

## THE LOCAL COSTS OF PUBLIC LAND USE RESTRICTIONS

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Citizens are increasingly concerned about public land management and use decisions. Much of their concern stems from the belief that local individuals and groups are at a disadvantage in influencing public land use decisions. More effective local participation is possible if citizens understand the process of public land use decision-making, organize at the local level to present consensus views to public decision-makers, and bring relevant information to bear on local impacts of public land management and use decisions. These are the three keys to effective local participation. One of the three is addressed below.

The purpose of this paper is to provide citizens with useful guidelines on the local impacts of public land use restrictions. Two examples are used. The first involves proposed wilderness areas in the Umatilla and Malheur National Forests in Oregon's Blue Mountain region. The second example is a proposed reduction in the availability of public range for livestock grazing in the Baker grazing district, Baker County, Oregon, administered by the Bureau of Land Management. Measures of local benefits derived from these pending public land use restrictions are provided. The measures can be interpreted as (1) the local monetary costs of proposed use restrictions or (2) the minimum value that offsetting local benefits must achieve if local citizens are to be as well off as they would have been without the restrictions.

No attempt is made to argue that restrictions which cause local communities or user groups to suffer are not in the best interest of the nation. Nor is it argued that economic values alone should determine public land use decisions. Rather, it is argued that local communities can participate more effectively in the decision-making process if armed with facts on the local economic costs of public land use restrictions.

### THE INSTITUTIONAL SETTING FOR LOCAL INVOLVEMENT

Over the last 20 years, Congress had directed federal agencies (particularly the Forest Service, Bureau of Land Management, Bureau of Reclamation, and National Park Service) to assess the economic, physical and environmental consequences of proposed public land management and use decisions. These directives have been in the form of legislative acts. Some of these acts emphasize the effects of decisions on the direct or immediate users of the land. Others are concerned with preservation of the resource base for use by future generations. In some cases, these congressional acts have created confusion and uncertainty as agency personnel, private resource managers, concerned citizens, and special interest groups attempt to respond to the federal mandates.

For example, four major Acts of Congress direct public land management agencies to manage public lands to best meet the needs of the American people, through, in general, multiple use and sustained yield management.

## EVALUATING THE LEVEL AND DISTRIBUTION OF LOCAL COSTS

To evaluate the local costs of public land use restrictions, an understanding is needed (1) the multiple use concept, (2) market versus non-market resource outputs, and (3) foregone benefits, or opportunity costs, of use decisions. Moreover, evaluation must reflect the local frame of reference, used here to refer to the county or multi-county area where the restricted use decision is implemented. Although local users and dependent communities are only one participant in the decision-making process, their concerns about local impacts are both legitimate and institutionalized in law and agency regulations.

Multiple-use management of the public land, at least in part, is the consequence of the historical pattern of settlement in the western United States. In early years, settlers chose to homestead lands with greatest natural productivity along major transportation arteries. Great expanses of rangeland, forestland, and other lands with lesser natural productivity in the interior of the west remained in the public domain. Over time, an economic system developed in the interior West which depended largely on the use of public resources by citizens. This land-extensive and public land dependent economic system, characterized by rangeland cow-calf operations, small sawmills, and widely scattered rural communities, largely remains in effect today. Management and use decisions on the public domain had, and have, a major influence on the stability of basic resource-using industries and rural communities throughout the region.

Multiple use resource management has been a rational response to economic dependency in areas characterized by substantial public land holdings. Distances separating interior producers from major markets, associated transportation costs, and natural productivity differentials place such producers at a competitive disadvantage. The land may not support a local economy if used only to produce trees, and in many cases cannot support an entire economy if used only to grow grass.

From the local perspective, an economy centered only on a recreation industry may be infeasible, suggesting the land cannot be devoted solely to wildlife habitat and watershed. But when and where the public lands can produce timber, range, outdoor recreation, watershed, and/or fish and wildlife outputs, the land can support viable timber, ranching, and outdoor recreation industries concurrently if used to serve all three purposes. It is this rationale, the embodiment of the greatest good for the greatest number as a public land management goal, that underlies the multiple use approach to public land management.

The multiple use concept provides a useful point of departure in evaluating the values of public land and water resources. None of these resource outputs (trees, grass, water, wildlife) have a direct monetary value since, in their natural state, none are exchanged in the marketplace. All are basic inputs which, when combined with labor, management, capital, and technology, are used to produce goods and services. Goods, such as logs or calves, and services like outdoor recreation do have economic value even though all are not priced in the marketplace. It is from the

These include the "Multiple-Use, Sustained Yield Act of 1960," "Forest and Rangeland Renewable Resources Planning Act of 1974," "National Forest Management Act of 1976," and "Federal Land Policy and Management Act of 1976." The four production-oriented acts are similar in that coordinated management of all resources is required. Achieving the greatest good for the greatest number, without impairing the land's productivity, is a common goal. Immediate uses to be considered in the decision-making process include those economic activities which depend on range and timber resources, watershed, fish and wildlife, and outdoor recreation. Values of public land resources in those multiple uses are to be established when possible on the basis of true market value, and on the basis of equivalent measures for resources not priced in the marketplace.

A second set of Acts of Congress is concerned with the tradeoffs between economic and environmental factors. These acts generally constrain the production-oriented, decision-making framework to protect or preserve public land areas of critical environmental or social concern, or to minimize the environmental costs of public land use decisions. They include the "Wild and Scenic Rivers Act of 1968," "National Environmental Policy Act of 1969," "Wild Horses and Burros Protection Act of 1971," "Endangered Species Act of 1973," and "Archeological and Historical Preservation Act of 1974." In one instance (the "Wilderness Act of 1974"), this second set of congressional initiatives establishes preservation of the resource base as an overriding public concern, "to secure for the American people of present and future generations the benefits of an enduring resource of wilderness."

