
Wood fiber supply and demand in the United States

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Abstract

The USDA Forest Service is preparing a national assessment of supply and demand for wood fiber resources in the United States. Based in part on preliminary results of this assessment and partly on our 1993 Assessment, this paper outlines trends and gives an outlook for demand and trade for timber and fiber products, changes in technology, and wood fiber resource supply. We use the term wood fiber to include timber for solid wood products, pulp and paper products, and recycled paper for paper products. Demand for solid wood products and paper and paperboard products will be driven by growth in population, gross domestic product (GDP), and personal disposable income (PDI). The growth rate of these indicators is sustained but slowing. Population, GDP, and PDI are projected to grow about 1

percent, 2.7 percent, and 2.5 percent per year, respectively, through 2005. Growth will be slower through 2050. Population growth will be 0.5 percent by 2050, and GDP and PDI will average 1.9 percent growth per year. Despite continued strong growth in GDP and PDI per capita, consumption of forest products per capita will slow, stop, or actually decline for some solid wood products but will increase for engineered products and slow for paper and paperboard products. Consumption of wood fiber products will continue to shift from lumber and plywood to engineered wood products, such as oriented strandboard and laminated veneer lumber, and to fiber-based panels, and from solid wood products to paper and paperboard products. The United States is a net importer of forest products. Preliminary analysis suggests net imports of paper and paperboard could continue to decline relatively with a faster growth of exports. Timber supply for solid wood products will continue to shift from larger softwoods to smaller softwoods and hardwoods. Paper and paperboard fiber supply will continue to shift away from residue use (because of lower residue production from lumber and plywood mills) toward recycled paper use and greater roundwood timber use. Timber supplies are projected to increase 43 percent between 1991 and 2040. The most striking shift during this time is the shift toward supply

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coming from farm and other private sources—a growth of 67 percent versus a growth of only 17 percent from other types of ownership. This shift could result in a significant change in the direction and content of forest management and policy debates in the coming decades. Harvest of hardwoods will increase substantially in the South. With expected increasing prices for pulpwood, short-rotation hardwood plantations may expand, with most growth occurring after 2010. Pulpwood and woodpulp imports are projected to increase, but imports remain small relative to domestic supply. Technology is expected to continue to adapt to changing fiber supply with shifts toward engineered wood products using smaller diameter trees and hardwoods and shifts toward paper and paperboard processes that use more hardwood and recycled paper.

Introduction

The past decade has seen a number of changes in U.S. timber supply prospects. Some of these changes have reduced prospective timber harvests. Others have encouraged various parts of the forest products industry to find and use alternative sources of supply.

Most of our perceptions are that these changes result from increasing environmental regulations and that they involve reductions in timber supply. The most controversial have been the changes in federal timber harvests. The federal harvests have decreased in some places by as much as 90 percent. The current outlook is that National Forest harvest will fall by two-thirds between the late 1980s and 2000. This decrease results from a number of policy changes including habitat protection for the spotted owl and the red cockaded woodpecker, ban on development of current roadless areas, and reductions in below cost timber sales. Projections of total National Forest harvest are 1.17 billion ft.³ for 2000 and 1.28 billion ft.³ for 2040 (33 and 36 million m³, respectively). Most of this decrease is in five states (Montana, Idaho, Washington, Oregon, and California), and most of this decrease has already occurred.

In addition to environmental regulations, there are other changes that will significantly impact our timber needs and timber use patterns. These include the changing influence of population and economic growth on growth of product demand, the changing mix of products produced to meet needs, the changing technology to make products more ef-

ficiently, and the shift among timber supply sources from public to private ownerships, from sawtimber to nonsawtimber, and from softwoods to hardwoods.

The Forest and Rangeland Renewable Planning Act of 1974 requires periodic long-range assessments of timber supply and demand that provide information for stewardship and management decisions in both the public and private sectors. The latest assessment was completed in the fall of 1993 (2). The next assessment is to be completed in early 2000. This paper is based primarily on the 1993 assessment with some preliminary projections for the paper and paperboard industries from the 2000 assessment.

First, we will present an overview of prospective forest products demand and resultant wood fiber demands. Second, we will discuss changes in technology that are affecting wood fiber demand and supply, and finally we will discuss the associated trends in timber and recycled fiber supplies.

Demand

Determinants of demand

One way to view forest products demand is in terms of trends and projections of per capita consumption. Economic theories of natural resource use often assume that resource use increases as population and income grow.

Population growth is projected to slow during the next 50 years, from about 1 percent per year currently to 0.5 percent per year by 2050 (Fig. 1). Gross domestic product (GDP) and personal disposable income (PDI) are projected to grow 2.7 percent and 2.5 percent, respectively, through 2005. But GDP and PDI growth decline to an average of 1.9 percent per year between 2005 and 2050 (5).

Consumption of solid wood products, pulp and paper products, and fuelwood were growing at nearly the pace of economic growth (GDP) from the 1960s until the mid 1980s (Fig. 2). The consumption of solid wood products, paper and paperboard products, and roundwood used for fuel has more than doubled since 1960—from 100 million metric tons to about 215 million metric tons in 1996. Much of this increase is due to the fuelwood consumption increase in the late 1970s and 1980s. This total does not include the tonnage of black liquor from pulping, which is used for fuel.

Since the 1980s, solid wood products consumption has grown at about the pace of population, and paper and paperboard products consumption has grown faster than the population but slower than the GDP (Fig. 2). The growth rate for solid wood products per capita per year is projected to remain at the current level of about 0.32 metric tons (0.74 m³) per capita or decline slightly by 2040 (Fig. 3). Growth in per capita consumption of pulp and paper is slowing but is projected to rise from about 0.33 metric tons in 1996 to 0.41 metric tons in 2040 (Fig. 3).

Solid wood products.—Residential construction is expected to continue to dominate demand for lumber and panel type products. Housing starts are expected to increase from 1.4 million units annu-

ally in the 1990s to about 1.7 million units by 2010, and then decline to 1.5 million by 2040. Early next century, lumber and panel demand for residential repair and remodeling is expected to overtake demand in new construction. These two end uses consumed 50 percent of the lumber and 60 percent of the structural panels in 1990, but these proportions are expected to decline to 45 percent and 48 percent, respectively, by 2040, while consumption in other end uses will increase, such as nonresidential construction, manufacturing, and shipping.

Paper and paperboard products.—Consumption of paper and paperboard has been driven by population and per capita GDP, as well as substitution of other products for paper and nonpaper products, such as plastics and electronic media. For sev-

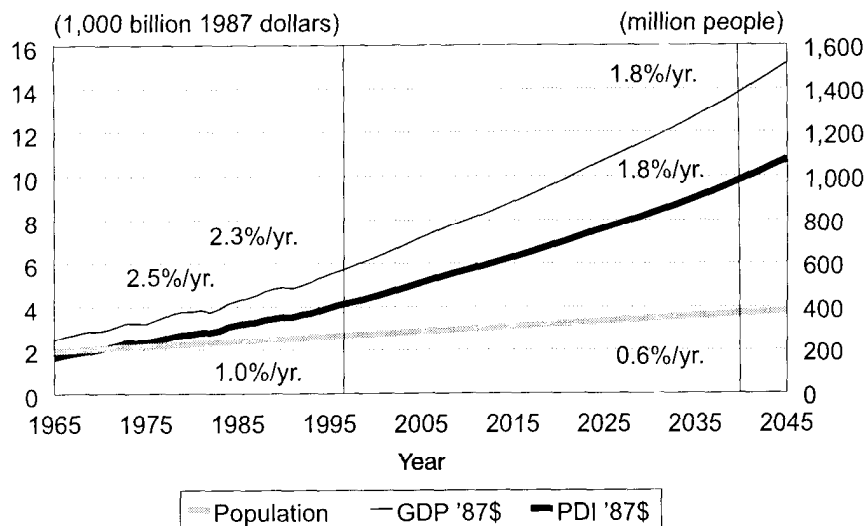


Figure 1.—Population, gross domestic product, and personal disposable income for the United States.

