



Seeing the Forests for Their Green

ECONOMIC BENEFITS OF FOREST PROTECTION, RECREATION AND RESTORATION

SEEING THE FORESTS FOR THEIR GREEN:

Economic Benefits of Forest Protection, Recreation and Restoration

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Over one hundred years ago America embarked on an enlightened conservation mission. After witnessing decades of reckless destruction of the nation's valuable forests and watersheds, national leaders established the first Forest Preserves in 1891. The goal, as Gifford Pinchot explained in a Forest Service booklet in 1907, was "...to save the timber for the use of the people, and to hold the mountain forests as great sponges to give out steady flows of water for use in the fertile valleys below."

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Throughout the report we have identified our sources of information and assumptions used in this analysis. Within the limitations imposed by uncertainty and the project budget, we have made every effort to check the reasonableness of the data and assumptions. As time passes the results of this report should not be used without accounting for more recent data and relevant assumptions.

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Executive Summary

continued from cover...

Even in 1891 our nation's forests were recognized for providing valuable services and benefits that couldn't be measured in board feet or dollars.

Unfortunately, somewhere along the way the Forest Service took a wrong turn. Instead of recognizing the value of forests for clean air and water, recreation, wildlife habitat and the benefit of providing these for future generations, the Forest Service assessed our natural treasures only in terms of timber targets and congressional appropriations. As a result, today almost all of our old growth forests are gone and the timber industry has turned our National Forests into a patch work of clearcuts, logging roads and devastated habitat.

The need for protected forests cannot be overstated. A Forest Service survey of Oregon's Clackamas Watershed found that out of 254

mudslides, almost 75 percent occurred in areas that were logged or roaded. After the winter storms of 1995-96, the Forest Service found that 70 percent of Idaho's 422 landslides were linked to logging roads. More than 3,000 species of fish and wildlife and 10,000 plant species -- including 230 endangered plant and animal species -- rely on National Forests for their habitat. These include salmon in Oregon's Mt. Hood National Forest, songbirds in Georgia's Chattahoochee National Forest and elk in Idaho's Panhandle National Forest.

Logging our forests has cost us wildlife habitat and healthy, wild forests and more. Ironically, it's also cost jobs and hurt our economies. To document that point, the Sierra Club commissioned this report from ECONorthwest because we wanted independent economists to research the best available data and help clear up some myths about the real value of our

National Forests. With more than a quarter-century of experience as an economics and financial consulting firm, ECONorthwest is respected for its expertise in forestry issues; when the U.S. Forest Service wanted to assess economic trade-offs in forest management policies, it hired ECONorthwest. Other clients of this independent firm include the U.S. Army Corps of Engineers, Pacific Power and Light, the U.S. Environmental Protection Agency and the Louisiana Pacific Corporation.

In our study, ECONorthwest reached three major conclusions:

- Despite years of rhetoric and misinformation, national and regional economies are not dependent on logging National Forests. The most often cited misconception is that the regional economy of the Pacific Northwest declined after a court injunction and related events reduced National Forest logging.

In fact, instead of collapsing, the region's economy expanded and the Pacific Northwest weathered virtually unscathed the national economic recession that occurred at the same time as the court injunction. Today economic dependence on logging is minimal in each state and currently not one state is as dependent on logging as Oregon was in its peak logging year of 1988. The day when National Forest logging was the base of economic development has long gone. Relying on logging of National Forests to produce a vibrant economy will harm real economic benefits and lose jobs.

- National Forests now produce goods and services that are much more significant than the value of logging. Logging on National Forests is not only subsidized and costs taxpayers money each year but it also damages important economic generators that currently produce more jobs and benefits than logging. The Forest Service logging program causes Americans to lose both wasted tax dollars and lost economic production by clean water, recreation, fish and wildlife habitat and other benefits. Forest Service economists estimate that timber only accounts for 2.7 percent of the total values of goods and services derived from the National Forests while recreation and fish and wildlife habitat produce 84.6 percent. However, this only tells part of the story. When the value of clean water, carbon sequestration and the protection of wild forests is taken into account it becomes clear that not logging National Forests creates even more economic benefit than previously measured.

- The Forest Service logging program has caused devastating

impacts in the ability of the National Forests to provide economically valuable goods and services. Reversing the damage caused by logging will be costly but ignoring the need to restore damaged forests will cost even more. Forest restoration is a viable replacement for logging and is currently happening in several areas of the country. One of the prime nominees for restoration: The thousands of miles of old logging roads that are falling apart, dumping dirt into streams and degrading water quality. These roads need to be rehabilitated or removed in order for forest streams and rivers to reach their full capability to provide the nation with clear, fresh water. The clean, filtered water produced by National Forests is valuable for municipal and industrial uses. A properly designed National Forest restoration program would generate jobs in rural areas and stabilize the economies of rural communities while increasing goods and services from National Forests.

Continuing down the path of subsidized logging is even more wasteful when we realize our National Forests provide less than 4 percent of our wood products. By reducing waste, increasing recycling and using more wood alternatives, we can easily compensate for the trees now being cut from National Forests. Approximately 48 percent of all U.S. hardwood lumber production in 1992 was for use in shipping pallets, more than half of which are used just once and then end up in landfills. This waste can certainly be reduced. And, each year, U.S. farmers produce 280 million tons of excess agricultural fiber, which could be made into paper. Pulping this material results in a higher fiber

yield than wood and requires fewer chemicals, less water and less energy. Crops such as kenaf can be grown sustainably, with no pesticides and little or no fertilizer or chemicals.

Many people assume our National Forests are already protected from logging, because it just makes so much sense to protect our wild heritage. When the ecological and economic benefits of protecting our National Forests are added up, it's astounding that they are not protected already. Polls show that when people learn that timber companies log our National Forests, a majority want the program stopped. Closing our National Forests to commercial logging is an idea that's gaining momentum and support. A nationwide poll in January 2000 found 60 percent of Americans oppose commodity production, including timber sales, in National Forests.

We must make a choice. Our legacy can be National Forests full of logging roads, mudslides and stumps, or National Forests that work as nature intended -- filtering pollution out of our water, protecting us from flooding, providing wildlife habitat and a place for us to play and find a little peace. It makes dollars and common sense to do so.

To protect and restore what's left of our National Forests, we must make a clean break from the failed and costly policies of the past. It is time to be conservative and cautious with our children's inheritance. It will take generations for our National Forests to recover -- and that's if we start restoring them immediately. It is time to stop the commercial logging of our National Forests and work to restore them.

Lessons from Logging Reductions in the Pacific Northwest

Until the past decade, federal lands in the Pacific Northwest were the most important, single source of logs in the region and the nation. In 1988, for example, the National Forests in Oregon and Washington, administered by the Forest Service, plus lands administered by the Bureau of Land Management, accounted for 41 percent of total log production in the region, and 51 percent of total timber production from U.S. National Forests.

All this changed on May 29, 1991. In Seattle, Federal District Judge William Dwyer, ruling on a lawsuit seeking to prevent the extinction of the northern spotted owl, banned new timber sales on 24 million acres in 17 National Forests in western Oregon, Washington,

and northern California until the Forest Service could provide assurance that logging would not harm the owl. The injunction and related events reduced timber harvests on National Forests and other federal lands in Oregon and Washington (the Pacific Northwest, or PNW) from a peak level of 6.4 billion board feet (bbf) in 1988 to 0.6 bbf in 1998.

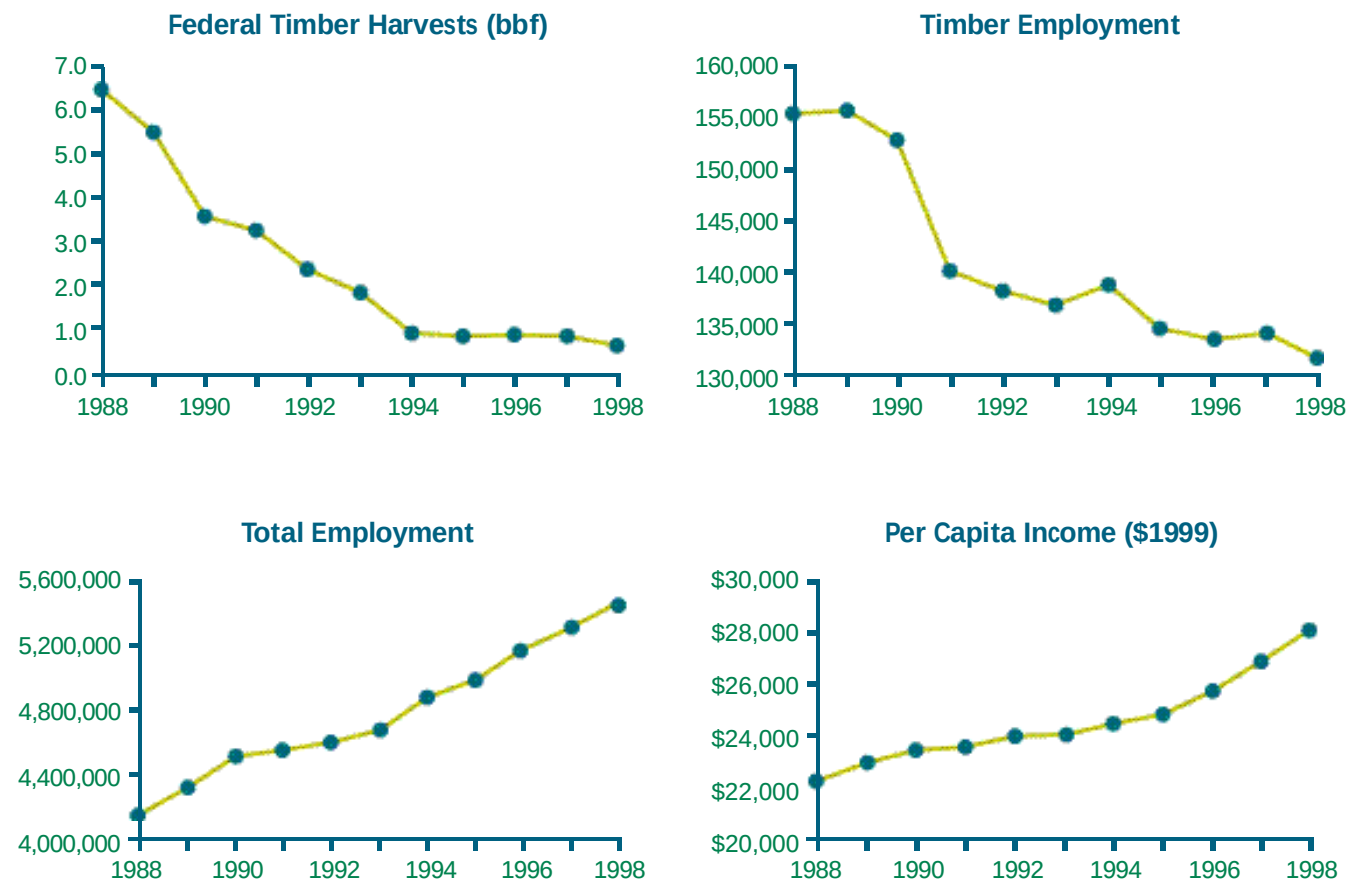
The prospect of a major reduction in federal logging triggered widespread fear of economic catastrophe. Some predicted as many as 150,000 workers would lose their timber-related jobs, hundreds of communities would become economic wastelands, and the region as a whole would fall into a depression that would take years, if not decades, to reverse.