Mostly because of provisions of the National Environmental Policy Act, public land management agencies are required to evaluate the impacts of either production or preservation oriented plans before final decisions are made, and to secure citizen participation in the evaluation process. The agencies have responded with regulations and procedures to be used in acquiring local and special interest group participation, preparing reports (environmental analysis, environmental impact statements), and developing management action plans (resource management, coordinated resource management, etc.). Court decisions repeatedly have confirmed the needs to assess private and public effects of proposed programs and consider special interests and local community preferences in formulating public land management and use plans. However, the regulations and procedures which have been developed often are viewed by local users and public land dependent communities, and often by environmental groups as well, as inadequate, leading to a less than equitable consideration of the effects of proposed public land use decisions.

Local users and dependent communities must share responsibility in the public land use decision-making process. Understanding how the process works is absolutely necessary. Organizing to present a common front, a local consensus of constructive concern, is invaluable. Presenting objective information on the local costs of proposed public land use decisions is indispensable.



market or non-market values of resources in their alternative uses that the values of public land resources are derived. Because other factors of production (labor, capital input like machinery, etc.) also are used in producing outputs, by resource-using industries, the derived values of public land resources used to produce one unit of output (e.g., one calf) are equal to only a portion of the value of that unit of output. As management alternatives available to the producer increases (for example, purchasing hay to replace public allotment AUM's or reducing herd size and shifting from cow-calf to cow yearling operations), the derived value of public land resources tends to decline.

The non-market values of public land resource outputs such as fish and wildlife are derived from the expenditures recreationists are willing to make to enjoy those resources. Willingness to pay is used as an equivalent for true market value for such resources. Alternatives available to the recreator, as a consumer, influence the value of non-market resources in the same sense as management alternatives affect the value of forage or trees. As opportunities for outdoor recreation increase, the derived values of fish, wildlife, and related public land resources decline.

Since it is easier to derive the values of resources used in producing marketable goods such as logs or calves, use decisions allocating more land to, say, outdoor recreation and less to grazing or commercial timber harvest often are evaluated by contrasting timber and forage benefits foregone with recreational opportunities gained. The value of foregone benefits represents the opportunity costs of recreation enhancement. If the opportunity costs is less than the recreation benefit, the decision is said to be economically efficient; and if not, the decision is inefficient. In the case of wilderness area decisions, the benefits associated with preservation of wilderness resources for present and future generations must be greater than the foregone timber, forage, and developed recreation benefits if the wilderness decision is to be judged economically plausible. While economic considerations are only one of several decision variables in the public land planning process, the opportunity costs of proposed decisions do provide a basis for evaluating prospective tradeoffs.

Efficient decisions may not be equitable. The distributions of benefits foregone by some user groups relative to the benefits gained by others also are relevant. If a resource management plan benefits ranchers while penalizing timber interests and recreators, or vice versa, an economically efficient decision may not be economically equitable. From the point of view of local resource users and dependent communities, a decision which is efficient in the national context may be viewed as quite inequitable by local people if they must forego benefits in the interests of greater net benefit at the national level.

For these reasons, citizens need to evaluate the local opportunity costs of public land use restrictions, and provide such information in an appropriate form and timely way to public decision-makers. Information on both the direct and indirect values of local costs (or foregone benefits) is relevant.

Direct costs (benefits) are, in essence, the reduction (increase) in monetary returns associated with the rights to public land resources -- just as the final value of privately owned resources is determined by the rate of return to owner. Indirect costs (benefits) are the reductions (increases) in final returns to other segments of the local economy induced by changes in economic activity in the basic resource-using industries. In either case, losses in household income attributable to reduced availabilities of public land resources are the appropriate measure of the local opportunity cost of public land use restrictions.

#### ESTIMATING LOCAL OPPORTUNITY COSTS OF PROPOSED LAND USE RESTRICTIONS

The local opportunity costs of two public land use restrictions, (1) the Strawberry Mountain and North Fork proposed wilderness areas in Grant and Umatilla Counties, Oregon; and (2) reduced availability of public grazing in the Baker grazing district (Baker County, Oregon) administered by the Bureau of Land Management, are evaluated below. Use is made of primary data input-output models developed by Oregon State University for Grant County, Oregon (1, 4). Additional information is derived from a M.S. thesis on the structure of the Grant County timber industry (2). Data on projected losses in grazing AUM's and timber harvest were provided by Forest Service and Bureau of Land Management personnel, timber and cattle industry sources, and two citizens group, the Grant County Resource Council and the Blue Mountain Resources Council. In both applications, local opportunity costs are measured as the present value of foregone household income from declines in public grazing and timber harvest. To be appropriately used in public decision-making, these values should be compared with benefits from increased recreation. From the local perspective, however, it must be remembered that only those increased recreation expenditures made in the local economy should be used to derive offsetting increases in household income.

#### North Fork and Strawberry Mountain Wilderness Areas

Although some public grazing could be lost, the primary effect of the proposed North Fork and Strawberry Mountain wilderness areas would be reduced commercial timber harvest. Based on an assumed harvestable timber growth rate of 153 board feet/acre/year, the proposed wilderness areas would result in an annual loss in programmed harvest of 17,302 MBF. Of this total, 4,002 MBF would be lost in the Strawberry Mountain area, and 13,300 MBF in the North Fork area. Under present sustained, non-declining yield policy, the annual loss in programmed harvest could not be offset by increased harvest levels elsewhere in the Malheur and Umatilla National Forests.

The species mix in annual programmed harvest loss is known for the proposed Strawberry wilderness area, and is assumed to be the same for the North Fork area. The species composition is 38.88 percent ponderosa pine, 55.56 percent associated species, and 5.66 percent lodgepole pine. For example, the 4,002 MBF loss in annual programmed harvest in the Strawberry area would consist of losses in harvestable ponderosa pine (1,556 MBF), associated species (2,220 MBF), and lodgepole pine (226 MBF).