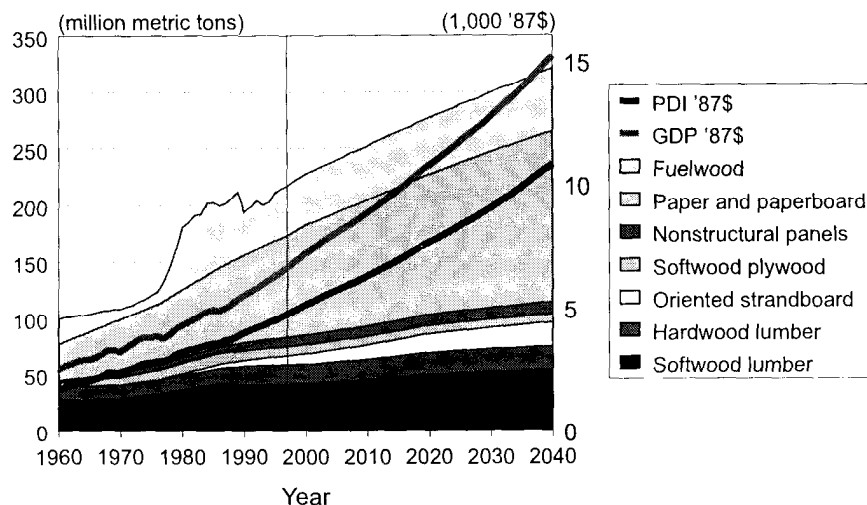


Figure 2.—Consumption of forest products in the United States.

eral decades, overall growth in paper and paperboard consumption had kept pace with growth in GDP. But growth is now well below the rate of GDP growth, although it still exceeds the rate of population growth.

Roundwood requirements for consumption

Consumption of roundwood for solid wood products, pulp and paper products, and fuelwood has grown more slowly than consumption of products because of increased paper recycling and improvements in production efficiency. Per capita consumption of roundwood for forest products was 2.3 m³ in 1950, declined to a low of 1.7 m³ in 1970, reached 2.3 m³ in 1988, and is currently 2.1 m³ (Fig. 4).

Per capita roundwood consumption is projected to decline slightly during the next 50 years. This view of the future shows 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. In spite of this, total roundwood consumption required for U.S. products is expected to grow 0.6 percent per year to 750 million m³ (26.5 billion ft.³) by 2040, up from 550 million m³ (19.4 billion ft.³) currently (Fig. 4).

Perhaps more important than the slowing of growth has been the change in the composition of product consumption. Between 1960 and 1996, the

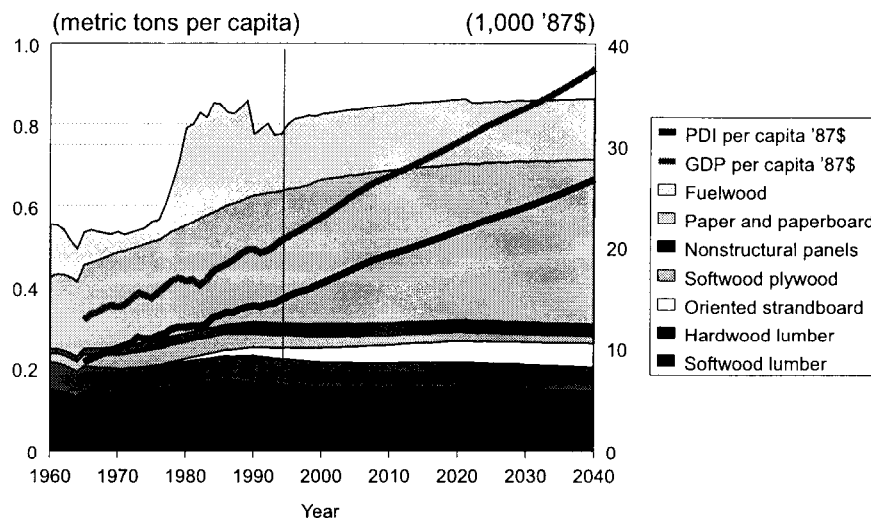


Figure 3.—Consumption of forest products per capita in the United States.

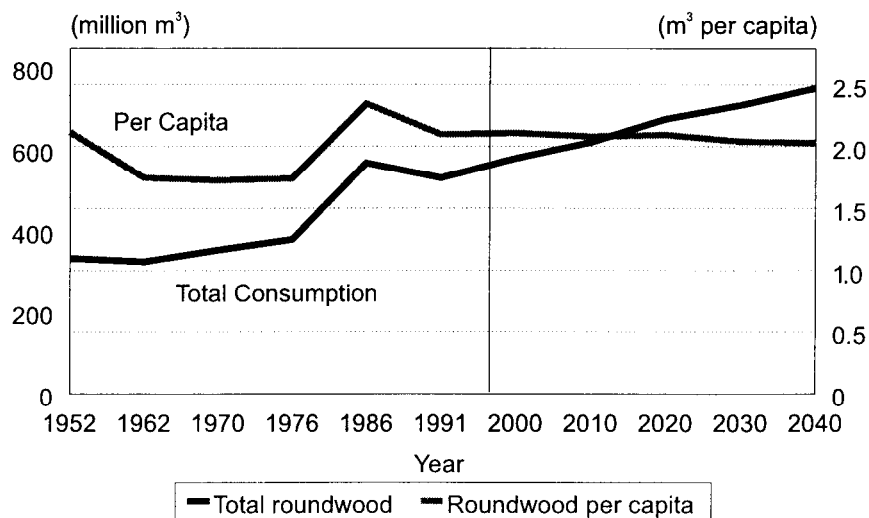


Figure 4.—Roundwood required for U.S. forest products consumption.

share of lumber dropped from 38 percent to 27 percent, the share of paper and paperboard increased from 33 percent to 42 percent, and the share for panels increased from 6 percent to 11 percent (Fig. 3). The fuelwood share was at 23 percent in 1960, increased to about 30 percent in the 1980s, and has now declined to 20 percent. Paper and paperboard consumption has increased the most in absolute amount—from 33 million to 89 million metric tons.

Recycled paper and mill residue requirements for consumption

The fiber sources for U.S. paper and paperboard production have shifted from roundwood to mill residue and, most recently, to recycled paper between 1960 and 1996: from 60 percent roundwood, 12 percent mill residue, 20 percent recycled paper, and 8 percent imported wood pulp to 50 percent roundwood, 19 percent mill residue, 25 percent recycled paper, and 6 percent imported wood pulp. The share of recycled paper used as a fiber source is projected to increase through 2040, to 36 percent, while the roundwood share and residue share are projected to decrease to 30 percent and 13 percent, respectively (Fig. 5).

Production of forest products

The United States is a net importer of both solid wood and pulp and paper products. For solid wood products, we are a major importer of softwood lumber but a net exporter of hardwood lumber. The amount of U.S. roundwood required for domestic

production has increased 1.7 percent per year since 1960 from 289 to 520 million m³, whereas total roundwood required for consumption has increased 1.6 percent per year since 1960—324 to 550 million m³. Per capita roundwood harvest for U.S. production is about 2.0 m³ (71 ft³).

Solid wood products.—In the 1990s, softwood species comprised about 76 percent of all lumber produced. Total softwood lumber production rose from 41 million m³ in 1960 to 51 million m³ in 1996. The increase has been even greater for structural and nonstructural panels and engineered wood products—from 8 to 26 million m³.

