



Pulpwood Supply and Demand

Development in the South, Little Growth Elsewhere

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ABSTRACT

This long-range outlook derives from analysis of pulp and paper markets and pulpwood demands for wood panels. The analysis projects modest increases in pulpwood demand beyond 2010, with decelerating growth in paper and paperboard consumption; increased demand for pulpwood in wood panels; increased imports of pulp, paper, and paperboard; and little additional growth in paper recovery for recycling. Results point to expanded pulpwood markets, particularly for softwoods in the US South, but to limited expansion of pulpwood markets elsewhere in the United States.

Keywords: economics; industry; paper; pulp; timber

The US pulp and paper industry consumes a large share of US timber output, more than 7 billion cubic feet per year of roundwood pulpwood and wood residues, plus large volumes of recycled fiber. In addition, pulpwood demands are increasing in the expanding US wood panel industry. The current Resources Planning Act (RPA) Timber Assessment (Haynes, in press) includes this baseline analysis of fiber markets in the pulp and paper sector along with pulpwood demands for wood panels.

AF&PA pulp and paper data series (1998) were the main source of historical data used in this analysis and shown in this article. Projections were derived independently using the USDA Forest Service North American Pulp and Paper Model (NAPAP) model, which is maintained at the Forest Products Laboratory. Using NAPAP, we projected changes in regional production capacities for pulp and paper manufacturing processes—including shifts between virgin fiber

and recycling technologies—as economic responses to projected market conditions, and in turn capacity change influenced projected market equilibria. The robust structure of our model and overlap of projections with historical data allowed for extensive testing and calibration of model performance; average annual errors between historical and projected equilibrium product demands, production levels, pulpwood supply, and recycling rates were generally less than 1 percent.

Paper and Paperboard

Markets were analyzed and projected for all paper products (e.g., newsprint, printing and writing paper, tissue and sanitary paper, and packaging paper) and all paperboard products (e.g., containerboard, bleached board, and recycled paperboard). Basic growth assumptions for economic determinants of population and per capita gross domestic product (GDP) are illustrated in *figure 1* (p. 22). Domestic demand relations vary among com-

modities with respect to population and GDP, with varying potential for product substitution by electronic media or plastics (Zhang 1995).

In recent decades, paperboard consumption increased more rapidly than paper consumption, a trend projected to continue beyond the current economic slowdown. Per capita paperboard consumption rose from 243 pounds in 1980 to 337 pounds in 1998, but consumption relative to GDP in 1998 was nearly the same as in 1980, at 6.0 tons per million dollars of real GDP (in 1992 dollars). Paperboard demands weakened in the current economic slowdown, but economic recovery is projected to propel paperboard consumption levels to 350 pounds per capita by 2010 at 5.2 tons per million dollars of real GDP and 418 pounds per capita by 2050 at 4.0 tons per million dollars of real GDP.

Per capita paper consumption (excluding building paper) rose from 326 pounds in 1980 to 407 pounds in 1998, but consumption relative to real GDP declined during that period, from 8.0 to 7.3 tons per million dollars of real GDP. Per capita paper consumption has receded during the current economic slowdown but consumption is projected to recover to 401 pounds in 2010 and gradually rise to a peak at 414 pounds around 2030, at 4.9 tons per million dollars of real GDP. Paper consumption is then projected to decline slowly to 391 pounds



per capita in 2050, at 3.7 tons per million dollars of real GDP.

