VII. CONCLUSIONS

In this chapter we summarize our findings and make recommendations for related future research.

A. Findings

Prior to this study, our experience in the Pacific Northwest led us to conclude that common approaches for assessing the economic consequences of forest-management decisions aimed toward accomplishing environmental objectives were seriously incomplete insofar as they focused on the short-run economic costs to extractive and development activities and overlooked a wide array of other, generally mitigating, consequences. A full accounting of the consequences must take into account the decision's effects on: (1) other commercial activities; (2) subsidies; (3) externalities; (4) consumption amenities that affect household-location decisions; and (5) the desire to protect the intrinsic values of the forest. Further, one must examine how the economy will adjust to the decision in the short, medium, and long runs. To weigh the different consequences, one must look at the value of the goods and services derived from the forest with and without the decision, the impacts on jobs, incomes, and related variables, and perceptions of the fairness, or equity.

There are any number of possible ways to organize the analysis of these concerns. The framework we have developed is useful because it is both technically rigorous and generally understandable by resource managers, political leaders, news reporters, and the general public.

We applied the framework to six case-study forests. It works well. This reinforces the conclusion that the ecosystem-economy relationship is complex in all these areas, i.e., forests are important to the economy for far more reasons than just the extraction or development of resources. To understand the economic consequences of forest-management decisions in each of the six case-study forests, and especially decisions affecting major extractive or development activities, one must look at all the competing demands. Using industrial timber production as the major indicator of extractive-development use, these findings apply where this use is declining (Pacific Northwest), growing (Southern Appalachians), or not yet existent (Interior Alaska). Our examination of the riparian bosque forest in the southwest indicates that the framework also applies to extractive use of water for irrigated agriculture and, by extension, other extractive or development activities.

There are wide disparities in data and analytical techniques for analyzing the different sources of demand for forest resources. Extensive data exist for some extractive-development industries, such as timber and some irrigated agriculture, but not for others, especially land development. Natural-resource economists have focused intensively for the past two decades on developing and applying analytical techniques, such as the contingent-valuation method, for estimating the value of the demand for protecting intrinsic values, such as those associated with endangered species.
Much less is known about the demands we label Types 2 and 3. Type 2 demands arise when one extractive-development use displaces another, receives subsidies, or imposes externalities. Type 3 are associated with forest amenities that influence the locational decisions of households. The shortcomings here are significant, and documentation of these demands currently relies heavily on little more than collections of anecdotes. Many, if not all, extractive-development uses of forests displace other commercial uses, receive subsidies (or exhibit price distortions from other sources) or impose externalities. As the American public becomes more mobile, the availability and management of quality-of-life amenities will exert a greater influence on the distribution of economic activity over the national and regional landscapes.

Despite the disparities in data and analytical techniques, what does exist supports these general conclusions:

- The timber industry, the primary extractive user of forest resources, provides the major demand for forest resources in all areas except Interior Alaska. Some variables indicate that this demand will grow in the future. Most important, prices for timber are expected to rise, although recent events indicate that reductions in the supply of timber may not trigger price increases as high as many analysts expected. Other variables indicate that the strength of timber's demand for forest resources will stagnate or shrink. Many people express their demand for extracting timber from forests by arguing, through political channels and elsewhere, that converting forests to timber creates jobs, incomes, and community well-being. Considerable evidence, however, indicates otherwise. Especially in the Pacific Northwest, timber-related jobs and incomes have been declining. Elsewhere, the levels of jobs and incomes per unit of forest converted to timber are not expected to increase and may decrease.

- The competing demands for forest resources are likely to increase relative to the timber industry’s demand. Through markets, litigation, and political channels, pressure will build to restrict the subsidies and externalities associated with timber production and to prevent timber's adverse effects on consumer amenities, and to protect forest intrinsic values. The increase in these demands will be driven largely by powerful, fundamental economic forces, including public preferences for environmental protection, increased knowledge about subsidies and externalities, and increases in the population of retirees and other groups seeking to live near consumption amenities.

Our efforts to communicate these analytical findings revealed that most groups readily understand the core ideas. This is especially true of groups in the Pacific Northwest and persons who have been engaged in ecosystem-management activities that entail taking a broad look at the consequences of forest management. Groups most resistant to the ideas include those associated with irrigated agriculture in the West. Among these groups, especially in the Southwest, there often is strong resistance to ecosystem management and little recognition of demands for water that are not substantiated in the prior-appropriation doctrine.

Perhaps the most interesting communication challenge arises with bio-physical scientists and ecologists. We found that, although all of the scientists we spoke with were keenly interested in resource management and recognized the important role that economic issues play, efforts to talk with them about these issues often quickly ran aground for the lack of a common vocabulary. Basic terms, such as ecosystem management, value, and
efficiency, can mean different things to economists and ecologists. With the development of common understanding about these and other terms, we found that our analytical framework, especially Figures 2.1 (lens diagram) and 2.2 (competing-demands diagram) were useful tools for exploring opportunities for making the concepts of multidisciplinary research more meaningful.

B. Recommendations

We make four general recommendations—three substantive and one communicative—for future research regarding the relationship between forested ecosystems and the nation's economic system.

