ANALYSIS OF CHANGES IN EASTERN NATIONAL FOREST TIMBER SALES BETWEEN 1985 AND 1997

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ABSTRACT

Since the mid-1980s, the volume of sawtimber sold by eastern national forests has declined by 55 percent. Factors contributing to this decline include increased recreational demands, political pressures from environmentalists and the adoption of ecosystem management techniques. This paper examines the changes in the sales of roundwood products from 1985 to 1997 for three eastern regions that contain relatively large quantities of hardwood sawtimber: the Lake States, Northern Appalachian Mountains (Northern Mountains), and Southern Appalachian Mountains (Southern Mountains). Although this analysis was concerned primarily with hardwood sawtimber sales, softwood sawtimber and softwood and hardwood pulpwood sales also were examined because all these products are part of national forest timber sales. Although roundwood sales have decreased in all three regions, sales revenue has increased in the Lake States and Northern Mountains regions because roundwood product prices have increased more than sales volumes have decreased. However, the increased revenue in the Lake States emanated from increased pulpwood sales revenues while the increased revenue in the Northern Mountains resulted from increased black cherry sales revenue. The Southern Mountains was the only region that experienced a decline in roundwood sales revenue between 1985 and 1997.

In a 1998 speech, Forest Service Chief Michael Dombeck announced a change in national forest management policy, placing greater emphasis on watershed health, sustainable forest ecosystems, and recreation.[1] Although the ideas presented by Chief Dombeck are not new, his delineation of objectives clarified many ideas and principles that have affected national forest management for most of the last decade. These principles, in combination with reduced timber harvesting budgets and continual appeals of timber sales by nongovernment organizations, have reduced the emphasis on timber management on national forests.

The most visible manifestation of the change in national forest policy has been the decline of timber harvests on western national forests. However, timber sales from eastern national forests have also decreased. It may be that the latter reductions have not gained more attention because national forests comprise only a small portion of the eastern timber base. Also, the decline in timber sales from eastern national forests has been gradual. Still, eastern national forests may be an important source of quality timber to the industries located near them (11). Therefore, a knowledge of changes in timber sales from eastern national forests would be useful in assessing the impact of changing forest policies on the forest products industries in the East.

Specifically, we were interested in the kinds of timber products sold by eastern national forests in 1997; whether changes in sales volume, product mix, and total revenues have been consistent across these forests; and the potential impact of a continuation of these trends on wood products industries. Although our primary focus was hardwood sawtimber sales, sales of softwood sawtimber and softwood and hardwood pulpwood also were examined because these products are part of the total product mix.

One obstacle to analyzing trends in timber sales on eastern national forests is the diversity of this resource. For example, the pine forests of the Southern Piedmont and Coastal Plains contain relatively little hardwood sawtimber, the forests of the Appalachian mountains are primarily hardwood, and forests of the Lake States contain both hardwoods and softwoods (12). This diversity means that an analysis based on an aggregate of

[1] "A gradual unfolding of a national purpose: A natural resource agenda for the 21st century," presented March 2, 1998.

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eastern timber sales might not reveal trends that are important regionally. Therefore, we examined national forest timber sales in three geographic regions containing relatively large volumes of hardwood sawtimber: The Lake States, Northern Appalachian Mountains (Northern Mountains), and Southern Appalachian Mountains (Southern Mountains) (**Table 1**).

TABLE 1. — National forest within the Lake States, Northern Mountains, and Southern Mountains regions and estimated sawtimber volumes in the most recent forest survey.