"Normal" stumpage prices paid for ponderosa pine, associated species, and lodgepole pine in the vicinity of each of the wilderness areas were provided by Forest Service planning officers assigned to the two affected National Forests.<sup>1</sup> In the Strawberry Mountain area on the Malheur National Forest, these values were \$209, \$40.50, and \$8.50 per thousand board feet, respectively. The corresponding stumpage prices in the Umatilla National Forest's North Fork area were \$210/MBF for ponderosa pine, \$80/MBF for associated species, and \$10/MBF for lodgepole pine. Lodgepole pine values were for stands of predominantly dead trees caused by insect infestation.

Using those data, summarized in Table 1 below, the annual quantity and value of commercial timber harvest loss in the proposed wilderness areas can be estimated. These projected losses in timber sales, amounting to \$417,000 in the Strawberry area and \$1,684,000 in the North Fork area, may be interpreted as an equivalent reduction in National Forest System receipts. In total, \$2,101,000 in annual timber receipts (to the federal government) would be foregone in perpetuity as a consequence of the wilderness designations.

Table 1. Projected annual losses in National Forest system receipts attributable to proposed wilderness areas in the Strawberry Mountain and North Fork areas of Oregon

Species Group	Annual Harvest Loss			Value of Annual Harvest Loss		
	Strawberry Area (MBF)	North Fork Area (MBF)	Total Area (MBF)	Strawberry Area (\$000)	North Fork Area (\$000)	Total Area (\$000)
Ponderosa Pine	1,556	5,171	6,727	325	1,086	1,411
Associated Species	2,220	7,376	9,596	90	590	680
Lodepole Pine	226	753	979	2	8	10
ALL SPECIES	4,002	13,300	17,302	417	1,684	2,101

Some of these National Forest System receipts (25 percent) are returned directly to county governments in the form of "payments in lieu of taxes." These payments are made to compensate local governments for property tax and other revenues which would have been received if the local public lands had been in private ownership. The Strawberry Mountain wilderness area would result in foregone timber sale payments to Grant County of about \$104,000 per year, representing roughly two percent of total annual in lieu of tax payments to Grant County (Table 2).

<sup>1</sup> Personal communications with Chet Bennett, Malheur National Forest planning staff officer, and Richard Schimel, Umatilla National Forest timber sales officer, February 5, 1980.



Umatilla County would forego receipt of annual payments in lieu of taxes amounting to \$421,000, almost 50 percent of the total value of in lieu of taxes payments to that county, because of lost timber sales in the North Fork area. Smaller in lieu of taxes payments would be lost to Morrow and Baker County governments. As with National Forest System receipts, these in lieu of taxes payments to affected local governments also would be foregone in perpetuity.

Table 2. Projected annual losses in National Forest system payments in lieu of taxes to Grant and Umatilla Counties attributable to proposed wilderness areas in the Strawberry Mountain and North Fork areas of Oregon.

National Forest & Affected County Government			
Receipt or Payment	Malheur (Grant County)	Umatilla (Umatilla County)	Total
National Forest System Receipts	\$417,000	\$1,684,000	\$2,101,000
Payments in Lieu of Taxes	\$104,250	\$ 421,000	\$ 525,250

Uses by county governments of payments in lieu of taxes are "earmarked," and restricted in use: 75 percent of the payment must be used for roads and highways, and 25 percent for education. Research has confirmed that these payments in fact, are used for those specified services (3). It can be concluded that reduced payments from the loss of wilderness are timber sales would lead to reduced county expenditures on education of roughly \$26,000 per year in Grant County, and \$105,000 per year in Umatilla County. Road expenditures per annum would decline by \$78,000 and \$316,000 in Grant and Umatilla Counties, respectively. Expenditures for either service could, however, be held constant by imposing offsetting property tax increases on local residents. In either case, residents of the two counties would bear the costs of foregone payments in lieu of taxes.

Effects on Local Timber Industry Exports. Lost timber sales and foregone payments in lieu of taxes generate economic effects on local economics and local residents which are not entirely captured in the receipts and payments relationships described above. This is especially true of foregone timber sales where the immediate effect of foregone public timber harvest is reduced exports. Some of the National Forest sales would be to firms outside either county. Some would be to local firms which would either export logs or process them locally. Hence, foregone receipts result in (1) reduced "exports" of National Forest stumpage to nonlocal buyers, (2) reduced log export sales by local firms, and (3) reduced exports of processed timber products by local firms.

A recent analysis of the Grant County timber industry shows that, on the average, about 70 percent of the Malheur National Forest timber harvest is processed in the county and 30 percent is exported as logs (2). Not more than one-sixth of the log exports (five percent of total annual harvest) result from Malheur National Forest sales to firms outside of Grant County. For this analysis, it is assumed that the same proportions apply to both Umatilla National Forest sales and Umatilla County timber industry firms. In both proposed wilderness areas, annual foregone timber sales would reduce exports by National Forests by five percent, and would reduce sales to local firms by 95 percent, of the projected annual value of foregone timber harvest. Reduced log exports from the Malheur and Umatilla National Forests (purchases by nonlocal buyers), then, would amount to five percent of the values given in Table 1, or \$21,000 and \$84,000, respectively (Table 3).

Table 3. Projected annual losses in National Forest system log exports attributable to proposed wilderness areas in the Strawberry Mountain and North Fork areas of Oregon

	Value of Annual Harvest Loss	Percent Sold to Outside Firms	Value of Lost National Forest Log Exports
Malheur (Grant)	\$ 417,000	5	\$ 20,850
Umatilla (Umatilla)	\$1,684,000	5	\$ 84,200
TOTAL	\$2,101,000	5	\$105,050

Log export prices in the affected areas in part, are based, on timber sales in other years. In the long term, logs cannot be exported at a price less than the price paid for stumpage plus value-added. If it is assumed for the sake of simplicity that logs are exported by firms in the local timber harvest and hauling sector, value-added in that sector plus prices paid for National Forest stumpage is a reasonable value to attach to future foregone exports, by local firms, of logs which otherwise would have been harvested on National Forests in the proposed wilderness areas. Drawing on the 1978 input-output model of the Grant County economy, value-added in the timber harvesting and hauling sector is 70 cents per dollar of stumpage purchased. The implied future export values for Strawberry Mountain area stumpage, and for North Fork area stumpage, are as given in Table 4. These required export values are used to project the decline in annual value of log export sales by local firms in the two affected counties.



