SOCIO-ECONOMIC ISSUES RELATED TO INTERIOR ECOSYSTEMS

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ABSTRACT

Land stewardship in the western interior forests is evolving to balance concerns about fitness and diversity of ecosystems with socio-economic concerns. The socio-economic aspects deal with broad issues such as the costs and benefits to society, their congruence with social values and expectations, type and availability of future management options, opportunities foregone and trade-offs, and sources of resistance to management direction. The basis for land management will continue to be notions of the markets for the goods and services. Management will likely continue to be controversial because notions of the future in a diverse society are multiple and divergent. In addition, there are multiple economic issues in land management including questions about the need for a systems framework for ecosystem management; the distribution of costs and benefits; equitable balancing between the wants and needs of future generations and those of the present generation; accurate valuation of the bundle of ecosystem products (ecosystem goods, services, and states); and the economics of ecosystem restoration. There is the question of appropriate spatial scales for economic and social analysis and associated global economic implications of cumulative local and regional land management. Finally, society will examine implications of management alternatives as instruments to advance rural economic and social development.

Keywords: forest economics, timber supply/demand, economics of forest management

INTRODUCTION

In this paper, we discuss some of the relevant economic concepts that guide forest management both now and as we attempt to implement ecosystem management. Traditional concepts in neoclassical economic theory such as supply and demand, efficiency, and equity remain useful. However, new societal concerns about appropriate systems frameworks, non-traditional ecosystem products, societal discount rates that vary across products depending on effects on ecosystem sustainability, spatial and temporal scales, and links between forest management and economic development for natural resource-dependent communities are also emerging.

The basis for land stewardship is some notion of the future markets for the goods, services, and states derived from various ecosystems. Society's demand for ecosystem products shapes the context of economic policy, and basic cultural values shape society's demands and its economic behavior. Americans have long held that the use of renewable resources is to be favored over nonrenewable resources. This tenet has guided forest policy formulation and implementation for most of the 20th century. A more recent corollary to that belief is the notion that the use of forest products has lower ecological cost and more benign environmental impacts than substitutable products that are often made from nonrenewable resources (Cliff 1973; Alexander and Greber 1991). A second tenet is that economic efficiency assumptions drive basic supply and demand projections. On the supply side, capacity adjustment, technological improvements and land management actions are driven by various perceptions of profitability. On the demand side, changes in consumer preferences, and growing income influence levels of demands.

EMERGING ISSUES

There are several emerging economic issues in land management including questions about the systems framework for economics for ecosystem management: the distribution of costs and benefits; equitable balancing between the wants and needs of future generations and those of the present generation; accurate valuation of the bundle of ecosystem products (ecosystem goods, services, and states); and the economics of ecosystem restoration. There is the question of appropriate spatial scales for economic analysis and associated global economic implications of cumulative local and regional land management. Finally, society has expressed a willingness to examine implications of management alternatives as instruments to advance rural economic and social development.

A Systems Framework for Economic Analysis of Ecosystem Management

The policy decision on the part of the Forest Service to manage for sustainable ecosystems (Overbay 1992) requires National Forest managers to plan over the long-term for ecosystem integrity and for the benefit of multiple generations of people. For ascertaining the level of ecosystem management that society desires, and that is biophysically possible, decision-makers must be acquainted with the possible biological, physical, social, and economic consequences of each alternative decision under consideration. Practical adoption of this policy has problematic aspects. Complex management strategies entail development of more complex and explicit models for ecosystem outputs that show the effects of joint production of multiple ecosystem

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resources. The goal is to design these frameworks to provide greater clarity in societal decisions for ecosystem management.

The basic analysis process assumes a systems view of forestry's biophysical and societal processes. Ecosystem managers would develop models of the constituent parts of an ecosystem. For example, input variables would include timber yield functions for timber inventory projection systems, habitat indicator relationships (linked to physical attributes of the forests), mushroom yield relationships, available labor force, etc. Solution variables might be timber and mushroom production, habitats, stand conditions (i.e., seral stages), jobs, community stability, and levels of stand disturbance. Some of these variables would define the boundaries of acceptable combinations of management options for individual resources.