Forest	State	Hardwood sawtimber volume	Softwood sawtimber volume
		(million BF)	
Lake States			
Huron-Manistee	MI	1,822.2	1,215.6
Hiawatha	MI	1,046.3	1,713.1
Ottawa	MI	1,943.5	1,595.9
Nicolet	WI	1,308.6	1,018.2
Chequamegon	WI	1,471.3	1,266.2
Superior	MN	1,282.1	1,908.8
Chippewa	MN	1,052.6	979.3
		9,926.6	9,697.1
Northern Mountains			
Monongahela	WV	4,339.7	841.9
Allegheny	PA	3,336.2	159.0
Green Mountains	VT	1,145.3	171.5
White Mountains	NH	4,339.7	841.9
		13,160.9	2,014.3
Southern Mountains			
Chattahoochee	GA	2,744.4	1,566.7
Cherokee	TN	2,102.9	1,309.1
North Carolina	NC	5,982.4	1,461.5
Washington-Jefferson	VA	6,548.5	1,254.5
Daniel Boone	KY	2,794.5	421.5
		20,172.7	6,013.3

TABLE 2. — Volume of timber product sales for the Lake States, Northern Mountains, and Southern Mountains regions in 1997 and changes in the volume of sales between 1985 and 1997.

	Lake States	Northern Mountains	Southern Mountains
Total volume of timber products sold in 1997 (million BF)	428.3	75.7	97.8
Volume of hardwood sawtimber sold in 1997 (million BF)	16.7	35.0	30.8
Volume of select hardwood sawtimber sold in 1997 (million BF)	4.1	21.5	9.9
Volume of softwood sawtimber sold in 1997 (million BF)	30.2	4.7	18.1
Volume of hardwood pulpwood sold in 1997 (million BF)	251.3	32.6	26.7
Volume of softwood pulpwood sold in 1997 (million BF)	130.1	3.4	22.3
Changes in total sales volume of timber products (%)	-21.8	-49.5	-62.4
Change in volume of hardwood sawtimber sold (%)	-78.6	-46.7	-64.5
Change in volume of select hardwood sawtimber sold (%)	-28.1	-43.8	-52.9
Change in volume of softwood sawtimber sold (%)	-52.8	-40.4	-72.6
Change in volume of hardwood pulpwood sold (%)	-6.6	-53.8	-66.8
Change in volume of softwood pulpwood sold (%)	-4.8	-39.9	-17.6

REGIONAL DIFFERENCES IN NATIONAL FORESTS

An examination of the forest type map found in Powell et al. (12) indicates that the national forests of the Lake States contain aspen-birch, maple-beech-birch, white-red-jack pine, spruce-fir, and oak-hickory forest types. Although some Lake States forests contain more hardwood than softwood, none can be considered as predominantly coniferous or deciduous. The forest types in the Northern Mountains are less diverse and can be considered as predominantly hardwood. The West Virginia and Pennsylvania national forests contain oak-hickory and maple-beech-birch forest types (12). The Allegheny and Monongahela National Forests have most of the black cherry in our national forests. The Vermont and New Hampshire national forests contain maple-beech-birch and spruce-fir forest types (12). The national forests of the Southern Mountains are predominantly oak-hickory and oak-pine but also contain some loblolly-shortleaf pine (12). The Chattahoochee and Cherokee forests contain significant proportions of softwood sawtimber, while the North Carolina, Washington-Jefferson, and Daniel Boone forests are predominantly hardwood.

Three of the forests listed in **Table 1** represent more than one national forest. Timber sales for Huron and Manistee were initially reported separately but have been reported jointly since 1996. The forests of North Carolina have reported combined timber sales for the entire length of the data series (1985 to 1997) and include the Pisgah, Nantahala, Croatan, and Uwharrie forests. The Washington and Jefferson forests report timber sales separately but were combined because it was difficult to develop separate estimates of sawtimber volumes for these adjacent forests.

DATA USED

The data used in this study were developed from "timber cut and sold on national forests under sales and land exchanges," reports issued from 1985 to 1997 by national forests in Region 8 (southern region) and Region 9 (eastern region) of the USDA Forest Service. These reports contain volumes and revenue of sawtimber, pulpwood, and other products sold by species or species group. Inventory data were obtained from the East-Wide Forest Inventory Data Base, the Northeastern Research

Station's Forest Inventory and Analysis unit, and other sources (6-10,12,13).

