Eastern Hemlock: A Market Perspective

Theodore Howard[1], Paul Sendak[2], and Claudia Codrescu[1]

Abstract

Although it is an important component of the northern forest, eastern hemlock (*Tsuga canadensis* (L.) Carr.) is a secondary species in its regions' markets. In this paper, we examine the markets for hemlock, analyze price trends for stumpage, and suggest implications of market forces for management of forests containing hemlock. The characteristics of hemlock wood limit its use to relatively low-grade products, such as structural lumber, pulpwood, and pallets, although higher value niche markets exist, such as post and beam house frames. Analysis of trends for sawlog and pulpwood stumpage prices from publicly available reports indicates little change in inflation-adjusted prices over long time periods. Such price performance indicates that available supply is more than adequate to meet demand throughout hemlock's natural range. Markets for hemlock have rarely been strong and are not likely to become so. Therefore, forest management plans that require the removal of hemlock may require opportunistic harvesting decisions. Eastern hemlock's nonmarket values must also be incorporated into management plans.

Introduction

Eastern hemlock (*Tsuga canadensis* (L.) Carr.) is an important component of the forests of the southern parts of eastern Canada as well as those of the northern United States stretching from Maine to Minnesota and southward through the Appalachian Mountains into northern Georgia and Alabama. While the species itself is common, its scientific name, *Tsuga canadensis*, has an uncommon origin. All of the other softwoods native to North America, with the exception of *Sequoia* and *Pseudotsuga*, can trace their names to Latin or Greek. *Sequoia* is of Native American origin and *Psuedotsuga* is simply "false hemlock". Hemlock's name comes from the Japanese word for hemlock. The kanji character for *Tsuga siebolii*, southern Japanese hemlock, is a combination of tree and mother.

The objective of this paper is to examine eastern hemlock from a market perspective. We will first outline the wood characteristics that limit hemlock utilization and describe the types of products made from hemlock. Second, we will provide information on the consumption patterns of hemlock sawtimber and pulpwood and analyze price trends for hemlock stumpage. Finally, we suggest how landowners and forest managers can incorporate this market information into their management decisions.

Wood Characteristics

Hemlock has never enjoyed the levels of high demand that many of the other conifers in its range have experienced. Eastern white pine, black, red, and white spruce, as well as balsam fir have had much wider market acceptance. Eastern white pine, for example, was the primary commercial species in the northeast and northcentral United States from the early colonial period to the late 1800s (Howard 1986). Eastern spruce and fir in those same areas and into eastern Canada now account for most of the softwood volumes harvested.

Hemlock has lagged because its wood properties do not compare well to those of other conifers. As Alden (1997) notes, hemlock wood is uneven in texture and tends to have considerable ring shake. It has only moderate strength properties, has low resistance to splitting, is harsh and splintery when worked with tools, and is not decay resistant. Hemlock also is resistant to preservative treatment. The desirable properties of lack of odor and taste once made hemlock an important wood for food containers. One of the earliest commercial uses of eastern hemlock was its bark as a source of tannin for the tanning industry. Hemlock bark is still in demand today, but for landscaping mulch.

Methods

We contacted over a dozen manufacturers throughout the Northeastern United States in an informal survey of the current hemlock end product market situation. We selected our participants from the *Sawlog Bulletin*, generally focusing on those organizations that listed themselves as buying multiple grades of hemlock logs. We felt that the expressed demand for various grades indicated greater market segmentation by the producer and therefore, we would capture a larger view of the variety of hemlock end products.

We collected data from publicly reported sources of hemlock roundwood consumption and stumpage prices. These time series were plotted and rates of annual stumpage price change were estimated for selected series by ordinary least squares regression using the following model:

$$\ln V_t = \ln V_0 + rt \qquad [1]$$

where
V_t = future price,
V_0 = initial price,
t = time period for compounding in years,
r = the continuous rate of change, and
ln is the natural logarithm (base e).