Pulp, paper, and paperboard products.—Paper and paperboard production and production capacity have been increasing in the United States for most principal product grades, and production is projected to increase in the future. Growth will be tempered somewhat by a projected gradually slower growth in population and a slower growth in demands relative to GDP. The bulk of projected growth in paper and paperboard capacity is concentrated in the printing and writing grades and in containerboard.

Trade in forest products

The U.S. fiber requirements are increased by the fiber needed for export products. Pulp, paper, and paperboard dominate U.S. exports [Fig. 6]. We are also a net exporter of hardwood lumber. These exports increase requirements for hardwood sawtimber. The demand for paper and paperboard exports

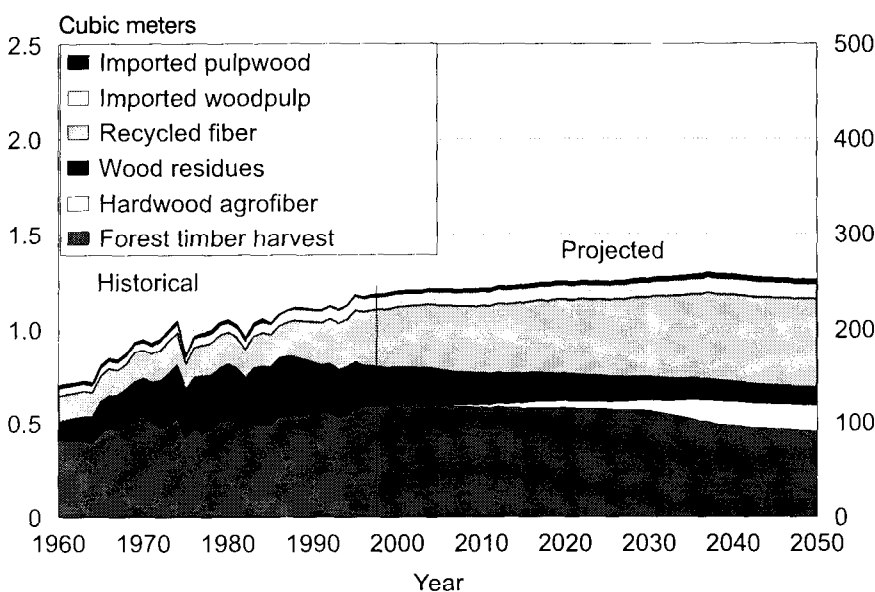


Figure 5.—Per capita use of wood and wood fiber in United States pulp and paper industry, 1960-2050.

has been growing faster than the demand for solid wood products, although both have been increasing in value terms (Fig. 7).

Changes in exports are strongly influenced by conditions in our export markets and by relative U.S. competitiveness. Five of the top 10, and 9 of the top 20, trading partners for U.S. forest products exports are Asian countries. In 1996, these countries accounted for about 40 percent of the value of U.S. solid wood and pulp and paper exports. The recession, or even slow growth, in these countries will have a continuing effect on U.S. exports. At the same time, 3 of the top 10, and 6 of the top 20, trading partners for imports are also Asian countries.

Currency revaluation, which has already occurred for the most part, makes imports from these countries more competitive in U.S. markets.

U.S. fiber requirements are reduced by the type and amount of fiber that would have been needed to make products imported. The leading imports are softwood lumber and newsprint (Fig. 6) from Canada. Imports of Canadian softwood lumber provide more than 30 percent of U.S. softwood lumber consumption. These imports decrease requirements for softwood sawtimber and softwood pulpwood. Hardwood lumber imports have been and are projected to remain below 5 percent of total hardwood lumber consumption.

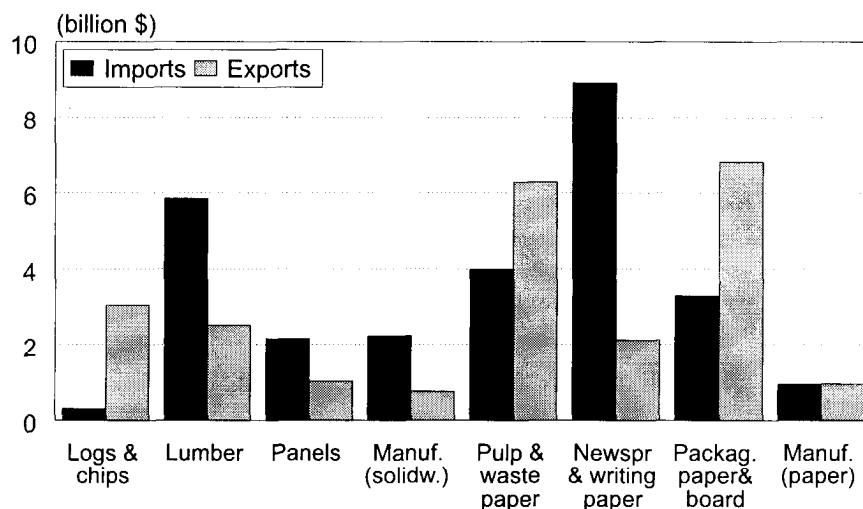


Figure 6.—U.S. forest products trade, 1995. Value of trade by commodity group.

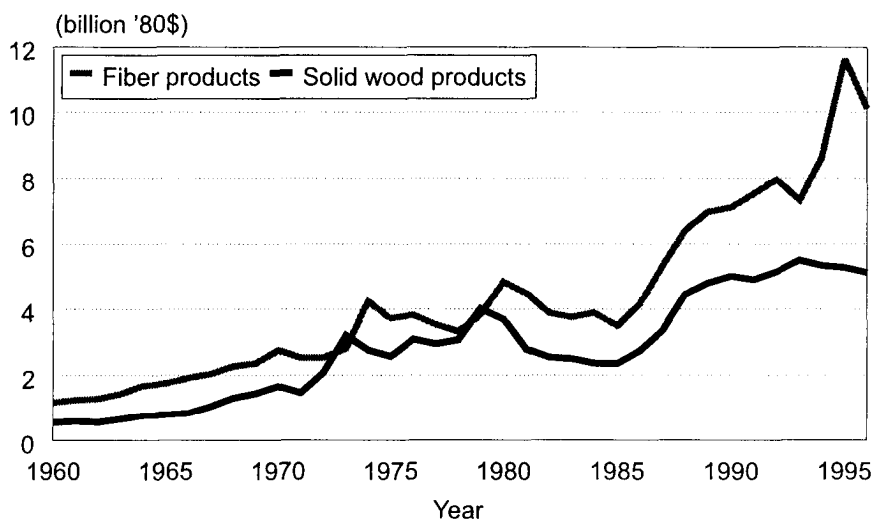


Figure 7.—United States forest products, exports, 1960-1996.

Technology change

There have been several major technology changes affecting wood fiber requirements:

- a shift in production from solid wood products toward paper and paperboard products, with an associated shift from sawtimber to pulpwood [Figs. 2 and 15];
- a shift among solid wood products from lumber and plywood to other composite panels and engineered lumber (Fig. 8), with an associated shift from softwoods to hardwoods and from larger diameter to smaller diameter trees (Fig. 9);
- a continuing increase in log conversion efficiency for solid wood products (Fig. 10), with a resultant decline in availability and use of mill

residue for pulp, paper, and paperboard production (Fig. 12);

- a shift in pulping from softwoods to hardwoods; and
- a shift from virgin wood to recycled fiber (Figs. 11 and 12).

Changes in the pulp and paper industry are projected to have the greatest effects on fiber requirements. Shifting technology, shifts among product grades produced, shifts in trade, and shifts in recycling rates have led to some specific changes in relative quantities of fiber material inputs.

