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Estimates of the Values of Elk in the Blue Mountains of Oregon and Washington: Evidence from the Existing Literature

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Abstract

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Existing literature was used to estimate the economic value of elk to hunters and wildlife watchers, and the economic impact on personal income to local communities in the Blue Mountains (Blues) of Oregon and Washington. An annual survey of hunters at the Starkey Experimental Forest and Range provided data for estimated elk hunting values and expenditure impacts. The Starkey data show an estimated median value of about $118 per trip in 1991 dollars; assumptions allowing a mean per-day value, over and above expenditures, result in a potential range of $39 to $78. A previous literature review of hunting valuation studies in the West was updated and converted to 1991 dollars; these data show elk hunting values of $7 to $82 per hunter day with an average of $45. The value of the elk hunting season in the Blues was estimated to be $17 to $20 million per year. Estimated average hunter expenditures in northeast Oregon were $23 per hunter day ($10 million annually), for a personal income impact of $10.31 per hunter day ($5 million annually). Average expenditures State-wide were $48 per day ($19 million annually), generating a State-wide personal income impact of $36 per hunter day ($14 million annually). Values and expenditure data for viewing elk were scarce; estimated per-day values from the compiled studies ranged from about $13 to $48 per activity day for non-consumptive wildlife use State-wide. If just one of the eight trips taken for non-consumptive use were to view elk, then the worth of elk viewing in Oregon would range from $11.5 to $42 million, averaging about $22 million annually. If four of the elk viewing sites in the State were further developed to attract half of the users and users took one annual trip to do so, worth would range from $6 to $21 million (averaging $11 million) annually. Of that, $1.3 to $4.8 million annually ($2.5 million on average) could be attributed to the elk viewing site in the Blues if it was further developed. Personal income impacts from viewing elk are not well known but are estimated to generate $8 to $10 million per year in Oregon if one trip annually is taken by nonconsumptive Users to view elk. If the four viewing sites are developed, elk viewing could potentially account for about one-half (or $3.8 to $5.2 million) of the personal income State wide. The Blues could capture about $1 million in personal income by further developing the site there.

Keywords: Big game, Blue Mountains, community impacts, economic values, elk, hunter expenditures, hunting, Oregon, valuation, viewing, Washington.

Contents

Introduction

Economics, as a tool, has much to offer wildlife management; economic values are important in the efficient allocation of scarce resources, and expenditure impacts are important in understanding local economic effects on counties wanting to diversify their economic base. Both types of information can be of direct use to communities, counties, state development divisions and wildlife departments, Federal natural resource agencies, recreationists, and entrepreneurs for management of wildlife, recreationists, and land.

The Blue Mountains (Blues) of northeast Oregon and southeast Washington (fig. 1) serve as a case study. Most landowners there receive little or no monetary compensation for involuntary participation in the production of Rocky Mountain elk *{Cervus elaphus nelsoni),* and yet they carry the cost of damage to reforestation efforts, agricultural crops, and forage managed for livestock. Despite these [prevalent concerns, elk also provide many significant economic and recreational benefits to the area. These benefits are enjoyed by recreationists, such as elk hunters and viewers, as well as communities, counties, landowners, and entrepreneurs.

Potential economic values exist for landowners to offset their costs and for entrepreneurs as well, such as in fee hunting and viewing operations or elk ranching. Research into these particular opportunities, however, is not considered in this report; the former is difficult to sustain under the controlled hunt market that exists in the Blues, and the latter is now restricted in Oregon and Washington by legislation. mainly due to disease and interbreeding risks.

Hunters, however, gain economic and recreational value or benefit during the hunting season, and the general public enjoys viewing elk throughout the year. Expenditures by these recreationists provide communities, counties, and entrepreneurs with a significant increase in business activity. The analysis of these values and expenditures can show how careful management of elk recreation and habitat can be a benefit and stimulus to the economy.

Despite the potential significance of the economic values and impacts of recreationists to local communities of the Blues, few economic analyses have been conducted to estimate their specific value and impact. Recognizing the bias of only looking at costs and foreseeing the potential value of elk, the Blue Mountain Elk Initiative (BMEI),[7] consisting of 27 public and private cooperators, commissioned this report to integrate and make useful the information on the economic values of elk to hunters and local communities. This report expands on that somewhat by summarizing the available and relevant economic information that exists on elk hunting and viewing recreational values and expenditure impacts; applying the results to the Blues. The recreational value of elk hunting and viewing as well as personal income impacts with data from the Starkey Experimental Forest and Range (Starkey) are calculated and compared with other relevant studies found. Research needs are identified, and how best to transfer new information, such as that in this report, to users is discussed

[1] Blue Mountain Elk Initiative (BMFI). 1991 Blue Mountains elk initiative charter for 1991-95 La Grande, OR U S Department of Agriculture, Forest Service, Pacific Northwest Research Station 40 p. On file with Gene Silousky, Fish, Wildlife, and Botany, USDA Forest Service, Pacific Northwest Region, P.O Box 3623, Portland, OR 97208-3623

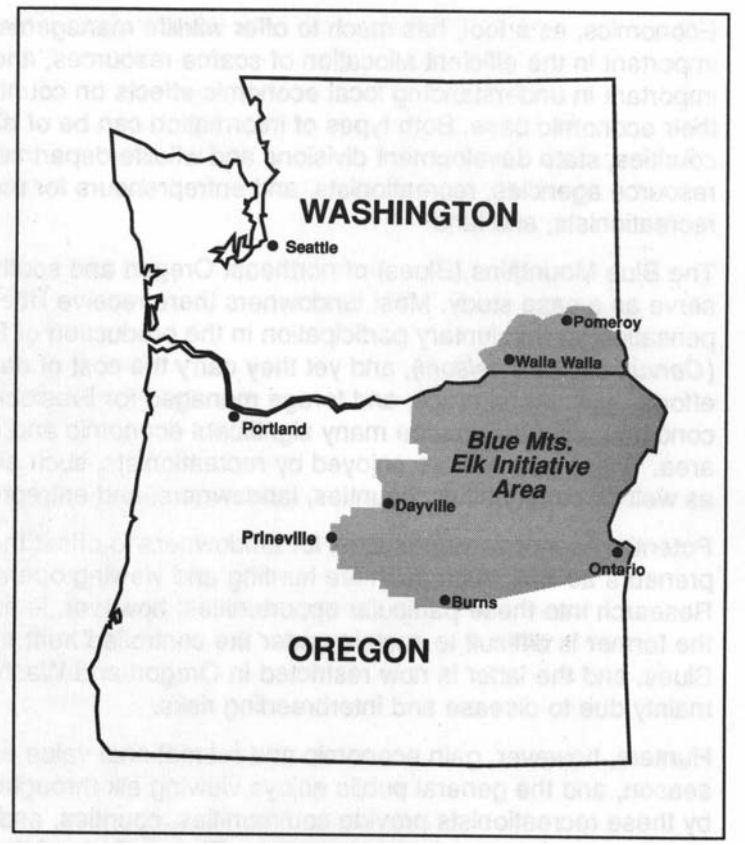

Figure 1—The Blue Mountain region of northeast Oregon and southeast Washington

Background

The economic value of elk to hunters and viewers and the impact of their expenditures on local communities, particularly in the Blues, is not well understood. It is first important to understand the difference between economic value and the impacts related to expenditures. Please refer to appendix 1 for further definition of economic value, benefits, expenditures, impacts, and their proper uses.

Two categories of wildlife use exist that are not always mutually exclusive: consumptive and nonconsumptive. Consumptive use includes any activity that results in taking or removing wildlife from nature, such as in hunting, trapping, and fishing. Consumptive use is further divided into recreational, subsistence, and commercial use. Nonconsumptive use includes any use that does not require removal of the wildlife species and has both recreational and commercial interests. Examples of nonconsumptive use are observing, photographing, and feeding wildlife. The magnitude of interest in Oregon and Washington for both uses is discussed below.

According to statistical reports from the Oregon Department of Fish and Wildlife (ODFW) and the Washington Department of Wildlife (WDW), the Blues hosted 55,861 elk hunters in Oregon and 7,921 in Washington during the 1991 hunting season (ODFW 1990, 1991 a; WDW 1992). This is down from previous years: 62,575 in 1990 and 64,186 in 1989 (ODFW 1990, 1991 a) in Oregon, and 8,643 in 1989-90 in Washington (WDW 1990). The decline most likely is due to implementation of controlled permit hunting during the early rifle season in Oregon in 1991, which restricted the number of early season elk hunters.[2] Despite this small loss, elk hunters continue to be a significant component of all hunters recreating and spending money in the Blues and two states.

The demand for nonconsumptive use of wildlife in the United States has been projected to increase more than 150 percent by 2040 from the current use (Flather and Hoekstra 1989). Nonconsumptive use is primary nonresidential use and is defined here as residents and nonresidents 16 years or older who took trips 1 mile or more from home for the primary purpose of observing, photographing, or feeding wildlife (USDA Forest Service 1990; USFWS 1993a, 1993b).

Data in table 1 are from the 1991 national survey of fishing, hunting, and wildlife-associated recreation (national survey) and allow a comparison of annual trip-related (or variable expenditures with equipment excluded) with the number of resident and nonresident hunters (of all species) and nonconsumptive users in Oregon and Washington (tables 13 and 57 in USFWS 1993a, 1993b). We are interested primarily in trip-related expenditures because they are the ones made on the way to and in the area where the activity occurs.

Given the recreational demand for elk in Oregon and Washington, it is important to understand the economic impacts of such pursuits to local communities and counties. These values are important for the efficient allocation of resources. For example, how will current and future forest and range management in the Blues affect the economic value of wildlife recreation, and what are the impacts to the communities? How will the revenue and future management plans of state wildlife departments be affected by management for different resources by other agencies? These are important questions that often arise during the resource allocation process among land users and agencies.

Methods

A review of the literature relevant to the Blues of Oregon and Washington about economic aspects of natural resources in general was conducted by the Blue Mountain Natural Resource Institute (BMNRI) in 1992. In cooperation with the BMNRI study, the literature search was augmented to include studies in the West specific to elk. Several studies were selected for their pertinence in indicating economic values of elk to communities in the Blues.

