No Free Lunch

The Potential Economic Consequences of Post-Fire Logging on Federal Lands

Prepared for

Sierra Club

by

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I. BACKGROUND

When fire sweeps through a forest the flames often appear to consume everything in their path. Often, however, fires are not this intense and consume only the most combustible items, such as bushes and the small limbs and outer bark of trees. Other fires burn in a mosaic pattern: the flames do consume all the vegetation in some patches, but in others they burn only the most combustible items, and they leave yet other patches untouched. Areas not totally burned are left with many standing trees, some dead and some alive.

Forest fires on federal lands induce many people to propose logging of the remaining trees—at least the dead ones, but sometimes the lives ones as well—anticipating that the logging would yield economic benefits of three types:

1. *Wood products.* They anticipate that trees in a burned area would be more valuable converted into logs and then into lumber and other valuable wood products, rather than left in the forest.
2. *Local jobs and income.* They anticipate that logging and processing of wood from the burned area would generate additional jobs and income for the local economy.
3. *Revenue to support the restoration.* They anticipate that, without the sale of trees in a burned area to the timber industry, the federal agency (usually a national forest) managing the burned area would lack funds to support activities, such as planting tree seedlings, needed to restore the forest's environmental health. They assert that post-fire logging is a way—perhaps the only way—to produce revenue for these activities.

It sounds like a free lunch, something for nothing: the forest has already been devastated, and logging will at least salvage something good from the ashes.

As with all free lunches, they are more illusion than truth. Post-fire logging of federal forests can yield something for nothing only if one overstates the potential benefits and overlooks important costs of post-fire logging. To substantiate this statement, consider this example: a proposal by the Umatilla National Forest to log 85 million board feet within the perimeter of the 2005 School Fire in the Umatilla National Forest in southeastern Washington.[1] The free lunch looks pretty tasty: logs worth $13,207,874, $2,500,000 additional income for local workers, and $11,600,000 for reforestation. Closer examination, though, makes the meal less appetizing. Ecological damage from the logging will generate both short- and long-run economic costs, some perhaps lasting 50 years or more; the net impact on jobs and workers' income may be zero, and there is no guarantee that the logging will generate any money at all that the Umatilla National Forest can use for forest restoration.

A more widely publicized example comes from proposals for post-fire logging in the perimeter of the 500,000-acre, 2002 Biscuit Fire in the Rogue River-Siskiyou National Forest of southern Oregon. After local forest managers had concluded that logging just 96

[1] Pomeroy Ranger District, Umatilla National Forest. 2006. *School Fire Salvage Recovery Project, Final Environmental Impact Statement*. July. http://www.fs.fed.us/r6/uma/projects/readroom/pomeroy/school/index.shtml (accessed September 25, 2006).

million board feet, mostly easily accessed timber along existing roads, would best satisfy applicable economic and environmental concerns, logging advocates issued a report asserting that up to 2 billion board feet of wood was "economically salvageable."[2] Commonly known as the "Sessions report," it provided justification the Forest Services to withdraw the initial proposal and replace it with one calling for logging of nearly 400 million board feet.[3] Astoundingly, the Sessions report contains no economic analysis of the potential costs and benefits of the proposed logging. The plan adopted by the Forest Services has been mired in controversy ever since and the agency has not come close to its stated objectives.

In the following pages we briefly explain common errors in economic assumptions and analysis that accompany proposals for post-fire logging of federal forests. We separately address mistakes that enable proponents to

- Overstate the economic benefits of post-fire logging and overlook important costs.
- Understate the economic costs of post-fire logging.

Our conclusion: post-fire logging provides no free lunch. Sure, those who benefit from the logging will find it mighty tasty, but somebody else—U.S. taxpayers as a whole and local residents who must cope with the costs logging imposes on the forest's ability to provide valuable goods and services other than logs—has to pick up the tab. This conclusion is especially true for post-fire logging in unroaded areas.

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[2] Sessions, J., R. Buckman, M. Newton, and J. Hamann. 2003. *The Biscuit Fire: Management Options for Forest Regeneration, Fire and Insect Risk Reduction and Timber Salvage.* Oregon State University, College of Forestry. July 8. http://www.cof.orst.edu/cof/admin/Biscuit%20Fire%20Report.pdf#search=%22sessions%20biscuit%22 (accessed September 25, 2006).

