



# Forest Products Industry

## Kinds of products

The forest products industry supplies a wide array of products. Examples include logs, chips, poles, lumber, paper, flooring, siding, molding, railroad ties, veneer, plywood, hardboard, particleboard, and oriented strand board (OSB). There are numerous specialty products as well, including Christmas trees and greenery. Technically, employment in the furniture industry is not considered a wood remanufacturing industry; therefore, no description is included in this Assessment.



*Plywood, one of the many important forest products.*

In California, a substantial subsector of the forest products inventory is based on coastal redwood (*Sequoia sempervirens*) This species, whose range is principally limited to the north coast of California, supplies products including bark and lumber as well as a variety of specialty products such as decks, trellises, arbors, fences, split boards, benderboard, gazebos, hot tubs, and spas. For more information, access the [California Redwood Association](#) web site.

## Overview of structure and economic dimensions of forest products industry in California

### Forest products industry structure

The forest products industry in California is divided into several sectors. These include forestry and logging, wood products manufacturing, and paper manufacturing. The wood and paper manufacturing groups are classified by the North American Industry Classification System (NAICS) with several subsectors as shown below:

#### Wood products manufacturing (NAICS code 321)

- Sawmills and wood preservation (3211 code): primary production of raw logs into boards, dimension lumber, beams etc.
- Veneer, plywood and engineered products (NAISC code 3212): manufacturing of structural (truss), component hardwood and softwood veneer and composite (OSB) or reconstituted wood products.
- Other wood products (NAICS code 3219): mill work, pallets and containers, window and doors, prefabricated buildings, etc.

#### Paper manufacturing (NAICS code 322)

- Pulp, paper, and paperboard mills (NAICS code 3221).
- Converted paper product manufacturing (NAICS code 3222).

**Industry classifications:** In 1997 the U.S. Census Bureau began using the North American Industry Classification System (NAICS) in place of the Standard Industrial Classification System (SIC). In some cases, these classifications use different groupings of industries under the same sector title. When such divergences happen, the exact comparison of data series using points both before and after 1997 is not possible. A significant part of the forest products industry fits this scenario.

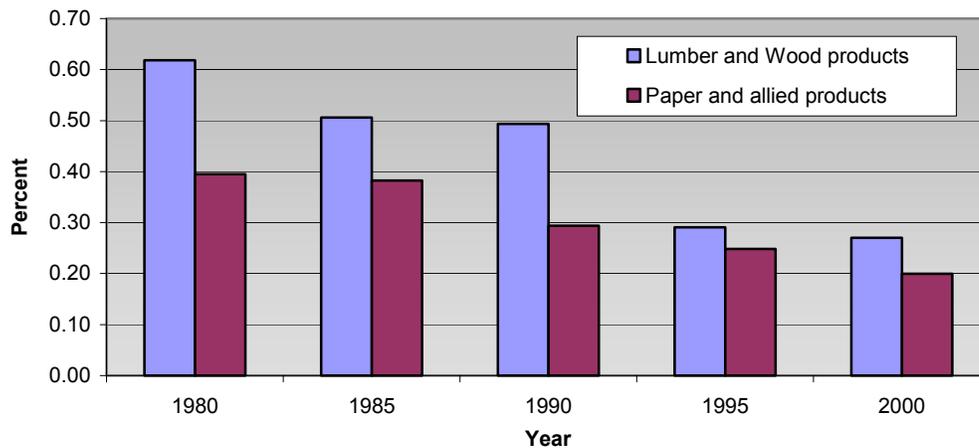
Under NAICS, the forest products industry includes several elements. The Annual Census of Manufacturers identifies two general categories. These are wood product manufacturing (industry code 321) and paper manufacturing (industry code 322). There are multiple subcategories within each. sawmill and wood preservation (industry code 3211), veneer, plywood, and engineered wood product manufacturing (industry code 3212), and other wood product manufacturing (industry code 3219) are all included under industry code 321. pulp, paper, and paperboard mills (industry code 3221) and Converted Paper Product Manufacturing (industry code 3222) are both included under industry code 322. Only pulp, paper, and paperboard mills (industry code 3221) is considered in this analysis as it relates most closely to forest products industries activities.

Further industry groups not related to manufacturing, but part of the forest industries include forestry and logging (industry code 113) and support activities for agriculture and forestry (industry code 115).

### Value of products from forest product sectors

The broadest economic measure of the forest products industries is the contribution towards gross state product (GSP). The GSP percentage of both the lumber and wood products industry and the paper and allied products industry as a percentage of total California GSP have declined steadily since 1980. The percentage of the state GSP represented directly by the lumber and wood products industry in 2000 is just under 0.3 percent (Figure 1).

Figure 1. Lumber, wood, paper, and allied products Gross State Product as a percentage of total California Gross State Product, 1980, 1985, 1990, 1995 and 2000 (1996 constant dollars)



Source: U.S. Department of Commerce, 2002b

A closer examination of the values derived from the various forest industry sectors shows the importance to the overall manufacturing sector in California and to the wood and paper manufacturing industries in the United States. In 1997, the value of shipments from California's wood and paper manufacturing sectors was \$7.8 billion, or 2.1 percent of all California manufacturing sector shipments. In

2000, the value of shipments increased to \$8.7 billion, or slightly less than 2.0 percent of all California manufacturing product shipments (Table 1).

Table 1. Value of shipments, California, 1997 and 2000 (million dollars)

Industry group	1997	Percentage of total manufacturing	2000	Percentage of total manufacturing
All manufacturing	378,730	100	446,873	100
All wood and paper manufacturing	7,801	2.1	8,690	2.0
Wood product manufacturing	6,169	1.6	6,740	1.5
Sawmills and wood preservation	2,055	0.5	1,866	0.4
Veneer, plywood, and engineered wood product manufacturing	820	0.2	1,054	0.2
Other wood product manufacturing	3,294	0.9	3,820	0.9
Pulp, paper, and paperboard mills	1,632	0.4	1,950	0.4

Source: U.S. Census Bureau, 2002k

In relation to economic importance to overall wood and paper manufacturing in the United States, California shipment values represent five percent of the United States total manufacturing shipment values, with little change in proportion between 1997 and 2000 (Table 2).

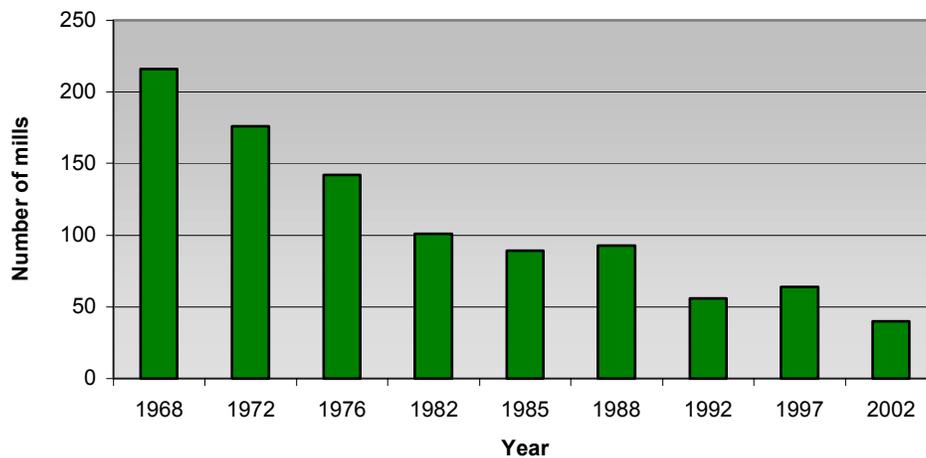
Table 2. Value of shipments, United States and California, 1997 and 2000 (millions of dollars)

Industry group	California		United States		California percentage of United States	
	1997	2000	1997	2000	1997	2000
All manufacturing	378,730	446,873	3,834,701	4,217,852	10	11
All wood and paper manufacturing	7,801	8,690	160,009	172,282	5	5
Wood product manufacturing	6,169	6,740	88,470	93,767	7	7
Sawmills and wood preservation	2,055	1,866	29,094	28,124	7	7
Veneer, plywood, and engineered wood product manufacturing	820	1,054	18,815	21,269	4	5
Other wood product manufacturing	3,294	3,820	40,561	44,374	8	9
Pulp, paper, and paperboard mills	1,632	1,950	71,539	78,515	2	2

Source: U.S. Census Bureau, 2002k

Historically, based on creating lumber and other forest products from abundant old growth timber, sawmills were the largest manufacturing sector in many forested counties in California. However, there has been a decline in the number of sawmills over the last three decades (Figure 2). This has been due in part to decreases in available raw material and to an evolving technology that uses smaller, young growth logs. Mills today are much more efficient in conversion of logs to lumber and are located further from where trees are harvested. Of the sawmills remaining in California, most are still located in the northern portion of the State. In 2001, there were fewer than 40 mills with substantial individual production capacity with a total estimated capacity of over seven billion board feet. Counties with significant sawmill capacity include Humboldt, Mendocino, Trinity, Siskiyou, Shasta, Tehama, Lassen, Plumas, and Placer (Spelter and McKeever, 1999). A list of forest product sawmills, structural product plants and secondary manufacturing plants is linked at [Forest Product Industrial Plants](#).