[2] Personal communication 1993 Mike Wisdom, wildlife biologist, Pacific Northwest Research Station, Forestry and Range Sciences Lab, 1401 Gekeler Lane, La Grande, OR 97850

Table 1—Annual variable expenditures and numbers of resident and non-resident hunters and nonconsumptive users in Oregon and Washington

	Hunters				Nonconsumptive users		
		Variable expenditures				Variable expenditures	
State	Number[a]	Total	Per person	Hunt elk	Number	Total	Per person
		Million dollars	*Dollars*	*Percent*		*Million dollars*	*Dollars*
Oregon	490.600	56.3	115	20.9	882,000	169	192
Washington	590,700	66.5	113	11.5	1,058,000	267	252

[a] A hunter that hunts big game and game birds is counted twice.

Little information was found specific to the Blue Mountains of Washington. Most of the Blue Mountain region, however, falls within Oregon. Therefore, estimated values and impacts reported in this study for the Blues of Oregon are assumed to be similar to those that would be found in the Blues of Washington, if such data existed. This would not necessarily be true for these States outside of the Blues, as values, and particularly impacts, may differ between the two States.

Due to the lack of relevant studies specific to the Blues, most of the selected studies were conducted outside that area. The different methods used to estimate hunting and nonconsumptive wildlife values and expenditures in those studies complicated their use and comparability. Also, a lack of data forced assumptions to be made as the study progressed, so that final values and impacts could be estimated. Detailed assumptions and methods therefore are combined for discussion in the section "Results" where the findings are reported.

Results

Historical Perspective

Little information exists specific to the value of elk hunting and viewing or on the expenditures made in the pursuit of these activities in the Blues. No studies were found concerning elk viewing, and only two were found related to elk hunting (Fried 1993).[3] The two hunting-related studies provided the most specific and local information available for the Blues and are from the Starkey Experimental Forest and Range, 28 miles southwest of La Grande, Oregon. The 29 nonlocal elk hunting valuation and three expenditure studies (one Oregon-wide and two nonlocal) gave significant insight to the value of elk hunting possibly experienced in the Blues. The four nonlocal valuation and four expenditure studies found on viewing or wildlife watching were used as applicable.

[3] Carter, Chris 1992. Starkey Experimental Forest hunt data 1989-91 On file with: Oregon Department of Fish and Game, P.0. Box 59, 2501 SW First Avenue, Portland, OR 97207.

Valuation of Elk Hunting

Local elk hunting valuation—Researchers at Starkey collected survey data on elk hunting with rifles from hunters during 1988-91; survey questions included the value of hunting. Starkey is viewed by some as a special or unique site for hunting[4] because it is an Experimental Forest and Range. Given that, one question that arises is, How applicable are the Starkey results to the rest of the Blues? It is not known whether hunters at Starkey and hunters in the rest of the Blues have similar values, success rates, and lengths of their hunting trips. For areas outside Starkey that provide a similar resource with comparable hunt characteristics, the Starkey data most likely are valid. For areas significantly different, which are many, the question becomes, How sensitive are the values and expenditure patterns to changes in the characteristics of a hunt or hunting area?

A brief look at hunting success rates at Starkey from 1988 to 1990 reveals an average of 43 percent, whereas for hunting of Rocky Mountain and Roosevelt elk *(Cervus elaphus roosevelti)* State-wide, the average was 16 percent (Fried 1993). This gross comparison does not take into account types of hunts or whether they are controlled or not, which may account for part of the difference. Another study specifically compares the success rates and the hunter-per-elk ratio from 1988 to 1990 and suggests that the processes driving the interactions between hunters and elk are similar at Starkey and in the Chesnimnus and Sled Springs units, which are in the northeast corner of Oregon.[5] Whether or not the value and length of trip are the same is not clear. This uncertainty is why nonlocal studies were used for comparison to the Starkey results.

Fried (1993), by using Starkey survey data, concludes that the hunting experience provides substantial benefits to Starkey hunters. His conclusions are based on an estimated median value of $117.76 per trip in 1991 constant dollars for the rifle hunting of elk (Fried 1993).[6] Caution is needed in interpreting this value as it is a median and not comparable to most other valuation studies that report the mean (which typically is larger). Because it is not possible to compare this value statistically to other elk hunting valuation studies, a general comparison calls for the next best approach. Therefore, a Montana elk hunting study (Loomis and others 1988), reporting both the median and the mean, was used due to its similar wording of the valuation question and somewhat comparable analysis methods. That study found a median hunter day value of $10.99 and a mean of $39.90, which is a magnitude 3.6 times greater. Assuming a similar distribution, the mean of the Starkey hunting

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[4] Starkey is a 40-square-mile enclosure of woven wire fence used for research purposes Characteristics of a hunt can differ from those outside the area to meet research objectives.

[5] Personal communication 1992 David Vales, graduate student, Department of Wildlife Resources, College of Forestry, Wildlife, and Range, University of Idaho, Moscow, ID 83843.

[6] Fried's hunting value is an average of years 1989, 1990, and 1991 with no adjustment for inflation in those years Therefore, the procedure used was to assume the value is in 1990 dollars. The Consumer Price Index (CPI) is then used to adjust for inflation to 1991 dollars.

trip value may be two to four times that of the $117.76 median value. By using the Starkey average of 6 days per trip, the mean likely would range from about $39.25 to $78.51 per day. That it was not possible for Fried (1993) to derive a mean value indicates that the confidence bounds for the median estimate may be quite wide. Given the data at the time of this report, a best estimate was made, and as knowledge improves, newer information can be incorporated into any necessary analyses and decisionmaking.

Nonlocal elk hunting valuation—It is helpful to compare the Starkey hunting values with a range of values from other elk hunting valuation studies in the West. Such studies yield a range and mean value of elk hunting in general. Adjustments to the Starkey results may or may not be justified depending on their comparability.

The nonlocal studies found used different methods to estimate hunting and nonconsumptive wildlife values and expenditures, thereby complicating their use and comparability. In part, this problem was overcome by the helpful and comprehensive study done by Walsh and others (1988), hereafter referred to as the Walsh report, that synthesized and then standardized for differences in method, valuation studies from 1968 to 1988. Due to improvements in methods over time, the Walsh report showed that studies occurring between 1983 and 1988 for elk, deer, and other big game species provided better valuation estimates than earlier studies; this report focuses on those studies.

The Walsh report was updated with more recent studies that were adjusted by using the same methods described in that report. The Walsh report has been used by the USDA Forest Service in determining program values for recreation by region under the Resource Planning Act (RPA). The Blue Mountains primarily include the Umatilla, Wallowa-Whitman, and Malheur National Forests in the Pacific Northwest Region of the Forest Service. These Forests use the RPA values in their Forest planning process (USDA Forest Service 1990). The goal of the RPA program was to develop a valuation approach that would make the prices of all resource outputs from Forest Service lands commensurate with each other. For example, the RPA values for big game hunting are a composite average, broken out by region, of all big game hunting studies the Walsh report found from 1983 to 1988. The same was done for nonconsumptive use values as well. It is not known how applicable these values are for a specific area within a region or a particular wildlife species.

Most of the big game hunting in the RPA report is for deer and elk, but implicit in these values is the assumption that hunters hold comparable value among all types of big game hunting. To test the reliability of the RPA values in regard to elk, studies concerned primarily with elk were extracted from the Walsh report. Such studies yield a range and mean value per activity day of elk hunting to compare with the results at Starkey. Seven of the studies from the Walsh report measured the value of elk hunting in the West, and five measured big game hunting in general. For this study, big game hunting was assumed to consist primarily of elk hunting. Three studies more current than the 1988 Walsh report were found, two on elk and one on big game hunting. These studies were adjusted for different methods as needed and described in the Walsh report and included. The 15 selected studies produced 29 valuation estimates on a per-activity-day basis; these estimates were adjusted for inflation by converting them to 1991 real dollars.

The RPA composite values (based on the Walsh report) price all big game hunting at $39.36 for an activity day of about 8 hours or $60.48 per wildlife and fish user day (WFUD, 12-hour-day value) in 1991 constant dollars[7] (USDA Forest Service 1990) for the Pacific Northwest region, which includes the Blues. Future projections show an increase to $41.64 per activity day and $68.46 per WFUD by 2040 in 1991 constant dollars, reflecting some real price appreciation (USDA Forest Service 1990). This information is useful for various analyses with horizons up to 50 years or so.

Table 2 shows the values for elk hunting from the 29 valuation estimations described in the section "Methods." They allow a comparison not only with the Starkey elk hunting results but with the RPA big game values for the Pacific Northwest that the National Forests in the Blues have been using.

The nonlocal studies listed in table 2 show an average value of $45.23 per activity day, which reflects a range, weighted at the lower end, of $31 to $82 (excluding the lower $7 figure). As discussed earlier, the Starkey had a potential mean value per day ranging from $39.25 to $78.51. The reported RPA big game value for the Pacific Northwest region was $39.36 in 1991 constant dollars (see footnote 5) and included hunting for all big game species. Values for elk hunting per day (table 2) seem slightly higher than the RPA value for big game hunting in general. All these estimates are fairly comparable, however. Therefore, neither the Starkey nor the RPA values used by the National Forests in the area may need adjusting. A reasonable value for elk hunting in the Blues may lie between $30 and $80 per activity day. These figures are not meant to be absolutes but to provide benchmark figures for use as a range in analyses that provide information to decisionmakers. If the answer does not change when either $30 or $80 is used in the analysis, then further value assumptions may not be necessary.

The first study listed by McCollum and others (1990) shows a $7 value considerably lower than the others. For the purpose of this study, the value was considered legitimate but actually affected the mean very little. By using a consistent survey instrument, method, and model, comparisons among various activities and Forest Service regions in the United States were allowed. McCollum[8] is confident that the $7 value represents a solid lower bound and suggests several reasons for it being lower than values from the other studies: (1) the consistent structure of the study might not represent all activities in all places equally well; (2) sites selected for surveying were recreation sites, not necessarily hunting sites; (3) data were local in nature in that large distances were not traveled, and thus the travel cost model would lead to a lower value; (4) due to the seasonal nature of hunting, the interviewing process may have missed some hunters; and (5) a wide range of values for big game hunting correspond to the wide range of sites and site quality. The $7 value reported by McCollum and others (1990) most likely represents lower quality hunting areas, whereas several of the studies in the Walsh report likely reflect high-quality and high-use sites.

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[7] Revised from a Gross Domestic Product (GDP) implicit price deflator basis to a Consumer Price Index (CPI) basis.

[8] Personal communication. 1992 Daniel W McCollum, economist, Rocky Mountain Forest and Range Experiment Station, 240 W Prospect, Fort Collins, CO 80526-2098.