The predictions of public leaders opposed to reductions in logging on federal lands struck at the visceral fears of families residing in rural communities. “We’ll be up to our neck in owls, and every mill-worker will be out of a job,” predicted then-President George Bush as he toured the region in 1992. “It is time we worried not only about endangered species, but endangered jobs.” In the same year, Oregon Congressman Bob Smith warned that reducing logging on federal lands “will take us to the bottom of a black hole.” As supporters of logging on federal lands maneuvered to sustain harvest levels prior to Judge Dwyer’s decision, then-Senator Mark Hatfield from Oregon warned: “Let me put the people dimension in this... Mill towns into ghost towns—that’s what [cuts in the budget for building logging roads] would create.”

These dire predictions, however, never materialized. Instead of collapsing, the region’s economy expanded. The PNW weathered virtually unscathed the national economic recession that occurred at about the same time as Judge Dwyer’s ruling, and both Oregon and Washington consistently outperformed the national economy throughout the 1990s. While timber harvests fell 91 percent on federal lands and 52 percent overall from their peak in 1988 to 1998, employment in timber-related industries fell 15 percent.¹ In contrast, total employment in the region rose 31 percent.

¹Throughout this report the timber industry refers to SIC 24, lumber and wood products; SIC 25, furniture and fixtures; and SIC 26, paper and allied products.

Figure 1:
The Pacific Northwest's Economy Grew Rapidly in the 1990s, Even Though Logging on Federal Lands Plummeted



Source: ECONorthwest with data from U.S. Department of Commerce (2000) and Warren (2000).

Why did eliminating logging on millions of acres of federal lands have so little economic impact? Three reasons are most important: (1) contrary to the beliefs of logging advocates, the timber industry does not play a special, basic role in the economy; (2) the timber industry is a mature industry whose economic importance is shrinking relative to other, faster growing industries; and (3) leaving federal forests unlogged has important, positive impacts on the economy.

In short, eliminating logging on federal lands had much smaller negative impacts on the economy than was feared, and leaving forests standing has had much larger positive impacts than was anticipated.

LESSON #1:
THE TIMBER INDUSTRY DOES NOT PLAY A SPECIAL ROLE IN THE ECONOMY

Much of the fear about logging reductions arose from the belief that the timber industry played a special role in the economies of individual communities, states, and the entire region. According to the so-called economic-base theory, logging – together with mining, agriculture, and fishing – form the base of each economy supporting all other public and private-sector activities. Any reduction in logging would cause the base to crumble, bringing down all the superstructure sitting atop it.

For decades, timber-industry advocates in the Pacific Northwest used the economic-base argument to strike fear into the hearts of public officials, communities, and the public whenever anyone proposed to rein-in the industry's harmful environmental practices. As it became clear that protecting the spotted owl would require serious logging restrictions, the messages of fear became more extreme. Following Judge Dwyer's decision, a leading industry economist warned that, even though the timber industry provided only 5 percent

of the state's jobs, almost one-half of Oregon's economy rested solely on a timber-industry base. Based on his reasoning, he pressed for overthrowing the protections afforded the owl by the Endangered Species Act so that federal timber could be sold before the economy fell into ruins. Halfway through the decade, a logging advocate and former overseer of the Forest Service concluded that, because of the timber-industry's special role as a component of Oregon's economic base, adding a second shift with

67 workers at a plywood mill would be more important to the state's economy than building a new high-tech plant with 1,000 workers.

These voices roared in the ears of public officials, community planners, and workers. Local, regional, and national media heard the cry too, with *U.S. News & World Report* declaring, “it is they [loggers] who may become the region's next endangered species,” and *BusinessWeek* running a headline saying, “The Spotted Owl Could Wipe Us Out.” No wonder the owl was the scariest critter in the nation throughout the late 1980s and early 1990s.

Now, of course, it is clear that the timber industry does not have a special, basic role in determining

the prosperity of communities, states, and regions. How can it, when, as logging levels crumbled 91 percent on federal lands and 52 percent on all lands, the rest of the Pacific Northwest's economy has boomed?

Old habits persist, though, and the economic-base argument remains popular among logging advocates across the U.S., raising issues extending far beyond mere curiosity. Those who exaggerate the importance of logging can cause real economic harm to innocent people. This was seen in the Pacific Northwest, where much of the economic distress resulting from the logging reductions on federal lands materialized because workers, families, and communities were misled into thinking that the reductions would devastate the

larger economy. Many believed the industry was too important for Judge Dwyer's ruling to stick, and they waited fruitlessly for the industry to rebound rather than shifting to other industries promising better opportunities. Others needlessly acted out of panic, believing the economic walls would soon tumble around them.

Understanding correctly the timber industry's role is crucial if one is to have an accurate picture of how further reductions in logging on federal lands would affect local economies. The Pacific Northwest's experience over the past decade shows that timber makes no special contributions to propping up the overall economy. Instead, as the discussions in the next two sections demonstrate, the opposite is true.

tree would have generated at the beginning of the decade.

Ironically, the timber industry itself – through cutbacks in workers and wages and other cost-cutting measures – helped keep the actual economic impacts of the federal logging reductions smaller than what was predicted. One important action was to curtail exports of logs to Japan and elsewhere. In 1988, 24 percent of all harvested logs were exported from the Oregon and Washington Customs Districts, but as logging declined on federal lands, the industry diverted export-quality logs to domestic mills. By 1998, only 11 percent of all harvested logs were exported (Warren 2000). We estimate that logging restrictions to protect the spotted owl caused 9,300-and perhaps fewer than 6,200-workers to lose their jobs. Other researchers have concluded that the impacts were

even smaller. This is a far cry from the earlier predictions of 100,000-150,000 lost jobs.

None of this should be interpreted as trivializing the substantial, even wrenching, change endured by individual loggers, their families and some rural logging communities as federal logging declined. The impact for some undoubtedly was traumatic. But for most, the fear-filled forecasts did not materialize. Although data on individual timber workers are sketchy, they apparently experienced outcomes similar to those found in national surveys of laid-off workers. Of those laid off in 1995-96, for example, 83 percent found work by February, 1998, and of those, half found a replacement job in less than 8 weeks. More than half of the workers displaced from full-time jobs who subsequently

obtained full-time replacement jobs were earning as much or more than they did prior to displacement (Hipple 1999). Workers in rural areas have fared equally well, or better, than those in metropolitan areas (Hamrick 1999).

With timber-industry employment and incomes shrinking, the rest of the economy growing, and most displaced workers able to find replacement jobs, the timber industry was simply too small to exert much leverage over the overall economy. In 1988, when logging peaked, only 5.7 percent of all jobs in Oregon, and 2.6 percent in Washington were timber jobs. Since then, logging on all federal lands has declined 91 percent and logging on all lands has declined by 52 percent but total employment grew by 31 percent. In other words, when the timber industry provided 3-6 percent of total employment in the Pacific Northwest and logging declined by half, the impact was not large enough to keep total employment from growing rapidly.

LESSON #2:
THE TIMBER INDUSTRY AND LOGGING ON FEDERAL LANDS ARE SMALL PARTS OF THE ECONOMY

Once the king of industries in the Pacific Northwest, the timber industry had lost its crown well before Judge Dwyer's 1991 ruling banning timber sales harmful to spotted owls on federal lands. After slashing jobs and wages in the 1980s, before spotted owls had flown into public consciousness, by 1991 the industry provided only a small percentage of the region's jobs. Each tree converted into a log produced far fewer jobs and less income for workers than in the past. Even though federal lands provided about 40 percent of all timber logged in Oregon and Washington at the end of the

1980s, their overall importance to the industry was changing, as millowners increasingly adopted technologies suitable for the small logs coming from industry-owned lands, rather than the large logs from federal lands.

