	10.30%
Montana	22,512	13,833	61.45%
Nebraska	722	37	5.12%
Nevada	8,938	2,395	26.80%
New Hamp.	4,981	718	14.41%
New Jersey	2,007	0	0.00%
New Mexico	15,296	7,178	46.93%
New York	18,713	6	0.03%
N. Carolina	19,278	1,212	6.29%
N. Dakota	462	0	0.00%
Ohio	7,863	188	2.39%
Oklahoma	7,539	244	3.24%
Oregon	27,997	12,661	45.22%
Pennsylvania	16,969	466	2.75%
Rhode Is.	401	0	0.00%
S. Carolina	12,257	598	4.88%
S. Dakota	1,690	973	57.57%
Tennessee	13,612	627	4.61%
Texas	19,193	636	3.31%
Utah	16,234	5,146	31.70%
Vermont	4,538	321	7.07%
Virginia	15,858	1,585	9.99%
Washington	20,483	7,586	37.04%
W. Virginia	12,128	1,011	8.34%
Wisconsin	15,513	1,392	8.97%
Wyoming	9,966	4,838	48.55%
U.S. Total	736,684	139,944	18.99%

Figures in thousands of acres.
Source: USDA Forest Service,
Forest Statistics of the U.S., 1992.

forests on lands scheduled for logging, and the externalized costs of such logging that are passed on to communities, businesses, and society as a whole when national forests are logged. These techniques are widely accepted among the nation's leading natural resource economists, and, in fact, are employed regularly by the Forest Service and other federal agencies to help determine damages owed to the federal government when private parties damage natural resources located on public lands. For instance, one method, known as "replacement cost," estimates the value of ecosystem services such as flood control by estimating what it would cost to replace such services with a technological

solution, such as a dam.¹⁷

Despite the widespread acceptability of such methods, the Forest Service assigns no existing economic value whatsoever to the forests slated for logging. Stated succinctly, the Forest Service views forests as economically worthless, unless they are logged. For example, in a recent timber sale decision on the Appalachicola National Forest in Florida, the Forest Service concluded that the "no action" alternative would "not contribute to the economy of Liberty County," where the timber sale was located.¹⁸ In a timber sale analysis document for the Windy Canyon Timber Sale, located immediately adjacent to the Breitenbush resort, the Forest

Service concluded that "the no action alternative produces no quantifiable economic benefits."¹⁹

By law, the Forest Service's logging program must make sense from a social and economic perspective. This obligation appears extensively in the Forest and Rangeland Renewable Resources Planning Act (RPA), the National Forest Management Act (NFMA), and the Multiple Use and Sustained Yield Act (MUSYA), and is among the agency's most important Congressional mandates. In addition, the National Environmental Policy Act (NEPA) requires that all of the socioeconomic effects of the logging program be fully disclosed, and that a full and fair analysis of alternative configura-

Table 2 1988 & 1996 EMPLOYMENT PROFILES: *Wood Products vs. Environmental Quality*

State	Wood Products ¹			Environmental Quality ²		
	1988 Employment	1996 Employment	Percent Change	1988 Employment	1996 Employment	Percent Change
Alaska	2,726	1,882	-31.0%	9,356	15,504	65.7%
Arizona	11,728	13,209	12.6%	59,182	68,980	16.6%
California	122,145	98,055	-19.7%	329,976	371,522	12.6%
Colorado	8,375	9,739	16.3%	56,323	75,527	34.1%
Idaho	18,269	15,696	-14.1%	10,354	19,201	85.4%
Minnesota	24,733	32,453	31.2%	42,404	66,644	57.2%
Montana	8,428	7,706	-8.6%	15,380	18,138	17.9%
Texas	50,742	65,588	29.3%	130,651	140,493	7.5%
Utah	4,496	5,481	21.9%	18,871	30,555	61.9%
Virginia	58,158	57,336	-1.4%	67,284	84,081	25.0%

¹ Includes all SIC (Standard Industrial Classification) codes related to logging and manufacturing of wood and paper products.

² Includes all SIC codes related to outdoor recreation, tourism, hunting, fishing, research, and maintenance of environmental quality.

Source: U.S. Department of Labor, Bureau of Labor Statistics, 1997: Covered employment and wages (ES-202) program.