Table 2—Elk-hunting literature review and benefit estimate, 1991

Author (year), study location, date of survey, and method, subject if not elk or data source	CPI[a] at date of survey	CPI index (1991 base)	Value per activity		
			Reported value	Adjusted to 1991 dollars	Adjusted for method
			----------*Dollars*----------		
1991	136.2	1.000			
McCollum and others (1990) US/Region 6 1986 TCM,[b] all big game	109.6	1.243	5.56	6.91	6.91
Connelly and Brown (1990): Montana Colorado Wyoming Arizona New Mexico Idaho Utah Oregon Washington 1985 CVM,[c] National survey data, Federal land users	107.6	1.266	39.92 39.08 44.06 39.81 27.52 40.90 29.65 27.30 30.65	50.54 49.48 55.78 50.40 34.84 51.78 37.54 34.56 38.80	50.54 49.48 55.78 50.40 34.84 51.78 37.54 34.56 3880
Loomis and others (1988) Montana 1986 CVM[c]	109.6	1.243	39.90	49.58	49.58
Duffield (1988) Montana 1985 TCM[b] with standard costs	107.6	1.266	26.90	34.05	34.05
Duffield (1988) Montana 1985 TCM[b] with reported costs	107.6	1.266	66.06	83.63	83.63
Hay(1988a): Montana Colorado Wyoming Idaho Utah Oregon Washington 1985 CVM,[c] National survey data	107.6	1.266	30.00 40.00 48.00 33.00 41.00 27.00 48.00	37.97 50.63 60.76 41.77 51.90 34.18 60.76	37.97 50.63 60.76 41.77 51.90 34.18 60.76

Table 2—Elk-hunting literature review and benefit estimate, 1991 (continued)

Author (year), study location, date of survey, and method, subject if not elk or data source	CPI[a] at date of survey	CPI index (1991 base)	Value per activity: Reported value	Value per activity: Adjusted to 1991 dollars	Value per activity: Adjusted for method
			Dollars		
Sorg and Nelson (1986) Idaho 1982 TCM[b]	96.5	1.411	35.18	49.65	49.65
Sorg and Nelson (1986) Idaho 1983 CVM[c]	99.6	1.367	22.57	30.86	30.86
Cory and Martin (1985) Arizona 1981 CVM[c]	90.9	1.498	29.40	44.05	44.05
Brown and Plummer (1979) Oregon 1976 Hedonic, all big game	56.9	2.394	38.14	91.29	118.68
Brown and Plummer (1979) Idaho 1976 Hedonic, all big game	56.9	2.394	32.73	78.34	101.85
Charbonneau and Hay (1978) United States 1975 CVM,[c] all big game	53.8	2.532	64.00	162.02	113.42
Hansen (1977) Intermountain 1975 CVM[c]	53.8	2.532	22.63	57.29	57.29
Martin and others (1974) Arizona 1970 TCM,[b] other big game (not deer)	38.8	3.510	20.15	70.73	70.73
Brown and others (1973) Oregon 1968 TCM,[b] all big game	34.8	3.914	9.20	36.01	36.01

Table 2—Elk-hunting literature review and benefit estimate, 1991 (continued)

Author (year), study location, date of survey, and method, subject if not elk or data source	*CFI*[a] at date of survey	CPI index (1991 base)	Value per activity: Reported value	Value per activity: Adjusted to 1991 dollars	Value per activity: Adjusted for method
			------Dollars------		
Average value (n s=29)			34.42	52.97	53.05
1983-90 (n= 23)			35.28	45.23	45.23
1968-83(n=6)			31.14	82.62	83.00
Range 1983-88 (n =23)					7-82

[a] CPI = all item consumer price index (82-82 = 100), from the economic report of the President, February 1992, p 364
[b] TCM = travel cost method
[c] CVM = contingent value method.

The assumption can be made that hunters with any type of weapon, whether rifle, bow, or musket, fall into the above $7 to $82 range of per-day values for/elk hunting. In the Blues of Oregon, elk hunters using rifles are limited by ODFW to one of two seasons annually per hunter, each about 1 week long. One longer season of about 4 weeks is allowed for bow hunters.[9] Because hunters using a bow generally spend twice the number of days hunting than rifle hunters and have more of an opportunity for another trip to the Blues (ODFW 1990, 1991 a, 1992), a complication exists when the number of trips per season taken by bow hunters is not known and when the elk hunting data are not reported by type of hunting. Data received for Oregon showed information for both rifle and bow hunting, but data for southeast Washington were grouped together. The average number of days hunted at Starkey was 6. Therefore, one annual trip of 6 days per hunter, of any kind, was assumed for Washington. Oregon data are used as received under an assumption of two trips each 6 days long for bow hunters and one trip of 6 days for rifle hunters.

The annual value of elk hunting (AV) was calculated as follows:

AV = (value per day per hunter * no. days per trip)(no. trips per year)(no. hunters)

By using the $7 to $82 range above, the estimated annual value of elk hunting by either weapon in the Blues would range from about $3 to $36 million. These figures and those in table 3 use the number of days and trips as discussed above and the number of hunters hunting elk in the Blues. There was an annual average of 56,046 rifle and 4,828 bow hunters in northeast Oregon (ODFW 1990, 1991 a, 1992) and an annual average of 8,282 all-weapon hunters in southeast Washington (WDW 1990, 1992).

[9] Personal communication. 1992 Chris Carter, economist, Oregon Department of Fish and Wildlife, P 0 Box 59, 2501 SW First Avenue, Portland, OR 97207

Table 3— Estimated average annual worth of elk hunting In the Blue Mountains

Study	Average value per activity day	Average annual value of Blue Mountain elk hunting
	1991 Dollars	*Million dollars*
Range of table 2 studies	7-82	3-36
Average of table 2 studies	45.23	20.1
RPA	39.36	17.5
Starkey	39.25[a]	17.4

[a] Used as a possible example if the mean is twice the median

To determine whether the values for elk hunting in table 3 are reasonable, a comparison to another study may be useful. Connelly and Brown (1990) found that the net value (over and above costs) held by Federal land users for elk hunting on Forest Service lands was $7.8 million (in 1991 dollars) in Oregon and $10.6 million in Washington ($18 million in two states overall). Table 3 shows a $17 to $20 million range for elk hunting in the Blues alone (essentially on Forest Service lands but on other ownerships as well). The difference may be that the Connelly and Brown (1990) report used slightly lower per-day values than those listed in table 3 and did not include hunters on private land; table 3 included all license holders who hunt elk in the Blues, 80 percent of which come from the other side of the state, and many hold greater values as witnessed by the distance traveled to hunt there. Comparability between the values from Connelly and Brown (1990) and this report is questionable and needs further analysis

Expenditures and Income Impacts of Elk Hunting

Relevant expenditure data for hunting was found in one local Starkey study, two nonlocal studies, and one Oregon-wide study. Estimates were adjusted for inflation and converted to 1991 dollars. As a measure of reliability, the other three studies were used to compare average expenditure figures to those from Starkey.

Local elk hunting expenditure impacts—The hunter expenditure data collected in the Starkey surveys excluded equipment costs. Variable cost data from 1989 to 1991 from the Starkey survey and coefficients from the IMPLAN[10] model were used to estimate hunter expenditure impacts on personal income in the Blues (ODFW 1991b). Income impacts from Oregon income tax revenues, Washington State sales tax on variable cost purchases, and hunting license sales were not estimated in this report.

[10] IMPLAN is an input-output model developed by the Forest Service that simulates the interactions among various sectors in an economy and can determine the direct, indirect, and induced impacts of spending in an economy That is, the model describes how sales in one industry impact not only that industry, but also ones that supply goods and services to that industry. The Blue Mountain IMPLAN model is a product of localized total gross outputs by sector and technical coefficients from a disaggregated National IMPLAN model that together represent the Blue Mountain region including Wallowa, Union, Umatilla, Morrow, Gilliam, Wheeler, and Grant Counties (ODFW 1991).

Table 4—State-wide income impacts of elk hunting expenditures per day per hunter (1991 dollars)

Expenditure category	Average expenditures		Total impact[a]	
	Outside NE OR	Inside NE OR	NE OR	State
	1991 dollars			
Travel	6.98	7.46	2.37	8.47
Lodging	.52	.93	.72	1.34
Food in store	6.50	5.59	1.49	8.45
Food in restaurant	1.27	2.12	1.33	2.72
Supplies and miscellaneous	6.24	3.84	1.64	8.57
Fees	3.41	2.97	2.76	6.32
Total expenses and impact	24.93	22.90	10.31	35.88

[a] The results for northeast Oregon use IMPLAN coefficients representing the effect of a dollar spent in northeast Oregon in each category, while the State impacts use different IMPLAN coefficients for the effects State-wide, therefore it is not correct to look at the difference between them

The extent that money spent in Oregon is "new money" and not what would have been spent for other local purchases anyway is not known or estimated here. As over 80 percent of the Rocky Mountain elk hunters in the Blues come from the Willamette Valley, expenditures by nonarea residents are considered "new money" to the Blues region, and the impacts from this money can be considered a source of economic development. Impacts of activity expenditures by local residents are a source of economic development only if the activities prevent impact substitution or local resident travel to other areas for hunting. Money from local residents is argued not to be "new," in the sense that if they were not able to hunt locally in a given year, they would spend that money on other local goods and services (termed "impact substitution"). Because hunting is somewhat ritualistic, however, they also may spend it for hunting in a nonlocal area (where their money may be "new"), thereby causing the local area to lose out. Alternatively, they could save that money for local hunting the following year. Although, the above argument is acknowledged, differentiation between local resident and nonlocal impacts are not made in this report for expenditures in the Blues or State-wide.

The average expenditure pattern of an elk hunter per hunter day in 1991 dollars and the economic impact elk hunters have on the Blues region, specifically in Oregon, and in Oregon State-wide are shown in table 4 (see footnote 2 and appendix 2).