Timber-industry employment had been steadily decreasing in the Pacific Northwest long before the listing of the spotted owl as a threatened species and Judge Dwyer's injunction. Timber employment in the Pacific Northwest declined by more than 21,000, or 12 percent, between 1979 and 1989, the two peak

years that bound the economic cycle of the 1980s. Furthermore, the wages paid to the remaining workers also decreased, as payroll per employee fell almost 8 percent, from \$43,341 in 1979 to \$40,068 in 1989 (measured in 1999 dollars). Cuts in jobs and wages were especially pronounced in the lumber-and-wood sector of the industry, where jobs fell 17 percent and payroll per employee fell 12 percent. Thus, within this sector, logging a tree at the end of the decade generated less than two-thirds as much income, adjusted for inflation, for timber workers as cutting the

Table 1: The Timber Industry Currently Plays a Smaller Role in Each State's Economy than It Did In Oregon, in 1988, When Dramatic Logging Reductions Began^a

State	% of Total 1998 Employment	State	% of Total 1998 Employment	State	% of Total 1998 Employment
OR in '88	5.7%	KY	1.7%	OH	1.3%
AL	3.2%	LA	1.2%	OK	0.7%
AK	0.6%	ME	4.2%	OR	3.4%
AZ	0.8%	MD	0.6%	PA	1.5%
AR	3.7%	MA	0.8%	RI	0.9%
CA	0.9%	MI	1.6%	SC	1.8%
CO	0.6%	MN	2.0%	SD	1.1%
CT	0.7%	MS	4.8%	TN	2.3%
DE ^b	0.7%	MO	1.3%	TX	0.9%
DC	0.0%	MT ^b	1.9%	UT	1.0%
FL	0.6%	NE	0.7%	VT ^b	1.3%
GA	2.0%	NV	0.3%	VA	1.7%
HI	0.2%	NH	1.7%	WA	1.8%
ID	2.7%	NJ	0.7%	WV	1.7%
IL	0.9%	NM	0.5%	WI	3.3%
IN	2.1%	NY	0.7%	WY ^b	0.6%
IA	1.4%	NC	3.2%		
KS	0.8%	ND ^b	0.6%		

a. The timber industry refers to Standard Industrial Classification (SIC) 24, lumber and wood products; SIC 25, furniture and fixtures; and SIC 26, paper and allied products.

b. The percentage does not include all 3 industrial sectors because some data are suppressed to protect confidentiality.

Source: U.S. Department of Commerce (2000).

To place the significance of these numbers into a national context, Table 1 compares the situation a decade ago in Oregon with current conditions, by state. In no state does the timber industry's percentage of total employment currently exceed the percentage that existed in 1988 in Oregon. The closest is Mississippi, where the timber industry currently provides 4.8 percent of all jobs.

Hence, Oregon's experience offers reassurance for other states facing the prospect of logging reductions. If Oregon could prosper despite a 91 percent drop in logging on federal lands and a 52 percent drop in total logging, then it seems reasonable to anticipate that other states, where the timber industry is less prominent, can prosper, should they experience similar logging reductions.

LESSONS #3:
UNLOGGED FORESTS ARE IMPORTANT TO THE ECONOMY

Growth in the PNW's overall economy, while the timber industry shrank, demonstrates that the vast majority of the economy has decoupled itself from the timber industry. But the economy has not decoupled itself from the forest. Indeed, the vitality of the region's economy depends in no small part on the health and vitality of its forests. A standing forest often is now more valuable to the economy than a logged one.

Many firms locate in the PNW because it has a good workforce and many workers, in turn, are in the region because they cherish the quality of life. Healthy forests contribute far more to the quality of life than do stumps. In addition, residents of the region and the nation have learned more about the high costs they bear to support the timber industry, costs that include subsidies, the loss of jobs in other industries, and the costs of cleaning up the environmental mess that logging leaves behind.

In the distant past, regional economies grew largely by their ability to exploit their natural resources. But in today's economy it is more important to have a skilled, productive workforce. Service industries now constitute the bulk of the economy and show the greatest ability to generate new jobs and higher incomes. Increasingly, the prosperity of the region and its communities depends on the ability to attract and retain skilled workers.

Forests can boost the economy in two major ways: by providing commodities (logs) or services (recreational opportunities, clean water, etc.). As the timber industry shrinks and non-timber industries grow, the services become more important. Residents of the region derive numerous services from healthy forests. The services constitute, in effect, a second paycheck that complements the first paycheck they derive from their place of employment, pension program, and so forth.

Far more residents of the PNW receive a second paycheck than a first paycheck from the region's forests. In 1990, there were more than 134 million visits to the National Forests and other federal lands in the spotted-owl region of western Washington, Oregon, and northern California. An assessment of the recreational needs for the year 2000, concluded that, if lands in this region were allocated to meet these needs, their recreational value, alone, would total almost \$1 billion (Forest Ecosystem Management Assessment Team 1993).

A more recent and extensive study, of federal timber and range lands in the Columbia River Basin between the Cascades and Rockies, provides even more insight into the importance of federal lands for recreation and other activities. It found that the services associated with unroaded areas, camping spots, fishing holes, and so forth, accounted for 89 percent of the total value of all commodities and services derived from those lands in

1995. By contrast, the value of timber was only 11 percent of the total (Haynes and Horne 1997). The authors predicted that, by 2045, timber will have decreased to just 5 percent of the total.

These studies of federal lands in the Pacific Northwest confirm that, although the timber derived from them is not unimportant, its value is smaller and receding relative to the value of the recreational and other services that can be derived from these lands. Although logging does not always conflict with the lands' ability to provide these services, it often does, and, in many instances, the conflicts are becoming increasingly intense. In short, in most cases, the benefits that society loses when logging occurs are increasing and, hence, so too are the costs to society of logging federal lands.

Other costs of logging are also important. At the end of the 1980s and into the 1990s critics of logging on federal lands began to document the full costs such logging imposed on taxpayers. They took these steps after finding that the

agencies administering federal lands did not provide a full accounting of logging's costs. In a recent analysis based on government data, the Wilderness Society determined that, although most of the national forests in the spotted-owl region generated net revenues, these were far smaller than had been touted prior to the Dwyer decision.² In addition, the research found that nationwide 83 of the 104 National Forest units that held commercial timber sales in 1997 yielded a net loss to taxpayers (Wilderness Society 1998). Table 2 shows the detailed results. Direct subsidies to the timber industry occur when the Forest Service and other agencies sell timber for a price that is lower than the agencies' costs of making the sale.

Another subsidy materializes when firms in the timber industry fail to pay premiums covering the full costs of unemployment insurance, so that workers and business owners in other industries have to make up the difference. In Oregon alone, for the years 1980-90, this subsidy amounted to \$192 million, which was paid

by the owners and workers in other industries (Niemi and Whitelaw 1995).

Another form of subsidy is the cost that society as a whole incurs to clean up the environmental and social messes that remain after forests are logged. These costs have become far more clear as the Pacific Northwest has had to cope with flooding made worse when logging causes sediment to clog stream channels and with the threat of extinctions for owls, salmon, marbled murrelets, bull trout, and other species. Logging is not the sole cause of these problems, but it surely is a major contributor. For example, a recent study by Forest Service scientists working in the western Cascades found that clearcuts increased the amount of sediment suspended in forest streams more than 15 times the level that occurs with unlogged forests (Grant and Hayes 2000).

² The accounting of net revenues for the spotted owl forests is enhanced because forest-related payments to local counties no longer come from timber receipts but, instead, directly from the federal Treasury.

The full cost of cleaning up the timber industry’s mess is not known. But there is a growing recognition that the cost is large enough to warrant a marked reduction in logging.

The subsidies to timber extract money from households and firms in other industries. In effect, they act like a punitive tax on non-timber economic activities, reducing the ability of firms in other sectors to grow and generate jobs. In addition, logging’s negative impact on

fish populations has, in turn, had a negative impact on jobs in the commercial and recreational fishing industries. An analysis in the early 1990s estimated that as many as 60,000 fishing-related jobs were at risk (Oregon Rivers Council 1991).

The public’s recognition that logging can have a negative impact on jobs dramatically altered its response to logging reductions. Judge Dwyer’s injunction and related actions were previously cast as jobs vs. owls, i.e., a contest

between the economy and the environment. Afterward, the public generally realized that the issues were far more complex. To some extent, the region has prospered despite the logging reductions simply because the timber industry is such a small portion of the regional economy. More important, though, the mounting evidence indicates the region has prospered in part because of the logging reductions, insofar as they reduced the subsidies, cleaning-up costs, and job losses that accompany logging.

