Forests by definition represent a complicated set of interactions, natural and social. No less complicated is how Americans use and value the wood and paper products that come from forests. All of us absolutely depend on wood and paper to make our lives easier, healthier, safer, and more rewarding. Our standard of living is in many ways defined by the plethora of wood and paper products that we use and enjoy. Follow the daily life of most Americans, from the moment they rise (often from their wooden beds) to the moment they retire to read or relax in the evening (usually in wood-framed homes), and wood and paper products are an integral part of their day. Yet most Americans do not easily make the mental connection between these products and the resource from which they originate.

We are blessed in this country with vast forest resources and, contrary to some popular notions, forests have actually expanded over time. While the total forest area in the United States remained relatively stable over the past 50 years, the volume of fiber growing in those forests has increased significantly. In 1997, the total US forest inventory was 36 percent higher than in 1952. The increase in wood fiber occurred despite continuously increasing demand for wood and paper products. Annual removals in 1997 were 35 percent higher than in 1952, and still the inventory increased. In large part the inventory is increasing because forest landowners are motivated by the economic returns from increasing forest productivity.

Among the many arguments aimed at preserving natural resources, such as forests, is that people should consume less. Yet, paradoxically, the very act of consumption provides the economic motivation to keep forests healthy and growing. The engine of economic growth creates demands, but also provides the incentives to maintain or increase productive capacity. The economic returns from forest management enable forestry to compete with other uses of capital. Absent consumer demand and an economically healthy industry, economic returns would diminish and the incentive for keeping forests healthy and productive would diminish as well.

The Challenge

The challenge for natural resource managers is to meet growing demand for forest-based products in a manner that is economically, socially, and environmentally sustainable to ensure that future generations enjoy the same benefits from the forests that we enjoy today. While this challenge is being met through a variety of evolutionary changes in forest management and much greater awareness of forest interactions with wildlife, water, natural processes, and people, the challenge is not all that new. The forestry profession has been at the forefront of sustainable development for decades and the record to date is fairly impressive: We currently enjoy more forest products, more recreational opportunities, and cleaner water than our parents and grandparents did. And we are certainly seeking to ensure that our children and grandchildren can make the same observation.

In reality, the industry is producing the products that consumers vote for in the marketplace every day. Forest industry owns less than 15 percent of the forestland in the United States, but accounts for over 30 percent of the production. These lands are intensively managed for high fiber production, but not without regard for environmental concerns. By developing habitat conservation plans, identifying and protecting special sites on its own lands, funding research, working cooperatively with state agencies and universities, and developing and promoting sustainable forestry programs, such as the Sustainable Forestry Initiative (SFI®) program and the American Tree Farm system, the forest industry has responded to public concerns about the effects of increased demand on forests. The SFI program was developed and has been evolving in response to wider public concern about forests. The SFI program currently covers more than 60 million acres, and participants represent more than 60 percent of the industrial roundwood harvest in the United States.

This is not to say there are no resource challenges. In some areas, forests are not as productive as they could or should be, and we are losing forest cover in some areas and increasing it in others. On public lands, some 26 million acres are at risk of mortality from insects and diseases and 39 million acres are at risk of wildfire. Mortality on the national forests has increased by 74 percent since 1987, and this year will witness one of the worst fire seasons in history.

Critics will note that in some areas harvest exceeds growth—softwoods in the South, for example. Like everything else, sustainability is more complicated than one statistic. Removals exceed growth in the South in the context of an inventory that has increased more than 70 percent since 1952 despite continuously increasing demand. And the inventory does not include stands that have not reached the minimum threshold for counting. It is not unexpected in managing renewable resources that, during some periods, removals will tend to exceed growth.