Table 4. Projected log export values and annual losses in private sector log export sales attributable to proposed wilderness areas in the Strawberry Mountain and North Fork areas of Oregon

National Forest, County, and Species Group	Actual & Expected Values		Values of Purchases & Sales	
	National Forest Stumpage (\$/MBF)	Private Sector Logs Exports (\$/MBF)	Value of Lost Stumpage Purchased to be Resold as Log Exports	Value of Lost Exports by the Local Private Sector
Malheur (Grant)				
Ponderosa Pine	209.00	355.50	\$ 81,300	\$138,300
Associated Species	40.50	68.90	\$ 22,500	\$ 38,200
Lodgepole Pine	8.50	14.50	\$ 500	\$ 800
All Species	104.20	177.20	\$104,300	\$177,300
Umatilla (Umatilla)				
Ponderosa Pine	210.00	357.20	\$271,500	\$461,800
Associated Species	80.00	136.10	\$147,500	\$251,000
Lodgepole Pine	10.00	17.00	\$ 1,900	\$ 3,200
All Species	126.60	2k5,39	\$429,900	\$716,000

The data in Table 4 show that, in addition to the regional decline in National Forest System stumpage exports of \$105,050 as reported in Table 3, an annual loss in future log exports by local firms of \$893,600 (\$177,300 in Grant County plus \$716,000 in Umatilla County) can be expected to the proposed wilderness areas are implemented. However, these foregone exports account for only 30 percent of the annual harvest loss in the two areas. The remaining 70 percent would have been processed into lumber and wood products by local industries.

Local wood processing firms in the two counties could purchase stumpage directly from the National Forest by bidding successfully for timber sales, or they could purchase logs from timber harvesting and hauling firms. If the processing firms were to buy directly from the National Forest System they, just as independent loggers, would add value through the harvesting and hauling activities. Additional value would be added as logs are processed into lumber and wood products. Again using the Grant County input-output model, value added in the lumber and wood products processing industry is

59 cents per dollar of logs purchased. The consistent export values for lumber and wood products, then, are 1.59 times the value of private sector log exports as reported in Table 4.

The relevant weighted average export value for lumber and wood products is \$281/MBF for Grant County processing firms ( $1.59 \times 177.20$ ), and \$342/MBF ( $1.59 \times 215.30$ ) for Umatilla County wood processors. As before, these expected export values for locally processed lumber and wood products are used to project the decline in annual value of wood product export sales by local firms in Grant and Umatilla Counties (Table 5), based on the assumption that 70 percent of the annual National Forest timber harvest would have been processed locally.

All data in Table 5 show how timber industry exports from Grant and Umatilla Counties would be affected by losses in programmed harvest because of proposed wilderness areas in the Malheur and Umatilla National Forests. For the two-county region as a whole, timber industry export sales would be

Table 5. Projected average lumber and wood product export values and annual losses in private sector export sales attributable to proposed wilderness areas in the Strawberry Mountain and North Fork areas of Oregon.

National Forest & County	Expected Export Values		Values of Foregone Exports		
	All Logs (\$/MBF)	Lumber & Wood Products (\$/MBF)	All Logs (\$000)	Lumber & Wood Products (\$000)	All Private Sector Exports (\$000)
Malheur (Grant)	177.20	281.25	177.3	787.9	965.2
Umatilla (Umatilla)	215.30	341.70	716.0	3,181.2	3,897.2
TOTAL	-----	-----	893.3	3,969.1	4,862.4

expected to decline, on an annual basis, by \$4,862,400. An additional \$105,050 in National Forest System exports to nonlocal firms would be lost as well, bringing the total annual decline in value of regional exports to \$4,967,450. These foregone exports are significantly higher than the value of annual harvest loss reported in Table 1 (2,101,000). The magnified loss in export sales is from the structure of local dependent economies. In both counties, an economic base heavily depends on the use of public land resources has been established. When those resources are withdrawn from use, local economies and local residents bear the costs.

Effects on Local Timber Industry Exports. Just as economic activity in local timber industries depends on National Forest System management and land use policies, so are all other sectors of local economies related to the timber industry. The nature and degree of these structural relationships can be measured. One form of measurement is an input-output model of the local economy. The 1978 Grant County input-output model (4) is used here to evaluate the effect, on the county economies, of reduced National Forest and timber industry exports. Effects on county-level economic activity of reduced payments in lieu of taxes are evaluated as well. It is assumed that Grant and Umatilla Counties are structurally similar, differing essentially on the basis of greater overall size of the Umatilla County economy.

An input-output model can be used to estimate benefits foregone because of decreased exports (sales to final demand) or benefits gained from increased exports. The initial change in exports, or sales to final demand, is the direct effect of interest. Induced or indirect changes are measured by the increased (or decreased) transactions inside the county which result from an initial change in economic activity. For example, decreased timber harvest, translated into decreased timber industry exports, would cause a decrease in purchase of products required to harvest, haul, and process that resource. Mill owners might lay off local employees, but less electricity or fuel, and forego purchases they otherwise would have made. Residents who sold their labor, electricity, or fuel would have to decrease their purchases inside and outside the county. Likewise, businesses in the county that sell to residents, energy suppliers, and fuel firms would have to decrease their inside and outside purchases. Hence, the effects of the initial changes in timber harvest and export sales "ripple" throughout the local economy, leading to a multiplied impact in the economy as a whole.