The cut/sold reports provide reasonable information concerning timber sales, but there are variations in these reports that should be noted. The reports used in this study were obtained for separate forests except those in North Carolina and Georgia. The reports for North Carolina also contain sales from the Pisgah, Nantahala, Croatan, and Uwharrie forests. The Pisgah and Nantahala are large, predominantly hardwood forests located in the western mountains of the state. The Croatan and Uwharrie are small, primarily softwood forests located in the Piedmont and Coastal Plain region. The cut/sold reports for Georgia combine the Chattahoochee and the Oconee forests. The Chattahoochee is primarily hardwood forest, the Oconee is primarily pine.

Although volumes reported in cut/sold reports are in thousand board feet (MBF) International scale, sawtimber traditionally has been sold using the Scribner or International scale and pulpwood has been sold by the cord or hundred cubic feet (CCF). Although the most common log scale used in private timber sales is Doyle, the Forest Service does not commonly use this scale. Since 1996, most forests in Region 8 recorded sawtimber and pulpwood sales volumes in cubic meters (J.K. Eichenberger, Region 8, personal communication). The Daniel Boone forest began reporting in cubic meters in 1997. During this transition, the conversion of pulpwood into MBF changed from 0.77 MBF/CCF to .55 MBF/CCF. This means that the pulpwood sales volumes in Region 8 since 1996 were multiplied by 1.4 to be consistent with sales volumes prior to 1996.

Definitions of sawtimber differ across forests. As defined by the Forest Service, sawtimber is hardwood trees greater than 11 inches diameter at breast height (DBH) and softwood trees greater than 9 inches DBH. Hardwood pulpwood is 6 to 11 inches DBH and softwood pulpwood is 5 to 9 inches DBH. In the Allegheny National Forest, sawtimber trees must contain one grade 3 sawlog; otherwise, it is considered cull. Cull trees have been sold as pulpwood in the past but currently are being sold as low-grade sawtimber. In national forests of Region 8, cull sawtimber is not considered as pulpwood even when sold at pulpwood prices.

An important subset of hardwood sawtimber is "select hardwoods" (white oak, northern red oak, sugar maple, ash, black cherry, and black walnut). These species have had a higher market value over the last 20 years because of appearance characteristics.

Analysis of National Forest Timber Sales

In 1997, the Lake States region sold the greatest volume of timber products, surpassing the Northern Mountains and Southern Mountains regions by 473 and 338 percent, respectively (**Table 2**). Nearly 90 percent of the timber sold in the Lake States was pulpwood. Some roundwood sold as pulpwood was used to produce lumber, plywood, and pallets. Sawtimber sales volume was a greater component of timber sales in the Northern and Southern Mountains, accounting for 52 and 50 percent of volume, respectively.

Sawtimber sales in 1997 were fairly consistent across regions ranging from 39.7 million board feet (MMBF) in the Northern Mountains, 46.9 MMBF in the Lake States, and 48.9 MMBF in the Southern Mountains (**Table 2**). However, the proportion of hardwood versus softwood sales varied considerably.

In 1997, 64 percent of the sawtimber sold by Lake States national forests was softwood and only 9 percent was select hardwood species (**Table 2**). By contrast, 88 percent of the sawtimber sold from Northern Mountains national forests was hardwood, with select species sales accounting for 54 percent of total sawtimber sales. Hardwood accounted for 63 percent of sawtimber sales in the Southern Mountains; 20 percent was from sales of select hardwood species.