Table 5—Extrapolation of Starkey hunter day expenditure values

Area	Average total expenditures			Total impact to income		
	Per day	Pertrip[a]	Peryear[b]	Per day	Per trip[a]	Peryear[b]
	------Dollars------		*Million dollars*	--------Dollars-------		*Million dollars*
Northeast Oregon/ southeast Washington	22.90	138.88	10.3	10.31	62.50	4.6
Oregon State	47.83	290.09	19.1	35.88	217.57	14.3

[a] Uses 6 days per trip (Starkey data)
[b] Uses an average of 56,046 Blue Mountain elk rifle hunters (1 trip) and 4,828 bow hunters (2 trips) in Oregon per year (ODFW 1990, 1991a, 1992) and an average of 8,282 all weapon elk hunters (1 trip) in Washington per year (WDW 1990, 1992) for the northeast Oregon/southeast Washington results Oregon State values use Oregon rifle and bow hunter numbers

The results in table 4 show that rifle hunters who hunt in the Blues, specifically northeast Oregon, spend about $25 per hunter day outside the area and about $23 inside the area on variable trip costs. The impact is about $10 per hunter day within the Blues region. That is, of the $23 spent there, $10 stays and the remainder leaks out of the area. The State-wide impact of the $48 in variable expenditures in Oregon, and potentially Washington, is about $36 per hunter day. It is assumed that hunters using bows and those using other weapons have similar expenditure patterns and that, although what is spent in the Blues region is not "new" money to the State, it is to the Blue Mountain region. This is assumed as trip-related expenditures in the Blues from Starkey elk hunters are purported to be primarily from hunters residing in the Willamette Valley, where it otherwise could have been spent.[11]

What do the impacts of elk hunting and viewing mean over the hunting season and per year for the Blues and the State of Oregon? Table 5 shows reasonable estimates based on the results in table 4. The values are conservative because for Washington, they include all weapon hunters, but for the small proportion of bow hunters, they account for only half the days hunted.

The per-hunter day and per-trip values most likely are representative of southeast Washington Blue Mountain elk hunting expenditures, but the impacts in Washington State-wide cannot be estimated from the IMPLAN coefficients used in this report, because the structure of Washington's economy is different from that in Oregon.

[11] Personal communication. 1993. Chris Carter, economist, Oregon Department of Fish and Wildlife, P.0. Box 59, 2501 SW First Avenue, Portland, OR 97207

Two studies by Southwick Associates (1987,1992) looked at expenditures and impacts from hunting in Washington and Oregon. The Washington report is the most recent and also provides some expenditure results by regions within the State. In 1991, $251.4 million in expenditures for all hunting activities and purchases in Washington supported 6,800 jobs and generated a total economic effect or impact of $447.1 million, including $134.7 million in household income, and $24.1 million in State and $12.9 million in Federal tax revenues. The Southwick report did not break out the impacts by region or type of cost, thereby making further comparisons difficult, but they did report some other noteworthy expenditures. Of the total $251.4 million spent, the trip-related or variable expenditures for all types of hunting accounted for $121.3 million, whereas $106.5 million was spent on variable and fixed (equipment) purchases by big game hunters alone. The most eastern region, including the Blues of Washington, also contained the area north of it to the Canadian border, thereby overestimating the following results. In the most eastern region in 1991, an estimated $16.8 million (1991 dollars) was spent for all types of hunting and costs (variable and fixed).

In 1987, $205.2 million in expenditures for all hunting activities and purchases in Oregon supported 5,600 jobs and generated a total economic effect or impact of $320.7 million, including $99.5 million in household income, $10.7 million in State and $12.9 million in Federal tax revenues. The Southwick results are useful in demonstrating the magnitude of value the hunting industry gives to all residents of the State. It is also an example of economics applied to wildlife to provide managers with background data for use in planning and justification of projects, programs, and so forth.

Impacts of nonlocal elk hunting expenditures—According to the national survey, resident and nonresident Oregon elk hunters make up a larger portion of big game hunters than do those in Washington (table 13 in USFWS 1993a):

	Number of hunters	
Type of hunter	**Oregon**	**Washington**
Elk	102,400	68,000
Big game	313,700	260,800

The national survey contains various aggregate information on all types of hunting and expenditures for food, lodging, and so forth. It does not, however, give average trip-related expenditures by such categories for residents and nonresidents for big game or elk hunting trips in the State of Oregon (or Washington) alone. The expenditure figures for all types of hunting given in the national survey seemed high for elk hunting compared to the Starkey data and other studies mentioned below. Therefore, the variable expenditures by residents and nonresidents in Oregon for elk hunting were estimated by assuming that all hunters have similar spending patterns. The proportion of hunters of all types that are elk hunters (20.9 percent), calculated from table 13 in the national survey, was applied to the total amount spent in each category by hunters of all types (from table 23 of the same report). This figure divided by the number of elk hunters (102,400) and then by the average number of elk hunting days per elk hunter (6) gives average daily expenditures per hunter (table 6).

Table 6— National survey average daily elk-hunting expenditures per hunter in Oregon by resident and nonresident elk hunters by category

Category	Average expenditures per day
	1991 dollars
Food and lodging	9.84
Transportation	8.30
Other	0.66
Total	18.80

The $18.80 figure is for State-wide expenditures in Oregon but seems more comparable to expenditures in the Blues per day than the Starkey State-wide expenditure figure (see table 5). The impact to personal income of using the $18.80 figure would be somewhat less than the $4.6 million found in table 5 for northeast Oregon. The figures in table 6 are based on original expenditures of a mix of hunters hunting in different areas across the State and for different species (deer, elk, and game and migratory birds, for example). As the data are preliminary, the U.S. Fish and Wildlife office, where the national survey is being analyzed, was unable to retrieve raw data for elk or big game hunting alone. Primarily, the hunting is for deer, of which only 35 percent occurs in eastern Oregon (ODFW 1992). The hunters hunting deer on the west side generally live there and have less travel and fewer trip-related costs. The sampling methods of the national survey were such that most of the hunters included likely came from the more populated west side.[12] The last two statements partially explain the difference in expenditure values between the Starkey and national survey.

The number of elk hunters used in conjunction with the expenditures from the national survey consisted of hunters hunting both Rocky Mountain elk (found on the east side of the State) and Roosevelt elk (found on the west side). Of all elk hunters in Oregon, 60 percent hunt Rocky Mountain elk, and 40 percent hunt Roosevelt elk (ODFW 1992). Of the 60 percent hunting Rocky Mountain elk, 83 percent hunt them in the Blues but come primarily from the Willamette Valley in the west side of the State (ODFW 1992 and footnote 11). These two facts could cause the Starkey results to be higher than those from the national survey due to the inclusion in the latter of Roosevelt elk hunters. Roosevelt elk hunters from the highly populated Willamette Valley would not need to travel as far as Rocky Mountain elk hunters traveling to eastern Oregon. If more Roosevelt elk hunters were surveyed in the national survey, the expenditures would be less.

Results from two studies of nonlocal elk hunting expenditures are displayed in table 7. One study is from Montana (Duffield 1988) and the other is from Idaho (Sorg and Nelson 1986). They allow for more closely related comparisons to the Starkey data.

[12] Personal communication. 1993 Richard Alken, economist, U.S Fish and Wildlife Service, 4401 N. Fairfax Drive, Arlington, VA 22203.

Table 7—Nonlocal elk-hunting expenditures by category

Category	Average expenditures per day trip[a]	
	Montana	Idaho[0]
	----------1991 dollars----------	
Food	15.58[b]	10.82
Lodging	17.49[b]	20.50[b]
Transportation	15.18	18.16
Other	9.57[b]	—
Total	57.82	49.48

[a] Does not include guide fees Per-trip values were converted to per-day trip values by using 2 84 average number of days per trip (both studies had the same average).
[b] Only those using the service entered into calculation of the mean
[c] From the 1983 data set

The per-day value in Idaho is more closely related than is the Montana value to the State-wide per-day figure for Oregon of $47.83 from table 5. Because these studies may be considered reasonable substitutes, the expenditures from table 7 can be used to estimate the impact to personal income in Oregon by using the ratio of State-wide per-day expenditures to impacts from table 5. The result would be about $14.8 and $17.3 million in State-wide personal income across Oregon. These figures are reasonably similar to the $14.3 State-wide impact from the Starkey results (see table 5).

There are potentially more out-of-state hunters in Montana and Idaho than in northeast Oregon and southeast Washington. If Montana has significantly more, then the higher expenditures for Montana may partially be explained; there are some differences in methods as well. If Idaho has comparable hunter characteristics, a possible conclusion may be that the Starkey results are reasonable and may not need adjusting.

Valuation of Elk Viewing

Few studies provide values for wildlife watching or viewing, and those that do have tended species specific rather than comprehensive (Rockel and Kealy 1991). As there are no studies specific to elk, estimates of general nonconsumptive use values and values from studies on other species were used as proxies. Three nonconsumptive valuation studies from the Walsh report were selected as useful in indicating economic values of elk to communities in the Blues. Two of the studies measured the value of nonconsumptive wildlife-related recreation in the West in general, and one measured deer viewing in California in particular. One study, completed since the Walsh report, was found and added. From a total of four studies, seven valuation estimates were adjusted for inflation and converted to 1991 dollars. Calculations for annual value for wildlife viewing used the same formula as for hunting.

Nonconsumptive wildlife use is defined in the RPA as "trips or outings of at least 1 mile from home for the primary purpose of observing, photographing, or feeding wildlife" (USDA Forest Service 1990). Generally, nonconsumptive studies, such as many used in the RPA assessment, consisted of special species and sites, few of which occurred in the Pacific Northwest.

One survey of Oregon residents (Intercept Research Corp. 1990) reveals that wildlife watchers, not necessarily elk viewers, would be willing to pay, in 1991 dollars, $58.36 a day to charter a boat, $44.81 a day for a naturalist or guide, and $32.30 a day for a van tour of viewing sites. These values provide basic information on wildlife watchers' willingness to pay (WTP), but they do not indicate what such people would be willing to pay for viewing wildlife without such services. Thus, such results are of limited use here.

The RPA value for nonconsumptive uses in the Pacific Northwest region is $25 for an activity day of about 4.4 hours or $67.70 per WFUD (12-hour-day value) in 1991 constant dollars (USDA Forest Service 1990). The projected prices for 20^0 incorporate appreciation and are estimated to be $29.53 per activity day and $79.88 per WFUD.

The four relevant nonconsumptive valuation studies conducted in the West are summarized in table 8. The average value for noncomsumptive use is about $26 per day with a range of $13 to $48.

Beside those mentioned above and in table 8, Loomis and others (1989) reported that deer hunters receive about $12.77 (1991 dollars) in benefits from viewing deer on outdoor recreation day trips taken for **other** purposes. Loomis found that the benefits from day trips for any purpose increased with the number of deer observed. Of the few nonconsumptive valuation studies found, the Loomis report (from table 8) seems to be the most relevant to elk: it values general deer viewing in California, not a threatened and endangered or otherwise special species. It is interesting to note the similarity in value between the Loomis and McCollum reports even though the former measured viewing value for one species, and the latter measured the value of viewing all wildlife.