Demand trends vary greatly among individual paper products. Per capita newsprint consumption peaked historically at 113 pounds in 1987 and declined to 89 pounds in 1996. Newsprint consumption picked up recently (to around 96 pounds in 1999), but consumption is projected to fall to 81 pounds by 2010 and to 43 pounds by 2050, reflecting gradual long-run substitution by electronic media. Likewise, consumption of unbleached kraft packaging paper is projected to gradually recede, reflecting continued substitution of paper bags by plastic, although not declining so rapidly as in the past two decades. On the other hand, per capita consumption of printing and writing paper has increased, rising from 142 pounds in 1980 to 232 pounds in 1999, boosted by complimentary demands for computer printers, office copiers, and print media. Printing and writing paper consumption is projected to increase but at a decelerating rate of growth, climbing above 250 pounds per capita by 2020 and reaching a peak above 260 pounds around 2030, with gradually declining consumption relative to real GDP. Tissue, toweling, and sanitary paper products increased in per capita consumption from 38 pounds in 1980 to just over 50 pounds in 1999, and con-

sumption is projected to increase modestly throughout the projection period, reaching more than 60 pounds per capita by 2050.

Among paperboard commodities growth trends are more consistently upward for containerboard grades. Per capita consumption of containerboard (linerboard and corrugating medium) climbed from 166 pounds in 1980 to 246 pounds in 1999 (48 percent). Per capita consumption of all other grades of paperboard (other recycled paperboard and bleached paperboard) plus building paper was at 101 pounds in 1999, slightly above consumption lev-

jection period. Other paperboard and building paper consumption is projected to remain at around 100 pounds per capita throughout the projection period.

Overall US per capita consumption of paper and paperboard is projected to increase at a decelerating rate, while consumption per unit of real GDP is projected to gradually decline, consistent with historical trends of recent decades. *Figure 2* (p. 22) illustrates historical and projected trends in per capita US paper and paperboard consumption (including building paper) and consumption per million dollars of

The West will continue to see little growth in pulpwood supply and demand, with serious implications for management of forest health, fire hazards, and watershed quality.

els of the 1980s but slightly below consumption levels of the 1960s and 1970s. With projected economic expansion in the base scenario, per capita containerboard consumption is projected to reach 256 pounds by 2010 and 324 pounds by 2050, while consumption relative to real GDP is projected to gradually recede over the pro-

real GDP. Following the current economic slowdown, per capita consumption is projected to return to recent peak levels of around 750 pounds by 2010 and then rise to 809 pounds in 2050. The historical pattern of decelerating growth in demand observed in the latter half of the 20th century is projected to continue, with average

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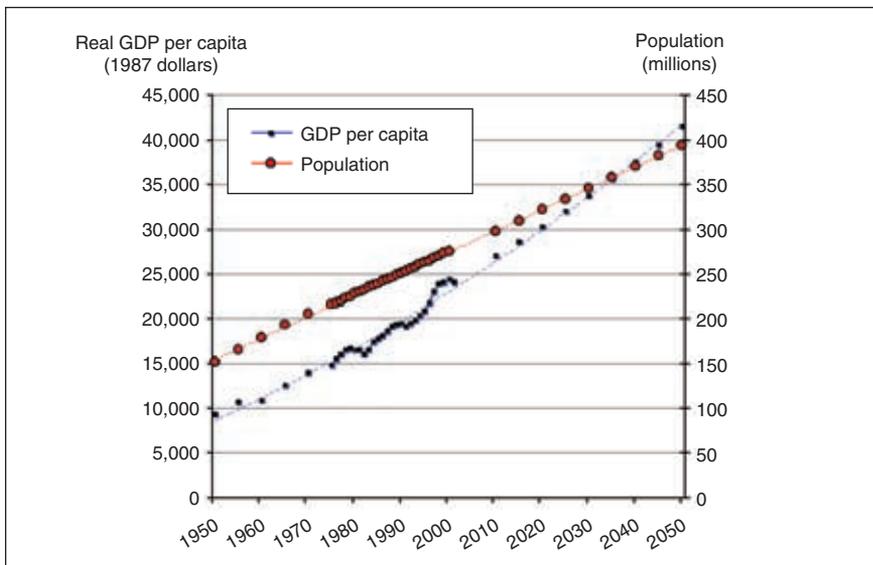


Figure 1. Historical and projected trend assumptions for US population and per capita gross domestic product (GDP).