A systems approach allows the manager to explore possibilities for change in forest landscapes over time under alternative versions of future management strategies. It differs from traditional approaches by directly treating uncertainty in the analysis. In the modeling literature, this approach has been called scenario planning (Wack 1985). Scenario planning, as usually applied, does not attempt to predict the future but rather postulates a set of plausible futures each dependent on the assumptions that underlie a future vision. By doing so, the technique focuses on what might happen or go awry and how people can respond effectively under multiple events. Planning for a single predetermined future is avoided.

Most scenario planning applications in forestry (e.g., USDA Forest Service 1983; Haynes 1990) take a classical sensitivity analysis approach. In this method, a limited number of key predetermined and solution elements are varied. Then, key projection results (significant for their policy relevance) are examined for differences. These differences allow analysts to identify emerging problems and to measure the effectiveness of possible solutions to various problems. Use of such a framework has been absent in the recent large scale ecosystem management efforts. The Forest Service adopted its new policy of sustainable ecosystem management assuming that both society and ecosystems benefit in the long-term. Without a framework for planning and decision making, evaluating ecosystem management strategies is more of an ideological exercise marred by value-laden, all-or-nothing choices.

Spatial Scales in Economic Analyses

The relevant scales in economic analyses are, generally speaking: local, regional, national, and global. At local scales, it is often difficult to assess what society as a whole values: that is, what it expects from ecosystem management, what it is willing to accept in trade-offs, what it is willing to forego, what level of cost is acceptable, and at what level of benefits it is willing to invest given the multitude of opportunities elsewhere. The more relevant scales for economic impacts may be regional rather than local because of the opportunities for substitution between local places within ecosystems. At the national and international levels, one relevant question is how alternative management in one country influences management emphases and levels in other countries. Various world governments collectively need to decide how much timber will be harvested globally, who will harvest it, who will develop technologies and alternatives to wood products, who will prefer sustainable ecosystems and who will not.

Specifically, the U.S., as the world's largest importer of softwood timber, will need to assess its impact on the Canadian forest sector, our largest trading partner. Globally, we are assessing the need for ecosystem management and the state of its technology as part of global environmental policies that may be driven more by non-forestry concerns. For example, policies to manage the terrestrial biosphere to sequester atmospheric carbon dioxide may greatly influence forest management in the coming decades. Finally, the shift to ecosystem management with less emphasis on timber harvests may be accompanied by higher product prices and greater dependence on lumber imports from Canada. Harder to define are the ripple economic effects of implementation of ecosystem management in the Pacific Northwest over other ecosystems, whether they be in Canada, the southeastern United States, Malaysia or Siberia.

Temporal Scale: Intergenerational Equity

Another concern relevant to choosing alternatives in forest management is the socially appropriate balancing of the wants and needs of future generations with the present generation. The issue is whether the current generation should gain at the expense of future generations. Currently, relatively high interest rates are often used to evaluate forest management practices. At an 8% rate of interest, returns on investments have to be twice as high as those made at a 4% rate. Another way of regarding this is to consider the value of a dollar. To the current generation the value of a dollar is one dollar, but the value of that dollar in twenty years is $0.46, assuming a discount rate of 4%, and $0.21 at an 8% discount rate. People clearly prefer to use the dollar of benefits now rather than defer receipt of benefits if the value of the benefits are perceived to drop in the future.

Concerns over sustainability, ecologic and economic, in ecosystems prompt a reevaluation of the traditional assumptions of a positive discount rate for time preference. If unconditional sustainability of ecosystems and economic production from ecosystems is a societal goal, positive societal discount rates are probably inappropriate. Such rates favor consumption in the near term. In an attempt to give a greater consideration to future generations in ecosystem management, practitioners of sustainable development advocate a non-positive discount rate (either zero or negative).

Valuing Non-Traditional Outputs

A key feature of ecosystem management is the recognition that society manages large landscapes for a bundle of goods, services, and ecosystem states (such as old growth, biodiversity, etc.). The challenge is to reflect the true value to society of these goods, services, and states. Ideally, transactions between buyers and sellers in markets determine economic value, but this turns out to be true only for a small number of the goods and services

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(primarily timber and range) produced in forested ecosystems. Values for other goods and services are set by public (government) intervention or by some proxy representing the public's perceived willingness to pay for ecosystem products.