Clarify Subsidies and Externalities of Major Forest Uses

As we explain above, we believe that the starting point for better understanding the relationship between forests and economies is to describe the competing demands for forest resources and to trace the effects of forest-management decisions on these demands. Our examination of the six case-study forests confirmed, however, that there is a wide disparity in the data and analytical techniques related to the different types of demand, making it easier to trace a decision's effects on some of the demands than on others. We, and others, strongly suspect that these disparities influence the outcomes of forest-management decisions.

Some of the most important data and analytical gaps are associated with (1) the subsidies to different major forest uses, especially extractive and development activities; and (2) the externalities of these uses. Outside some of our own initial work in the Pacific Northwest associated with decisions to protect at-risk species, we found no comprehensive assessment of the subsidies and externalities associated with timber production, grazing, mining, and forest development. The absence applies both in the aggregate and to specific forest-use events. Historically, most natural-resource economists focused on measuring the value, jobs, etc. associated with the production of timber and other forest-based commodities. Over the past two decades, there has been a greater emphasis on measuring less-tangible attributes, such as the demand for recreation and the existence value of particular species or habitats. In both instances, economists have largely overlooked the fact that the current pattern of forest uses is riddled with subsidies, externalities, and other major price distortions. Given the failure to provide them with a better explanation of these components of the full costs of current forest uses, the public generally has no option than to weigh forest-management alternatives in simplistic terms, such as comparing jobs versus owls.

We specifically recommend that NSF sponsor research to determine the full costs of timber production, irrigated agriculture, recreational development, and urban development associated with one or more of the LTER sites. Why the LTER sites and not elsewhere? To the extent that economists have examined the full costs of extractive industries or land development, they have focused solely on the infrastructure costs: police, sewer, water,
schools, etc. They have not examined the ecosystem-related costs. The LTER sites offer the best opportunities for looking at both.

**Clarify the Demand for Quality-of-Life Amenities**

Across America, people are seeking to improve their quality of life and moving to areas with a high-quality natural environment. We identify this phenomenon as a major type of demand (Type 3) for forest resources. Although the fundamental theoretical concepts underlying this type of demand have been worked out, the actual mechanics are poorly understood. It is easy to conclude that clearcutting scenic forested hillsides will diminish the region's attractiveness for some households, but impossible to say by how much.

Further, it is easy to conclude that, eventually, the demand for particular forest amenities will lead to overcongestion of those amenities, but impossible to say when or by how much. The problem is especially acute where a state or community further encourages congestion by subsidizing the infrastructure costs of the households and firms that initially come to a place because of its natural-resource amenities.

We specifically recommend that NSF sponsor research to clarify (a) what forest amenities individually or collectively can influence household-location decisions; (b) the strength of the influence; (c) the economic and ecological consequences of different levels of congestion; and (d) the potential effects of alternative resource-management strategies. We recommend that this research be conducted through the LTER program to take advantage of ecologists' expertise regarding the nature of the amenities, the consequences of congestion, and the consequences of management strategies.

**Clarify the Competing Demands for Water from Forested Ecosystems**

We describe above the limited literature on the economics of water from forested ecosystems. No forest-manager or member of the public can currently determine the economic consequences of forest-management decisions that affect the amount, timing, or quality of water produced by forested watersheds. This is despite the fact that forests are the source of fresh water in much of the country, and the demand for fresh water is growing.

We recommend that NSF sponsor research to clarify the water-related costs and benefits associated with major forest-management activities. This recommendation overlaps with the previous two. We believe, however, that issues associated with water are sufficiently important that NSF focus on them.

**Facilitate Better Communication Among Forest Ecologists and Economists**

By definition, gaining a better understanding of the ecosystem-economy relationship requires marrying the analytical insights of ecological and economic disciplines. The stark reality, though, is that it often is extremely difficult to bring about this marriage. If NSF is
to promote integrated, multidisciplinary research through its LTER program, it must do more than sponsor many research projects, each individually focusing on one discipline, but collectively covering many, and hope that the researchers, somehow, will connect in a meaningful way. We recommend that NSF also sponsor dialogue among ecologists and economists to increase the likelihood that they will identify opportunities for coordinating their efforts. Such a dialogue currently is minimal, at best, at each of the LTER sites we examined, and nonexistent across the sites.

Specifically, we recommend that NSF sponsor a program of conferences on ecological-economic issues. These conferences should especially focus on summarizing the ecological and economic knowledge regarding the three topics we discuss above: (1) subsidies and externalities of major forest uses; (2) quality-of-life amenities; and (3) forest water. In coordination with these conferences, we recommend that NSF also sponsor multidisciplinary research on these topics, so that the research proposals are informed by the results of the first round of conferences and, in time, the research provides the grist for future conferences.

Finally, we observe that, although our findings and recommendations stem from research of forested ecosystems and their affiliated economies, we believe they apply equally well to other ecosystems and their relationships with local, regional, and national economies.
VIII. REFERENCES


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Figlio, D.N. 1996. A Suggestion for an Amenity-Constant Inter-City Cost of Living Adjustment. Department of Economics, University of Oregon. February.


Oregon Employment Department. Various Years. *Oregon Covered Employment & Payrolls.*