Table 2: Monetary Loss or Gain from Commercial Timber Sales, by National Forest, 1997								
State	National Forest	Commercial Volume Logged (mbf)	Actual Loss or Gain ^a (\$1,000s)		State	National Forest	Commercial Volume Logged (mbf)	Actual Loss or Gain ^a (\$1,000s)
Region 1 - Northern					Region 3 - Southwestern, cont.			
MT	Beaverhead	6,563	-1,644		AZ	Coronado	15	-72
MT	Bitterroot	1,523	-188		NM	Gila	0	-12
ID	Idaho Panhandle	49,978	-1,732		AZ	Kaibab	807	-146
ID	Clearwater	39,327	-2,467		NM	Lincoln	0	-21
MT	Custer	0	-27		AZ	Prescott	0	0
MT	Deerlodge	0	0		NM	Santa Fe	890	-440
MT	Flathead	1,723	-9		AZ	Tonto	139	-191
MT	Gallatin	264	-46		Region 4 - Intermountain			
MT	Helena	123	-62		UT	Ashley	4,533	-350
MT	Kootenai	82,879	-7,419		ID	Boise	56,866	-2,491
MT	Lewis & Clark	2,253	-229		WY	Bridger-Teton	1,858	-185
MT	Lolo	20,339	-1,633		ID	Caribou	8,461	32
ID	Nez Perce	15,639	-2,706		UT	Dixie	2,887	-121
Region 2 - Rocky Mountain					UT	Fishlake	1,501	-2
WY	Bighorn	883	-173		UT	Manti-La Sal	0	85
SD	Black Hills	46,903	3,382		ID	Payette	29,751	-2,156
CO	GMUG ^b	3,204	-362		ID	Salmon-Challis	5,759	-1,433
WY	Medicine Bow-Routt	13,616	-643		ID	Sawtooth	1,144	-98
NE	Nebraska	0	0		ID	Targhee	2,647	-742
CO	San Juan-Rio Grande	2,466	-1,012		NV	Toiyabe-Humboldt	60	-10
CO	Arapaho-Roosevelt	125	-61		UT	Uinta	47	-7
CO	Pike-San Isabel	314	-81		UT	Wasatch-Cache	1,823	-71
WY	Shoshone	1,876	-169		Region 5 - Pacific Southwest			
CO	White River	3,056	-605		CA	Angeles	0	0
Region 3 - Southwestern					CA	Cleveland	0	0
AZ	Apache-Sitgreaves	10,715	-1,628		CA	Eldorado	2,938	-510
NM	Carson	4	-38		CA	Inyo	1,092	-164
NM	Cibola	1,098	-206		CA	Klamath	0	-70
AZ	Coconino	44	-15					

State	National Forest	Commercial Volume Logged (mbf)	Actual Loss or Gain ^a (\$1,000s)		State	National Forest	Commercial Volume Logged (mbf)	Actual Loss or Gain ^a (\$1,000s)
Region 5 - Pacific Southwest, cont.					Region 8 - Southern			
CA	Lassen	4,303	-323		AL	Alabama	13,404	-465
CA	Los Padres	0	0		KY	Daniel Boone	8,778	-1,310
CA	Mendocino	4,561	193		GA	Chattahoochee-Oconee	15,257	-1,283
CA	Modoc	3,484	888		TN	Cherokee	7,806	-515
CA	Six Rivers	7,174	-499		FL	Florida	6,249	-228
CA	Plumas	18,768	-496		LA	Kisatchie	37,812	1,291
CA	San Bernardino	0	0		MS	Mississippi	76,005	3,493
CA	Sequoia	13,439	-1,552		VA	Washington-Jefferson	7,633	-447
CA	Shasta-Trinity	4,070	124		AR	Ouachita	80,617	2,746
CA	Sierra	4,462	576		AR	Ozark-St. Francis	43,193	-654
CA	Stanislaus	12,369	-2,014		NC	North Carolina	13,341	-2,100
CA	Tahoe	7,987	8		SC	Francis Marion & Sumter	15,318	351
CA	Lake Tahoe Basin	0	0		TX	Texas	16,720	289
Region 6 - Pacific Northwest					PR	Caribbean	0	0
WA	Colville	12,976	-1,348		Region 9 - Eastern			
OR	Deschutes	161	-63		PA	Allegheny	56,590	11,862
OR	Fremont	17,554	-685		WI	Chequamegon	68,926	-454
WA	Gifford Pinchot	26,903	6,568		MN	Chippewa	34,507	-505
OR	Malheur	18,445	-2,047		VT	Green Mountain	1,494	-239
WA	Mt. Baker-Snoqualmie	6,184	-4,063		MI	Hiawatha	22,658	-608
OR	Mt. Hood	18,433	76		IN	Hoosier	0	0
OR	Ochoco	8,655	-1,986		MI	Huron-Manistee	46,435	-666
WA	Okanogan	4,178	-650		MO	Mark Twain	46,844	-1,254
WA	Olympic	3,975	-895		WV	Monongahela	24,322	1,025
OR	Rogue River	22,508	6,156		WI	Nicolet	36,005	-1,014
OR	Siskiyou	31,906	3,697		MI	Ottawa	42,355	-826
OR	Siuslaw	527	16		IL	Shawnee	0	-8
OR	Umatilla	10,576	-635		MN	Superior	29,832	-623
OR	Umpqua	51,383	12,890		OH	Wayne	43	-42
OR	Wallowa-Whitman	10,388	-356		NH	White Mountain	13,820	-1,272
WA	Wenatchee	10,009	-1,040		Region 10 - Alaska			
OR	Willamette	54,863	10,032		AK	Tongass	106,615	-42,249
OR	Winema	12,999	-3,378		AK	Chugach	0	1

a. The actual loss or gain for each National Forest is calculated by subtracting payments to states from timber revenue, and then subtracting office costs.

b. Grand Mesa, Uncompahgre, and Gunnison.

Source: Wilderness Society (1998) with data from the U.S. Forest Service.

Recreation and Other Services from the National Forests Are Far More Important to the Economy than Timber

America's National Forests produce many goods and services important to the economic well-being of consumers, workers, communities, and the entire nation. In the distant past, the production of the goods – timber, minerals, and forage for livestock – was thought to be far more important economically than the production of the services, such as recreational opportunities, the delivery of clean and cool water, and the protection of fish and wildlife. It is now clear that the services are far more valuable economically than the goods.

In 1995 the Forest Service tallied the contributions to the Gross Domestic Product, or GDP, of different goods and services from the National Forests (U.S. Department

of Agriculture 1995). GDP is the value of all domestically produced goods and services and provides a widely accepted measure of the nation's overall economy and its component parts. Many fault the GDP for generally ignoring the environment and unpriced items, such as recreation. Hence, the Forest Service researchers attempted to fill in some of the blanks.

RECREATION, FISH, AND WILDLIFE

The agency estimated that, by the year 2000, the most easily measured goods and services from the National Forests would contribute \$145.1 billion to GDP, about 2 percent of the national total. As the left side of Figure 2 shows, recreation accounts for three-quarters

of this contribution, or \$108.4 billion. Fish and wildlife account for \$14.4 billion. In contrast, the major goods – timber, forage, and minerals – account for less than 12 percent. Timber, by itself, accounts for only 2.7 percent of the total value of all goods and services derived annually from the national forests, as estimated by Forest Service economists. They also predicted that, for the foreseeable future, the value of the services would increase, relative to the value of timber, range, and minerals.

America's National Forests have always been Capable of Producing Both...

...GOODS...

- Timber
- Minerals
- Forage for Livestock
- "Special" Forest Products (Mushrooms, Ferns, etc.)

...AND SERVICES...

- Recreational Opportunities
- Unroaded and Wild Areas
- Sequestration of Atmospheric Carbon
- High-Quality Water
- Fish and Wildlife Protection
- Visibility and Scenic Integrity
- Soil Productivity
- Natural Protection Against Pests

... But in Today's Economy the Services are More Valuable and Generate More Jobs than Timber, Minerals and Forage.

The right side of Figure 2 shows that recreation also accounts for more than three-quarters of all jobs derived from the National Forests. By contrast, the timber-sale program accounts for fewer than 3 of every 100 jobs derived from the goods and services that the National Forests provide the American public.

Figure 2:
Even a Partial Accounting Shows that Services, Not Timber, Account for the Bulk of the Value and Jobs Produced by the National Forests

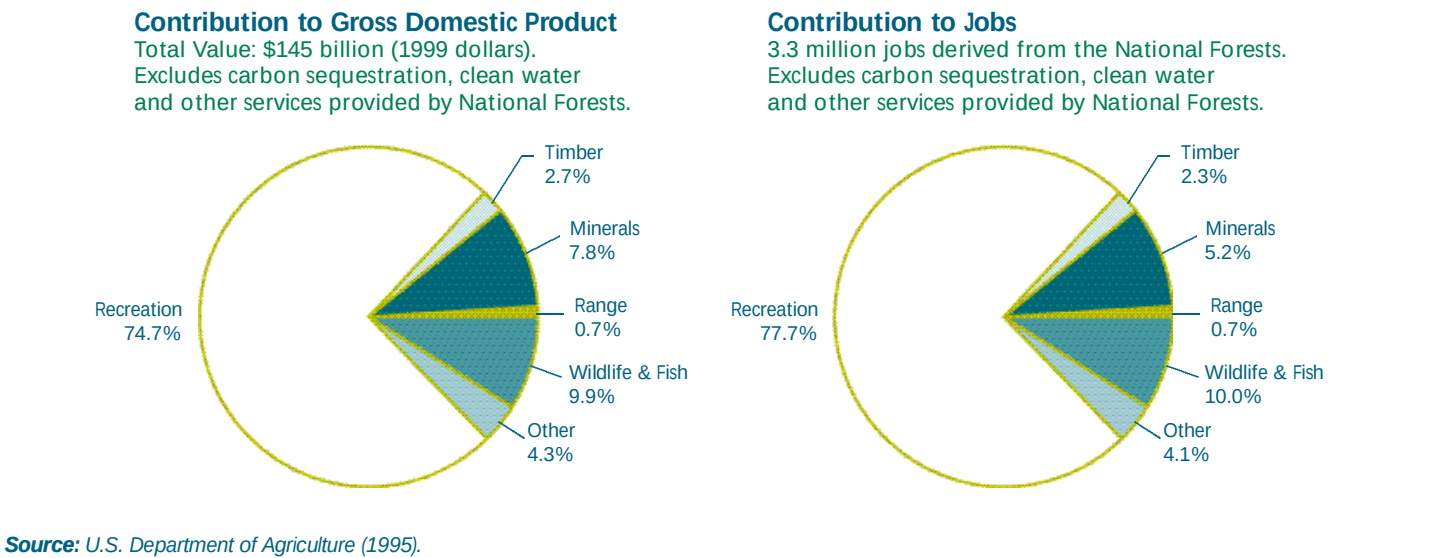


Figure 2, however, tells only part of the story. The Forest Service economists who compiled the underlying data did not include three of the most important services the National Forests provide: (1) the delivery of clean, cool water; (2) the sequestration of atmospheric carbon; and (3) the provision of unroaded, wild areas. Thus, even though the data they did compile clearly show that recreational and other services derived from the National Forests

far outweigh timber and the other goods in terms of their contribution to the American economy, adding into the mix these other services shows that the services are even more important.