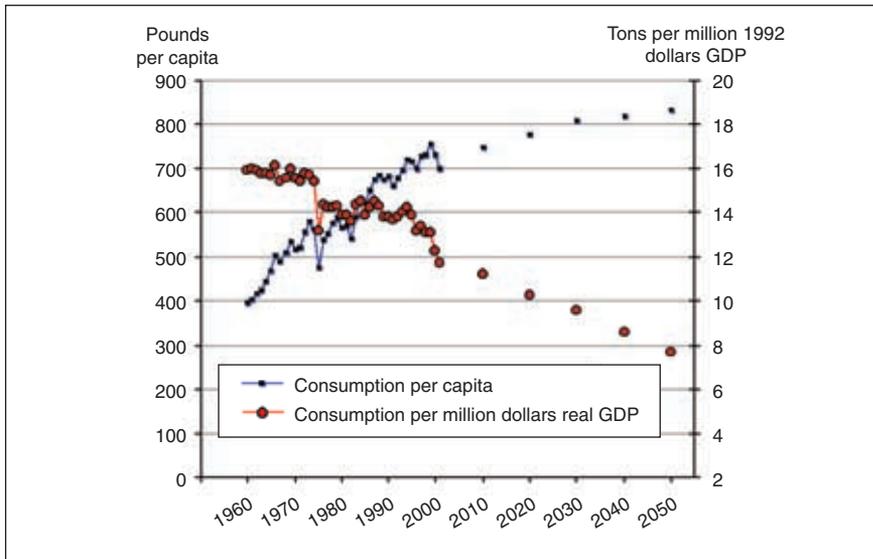


Figure 2. Historical and projected trends in US per capita paper and paperboard consumption and consumption per unit of real gross domestic product (GDP), in 1992 dollars.

Source: Historical data from AF&PA (1998).

compound growth in per capita consumption declining to just 0.2 percent per year over the next 50 years. Consumption of paper and paperboard per million dollars of real GDP is projected to gradually decline from 13.6 tons in 1998 to 11.2 tons in 2010 and 7.7 tons in 2050.

With projected increases in US population and per capita GDP (fig. 1), US paper and paperboard consumption is projected to increase in total tonnage from 103 million tons in 1999 to 112 million tons by 2010 and 159 million tons by 2050. Population, economic growth, and end-use assumptions drive the demand projections. However, because of decelerating demand growth, the projected annual increase in tonnage over the next 50 years is just 0.8 percent, less than one-third the average growth rate of 2.8 percent from 1960 to 1999.

Production and Trade

The baseline trade outlook projects continued increases in paper and paperboard imports particularly over the next decade, with little growth in US paper and paperboard exports and only modest weakening in the exchange value of the US dollar. The trade outlook is consistent with trends of recent years, during which the US dollar gained value appreciably and the gap between US imports and exports of paper and paperboard widened.

US paper and paperboard imports surged in recent years, attracted by the strong US dollar. Exports declined as a result of the Asian economic decline in 1997 and 1998 and, more recently,

Table 1. US wood fiber supply, historical and projected to 2050.

Elements of fiber supply	1986	1996	2010	2020	2030	2040	2050
..... Millions of short tons (pulpwood on dry-weight basis)							
Softwood pulpwood	69.1	69.3	67.4	78.2	89.4	97.1	105.5
Roundwood harvest	39.2	46.2	50.9	63.1	74.6	83.9	92.3
Wood residues	29.9	23.1	16.5	15.1	14.8	13.2	13.2
Hardwood pulpwood	38.4	50.5	49.0	55.1	59.2	60.1	59.6
Roundwood harvest	30.3	42.8	40.5	46.1	50.2	51.1	50.5
Wood residues	8.1	7.6	8.5	9.0	9.0	9.1	9.1
Hardwood agrifiber	0.0	0.2	0.0	0.0	0.1	0.2	1.7
Total pulpwood	107.5	120.0	116.4	133.3	148.7	157.4	166.9
Recovered paper	22.4	42.6	55.8	63.0	69.8	74.9	79.7
Total pulpwood and recovered paper	129.9	162.6	172.2	196.2	218.5	232.3	246.5