Figure 2. Number of sawmills operating in California, 1968-2002



Sources: Compiled by FRAP from Howard and Ward, 1991; Anderson, 1997 and 2000; U.S. Forest Service, 2001; U.S. Forest Service, 2003; Random Lengths Publications, Inc, 2001

## Industry employment

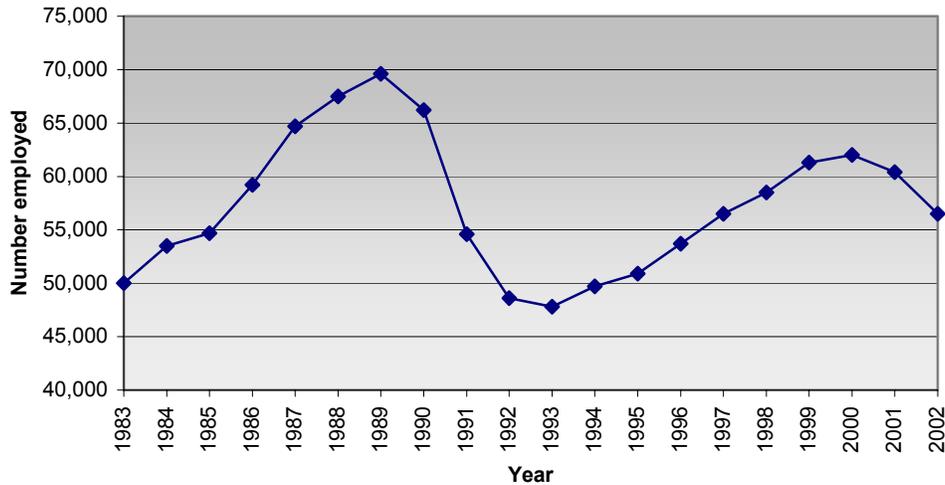
In 2000, the U.S. Census Bureau reported almost 1,800 firms in logging, forestry support services, and wood products manufacturing employment related to forest operations and forest manufacturing. This employment accounted for an estimated annual payroll of over \$1.4 billion (U.S. Census Bureau, 2000a).

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Loggers and other forestry service personnel make up a small, but seasonally significant work force. Logging is more seasonal in California than in most other parts of the United States (Stewart, 1993). In 2000, the U.S. Census Bureau reported that there were 480 logging firms (NAICS industry code 1133) with 2,900 employees and an estimated annual payroll of about \$112 million. Seventy percent of these firms had four employees or less (U.S. Census Bureau, 2002b). The wood products manufacturing sector is the largest provider of employment in forestry related sectors. Employment in the wood products sector (SIC 24) is measured by the California Employment Development Department (EDD) using Standard Industry Codes (SIC) industrial grouping. While these groupings have generally been replaced by the NAICS, information provided by SIC reflects NAICS groups.

Statewide employment in the wood products manufacturing industries peaked in 1989-90 during the fire/insect salvage. It bottomed out in 1993-94 near the end of the general economic recession and has climbed to its current level of about 60,000 employees (Figure 3).

Figure 3. Number employed in lumber and wood product industries within California, 1983-2001



Source: EDD, 2000a

In 2000, there were 6,900 employees working in sawmills with an estimated payroll of almost \$271 million (U.S. Census Bureau, 2002g). Most sawmills are very small with 20 or fewer employees. The greatest proportion of sawmill employment is found in larger capacity mills, located in Humboldt, Mendocino, Trinity, Siskiyou, Shasta, Tehama, Lassen, Plumas, and Placer counties (Spelter and McKeever, 1999).

*As lumber production declined, the wood remanufacturing industry has become the major employer of timber-related workers in California.*



Paperboard mill automation. Over half of paperboard mill facilities are in southern California.

As lumber production declined, the wood remanufacturing industry has become the major employer of timber-related workers in California. These jobs are usually in more urban areas. Within California, production of wood products other than logging and sawmills is located mostly in southern California. As measured by employment, almost 70 percent is in the five counties of Los Angeles, Orange, Riverside, San Bernardino, and San Diego (EDD, 2000a).

In 2000, there were only two operating pulp and paper mills of any size in California. Both were in Humboldt County and had between 100 and 250 employees. By 2003, there is only one mill remaining. There are some specialty products facilities and converted paper products manufacturing plants. In 2000, exclusive of pulp and paper mills, there were 31 paper and paperboard mills in California. Of these, 11 are located in Los Angeles County with an estimated annual payroll of over \$54 million and over 1,100 employees. Over half of all facilities were in southern California. Total employment in the pulp, paper, and paperboard mill sector (NAICS industry code 3221) declined from 4,321 in 1997 to 3,725 in 2000, a decrease of almost 15 percent over 1997 levels.

**The tale of two counties:** Humboldt and Los Angeles counties represent extremes in California's forest products industry. Nowhere is this contrast more evident than in the listing of each county's manufacturing sectors. Humboldt County maintains California's largest sawmilling sector while Los Angeles possesses the State's largest wood remanufacturing, wood, and paper manufacturing sector. The specifics are illustrated in Table 3.

Table 3. Number of firms and annual payroll for selected sectors of the forest products industry in Humboldt and Los Angeles counties, 2000

	Humboldt County		Los Angeles County	
	Number of firms	Annual payroll (millions of dollars)	Number of firms	Annual payroll (millions of dollars)
Logging	81	25	8	2
Wood product manufacturing	38	105	275	189
Sawmills and wood preservation	20	93	7	1
Veneer, plywood, and engineered wood product manufacturing	3	NR	16	14
Other wood product manufacturing	15	NR	252	174
Paper manufacturing	2	NR	212	485
Pulp, paper, and paperboard mills	2	NR	11	54
Other	0	0	201	431

NR = not reported

Other wood product manufacturing = mill work, pallets and containers, window and doors, etc.

Source: U.S. Census Bureau, 2002c, 2002d, 2002e, 2002f

Future Statewide employment in the lumber and wood products sector is projected to grow by about four percent between 2000 and 2010, despite an anticipated decline in sawmills and planing mills. The paper and allied products sector is projected to decline by about five percent (EDD, 2000b).

The forest products industry is important to the economy beyond the employees it directly supports. It is connected with other industries, and naturally, employees of these industries purchase goods and services in their communities. Economists have developed measures, called "multipliers," that relate total industrial production output to jobs or income created in specific industries. Income multipliers differ from employment multipliers because of variances in wages. In one study, a timber industry employment multiplier of two and an income multiplier of 1.6 per million board feet (MMBF) of timber harvested was cited (Mendocino Redwood

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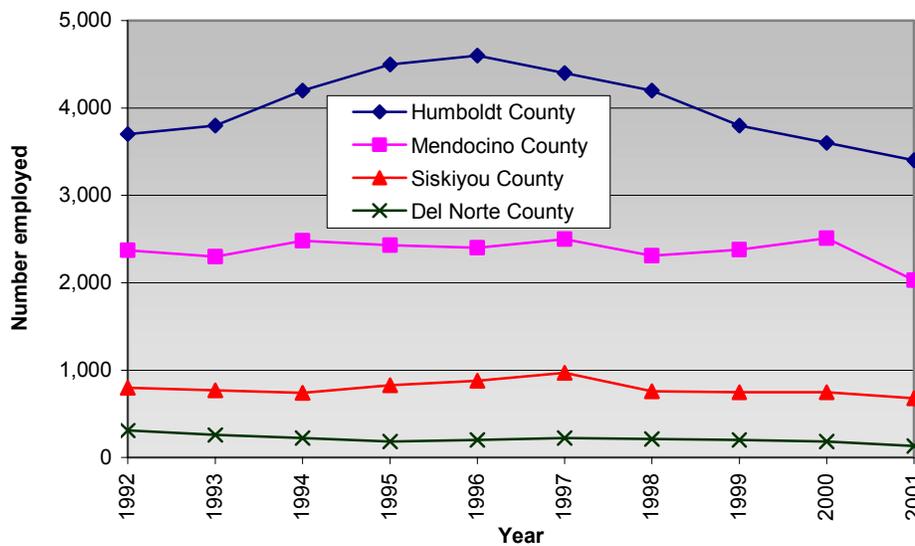
Company, 2000). Using an economic base model, Stewart (1993) estimated an employment multiplier of 1.85 and an income multiplier of 1.45 for the timber industry in northwestern California.