According to the 1991 national survey, 882,000 Oregonians and nonresidents 16 years or older took trips an average of 56 miles one-way in Oregon for the primary purpose of observing, photographing, or feeding wildlife (table 27 in USFWS 1993a). Most viewers averaged 1 day per trip and eight annual trips to view wildlife in general. The average annual value for wildlife viewing (not necessarily elk) in Oregon is shown in column 3 of table 9. Average nonconsumptive wildlife values came from the RPA assessment and table 8.

The proportion of wildlife viewing in Oregon that is primarily elk viewing is not known explicitly. An Intercept Research Corporation (1990) survey in Oregon, showed that wildlife watchers are most interested in large and small mammals, therefore it is logical to assume at least one out of the eight annual primary wildlife viewing trips could have been taken to view elk; one of the more popular, majestic, and accessible big mammals. Such an assumption gives a range in value of $11.5 to $42.3 million with an average around $22 million (see column 4 of table 9). The number of people who travel specifically to the Blues for elk viewing is unknown and not estimated directly. Cases from elk viewing areas, however, may give insight as to the potential value of elk viewing in Oregon and in the Blues.

Table 8—Nonconsumptlve wildlife literature review and benefit estimate, 1991

Author (year), study location, date of survey, and method, subject if not elk or date source	CPI[a] at date of survey	CPI index (1991 base)	Value per activity day: Reported value	Value per activity day: Adjusted to 1991 dollars	Value per activity day: Adjusted for method
				------*Dollars*-------	
McCollum and others (1990) US/Region 6 1986 All big game	109.6	1.243	14.20	17.65	17.65
Loomis and others (1989)[b] California: Primary trip All trips 1987 CVM,[c] deer	113.6	1.199	15.00 11.06	17.99 13.26	17.99 13.26
Hay(1988b): Rocky Mountain Intermountain Pacific Northwest 1985 CVM,[c] nonconsumptive wildlife-related recreation, National survey data	107.6	1.266	19.21 28.15 18.06	24.32 35.64 22.86	24.32 35.64 22.86
Richards and King (1982) Arizona 1977 TCM,[d] nonconsumptive wildlife-related recreation	60.6	2.247	39.50	88.76	48.82
Average value (n = 7)			20.74	31.50	25.79
Range (n = 7)					13-48

[a] CPI = all item consumer price index (82-82 = 100), from the economic report of the President, February 1992, p.364.
[b] Walsh (1988) used preliminary Loomis and others (1989) results. These are final figures.
[c] CVM = contingent value method
[d] TCM = travel cost method

Table 9—Estimated potential worth of wildlife and elk viewing In Oregon and elk viewing In the Blues

Study	Per activity day value	Average annual value of Oregon wildlife viewing[a]	Potential value of elk viewing in Oregon: All *take* 1 trip[b]	Potential value of elk viewing in Oregon: Half take 1 trip to a view site[c]	Potential value of elk viewing in the Blues
	1991 dollars	*Million dollars*			
Range of table 3 studies	13-48	91.7-338.7	11.5-42.3	5.7-21.2	1.3-4.8
Average of table 3 studies	25.79	182.0	22.7	11.4	2.6
RPA	25.00	176.4	22.0	11.0	2.5

[a] Assumes 882,000 resident and nonresident nonconsumptive users take 8 annual 1-day trips.
[b] Assumes 882,000 nonconsumptive users take 1 annual 1-day trip to view elk in Oregon anywhere.
[c] Assumes 441,000 nonconsumptive users take 1 annual 1-day trip to an elk viewing site in the State.
[d] Assumes 100.000 nonconsumptive users take 1 annual 1-day trip to an elk viewing site in the Blues

The Oak Creek Wildlife Area outside of Nachez in south-central Washington receives between 80,000 and 100,000 visitors per year who come specifically to view elk.^[3] The interpretive site at Oak Creek monitors the number of users and publicizes its existence but does not survey users for willingness to pay, expenditures, or other trip-related information. The Hardware Ranch in Utah offers elk-viewing sleigh rides in winter. In 1992 there were 25,000 visitors in the 3 months of operation; this estimate is based on the number of people who sign the register, which the owners believe to be about 75 percent of the visitors.[14]

Currently there are four known formal viewing areas classified for elk in the State of Oregon (Goodnight 1989).[75] If each had the potential of 100,000 visitors per year, then about one-half of the 882,000 total wildlife viewers taking one annual trip to view elk might be reasonable. Consequently, a potential value for elk viewing State-wide could range from about $6 to $21 million, with an average of about $11 million, as shown in column 5 of table 9. If one of those formal viewing sites for elk is in the Blue Mountain area (and at least one is: the Elkhorn Wildlife Management Area) and it can attract 100,000 visitors annually, then $1.3 to $4.8 million, or about $2.5 million on average, could be attributed to the Blue Mountains region. The Wenaha Wildlife Area, located in the Blues just outside Troy, Oregon, is also a potential site for further development for viewing elk and could help meet the needs of the 100,000 visitors, or potentially increase it.

[13] Personal communication. 1992 John McGowan, manager, Oak Creek Wildlife Area, 16601 Highway 12, Nachez, WA 98937.

[14] Personal communication. 1992 Shelley Woolstenhulme. concessionaire, Hardware Ranch (state owned), 1975 S Hoytsville Road, Coalville, Utah 84017.

[15] Personal communication 1993 Dan Edwards, biologist, Oregon Department of Fish and Wildlife, P.0. Box 59, 2501 SW First Avenue, Portland, OR 97207.

The average annual values shown in table 9 for viewing wildlife and elk in Oregon and the value for viewing elk in the Blues will be low, as they account only for primary trips; the additional value from trips where wildlife viewing was secondary was not included. The elk viewing figures are based on only one primary trip per year and may be conservative as well. Also, the 1991 national survey number of 882,000 resident and nonresident Oregon wildlife watchers is probably a conservative estimate of nonconsumptive use because interest in viewing is projected to grow by over 150 percent by 2040 (Rather and Hoekstra 1989).

Although empirical data are sparse for nonconsumptive uses of wildlife, those available demonstrate the intense interest by the public in wildlife watching. Such interest bears consideration in current and potential future planning between communities and landowners in the Blues to (1) take advantage of any development opportunities and (2) manage use sustainably.

Expenditures and Income Impacts of Elk Viewing

Few studies exist that estimate expenditures for viewing wildlife of any kind, let alone elk. Four studies of nonconsumptive use expenditures were found, however; two were used to calculate the annual income impacts to communities in the Blues. Estimates were adjusted for inflation and converted to 1991 dollars. The IMPLAN coefficients from above that matched the categories given by these two studies were used (ODFW 1991b). Because only one food category was given, the "food in store" coefficient was selected and not the the "food in restaurant" coefficient.

The Oregon resident study (Intercept Research Corp. 1990) reported that over 50 percent of the respondents were willing to travel 10 to 100 miles from a town with basic services to view, study, or photograph wildlife. Another study (Intercept Research Corp. 1988) estimated general nongame wildlife expenditures in Oregon. Although data were collected primarily on fixed costs, such as equipment, the study did show that about $418 per year (1991 dollars) on average was spent for travel.

The national survey nonconsumptive data are difficult to interpret to describe primary nonresidential expenditures made by residents and nonresidents in Oregon by category. Average categorical expenditures for participating in nonconsumptive viewing, photographing, and feeding of wildlife farther than 1 mile from home are mixed in with out-of-state expenditures of residents; the reason explained under the "nonlocal elk hunting expenditure studies" section above. The easy assumption that what Oregonians spend out-of-state is spent in-state by nonresidents would be false, as a comparison between tables 31 and 57 in the national survey shows that nonresidents spent in Oregon more than twice what Oregonians spent out-of-state. Therefore, to report primary nonresidential expenditures by residents and nonresidents in Oregon itself by category, the proportion of the total amount spent in each category was calculated from resident in and out-of-state figures in table 31 and applied to the total trip-related expenditures made in Oregon found in table 57; the result was divided by the number of participants (882,000) then days (8) from table 27. The final figures are shown in table 10, and although reasonable, are slightly lower than those in a study by Loomis and others (1988), which looked specifically at deer viewing.

Table 10—National survey daily nonconsumptive expenditures by residents and nonresidents In Oregon by category

Category	Average expenditures per day
	1991 dollars
Food	10.65
Lodging	3.59
Transportation	8.69
Other	1.01
Total	23.94

Table 11—Californian deer viewing expenditures per day trip by category

Category	Average expenditures per day trip
	1991 dollars
Food	21.90
Lodging	2.43
Transportation	8.60
Other	2.99
Total	35.92

Loomis and others (1989) report on the expenditures of deer viewing in California; the expenditures serve as proxies for elk viewing because general wildlife viewing includes elk and many other species (particularly birds), whereas deer viewing looks at one closely related animal found in similar locations. In 1987, Californians spent $82.7 million in trip-related expenses to view deer, which generated $55.4 million in income to the State of California (1991 dollars). The average spent per day trip was $35.92 (1991 dollars). Average expenditures per day trip by category are in table 11.

The difference in per-trip values between the national survey and the Loomis and others (1988) study may be due to the fact that the national survey values all wildlife viewing, even ducks at a nearby park if it is at least 1 mile from home, whereas the California study looked specifically at deer in the wild. Beside differences in distances driven, the duration of the trip also may vary.

Table 12—Estimated potential impact to Oregon Income from nonconsumptive expenditures for elk viewing in Oregon and the Blues

Study	Average expenditure per day	Impact to Oregon income per day[a]	Annual Oregon wildlife viewing[b]		Annual Oregon elk viewing: 1 trip anywhere[c]		Annual Oregon elk viewing: 1 trip to view site[d]		View site in the Blues[e]	
			Expend/ year	Impact	Expend/ year	Impact	Expend/ year	Impact	Expend/ year	Impact
	---1991----		----------Million dollars----------							
National survey	23.94	8.79	168.9	82.7	21.1	7.8	10.6	3.9	2.4	0.9
CA deer	35.92	11.72	253.4	62.0	31.7	10.3	15.8	5.2	3.6	1.2

[a] IMPLAN coefficients from earlier analysis used Store coefficient was used for food
[b] Assumes 882,000 resident and nonresident nonconsumptive users take 8 annual 1-day trips (USFWS 1993a)
[c] Assumes 882,000 nonconsumptive users take 1 annual 1-day trip to view elk in Oregon anywhere
[d] Assumes 441,000 nonconsumptive users take 1 annual 1-day trip to an elk viewing site in Oregon.
[e] Assumes 100,000 nonconsumptive users take 1 annual 1-day trip to an elk viewing site in the Blues.