Hardwood sawtimber sales decreased in all three regions between 1985 and 1997, with the Lake States and Southern Mountains showing the greatest decrease (**Fig. 1**, **Table 2**). This downward trend has been evident since the late 1980s for the two mountain regions and since 1985 for the Lake States (**Fig. 1**). Softwood sawtimber sales also have decreased considerably in all regions. However, as much as 50 percent of the decline in softwood sales in the Southern Mountains can be attributed to reduced sales of southern pine from the Oconee. The Southern Mountains have had the greatest decline in total (softwood and hardwood) sawtimber sales of the three regions examined.

Although sales of hardwood sawtimber have decreased by more than 78 percent in the Lake States, sales of select hardwoods have decreased by only 28 percent. However, as stated previously, sales of select hardwoods accounted for only 9 percent of sawtimber sales in this

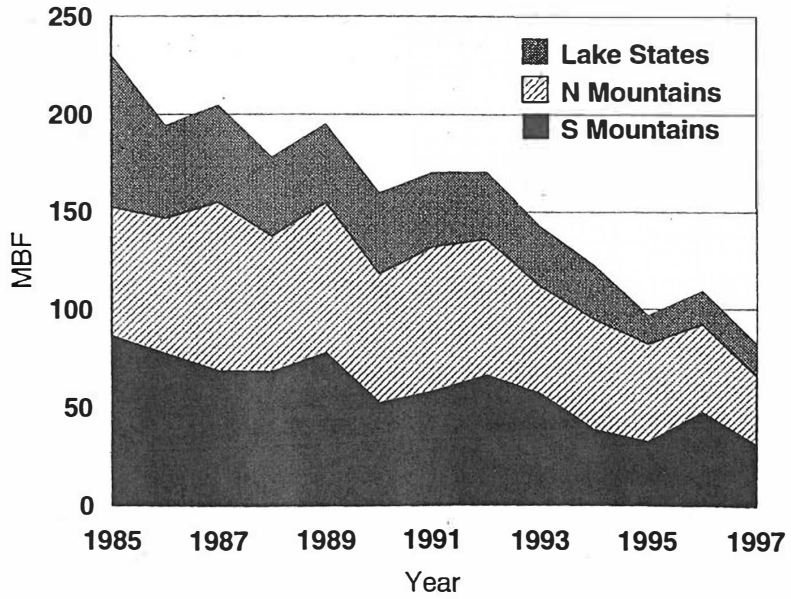

Figure 1. — Hardwood sawtimber sales for the Lake States, Northern Mountains, and Southern Mountains national forests, 1985 to 1997.

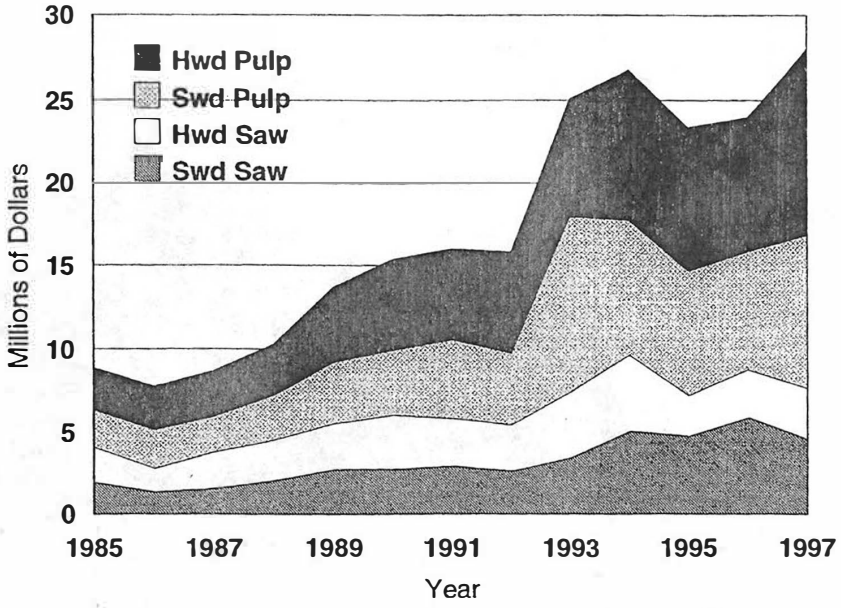

Figure 2. — Revenue from roundwood sold by Lake States national forests, 1985 to 1997.