[1]Department of Natural Resources, University of New Hampshire, Durham, NH 03824

[2]USDA Forest Service, Northeastern Experiment Station, 271 Mast Rd., Durham, NH 03824

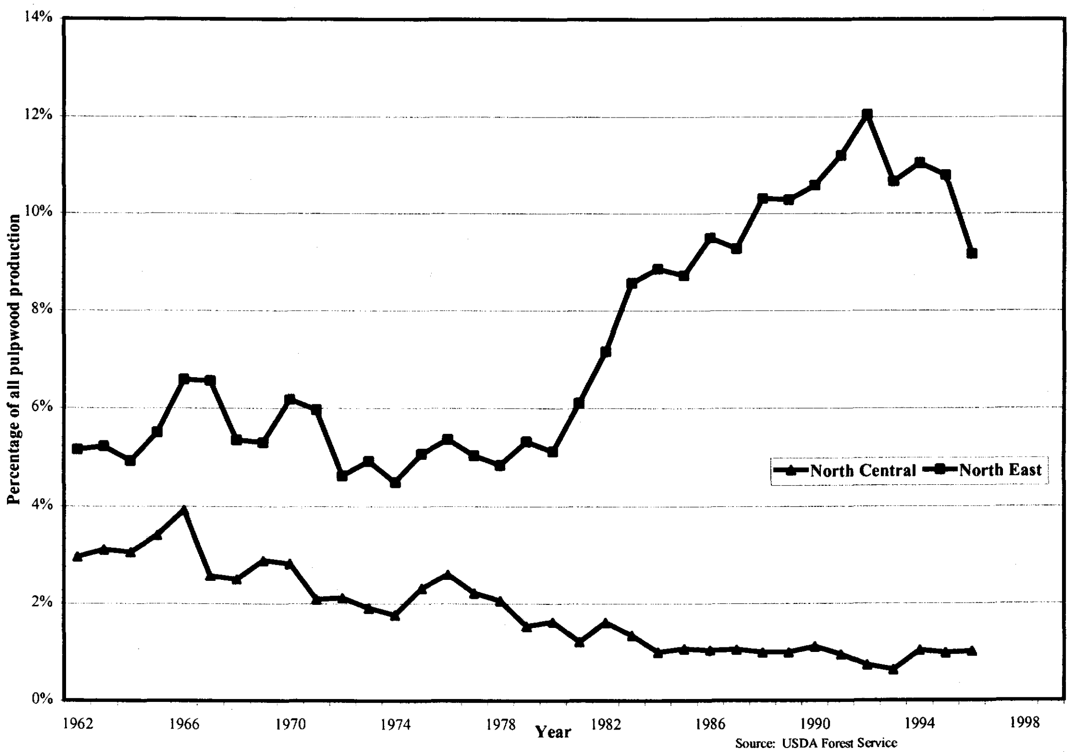

Figure 1.—Hemlock pulpwood production as a percentage of all pulpwood production in North Central and Northeastern United States, 1963-1997.

Results

Perspectives on Utilization

Based on the survey of hemlock roundwood purchasers, the following hemlock products were identified: pulpwood; dimension lumber including studs; boards; timbers for construction, post and beam house frames, and bridges; plywood core veneers; landscape timbers; and bark. Almost all hemlock lumber was sold green and usually not graded, some was air dried. In timber applications, hemlock was not subject to as much twist as eastern spruce and fir although somewhat weaker than those species. Hemlock timbers were used in landscaping despite its poor decay resistance. Hemlock bark for landscaping mulch, pound for pound, may be the most valuable commercial component of the species.

Consumption

The commercial importance of hemlock can be judged partly by examining harvest volumes for pulpwood and sawtimber throughout its range. While the USDA Forest Service publishes pulpwood production data for the North Central and Northeastern states, we focused on only those states whose annual production regularly exceeded 10,000 cords. Because only a few states collect annual sawtimber production data, our analysis of those trends is geographically limited.

Pulpwood production has been moving upward in the Northeast and downward in the North Central region in terms of total volume and as a percentage of all pulpwood produced (Figure 1). In the North Central region, hemlock has practically disappeared from the pulpmill furnish, representing barely 1% of all pulpwood used. Pulpwood production in Wisconsin and Michigan has been highly variable and generally declining. Michigan's production has shown an upward trend during the last few years of the 1990s. Although there has been recent downturn in hemlock's Northeast market share, its representation in that market more than doubled from 1980 to 1991.