Many of these other outputs are often characterized as having non-market values and are frequently overlooked by policy-makers and resource managers as they assess the value of resource outputs. Failure to recognize elements of forest ecosystem production that benefits society can lead to errors in policy and management and to market failures so that products are valued incorrectly or not all. The true set of ecosystem outputs remains unknown, and many times prices do not reflect the true ecological cost of production nor the true market price for the ecosystem product.

For society, broad-ranging values of forested landscapes may be quite different than those held by the resource managers. For example, in a study assessing the economic impacts of listing the Columbia/Snake sockeye salmon, the economic costs of shutting down various recreation, timber, range, and mineral programs for the nine National Forests in the Snake River basin (Haynes et al. 1992) were measured. The costs for doing this are as follows:

Analysis	Range	Timber	Recreation	Minerals*
	Present value, million 1990 dollars			
Worst case	10.3	480.8	2030.4	72.8

* Worst Case estimates may be conservative as they include only placer mine losses.

The costs of lost recreation was 4.3 times greater than the lost timber values and 197 times greater than the lost range values. This outcome surprised Forest Service planners, where traditional budgeting emphasis for staff and activities has been directed to range and timber production.

From an economic standpoint, one proxy for dealing with uncertainty in the ability to describe total forest ecosystem production is to measure values in terms of opportunity costs. Opportunity costs are the minimum estimates of value (cost of production) of a particular product as the value of the next best alternative foregone or traded-off. For example, if a National Forest adopts new riparian zone management standards that reduces allowable sale quantities (ASQ) of timber in a watershed by 5%, then the opportunity costs of that decision is the reduction in ASQ times the value of timber (assuming timber is the highest alternative use). If the reduction is 10 million board feet in the first decade, and assuming a stumpage price of $300 per thousand board feet, the opportunity cost is $3,000,000. In a broad sense, the value of those riparian zone management standards and guides must be worth at least $3,000,000 to society. Land managers will need to make sure that the costs of alternative management strategies are explicit so that the public can gauge the magnitudes of net benefits of management alternatives to society.

The complexity of forest ecosystem analyses challenges our way of thinking. Often, there are real but difficult-to-quantify economic benefits that extend beyond the confines of forests and rural communities adjacent to forests. For example, so-called "second dividends" from available ecosystem services continue to attract new businesses to the Pacific Northwest (Whitelaw and Niemi 1989; Yang 1992). Perceptions of environmental quality have been conducive to economic development in future-oriented, high-tech industries.

TIMBER SUPPLY AND DEMAND

Presently, and probably at a diminishing rate in the future, timber is the primary market good obtained from forest ecosystems. Economic theories of natural resource use often assume that resource use increases as population and income grows. Facts point to a different reality. Per capita consumption of all forest products in the United States was 80 cubic feet in 1950, declined to a low of 60 cubic feet in 1970, reached 95 cubic feet in 1988 and currently is 80 cubic feet (see Figure 1). Perhaps more important has been the change in the composition of product consumption. Per capita consumption of solid wood products has fallen, although in recent years it has rebounded as Americans have spent more to repair and alter existing housing units. Per capita fiber consumption has increased 45% throughout the past four decades with most of the growth taking place in the 1950s and 1960s. Finally, fuelwood consumption which fell by 82% between 1950 and 1970 rose rapidly in the 1970s reaching the 1950 level by the late 1980s.

Recent research in the United States (USDA Forest Service 1988; Haynes 1990; Haynes et al. in press) suggests that per capita wood product consumption will decline slightly over the next 50 years. This view of the future places less reliance on solid wood products manufactured from logs but greater reliance on engineered and reconstituted products for structural applications. It assumes a greater use of recycled fiber, and greater demand for nontimber commodities and noncommodity benefits from forests. In spite of this, total roundwood consumption in the United States is expected to grow 0.4% per year to 24 billion cubic feet by 2040 (Figure 1). By contrast, U.S. population is expected to increase at an annual rate of 0.6% for the same period.