WATER

In a recent analysis, the Forest Service estimated that the national forests are the largest single source of water in the United

States, producing 14 percent of the total surface water runoff from the contiguous 48 states (Sedell et al. 2000). Figure 3 shows the amount of water runoff coming from National Forests to each of the 18 water-resource regions in the contiguous states, shown in the accompanying map. The chart in Figure 3 also shows the percentage of water of the total water runoff from each region that comes from National Forest lands.

Figure 3.
The Contribution and Proportion of Water from National Forest Lands to 18 Water-Resource Regions of the Contiguous United States

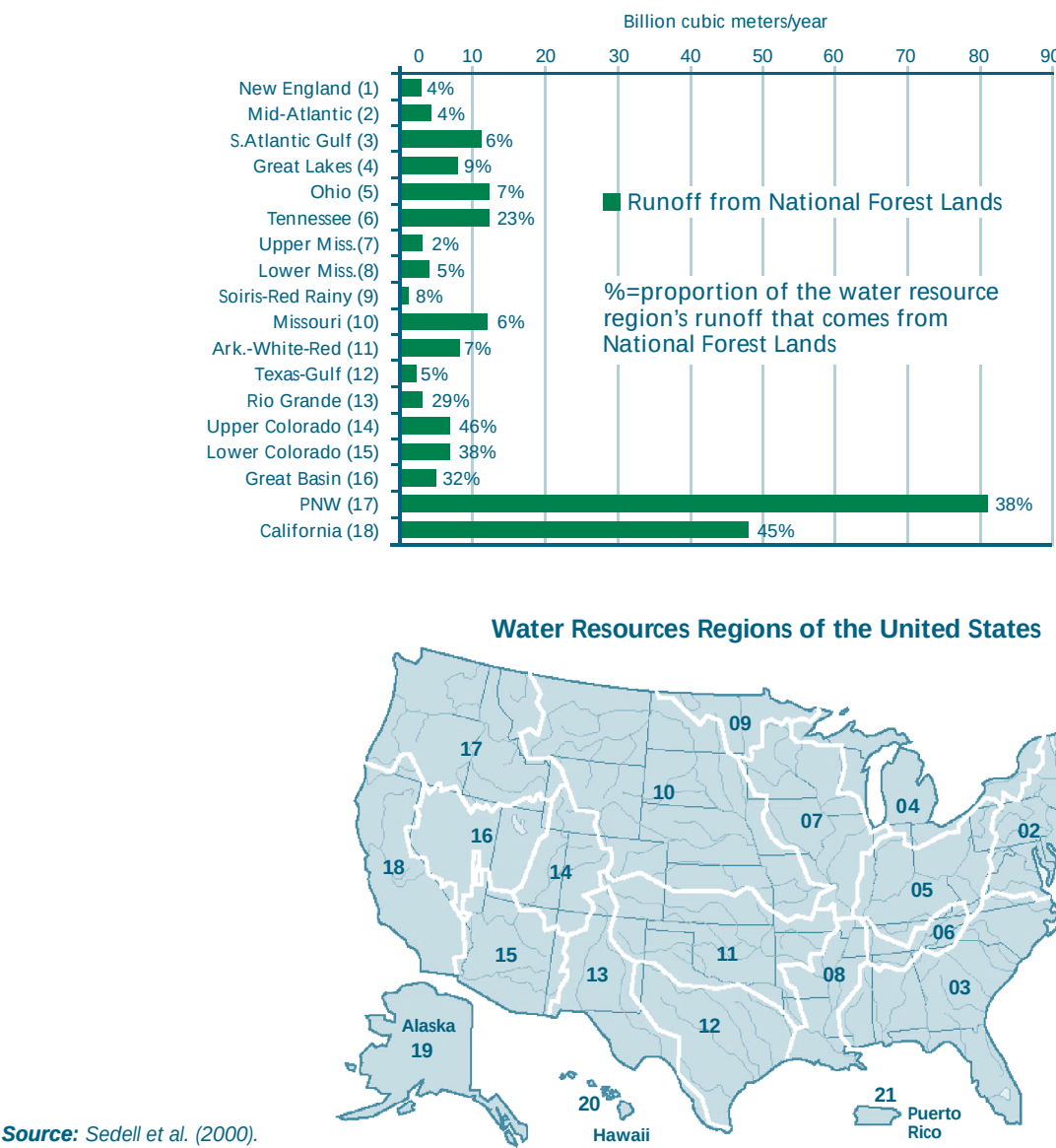


Table 3 reorganizes the data to show the amount of water from National Forest lands that is used for instream flows and offstream uses by Forest Service region. Figure 4 shows the Forest Service regions. Water coming from National Forest lands generally is not priced and, hence, Forest Service economists had to estimate appropriate values.

They determined that, even though the value of water varies widely from place to place, some rough aggregations are possible. In the Eastern region, the economists concluded water from the National Forests is worth about \$8 per acre-foot, regardless of use. (An acre-foot of water is the amount that would cover an acre of land one

foot deep, or about 329,000 gallons.) Elsewhere in the contiguous U.S., water that remains instream is worth \$17 per acre-foot, while water used offstream is worth \$40 per acre-foot. The total value of all water flowing from the National Forests is conservatively estimated to be \$3.7 billion per year.

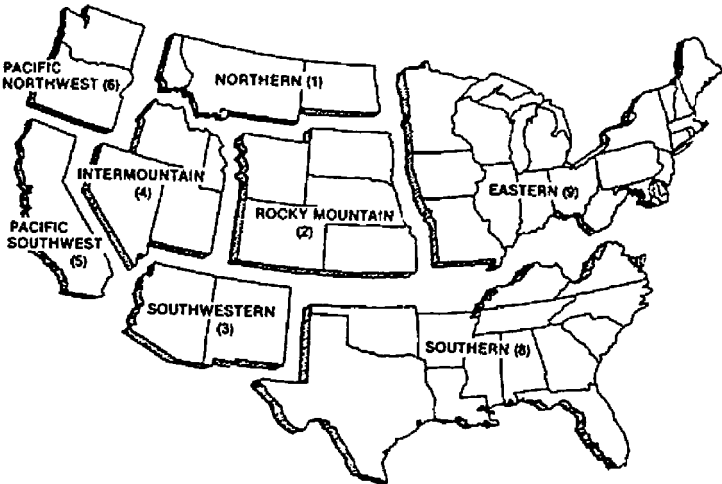
Table 3. Water Supply from National Forests by Forest Service Region

Region	N.F. Instream Flow	N.F. Offstream Use	Marginal Instream Value	Marginal Offstream Value	Total Value
Northern	15,914,000	3,815,342	\$17	\$40	\$423,151,680
Rocky Mountain	9,144,792	2,150,811	\$17	\$40	\$241,493,904
Southwestern	7,428,051	1,971,245	\$17	\$40	\$205,126,667
Intermountain	11,458,855	4,785,689	\$17	\$40	\$386,228,095
Pacific Southwest	33,201,475	9,496,005	\$17	\$40	\$944,265,275
Pacific Northwest	44,658,346	4,806,316	\$17	\$40	\$951,444,522
Southern	19,041,809	3,587,515	\$17	\$40	\$467,211,353
Eastern	14,714,248	3,376,458	\$8	\$8	\$144,725,648
Total	155,561,576	33,989,381			\$3,763,647,144

Source: Sedell et al. (2000).

Figure 4. Forest Service Regions

Source: U.S. Forest Service.



By this estimate, the water coming from the National Forests is worth slightly less than the timber value in the left pie chart in Figure 2, \$3.9 billion. The water-value estimate, however, is rough and “conservative” and future refinements may show that the actual value is greater.

Some unquantified portion of the values shown in Table 3 represents

the quality of the water coming from the National Forests, the remainder reflects the amount of water and its timing. Forest management and different forest uses can affect many of these attributes. Logging can increase the amount of sediment in stream water or remove shade cover that keeps water cool and suitable for fish habitat. Some recreational activities, if not managed correct-

ly, can affect the concentration of pathogens in streams and increase siltation. Roads can affect both the timing and quality of runoff (Brown and Binkley 1994). Water from the National Forests generally is cleaner and cooler than stream water originating from other sources, largely because the National Forests occupy higher lands and often have experienced less intensive development.

CARBON SEQUESTRATION

Global warming is a pollution problem caused primarily by burning fossil fuel. The world's leading scientists have warned that if society does not dramatically reduce global warming pollution, we will face severe heat waves, rising sea levels, changing rain fall patterns, spread of infectious diseases and species extinction.

Carbon dioxide, the major global warming gas, is absorbed by trees as they grow and is stored as cellulose or wood. When trees are cut they cease to absorb carbon dioxide and begin to return the stored carbon to the atmosphere. Global warming is probably the most serious of environmental problems society faces. Preventing global warming and its adverse impacts obviously has great value.