Table 12 summarizes the potential impact to Oregon personal income from nonconsumptive use that results from using the Oregon State and Blue Mountains income coefficients and either the national survey expenditure calculations or the deer expenditures.

The impact on income State-wide of 882,000 users taking eight trips annually to view wildlife in Oregon ranges from $62 to $82.7 million annually. As mentioned in the section "Valuation of Elk Viewing," the proportion of wildlife viewing in Oregon that is primarily elk viewing is not explicitly known. The Intercept Research Corporation (1990) survey in Oregon, showed that wildlife watchers are most interested in large and small mammals, therefore it is logical to assume at least one out of the eight annual primary wildlife viewing trips could have been taken to view elk; one of the more popular, majestic, and accessible big mammals. Assuming all 882,000 nonconsumptive users take one of their eight primary trips per year to see elk in Oregon, a minimum of $8 to $10 million in Oregon annual income could be due to elk watching. The proportion of this attributable to elk viewing in the Blues is unknown; therefore, a final income impact due to elk viewing for that area cannot be estimated. If, however, the potential of elk viewing sites is as discussed under the section "Valuation of Elk Viewing," then about $4 to $5 million may be reasonable as a State-wide income estimate due to elk viewing. If the viewing site located in the Blues could generate 100,000 visitors annually, then about $1 million in income could be captured there.

The average annual figures in table 12 for viewing wildlife and elk in Oregon and the Blues will be low, as they account only for primary trips; the additional value from trips where wildlife viewing was secondary was not included. The elk viewing figures are based on only one primary trip per year and may be conservative as well. Also, the 1991 national survey number of 882,000 resident and nonresident Oregon wildlife watchers is probably a conservative estimate of nonconsumptive use because interest in viewing is projected to grow by over 150 percent by 2040 (Rather and Hoekstra 1989).

Southwick Associates (1992) report that State-wide in Washington in 1991, $354 4 million in expenditures for all nonconsumptive activities and purchases supported 7,900 jobs and generated a total economic effect or impact of $475.3 million, including $150 8 million in household income and $29.2 million in State and $14.1 million in Federal tax revenues. Although impacts were not broken out by regions in the State or by cost category, a total of $103.6 million in variable expenditures for nonconsumptive recreation in 1991 was reported. These figures relate the magnitude of interest in nonconsumptive recreation and are an example of an application of economics to broaden the base of knowledge and understanding of this outdoor activity.

Implications

An implication of the impact from nonconsumptive use is that significant value does exist from viewing wildlife. The lack of data on nonconsumptive use, value, and expenditures suggests that this value is largely unrecognized and underused. Residents of the Blues, communities, counties, economic development agencies, and others could economically diversify by developing at least the one existing viewing site (along with related support services and businesses), marketing it, and encouraging potential users to travel there and stay longer. The demand for elk viewing may or may not be able to support more than one viewing site in the Blues.

Communities, counties, economic development agencies, and others also may be interested in drawing, and keeping for a longer time, more out-of-state hunters and viewers to bring new money to the Blues region. This would require reevaluation of current ODFW and WDW policy for nonresident hunters and contemplation of new policy for nonresident viewers. One attraction nonresident hunters may have is for a quality hunt; there likely are other reasons as well. Marketing wildlife resources of the Blues for various uses could boost the economy.

A perception encountered during preparation of this report was that communities felt tourists were more important and sought after than hunters because tourists stay and spend more in the community or area of travel whereas hunters camp out and bring their own supplies. An implication of this is that hunters are thought of as less important to the economy. Nonlocal hunters have the opportunity to increase their worth to these rural communities by (1) supporting research, such as this report, about the contribution made by hunters to the economy; (2) seeing that such results are made available and are used by managers and planners; (3) promoting facilities that encourage hunters to spend once in the rural community, such as outdoor sports stores and so forth; and (4) encouraging hunters, perhaps through the Rocky Mountain Elk Foundation, to buy more of their food and supplies in the area of destination rather than at home

Research Needs

Synthesis and analysis of the literature revealed information gaps and research needs. They are presented in this report to strengthen our understanding of the value and impact of elk in the Blues of Oregon and Washington and to entice furtherwork.

In general, the difficulty of doing this synthesis and the cost potentially incurred by surveying for original data by region and species lend themselves to a recommendation for a framework of research that allows for inferences to be drawn and applied elsewhere and at varying scales. The difficulty existed because of the various methods used in the studies, the different ways data were reported both in the studies and by the different State agencies, the lack of transferability of the studies, and the lack of a process for adaptation. Studies and agencies using comparable methods and data reporting techniques would be a start in ensuring their use in specific syntheses, such as this, and in broader policy analyses. Research with this idea in mind and a more rigorous design could allow for general rules of thumb to be used in transferring or adapting known data to a new question or different location.

Blue Mountain Surveys

To provide better information to resource managers on recreational opportunities associated with elk, a comprehensive elk hunting and viewing valuation and expenditure survey of Blue Mountain elk hunters and watchers may be beneficial. This is particularly true of elk viewers, as information about them is most scarce. Pretesting of a survey instrument to gather economic data regarding elk viewing in the Blues could be done at the Oak Creek Wildlife Area in central Washington.

A comparative study using the Starkey survey instrument, or a slightly modified one, both at the Starkey site and at a location outside Starkey but still in the Blues (perhaps a different check station) that has similar hunt characteristics could be done in the same hunting season. This would help assess the applicability of the Starkey survey results to the rest of the Blues.

A relatively inexpensive yet comprehensive study, similar to that produced for Washington State by Southwick Associates (1992) which used national survey data, could at least address the expenditure and impact issues and possibly be completed for about $7000. Such a survey would provide the most applicable regional data for planning and analysis purposes without having to analyze or modify studies from other areas.

A comparison of the results in this report or the comprehensive survey mentioned above with impacts from other industries in the Blues is essential. This requires researching available data and ranking the industries worth and impacts to the area.

Elk can also represent significant costs to landowners and state wildlife departments due to crop and forage damage. A review of agency records of compensation in conjunction with a survey of landowners in the Blues could estimate the worth of damaged crops and private abatement expenditures (including elk hunter and viewer control) as well as estimate any income from elk hunters and viewers. The latter allows an average net cost to landowners to be calculated. If, however, a total cost for managing elk in the Blues is estimated, costs to landowners over those compensated for by the state wildlife departments and the outlay by the departments are not the only pertinent costs to consider; other costs include grants by the Rocky Mountain Elk Foundation, Forest Service, and other departments and associations for on-the-ground elk habitat and management projects.

A direct comparison for a benefit-cost analysis, as mentioned for landowners in the previous paragraph, may not be possible. The information can be used, however, to determine if in general the value of elk (such as that estimated in this report or found through a direct survey) outweighs the landowners costs discussed above. Equity issues, such as who wins and who loses, and proposals to compensate losers could then be evaluated. Heinrich and Craven (1992) did a similar study for geese in Wisconsin.

A study on how landowners themselves can gain benefits from managing directly for elk could determine methods by which equity could be better achieved. On the other hand, hunters wonder how equitable it is that a private landowner can close access to a public good. This conflict requires good management skills based on sound social and ecological science.

To help understand equity issues from the perceptions of recreationists, a survey of viewer and hunter preferences could give substantial direction for program development by Federal land and wildlife management departments. Site-selection models that look at why hunters and viewers choose certain areas to recreate in are important for analyzing the effects of change. Some information already exists, such as the Johnson and Moore (1992) Oregon elk hunter survey that looked at hunter preferences, a study by McLaughlin and others (1989) of Idaho hunter preferences, and the Loomis and others (1989) report which includes site-selection models.

McLaughlin and others (1989) surveyed Idaho elk hunters to better understand their views, hunting habits, and why they hunt. A cluster analysis was applied that resulted in defined hunter types or groups. The same could be done in the Blues. Descriptions of elk hunters, attributes of a quality elk hunting experience with rifles, characteristics of preferred elk hunting settings, and hunter opinions about various game management issues were explored. Such a survey in the Blues would allow for varying qualities of hunt to be defined in terms of habitat, hunter densities, hunter success, access management, and aesthetics, which could aid management agencies in meeting clientele needs.

Following is an example of the usefulness of such preference studies: a study by Flather and Hoekstra (1989) made the assumption that the change in animal populations is important information for potential hunters in deciding whether to hunt or not. Hunter concerns over decreased access to hunting land, crowded hunting conditions, and increases in hunter lease or fee agreements for access may cause future big game hunting to be more dependent on accessible game and access prices than on total game populations. A recent State-wide study in Oregon showed that hunters perceive that access to private lands has decreased over the last decade (Johnson and Moore 1992). This perception needs to be tested in the Blues because Bolon (1990) found that for private landowners in Idaho, accessibility and leasing were not major issues; basically owners posted their lands because they wanted to be asked for access, know who was on their lands, and have respect shown for their property.

One of the implications of the study by McLaughlin and others (1989) for wildlife management policy was that a diversity of hunting opportunities or products exist that have the potential of being marketed to definable hunter market segments. This suggests that various hunting opportunities demanded should be incorporated into new management policies, not only for rifle, muzzle loader, and bow hunts, such as currently carried out by wildlife departments, but also for the hunter types as well (including quality, recreational meat hunters, and so forth). There are implicit values behind the hunter types that could be looked at further; hunting values such as those discussed in this report could be segmented by hunter type to reflect their differing values, thereby linking their WTP with their hunting expectations. A study similar to those by McLaughlin and others (1989) and Johnson and Moore (1992), but including or coupled with economic valuation, would broaden the understanding of hunter demands. What this may mean in terms of various user-pay fee structures could then be further analyzed, potentially contributing higher revenues to the wildlife departments, part of which could be invested back into the habitat through various programs.

A second implication of the McLaughlin study was that nonconsumptive opportunities need to be developed as they will play a critical role in future programs. What is of prime importance is that a study be done with nonconsumptive users to better understand their views and viewing habits to determine if there may be definable nonconsumptive user markets as well. Currently, hunting fees and equipment taxes support wildlife habitat whereas nonconsumptive users do not have to pay for their use and demands. With viewing being given away and hunting being charged, less research will continue to be the norm for nonconsumptive uses until viewing is explicitly priced, even if not charged. With the tremendous growth in the number of people interested in nonconsumptive use and the impact their use has on the land and their demands on management, a user-pay structure may be inevitable, to control access and abuse if for no other reason. Equity also suggests a user fee of some kind for nonconsumptive uses. This again requires potential new policy for ODFW and WDW.