In New Hampshire, Maine, and Vermont, hemlock pulpwood production has been increasing since the early 1980s (Figure 2) while New York experienced a significant jump in production in the mid-1970s. The increase in New England can be partly attributed to changes in supply associated with massive losses of spruce and fir inventory due to the spruce budworm.

Hemlock sawtimber production in New Hampshire and Vermont has been in the range of 10 to 20 million board feet (bf) per year consistently over the last 4 decades (Figure 3). Annual Maine production has been significantly greater compared to New Hampshire and Vermont. Maine had producing in the range of from 40 to 65 million bf of hemlock sawtimber from the mid-1970s to the mid-1980s. But for the last 10 years, Maine hemlock production has been in the range of from 80 to 110 million bf per year (Figure 3). This large increase may, in part, be due to increased utilization of hemlock for stud mills in Maine.

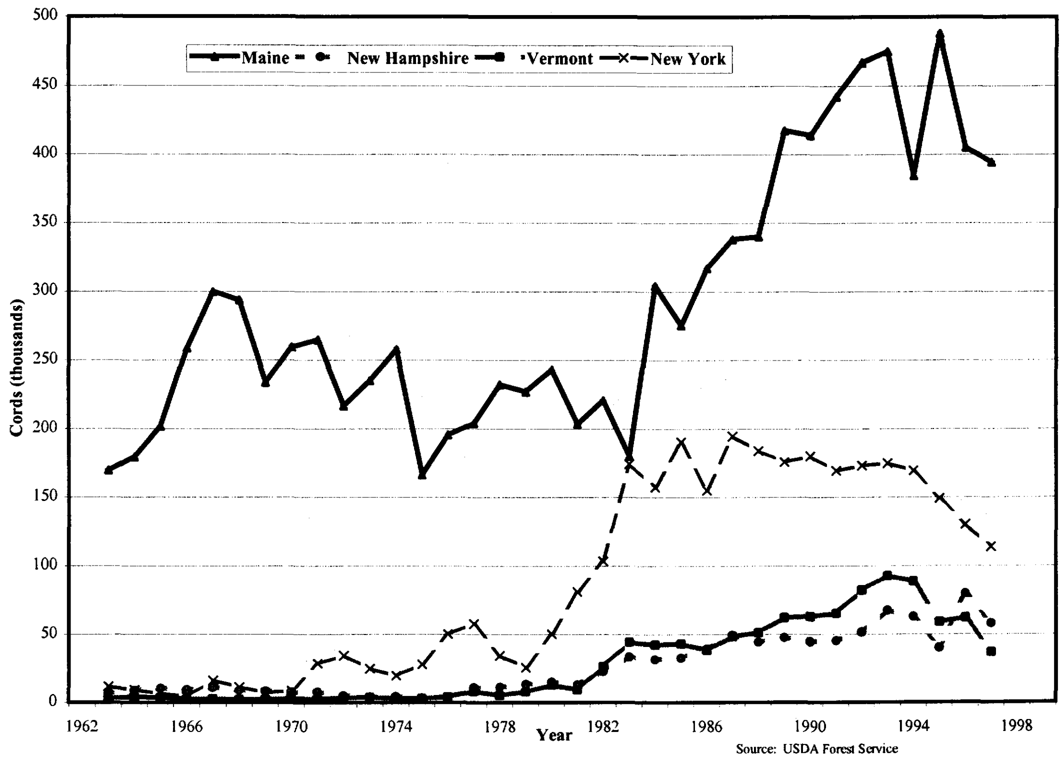

Figure 2.—Significant hemlock pulpwood production by Northeastern states, 1963-1997.