Table 3 SHARE OF ALL STATEWIDE EMPLOYMENT

State	Wood Products		Environmental Quality	
	1988 Share	1996 Share	1988 Share	1996 Share
Alaska	1.3%	0.7%	4.5%	6.0%
Arizona	0.8%	0.7%	4.1%	3.6%
California	1.0%	0.7%	2.6%	2.8%
Colorado	0.6%	0.5%	4.0%	4.0%
Idaho	5.3%	3.2%	3.0%	3.9%
Minnesota	1.3%	1.4%	2.2%	2.8%
Montana	3.1%	2.2%	5.7%	5.2%
Texas	0.8%	0.8%	2.0%	1.7%
Utah	0.7%	0.6%	3.0%	3.3%
Virginia	2.1%	1.9%	2.5%	2.7%

Source: U.S. Department of Labor, Bureau of Labor Statistics, 1997: Covered employment and wages (ES-202) program.

tions of the logging program, including no logging at all, be completed. These statutory requirements have been refined and amplified in the Forest Service's regulations, rules, and directives.

Within the framework of these statutes, the Forest Service must show that the public is better off economically with the logging program, than without. To make this determination, the Forest Service must estimate all of the costs associated with logging incurred by society, and compare these costs with the economic benefits of converting our national forests into lumber. If the costs to the American public outweigh the benefits to the timber industry, then no logging ought to occur. In addition, the Forest Service must compare the

value of our national forests as lumber with their values as intact natural ecosystems. If the value of a particular tract of forest for recreation, hunting, water supply, or pharmaceutical products outweighs values for timber, then no logging ought to occur.

In flagrant violation of statute, regulation, rule, and directive, the Forest Service refuses to conduct this simple analysis at any level of decision making related to the timber sale program. Instead, the socioeconomic values of existing forests and the externalized costs of the logging program are ignored, while the alleged benefits of logging are systematically overinflated.

For instance, national forest timber supports less than 5% of annual wood products consumption in the U.S.²⁰ The remainder

is supplied from other sources, including state and private lands. In each and every timber sale decision, as well as programmatic evaluations of the timber sale program's effects, the Forest Service trumpets the numbers of jobs created as if these jobs wouldn't exist in the logging program's absence. In reality, the Forest Service is taking credit for creating wood products jobs despite the fact that in many cases, the agency is simply displacing jobs that would otherwise be available harvesting timber from private lands or supplying recycled and alternative fiber products. This is because national forest timber, unlike timber from private lands and unlike recycled and alternative fiber products, is heavily subsidized.

Subsidized national forest timber drives wood product prices down and places businesses which supply timber from private lands, or businesses that provide substitutes at a competitive disadvantage. Conversely, when national forest timber is taken off the market, the door is opened for these businesses to operate profitably. This phenomenon is suggested in the wood products employment data from many disparate regions of the U.S. Figures 1 and 2 provide examples from Utah and Kentucky. As Figure 1