[3] Rogue River-Siskiyou National Forest and the Medford District of the Bureau of Land Management. 2004. *Forest Service and Bureau of Land ManagementFinal Environmental Impact Statement*. June 1. http://www.fs.fed.us/r6/rogue-siskiyou/biscuit-fire/feis.shtml (accessed September 29, 2006).

I. COMMON ERRORS THAT OVERSTATE THE ECONOMIC BENEFITS OF POST-FIRE LOGGING

We all know the maxim, there is no such thing as a free lunch. It applies to post-fire logging on federal lands. There is no such thing as free logs. It is not possible to generate the economic benefits of logging without also generating some costs, and somebody has to pay these costs. Of course, if the benefits are greater than the costs, then post-fire logging mould make economic sense. In many cases, though, the benefits are not as large as logging advocates assert.

Post-fire logging generates economic benefits when it increases the supply of logs to be converted into lumber and other consumer products. Proposals for post-fire logging of federal forest lands have often overstated these economic benefits, however, by making one or more of four common errors. They've overstated:

- The number of trees that can be logged.
- The value of the logs produced by logging.
- The jobs and incomes that will accompany the logging.
- The amount of money the logging will generate for local forest managers to use on forest restoration.

Not every pro-logging proposal or assessment has all of these errors, but we know of none that has avoided them all. Here are some illustrative examples.

The number of trees that can be logged. In 2004, after almost two years of analysis following the 2002 Biscuit Fire in southern Oregon, the Forest Service adopted a plan to log almost 400 million board feet on roughly 19,000 acres within the fire's perimeter. By the spring of 2006, however, the agency had dropped more than 9,000 acres from the plan because on-the-ground reconnaissance found that they contained fewer trees suitable for logging than the agency had concluded from prior, remote sensing. Specifically, these acres contained live trees, not dead ones, or the dead trees did not contain enough sound wood to warrant logging, or the areas did not satisfy legal requirements that define where logging is allowed.[4]

The value of the logs. To estimate the value of burned logs from federal lands, logging proponents often assume the value will be the same as the recent, average market price for logs. Several factors can cause this assumption to overestimate the logs' true value. Market prices largely reflect the demand for and supply of logs from private lands. Logs produced by post-fire logging on federal lands may exhibit lower prices, because these lands often are less accessible, more rugged, and more costly to log. If a fire burned some trees so badly

[4] Rogue River-Siskiyou National Forest. 2006. *Responses to Questions Asked by the House and Senate Committee Appropriations concerning the Biscuit Fire in southern Oregon*. March. http://www.fs.fed.us/r6/rogue-siskiyou/biscuit-fire/ (accessed September 25, 2006); Fattig, P. 2006. "USFS: Biscuit Salvage Turns Profit." *(Medford, Oregon) Mail Tribune*. April 23. http://www.mailtribune.com/archive/2006/0423/local/stories/13local.htm (accessed September 27, 2006).

mills no longer want them, thereby lowering the density of merchantable logs per acre, the costs of logging these remaining logs may rise even further. After accounting for these and other factors, the State of California has determined that the log value of trees killed by fire is 25–50 percent lower than the value of green trees.[5] Values may fall drop even more if post-fire logging is so extensive it floods the market: Forest Service economists predicted the proposed logging of the Biscuit Fire area would reduce log prices in the vicinity by about 9 percent.[6]

Logging-related jobs and incomes. To estimate the potential impacts of post-fire logging on the local economy, logging proponents often apply this reasoning: post-fire logging will increase the amount of timber entering the market and, if the logging industry currently generates *X* jobs and *$Y* income per million board feet of timber, then the post-fire logging will boost the economy at the same rate, creating more jobs and income for local residents. In reality, though, things probably won't turn out that way. As the federal government puts burned logs on the market, it may saturate the market, overwhelm the capacity of local mills, and drive down the price mills are willing to pay for logs from other lands. If it does, private landowners will withhold some of their logs. In some cases, the net effect may be zero; every time the federal government adds a log to the market, another landowner will withhold an equivalent log and the net amount of timber on the market will remain unchanged. This is what the Forest Service predicts will happen in eastern Washington and Oregon, if it sells timber from the area burned by the School Fire.[7]