In addition to employment, other measures can be used to approximate the overall economic significance of the forest products industry to California. These include total sales, personal income, and value added factors. A 1997 estimate of these measures (including employment) indicated that the forest products industry exceeded one percent of the State total in each category (Laaksonen-Craig et al., 2002). According to these measures, the direct impact of the forest products industry in California is small. However, when considering the impact of economic ties between this industry and other sectors in the State, its significance to California becomes greater. A study of these identical measures in a 14 county area of northern California containing significant forest land indicated that the forest products industry exceeded 11 percent of the State total in employment, total sales, personal income, and value added factors.

### Local forest industry employment and economic importance

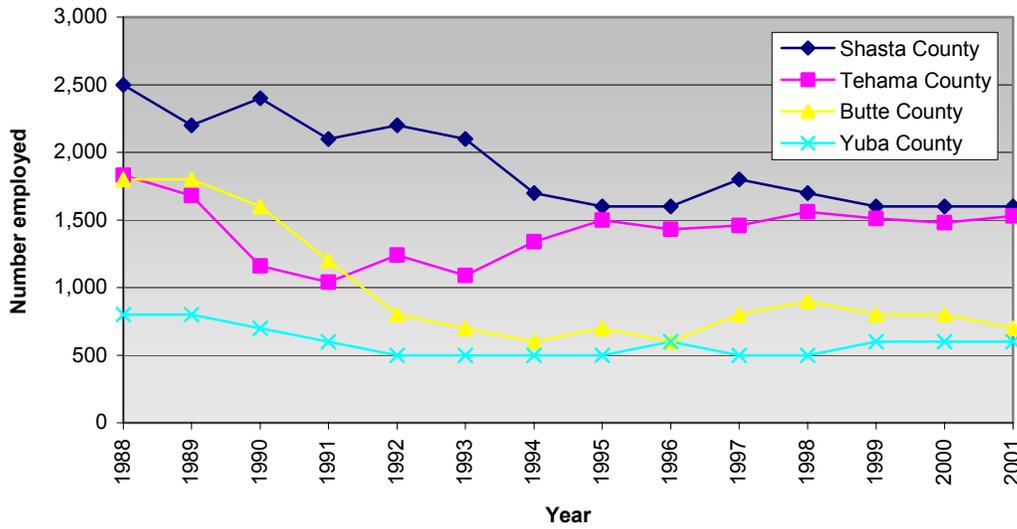
Statewide statistics mask considerable variation in employment trends at the county level. From 1978 to 1990, 15 counties in northern California experienced growth in timber-related employment while 22 counties experienced declines (Stewart, 1993). At the same time, wood products remanufacturing grew and diversified in southern California after a slump during the last decade (Stewart, 1993). Figures 4 through 7 illustrate employment levels in various counties for the specified years.

Figure 4. Lumber and wood products employment for selected counties in the North Coast, 1992-2001



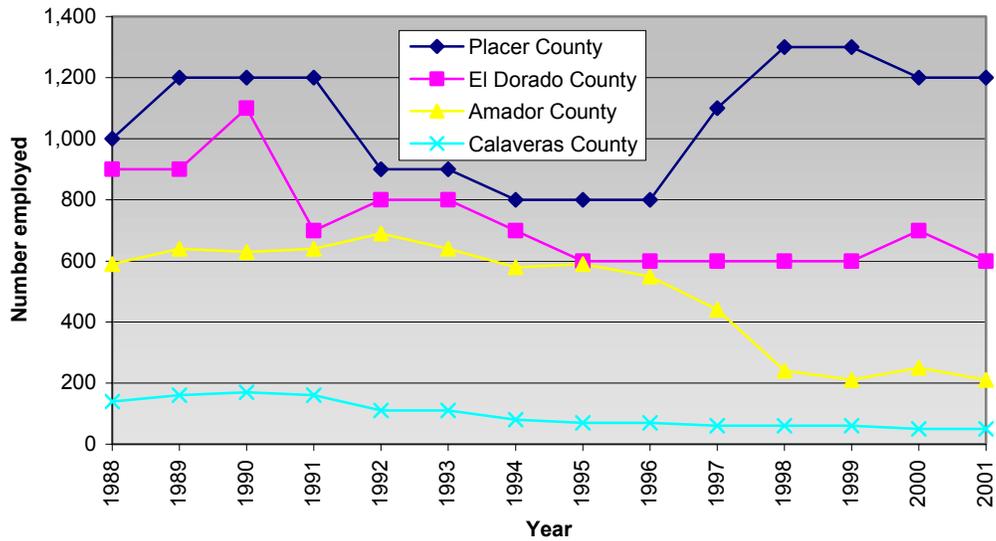
Source: EDD, 2000a

Figure 5. Lumber and wood products employment for selected counties in the Northern Sacramento Valley, 1988-2001



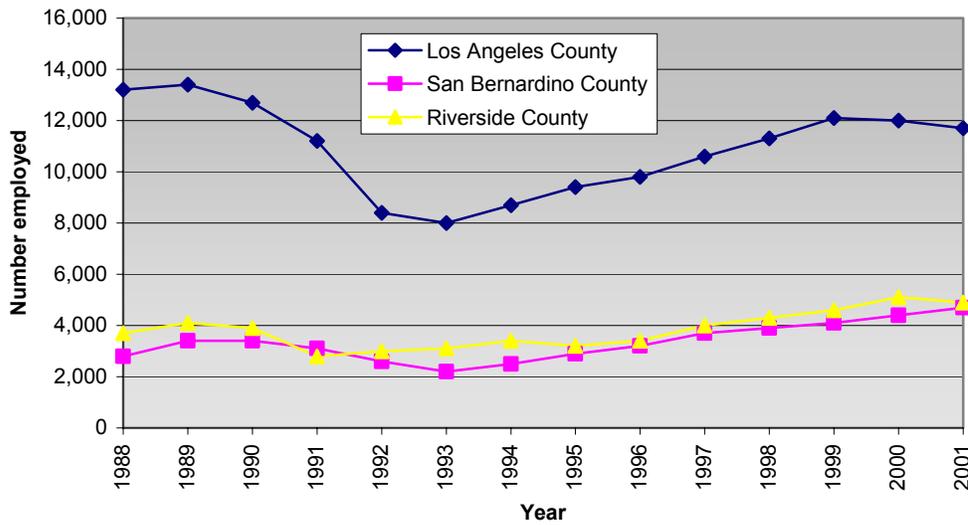
Source: EDD, 2000a

Figure 6. Lumber and wood products employment for selected counties in the Central Sierra, 1988-2001



Source: EDD, 2000a

Figure 7. Lumber and wood products employment for selected counties in Southern California, 1988-2001



Source: EDD, 2000a

In several counties, lumber production historically has been the most significant part of local economies in the agricultural sectors and the only major manufacturing or exporting component (Stewart, 1993). A total of nine counties (Del Norte, Humboldt, Lassen, Mendocino, Plumas, Sierra, Siskiyou, Tehama, and Trinity) accounted for 55 percent of California’s logging and sawmilling jobs between 1984 and 1992 (Stewart, 1993). Based on gross value of the combined agriculture and timber sectors, timber was the leading source of gross value in the combined agricultural and timber growing sectors in 17 counties during 1990. In 1999, this trend continued in 16 counties.

Reliance on timber-related manufacturing jobs has become less important as local economies diversify and residents increasingly rely on transfer payments (such as social security and welfare) and capital payments (such as interest and dividends) as sources of income. Table 4 lists the percentages of civilian labor forces in selected counties for 1992, 1996, and 2001. At the same time, about 20 percent of personal income in these counties was derived from transfer payments.

Table 4. Percentage of total civilian workforce in wood products employment and percentage of personal income from transfer payments for selected counties, 1992, 1996, 2000, and 2001

County	Wood products employment as a percentage of total civilian workforce in selected counties			Transfer payments as percent of personal income
	1992	1996	2001	2000
Tehama	5.4	6.2	5.9	23
Humboldt	6.3	7.6	5.8	20
Mendocino	5.9	5.7	4.7	19
Siskiyou	4.1	4.7	4.0	25
Yuba	2.2	2.9	2.8	28
Shasta	3.0	2.2	2.1	21
Amador	5.4	4.1	1.4	18
Del Norte	3.1	2.0	1.3	27
Placer	1.0	0.8	0.9	9
Butte	1.0	0.7	0.8	21
El Dorado	1.2	0.8	0.7	11
Riverside	0.5	0.6	0.7	14
San Bernardino	0.4	0.5	0.6	15
Calaveras	0.7	0.5	0.3	21
Los Angeles	0.2	0.2	0.2	13
<b>California</b>	0.3	0.3	0.3	
California non-metro				19
California metro				11