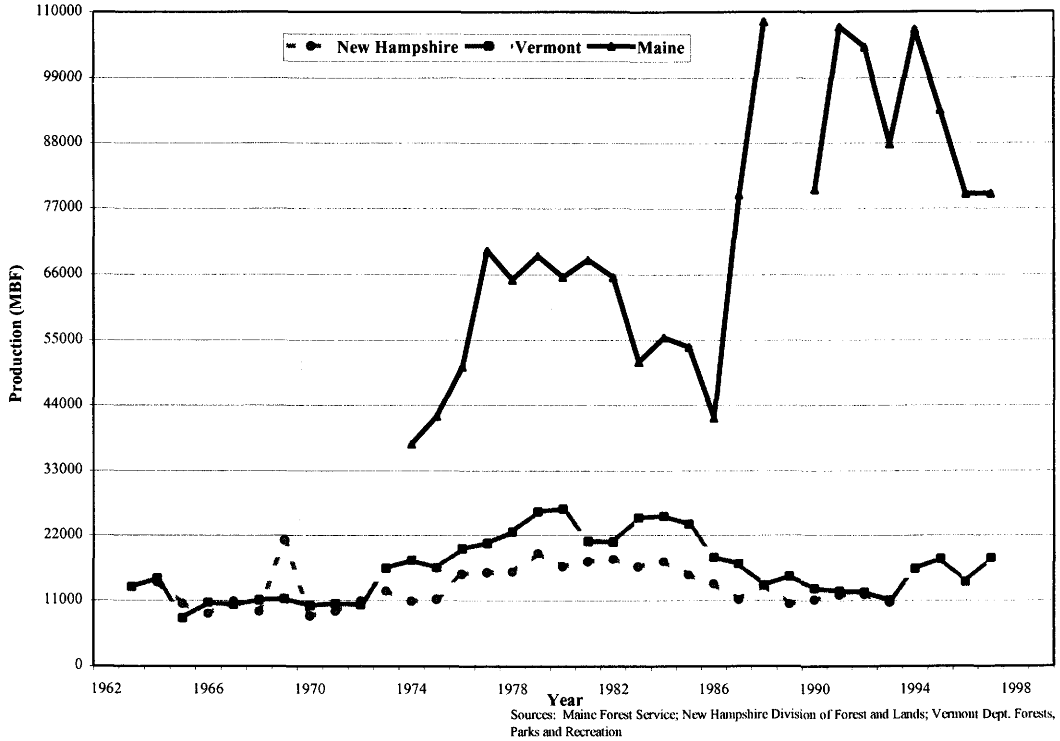

Figure 3.—Hemlock sawtimber production in Maine, New Hampshire, and Vermont, 1963-1997.