Money for local forest restoration. A common argument used to justify post-fire logging on federal lands is that federal land managers must sell burned trees if they are to have funds to cover the costs of rehabilitating the burned area. Not so. Much of the money for rehabilitation comes through Congressional appropriations of money from the federal Treasury, i.e., money collected from taxpayers. The revenues from a post-fire timber sale are not dedicated to rehabilitation of that burned area. Instead, the Forest Service pools the revenues from all so-called salvage sales, then redistributes the money among the national forests according to the priorities of the agency's administrators. It is possible that the agency will use the revenues from a post-fire timber sale on one national forest not to cover the costs of rehabilitating that forest but to subsidize timber sales elsewhere.

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[5] California State Board of Equalization. 2006. *Harvest Values Schedule, Effective July 1, 2006 through December 31, 2006,* and *Modified Harvest Value Schedules for Fire-Damaged Timber in Timber Value Area 8.* June 27. http://www.boe.ca.gov/proptaxes/timbertax.htm (accessed September 27, 2006).

[6] Rogue River-Siskiyou National Forest. 2003. *Biscuit Fire Recovery Project Final Environmental Impact Statement, Appendix I Socioeconomics.*

[7] Pomeroy Ranger District, Umatilla National Forest. 2006. *School Fire Salvage Recovery Project, Final Environmental Impact Statement*. July. http://www.fs.fed.us/r6/uma/projects/readroom/pomeroy/school/index.shtml (accessed September 25, 2006).

II. COMMON ERRORS THAT UNDERSTATE THE ECONOMIC COSTS OF POST-FIRE LOGGING

To understand the costs of post-fire logging it is useful to recognize that forests are economically important not just when they produce commodities, such as logs, but also when they provide services, such as providing habitat for fish and wildlife or producing and regulating the flow of clean water. A recent report by the National Research Council explains:[8]

> "Ecosystems provide a wide variety of marketable goods, fish and lumber being two familiar examples. However, society is increasingly recognizing the myriad functions—the observable manifestations of ecosystem processes such as nutrient recycling, regulation of climate, and maintenance of biodiversity—that they provide, without which human civilizations could not thrive. Derived from the physical, biological, and chemical processes at work in natural ecosystems, these functions are seldom experienced directly by users of the resource. Rather, it is the services provided by ecosystems, such as flood risk reduction and water supply, together with ecosystem goods, that create value for human users…."

Over the past several decades, economists and ecological scientists have worked hard to understand the processes, called ecosystem functions, by which forests and other ecosystems produce economically valuable goods and services. They've found it useful to segregate the functions, goods, and services into categories, such as those illustrated in Table 1. Some of the goods and services are easily recognized, but others are not well understood, even by forest scientists.

Post-fire logging can diminish the forest's ability to provide many goods and services. An important review of more than 80 publications regarding the overall ecological effects of post-fire logging placed these impacts in their fundamental context: native species have adapted to fire and ecosystem diversity depends on the natural cycle of fire and recovery, but past forest-management practices have diminished ecosystem diversity and post-fire logging can exacerbate this effect.[9] The literature shows post-fire logging can have these specific, negative effects on ecological functions, goods and services:

- Disrupt natural germination and establishment of seedlings.
- Compact some soils, reducing their productivity and increasing the water runoff from them for 50-80 years or longer.
- Disturb some soils, increasing erosion and sedimentation in streams, degrading habitat for and reducing survival of salmonids and other aquatic species, widening stream channels, and increasing stream temperature.
- Have detrimental effect on soil microbes and other organisms associated with recovery, as well as on native plants that typically emerge after fires, including those that fix nitrogen in the soil. These effects can impede the subsequent growth of trees and shrubs, reducing their overall biomass and number of species.

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[8] National Research Council of the National Academies. 2005. *Valuing Ecosystem Services: Toward Better Environmental Decision-Making*. National Academies Press. pp. 1, 156.