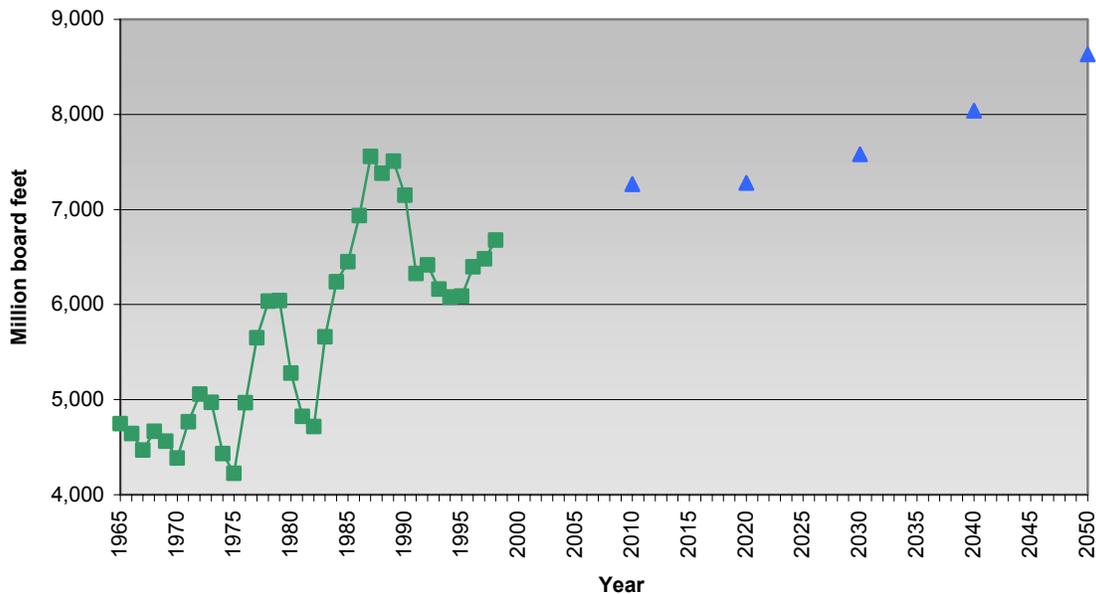
Source: EDD, 2000a

### Findings on consumption of wood products

The consumption of wood products in the United States and California consists of several elements. These include new housing construction, non-residential construction, housing renovation, furniture and fixtures, and paper and paper products output.

Lumber is mostly used in residential construction and renovation. Consequently, it tends to follow cycles in housing demand. Figure 8 illustrates California's lumber consumption from 1965 through 2001 and makes a projection until 2050.

Figure 8. Volume of lumber consumption in California, 1965-2050, projections for 2010-2050



Source: Compiled by FRAP from Howard, 1999; Haynes, 2002; California Department of Finances, 2002; U.S. Department of Commerce, 2002a

The future consumption of lumber depends in a large part on the demand for housing in California. This demand is likely to remain high as population and economic growth continues. However, housing prices in many areas are very high, and new construction may eventually become constrained by high prices or other limiting environmental, infrastructure or water supply factors. This suggests that consumption for renovation/remodeling will be a major consumptive use and is expected to grow strongly over the next decade. This projection is expected for several reasons: 1) houses are getting older; 2) consumers prefer to remodel rather than to move; 3) the age range of those who remodel will expand dramatically; and 4) real housing values have started to rise again (Schuler, 2001).



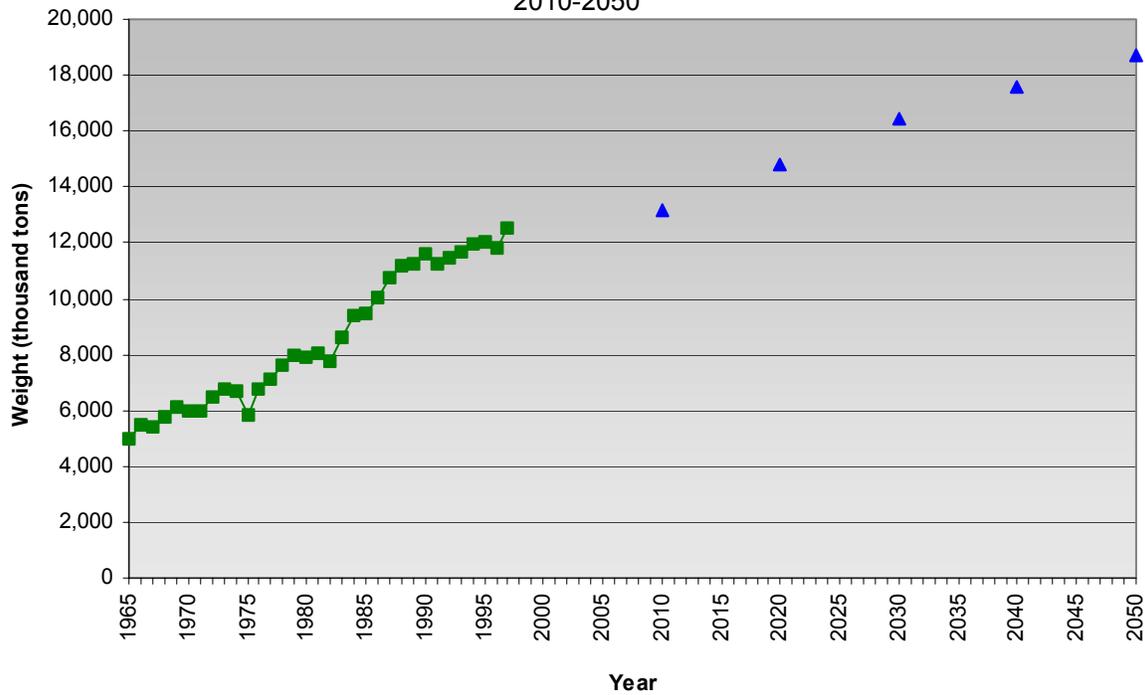
The future consumption of lumber depends in a large part on the demand for housing in California.

The use of forest products also depends on the demand for paper and paperboard. Total United States paper and paperboard consumption grew by 2.7 percent from 1960 through 1999. It is projected to continue to grow until 2050, but at the slower rate of 1.1 percent.

Because of the size of its population, California probably consumes the largest amount of paper and paperboard in the nation. However, since California's timber is mainly used for lumber production, most

of the paper and paperboard consumed in the State is imported. Figure 9 shows paper and paperboard consumption since 1965 with a projection to 2050. Per capita paper and paperboard consumption grew at a rate of 1.7 percent per year from 1960 through 1999. Future rates of growth are projected to be lower, about 1 percent, with projections related both to per capita use and income. Nationally, the demand for paper and paperboard is projected to grow until 2050 at a rate of 0.4 percent (U.S. Forest Service (USFS), 2002b).

Figure 9. Volume of paper and paperboard consumption in California, 1965-1997, and projections for 2010-2050



Source: Compiled by FRAP from Howard, 1999; Haynes, 2002; California Department of Finances, 2002; U.S. Department of Commerce, 2002a

### Findings on California wood product imports and exports

California is part of a global market for wood products. Based on value of forest products, the United States is the largest single importer and the second largest exporter of forest products in the world. It uses more wood per capita than the world average.

**The United States in the global wood products market:** Global consumption of wood products has increased over the last 50 years, though the rate of growth has gradually declined (Sedjo, 2001). To accommodate the growth in consumption, a global economy in wood products has developed. World trade in forest products is valued between \$150 and \$200 billion. In real terms, it has increased nearly fourfold over the past 30 years and now accounts for about 30 percent of world production and consumption of forest products (Brooks et al., 2001).

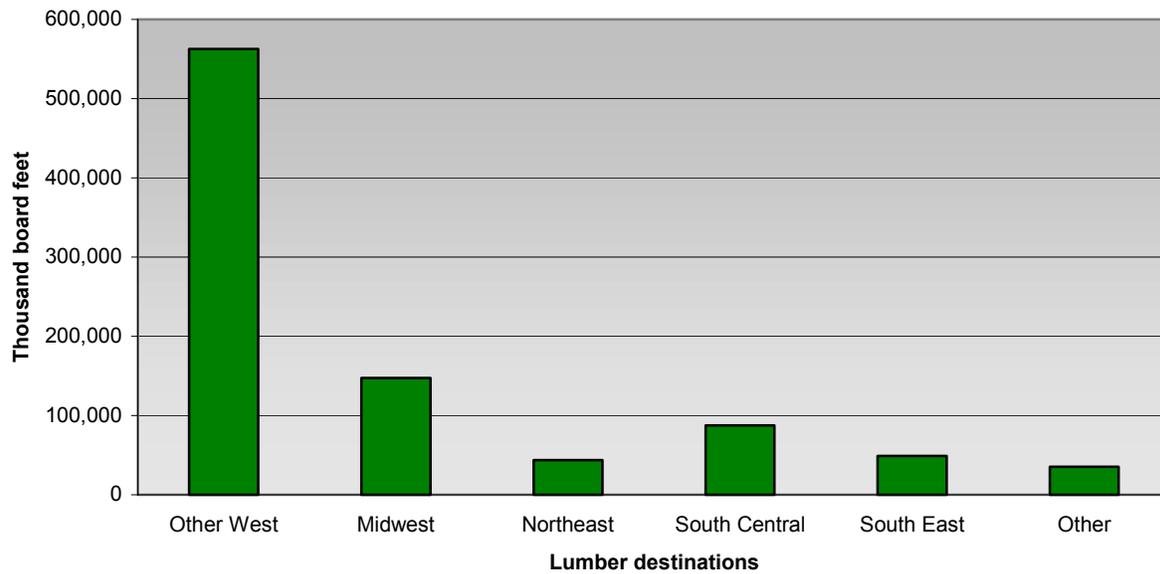
Global trade is primarily between regions. Nearly 80 percent of world forest products trade is conducted within Europe (50 percent) and North America (30 percent). During the last decade, the United States became a net importer of wood products (Schuler, 2001). The value of United States wood product imports increased from approximately \$5.4 billion in 1990 to \$15.55 billion in 2000. Imports have increased in every significant commodity, but the largest increase in total value has been softwood lumber, rising from \$2.9 billion in 1990 to \$6.6 billion in 2000. Other categories that grew by a billion dollars over the same period included OSB/waferboard, builder's carpentry material, and other wood products (Foreign Agricultural Service (FAS), 2001).