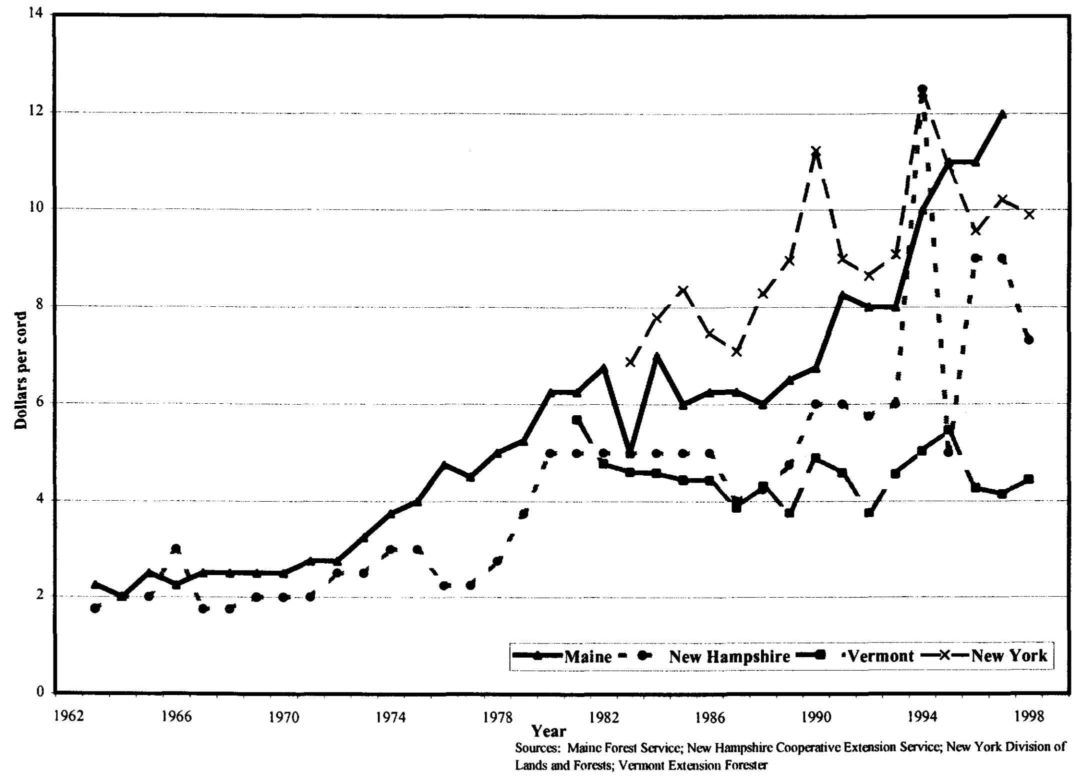

Figure 4.—Nominal hemlock pulpwood stumpage prices in Maine, New Hampshire, Vermont, and New York, 1963-1998.

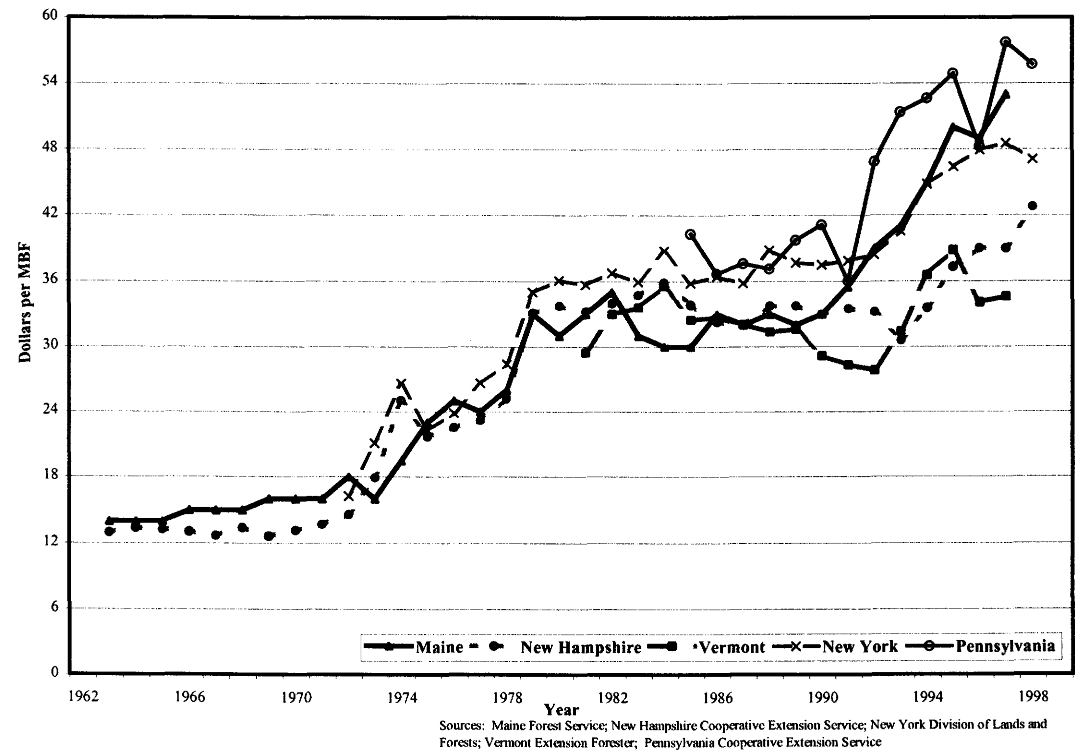

Figure 5.—Nominal sawtimber hemlock stumpage prices in Maine, New Hampshire, Vermont, New York, and Pennsylvania, 1963-1998.