TABLE 3. — Revenue from timber product sales for the Lake States, Northern Mountains, and Southern Mountains regions in 1997 and changes in revenues between 1985 and 1997.

	Lake States	Northern Mountains	Southern Mountains
Total revenue for timber products sold in 1997 (million $)	28.0	23.2	7.7
Revenue for hardwood sawtimber sold in 1997 (million $)	3.1	22.2	4.8
Revenue for select hardwood sawtimber sold in 1997 (million $)	1.4	20.4	2.7
Revenue for softwood sawtimber sold in 1997 (million $)	4.5	0.5	2.4
Revenue for hardwood pulpwood sold in 1997 (million $)	11.2	0.4	0.2
Revenue for softwood pulpwood sold in 1997 (million $)	9.2	0.1	0.3
Changes in total sales revenue for timber products (%)	216.9	159.1	-25.4
Change in revenue for hardwood sawtimber sold (%)	40.4	172.1	16.1
Change in revenue for select hardwood sawtimber sold (%)	202.7	190.0	62.2
Change in revenue for softwood sawtimber sold (%)	136.2	51.6	-56.6
Change in revenue for hardwood pulpwood sold (%)	332.3	1.8	-41.1
Change in revenue for softwood pulpwood sold (%)	326.8	25.6	-0.1

region. The decrease in sales of select species also was smaller in the other two regions.

Pulpwood sales in the Lake States have declined by less than 7 percent. By contrast, pulpwood sales have declined sharply in the Northern Mountains; these declines have been greater for hardwood pulpwood compared to softwood pulpwood (**Table 2**). Hardwood pulpwood volumes declined by more than 66 percent in the Southern Mountains, but sales of softwood pulpwood decreased by only 18 percent.

In 1997, revenues from timber sales were considerably higher in the Northern Mountains and Lake States than from the Southern Mountains (**Table 3**). The distribution of revenues by product also differed across regions; pulpwood accounted for over 70 percent of sales in the Lake States while hardwood sawtimber accounted for 96 percent of the sales revenue in the Northern Mountains and 62 percent of the revenue in the Southern Mountains.

Although the sales volume of timber has declined in all regions, revenues for timber product sales has increased by more than 200 percent in the Lake States and more than 150 percent for the Northern Mountains (**Table 1**, **Figs. 2** and **3**). While most of the increased revenue for the Lake States is attributable to increased pulpwood revenues, most of the increased revenue for the Northern Mountains was attributable to select species sawtimber (**Fig. 3**). However, while sales revenue for the Lake States forests has continued to increase, revenues for the Northern Mountains peaked in 1994.

Revenue from timber product sales in the Southern Mountains decreased by 25 percent while revenue from hardwood sawtimber increased by 16 percent (**Table 3**, **Fig. 4**). The decrease in sales revenue resulted primarily from a decrease in softwood sawtimber sales from the Chattahoochee National Forest.

The price of hardwood stumpage in the Northern Mountains far exceeds that of all other products in all three regions by a considerable margin, with select hardwoods approaching $950/MBF (**Table 4**). This high price is primarily the result of prices for black cherry from the Allegheny National Forest ($1,383/MBF in 1997). Although the price of hardwood sawtimber from the Lake States and Southern Mountains seems low compared to the Northern Mountains, it still exceeds the price of softwood sawtimber.

Pulpwood prices are considerably higher in the Lakes States than in the Mountain regions. This higher price is due in part to pulpwood being diverted to lumber, plywood, and pallet mills; however, the high concentration of pulpmills probably is the primary reason for higher pulpwood prices. Because of the high volume of pulpwood sold in the Lake States, the average price of timber prod-

ucts sold was relatively low at $65 per MBF.