In 1990, nearly 70 percent (by value) of United States wood product imports came from Canada. The same was true in 2000. However, there have been significant increases in imports from China, Brazil, Indonesia, Chile, Mexico, and Malaysia. Indonesia and Malaysia have formed a loose trading block, becoming the largest exporting region of wood products in the world (Freese, 2000).

Import records maintained by California's customs ports do not indicate the distribution of materials between California and other states. However, estimates of wood product inflows from other states into California indicate that in addition to the 1.8 billion board feet of lumber produced and used within the State in 2001, at least 3 billion board feet of lumber were imported from other western states (Western Wood Products Association, 2002). Additional lumber was also imported from the southern states (235 million board feet (MMBF) in 1999) and from Canada (Southern Forest Products Association, 2002). In 2001, Oregon was California's single largest supplier of lumber, exceeding lumber produced within California.

Exports of solid wood products passing through California ports exceeded \$517 million in 1999. This figure is approximately 8.5 percent of total United States solid wood exports and positions California among the 50 states as the fourth highest exporter of wood products (FAS, 2000; FAS 2001). The amount of lumber exported by California to other countries is not significant, estimated to be about 36 MMBF in 2001 (Western Wood Products Association, 2002). The largest export destination is other western states, amounting to over 500 MMBF in 2001 (Figure 10).

Figure 10. Volume of lumber exports by destination, 2001



Source: Western Wood Products Association, 2002

### International trade considerations in California forest products

International trade agreements have affected United States wood products in several ways. The two most significant relate to trade barriers and phytosanitary standards. See the Assessment document [Global Context of California's Economy and Environmental Concerns](#) for a further discussion.

*Trade barriers to wood products in California are most significant in the case of U.S./Canada trade relations.*

Trade barriers to wood products in California are most significant in the case of United States /Canada trade relations. Reasons for this influence include the fact that California heavily relies on Oregon, Washington, and, to a smaller extent, Canada for imports of softwood lumber. Canada also exports a significant quantity of lumber and logs to Oregon and Washington. Therefore, factors that affect United States trade relations with Canada have some impact in California.

For a number of years, the United States has attached either duty or volume constraints to imports of softwood lumber from Canada. The United States-Canada Softwood Lumber Agreement, which expired in March of 2001, imposed volume restrictions. The United States replaced these volume restrictions in August 2001 by a 19.3 percent countervailing duty (later lowered to 18.8 percent effective May 2002). An anti-dumping duty averaging 9.3 percent was also imposed in December 2001 (lowered to an average 8.4 percent in May 2002).

These duties changed the delivery cost framework for lumber in the United States. Before they were imposed, United States inland and west coast mills absorbed the largest costs for delivered lumber in North America (International Wood Markets Research Inc, 2002). Because of the new duties, the producers in the southern United States maintain the lowest delivered cost for lumber, while west coast and inland mills are positioned in the mid-range of delivered costs (International Wood Markets Research Inc, 2002).

In addition, there has been a 59 percent increase in European lumber imports (369 MMBF in 2000 to 588 MMBF in 2001). This influx is still minor compared to the 18 billion board feet imported from Canada (PricewaterhouseCoopers, 2002). United States lumber exports continued their decade-old downward trend, dropping from approximately 3 billion board feet in 1991 to 0.8 billion board feet in 2001 (PricewaterhouseCoopers, 2002).

**Impact of Softwood Agreement:** Under the United States-Canada Softwood Lumber Agreement that expired in 2001, the cost of lumber is estimated to have increased by \$50 to \$100 dollars at the margin. Combined with strong United States housing demand, softwood lumber prices rose sufficiently enough to increase the profitability of lumber production. Industry responded by building new plants and expanding existing ones. Softwood sawmill capacity in the United States and Canada expanded by 13 percent between 1995 and 2000. The capacity of mills in the western United States expanded more slowly (about 6 percent) than mills in the east because they were challenged by higher timber costs and a weak demand for lumber from Japan. The overall capacity increase required an additional demand for softwood lumber. However, because of higher interest rates and declining construction, it did not materialize. This result led to excess capacity and lumber prices that fell below the cost of production in 2001. As a result, a number of mills closed or cut back operations (Kosco, 2002).

The second area of international concern is standards related to the movement of forest pests between countries. One such example is the concern exhibited by the United Kingdom regarding the outbreak of Sudden Oak Death (SOD) in the United States. On May 3, 2002, the United Kingdom announced that it was imposing additional requirements on the importation of certain wood species from the United States because of SOD in California and Oregon. The United Kingdom has also modified an already existing ban on the import of oak wood from the affected area to include the wood of all host species. A phytosanitary certificate clearly indicating the wood origin must accompany shipments of host species wood from regions outside of the affected area. South Korea and Canada have similar requirements.

*Historically, the movement of forest pests from other countries to those where they have no natural enemies has been a significant issue.*

Another example relating to forest pest movement can be found in concerns voiced by Mexico, Canada, and the United States regarding pests introduced by solid wood packaging materials such as pallets, wood dunnage, crating, cable spools, packing blocks, drums, cases, and skids. Historically, the movement of forest pests to countries where they have no natural enemies has been a significant issue. Two such incidents are the introduction of chestnut blight and Dutch elm disease into the United States. More recently, an outbreak of the Asian long horned beetle led to the destruction of numerous of hardwood trees in New York and Chicago neighborhoods.

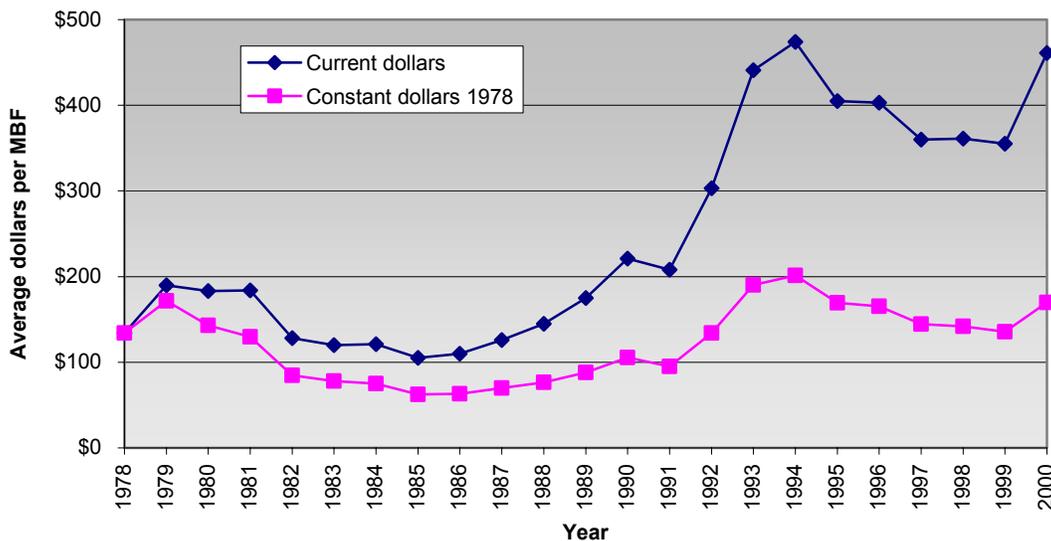
In November 1998, the United States, Canada, and Mexico (under the North American Plant Protection Organization umbrella) agreed on the components of a common standard addressing the risks related to solid wood packaging materials. The U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS) has completed a draft entitled "Pest Risk Assessment" that examines the risks associated with solid wood packing material. The service is also in the process of preparing a "Pest Risk Reduction Analysis" that investigates the environmental and economic impacts of various alternatives that would minimize risks associated with solid wood packaging materials.