Price Performance

Many states in the range of eastern hemlock maintain stumpage price reporting systems (Lutz, Howard, and Sendak 1992). We selected some of the longer price series for eastern hemlock and analyzed nominal (unadjusted for inflation) price performance and real price performance (adjusted for inflation). We also chose a shorter common time period, 1985 to 1997, to compare price change among all states. The two longest price series in the region were from Maine and New Hampshire. We plotted Maine hemlock pulpwood stumpage prices from 1963 to 1997 and New Hampshire from 1963 to 1998. The general trend for both states has been upward with significantly more volatility in New Hampshire prices in the mid-1990s (Figure 4). Over these periods, the average annual nominal rate of price change was 4.97% in Maine and 4.53% in New Hampshire. Inflation as measured by the Producer Price Index, All Commodity, averaged about 4.6% annually (Table 1). Adjusted for inflation, real prices remained just above to just below constant in Maine and New Hampshire, respectively.

Table 1.—Annual percentage rates of nominal and real hemlock pulpwood stumpage price change in selected states.

State	Period	Rate of change	
		Nominal	Real
Maine	1963-1997	4.97	0.07
	1985-1997	6.24	4.11
New Hampshire	1963-1998	4.53	-0.08
	1985-1997	6.05	3.92
Vermont	1981-1997	-0.39[a]	-2.04
	1985-1997	0.75	-1.28
New York	1983-1998	2.64	-0.88
	1985-1997	2.83	0.77

[a]Not significantly different from zero (p <=0.05), that is, constant.

In the shorter term, 1985 to 1997, nominal hemlock pulpwood stumpage prices were flat in Vermont and trended upward in Maine, New Hampshire, and New York (Figure 4). The average annual rates of price change ranged from 0.75% in Vermont to 6.24% in Maine. Since the rate of inflation averaged 2.05% from 1985 to 1997, there were significant real positive rates of change of about 4% in both Maine and New Hampshire (Table 1). In Vermont, real rate of price change was negative and in New York, less than 1% per year.

Nominal hemlock sawtimber stumpage prices were plotted for Maine, New Hampshire, New York, Pennsylvania, and Vermont. Again, the longest price series were for Maine and New Hampshire (Figure 5). All five series generally trend upward over the period of time that they represent. In Maine (1963 to 1997) and New Hampshire (1963 to 1998), the average annual rates of price change were 3.93% and 3.63%, respectively. Since annual inflation averaged about 4.6%, real rates of price change were negative over the time period (Table 2). This was true for New York from 1972 to 1998 and Vermont from 1981 to 1997. Pennsylvania had the only positive real rate of price change and in general had the highest nominal prices for hemlock sawtimber in the region (Figure 5). Pennsylvania prices average only the two northern reporting regions rather than a state average as for the other states because hemlock and white pine were reported as a species group.

In the shorter term, 1985 to 1997, nominal hemlock pulpwood stumpage prices trended upward in all five states (Figure 5). The average annual rates of price change ranged from 0.97% in Vermont to 4.82% in Maine (Table 2). Since the rate of inflation averaged 2.05% from 1985 to 1997, there were real positive rates of change in Maine (2.71%), Pennsylvania (2.24%), and New York (0.59%). In Vermont and New Hampshire real rate of price change was negative, so that nominal prices were not keeping pace with inflation.

Table 2.—Annual percentage rates of nominal and real hemlock sawtimber stumpage price change in selected states.

State	Period	Rate of change	
		Nominal	Real
Maine	1963-1997	3.93	-0.66
	1985-1997	4.82	2.71
New Hampshire	1963-1998	3.63	-0.94
	1985-1997	1.21	-0.82
Vermont	1981-1997	0.39[a]	-1.35
	1985-1997	0.97	-1.06
New York	1972-1998	3.04	-0.80
	1985-1997	2.65	0.59
Pennsylvania	1985-1998	2.62	0.73
	1985-1997	4.34	2.24

[a]Not significantly different from zero (p <=0.05), that is, constant.

Management Implications

From the perspective of efficient use of forest capital, we can afford timber production as long as the combinations of biological growth rates, per unit price changes associated with higher valued products from larger trees, and the general price growth exceed the landowner's opportunity cost of capital. When timber production cannot pay as well, we can expect poor forest practices and land use changes to occur. The future for eastern hemlock is not very promising for three reasons.