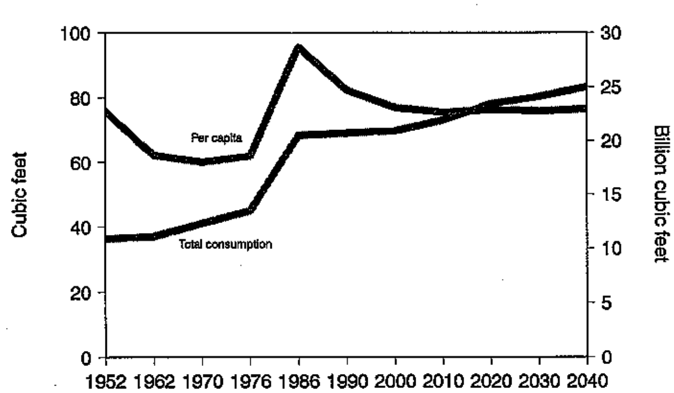

Figure 1.—Consumption of timber products.

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Stumpage prices are expected to increase in the next fifteen years as the transition from harvesting natural stands to harvesting managed stands is completed and as public harvests are reduced in the west. In the longer term prices stabilize, reflecting a balance between supply and demand in both the stumpage and wood product markets. In the near term, however, there are painful adjustments as a consequence of cumulative federal land management planning decisions and actions to protect the northern spotted owl, marbled murrelet, and anadromous fish species. By 1995, real (inflation-adjusted) stumpage prices will increase on average 118% over 1989 levels in eastern Oregon and Washington.

Timber harvest levels in the Columbia River Basin, when measured as a proportion of total U.S., harvest have been declining since the early 1960s (Table 1). Currently they account for 10% of total United States harvest. Timber harvests in the basin have declined by roughly 7% since 1986 and are expected to decline by another 5% by the end of the decade. Public harvests currently account for 65% of the total harvest and the forest industry ownership is larger than the other private ownership. Current projections for lumber and plywood production between the years 1991-2000 are for a 800 million board feet drop in lumber production, and for an increase in structural panel production of roughly 500 million square feet (Haynes et al. in press).

Table 1.—Columbia River Basin softwood harvest by owner group.

							Projections				
Item	**1952**	**1962**	**1970**	**1976**	**1986**	**1991**	**2000**	**2010**	**2020**	**2030**	**2040**
					Million cubic feet						
Ponderosa pine regions (PNWE)											
National Forest	100	232	286	292	378	352	152	152	152	152	152
Other Public	48	61	97	89	77	81	92	112	114	116	120
Forest Industry	100	94	117	151	166	100	178	190	219	221	234
Other Private	100	67	48	60	65	61	85	99	133	170	227
Total	348	454	548	592	686	594	507	553	618	659	733
Northern Rockies*											
National Forest	126	259	319	279	254	231	157	167	177	185	194
Other Public	45	46	40	45	40	98	120	119	119	119	119
Forest Industry	79	114	153	162	228	251	173	78	54	96	152
Other Private	81	72	73	71	48	96	144	150	181	175	176
Total	331	491	585	557	570	676	594	514	531	575	641
United States total											
National Forest	961	1,635	1,918	1,867	2,153	1,789	1,011	1,040	1,070	1,099	1,124
Other Public	403	562	702	822	814	769	890	939	953	964	969
Forest Industry	2,668	2,144	2,758	3,302	4,043	3,936	3,823	4,033	4,918	5,710	5,825
Other Private	3,490	2,981	3,317	3,518	4,253	4,238	5,336	5,473	5,645	5,887	6,699
Total	7,522	7,322	8,695	9,509	11,263	10,732	11,060	11,485	12,586	13,660	14,617

Data from 1992 RPA update
* Northern Rockies data estimated from total Rocky Mountain data

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Gainers and Losers

Another traditional economic concern has been the equity considerations of forest policies. Conventionally, three broad groups (stumpage owners, producers of forest products, and consumers) are considered to be affected by changes in forest product markets. Events that change either property values or the regulatory climate affect stumpage owners. Changes in costs[1] of production and change in the prices of final products affect producers; changes in prices of forest products impact consumers. Often, changes in the forest sector do not affect the three groups equally or even in the same direction. For example, the long-term declines in harvest levels from federal timberlands in the Douglas-fir subregion in general affect regional producers most while national consumers remain the least affected. One estimate of consumer impacts associated with owl related harvest reductions was that consumer expenditures for softwood lumber would increase by 12 (1989) dollars per household by 2010 (Haynes 1991). During the next two decades, increased production in other regions, particularly Canada, will likely reduce potential negative impacts on consumers. In later decades the opportunities for offsetting production are exhausted, thereby increasing total consumer impacts.