The Grant County input-output model, as do other such models, provides an estimate of the multiplied impact of change in exports. Multipliers are estimated for each sector of the economy, and the values of these multipliers differ among sectors. Those sectors most closely tied to other sectors of the economy generally have higher multipliers. For the National Forest, timber harvest and hauling, and lumber and wood products processing sectors the Grant County multipliers are 1.94, 2.59, and 2.55, respectively. Assuming that these sectoral multipliers also apply to Umatilla County, the gross economic impact of reduced export sales attributable to timber harvest losses in the two proposed wilderness areas can be projected. These impacts are summarized in Table 6.

The interpretation of these estimates is straightforward. Under the assumption stated earlier, foregone timber harvest in the proposed Strawberry Mountain wilderness area would lead to reduced business activity in Grant County. The annual reduction is more than 2 ½ million dollars in current prices. The North Fork wilderness area would impose a similar loss on Umatilla County business activity, valued at more than \$10 million dollars per year. Total regional loss in gross activity is valued at \$12,638,600 per year.



Table 6. Projected gross economic effects of reduced export sales attributable to proposed wilderness areas in the Strawberry Mountain and North Fork areas of Oregon

County	Sector and Impact							
	National Forest		Timber Harvesting & Hauling		Lumber & Wood Products		Total	
	Foregone Exports (\$000)	Total Loss (\$000)	Foregone Exports (\$000)	Total Loss (\$000)	Foregone Exports (\$000)	Total Loss (\$000)	Foregone Exports (\$000)	Total Loss (\$000)
Grant	20.9	40.5	177.3	459.2	787.9	2,009.1	986.1	2,508.8
Umatilla	84.2	163.3	716.0	1,854.4	3,181.2	8,112.1	3,981.4	10,129.8
Regional Total	105.1	203.8	893.3	2,313.6	3,969.1	10,121.2	4,967.5	12,638.6

An additional loss in business activity would result from reduced payments in lieu of taxes. As indicated in Table 2, payments to Grant County would be reduced by \$104,250, and payments to Umatilla County by \$421,000 per year. The Grant County local government multiplier is 2.79. Since "exports" of county government services would be reduced by the amounts of the reduced in lieu of taxes payments, local economic activity would again suffer. The amount of foregone gross economic activity in Grant County is \$290,850 per year. Foregone economic activity in Umatilla County is \$1,174,600 per year.

These totals are added to the impacts appearing in Table 6. Reduced annual economic activity in Grant County because of the Strawberry Mountain Wilderness area is \$2,799,650; reduced activity in Umatilla County is valued at \$11,304,400 per year. The annual regional loss is \$14,104,050. All impacts attributable to the proposed wilderness areas are summarized in Table 7.

Table 7. Projected annual losses in National Forest system receipts, value of county export sales, and gross county-level economic activity attributable to proposed wilderness areas in the Strawberry Mountain and North Fork areas of Oregon

County & National Forest	Value of Projected Loss (\$000)		
	National Forest Receipts	Total Exports	Gross Economic Activity
Grant (Malheur)	417	1,090.4	2,799.7
Umatilla (Umatilla)	1,684	4,402.4	11,304.4
Regional Total	2,101	5,492.8	14,104.1

The Local Opportunity costs of Wilderness Areas. The gross impacts reported in Table 7 above overstate the local opportunity costs of the proposed wilderness areas. As said earlier, reduced household income attributable to the restricted public land use actions is the appropriate measure of net benefits foregone. To some extent, these net benefits foregone may be offset by new expenditures associated with wilderness area maintenance or use. However, three qualifications apply. First, only those expenditures made in the two affected counties are relevant. Second, lost recreation expenditures associated with present and future developed recreation activities in the affected portions of the National Forests must be deducted from new expenditures associated with dispersed recreation. Third, only that portion of net recreation expenditures which increases local household income is relevant. With these qualifications in mind, the local opportunity costs of the proposed Strawberry Mountain and North Fork wilderness areas can be measured.

Table 8. Projected annual losses in local household income attributable to proposed wilderness areas in the Strawberry Mountain and North Fork areas of Oregon

County and Economic Sector	Value of Projected Loss		
	Gross Economic Activity (\$000)	Households' Share (Percent)	Household Income (\$000)
<b>Grant</b>			
Timber harvesting and hauling	459.2	27.07	124.3
Lumber and wood processing	2,009.1	23.00	462.1
Local government	290.9	23.44	68.2
National Forest	40.5	25.76	10.4
Total	2,799.7	-----	665.0
<b>Umatilla</b>			
Timber harvesting and hauling	1,854.5	27.07	502.0
Lumber and wood processing	8,112.1	23.00	1,865.8
Local government	1,174.6	23.44	275.3
National Forest	163.3	25.76	42.1
Total	11,304.4	-----	2,685.2
Regional Total	14,104.1	-----	3,350.2

Table 9. The local opportunity costs of proposed wilderness areas in the Strawberry Mountain and North Fork areas of Oregon

County	Annual Household Income Loss	Present Value or Opportunity Cost
Grant	\$ 665,000	\$ 6,650,000
Umatilla	\$2,685,200	\$26,852,000
Regional Total	\$3,350,200	\$33,502,000



As before, the Grant County input-output model is assumed to apply to Umatilla County as well. The model can be used to calculate the portion of gross economic activity in any sector which is from sales of labor, by local households, to local employers. The contribution of labor to total economic activity varies among sectors of the local economy. Hence, the effect on household income of change in local economic activity because of the wilderness areas is a combined effect of reduced export sales by the National Forest, local timber harvesting and hauling firms, local lumber and wood processing firms, and local government.