[9] Beschta, R., J. Rhodes, J. Kauffman, R. Gresswell, G. Minshall, J. Karr, D. Perry, R. Hauer, and C. Frissell. 2004. "Postfire Management on Forested Public Lands." *Conservation Biology* 18 (4): 957-967.

- Remove dead trees, called snags, that otherwise would provide wildlife habitat. In Oregon and Washington, for example, snags are associated with at least 96 wildlife species, most of whom use the larger trees that are the target of logging.
- Remove dead trees that otherwise would fall into streams and create beneficial habitat and influence stream dynamics. Removing the trees can affect for decades the physical characteristics of stream habitats, the structural components of stream systems, and the recycling of nutrients.
- Increase the risk of future fires by increasing the supply of flammable, small pieces of wood and creating drier, windier microclimates

Against this backdrop, an environmental impact statement (EIS) by the Umatilla National Forest describing proposed logging in the area burned by the School Fire illustrated the negative impacts that can accompany logging of a specific site.[10] It predicted that logging would increase accident-related spills of fuel into streams; disturb big-game animals and adversely affect hunting opportunities; disturb bald eagles and reduce habitat for woodpeckers and other birds associated with snags; disturb sites and resources important to Indian people; interrupt recreational travel and degrade the visual appearance of the forest landscapes; degrade air quality; increase erosion and the delivery of sediment to streams; degrade soil; and increase the amount of small wood and other fuels that can intensify future fires. In addition, logging operations would establish roads in areas that are currently unroaded.

[10] Pomeroy Ranger District, Umatilla National Forest. 2006. *School Fire Salvage Recovery Project, Final Environmental Impact Statement*. July. http://www.fs.fed.us/r6/uma/projects/readroom/pomeroy/school/index.shtml (accessed September 25, 2006).

Table 1. Functions, Goods, and Services of Forest Ecosystems

Functions	Examples of Goods and Services Produced
Production and regulation of water	Forests capture precipitation; filter, retain, and store water; regulate levels and timing of runoff.
Formation & retention of soil	Forests accumulate organic matter, and prevent erosion to help maintain productivity of soils.
Regulation of atmosphere & climate	Forest biota produce oxygen, and help maintain good air quality and a favorable climate.
Regulation of disturbances	Forests reduce flood damage by storing flood waters, and reducing and slowing flooding.
Regulation of nutrients and pollution	Forests improve water quality by trapping pollutants before they reach streams and aquifers.
Provision of habitat	Forests provide habitat for flora and fauna.
Production of food.	Forests convert solar energy into edible plants and animals.
Production of raw materials	Forests produce wood fiber, mushrooms, streams with energy convertible to electricity.
Pollination	Insects facilitate pollination of wild plants and agricultural crops.
Biological control	Birds, bats, and microorganisms control pests and diseases.
Production of genetic & medicinal resources	Genetic material in forest plants and animals provide potential basis for drugs and pharmaceuticals.
Production of ornamental resources	Products from forest plants and animals provide materials for handicraft, jewelry, worship, decoration, and souvenirs
Production of aesthetic resources	Trees, wetlands, riparian vegetation, and streams provide basis for enjoyment of scenery.
Production of recreational resources	Forests provide the basis for outdoor sports, eco-tourism.
Production of spiritual, historic, and cultural resources	Forests serve as the basis for group identity, spiritual renewal, folklore.
Production of scientific and educational resources	Forests provide inputs for research and focus for on-site education.

Source: Adapted by ECONorthwest from De Groot, R., M. Wilson, and R. Boumans. 2002. "A Typology for the Classification, Description and Valuation of Ecosystem Functions, Goods and Services." *Ecological Economics* 41: 393-408; Kusler, J. 2003. *Assessing Functions and Values.* Institute for Wetland Science and Public Policy and the Association of Wetland Managers, Inc.; and Postel, S. and S. Carpenter. 1997. "Freshwater Ecosystem Services." in *Nature's Services: Societal Dependence on Natural Ecosystems*. Edited by G.C. Daily. Washington, D.C.: Island Press, pgs. 195-214.