Table 4 shows an estimate of the carbon currently sequestered in

softwood trees in the National Forests, aggregated by the Forest Service region. The Forest Service estimates, for example, that there are 4,837 million cubic feet of wood fiber residing on the National Forests in the Northeast region. Assuming there are 30 lbs. of carbon per cubic foot of fiber, this translates to 72.6 million tons of carbon (personal communication, Richard Haynes, USFS Pacific Northwest Research Station). All the National Forests, as a whole, currently contain about 3.8 billion tons of carbon.

Economists have estimated the value of stored carbon based on a price a polluter might pay a tree owner to retain growing trees. The theory is that a trading system could be created in which a polluter could be allowed to pollute more as they would pay to “retain” the carbon in the trees. While Sierra Club opposes such trading systems as an ineffective and unreliable method to curb

pollution, retaining the carbon, as stored in trees, has great value.

There is great uncertainty about the value of sequestered carbon. But it is useful to examine the range of values that economists estimate polluters might pay-from a low of \$1 per ton to a high of \$65 per ton. The former is an arbitrary estimate of the lower bound. The latter is the value used by Forest Service economists, based on data from the Environmental Protection Agency, to estimate the value of carbon sequestration in the Columbia River Basin (Haynes and Horne 1997). It represents the marginal value of changes in the amount of sequestered carbon and probably overestimates the average value of the existing inventory of sequestered carbon, but by how much is not known. With these estimated values per ton, the current stock of sequestered carbon on the nation's National Forests has a value between \$3.8 billion and \$246.5 billion.

Table 4. Softwood and Hardwood Inventory and Carbon Storage in the National Forests, 2000

Region	Wood-fiber Inventory ^a (Million cu. ft.)	Stored Carbon ^b (Million tons)	Value of Stored Carbon (\$million) @ \$1/ton @ \$65/ton	
			@ \$1/ton	@ \$65/ton
Northeast	4,837	72.6	\$73	\$4,716
N. Central	9,915	148.7	\$149	\$9,667
Southeast	8,764	131.5	\$131	\$8,545
S. Central	11,645	174.7	\$175	\$11,354
Rocky Mtns. ^c	87,323	1,309.8	\$1,310	\$85,140
Pacific SW ^c	31,804	477.1	\$477	\$31,009
PNW (Westside) ^c	53,543	803.1	\$803	\$52,204
PNW (Eastside) ^c	26,058	390.9	\$391	\$25,407
Alaska	18,909	283.6	\$284	\$18,436
U.S.	252,798	3,792.0	\$3,792	\$246,478

a. Data provided by Richard Haynes, USFS Pacific Northwest Research Station.

b. Assumes 30 lbs. of carbon per cubic foot of wood fiber.

c. The Forest Service combined data for hardwoods for the four western subregions into a single western region. To estimate the quantity and value of the stored carbon, we divided the total inventory for the western region evenly among the four subregions.

Source: ECONorthwest.

UNROADED, WILD AREAS

National Forest lands in a wild state and without roads have special economic values. Many recreation-ists find that the value of their recreational activities is enhanced when they take place in wild and unroaded areas. Roadless areas provide significant opportunities for dispersed recreation, and large undisturbed landscapes that provide privacy and seclusion. These areas provide important habitat for rare plant and animal species, support the diversity of native species, and provide opportunities for scientific monitoring and research. In addition, Americans generally see unroaded areas as national assets that are to be protected. In a nationwide poll conducted in January 2000 by American Viewpoint, 76 percent of the American public supported the protection of roadless areas in national forests from logging, road construction and other development (DiVall and Onorato 2000).

Economists use the term “existence value”, to describe the value people place on protecting a natural-resource asset, and this value exists independent of a person’s intention to use the asset. Existence values arise whenever individuals place a value of the sheer existence of a species, scenic waterfall, or other resource, or the prospect that the resource will be useful, for example, to future generations.

Measuring the special values of wild and unroaded areas is difficult because there are no prices or other market data that typically are associated with goods and services traded in the private sector. As a rough indicator of these values, though, it is useful to consider the findings of Forest Service economists who assessed the economic importance of different goods and services derived from 78 million acres of federal lands in the Columbia River Basin (Haynes and Horne 1997). They

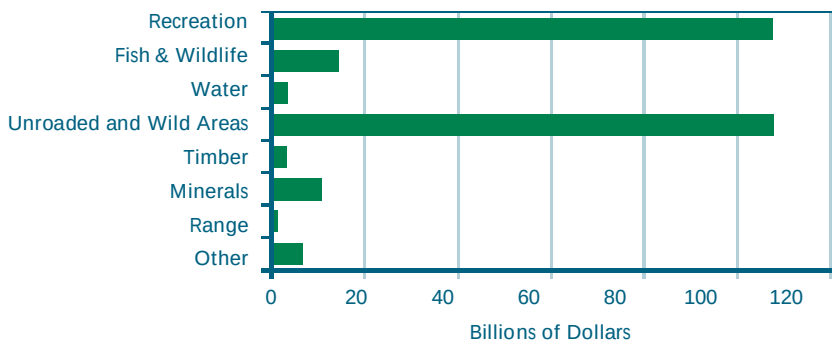
found that the value recreation-ists placed on activities taking place in a wilderness area were roughly double the values of similar activities on federal lands outside wilderness areas. In addition, they found that the existence value of unroaded areas was roughly equal to the total value of all recreation occurring on federal lands.

In the absence of more detailed estimates, we apply the findings from the Columbia River Basin study throughout the U.S. That is, we assume that the existence value of protecting unroaded, wild areas on the National Forests is equal to the value of all recreation occurring on the national forests. Above, we reported the Forest Service’s finding that recreation on the National Forests has a value of \$108.4 billion. We conclude that the remaining unroaded areas on the National Forests have an equal value.

VALUE SUMMARY

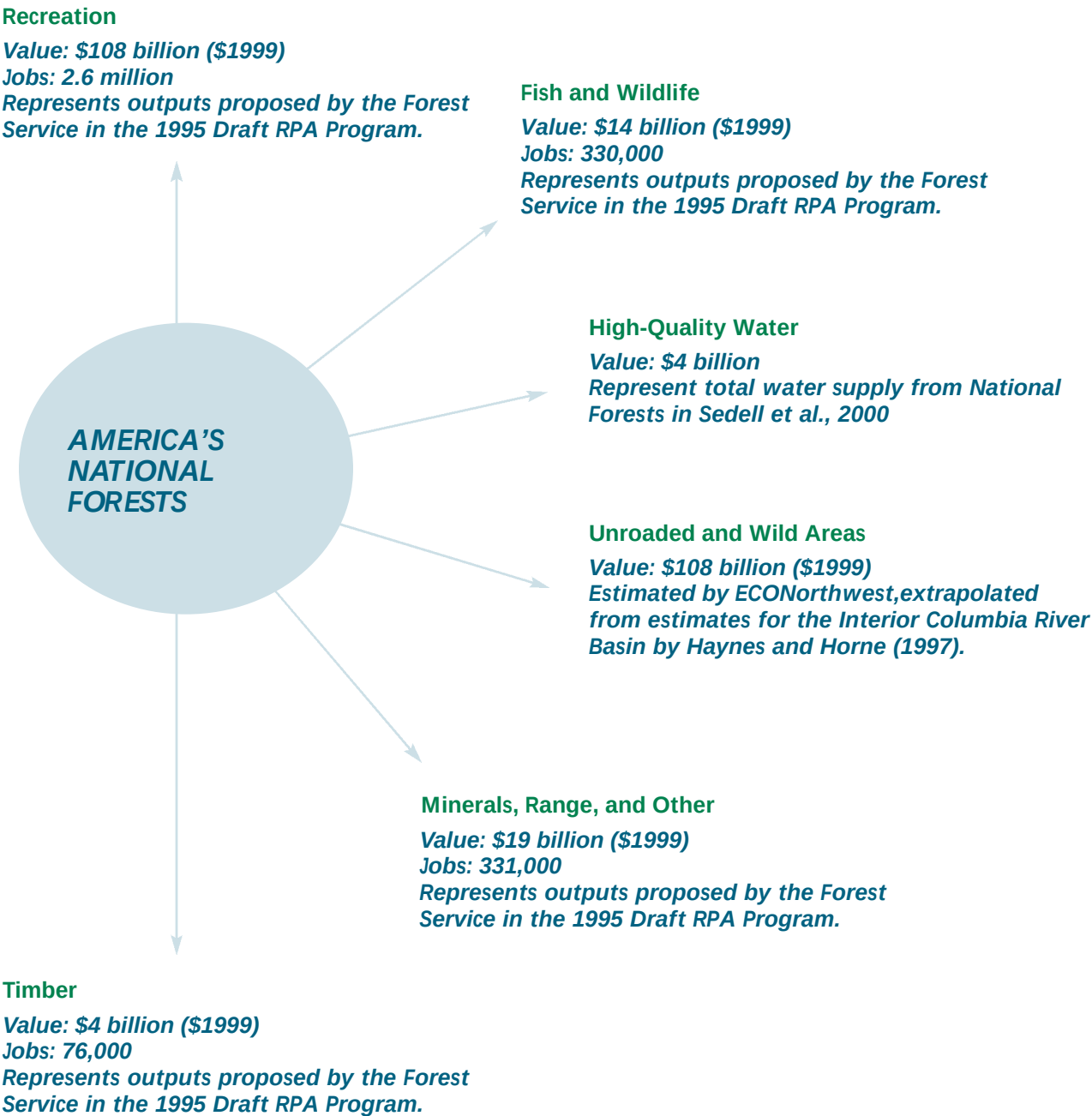
Figures 5 and 6 summarize the values of the services Americans derive from the national forests.

Figure 5.
The Value of Goods and Services from National Forest Lands



Source: ECONorthwest.