In Grant County, households capture 27.07 percent of the gross income induced by exports of logs by local timber harvesting and hauling firms. Households receive a slightly smaller share of total income attributable to National Forest stumpage, local government, and local lumber and wood products exports -- 25.76, 23.44, and 23.00 percent, respectively. Using these percentages, the annual losses in local household income attributable to the proposed wilderness areas can be calculated, (Table 8).

These figures show that Grant County households would bear a substantial cost for the Strawberry Mountain wilderness area. In current dollars, the annual value of that household income loss is \$665,000. Umatilla County residents would lose \$2,685,200 in annual household income. For the region as a whole, \$3,350,200 in household income would be lost each year.

Since this household income would be lost in perpetuity, it is possible to estimate the present value of the local income stream foregone as a consequence of the wilderness area decisions. The present value of foregone income varies with the long-term interest (social discount) rate. A conservative rate is 10 percent, meaning that the present value of foregone household income is 10 times its annual value (annual income lost divided by 0.10). The present values of local household income foregone as a consequence of the proposed wilderness area designations appear in Table 9. They are the most appropriate measure of the local opportunity costs of the wilderness area decisions.

#### Baker Grazing District AUM Reduction

Evaluating the local impacts of public grazing reductions is difficult. Ranchers dependent on public lands for grazing also use private pasture and/or rangeland to support their cattle or sheep operations. Hence, substitution of private forage (AUM's) is a possibility, although studies have shown that in Eastern Oregon, hay and pasture are more likely to be a complimentary part of a ranching operation than a separate enterprise engaged in hay production and selling (5). Further, public AUM's legally cannot be bought or sold, and therefore, have no observable market price. The value of a public AUM is derived from its contribution to returns to the ranch operation; and the rancher, in turn, owns cattle, private land, and other assets. Thus, he may have management alternatives which permit him to shift from, say, cow-calf to cow-yearling operations so as to partially offset the effects of public AUM withdrawals. However, the feasible alternatives for a ranch

operation are dependent on the rancher's financial position (especially long-term debt), and the unique land ownership and public land access rights of his operation. Consequently, the adaptation ranchers can and will make to losses in grazing privileges will vary from case to case.

For these reasons, and others, assessing the local economic effects of public grazing restrictions is more complicated than evaluating the impacts of lost programmed timber harvest. Assumptions must be made about the expected management response of ranchers to public grazing reductions, the availability of private pasture and hay on the ranch and in the local area, and the typical financial ownership characteristics of affected operations.

It is also necessary to distinguish between short-term response and longer-term adaptation to the reduced availability of public grazing. In the short-term, operations may attempt to hold cow herd or sheep band size at present levels by buying hay or renting pasture. However, because these practices add to annual operating costs, in the longer-term, herd size may have to be reduced. If cows are sold, the rancher will have fewer calves to sell; and his annual income and ability to repay long-term debt, if any, will be reduced. Depending on the operator's financial position, either maintaining herd size by buying hay or reducing herd size to accommodate decreased public AUM availability may be economically infeasible. The operations then may be sold.

To prevent sale of the operation or restore its economic viability, the rancher has two options: If capital is available, he may invest in his own private land to increase its carrying capacity through range fertilization and reseeding, irrigation, etc. If capital is unavailable, or the operator feels that costs and prices are attractive, a different form of management such as chow-short yearling or backgrounding may be adopted. In the absence of such a change in management, however, the long-term outcome of public land withdrawal likely will be fewer, but larger, ranching operations and higher average costs per calf sold.

In Eastern Oregon, as in most of the interior West, range livestock numbers over the long-term are at levels which fully utilize pasture and forage. In a "normal" or "average" year, there will be little or no export of grass or native hay from the region, and all pasture available for use will be taken. Even if operators try to maintain herd size by buying hay or renting pasture, they will be able to do so in the long-term only at very high hay purchase prices or pasture rental rates, if at all. Alfalfa hay, which is expected from many areas, perhaps could be purchased and mixed with straw as a substitute for native or grass hay. However, alfalfa hay mixed with straw would have the same effect on annual operating costs as would purchase of native hay. In either case, annual operating costs for the affected operation would increase.

Barring a change in management, the more likely and least costly long-term alternative to hay purchase is reduced herd size and calve sales. It is this alternative which is assumed for purposes of projecting the local economic impacts of public AUM losses in the Baker grazing district administered by the Bureau of Land Management.

Effects on the Dependent Ranching Sector. In the Baker grazing district, about 56,000 surveyed AUM's exist; more than 50,000 (89 percent) are allocated through licensing to permittees (Table 10). The remaining 11 percent of the existing AUM's are allocated to other users, especially elk and deer. Under a proposed range management plan, the allocation of AUM's to livestock will be reduced by 9,827 AUM's to 40,413 AUM's per year. The proposal would reduce the proportion of total available forage in the grazing district allocated to livestock from 89 to 72 percent, while the proportion dedicated to other uses would increase from 11 to 28 percent. At issue are the tradeoffs associated with the proposed reallocation of forage AUM's; specifically, the benefits foregone by local ranchers and the local community to enhance range condition and support uses and users other than the public land dependent ranching industry.

Table 10. Proposed reduction in animal unit months of grazing on the Baker District administered by the Bureau of Land Management, Baker County, Oregon

Number or Percent	Surveyed AUM's	Licensed AUM's		Loss in Livestock AUM's
		Existing Situation	Proposed Situation	
Number	56,261	50,240	40,413	9,827
Percent of Surveyed AUM's	100	89	72	17
Percent of Presently Licensed AUM's	112	100	80	20

On an animal unit basis, the 9,827 AUM's lost to livestock grazing is equivalent to 1,228 cow-calf pairs, assuming that, on average, cattle in the local dependent ranching industry are using forage other than private pasture and hay for eight months of the year. However, the forced sale of 1,228 cows would result in surplus hay and/or pasture, otherwise used to feed cattle during the winter. If, on average, cattle are wintered for four months on private land in the Baker County area, 409 of the 1,228 cows could be maintained using pasture and forage grown on privately owned land. The net effect of the public grazing reduction (Table 11) then would be the sale of 819 cows.