With the exception of China and Hong Kong, the United States currently depends on self-declaration by importers that packaging is free of bark and apparently free of insects. In December 1998, APHIS applied more stringent standards to packaging materials originating from China and Hong Kong. It is estimated that between one-quarter and one-half of China's exports to the United States (valued at \$42 billion in 1999) have been affected by the change (Hicks, 2001).

### Findings on prices in the forest products sector

Key prices in the forest products sector include stumpage, lumber, and many processed forest products. Stumpage price is the value of the tree standing on the stump before it is harvested. It is sensitive to harvest location, logging costs, transportation costs, and log prices offered by the mills. Average stumpage value grew from 1978, peaked in the early 1990s, declined, and then rose again in 2000 (Figure 11). Nominal values reveal a marked increase, with fluctuations, over time. Variance in constant dollars has been much less.

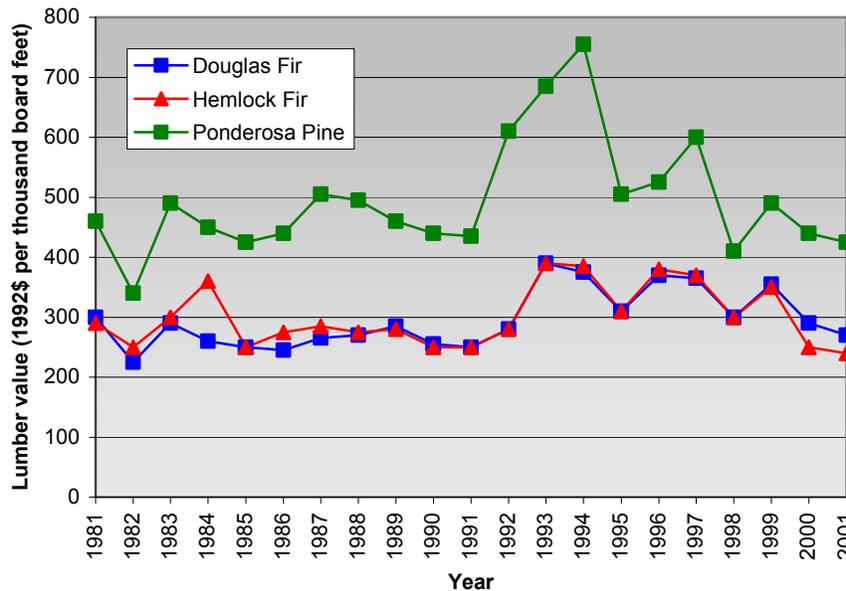
Figure 11. Average stumpage value of timber in current and 1978 constant dollars, 1978-2000



Source: California State Board of Equalization (BOE), 2002

Lumber price is both a driver and an outcome of lumber demand and supply. The price of most lumber products remained stable from 1981 until the early 1990s when the entire economy experienced a significant recession (Figure 12). Even though lumber prices began falling while the economy recovered between 1981 and 1996, the price of Douglas-fir 2x4s increased 24 percent, kiln dried hemlock and fir 2x4s increased 35 percent, and 4x4 grade 1 shop kiln dried and ponderosa pine increased 14 percent. Most lumber prices have remained low during the end of the 1990s and into the early 2000s.

Figure 12. Value of lumber, net Free On Board (F.O.B) mill price, of selected lumber products in the western region, dollars per thousand board feet, 1992 constant dollars



Source: Random Lengths Publications, Inc. 2001

In the United States, stumpage and product prices are projected to remain relatively constant. One significant exception is hardwood sawtimber and pulpwood prices in the South. Both are projected to rise because of continued increases in demand as well as a limited growth in the inventory available for harvest (USFS, 2002b).

Aluminum, plastic, and cement can serve as building material substitutes for lumber and can influence its supply and demand. Because timber quality is down, consumers have increasingly demanded plastic or composite lumber (combining plastic and wood fiber) for use in building decks and fences. These structures have traditionally been built using solid-sawn lumber. The use of plastic in molding products has resulted in a decreased market share for wood in this market (FAS, 2000). In recent years, there has been a shift in the forest resource base. The timber industry in California and elsewhere has become more dependent on smaller diameter trees and the products produced from them. In conjunction with this timber base shift, there is an increasing use of composite wood materials. For example, plastic lumber composite materials used for deck boards have become very popular in recent years for the following reasons: 1) many of these products are more water resistant; 2) they cost less to maintain; and 3) they are largely comprised of recycled content from both plastic and wood.

*Because timber quality is down, consumers have increasingly demanded plastic or composite lumber (combining plastic and wood fiber) for use in building decks and fences.*

## Findings on production of wood products in California

### Growing stock

Growing stock is a term representing trees of all sizes in a forest. The greater the net volume of growing stock on timberland, the greater the potential timber will be available to the market, at least in the foreseeable future. These characteristics of California's forests are extensively addressed in the Assessment chapter [Timberland Inventory Characteristics](#).

The net volume of growing stock on California's timberland (productive forest land, administratively available for harvesting) declined 18 percent or 11 billion cubic feet from 1953 to 1977 and then increased to 58 billion cubic feet by 1997 (Figure 13). In 1997, 55 percent of the total net volume of growing stock on the State's timberland belonged to national forests, 24 percent to non-industrial private, 18 percent to forest industry, and the remaining three percent to other public.

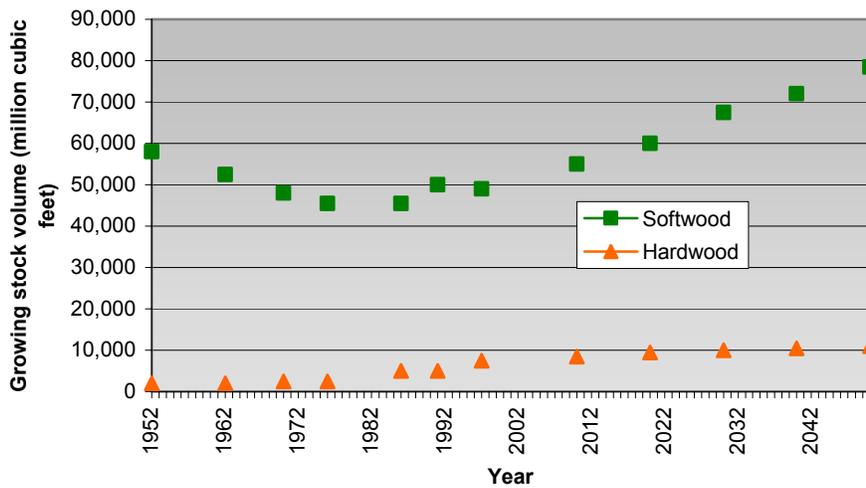
Hardwood have increased as a fraction of total volume of growing stock, rising from five percent in 1953 to 14 percent in 1997. Most of the increase during this time occurred in private ownerships, including a 406 percent or 1,365 million cubic feet increase on forest industrial timberland and a 306 percent or 3,056 million cubic feet increase on non-industrial private timberland.

The immediate indicator of potential economic value is sawtimber volume. This measure includes board foot volume of softwood trees larger than 11 inches in diameter and hardwood trees larger than nine inches in diameter.

Therefore, greater sawtimber volume on timberland implies that more large timber will potentially be available to the market, particularly for lumber production in California. Sawtimber is one component of growing stock volume and followed similar trends. The 1997 Assessment, mandated by the Forest and Rangeland Renewable Resources Planning Act of 1974, projected that growing stock in California would approximate the trend as illustrated in Figure 13.

***Greater sawtimber volume on timberland implies that more large timber will potentially be available to the market, particularly for lumber production in California.***

Figure 13. Volume of growing stock trend and projection on timberland in the Pacific Southwest Region (California and Hawaii)



\* National forests are not included in the hardwood volume  
Source: U.S. Forest Service (USFS), 1997

Net annual growth rates vary from two percent of total growing stock on public lands outside national forests to 2.8 percent of total growing stock on private lands owned by the forest industry. See the Assessment document [Timberland Inventory Characteristics](#) for a further discussion.

**Projected growing stock in the United States:** Economists for the USFS project that the total inventory of United States timber growing stock will continue to expand into 2050, particularly in the South. Growing stock inventory of softwood in the West and South is projected to increase more than 50 percent by 2050. While inventory in the West declined between 1952 and 1990, inventory in the West is now growing. By 2050, the West is projected to account for 68 percent of United States softwood inventory. The South is projected to account for 21 percent. By 2050, hardwood growing stock inventory should drop slightly in the South but increase by 44 percent in the North (USFS, 2002b).