When we look at fiber inputs (cubic meters) per unit of paper and paperboard output (metric tons) over timber, we see significant changes in the mix of

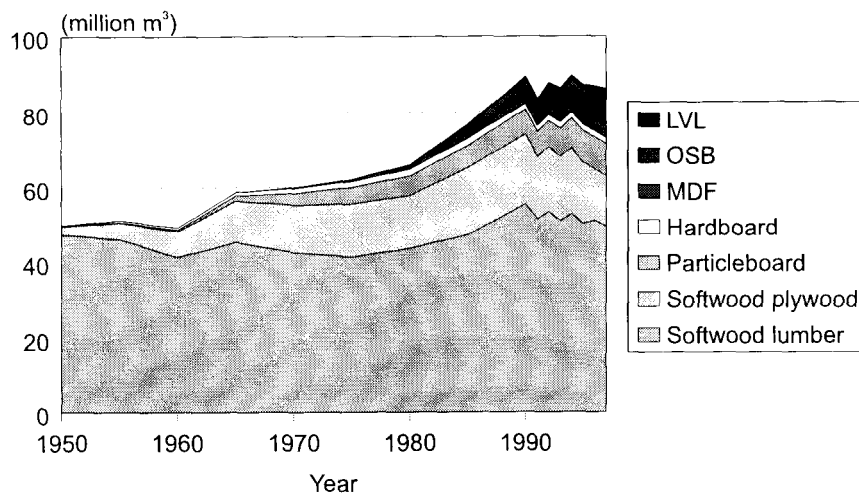


Figure 8.—Lumber and composite wood product production.

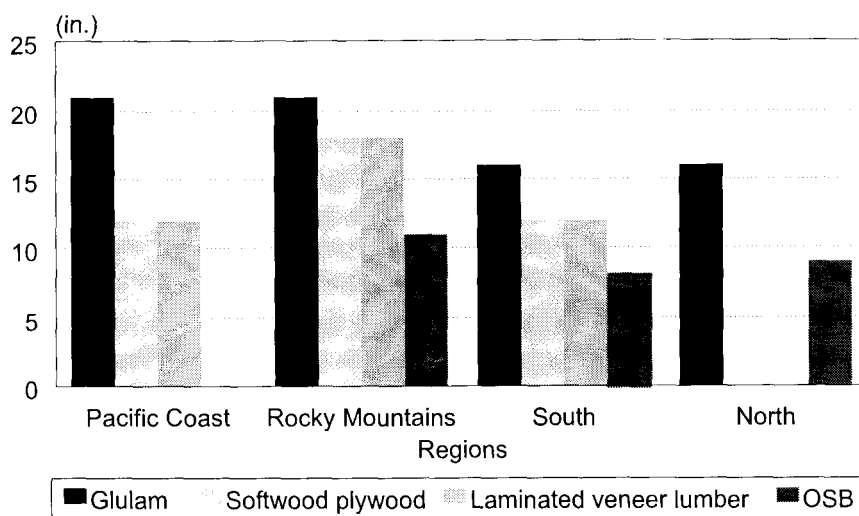


Figure 9.—Average diameter of logs used for glulam, softwood plywood, LVL, and OSB.

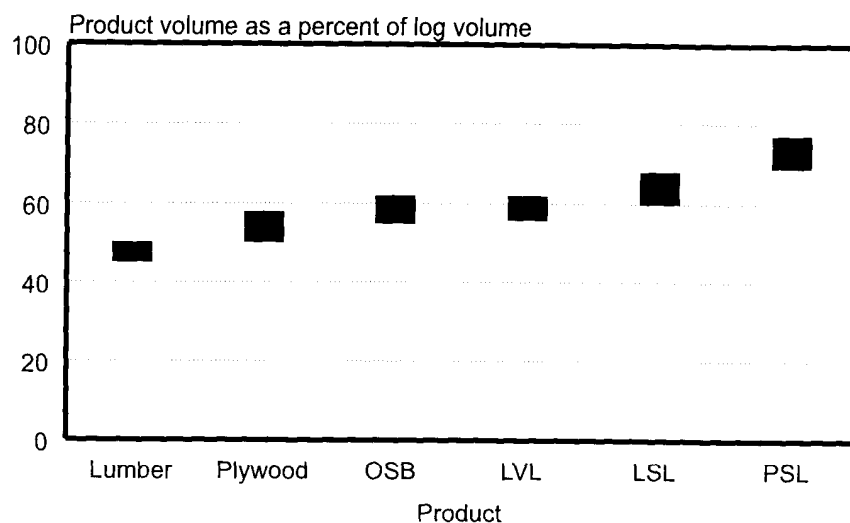


Figure 10.—Estimated log conversion efficiency by product.

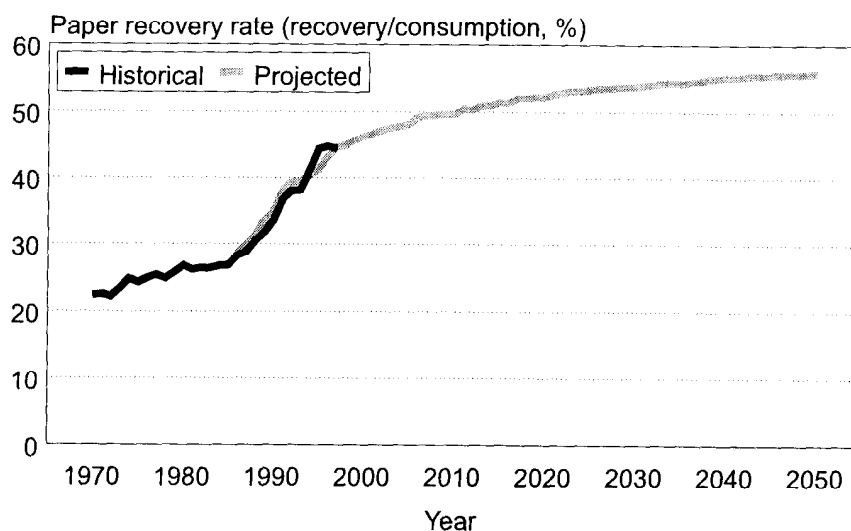


Figure 11.—Historical and projected U.S. rate of paper recovery for recycling, 1970-2050.

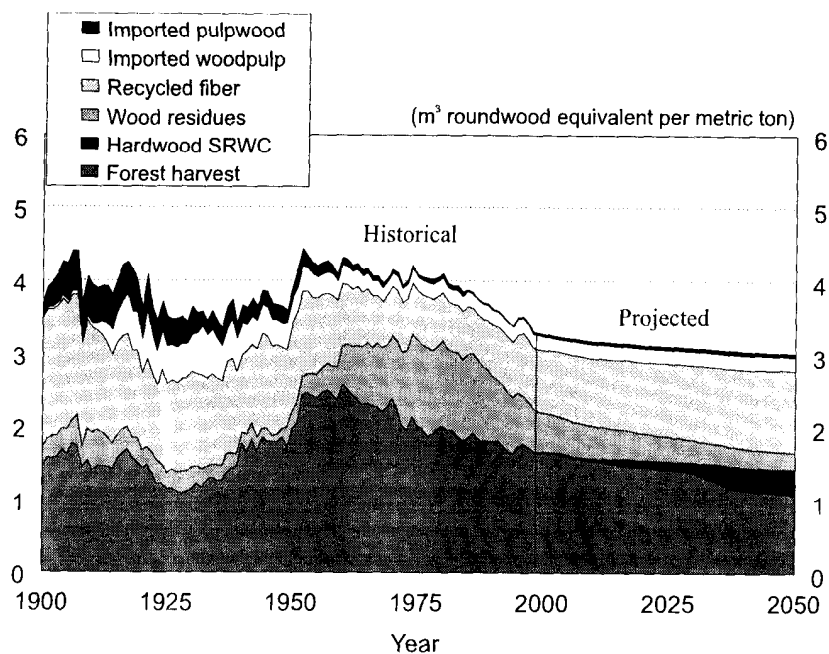


Figure 12.—Historical and projected fiber raw material use per ton of pulp, paper, and paperboard produced in the United States, 1900-2050.

fibers used and a decrease in fiber requirements per unit output. (Fig. 12).