The escalating price of most timber products is the reason timber sales revenues remained high (**Tables 2** through **4**). Even after adjusting for a 23 percent increase in the overall rate of inflation, prices of most timber products sold by the national forests had triple-digit increases between 1985 and 1997. Unfortunately, the lack of published timber prices makes it difficult to evaluate whether these increases were higher than for privately owned timber in all regions. One area where private prices are reported are Northwestern Pennsylvania. In this area, prices for national forest timber generally were higher than those for private sawtimber and pulpwood (1).

The increase in the average price of national forest sawtimber can be associated with specific species that are commercially important in the three regions. The 557 percent increase in the price of hardwood sawtimber in the Lake States is largely the result of increasing prices for paper birch and red oak sawtimber, while most of the increases in softwood sawtimber prices are attributable to increases in the price of red and white pine.

Much of the 411 percent increase in hardwood sawtimber prices in the Northern Mountains is attributable to increases in the price of cherry stumpage, red oak, and hard maple. In 1997, black cherry sales accounted for nearly 80 percent of the sales revenue for all products sold from Northern Mountains forests. The 227 percent increase in hardwood sawtimber prices in the Southern Mountains can be attributed to increases in prices of red and white oak sawtimber.

The large increase in pulpwood revenues in the Lake States is attributable to the more than 300 percent increase in the price of hardwood and softwood pulpwood. The 120 percent increase in hardwood pulpwood prices in the Northern Mountains offsets the decrease in pulpwood sales volumes. However, the 77 percent increase in hardwood pulpwood prices in the Southern Mountains was insufficient to offset the 67 percent decrease in sales volume.

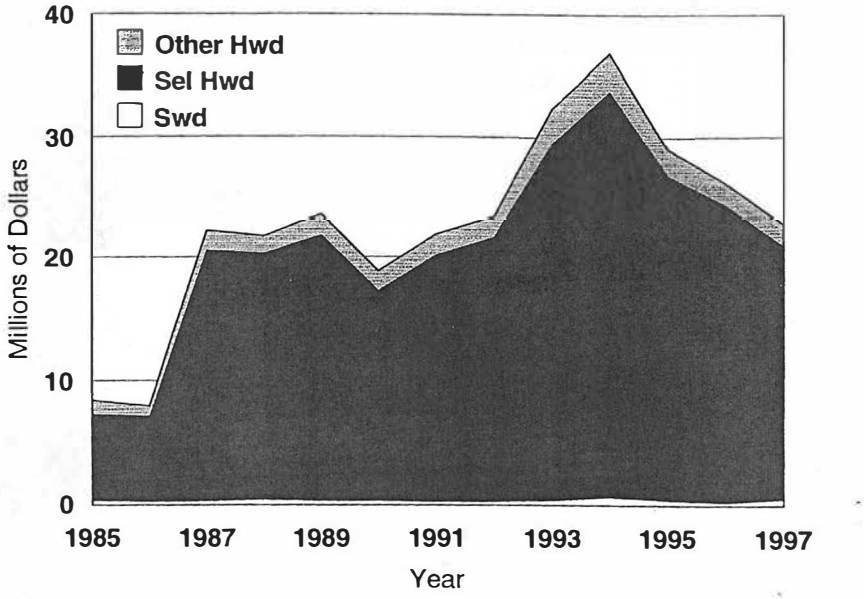

Figure 3. — Revenue from sawtimber sold by Northern Mountains national forests, 1985 to 1997.