Table 11. Reduced cow herd size and calf sales by dependent ranchers in Baker County, Oregon, resulting from a proposed reduction in animal unit months of grazing on the Bureau of Land Management's Baker District

Item	Amount
Change in animal unit months of livestock grazing	- 9,827
Change in cows grazed on public land	- 1,228
Adjustment for private pasture and hay	+ (409)
Net change in cow herd size	- 819

As suggested earlier, the income resulting from the forced sale of 819 cows could be used to reduce debt and/or increase the household income of ranchers. Alternatively, the money could be used to purchase long-term bonds yielding, say, 10 percent interest. However, in future years income obtained from the sale of cull cows and bulls also would be reduced. Assuming a 10 percent culling rate for cows, and ignoring bulls, the annual ranch income effect of forced cow sales is exactly offset by the value of reduced future cull sales. Net income to the rancher is unaffected.

However, calf sales are affected (Table 12). A 75 percent calf crop is assumed based on a 85 percent conception rate, 90 percent live calf ratio, and two percent death loss to weaning. This means that 614 calves would not be available for herd replacement or sale as a result of the AUM reduction. Of the 614 calves, 307 steers and 192 heifers would have been marketed, assuming that 115 heifers would be held for replacement of cows culled or subject to death loss (14 percent replacement rate). Hence, on an annual basis, the public grazing reduction would result in 499 fewer calves sold.

Valued in 1979 dollars, an "average" or "normal" long-term selling price for steers and heifers of 75 and 65 cents per pound, respectively, is assumed. If the average selling weight for steers is 425 pounds, and for heifers 375 pounds, \$318.75 in gross ranch income would be foregone per steer not sold and \$243.75 would be foregone per heifer calf not sold. Thus, the proposed grazing restriction would result in 499 calves not marketed, and \$144,656 in gross ranch sales would be foregone per annum.

Effects on Local Industry Exports. Under assumptions of this analysis, export sales by the local dependent ranching industry would decline by about \$145,000 from present levels. Other sectors of the local economy also would experience lost "export" sales. Under current law, Section 15 lands administered by the Bureau of Land Management result in an apportionment of grazing fee receipts among the federal treasury (25 percent), rangeland improvement on local public grazing lands (25 percent), and payments to local and state government (50 percent). Non-section 15 land receipts are allotted to range improvements (25 percent), The Department of Interior (25 percent), the federal treasury (43 3/4 percent), and local government (6 1/4 percent).

Table 12. Reduced calf sales by dependent ranchers in Baker County, Oregon resulting from a proposed reduction in animal unit months of grazing on the Bureau of Land Management's Baker District

Item	Amount
Net change in cow herd size	- 819
Gross change in calves for sale and replacement	- 614
Heifer calves to have been kept for replacement	+(115)
Net change in calves sold	
Steers	- 307
Heifers	- 192
All calves	- 499
Selling price of calves	
Steers	75¢/lb.
Heifers	65¢/lb.
Selling weight of calves	
Steers	425 lbs.
Heifers	375 lbs.
Value of Calves to be sold	
Steers	\$318.75/calf
Heifers	\$243.75/calf
Net change in value of calf sales	
Steers	-\$ 97,856
Heifers	-\$ 46,800
All calves	-\$144,656

In 1979, the grazing fee was \$1.89 per AUM, meaning that a 9,827 AUM reduction in licensed grazing would result in \$18,573 in foregone gross receipts, per year, by the Bureau of Land Management. Since none of the affected AUM's are Section 15 lands, the net annual loss in payments to local government would be \$1,161. The federal treasury would lose \$8,126 in annual receipts. Both the Department of Interior and local range improvement funds administered by the Bureau of Land Management Baker District would decline by \$4,643.

Since the Bureau of Land Management normally receives back from the federal treasury those monies paid to the treasury and to the Department of Interior, plus those earmarked for range improvements, the effect of the reduction in public grazing could be interpreted as \$17,412 loss in Bureau of Land Management "export" sales. In reality, the return of funds paid into

the treasury or to the Department of Interior are not assured. Further, the effects of foregone range improvement funds are taken into account by the input-output model. Hence, Bureau of Land Management "export" sales are unaffected by the reduction in grazing fee receipts.

However, payments to local government would be reduced by more than \$1,161 per year. Consequently, the proposed reduction in federal grazing privileges, given the assumption stated above, could be expected to result in a total loss of exports from Baker County valued at \$145,817 per year. Ranching sector exports would decline by \$144,656, and local government exports by \$1,161. In summary, export sales from Baker County would decline from current levels by just under \$150,000 annually as a result of the loss of public grazing (Table 13).

The Gross Economic Costs of Reduced Exports. Using the Grant County input-output model, the gross economic impacts associated with these losses

Table 13. Projected annual losses in Baker County export sales attributable to a proposed reduction in animal unit months of grazing on the Bureau of Land Management's Baker District

Economic Sector	Value of Foregone Exports
Dependent Ranching	\$144,656
Local Government	\$ 1,161
TOTAL	\$145,817

in export sales can be calculated. The sectoral multipliers relevant to the local dependent ranching industry and to the local government sector are 2.39 and 2.79, respectively. Assuming that these multipliers also apply to Baker County, the annual lost business transaction in Baker County attributable to the public land use restriction would be (1) \$346,306 resulting from foregone calf sales; and (2) \$3,238 because of lost payments to local government. The total gross impact on the local economy (Table 14) would be almost \$350,000 per year.