Investment in future United States timber supply will require continued improvements in the technology used both to grow trees and produce more wood and paper product output per unit of timber input. In the South, the timber outlook indicates that there will be substantial growth in softwood timber demand, justifying continued investment in timber management and southern pine plantations. However, expansion in the harvest of hardwood timber is likely to be constrained by available timber inventories. Investment opportunities on the Pacific Coast are much less promising (USFS, 2002b).

## Timber management

Forest management in California depends on the objectives of the forest manager. Timber production is the most common objective of private forest land managers; however, other objectives including those addressing recreation, wildlife habitat, and scenic values may be factors as well. California has several major forest types, also affecting the choice of management strategies.

Forest management in California focuses on control of the establishment, composition, and growth of forest stands. This practice is called “silviculture.” A silvicultural system is a program of forest stand treatments during the life of the stand. Growth of new or existing trees is stimulated by the removal of more mature trees. New trees

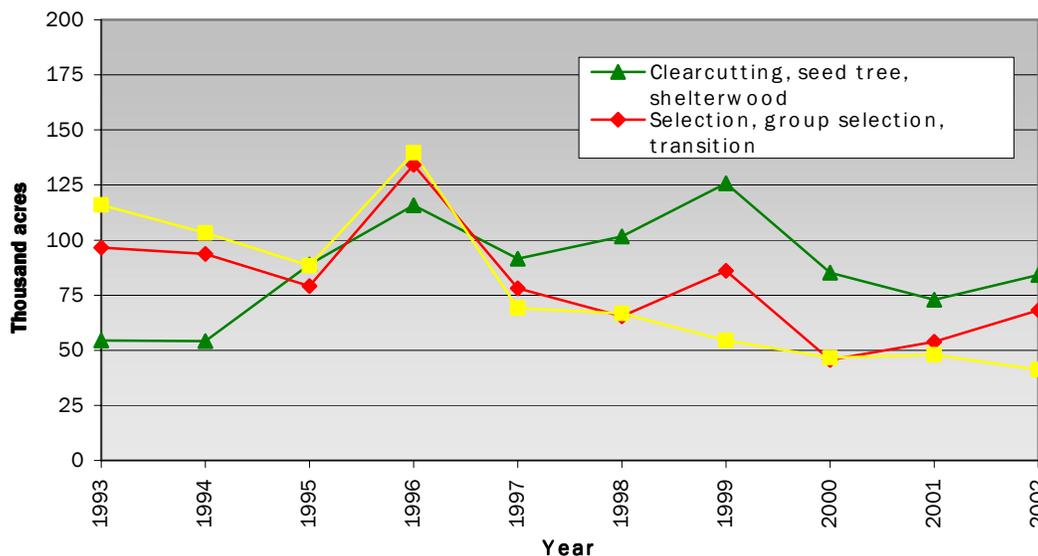
*Forest management in California focuses on controlling the establishment, composition, and growth of forest stands.*

are established, or regenerated, by natural processes, planting, or seeding. Forest composition and growth can be managed by stand improvement practices such as thinning and vegetation control. The Forest Practice Rules (FPRs) describe standard silvicultural systems with details about regeneration methods, intermediate treatments, alternatives, and limitations.

One common silvicultural system, usually referred to as even-aged management, addresses forests with tree stands with similar age class and size. Even-aged management systems include clear-cutting, seed tree, and shelterwood. Another common silvicultural system emphasizes the creation and maintenance of well-stocked forest stands with trees of various age classes termed uneven-aged management. Harvesting involves individual or small groups of trees, and common harvest methods include the selection and transition methods. The transition method is used when the manager wants to change an irregular or even-aged stand into an uneven-aged structure. Alternatives to any of the specified methods are allowed in some circumstances.

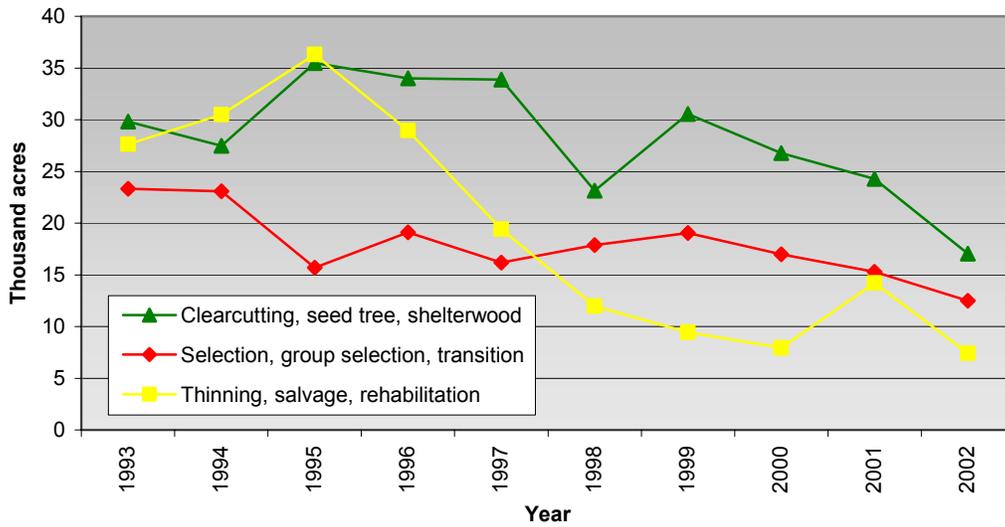
Over the last two decades, acres harvested under even-aged and uneven-aged silvicultural systems on private and State lands have varied by year and region. These fluctuations are illustrated in Figures 14 through 17 and are derived from the California Department of Forestry and Fire Protection's (CDF's) Forest Practice Database. Because of reporting issues, particularly before 1997, the data is approximate. However, it does provide some useful information. Harvesting systems associated with even-aged management peaked in Region 1 (North Coast) and are still the most frequently used. There is no clear pattern in Region 2 (North Sierra); however, even-aged harvesting systems have been most frequent since 1997. Harvesting associated with selection has tended to be most frequent in Region 3 (Southern Sierras).

Figure 14. Area of timber harvested by three silvicultural method on private and state lands combined in California, 1993-2002



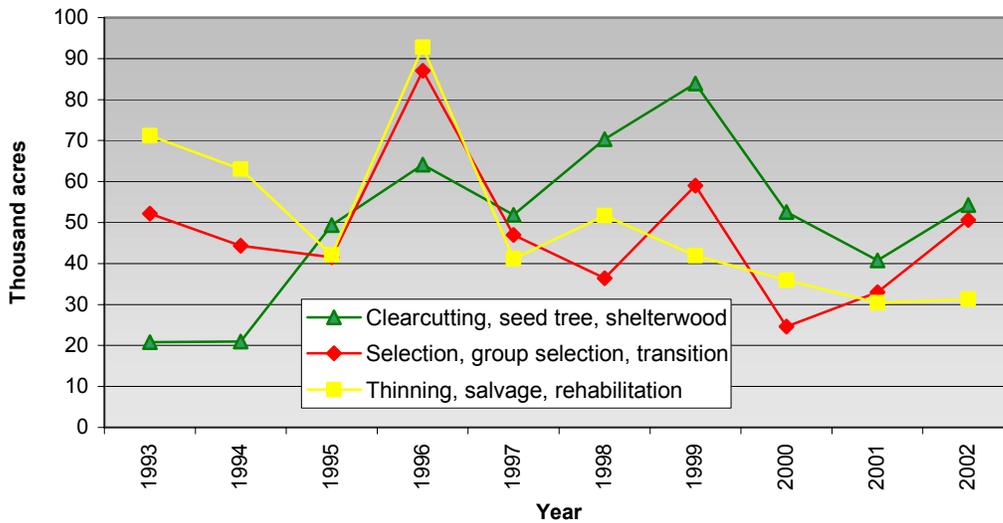
Source: CDF, 2002b

Figure 15. Area of timber harvested by three silvicultural method on private and state lands combined in Region 1 (North Coast), 1993-2002



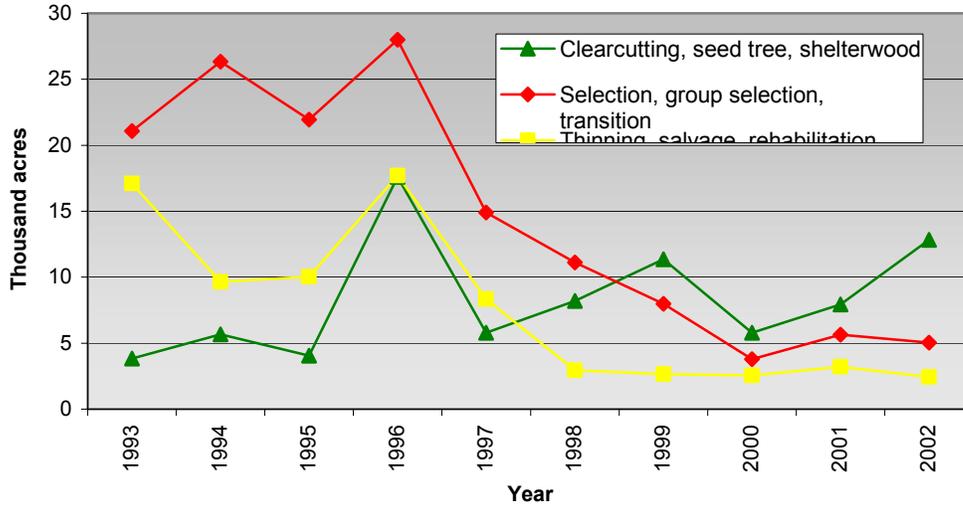
Source: CDF, 2002b

Figure 16. Area of timber harvested by silvicultural method on private and state lands in Region 2 (North Sierras), 1993-2002