because of weak competitiveness owing to the strong US dollar. Paper and paperboard imports are projected to reach 23.6 million tons by 2010 (about 6 million tons higher than current levels). Imports are projected to climb more gradually after 2010 as US softwood pulpwood supplies become more abundant, but projected paper and paperboard imports reach 35 million tons by 2050, roughly double current import levels. Relative to the recent peak in US paper and paperboard exports (10.4 million tons in 1997), exports are projected to remain depressed at around 8 million tons over the next decade, reaching 8.6 million tons in 2010, 11.1 million tons in 2030, and 10.7 million tons in 2050. *Figure 3* illustrates historical and projected US paper and paperboard production, consumption, and trade on a tonnage basis.

An important projected shift affecting US fiber supply is an increase in softwood pulpwood supply, primarily from southern pine plantations, although limited growth is projected for hardwood pulpwood supply in the South beyond 2010. Consequently, wood pulp production capacity is projected to remain concentrated in the South, but hardwood market pulp production is projected to decline as imports increase substantially from Latin America and elsewhere (from 2.3 million tons in 2000 to 7.2 million tons in 2050). Conversely, US production of softwood market pulp is projected to increase, with exports increasing from 3.8 million tons in 2000 to 5.4 million tons in 2050.

Canada has been and is projected to remain a significant element in the North American pulp and paper sector, and the largest source of US imports, but Canadian producers are not projected to gain dominant US market shares in any major commodity area. With declining US consumption of newsprint in the long run, Canadian producers are projected to increase production and export of printing and writing paper and of paperboard. Projected pulpwood receipts at Canadian wood pulp mills climb from around 107 million cubic meters in 1998 to a peak at 126 million cubic meters

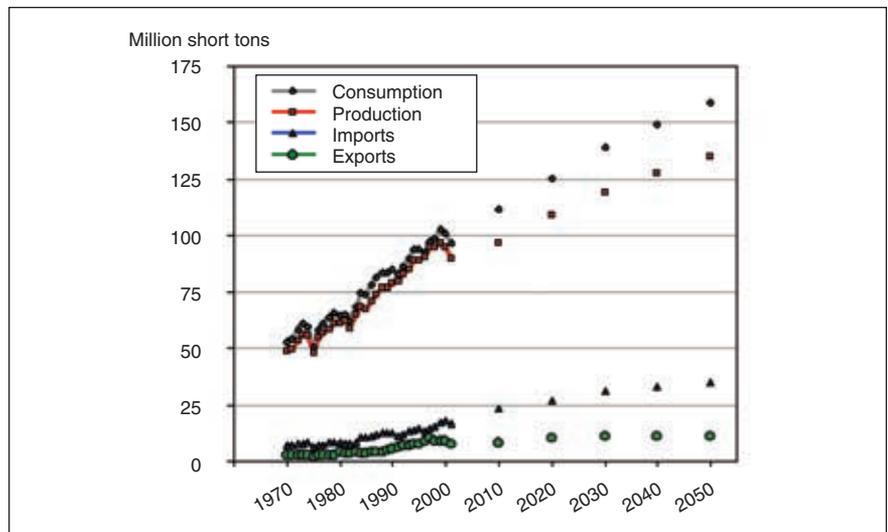


Figure 3. Historical and projected trends in US paper and paperboard production, consumption, and trade. Source: Historical data from AF&PA (1998).