Looking back over the past century, we see that recycled fiber was once much more important than today (rag stock provided a large share of fiber input in the early part of the century). The expansion of large-scale kraft pulping since the 1920s has increased the use of roundwood and wood residues. Total fiber input per ton of product output is projected to gradually decline into the future. Residue use in particular will decline with declining availability of wood residues in U.S. markets. Roundwood will remain the dominant fiber input, followed by recycled fiber (Fig. 12).

Significant changes in pulp and paper production technology, historical and projected, are exemplified by changes in processes used for linerboard production (Fig. 13). The U.S. linerboard production capacity is distributed historically among three principal process categories:

- unbleached kraft board with pre-1980s press technology, called “old press;”
- unbleached kraft board with post-1980, improved press technology, with wide-nip or extended-nip press sections in the paper machines, called “new press;” and
- so-called “recycled linerboard,” made from 100 percent recycled fiber (Fig. 13).

The unbleached kraft board made with the old press and new press technologies may also include some

recycled fiber, but the new press technology permits higher proportions of recycled fiber, as well as higher proportions of hardwood fiber (30% or more is typical in the new press technology, compared with less than 10% in the old press technology).

Future linerboard production capacity is projected to be dominated by unbleached kraft board, with the new press technology continuing to replace the old press technology. The amount of linerboard made entirely from recycled material (recycled linerboard) is also projected to increase, but recycled linerboard will remain only a fraction of total linerboard capacity. It is projected that other product grades, such as in tissue, newsprint, and corrugating medium, will be made with a greater percentage of recycled fiber.

Industrial wood productivity

The amount of industrial wood products produced by the United States per unit of roundwood input (industrial roundwood productivity) has improved by 39 percent between 1900 and 1998 (Fig. 14). Fuelwood is excluded from both roundwood input and product output. Productivity has increased most rapidly since about 1950 particularly due to gains in the use of wood residues and recycled wood fiber for wood and paper products. Further improvements are projected and will contribute to keeping roundwood requirement growth at or below the rate of growth in population.

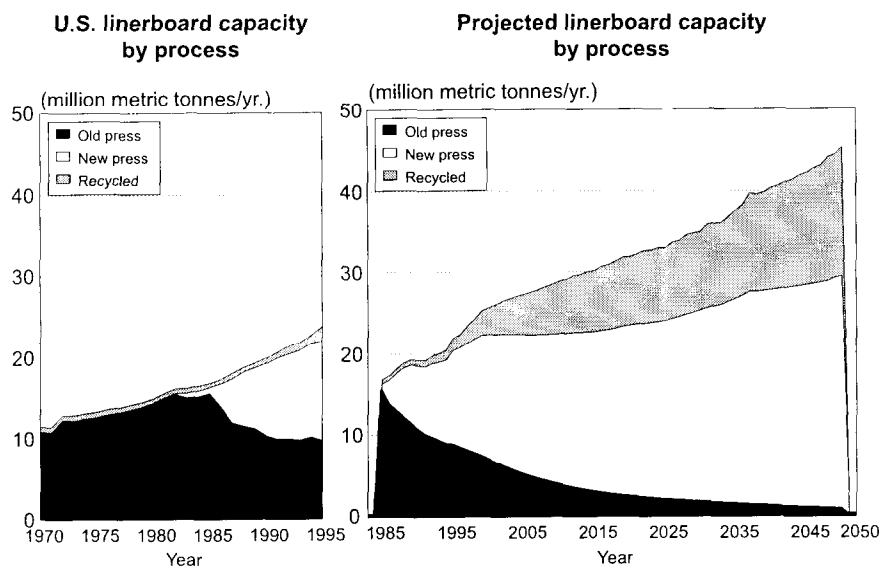


Figure 13.—U.S. linerboard capacity by process. Projected linerboard capacity by process.

Description of fiber supplies

Fiber supplies include roundwood from timber harvest, wood residue from primary wood products processing, recycled paper and wood, and imported wood fiber and wood pulp. We discuss timber supplies for all products, then separately focus on the pulp and paper industry to highlight the importance of recycled paper and wood residue as fiber sources.

Projected timber supplies

Softwood timber harvest has increased by more than 50 percent during the last four decades. It is projected to increase by an additional 35 percent, to 415 million m³ (14.6 billion ft.³), by the year 2040 (Fig. 15, Table 1). This slower projected growth in

demand for softwood timber is due to slower growth in domestic demand, increased use of recycled fiber, increasing use of hardwoods, and the shift of inventory, particularly in the South, to younger age classes of trees. The Pacific Northwest and the South are expected to remain the two most important timber producing regions for softwoods in the United States (Fig. 16). Total timber harvest during the next 50 years is projected to grow from 501 to 718 million m³ (18.1 to 25.3 billion ft.³), or 0.7 percent per year (Fig. 15).

The timber harvest projections can be split into two components: sawtimber and nonsawtimber (Fig. 15). The distinction is in how the timber is

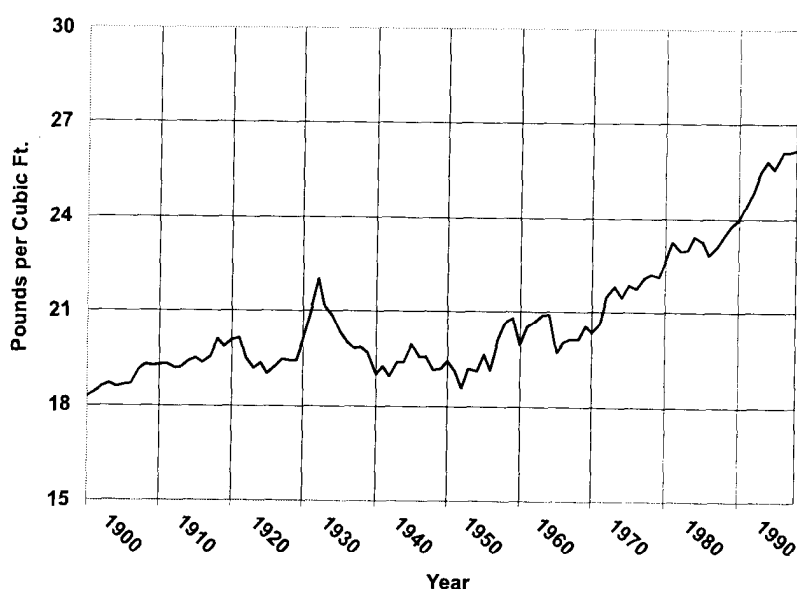


Figure 14.—U.S. industrial wood productivity—pounds of industrial wood product output per cubic foot of industrial roundwood input, 1900 to 1998.