Other implications pointed out in the McLaughlin study were the complexities of demand and the need for market research. Complexities in the form of (1) multiple-attribute consideration in the management and species planning process rather than just animals available and number of licenses sold; (2) hunters not wanting their opportunities limited but showing a willingness to trade road access and increased fees to ensure a quality game population, thereby providing managers an opportunity to manage for both biological and sociological perspectives; and (3) integrated social expertise in the day-to-day management operations, research, and planning programs of wildlife and Federal land management agencies. Market research would determine if the goods the public wants, such as high-quality hunting, are being produced and could include (1) the monitoring of opinion trends and changing values; and (2) the improvement of communication between users and management agencies. Human management is a greater and greater part of what wildlife management is all about these days. This will only grow more so as we move into the future of greater human populations and ever more scarce resources.

The annual harvest survey by ODFW asks for the number of days spent bow hunting. A question asking the number of trips bow hunters take during the season could easily be incorporated to test assumptions, such as that used in this analysis (two annual trips of 6 days each) and refine analyses. It may be possible to get future WDW data reported by type of hunting as well.

Adapting Other Studies

An alternative to surveying is research that explores methods of adapting existing data to represent the Blues region (given similar variables of interest among studies). Testing the assumptions made in extrapolating the Starkey hunter survey values and expenditures to the rest of the Blues would provide insight on the applicability of results given that the Starkey Experimental Forest and Range is viewed by some as a special or unique site. A complete survey of users of elk in the Blues might not add much to current levels of data; that is, the cost of information needs to be considered. Validity becomes less important if the outcome does not change.

The analysis presented in this study is reasonable across the Blues if values and expenditures are not overly sensitive to characteristics perceived to make the Starkey Forest unique, and if studies from other areas are also not overly sensitive to variations in hunt characteristics. Data from ODFW could be compiled to explicitly determine if hunters at Starkey have a similar number of hunter days per hunter and success rate, given similar types of hunts, as hunters in other areas of the Blues. Studies such as Vale's (see footnote 5) that compare success rates and hunter-per-elk ratios in various hunt units are initializing comparisons and can be very helpful in determining the applicability of existing data. If similarities exist, Starkey data may be fairly applicable to the entire Blues' region; if not, adjustments to better represent the area may be needed.

A particular use of comparisons such as Vale's would be adapting the Sorg and Nelson (1986) study of elk hunting in Idaho. Comparing interregional differences in elk hunting and hunter characteristics, values, and expenditures in Idaho versus in the Blues can lend insight into the validity of extrapolating the Idaho data to the Blues. Both areas may offer similar resource characteristics but attract slightly different hunter populations; for example, Idaho may have more nonresident hunters and a greater use of guide services than the Blues. Data to test this more thoroughly may exist; see for example, Johnson and Moore (1992) and McLaughlin and others (1989).

A more comprehensive study of the 1991 national survey data may be useful (USFWS 1993a, 1993b). The survey does have some, albeit limited (due to sample size), data on elk hunting and may be able to provide regional data as well. The national data tapes can be accessed by U.S. Fish and Wildlife staff or purchased, and could provide use and expenditure data for analyses and planning specific to elk hunting and possibly the Blues Results for northeast Oregon then could be compared more directly to the Starkey data and the other valuation and expenditure studies mentioned in this report.

The Starkey and national survey data could be used to break out local resident and nonlocal resident hunter expenditures to test the assumption that although what has been spent in the region of the Blues is not "new" money to the State, it is to the Blues' region. This is assumed, as trip-related expenditures in the Blues and Starkey for elk hunting are purported to be primarily from hunters residing in the Willamette Valley, where the money otherwise could have been spent (see footnote 12). Testing for differences in values, however, would be more difficult and would require surveys of residents in the region of the Blues, residents outside the area, and nonresidents.

The 1985 IMPLAN model was used to evaluate the expenditure impacts (ODFW 1991b). National-level data was disaggregated to counties in the Blues so the region could be assessed separately; there is now a newer version of IMPLAN. Also, due to differences in assumptions, there is evidence that models with primary data from the county or small region level aggregated to the Blues' region, if done right, would provide a more accurate representation of economic impacts there.[16] This type of model is more expensive and time consuming to build. Some northeast Oregon input-output models from primary data at the county level are already complete: Grant, Wallowa, and Baker. Two out of these three models are older and would need partial updating for price and structural changes, and all three would need adjusting for intraregional flows (all for a cost of around $20,000 plus 15 percent in indirect costs for university support with completion in about 9 months if started by summer). Extrapolation to the region of the Blues could occur through these three models; for instance, combined, they would be representative of Union County. To do a new nonmetro county in the Blues would cost about $25,000 plus indirect costs and take about a year to do. Such models could be used to better evaluate the impacts of elk hunting, viewing, and other expenditures on the Blues given its specific economy, but whether or not the answer would be significantly different between the disaggregated national model (new or older version) and the county-level model is unknown.

Ecosystem Management

There is a need to manage sustainably and interactively for multiple uses. Linking hunting, wildlife and nature viewing, fishing, recreational mushroom picking, and all other uses of plants and animals in a GIS database and applying other available analytical tools could show the cumulative and overlapping effects of use and change. Conflicts of use in particular areas arising from capacity and timing overlaps could be minimized. Such information may enable resource managers to better manage the ecosystem to balance all uses to allow quality recreational experiences and commodity production.

Management mainly for elk, excluding other resource considerations, would be unwise given values of the society and the need for sustainability. It also would not allow for economic constraints or benefits from joint resource production to become better understood.

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[16] Personal communication. 1992. Fred Obermiller, range economist, Agriculture and Resource Economics Department, Oregon State University, Corvallis, OR 97331.

Evaluation of tradeoffs between elk or elk recreation and other resources or industries is difficult because of the complexity in measuring the effects of management actions on elk populations. One example is a study by Rather and Hoekstra (1989, p. 83) that projected changes in hunter numbers and habitat through time; a 20-percent change in available habitats and in big game populations resulted in a 5-percent change in the number of hunters. This type of study is useful in policy analysis.

Studies on preferences, formulation of site-selection models, habitat and population models, vulnerability models, and so forth could be used in an encompassing conceptual model to link wildlife habitat changes to wildlife population changes to changes in human use and values. Thus, predicted changes in land use, management, and the effect on recreational use and value may be clarified for game species of all kinds as well as for nonconsumptive viewing species. Currently there is a severe lack of data to complete such a broad model, although one such prototype has been developed in the Elkhorn Mountains of Montana (Loomis 1992). Because elk and deer are game species and have been studied extensively, more data exist for these species and could lend insight on how to complete such a model.

Technology Transfer

Information from this report and from new research on the economic aspects of elk hunting and viewing could be directly useful to communities, counties, state development divisions and wildlife departments, Federal natural resource agencies, recreationists, and others. Information these groups could use, however, usually is published in journal articles and other outlets that reach only academia and peers. To communicate with a specific audience, information should be demonstrated in the form of presentations, newsletters, fact sheets, brochures, displays, and posters for exhibition at various public events, workshops, and seminars. The best method of communication is one tailored to the needs of each audience. The closer the contact between the audience and the messenger, the better, and because communication is cumulative, using several methods, rather than just one, generally produces better results. The users and some of their potential uses of economic information on elk are identified below. Individual technology-transfer methods, however, need to be researched and a plan funded and developed to best get a tailored message directly to each user for their specific need; such would be useful for many types of information.

Communities and counties in the Blues and state development divisions can make use of basic outdoor recreation expenditure information as an empirical indicator of economic importance rather than judging by myth and conjecture as sometimes happens. They will have a better understanding of how recreation for elk and its impact ranks among other resources and industries in the Blues. This can clarify decisions on how to best service each. Information on income and employment generated by people viewing and hunting wildlife, such as elk, can help city and county decisionmakers in land use planning.

Material such as "Nature Watch: a resource for enhancing wildlife viewing areas" (Hudson 1992) is written for resource managers and private landowners as an aid for promoting wildlife viewing on their lands. Information on site selection and management, and interpretive and media techniques are included to ensure visitor satisfaction and resource protection. The public in general and the communities involved are increasingly recognizing the value of wildlife and its nonconsumptive use as witnessed by the Nature Watch book and the increased number of wildlife viewing areas. The potential for development of this opportunity could be relevant to counties and communities.

State wildlife departments can use more specific WTP values and expenditure impact data as aids in developing and justifying wildlife management plans. Development plans for competing resources can be challenged with empirical economic impacts and benefits of wildlife-related activities potentially leading to resource allocation changes, increased social welfare, and recognition of the value of natural resources. State wildlife departments are becoming increasingly aware that they must enhance their economic and social understanding of the role of resources in the economy of the state and the general well-being of society to remain effective as land managers. Wildlife population inventory and manipulation alone are no longer sufficient strategies for astute decisionmaking in the face of increased human development and demands on natural resources. This is true for Federal agencies, such as the Forest Service, in forest planning and management efforts. Information on the economic aspects of elk and other wildlife can help define and fill information gaps and foster research to clarify the various tradeoffs among competing resources. Better information can lead to the development of basic policy decisionmaking tools for making increasingly better and more effective policy decisions.

One of the obstacles Federal and state land management and research agencies have to overcome is that of not marketing themselves. For instance, with specific training in marketing the BMNRI education program coordinator could advance technology transfer tremendously. Information in various useful forms could be supplied to extension agents throughout the area and states. Fact sheets, newsletters, signs, posters, displays, and even videos can be made to communicate the interactions between wildlife and other resources and what economics, as one of several tools, can do to help in resource management. The different values of wildlife, how they are or can be used. and the impacts to communities from recreational spending can be communicated through public events, such as home and garden shows. It is also possible to extend the public awareness of economics and its usefulness in natural resource management through a public broadcasting show. One study (Intercept Research Corp. 1990) shows that maps (82 percent), signs (71 percent), and brochures (68 percent) are the interpretive materials wildlife watchers consider most useful. Although the maps are specific to a given activity, the use of signs and brochures may be reasonable outlets for a new kind of information sharing on awareness of the economic aspects and value of natural resources.

Conclusion

This report summarized available and relevant information for identifying the worth and personal income impacts of hunting and viewing elk then related the findings specifically to the Blue Mountains of Oregon and Washington. Estimated recreational values and personal income impacts using Starkey Experimental Forest and Range data were calculated and compared with values based on data from nonlocal studies. Research needs were identified and technology transfer discussed.