As public harvests are reduced, losses are greatest for producers in the affected regions of forest products in the next decade, but level off after 2000 as producers reduce installed lumber capacity in response to lower harvest levels and higher stumpage prices. Least affected are private stumpage owners who see increases in revenues derived from the sale of sawtimber.

Private landowners will have financial incentives to manage and harvest their lands more intensively as federal timber harvests are reduced. However, state forest practice acts often prescribe actions on private timberlands to benefit the total public without compensation to private timberland owners for the costs incurred to them of foregoing harvests. Society as a whole gains but imposes an economic cost on private landowners who are legally obligated to provide ecosystem benefits. Society might choose to identify and assign a cost to the public as compensation to private landowners. In both Washington and Oregon, there has been resistance to expanding forest practice laws because the question of who pays for benefits shared by the entire public from private lands (water quality, biodiversity, etc.) have not been resolved.

There is also the issue of interregional gainers and losers. The forest sector is made up of a number of major regional markets each with a unique set of circumstances. Forest products markets in the East typically have only small involvement with public lands. Similar markets in the West may be dominated by the actions of a single public land management agency (e.g., the Forest Service in eastern Oregon). Many of the recent policy issues in forestry have involved the extent to which changes in one region might affect timber markets in other regions.[2]

ECONOMICS OF ECOSYSTEM MANAGEMENT

Understanding the tradeoffs, interactions, and outcomes associated with ecosystem management is important as we look to the future. The decision to have a specific ecosystem condition exist in the future has implications about the stream of commodities that may flow, the types of industries that may be compatible, the mix of inputs required to achieve and maintain the condition, as well as management's ability to move from here to there. It is important that these decisions be made with disclosure of these potential implications, including costs, tradeoffs, and probable outcomes.

Some ecosystem management will be motivated by concerns for ecosystem restoration. Decisions to restore an ecosystem are essentially economic decisions in the sense that society assesses that restoration provides greater utility than would other management alternatives such as rehabilitation, mitigation, or inaction. There are, in general, three broad categories of restoration. First, those opportunities to restore disturbed or damaged ecosystems. Second, those opportunities where efforts are made to alter the trajectory of existing ecosystem states (for example, young stands) to achieve desired ecosystem states (for example, stand structures). Third, those opportunities to restore missing parts (say, late seral stages) of various landscapes. This is not to say that restoration always requires explicit intervention. There may be cases where society's best interests are served when natural processes for ecosystem restoration are allowed to proceed unaugmented by human inputs of labor and capital.

The explicit consideration of ecosystem restoration is a significant change in land management. American society traditionally has undervalued sustaining the productivity of land, assuming that enough extra land was available as a low-cost substitute for lost productivity of degraded land. As a new management philosophy, ecosystem management focuses attention on processes to determine the appropriate level of restoration based on the biological, physical, social, and economic consequences of alternative decisions. This decision framework would focus on measuring costs, outputs and associated values to address societal questions of costs,benefits, and the public's willingness to pay for restoration activities, especially the second and third types of restoration.

As we carry out ecosystem management, we need to find innovative ways to use available management tools. For example, field trials from eastern Oregon illustrate how cattle grazing at the appropriate time and in the appropriate intensity for specific site conditions can greatly increase the production of stumpage biomass and stumpage value and additionally provides grazing income early in the rotation (Weigand et al. 1993). Benefits of grazing include shifting biomass production away from shrubs and grasses to trees early in the rotation and subse-

[1] Producer costs are influenced by the prices for various factors of production such as stumpage or labor.

[2] The concern is that changes in timber supplies in one region could preempt opportunities in other regions. For example, increases in programs that encourage tree planting in the South would reduce the opportunities (those that depend on increases in stumpage prices) for long-term land management in some western regions.

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quent facilitation of reforestation on dry sites. Emphasis on producing timber quality rather than timber quantity (i.e., ASQ) may also produce greater revenue. Using timely cattle grazing and silviculture to maximize timber quantity increases timber revenue 30% while grazing coupled with silviculture to produce higher timber quality creates 70% higher revenues.