These negative effects of post-fire logging slipped past the agency's economists unnoticed. Their section of the EIS makes no mention of them. Indeed, it mentions no costs of any kind, other than those directly tied to the logging, giving the impression that the proposed logging will provide the American economy with a free lunch. Besides being absurd on its surface, this position stands in stark contrast against volumes of research, much of it by Forest Service economists, that documents the economic value of ecosystem services.

This research has focused on determining the value of forest-related services even when they are not easily traded in markets, and they do not have prices attached to them. The

absence of market prices does not mean the services are necessarily less valuable than market commodities, such as logs and lumber. In the mid-1990s, for example, Forest Service researchers extensively analyzed the relative value of different goods and services provided by federal lands in the Interior Columbia River Basin, (essentially the area north of California and Nevada between the Cascades and the Rockies). Though they were unable to estimate values for many ecosystem services, such as providing high-quality water and habitat for at-risk species, they still determined that the federal lands' ability to produce services, such as recreational opportunities, has greater value than its ability to produce timber and other commodities. Table 2 shows their findings for the Blue Mountain Ecological Reporting Unit, which includes the School Fire. In 1995, logging accounted for 12.6 percent of the total, recreation for 48.2 percent. Figure 1 portrays this information graphically.

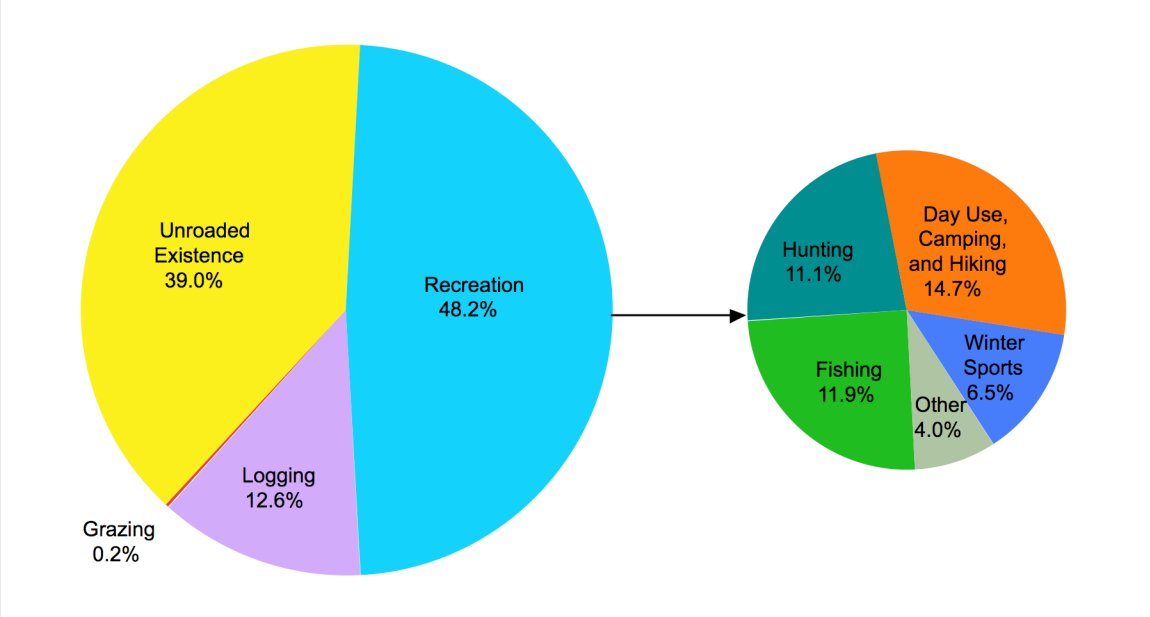
Table 2: Contribution of Logging and Other Activities to the Total Value of Goods and Services Derived from Federal Lands[a] in the Blue Mountains Ecological Reporting Unit, 1995

Activity	Contribution (percent)
Logging	12.6
Grazing	0.2
Recreation	
Camping	5.0
Day Use	6.0
Fishing	11.9
Hunting	11.1
Motor Boating	0.1
Motor Viewing	1.4
Non-Motor Boating	0.1
ORV	0.2
Snowmobiling	0.1
Trail Use	3.7
Viewing Wildlife	2.1
Winter Sports	6.5
Total Recreation	48.2
Unroaded Existence	39.0
Total	**100.0**

Source: 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. p. 1826.