Elk contribute substantial economic value in the Blues of Oregon and Washington Hunters, viewers, and the general public as well derive benefits from elk. It is assumed that Blue Mountain elk hunting and viewing values, expenditures, and impacts in Washington are similar to those found in Oregon.

The activity day value is estimated to be about $39 for elk hunting. This report shows that the elk hunting season in the Blues of Oregon is worth $17 to $20 million per year to hunters over and above their expenditures. Expenditures by Blue Mountain elk hunters were $23 per day in the Blues and $48 State-wide. The business activity generated by Blue Mountain elk hunting expenditures generates over $14 million in personal income in the State and about $5 million in northeast Oregon each year

The activity day value over and above expenditures is estimated to be about $27 for wildlife viewing. The general public values outdoor recreation trips taken in Oregon to view wildlife in general at about $92 to $339 million per year with an average of $176 to $182 million. If just one of the eight trips taken for nonconsumptive use is to view elk, then the worth of elk viewing in Oregon would range from $11.5 to $42 million (averaging about $22 million annually). If four of the elk viewing sites in the State were further developed to attract half of the users and they took one annual trip to do so, worth would range from $6 to $21 million (averaging $11 million) annually. Of that, $1.3 to $4.8 million annually ($2.5 million on average) could be attributed to the elk viewing site in the Blues if it was further developed.

Expenditures in Oregon by nonconsumptive wildlife users were $24 to $36 per day. Personal income impacts from viewing wildlife in Oregon in general were estimated at $62 to $83 million annually. Income impacts from viewing elk are not well known but are estimated to generate $8 to $10 million per year in Oregon if one annual trip is taken by nonconsumptive users to view elk. If the four view sites are developed, elk viewing could potentially account for about one-half (or $3.8 to $5.2 million) of these income impacts State-wide. The Blues could capture about $1 million in personal income by further developing the site there.

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Appendix 1
Defining the Economic Aspects of Elk

Economic versus financial benefits are two different measures. Financial benefits are actual dollars that change hands. Economic benefits describe the potential and actual willingness to pay (WTP) for an opportunity. The economic value of any resource, marketed or not, is defined as the user's WTP. The willingness and ability of a user to sacrifice either income or other goods to gain or maintain use of a resource of interest is WTP. This value does not have to be collected as cash. Politically, it may be important to transfer a portion of the user's WTP to actual cash flow, but any financial returns are just a transfer of benefits from users to the recipient. The distribution of the economic value between members of society changes. The total economic value received by society, however, does not.

A public good is one for which the right of use in any way is not sold on the open market; elk are a public good. Viewing or hunting elk provides utility to people, and as elk are a scarce resource (that is, more are demanded than supplied), they have economic value to society. This value can substantially exceed financial values, such as elk tag and license fees, which disclose little about the economic value of elk hunting to hunters or the economy. In the case of elk viewing, no fee is charged, and yet there is obvious value in viewing elk because many would be willing to pay. For public land allocation decisions between maintenance of elk habitat and other competing uses. the appropriate measure is economic value, not financial returns Financial returns from recreational expenditures are meaningful due to the income and employment created from elk hunting and viewing.

Benefits—There are many types of economic value provided by wildlife such as elk. Each is a component of total value (Randall and Stoll 1983) including recreational, option, existence, bequest, and commercial values. Each of these values applies to consumptive (hunting and trapping) and nonconsumptive (observing and photographing) uses of wildlife. Net economic value is the willingness to pay over and above the current expenditures for a recreation experience Option value is willingness to pay to maintain a resource so that it is available to use in the future. Existence value is the economic benefit received from simply knowing wildlife exists Bequest value is willingness to pay to provide wildlife resources for future generations. Commercial values include access fees for hunting and viewing wildlife and wildlife production, such as in big game ranching or farming, for meat, antlers, or breeding stock. Other types of value that currently fall outside the economic arena but surround wildlife include aesthetic values such as from wildlife art; educational values received by learning from wildlife about our world; biological and ecological values for environmental services; and contributions provided by wildlife, and social values found in conversation, newspaper stories, names of places, national symbols, and so forth (Decker 1989). All these components of total value can be held simultaneously by the same person. This report, however, is mainly interested in the recreational economic value of elk hunting and viewing and the impacts of expenditures made in their pursuit, primarily because those are the best quantified aspects found in the literature.

Expenditures–Expenditures that flow out of the state and county because residents choose to recreate elsewhere represent a loss of income to local, county, and state economies. Variable expenditures by elk hunters or viewers are for food, lodging, gas, film, and other goods. They are a cost of participation and a gain to the local economy. Hunters and viewers of wildlife spend money in the local economy by giving income to business owners who hire and pay employees who turn around and spend money in the local economy which provides another round of income and jobs—and the cycle continues. Income and employment also are supported in business sectors that supply goods or raw materials to the businesses that directly receive elk hunter or viewer dollars. The sum of all those rounds of spending in the economy is what is expressed in multipliers. Direct, indirect, and induced changes in income resulting from the original spending is calculated by using income multipliers from an input-output model. Only variable expenditures were analyzed in this report, such as for those items mentioned above. Fixed costs for equipment, clothing, and vehicles were not included even though those actually bought in the Blues do contribute to the local economy.

Benefit-cost analysis—Benefit-cost analysis is a process for comparing all the gains and losses, measured in common units, that result from proposing or taking an action. It compares various alternatives to determine which ones provide society with the most economically efficient use of its resources. When the policy issue is one of comparing benefits and costs to the nation as a whole, net WTP figures are relevant. If people are unable to go elk hunting, they may spend that money on some other recreation activity or purchase some other good. Expenditures are transferred either geographically within the economy (that is, hunting elsewhere) or transferred to another sector of the economy (that is, golfing instead of hunting). Therefore, from the national viewpoint of a Federal agency or when dealing with Federal funds, these expenditures and the income and employment generated by hunters or viewers are transfers and are not relevant when comparing the benefits and costs to the nation of providing elk hunting or viewing. Benefit-cost analysis defines net benefits as the gain in value of output over and above the costs (or expenditures) necessary to produce it. The net WTP of hunters or viewers over and above their current expenditures (defined as consumer surplus) is the relevant measure of the value of elk to the nation. When dealing with timber, the net economic value of timber is measured by the stumpage price, which is the price of the logs at the mill minus the harvesting and transportation cost to the mill. This is conceptually the same as the net economic value of elk hunting, which is the value of the hunting trip experience minus the elk harvesting and transportation cost to the hunter.

Many times when the benefits of an action are not fully known, an alternative process is used called cost efficiency in which case only the costs of the actions are measured and the least cost alternative for achieving the same end is sought.

Measuring the Benefits and Impacts

In measuring the benefits of resources, methods must be chosen that allow for comparisons between marketed and nonmarketed resources. To obtain consistency in valuation, economists use values measured from consumer demand curves and business supply or cost curves. In both cases, net WTP is the proper measurement of benefits.

The WTP of elk hunters and viewers can be estimated by either a demand estimation procedure called the travel cost method (TCM) or a market simulation approach called the contingent valuation method (CVM). The former assumes that travel costs can be used as a proxy for price to derive a demand curve, whereas CVM asks users directly to indicate their WTP for specific recreational opportunities. Both are recommended for use by Federal agencies (U.S. Water Resources Council 1979,1983) and others, including Walsh (1983), when performing benefit cost analysis. Both are applicable to valuing elk hunting and viewing. The choice between methods depends upon the nature of the data, the recreational activity being valued, sample sizes, and the objectives of the study.

Appendix 2

Table 13—Income impacts of elk hunting expenditures per day per hunter In the Blue Mountains of northeast Oregon and southeast Washington[3] (1991 dollars)

Expenditure category	IMPLAN coeffs[a]	Average expenditures in NE OR	Impact of expenditures in NE OR
		----1991 dollars----	
Travel	0.3181	7.46	2.37
Lodging	.7670	.93	.72
Food in store	.2669	5.59	1.49
Food in restaurant	.6304	2.12	1.33
Supplies and miscellaneous	.4268	3.84	1.64
Fees	.9285	2.97	2.76
Total expenses and impact		22.90	10.31

[a] Data are from the Blues in northeast Oregon but represent all of the Blues, including that part in southeast Washington
[b] Uses IMPLAN coefficients that represent the direct, indirect, and induced effect of a dollar spent in the Blue Mountains area in that category Multipliers explain relations; for example, an income multiplier of 0.77 would indicate that for every dollar received by a specific industry, 77 cents in wages and salaries would be paid to the employees of that industry.

Table 14—State-wide income impacts of elk hunting expenditures per day per hunter In the Blue Mountains of Oregon (1991 dollars)

Expenditure category:	IMPLAN coeffs[a]	Average expenditures		State impact of expenditures		Total State impact
		Outside NE OR	In NE OR	Outside NE OR	In NE OR	
		1991 dollars				
Travel	0.5866	6.98	7.46	4.10	4.37	8.47
Lodging	.9191	.52	.93	.48	.86	1.34
Food in store	.6990	6.50	5.59	4.54	3.91	8.45
Food in restaurant	.8014	1.27	2.12	1.02	1.70	2.72
Supplies and miscellaneous	.8507	6.24	3.84	5.31	3.26	8.57
Fees	.9914	3.41	2.97	3.38	2.94	6.32
Total expenses and impact		24.93	22.90	18.83	17.04	35.88

[a] Uses IMPLAN coefficients that represent the effect State-wide of a dollar spent in that category.

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Bolon, Natalie A. 1994. Estimates of the values of elk in the Blue Mountains of Oregon and Washington: evidence from the existing literature. Gen. Tech. Rep. PNW-GTR-316. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 38 p.

Existing literature was used to estimate the economic value of elk to hunters and wildlife watchers, and the economic impact on personal income to local communities in the Blue Mountains of Oregon and Washington. Data from the Starkey Experimental Forest and Range were calculated and compared with values and impacts from nonlocal studies. Elk contribute substantially to the economy; the annual worth of hunting was $17-20 million over and above hunter expenditures, the annual worth of viewing elk in the Blues could be at least $1.3 to $4.8 million. Expenditures by hunters contribute about $5 million to the area while those by viewers could contribute at least $1 million.

Keywords: Big game, Blue Mountains, community impacts, economic values, elk, hunter expenditures, hunting, Oregon, valuation, viewing, Washington.

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