Figure 6.
The Value of Goods and Services from National Forest Lands



Source: ECONorthwest.

Restoring the National Forests Provides Economic Benefits

America's National Forests are tremendously valuable national assets. Some call them National gems, as if they were luxuries, like diamonds and pearls. They're more than that. They are more like the assets – homes, cars, and factories – we rely on everyday to provide us with shelter and improve our standard of living. Now, however, Americans must face the fact that their National Forests have been damaged and need to be repaired, like a car crunched by an errant driver, a home robbed by a burglar, or a shop defaced by vandals. Repairing the damage done to the National Forests is necessary not to turn back the clock to a time before modern society

emerged in America, but to restore the forests' ability to provide the wealth of goods and services discussed in the previous chapter.

There should be no doubt that cleaning up the environmental mess from past logging on the National Forests will be costly. But the alternative – looking the other way and letting the mess get worse – would cost even more:

- If they are not removed or rehabilitated, thousands of miles of forest roads will eventually fall apart, causing landslides to dump dirt into streams, degrading the quality of the water coming from the National Forests and destroying the habitat fish and other aquatic species need to survive.

- If funds are not provided for non-logging management activities, such as prescribed burning, abnormal fire conditions will continue or worsen.

- If the devastating impacts of past logging in streamside and other forest wetlands are not repaired, the National Forests cannot reach their full capability to provide the nation with clear, cold, fresh water. The many species dependent on wetlands – among the most ecologically productive of all lands in the world – will continue to face unwarranted threats of extinction.

Though there remains much for forest scientists to learn about what needs to be done to restore the productivity of the national forests, the basic parameters of a restoration program are sufficiently understood that work should start immediately. The following text discusses the objectives and activities for a program to restore the National Forests, and the potential impacts on the economy.

WHAT RESTORATION MEANS

Restoration is the process of assisting the recovery and management of ecological integrity. To help promote effective restoration of streams and wetlands, the U.S. Environmental Protection Agency (EPA) (2000) assembled a list of principles considered to be critical to the success of restoration projects. They include the following:

- Preserve and protect existing aquatic resources.

- Restore ecological integrity: the structure, composition, and natural processes of its biotic communities and physical environment.

- Restore natural physical structure and original morphology.

- Restore natural functions, such as the hydrological regime, natural disturbance cycles, and nutrient fluxes.

- Work within the watershed and broader landscape context, not just the most degraded site.

- Understand the natural potential of the watershed.

- Address ongoing causes of degradation. Identify their causes and eliminate or remediate ongoing stresses wherever possible.

- Anticipate future changes. Because both the environment and human communities are dynamic, foreseeable changes should be factored into restoration design.

- Restore native species and avoid non-native species.

- Monitor and adapt where changes are necessary.

Understanding proper forest restoration is key to reviving and returning the many qualities that Americans value in their National Forests. The EPA's aquatic restoration principles could provide sound guidelines for National Forests restoration. **Broadly, restoration includes prescribed burning, stream and fisheries rehabilitation, road maintenance and decommissioning, reforestation, and the removal of non-native species. Specific restoration activi-**

ties include growing native plants for planting on the banks of streams denuded by past logging, removing or upgrading culverts to make it easier for migrating salmon to travel, and installing sensors to monitor improvements in water quality following the completion of restorative work.

The Forest Service has not yet fully assessed what must be done to repair past damage to the National Forests' ecological productivity or designed a restoration program to get the job done quickly and efficiently. It should do so as quickly as possible.

NATIONAL FOREST RESTORATION AND THE ECONOMY

With no programmatic proposal for restoring the National Forests' ecological productivity, it is impossible to say what the total cost would be, how the money would be spent, or how it would be distributed among the individual National Forests. Several things are clear about how a restoration program would affect the economy. If designed appropriately, a National Forest restoration program should:

- Promote public and private investment into basic and applied research related to restoration, thereby reinforcing the ability of U.S. firms to sell restoration products and services worldwide.

- Create new opportunities for entrepreneurs in the environmental-restoration industry.

- Generate jobs in rural areas and stabilize the economies of rural communities.

Some of the opposition to proposals to supplant the National Forests logging program with one to restore their ecological productivity apparently comes from a belief that a large industry is in place to conduct the logging but no such industry exists to conduct the restoration. With no segment of the private sector ready to remove deteriorating logging roads and complete the myriad other restorative activities, it is feared that the adoption of a restoration program would be followed by a prolonged silence while Forest Service bureaucrats struggled to give birth to a new industry. Or worse, the agency would seek to initiate a massive hiring of new Forest Service employees.

These fears are misplaced. Environmental restoration already is a sizeable industry across the United States. True, most of the industry is not engaged in forest restoration of the type and scope the National Forests require – how could it, given the Forest Service's lack of a coherent restoration program and the minimal restoration on private forest lands? Instead, much of the industry focuses on mitigating the adverse environmental effects of development projects, such as in-filling of wetlands, occasioned by new subdivisions, airports, factories, and so forth. This focus, though, gives the industry the fundamental building blocks to expand and adapt to meet the National Forests' needs.

For an introduction to the industry, we recommend these sources:

- There are several trade associations representing the industry, among them the Society for Ecological Restoration (SER),

whose 2,800 members include individuals, businesses, and organizations engaged in the repair and management of ecosystems. For information about SER contact:

Steve Gatewood,
Executive Director or
Don Falk,
Science and Policy Coordinator
1955 W. Grant Road, Suite 150
Tucson, AZ 85745
520-622-5485 (phone)
520-622-5491 (fax)
www.ser.org

- The industry's interests and accomplishments are covered in several trade publications and journals, such as *Ecological Restoration*, and *Restoration Ecology*, both published by SER, and *Conservation Biology in Practice* and *Land and Water*.

Conservation Biology in Practice
Contact: **Kathryn Kohm**
Department of Zoology,
Box 351800
University of Washington
Seattle, WA 98195-1800
206-685-4724 (phone)
206-221-7839 (fax)

Land and Water
Contact: **Teresa Doyle**
918B First Avenue South
PO Box 1197
Fort Dodge, IA 50501-9925
515-576-3191 (phone)
www.landandwater.com

A general picture of the restoration industry, as it would interact with the National Forests comes from northern California's mostly rural and heavily forested Humboldt County, population 121,000. The Redwood Community Action Agency recently surveyed firms in the restoration industry

and found the industry is diverse and vibrant, ranging from engineering firms, to heavy equipment operators, water resources consultants, nurseries, and mapping firms. The industry employs more than 200 people, and most of these are year-round positions (personal communication, Ruth Blyther, Redwood Community Action Agency).

About two-thirds of the firms' work involves providing services and consulting, such as educating landowners about problems restoration could solve, assessing the restoration needs of individual projects, designing an appropriate plan of action, securing the obligatory permits, and monitoring the results. The remaining third involves the production of restoration products and implementing restoration projects.

Restoration projects fall into a small set of categories, such as road removal, trail construction, removal of invasive exotic plant species, and restoration of in-stream and streamside habitats. About one-third of the funding for restoration comes from the private sector. Government grants and contracts fund half of the work, and foundations and other sources make up the remainder.

The results of this survey make it clear that rural, forested counties, if they don't already have one, can develop a private-sector, restoration industry capable of carrying out a restoration program for the National Forests, once the Forest Service prepares one and Congress provides the funds to implement it.

A major federal investment in restoration would yield other

economic benefits, insofar as it would open opportunities for individuals, groups, and communities currently with little or no access to the rapidly growing, so-called New Economy associated with high-technology industries. Throughout the U.S., residents of communities distant from metropolitan areas have fewer business and employment opportunities. Incomes and earnings are consistently lower in rural areas. Average job earnings in rural areas were 71 percent of job earnings in urban areas in 1996, and that number has progressively declined over the last decade. Total income, which includes non-wage income, such as Social Security payments and investment dividends, is about two-thirds less in rural areas than in urban areas on a per capita basis (Economic Research Service 1999).

The restoration industry can help meet the economic needs of rural communities. Many restoration activities are labor-intensive and require little capital investment, thus providing excellent openings for small businesses and new entrepreneurs, as well as for rural workers who do not have the skills and training needed by high-technology industries. The authors of a recent analysis of scientific and economic knowledge regarding forest roads, for example, estimated that every \$1 million spent removing existing roads and restoring the land underlying them creates 33 jobs (Gucinski et al. 2000). Much of this work matches the skills of many unemployed or under-employed workers in rural areas, and the demand for removing or rehabilitating roads is great.

To further illustrate the opportunities, the Pacific Rivers Council (1995) has estimated that the National Forests of a single region, the Sierra Nevada in California, contain 29,200 miles of roads that pose serious harm to the forests' ecological productivity. It estimates that rehabilitation would cost \$2,050 per mile (1999 dollars), and removing or rehabilitating the Sierra Nevada's roads would cost about \$60 million. Across the U.S., the National Forests contain more than 380,000 miles of forest roads. Built mostly to haul logs, the roads remained in place after the logging was completed. Table 5 summarizes the miles of roads managed by the Forest Service, by region. States, counties, and private individuals own and manage additional roads. There are also more than 60,000 miles of unauthorized roads, developed outside the Forest Service's planning processes that don't meet technical or environmental

Table 5. Miles of Forest Service Roads in 1998

Forest Service Region	Total Road Miles
Northern (1)	49,966
Rocky Mountain (2)	31,167
Southwest (3)	56,010
Intermountain (4)	38,403
Pacific Southwest (5)	44,398
Pacific Northwest (6)	93,879
Southern (8)	35,997
Eastern (9)	30,121
Alaska (10)	3,577
Total	383,518

Source: US Department of Agriculture, Forest Service (1999), table 43.

protection standards (U.S. Department of Agriculture 2000).