Another impact on the competitive position of the Columbia River Basin would be the increased costs associated with harvesting methods that are consistent with goals for new ecosystem management. Logging costs from the Lolo National Forest (Keegan et al. 1993) illustrate how changes to more complex stand retention patterns (i.e., group selection) can increase logging costs as shown in the following tabulation:

	Tractor	Cable
	Dollars/MBF	
Shelterwood	89	164
Clear cut/Seed Tree	87	155
Group Selection	98	219

Higher logging costs on National Forests relative to private timberlands will lead to lower stumpage prices for National Forest timber sales and result in lower payments to counties. In some areas, raising logging costs has the potential to force some sales to be appraised as below-cost sales.

The recent and continuing rapid increases in sawtimber stumpage prices are also changing perceptions about what might be feasible land management options in the interior west. These recent (real) price trends are consistent with past projections of rising prices for sawtimber and roughly constant prices for roundwood material as shown below:

	Sawtimber	Roundwood	Logging Costs
1990	100	100	100
2000	189	82	110
2010	184	69	119
2020	208	73	129
2030	206	78	130
2040	212	86	146

The difference in price trends between sawtimber and roundwood reflect the predominance of roundwood use by the pulp and paper industry and the ability of that industry to control its raw material costs (through different fiber sources [especially the increased use of recycled fiber expected in the 1990s] and technologies).

One question is the extent to which these higher stumpage prices will change the economic feasibility of harvesting some of the small diameter dense stands prevalent in some areas in the interior west. Using data provided by the Colville National Forest, we calculated the current break-even proportions of chipwood (roundwood) and small sawtimber at 42/58%. Assuming current price projections and logging costs as shown in the last paragraph; the proportion will change so that by 2040 it is 59/41%. The implication is that you will not be able to market stands that just contain round(chip)wood. In the future, as now, stands to be marketed have to have some amount of sawtimber. While that proportion is currently 58%, rising sawtimber prices will reduce it to something like 41% by 2040.

Strategies for Rural Development and Rural Employment

Some of the controversy surrounding the shift to ecosystem management stems from failure to adequately consider the link between social and economic aspirations of rural people (particularly for their communities and industries) and resource conservation. Many of the concerns have arisen from contemporary practices where resource conservation has been motivated by resource-related concerns, with rural development implications largely viewed as either impacts or consequences. Contemporary concern over the disparity between rural and urban economic and social opportunity is leading to efforts to merge rural development and resource management, with the latter seen partly as an instrument for achieving the former. As part of sustainable development, we need to identify the linkages between natural resources and local communities with resource-dependent economies. Such an understanding allows resource managers to predict structural change and dynamic adjustment in local and regional economies following major changes in resource output levels.

In the arguments about old growth retention, benefits of preservation of old growth stands have local impacts on employment. There were 136,000 people in Washington and Oregon employed during 1989 in the primary forest products industry (logging, lumber, plywood, and pulp and paper industries). This was approximately 3.3% of the total work force in the two states. More important, however, was the role that the forest products industry plays in providing 20% of manufacturing jobs in the two States (35% in Oregon and 13% in Washington). During 1989, there were 9.0 direct jobs associated with each million board feet harvested. Each direct job generates economic activity sufficient to support between 1 or 2 additional jobs in the service sector or in other supporting industries. More difficult to measure is the local importance of the forest products industry in various communities where forest products industry may provide the only manufacturing sector jobs.

A major policy issue to resolve is the concentration of negative employment impacts in a region where commodities from public land has been an important (if not critical) source of jobs. While there are limited opportunities to offset some of the commodity declines, by means of salvage cuts and mid-rotational thinnings for example, declines cannot be completely recouped. Alternative strategies for economic development in other rural economic sectors need to be devised. In many cases, tourism, recreation, and special forest products may provide suitable substitutes for timber jobs but there is concern that the potential shift in employment will be to non-family wage jobs. There is considerable value associated with recreation on public lands, yet the majority of these values are not captured in a market. This makes it

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difficult to shift emphasis away from a market commodity (timber and grazing) to a non-market commodity (wildlife, recreation, or ecosystem states). There is no guarantee that employment will be constituted as previously, and that ecosystem management can sustain previously known standards of living in rural areas.

CONCLUSION

There are four key points we wish to make about the economics of ecosystem management.