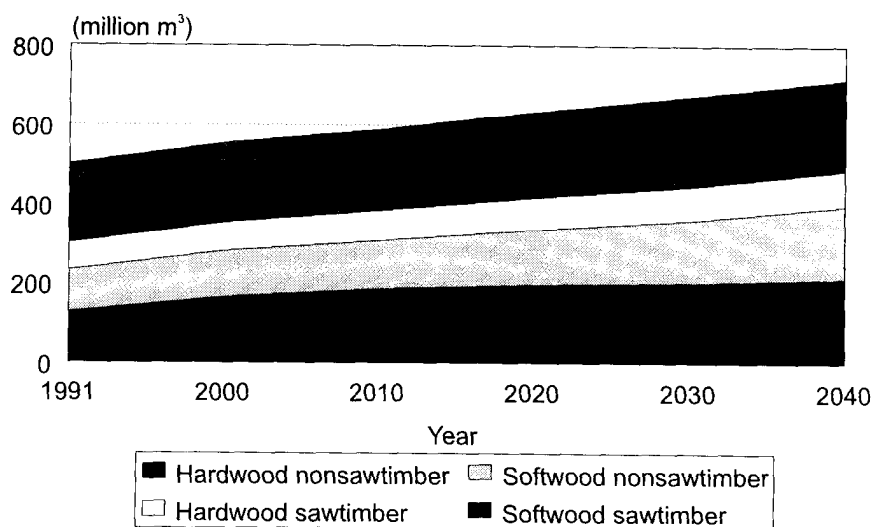


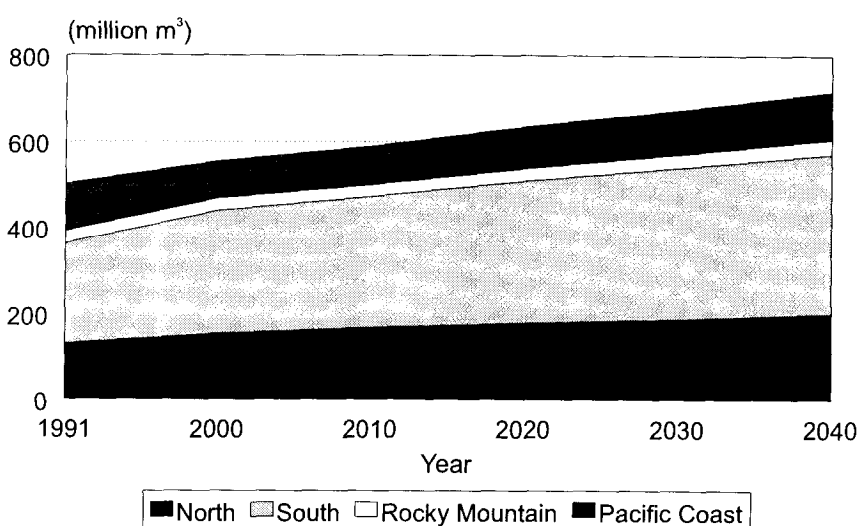
Figure 15.—U.S. timber harvest by species and type.

Table 1.—U.S. timber harvest by selected year.

Type, region, and source		Harvest					
		1991	2000	2010	2020	2030	2040
		(million m ³)					
Softwood sawtimber							
Region	North	9.7	11.8	13.4	13.7	13.6	13.4
	South	81.2	103.4	107.8	115.1	121.8	116.7
	Rocky Mountain	24.2	22.6	20.6	21.2	22.3	24.4
	Pacific Coast	86.1	61.9	62.0	66.1	69.5	74.9
Source	National Forest	37.9	19.0	19.5	20.1	20.7	21.2
	Other government	15.8	18.2	18.9	19.1	19.3	19.4
	Forest industry	81.2	72.5	74.8	88.1	100.2	96.4
	Farm and other private	66.3	90.0	90.6	88.8	87.1	92.5
Total softwood sawtimber		201.2	199.8	203.8	216.1	227.2	229.4
Softwood nonsawtimber							
Region	North	17.0	22.5	26.9	29.0	29.9	30.2
	South	68.4	74.0	72.5	84.9	101.5	123.7
	Rocky Mountain	4.0	4.4	5.0	5.7	6.4	7.6
	Pacific Coast	12.9	13.6	15.3	18.5	20.9	23.7
Source	National Forest	9.9	6.9	7.1	7.4	7.6	7.9
	Other government	5.9	6.9	7.5	7.7	7.8	7.8
	Forest Industry	37.4	40.7	42.1	53.1	64.4	72.5
	Farm and other private	49.1	60.1	63.0	70.0	78.8	97.0
Total softwood nonsawtimber		102.3	114.5	119.7	138.1	158.7	185.2
Hardwood sawtimber							
Region	North	35.2	34.3	33.9	34.3	34.8	35.9
	South	29.5	34.9	39.6	43.5	45.9	48.6
	Rocky Mountain	0.1	0.1	0.1	0.1	0.1	0.1
	Pacific Coast	3.9	4.3	4.6	5.1	4.9	5.0
Source	National Forest	2.5	2.4	2.5	2.7	2.7	2.8
	Other government	3.1	3.1	3.1	3.1	3.1	3.1
	Forest industry	11.3	10.2	8.5	8.4	8.9	9.6
	Farm and other private	51.9	57.9	64.1	68.8	71.0	74.1
Hardwood nonsawtimber							
Region	North	69.1	86.1	95.0	102.5	110.7	122.2
	South	53.0	72.4	83.1	85.3	81.4	80.5
	Rocky Mountain	1.1	1.3	1.6	1.9	2.2	2.4
	Pacific Coast	5.5	5.9	6.7	7.2	8.2	8.3
Source	National Forest	5.9	5.5	5.7	6.0	6.2	6.5
	Other government	5.5	5.5	5.5	5.5	5.5	5.5
	Forest industry	20.5	22.8	21.1	21.3	23.0	24.9
	Farm and other private	96.8	131.9	154.0	164.2	167.9	176.5
Total hardwood nonsawtimber		128.7	165.7	186.3	196.9	202.6	213.4

Table 1 (continued).—*U.S. timber harvest by selected year.*

Type, region, and source	Harvest					
	1991	2000	2010	2020	2030	2040
	(million m ³)					
Total softwood harvest	303.5	314.3	323.5	354.2	385.9	414.6
Total hardwood harvest	197.5	239.3	264.5	279.9	288.3	303.1
Total sawtimber	269.9	273.3	282.0	299.1	313.0	319.1
Total nonsawtimber	231.0	280.2	306.0	335.1	361.2	398.7
Total U.S. harvest	500.9	553.6	588.0	634.1	674.2	717.7

**Figure 16.**—*U.S. timber harvest by region.*

used and does not reflect size. Sawtimber includes parts of harvest used to manufacture lumber, plywood, miscellaneous products (for example, posts, poles, and piling) and does not include roundwood used for pulpwood, fuelwood, and chips. Table 1 and Figures 16 and 17 show harvest projections by region [North, South, Rocky Mountain, Pacific Coast] and timberland owner (National Forest, Other Government, Forest Industry, Farmer, and Other Private). Table 2 shows the average diameter of timber harvested on private timberlands.

Recent reductions in western harvests due to declining cutting on public lands and the limited availability of merchantable timber on private lands is clearly seen in the Pacific Coast states (Fig. 16). By 2040, all western regions will see some resurgence in harvests as private young-growth inventories

reach merchantable ages. In the South, after nearly three decades of growth, softwood harvests will roughly stabilize in the 2000 to 2015 period. Stumpage prices will rise, and growth in regional solid wood product output will stall as a result. After 2015, growth in softwood harvests will resume, reflecting the maturation of large areas of plantations. Harvest will increase in the North, primarily of hardwood nonsawtimber.

Key projected supply shifts include:

- a relative shift toward the South and North and away from the West (Fig. 16);
- a relative shift toward softwood and hardwood nonsawtimber and away from softwood and hardwood sawtimber (Fig. 15); and
- a shift mainly toward farm and other private ownerships, and to a lesser degree toward forest

Table 2.—Average diameter at breast height of timber harvested on private timberlands in the RPA Assessment regions.