The tremendous size of this road network doesn't allow forest managers to maintain, rebuild or decommission roads appropriately. The Forest Service estimates that they now have a \$8.4 billion backlog on the maintenance of roads. They have had sufficient budget, however, to maintain only about 20 percent of the roads (U.S. Department of Agriculture 2000). The vast road network outweighs Forest Service budgets and management capabilities. This neglect

causes roads to degrade and dumps sediment and debris into streams. Often, roads will cause massive landslides that bury streams, destroy fish and wildlife habitat and cause significant public safety concerns. By immediately investing \$500 to \$600 million – roughly half of what is spent to subsidize the logging program each year – into an agency-managed restoration program, Congress can demonstrate its commitment to enhance the value of these national gems. Unlike the timber industry, which the restoration industry would be replacing

in many communities, the restoration industry faces demands that are not highly cyclical. Thus, rural communities that become restoration centers would become less susceptible to the boom-bust swings in employment that have been a hallmark of timber-dependent communities in the past. A restoration program created as part of the Northwest Forest Plan, known as Jobs in the Woods, was funded with \$27.8 million in fiscal year 1995. This initial funding allowed for awarding of 600 contracts and the employment of more than 2,200 workers at an

average wage of \$18.14 per hour in 1995 (Doppelt 1997). Multi-year contracts would create more benefits in job predictability, development of a more skilled labor force, and allow contractors to establish their businesses.

Because many aspects of the restoration industry are, from an economic perspective, easy to enter, the industry also offers opportunities to unskilled workers who may have greater difficulties getting started in other industries. This is especially true for restorative activities requiring labor-

intensive, low-skill services, such as removing exotic species or planting trees. Individuals will be able to establish new restoration companies without large amounts of capital, because the start-up costs are relatively low. The opportunities do not stop there, however. The Stillaguamish Indian Tribe in Washington state, for example, has made preliminary investments to develop an extensive plant nursery specializing in the native plants required to re-establish the ecological productivity of streamside and other wetlands (Tapogna and Light 2000).

The economic importance of new opportunities in the labor-intensive sectors of the restoration industry cannot be over emphasized, at least for those rural residents who currently do not have sufficient skills or job opportunities to avoid high risks of unemployment and declining wages. In the long run, however, a different sector of the restoration industry, with roots in high technology and employing highly skilled workers, may prove more important to rural economies. As the restoration program for the National Forests matures, it will increasingly require highly sophisticated services in mapping, soil and

water testing, and other areas. In effect, a major restoration program for the National Forests will cause the high technology industries to pay greater attention to forest resources. In doing so, it will bring high-technology firms to rural communities, with a wide range of economically important spin-offs: stimulating the development of high-speed communication connections between rural communities and metropolitan areas; expanding the resources for high-technology education in rural schools; and providing opportunities for local graduates to find high-technology jobs in their own communities.

RESTORATION CONTINUES TO HAVE ECONOMIC BENEFITS, AFTER THE WORK IS DONE

A restoration project continues to have value after the workers have gone home and the paychecks have been cashed. A forest with decommissioned roads and healthy streambanks provides valuable services, such as high quality water for downstream users, improved habitat for fish and wildlife, and improved quality of life. For a full discussion of the economic benefits of healthy forests, see the previous chapter.

TEN YEARS OF COMMUNITY-BASED RESTORATION

For over a century timber crews logged the massive ancient trees and made their place in the Pacific Northwest's economy and communities. However, today the large trees are gone and in their place are damaged streams and threatened salmon runs. Northwesterners realized that to restore their heritage of clear-flowing streams and healthy salmon populations, it would require the same hard work and dedication that it took to log the native forests.

While ecological restoration may seem like a new idea, one community group has been working for ten years to restore salmon streams, stop erosion and reforest damaged areas. The Nooksack Salmon Enhancement Association (NSEA) of Bellingham, Washington is one of 12 regional salmon enhancement groups in Washington State. Working closely with local, state, and federal agencies and local tribes, NSEA employs a six-member full-time work crew, all former timber workers or fishermen, and also works with community and

student volunteers. NSEA has completed over 120 restoration projects and made major improvements on over 15 miles of local streams. NSEA's projects are done on state, private and federal lands. These projects address some of the causes of habitat degradation, including lack of stream side vegetation and livestock access. NSEA replants native trees and shrubs along stream banks to restore the riparian zone, shade the stream and improve salmon habitat and adds gravel to streams to create needed salmon rearing and spawning habitat.

NSEA's restoration efforts are focused on streambanks and are planned in conjunction with the Washington State Departments of Natural Resources, Fish and Wildlife, and Ecology. Some portion of the funding for these projects are provided through the "Jobs in the Woods" program created by the Northwest Forest Plan. One recent project on the Mt. Baker-Snoqualmie National Forest modified old logging roads to help prevent mass erosion.

NSEA's projects address the causes of habitat degradation and work to stabilize eroded, slumping, or undercut stream banks. Protecting the streambank area is the best way to protect species and the environment as a whole as 80 percent of all land species depend on the streambank area (about 1 percent of the land area) for survival. NSEA recognizes that the county's streams are crucial to the quality of water resources and to the economic future of Whatcom County. By restoring the streams to a more natural state, they can again provide adequate habitat for salmon and other wildlife, create more even stream flows throughout the year, buffer against high flood flows and low summer flows, and help to filter pollutants from the water supply.

Even small sections of improved streams, amid otherwise degraded habitat, provide an island of habitat in just a few years. In some cases, only a few months passed before spawning salmon were using enhanced habitat areas, such as newly installed gravel spawning pads.

REFERENCES

Brown, T.C. and D. Binkley. 1994. *Effect of Management on Water Quality in North American Forests*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. General Technical Report. RM-248. June.

DiVall, Linda and Tony Onorato. 2000. *Heritage Forest Campaign National Survey*. American Viewpoint, Inc. March.

Doppelt, B. 1997. "Saving and Creating Jobs through Watershed Restoration." In *Watershed Restoration: Principles and Practices*. Edited by J.E. Williams, C.A. Wood, and M.P. Dombeck. American Fisheries Society. Pgs. 472-486.

Economic Research Service. 1999. *Rural Conditions and Trends*. Economic Research Service, U.S. Department of Agriculture. February.

Forest Ecosystem Management Assessment Team. 1993. *Forest Ecosystem Management: An Ecological, Economic, and Social Assessment*. Forest Service, Fish and Wildlife Service, National Marine Fisheries Service, National Park Service, Bureau of Land Management, and Environmental Protection Agency. 794-478. July.

Grant, Gordon and Shannon Hayes. 2000. *Geomorphic Response to Peak Flow Increases due to Forest Harvest Activities, Western Cascades, Oregon*. USDA Forest Service, Pacific Northwest Research Station.

Gucinski, Hermann, Michael J. Furniss, Martha H. Brookes, and Robert R. Ziemer. 2000. *Forest Roads: A Synthesis of Scientific Information*. U.S. Department of Agriculture, Forest Service. May.

Hamrick, K.S. 1999. "Nonmetro Displaced Workers Face Less Hardship Than Metro Displaced Workers." *Rural Development Perspectives* 14 (1): 22-27.

Haynes, R.W. and A.L. Horne. 1997. "Chapter 6: Economic Assessment of the Basin." In *An Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins, Volume IV*. Edited by T.M. Quigley and S.J. Arbelbide. General Technical Report PNW-GTR-405. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. June. Pgs. 1715-1869.

Hipple, S. 1999. "Worker Displacement in the Mid-1990s." *Monthly Labor Review* (July): 15-32.

Niemi, E. and E. Whitelaw. 1995. *The Full Economic Costs of Proposed Logging on Federal Lands* (Preliminary Report). ECONorthwest. March.

Oregon Rivers Council. 1991. *The Case for Protecting Riverine Habitat: A Preliminary Analysis of the Economic Impact of Northwest Salmonoid Fisheries*. Draft.

Pacific Rivers Council, Inc. 1995. *The Urgent Need for Watershed Protection and Restoration in the Sierra Nevada*. Pacific Rivers Council. September.

Sedell, J., M. Sharpe, D. Apple, M. Copenhagen, and M. Furniss. 2000. *Water & the Forest Service*. USDA Forest Service, Policy Analysis. FS-660. January.

Tapogna, John and Tom Light. 2000. *Feasibility Study of the Banksavers Corporation*. Stillaguamish Tribe of Indians. January.

U.S. Department of Agriculture, Forest Service. 1995. *The Forest Service Program for Forest and Rangeland Resources: A Long-Term Strategic Plan*. U.S. Department of Agriculture Forest Service. Draft 1995 RPA Program. October.

U.S. Department of Agriculture, Forest Service. 1999. *Report of the Forest Service: Fiscal Year 1998*. US Department of Agriculture, Forest Service. May.

U.S. Department of Agriculture, Forest Service. 2000. "Road Management Website." [<http://www.fs.fed.us/news/roads/qanda.shtml>].

U.S. Department of Commerce, Economics and Statistics Administration, Bureau of Economic Analysis. 2000. *Regional Economic Information System 1969-1998*.

U.S. Environmental Protection Agency. 2000. *Principles for the Ecological Restoration of Aquatic Resources*. EPA841-F-00-003. 2000.

Warren, D. 2000. *Production, Prices, Employment, and Trade in Northwest Forest Industries, All Quarters 1998*. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Resource Bulletin. PNW-RB-231. May.

Wilderness Society. 1998. *Commercial Timber Sales on National Forest, by Forest, Fiscal Year 1997*. October.