Figure 1

STATE OF UTAH: 1988-1994
WOOD PRODUCTS EMPLOYMENT vs. NATIONAL FOREST LOGGING

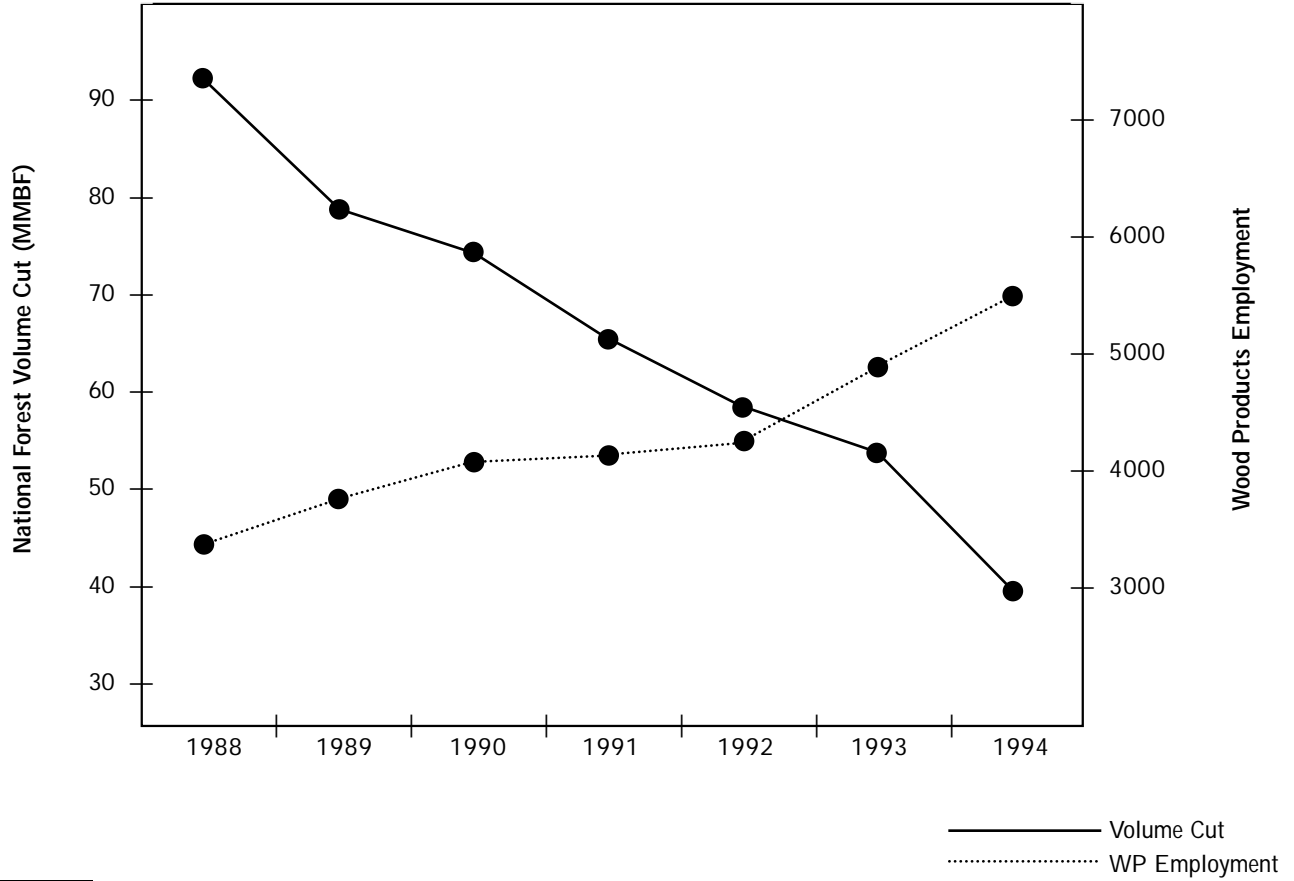
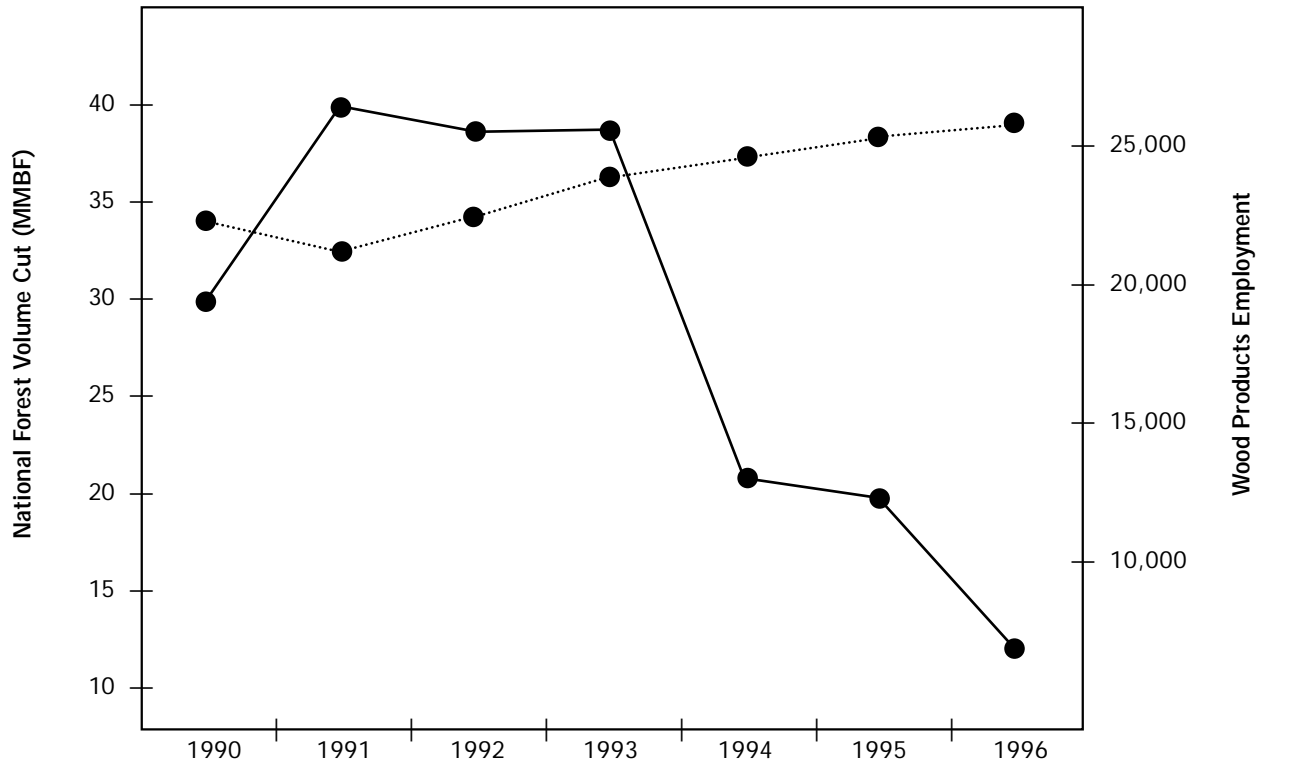