An Uneasy Trade-off

In a free society such as ours, almost all human behavior is about choices and trade-offs. By radically changing federal forest management to deemphasize timber production and by constraining forest management opportunities on private lands, public policy of late has forced an uneasy trade-off not supported in the marketplace by most Americans. By managing national forests for habitat protection, wilderness, and
The approach taken by Wernick et al. (p. 8) to assess the most effective ways to conserve forests and their benefits is useful but limited. It highlights key influences on harvesting—where decreasing harvest area is taken as proxy for increasing conservation of forests and increasing forest benefits. But such a focus ignores other critical environmental objectives that guide forest management.

The approach—tracing the flow of materials through production and consumption—is useful as a way to organize a discussion about how major economic groups act in concert to determine how much forest is harvested each year. Consumers, forest products producers, and forest owners (with or without the aid of foresters)—acting in their economic interest in the marketplace (within regulatory constraints) or, in the case of governments, guided by policy, regulation, and public influence—cause changes in consumption, production, supply of wood, and acres harvested.

The approach by Wernick et al. is useful to clarify trends and raise questions not only about ways to conserve wood but also about ways that increased wood use may serve environmental and economic ends. Here is a discussion of key trends using the approach. Total roundwood use per de-

Industrial Ecology and Sustainable Forestry

A response by Kenneth E. Skog and Peter J. Ince

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flated dollar of GDP (IOU) dropped 2.5 percent per year during the 20th century. The causes of the drop changed from the first half of the century to the second half. Much of the drop in IOU from 1900 to 1949 was caused by a shift from fuelwood use to industrial products use. Fuelwood as a fraction of total roundwood fell from 40 percent in 1900 to 20 percent in 1950 and 13 percent in 1998. As the fuelwood share of roundwood use declines, the trend in industrial roundwood use becomes more important. If we focus just on industrial roundwood, the IOU decline slowed from 2.8 percent per year between 1900 and 1949 to 2.1 percent per year between 1950 and 1998. The importance of wood in the economy is not falling as fast in more recent years. In fact, the decline in IOU since 1980 has slowed to 1.6 percent per year. The trend is even more pronounced if we look at IOU of products rather than the roundwood used to make them. IOU of wood and paper products fell at the rate of 2.5 percent per year between 1900 and 1949, 1.5 percent per year between 1950 and 1998, and only 0.6 percent per year since 1980. It would appear that economic forces are slowing the decline in importance of wood and wood products as a resource for our economy. The reason
human disturbance is usually exchanged for natural disturbance. In some situations, disturbance of large areas is necessary to restore ecological balance, as is the case when a pest infestation looms. Public policy and trade are also important factors. Part of the reason the intensity of use of wood products has declined in recent years is because of increased imports. For example, since 1990 imports of softwood lumber have increased by 60 percent. So Americans have used less domestically produced timber, but have in fact consumed more wood and paper products. By importing more products, the environmental trade-off is transferred to other countries.

Response to MacCleery

While Wernick et al. investigate possible trends in using less wood, MacCleery (p. 5) ponders the paradox between a land ethic and insatiable consumption. It is certainly ironic that as Americans become wealthier and consume more, their politics become greener. As MacCleery notes, our houses keep getting bigger and our appetite for anything packaged keeps growing. The editorial page of a newspaper can rail against expanding pulp production, but newsprint is essential for the paper to survive. Citizen activists can gather to plot strategy to stop a timber sale, but the home they meet in, and most of the furniture they use, is made from wood products. Americans take forest products for granted.

Forest issues tend to be judged in black and white, good or bad, from an environmental, social, or economic perspective, depending on your views and where you sit. But America is a complicated society and forests are a weave of complicated phenomena. Forest issues are not two-dimensional. The truth, more often than not, lies somewhere in the middle of the extremes. Americans continue to demand more wood and paper products even as their politics become more environmentally sensitive. If Americans made the connection between the products they consume and the resources from which they originate, there might be a greater understanding of the economic and environmental trade-offs involved in resource management. MacCleery points out that our consumption ethic is inconsistent with our land ethic. He correctly suggests that a land ethic in combination with a consumption ethic is the true definition of a conservation ethic.

Data Sources


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