Table 14. Projected gross economic effects of reduced export sales attributable to a proposed reduction in animal unit months of grazing on the Bureau of Land Management's Baker District

Economic Sector Generating Impact	Value of Gross Economic Impact
Dependent Ranching	\$346,306
Local Government	\$ 3,238
TOTAL	\$349,544

The Local Opportunity Costs of Reduced Federal Grazing. As in the wilderness area example, the gross economic impact of the reduced federal grazing privilege overstates the local opportunity cost of the proposed action. Reduced household income in the county again is the appropriate measure of net benefits foregone. As before, the Grant County input-output model may be used to calculate the portion of gross economic activity in any sector of the economy that is from sales of labor or other household services to local employers. In Grant County, households capture 21.48 percent of the gross income induced by export sales of calves and 23.44 percent of the income resulting from local government exports.

Applying these percentages to the gross business activity effects derived above yields the household income impacts of the federal land use decision (Table 15). In 1979 dollars, more than \$75,000 in household income would be foregone each year. The bulk of the foregone annual household income, \$74,387, is from decreased economic activity resulting from lost calf sales. Of the \$74,387, roughly 60 percent (\$45,038) in net income would be foregone by those ranchers using the grazing lands which will be withdrawn.

Table 15. Projected annual losses in Baker County export sales, gross economic activity, and household income attributable to a proposed reduction in animal unit months of grazing on the Bureau of Land Management's Baker District

Economic sector generating impact	Value of projected loss		
	Export sales	Gross economic activity	Household income
Dependent Ranching	\$144,656	\$346,306	\$74,387
Local Government	\$ 1,161	\$ 3,238	\$ 759
TOTAL	\$145,817	\$349,544	\$75,146

As in the wilderness example, the household income would be lost in perpetuity. The present value of the foregone income stream, using the relatively conservative rate of 10 percent, is \$751,460. Of this amount, more than half (60 percent or \$450,000) is the present value of the public grazing access rights (or license) given up by public land dependent ranchers.

#### SUMMARY AND IMPLICATIONS

Analysis of the proposed Strawberry Mountain and North Fork wilderness areas and the Baker grazing district management proposal show the costs to local residents of those decisions are indeed substantial. These values, or opportunity costs, may be interpreted in different ways.



Abstracting from the net local benefits, if any, attributable to the wilderness areas, local residents in Grant and Umatilla Counties would give up household income valued in current prices at well over three million dollars per year. The present value, or local opportunity costs, of foregone income exceeds 33 million dollars.

If, in fact, the purpose of wilderness areas is "to secure for the American people of present and future generations the benefits of an enduring resource of wilderness," it follows that America could accept responsibility for the burden those limited use designations impose on local people living in public land dependent communities. There are about 7,700 people who live and work in Grant County. Another 54,000 live in Umatilla County. If these local people were to be equally well off with or without the wilderness areas, they could be reimbursed by America on behalf of present and future generations who derive benefits from the wilderness. In this instance, a payment of \$864 to each man, woman, and child in Grant County, and a payment of \$497 to each Umatilla County resident, would be warranted.

Looking at the local costs somewhat differently, local timber firms and their employees depend on National Forest timber harvest for their livelihood. The "right to access" to that timber, while not legally recognized, is viewed by local people as more than a mere privilege. Local wood products firms would be willing to sell their "access rights" for an amount equal to the contribution National Forest stumpage makes to their household income.

If the foregone household income reported in Table 8 holds, approximately 50 percent (\$1,654,600) is lost to local dependent timber industry households. Since 17,302 MBF would be withdrawn from programmed harvest, the implication is that the timber industry households would sell their National Forest stumpage "access rights" for an average price of \$956/MBF, assuming that the 17,302 MBF are foregone in perpetuity. The additional lost household income (\$1,695,600 per year) could be reimbursed on a per capita basis to all remaining county residents. The average payment to non-timber industry households would be \$30.83 per person. These alternative compensation payments are depicted in Table 16.

Table 16. Compensation alternatives for county residents bearing the costs of proposed wilderness areas in the Strawberry Mountain and North Fork areas of Oregon

County	Uniform Per Capita Payment (\$/Person)	Access Right Purchase and Residual Per Capita Payment	
		Access Right (\$/MBF)	+ Per Capita (\$/Person)
Grant	\$863.63	\$820.59	\$67.32
Umatilla	\$497.26	\$997.14	\$27.18
Weighted Average	\$542.98	\$956.31	\$30.83

The impacts of the Baker grazing district AUM reduction can be interpreted in an analogous fashion. Since the present value of the lost AUM's is \$751,460, and there are 17,000 people living in Baker County, it follows that the nation could reimburse each resident for the opportunity foregone by removing the public grazing from livestock use. In this case, present residents would be equally well off with or without the 9,827 AUM's if each were to receive a check for \$44.20. However, such a compensation method ignores the fact that the distribution of costs borne by local residents is uneven.

Another approach would be to reimburse ranchers using the AUM's in question in proportion to their loss in final household income. In the present instance, each rancher would be paid \$45.79 (\$450,000 divided by 9,827 AUM's) for each AUM he or she formerly used -- a measure of the present value of his access right or license. Other people living and working in the county would be reimbursed for final income foregone because of reduced calve and local government exports. Their compensation payment would be about \$17.73 per person. Compensation alternatives in the grazing district AUM reduction example are given in Table 17.

Table 17. Compensation alternatives for county residents bearing the costs of proposed grazing reductions on the Bureau of Land Management's Baker District, Baker County, Oregon

County	Uniform Per Capita Payment (\$/Person)	Access Right Purchase and Residential Per Capita Payment	
		Access Right (\$/AUM)	+ Per Capita (\$/Person)
Baker	\$44.20	\$45.79	\$17.73

Compensating local people for income foregone, or access rights lost, because of public land use restrictions is, perhaps, unrealistic. However, as this analysis has shown, it is not unrealistic for persons living and working in public land dependent communities to be concerned with those decisions. The magnitude of the costs imposed on local economies, firms, and households lends credence to their efforts to influence the public land decision-making process.

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