Year	Average diameter							
	Pacific Coast		Rocky Mountain		North		South	
	Hardwood	Softwood	Hardwood	Softwood	Hardwood	Softwood	Hardwood	Softwood
	----- (cm) -----							
1976		76		43	34	29	35	33
1986	42	47	48	24	36	30	31	25
1990	42	45	44	24	36	30	31	27
2000	43	42	36	24	34	31	29	24
2040	42	39	32	24	36	31	27	23

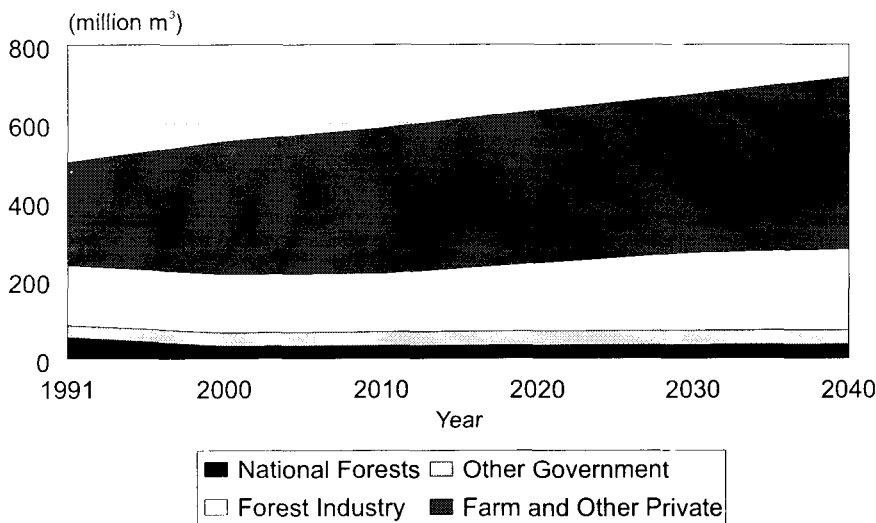


Figure 17.—U.S. timber harvest by ownership.

industry ownerships, and away from government ownerships.

Shifts by region.—Regional shares of timber harvest change modestly but noticeably during the projection period. Western regions consistently decline in importance, since only in a few cases will private harvests grow sufficiently by 2040 to compensate for public harvest reductions during the 1990s. The combined South and North, in contrast, rise from 59 percent of total U.S. harvest in 1991 to some 80 percent by 2040. The largest gain is in the South (from 50% to 58%) and occurs primarily in the final decades of the projection. Hardwood harvest is expected to increase in all regions, although not uniformly. The largest increases are in the South where growth in both hardwood lumber and pulpwood production pushes up the harvest. The lowest rate of growth in the East is in the north-central subregion.

Nonsawtimber-sawtimber shifts by region and ownership.—The shift toward nonsawtimber hardwood and softwood is focused on the North and South, but there are important differences in sources between hardwoods and softwoods.

- Hardwood nonsawtimber supply is large and projected to grow for both the North and South, but growth is projected to be fastest in the South (Fig. 18).
- Softwood nonsawtimber supply is much larger in the South than the North and is projected to grow much faster in the South (Fig. 19).
- Hardwood nonsawtimber supply is predominantly from farm and other private land where very fast growth is projected (Fig. 20).
- Softwood nonsawtimber supply is about evenly divided between farm and other private land and forest industry, and both sources are expected to grow substantially (Fig. 21).

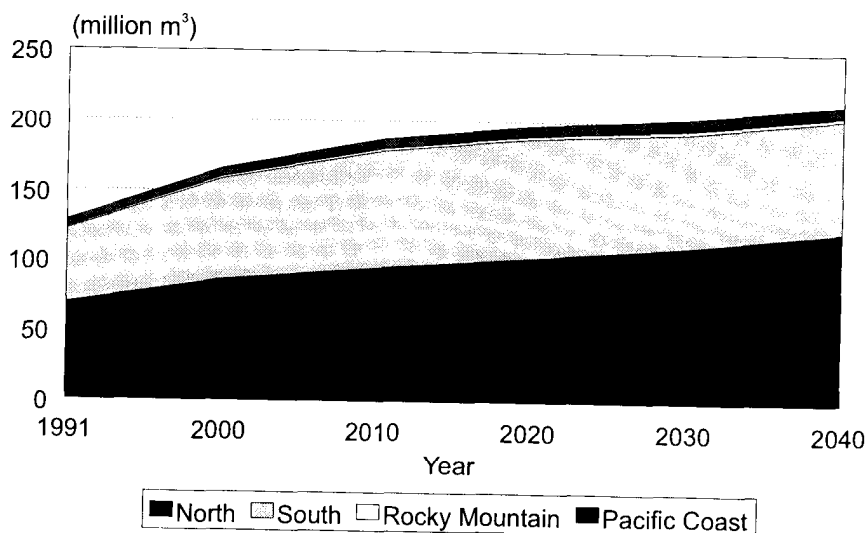


Figure 18.—U.S. hardwood nonsaw-timber harvest by region.

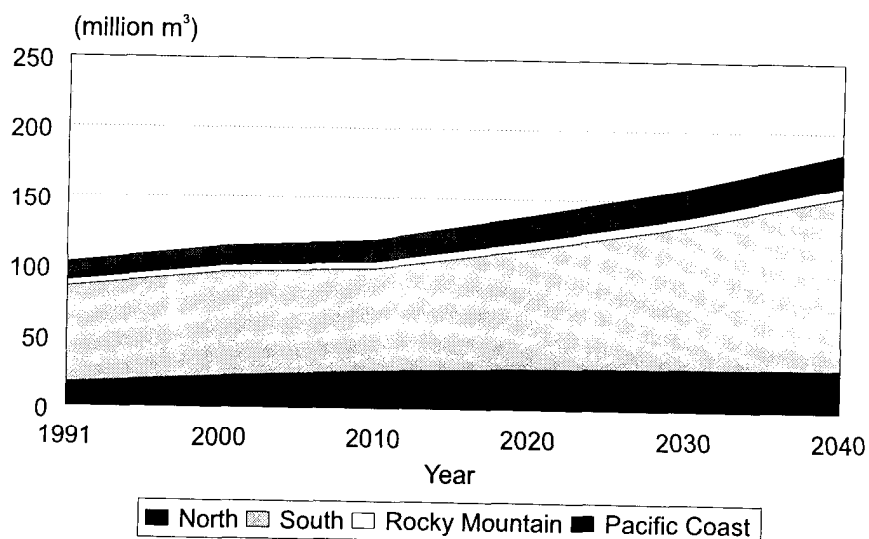


Figure 19.—U.S. softwood nonsaw-timber harvest by region.

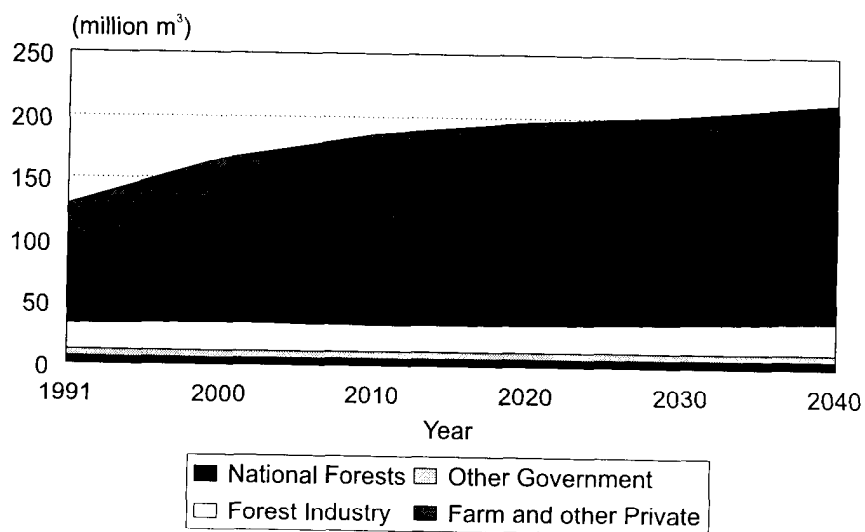


Figure 20.—U.S. hardwood nonsaw-timber harvest by ownership.

Overall, hardwood nonsawtimber growth is projected for both the North and South almost exclusively from farms and other private land, and softwood nonsawtimber growth is projected to come predominantly from the South and would be about evenly divided between industry, farms, and other private land.