[a] Includes primarily lands administered by the Forest Service and Bureau of Land Management. Does not include values for production of other goods and services, such as production clean water, provision of habitat for at-risk species, modulation of flooding, and sequestration of carbon. Numbers may not sum to 100 percent due to rounding.

Figure 1. Contribution of Logging and Other Activities to the Total Value of Goods and Services Derived from Federal Lands in the Blue Mountains Ecological Reporting Unit, 1995[a]



[a] Source and explanatory notes are the same as for Table 2.

The researchers also found that the value of unroaded areas warrants special distinction because, all else equal, recreational activities in them are more valuable than those elsewhere, and these areas have highly valued characteristics, such as the existence of wild places. Unroaded areas in the Blue Mountains accounted for 39 percent of the total value of all goods and services, more than three times the value of logging.

Table 3 offers additional data regarding the value of recreational opportunities that might be affected by logging in the School Fire area. The data come from a report published by the Forest Service and show the average consumer's surplus recreationists in the Pacific states enjoy from a day engaged in each type of activity. Consumer's surplus is the difference between what a recreationist is willing to pay and what she must pay to participate in a given activity, and represents the net economic benefit she derives from the activity. The data show, for example, that the consumer's surplus associated with a participant-day of hunting is $45.49. The data also show that, whenever recreational activity occurs in an area with wilderness characteristics, such as the roadless areas in the School Fire area, its economic value is $26.22 per participant day greater than similar activity in other areas. The ability of the roadless areas in the School Fire area to produce this additional value would be lost if the proposed logging destroyed the area's wilderness characteristics.

Table 3. Estimates of Average Consumer's Surplus per Participant per Day, by Activity, for Recreational Activities on Public Lands in the Pacific Coast Region:[a] Summary of Studies from 1967 to 2003

Recreational Activity	Mean of Estimates[b]	Recreational Activity	Mean of Estimates[b]
Hunting	$45.49	General recreation	$32.35
Fishing	$44.36	Picnicking	$64.22
Backpacking	$52.10	Hiking	$23.24
Swimming	$27.29	Mountain biking	$49.68
ORV driving	$40.37	Camping	$104.35
Floating/rafting/canoeing	$287.84	Sightseeing	$20.27
Activities in wilderness	$26.22		

Source: Loomis, J. 2005. *Updated Outdoor Recreation Use Values on National Forests and Other Public Lands*. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Gen. Tech. Rep. PNW-GTR-658. p. 6. http://www.fs.fed.us/pnw/pubs/ pnw_gtr658.pdf (accessed December 10, 2005).

[a] The Pacific Region includes Alaska, California, Oregon, and Washington.

[b] Values expressed in 2004 dollars.

A lot more information on the economic value of goods and services other than timber also is readily available. For example, Forest Service economists recently published a report summarizing estimates of the value of changes in the quality of water in streams and lakes.[11] Another economist from the agency has summarized studies and data regarding the value of changes in the quantity of water in streams on national forest lands.[12] The U.S. Environmental Protection Agency, in cooperation with counterpart agencies from other countries, sponsors a clearinghouse for studies that estimate values for ecosystem goods and services, including those produced by U.S. forests.[13]

Many economists have recognized more broadly the importance of ecosystem goods and services other than commodities, such as timber, to the economy of communities, such as those near the School Fire. More than 100 economists, including two Nobel Laureates, for example, described the economic importance of the West's natural environment in a recent letter to the President of the United States and the governors of Washington and ten other western states.[14] The letter includes this summary statement, which underscores the significance of the Forest Service's failure to evaluate the economic costs of the proposed logging's effects on pollution, roadless areas, and fish and wildlife habitat:

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[11] Koteen, J., S.J. Alexander, and J.B. Loomis. 2002. *Evaluating Benefits and Costs of Changes in Water Quality*. U.S. Department of Agriculture, Forest Service. PNW-GTR-548. July. p. 26

[12] Brown, T.C. 2004. *The Marginal Economic Value of Streamflow from National Forests*. U.S. Forest Service, Rocky Mountain Research Station. Discussion Paper. DP-04-1, RMRS-4851. December 28.