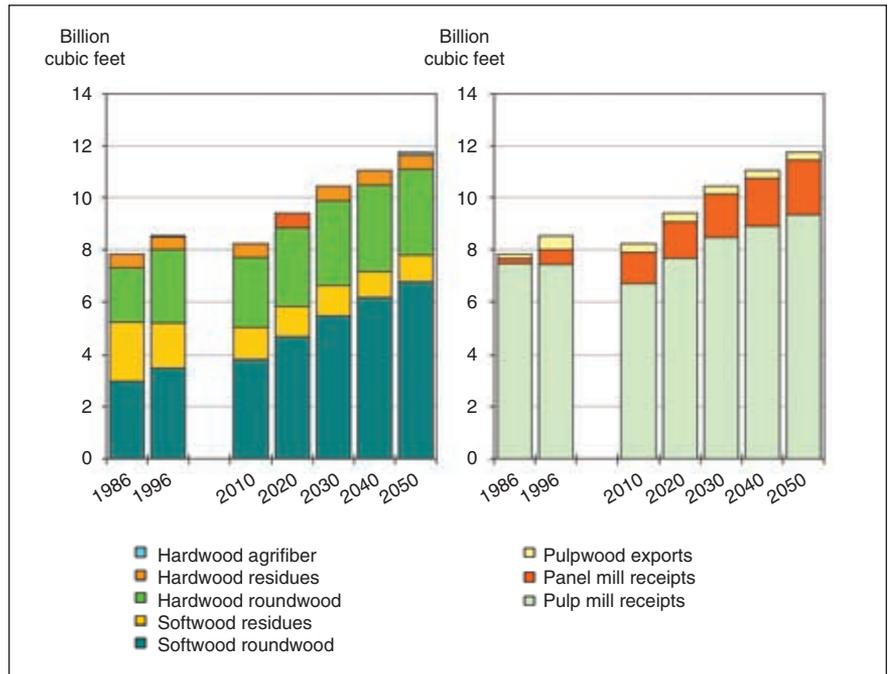


Figure 4. US pulpwood supply by source and destination, historical and projected.

around 2010 and then recede gradually to levels characteristic of the past decade, reaching 102 million cubic meters in 2050. Wood residues are the dominant element of pulpwood receipts at pulp mills in Canada (more than 60 percent), and expansion in residue supply is determined by projected trends in Canadian lumber production.

Wood Fiber

The US wood fiber outlook is characterized by expansion in softwood

pulpwood harvest in the South, decelerating trends in paper recovery for recycling, and limited growth in hardwood pulpwood and wood residue supply. *Table 1* shows historical and projected wood fiber supply.

The rate of paper and paperboard recovery for recycling in the United States increased from less than 30 percent of consumption to 48 percent in 2000, but growth in recycling is slowing down. The recovery rate is projected to climb gradually to 50 percent by 2010 and then remain at that level

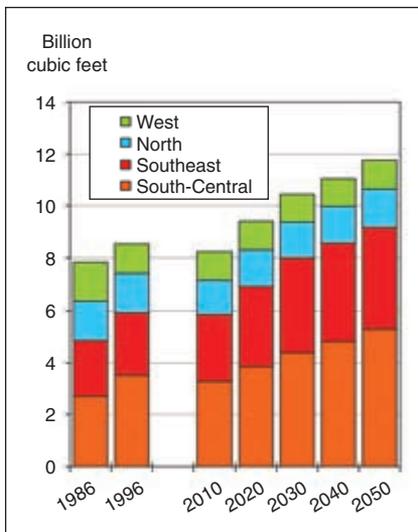


Figure 5. Projected annual US pulpwood supply by region, 2010–50.

through the end of the projection period. Higher recovery and recycling rates are inhibited by relatively slow expansion in paper and paperboard production capacity.

Supply of manufacturing residues for pulpwood has declined since the 1980s, with reduced softwood lumber production in the US West and increased production of wood products that generate fewer residues for pulping (e.g., oriented strand board [OSB]). Projected growth in supply of wood residues remains limited in the decades ahead.