Preliminary projections for the RPA Timber Assessment to be completed in 2000 suggest short-rotation woody crops (SRWC) may provide a notable portion of pulpwood supply, particularly in the southeastern United States. The potential use of

SRWC fiber is shown in Figures 5, 12, and 22, which indicate the composition of fiber sources for pulp and paper production. The SRWC fiber is not shown in the general roundwood tables (Figs. 15 to 21). These general roundwood tables are from the 1993 RPA Assessment update.

These changes in harvest are accompanied by shifts in the average diameter of trees harvested. Projected average harvest diameters of timber on private timberlands in the various assessment regions are shown in Table 2. Future harvests are expected to decrease in size in most regions in both

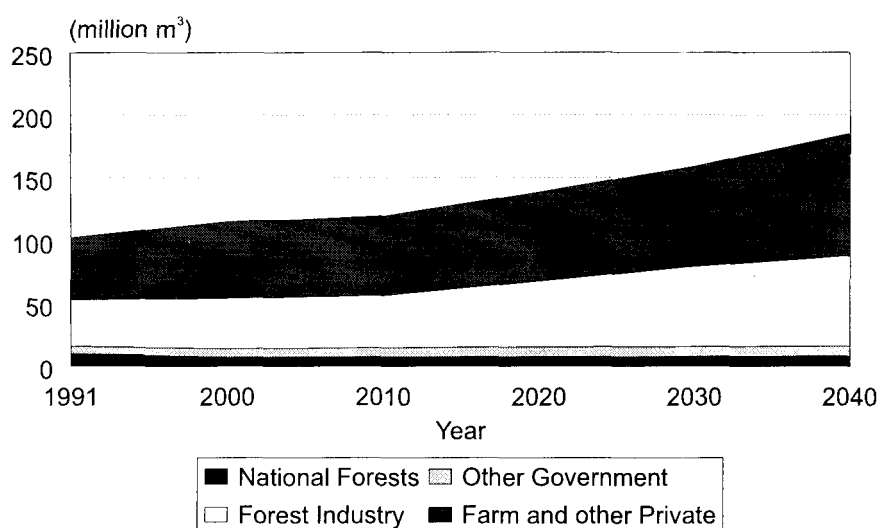


Figure 21.—U.S. softwood nonsawtimber harvest by ownership.

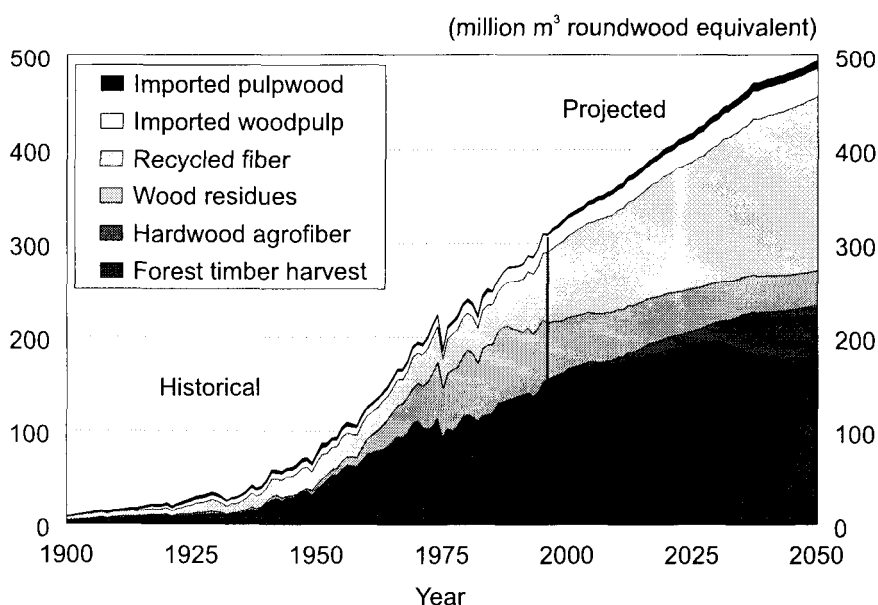


Figure 22.—Consumption of wood and fiber raw materials in pulp, paper, and paperboard production in the United States, 1900-2050

hardwoods and softwoods, but these changes will be smaller than those experienced during the past two decades. In the Pacific Coast region, reductions in average harvest diameters in the past reflected the shift in the concentration of cutting from old-growth to second-growth stands that regenerated naturally following early cutting. In the South, size reductions have accompanied the shift from stands of natural origin to more intensively managed plantations. In the future, average harvest diameters on the Pacific Coast will continue to fall as cutting shifts heavily into intensively managed plantation stands. Table 2 shows that the proportional changes in size are about the same in both the South and Pacific Coast states.

Recycled paper and mill residue supplies for pulp, paper, and paperboard

Growth in the use of roundwood fiber for paper and paperboard is slowing, from 2.0 percent per year from 1960 to 1996 to a projected 0.8 percent per year from 1996 through 2020. The use of recycled paper fiber continues to grow at a faster pace, 2.1 percent per year through 2020, although its pace of growth is slowing as well, down from 3.1 percent per year from 1960 to 1996. Wood residue supplies are projected to decrease in absolute volume slowly as production of solid wood products become more efficient. Roundwood pulpwood provided 65 percent of fiber in 1960. With the increase in recycled paper use, this share decreased to 50 percent in 1998. Preliminary projections suggest roundwood share (excluding SRWC) could decrease to 46 percent by 2020 and 36 percent by 2050, while SRWC fiber share could increase from less than 1 percent in 2000 to 11 percent by 2050 (Fig. 22).

The role of recycled fiber is increasing compared with that of roundwood. In 1997, recycled fiber contributed the roundwood equivalent of 80 million m³ to paper and paperboard production or about 14 percent of the level of roundwood harvest. Recycled fiber is projected to contribute 128 million m³ roundwood equivalent in 2020 or about 20 percent of the year 2020 level of harvest.

Summary

The general outlook for forest products is that consumption growth will be slowing. Solid wood products consumption and fiber requirements will grow at or slightly below the rate of population

growth. Paper and paperboard growth will be somewhat greater but not at historic rates, which matched GDP. Given this slowing growth, the industry will be changing in a continuing search to find the lowest cost wood and alternative sources of supply (such as recycled fiber). There will also be substitution of alternative building materials and technologies for traditional hem-fir lumber and plywood. The pulp and paper industry is facing more rapid increases in demand than solid wood industries and is more rapidly changing fiber sources toward recycled paper and hardwoods.

Timber supplies are projected to increase 43 percent between 1991 and 2040. The most striking shift during this time is the shift to farm and other private sources—a growth of 67 percent from 264 to 440 million m³ per year versus a growth of only 17 percent from other ownerships from 237 to 278 million m³ per year. This shift could result in a significant change in the direction and content of forest management and policy debates in the coming decades.

Timber supplies are also projected to come increasingly from nonsawtimber sources in the South and North. These increases depend on significant shifts in supply sources in the South and North. In the South, forest industry land and farm and other private lands are projected to notably increase supply of both softwoods and hardwoods, with emphasis and greatest growth in harvest on farm and other private land. In the South, there is also the potential for significant pulpwood supply from short rotation woody crops. In the North, nonsawtimber harvest growth is focused more on hardwood increase and will come almost entirely from farm and other private land. Projection of these trends relies heavily on two assumptions:

- 1 private landowners will respond to price incentives to manage and harvest as they have in the past; and
- 1 industry will continue to relocate and invest in new technological capacity in the South and North in response to cost incentives as they have in the past.

Recycled paper supply is projected to grow more rapidly than timber supply, increasing the recycled paper share of the overall fiber supply. Mill residue supply is projected to decrease with more efficient production of solid wood products.

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