- First, public supply and societal demand will drive future markets and future management goals for ecosystem goods, services, and states.
- Second, ecosystem management is new because it incorporates conscious efforts for management to respond quickly by means of continual monitoring of biophysical information and evolving societal values. Failure to perform monitoring promises to place society in the same gridlocked position of the late 1980s and early 1990s. Ecosystem management also has a dark side in that it places less relative emphasis on commodity outputs and may on occasion sacrifice the welfare of local rural communities to a more broadly defined sense of regional or national welfare whereby the minority concerns of rural people become subsumed. This "sacrifice" is not necessary if we include people's expectations and aspirations in ecosystem management.
- Third, there is no magic methodology to evaluate the full range of values for the bundle of goods, services, and ecosystem states that society expects from ecosystem management. We need to explicitly link the products that we value to the outputs being obtained from ecosystem management. Nonetheless, many if not most of the goods, services, and ecosystem states that society values will remained priced as opportunity costs in either direct or indirect timber values. This will persist as long as our society tolerates market failure for those ecosystem products that society values.
- Fourth, we end by stating the proposition that people cannot live in disregard of ecosystems, and ecosystems have no chance of sustainability if the varied economic demands of the human species are not accounted for.

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LITERATURE CITED

Alexander, S. and B. J. Greber. 1991. Environmental ramifications of various materials used in construction and manufacture in the United States. Gen. Tech. Rep. GTR-PNW-277. Portland, OR: USDA Forest Service. PNW Research Station. 28 pp.

Cliff, E. P. 1973. Timber: the renewable material - perspective for decision. Washington, DC: U.S. Gov't. Printing Office. Various pagination.

Haynes, R. W. 1990. An analysis of the timber situation in the United States: 1989-2040. Gen. Tech. Rep. RM-199. Fort Collins, CO. USDA Forest Service, Rocky Mountain Forest and Range Exp. Sta. 268 pp.

Haynes, R. W. 1991. Changes in timber supply in the Pacific Northwest. *In*: Proceedings of the 25th annual Pacific Northwest Regional Economic Conf., 2-4 May 1991, Portland, OR. Seattle: Univ. Washington. Northwest Policy Center. pp. 225-260.

Haynes, R. W., D. M. Adams, and J. R. Mills. In press. The 1993 RPA timber assessment update. Review Draft. 88 pp.

Haynes, R. W., N. A. Bolon, and D. T. Hormaechea. 1992. The economic impact on the forest sector of critical habitat delineation for salmon in the Columbia and Snake River basin. Gen. Tech. Rep. PNW-307. Portland, OR.: USDA Forest Service. PNW Research Station. 33 pp.

Keegan, C. E., D. P. Wichman, C. E. Fiedler, and F. J. Stewart. 1993. Logging systems and associated costs of timber harvesting on the Lolo National Forest under alternative silvicultural prescriptions. Revised Final Report. Cooperative Agreement #PNW 92-0123. 15 pp. + appendices.

Overbay, J. C. 1992. Ecosystem management. *In*: USDA Forest Service— Watershed and Air Management. Taking an ecological approach to management. Proceedings of a national workshop, 27-30 April, 1992, Salt Lake City, UT. Document #WO-WSA-3. Washington, DC: Gov't. Printing Office. 241 pp.

U.S. Department of Agriculture—Forest Service. 1983. America's renewable resources: a supplement to the 1979 assessment of the forest and range land situation in the United States. Forest Service Publ. 386. Washington, DC: USDA Forest Service. 84 pp.

U.S. Department of Agriculture—Forest Service. 1988. The South's Fourth Forest: Alternatives for the Future. USDA Forest Service, Forest Resource Rep. 24. Washington, DC. 512 pp.

Wack, P. 1985. Scenarios: Uncharted waters ahead. Harvard Bus. Rev. 63(5): 73-89.

Whitelaw, W. E. and E. G. Niemi. 1989. The greening of the economy. Old Oregon 69(3): 26-27.

Weigand, J. F., R. W. Haynes, A. R. Tiedemann, R. A. Riggs, and T. M. Quigley. 1993. Economic assessment of ungulate herbivory in commercial forests of eastern Oregon and Washington, USA. For. Ecol. and Manage. 61:137-155.

Yang, D. J. 1992. High-tech heaven, why the Pacific Northwest is surging with technology startups. Bus. Week May 25, 1992. pp. 50.

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