Pulpwood

Figure 4 shows historical and projected trends in US pulpwood supply, balancing domestic pulpwood supply by source and by destination (roundwood receipts at wood panel mills, such as OSB mills, are regarded as pulpwood in this study). Destinations for domestic pulpwood supply include receipts at domestic wood pulp mills (by far the largest category), roundwood receipts at wood panel mills, and pulpwood exports. Roundwood receipts at wood panel mills are projected to more than double and rise from 6 percent of total pulpwood supply in 1996 to 14 percent in 2010 and 18 percent in 2050. US pulpwood exports are projected to decline with worldwide expansion of global fiber supply from wood fiber plantations.

Projected expansion in pulpwood supply is concentrated in the eastern United States and primarily in the South. Figure 5 shows projected equilibrium supply quantities by region, including roundwood, manufacturing residues, and agrifiber supply. Increased supply of pulpwood from softwood roundwood in the South is facilitated in the long run by intensified softwood timber management based on southern pines (chiefly loblolly pine). Softwood roundwood is the largest element of US pulpwood sup-

ply throughout the projection period (table 1, fig. 4). Hardwood pulpwood supply becomes more limited in the South over the next two decades, with declining hardwood inventory.

Hardwood as a share of total US pulpwood supply on a volume basis (including roundwood for wood panels) was about 33 percent in 1986 and 39 percent in 1996. Hardwood is projected to be 39 percent of total US supply in 2010, but then hardwood falls back to 37 percent by 2030 and 33 percent in 2050. Softwood roundwood (excluding residues) was 38 percent of total US pulpwood supply in 1986 and 41 percent in 1996. Softwood roundwood is projected to rise in the next decade to 46 percent of total pulpwood supply and then increase to 53 percent by 2030 and 58 percent in 2050.

This analysis evaluated the market outlook for hardwood agrifiber supply, reflecting development of short-rotation woody crops such as hybrid poplars on agricultural lands. Hardwood agrifiber was analyzed using an assumption that the biological productivity of such crops in the US South could be doubled over the next several decades relative to productivity levels of the late 1990s, with future gains attributable to genetic engineering and other yield improvements. The assumed productivity gains resulted in approximately 25 percent reductions in delivered pulpwood costs for hybrid poplars and cottonwoods. Nevertheless, hardwood agrifiber does not become economically competitive in this analysis until after 2030, when real prices for hardwood pulpwood stumpage in the South are projected to be higher than recent historical peak levels (and higher-than-projected softwood stumpage prices). Hardwood agrifiber supply is then projected to expand in the last decade of the projection period, but the projected equilibrium supply quantity is only 1 percent of total pulpwood supply in 2050.

Even though wood panel production is boosting roundwood pulpwood demand, total pulpwood supply is receding relative to paper and paperboard consumption and production, largely because of gains in paper recycling and rising imports of paper and