[13] Environmental Valuation Reference Inventory. http://www.evri.ca/.

[14] Whitelaw, E. (editor). 2003. *A Letter from Economists to President Bush and the Governors of Eleven Western States Regarding the Economic Importance of the West's Natural Environment.* December 3. p. 1.

> "The West's natural environment is, arguably, its greatest, long-run economic strength. The natural landscapes of the western states, with wide open spaces, outdoor recreational opportunities, and productive natural-resource systems underlie a quality of life that contributes to robust economic growth by attracting productive families, firms, and investments. The West's natural environment, however, faces serious challenges that threaten to undermine its contribution to the economy. These include air and water pollution, urban sprawl, the extension of roads and other development into roadless public lands, and fragmentation of habitat for native fish and wildlife."

This statement reflects the findings of research that show forests can have a greater impact on local jobs and incomes not when they produce logs but when they produce recreational opportunities, wilderness characteristics, scenic vistas, and other amenities. One study, for example, found that logging levels in Oregon's counties are not correlated with changes in employment in those counties.[15] In contrast, other studies have found that rural western counties adjacent to wilderness areas experience faster growth in population, jobs, and income than those more distant from wilderness,[16] and the influence natural-resource amenities exert on economic development in local communities appears to be increasing.[17]

III. CONCLUSIONS

Some may see forest fires as catastrophic, leaving behind a wasteland. From this perspective, the prospect of salvaging something, anything, of value from the ashes produces a compelling vision: log as quickly as possible to extract logs from trees that were burned but not consumed by the fire. Such thinking is not just simple, though, it is simplistic. There is no free lunch, especially in a burned forest. There is no guarantee that a national forest will use the income it earns from post-fire logging to increase the amount of rehabilitation it accomplishes in the burned area. With post-fire logging of any significance, the economy will not stand still. Instead, it will adjust: the post-fire demand for logging equipment and workers will induce shortages elsewhere, and the introduction of federal logs into the market may depress log prices. In response, some landowners may opt to withhold their logs from the market until the federal logging has ceased. The overall, net effect on the supply of logs and on logging-related jobs and income may be negligible.

In some settings it may make economic sense to conduct post-fire logging on federal lands—to clear safety zones adjacent to existing roads of burned trees that constitute a hazard, for example. Beyond these limited cases, though, extensive evidence suggests that post-fire logging is likely to yield economic benefits only as it generates serious economic costs. The costs may exceed the benefits, especially as logging extends into sensitive soils and covers areas large enough to have a significant impact on the forest ecosystem. Some of the costs may materialize on-site, as post-fire logging compacts soils, reduces soil productivity,

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[15] Power, T. and P. Ruder. 2003. *Economic Realities in the Tillamook and Clatsop State Forests*. Tillamook Rainforest Coalition. January.

[16] Holmes, F. Patrick and Walter E. Hecox. 2004. "Does Wilderness Impoverish Rural Regions?" *International Journal of Wilderness* 10 (3): 34-39.

[17] Vias, Alexander. 1999. "Jobs Follow People in the Rural Rocky Mountain West." *Rural Development Perspectives* 14 (2): 14-23.

introduces invasive weeds, disrupts big-game habitat, and diminishes hunting opportunities, for example. Others will appear elsewhere. Increased sediment in streams may increase water-treatment costs downstream, for example, or increase the risk of flooding, or diminish the populations of salmon available for fishers hundreds of miles away. Still others will confront future generations, as they cope with the consequences of impacts on forest ecosystems that can persist for decades.

As with any forecasting exercise, estimating the economic benefits and costs of post-fire logging on federal lands is fraught with uncertainty. This is no excuse, however, for overstating the potential benefits and understating—or, worse, ignoring completely—the potential costs. The common errors that yield overstatement of the benefits are well-known and avoidable. The general nature of the costs also are well known and there exists extensive data one can use to estimate their value. Economists and ecological scientists have made great progress toward understanding the goods and services provided by forest ecosystems, burned and unburned, and their economic importance. They will make even more progress in the foreseeable future. This information should be fully accommodated in post-fire, forest-management decisions.

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