First, the biological growth rate of hemlock is not high. Second, hemlock sawtimber is not particularly valuable so that the price premium for sawlog-size trees relative to that of pulpwood-size trees is not large compared with other species. Finally, the long-term price performance of hemlock sawtimber and pulpwood suggest that hemlock has barely kept pace with inflation and has even lost ground in some markets. Flat or declining real prices for hemlock is a drag on capital returns that cannot be recovered via biology or quality premiums. Landowners simply cannot afford to manage for hemlock for financial returns for strictly timber purposes. The better performance of price appreciation in the shorter term (1985 to 1997), especially for pulpwood stumpage, may be attributed to changes in supply associated with massive losses of spruce and fir inventory due to the spruce budworm. It will be critical to the management and marketing of hemlock if these more recent trends in price can be sustained.

Economics is concerned with more than just the financial returns from timber production. If a standing forest has value in addition to timber value, Hartman (1976) has shown that these other values will have an important influence on "when or whether to harvest." If landowner goals include aesthetics, wildlife habitat, biological diversity, or other nonmarket values, then management of hemlock needs to take that into account. For example, hemlock stands are superior cover for white-tailed deer wintering areas in the northern part of their range (Reay et al. 1990). Practicality suggests that landowners and their forestry advisors should have a clear sense of what they would like to accomplish with their hemlock resource. If timber values are important, they need to harvest when stumpage prices are increasing. When the market strengthens, quick action will yield capital for management purposes. When those windows of opportunity close, hemlock can be safely stored on the stump.

Hemlock rarely grows as pure stands over a large area. So it is most often managed as a major or minor component of a mixed stand that may include other softwoods, hardwoods, or both (Lancaster 1985). Hemlock can be managed as even-aged or uneven-aged stands but the shelterwood system is the best method to regenerate hemlock stands. When hemlock grows in mixtures with other species the other species have to be considered as well as the hemlock in setting management goals. Where hemlock is a minor component it is often harvested along with major species in the stand.

Insect infestations, specifically hemlock woolly adelgid, are the wild card in hemlock markets. To date, the infestations have been in areas that are not overly important to the regional production picture although they are certainly important to the affected landowners. However, large-scale salvage operations in areas where hemlock is more important to the regional production picture could cause a short-term market surplus.

Hemlock has not enjoyed wide acceptance in the market due to "certain inherent undesirable characteristics plus unwarranted prejudice (which) have discouraged the proper use of this valuable resources" (USDA Forest Service 1973, foreword). In the early 1970s, the USDA Forest Service in cooperation with the Vermont Department of Forests and Parks prepared five utilization guides to promote the management of hemlock stands, the processing of hemlock lumber, and its use in construction. Despite this effort, hemlock has remained a secondary species as evidenced by the relatively low consumption across its entire range and the flat to negative real stumpage price performance in nearly every state sawtimber price series.

References

Alden, Henry A. 1997. **Softwoods of North America.** Gen. Tech. Rep. FPL-102. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory. 151 p.

Hartman, R. 1976. **The harvesting decision when the standing forest has value.** Economic Inquiry. 14(1): 52-58.

Howard, T. E. 1986. **The lore and lure of eastern white pine: a demand-sideview.** Proceedings: eastern white pine: today and tomorrow; 1985 June 12-14; Durham, NH. Gen. Tech. Rep. WO-51. U.S. Department of Agriculture, Forest Service: 10-15.

Lancaster, K. F. 1985. **Managing eastern hemlock: a preliminary guide.** NA-FR-30. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Area, State and Private Forestry. 5 p.

Lutz, J. K.; Howard, T. E.; Sendak, P. E. 1992. **Stumpage price reporting in the Northern United States.** Northern Journal of Applied Forestry. 9(2): 69-73.

Reay, R. S.; Blodgett, D. W.; Burns, B. S.; Weber, S. J.; Frey, T. 1990. **Management guide for deer wintering areas in Vermont.** Montpelier, VT: Vermont Departments of Fish and Wildlife and Forests, Parks and Recreation. 35 p.

US Forest Service, Northeast Area, State and Private Forestry and Vermont Agency for Environmental Conservation, Department of Forests and Parks. 1973. **Sawmiller's guide to manufacturing eastern hemlock lumber.** Hemlock utilization guide no. 3. 13 p.