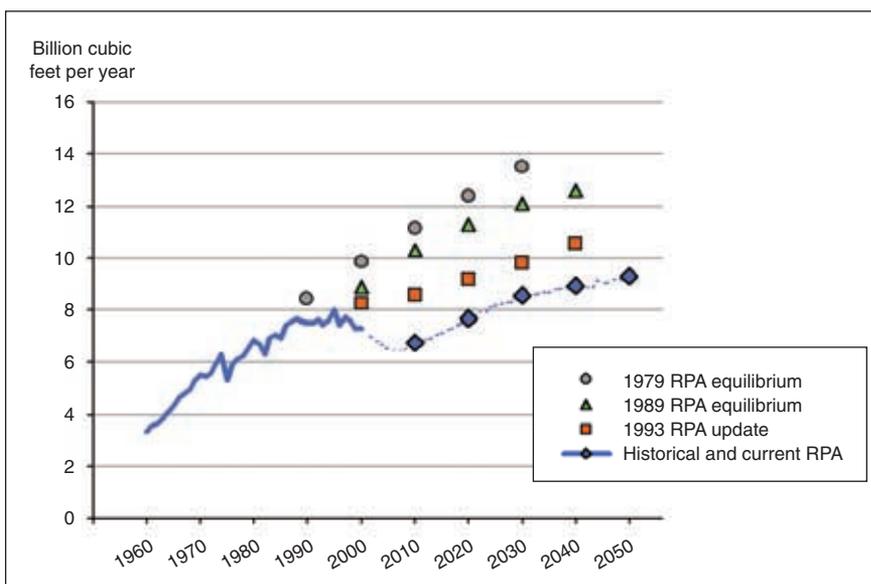


Figure 6. Trends in US pulpwood consumption at wood pulp mills, historical and comparison of RPA projections. Note: To allow comparison to previous RPA projections, data include pulpwood receipts at wood pulp mills only and exclude pulpwood receipts at wood panel mills.

paperboard. The total supply of pulpwood in the United States (roundwood and residue receipts at wood pulp mills, pulpwood exports, and roundwood pulpwood for wood panels) in dry weight per ton of paper and paperboard consumed in the United States receded from 1.38 tons in 1986 to 1.28 tons in 1996. This ratio is projected to decline to 1.04 in 2010 and then remains relatively constant through the projections to 2050. Total pulpwood supply per ton of paper and paperboard produced in the United States was 1.52 in 1986 and 1.33 in 1996, and it is projected to be 1.20 in 2010 and 1.24 in 2050 (with increasing supply of pulpwood for wood panel production).

Emerging Opportunities and Challenges

The baseline analysis concludes that the needs of future generations for wood fiber products in the United States will be met by a combination of increased domestic production and increased imports. Paper and paperboard consumption trends are projected to continue their historical pattern of

ating product demands, to the advent of increased paper recycling in the 1980s and 1990s (Ince 1994, 1999), and most recently to an ongoing economic recession and revisions of the US trade outlook with rising product imports. Nevertheless, pulpwood harvest is still projected to increase beyond 2010, primarily in the eastern United States, as projected paper recovery for recycling grows more slowly in future decades and as wood residue supplies decline in proportion to fiber demands.

US pulp, paper, and paperboard production capacity is projected to remain concentrated in the South, as southern softwood pulpwood harvest is projected to expand with expanded growth and harvest concentrated in pine plantations. The projected increase in fiber supply from pine plantations will partly displace hardwood pulpwood harvest over a period when hardwood timber inventories are projected to level out and decline in the South. The South is projected to remain the dominant US region in production of wood fiber products and in

timber, and yet pulp and OSB mill capacities in the West have receded in recent years and are not projected to increase significantly. Financial risks to investment in the West, including uncertain timber supplies from public lands, appear to preclude large-scale investments in new pulp mills or OSB mills within the region. Thus, the region appears likely to continue facing difficult forest health and fire hazards with limited opportunity for strategic responses based on commercial timber harvest.

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Per capita newsprint consumption is projected to fall to 81 pounds by 2010 and to 43 pounds by 2050, reflecting gradual substitution by electronic media.

decelerating growth. The analysis finds that projected shifts in supply and demand will exert downward pressures on pulpwood stumpage prices for several decades and have little influence on product demands or prices, as indicated by a flat projected trajectory for product prices despite increases in paper and paperboard production and consumption.

Figure 6 shows how projections of pulpwood demand have declined in RPA timber assessments, comparing current projections of pulpwood receipts at wood pulp mills to those of the 1993 RPA update (Haynes et al. 1995), the 1989 RPA (Haynes 1990), and the 1979 RPA (USDA-FS 1982). The decline is attributable to deceler-

pulpwood supply and demand. The North and West are not projected to see any net expansion in wood pulp capacity, although there is some projected expansion in OSB capacity in the North.

The West is projected to continue receding in pulpwood supply and demand, with serious implications for efficient management of forest health, fire hazards, and watershed quality. The West is experiencing a large accumulation of fire-prone, small-diameter timber, particularly on public forestlands, with wood volumes dwarfing regional capacities to harvest and use such timber. Wood pulp mills and OSB mills are the largest commercial consumers of small-diameter

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