Figure 2

STATE OF KENTUCKY: 1990-1996
WOOD PRODUCTS EMPLOYMENT vs. NATIONAL FOREST LOGGING



shows, between 1988 and 1994, logging on national forests in Utah dropped by 56%. During that same period, wood products jobs increased by precisely the same amount. Figure 2 depicts the situation in Kentucky, where national forest timber sale volume cut dropped by 59% between 1990 and 1996. During this period, wood products employment grew by 19%. These figures do not account for the jobs that may have been created in alternative and recycled fiber businesses.

Because the Forest Service

The Forest Service takes credit for creating wood products jobs despite the fact that in many cases, the agency is simply displacing jobs that would otherwise be available harvesting timber from private lands or supplying recycled and alternative fiber products.

inflates the economic importance of logging and ignores many of the costs, the national forest logging program appears far more worthwhile than it really is. The Forest Service's failure to conduct the proper economic analysis of its timber sale program masks the fact that the program creates far more socioeconomic harm than good. And for reasons discussed more completely in the following chapter, this represents a fundamental violation of the Forest Service's most important legal duty to maximize the net public benefits of its management programs.

Endnotes

- ¹ For a special expose on the floods, see Durbin, Kathy, 1998: "Logging and landslides-a personal tragedy triggers a political debate," and; Heilman, Leo, 1998: "Do we dare do the right thing?"; in *Oregon Quarterly*: The Northwest Perspective, Winter 1998, University of Oregon, Eugene, Oregon.
- ² The General Accounting Office has issued a report on the floods and effects in five municipal watersheds: General Accounting Office, 1998: Oregon Watersheds: Many Activities Contribute to Increased Turbidity During Large Storms, GAO/RCED-98-220. In this report, the GAO finds that "Our review of scientific studies and other documents showed that past timber harvesting practices were often not designed to protect water quality and resulted in cleared and compacted areas that exposed soil to the erosive impact of rain and contributed sediment to streams, especially in large storms. In addition, older forest roads along streams and hillsides were designed in ways that made them subject to erosion and failure. These roads have been found to be a major contributor of sediment to streams."
- ³ USDA Forest Service, 1998: Forest Service Roads, A Synthesis of Scientific Information.
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- ¹⁴ Ibid.
- ¹⁵ Magder, Richard, 1989: Forest Management Focus Paper, a Supplement to the State of the States report, Renew America.
- ¹⁶ USA Today, December 21, 1998: "Across the USA: News from Every State, Alaska."
- ¹⁷ For a description of these and many other techniques for quantifying the economic value of environmental impacts, see Dixon, John A., 1996: *Economic Analysis of Environmental Impacts*, Earthscan Publications, Ltd., London.
- ¹⁸ USDA Forest Service, Appalachian National Forest, 1998: Environmental assessment for the C-16 Timber Sale.
- ¹⁹ USDA Forest Service, Willamette National Forest, 1998: Environmental assessment for the Windy Canyon Timber Sale.
- ²⁰ Federal Register: February 12, 1999 (Volume 64, Number 29): Administration of the Forest Development Transportation System: Temporary Suspension of Road Construction and Reconstruction in Unroaded Areas.