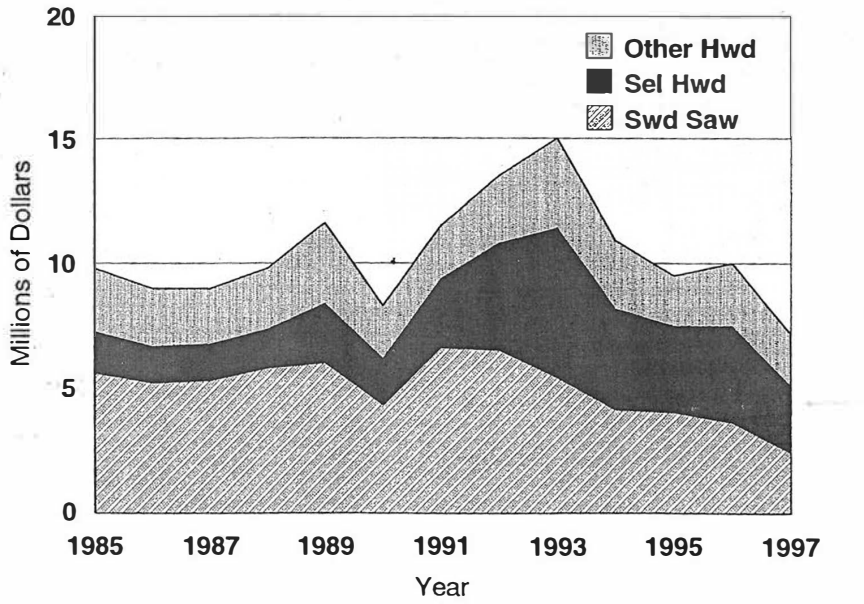

Figure 4. — Revenue from roundwood sold by Southern Mountains national forests, 1985 to 1997.

POTENTIAL IMPACT OF CONTINUAL REDUCTIONS IN SALES

The impact of reducing or halting sales of hardwood sawtimber and other roundwood products from national forests would appear to have little impact on the forest products industry as the eastern national forests contain less than 7 percent of hardwood sawtimber volume and less than 10 percent of the softwood sawtimber volume. However, national forest timber must be viewed with specific regions and users in mind.

The most recent surveys of the Lake States revealed 48 pulpmills in this region (2,3,4). Pulpmills account for 67 percent of the cubic volume of hardwood timber consumed and a similar volume of softwood roundwood (2,3,4). The highest concentration of primary processors in Michigan is near the Huron and western unit of the Hiawatha National Forests (4). High concentrations of primary wood users also are near the Nicolet and Chequamegon forests in Wis-

consin (3). Given that 10 percent of the hardwood and 18 percent of the softwood growing stock in the Lake States is on national forests, a reduction in pulpwood sales from these forests could force some pulpmills out of business and devastate communities associated with these mills. The economic importance of pulpmills in the Lake States may be the reason pulpwood sales from Lake States forests have decreased by less than 7 percent between 1985 and 1997.

Seven percent of the sawtimber in the Northern Mountains region is contained in national forests. However, this figure does not reflect the proportion of black cherry. Cherry is currently the most valuable, commonly traded domestic hardwood species (5) and rivals mahogany in importance in the manufacturing of traditional furniture. All indications are that cherry has been harvested on private lands at a faster rate than on the national forests, causing the national supply of cherry on these forests to increase. This faster cut rate on private lands also causes the black cherry to be cut at an earlier age, reducing the amount of veneer-quality material that is available.

The White and Green Mountains forests contain significant volumes of white pine and sugar maple. Sugar maple is currently the second most valued domestic species in the lumber market.[2] Eastern white pine also is an important furniture and millwork species that is increasingly used as a substitute for western species that now are in limited supply due to reduced Forest Service timber sales. However, the White Mountains National Forest is directly accessible by interstate highway while the Green Mountains National Forest is relativity close to several major population centers. Easy access by urban populations to these forests increases the potential for recreation demand.

Most forests in the Southern Mountains region are near the North Carolina-Virginia wood furniture industry, which originally located in this area because of the availability of lumber. Every forest in this region also is accessible by at least one interstate highway. The accessibility of these forests combined with the large number of urban population centers near them may be another reason why the Southern Mountains region has shown the greatest decline in timber sales.

TABLE 4. — Changes in prices of hardwood and softwood sawtimber and pulpwood sold from national forest timber between 1985 and 1997, and 1997 prices of these products for the Lake States, Northern Mountains, and Southern Mountains regions.

	Lake States	Northern Mountains	Southern Mountains
Average price of timber products sold in 1997 ($/MBF)	65.4	306.0	79.4
Price of hardwood sawtimber sold in 1997 ($/MBF)	183.1	634.9	156.9
Price of select hardwood sawtimber sold in 1997 ($/MBF)	340.3	949.5	270.8
Price of softwood sawtimber sold in 1997 ($/MBF)	149.2	109.1	132.7
Price of hardwood pulpwood sold in 1997 ($/MBF)	44.3	12.4	9.3
Price of softwood pulpwood sold in 1997 ($/MBF)	71.0	19.3	12.7
Change in average price of timber products sold (%)	305.3	412.6	98.5
Change in price of hardwood sawtimber sold (%)	557.3	411.0	227.4
Change in price of select hardwood sawtimber sold (%)	320.8	416.4	244.6
Change in price of softwood sawtimber sold (%)	400.1	154.4	58.5
Change in price of hardwood pulpwood sold (%)	362.9	120.3	77.4
Change in price of softwood pulpwood sold (%)	348.4	109.2	21.2

SUMMARY AND CONCLUSIONS

Sales of hardwood sawtimber and other products from eastern national forests have declined, but these declines are not uniform across regions. The Lake States region had the largest decline in hardwood sawtimber sales but sawtimber products account for only a small proportion of the total volume and even a smaller part of the total revenue in this region. Pulpwood sales, which account for most of the timber sales by volume and revenue, have decreased by less than 7 percent in volume and have increased by more than 325 percent in revenue. The relatively small declines in total timber sales in the Lake States may be attributed to the large number of pulpmills in this region.

Hardwood sawtimber sales volume in the Northern Mountains region decreased by a lesser extent than in the other two regions.[3] The Northern Mountains is the only region where revenue from hardwood sawtimber sales increased by more than 100 percent. This increase is largely attributable to sales of black cherry from the Allegheny National Forest and to a lesser extent from the Monongahela National Forest. Given the large volume of the national inventory of cherry on these forests, a continued decline in the sales volumes of cherry will result in increased prices of this species, possibly causing domestic and international users to substitute mahogany for cherry.

The Southern Mountains national forests have the greatest volumes of hardwood inventories but sell a smaller proportion of these inventories. This region experienced the largest decrease in volume of sales and also is the only one that showed a decline in total sales revenue between 1985 and 1987. The primary reason for this decline is that prices of hardwood and softwood sawtimber did not increase sufficiently to counteract the decrease in sales volume. Southern Mountains forests also are accessible by interstate and other highways, allowing urban populations easy access to them. Because recreation and timber production are not usually complementary functions, one can expect continued decline in timber sales in this region.

[2] Although baseline prices for high grade walnut lumber were higher than those for hard maple lumber in February 1998, once premiums are considered, the price of high grade hard maple is equivalent to or higher than the price of walnut (5).

[3] Preliminary data for 1998 timber sales from the Allegheny National Forest indicate a large decline in sales because of litigation by nongovernmental organizations (Randall A. Dumer, Allegheny National Forest, personal communication).

A reduction in national forest timber sales has an adverse economic effect on the industries that process and use timber products. But, there also are economic gains through increased recreational use. Because decisions concerning the sales of Forest Service timber will be based on objectives still being developed, it is important that policy makers understand the economic tradeoffs associated with their decisions. It also is important that future research focuses on the impact of changing timber sales and management policy with respect to recreational and ecological services. We believe that such analysis should be conducted on a forest-by-forest if not county-by-county basis to ensure fairness among rural communities within and beside national forests.

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