Source: CDF, 2002b

Figure 17. Area of timber harvested by three silvicultural method on private and state lands combined in Region 4 (Southern Sierras), 1993-2002



Source: CDF, 2002b

Table 5. Harvest details used in preceding figures

Evenaged	Unevenaged	Other
Alternative (clearcutting)	Alternative (group selection)	Alternative (commercial thin)
Alternative (seed tree removal)	Alternative (selection)	Alternative (other)
Alternative (seed tree removal/commercial thin)	Alternative (transition)	Alternative (rehabilitation)
Alternative (seed tree seed)	Group selection	Alternative (sanitation salvage)
Alternative (shelterwood removal/commercial thin)	Selection	Alternative (special treatment)
Alternative (shelterwood removal/sanitation salvage)	Transition	Commercial thinning
Alternative (shelterwood seed)		Conversion
Alternative (shelterwood removal)		Fuelbreak
Clearcutting		Rehabilitation
Seed tree		Right of way
Seed tree removal		Sanitation salvage
Seed tree seed		Substantially damaged timberland
Shelterwood prep		
Shelterwood removal		
Shelterwood seed		

Many in California, the Pacific Northwest, and Canada have criticized even-aged management, particularly the clear-cutting method. In fact, the clear-cutting of old-growth forests has been one of the strongest rallying cries of the environmental movement for the last two decades. Within California, clear-cutting now seldom occurs on federally owned lands. Private landowners still use even-aged management where the stands or species favor its use; however, they increasingly are looking for alternatives.

Recent trends suggest evenaged harvests represent about half of the total private harvest area in California. The percentage of total area harvested that was clearcut has increased from 3.6 percent in 1993 to around 15 percent in 2002 (see table 6) (CDF, 2002b).

Table 6. Area of total timber harvest and clearcut and percentage area of clearcuts for approved Timber Harvest Plans on private and State lands, 1993–2002 (thousand acres)

Clearcut and harvest	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Total harvest area	276	252	260	390	240	238	271	182	180	208
Clearcut area	10	13	18	24	25	28	47	29	25	31
Percentage clearcut	4	5	7	6	10	12	17	16	14	15

Source: CDF, 2002b

One such alternative that has been advocated by scientists in the Pacific Northwest and widely applied in British Columbia is termed “variable retention.” This harvesting system is also being applied in California even-aged stands as a transition to uneven-aged management. No fixed pattern defines the harvest block, but the goal is to leave varying degrees of forest structure in place. Older trees, snags, and woody debris are maintained in sufficient number to preserve the building blocks of an old-growth ecosystem, such as lichens, mosses, and microscopic fungi. For example, Mendocino Redwoods Company has indicated that it will use variable retention silviculture on its poorly stocked, tanoak-dominated stands as a transition to uneven-aged management across its property (Mendocino Redwood Company, 1999).

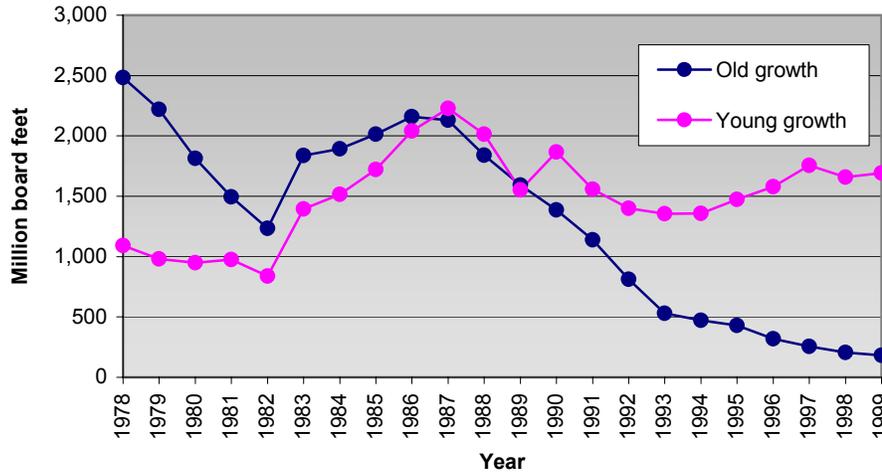


Variable retention harvest in Jackson Demonstration State forest

### Timber harvest

Currently, timber harvesting largely occurs in young growth stands (Figure 18). With records no longer tracking harvesting by young and old growth, this information is no longer available beyond 1999.

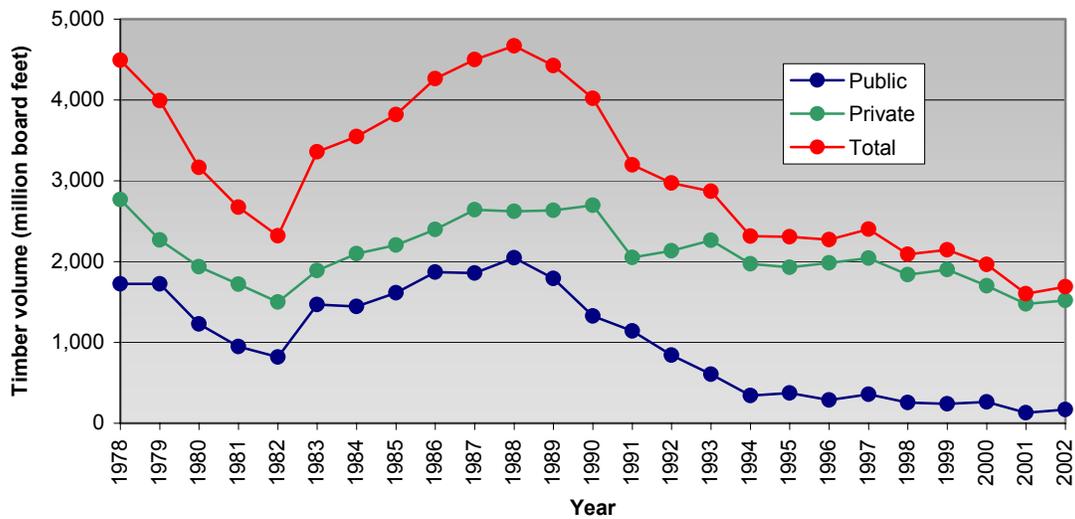
Figure 18. Volume of old and young green growth timber harvested in California, 1978-2000



Source: BOE, 2002

Timber harvesting on both public and private lands in California has decreased from the 1970 levels. Timber harvest volume on public lands has declined dramatically since 1989 (Figure 19). Timber harvest volume in California increased from 4 to 6 billion board feet between 1948 and 1955. It then fell to 2 billion board feet by 1998. The major decrease in 1982 was primarily related to economic factors.

Figure 19. Volume of timber harvested on public and private ownership, and total, 1978-2002



Source: BOE, 2002

The overall downward trend is related to both economic factors and the impact of forest policies regarding the protection of endangered and threatened wildlife species as well as other environmental concerns, particularly on public land. Timber harvest volume on public lands decreased from two MMBF in 1989 (40 percent of total timber harvest volume) to 376 MMBF by 1995 (16 percent of total timber

harvest volume). On the other hand, timber harvest volume on private lands has declined just slightly since 1991 and has maintained at around 2 billion board feet annually in recent years.

This decline in harvest on public lands has been especially significant in counties that traditionally have had high harvest volumes from national forest lands (Table 7). For example, the percentage of total timber harvested in Plumas County fell from 71 percent originates from federal lands in 1991 to 24 percent in 2002.

Table 7. Percentage area of total timber harvested from federal lands (selected counties), 1991, 1996, and 2000

County	1991	1996	2000
Del Norte	20	1	0
Humboldt	6	1	0
Mendocino	8	9	3
Trinity	49	41	2
Siskiyou	39	24	8
Modoc	50	54	13
Lassen	55	38	7
Shasta	20	7	3
Tehama	14	3	0
Plumas	71	10	5
Sierra	56	40	25
Nevada	48	8	19
Yuba	42	1	25
Placer	32	5	12
El Dorado	58	15	37
Amador	27	0	8

Source: BOE, 2000b

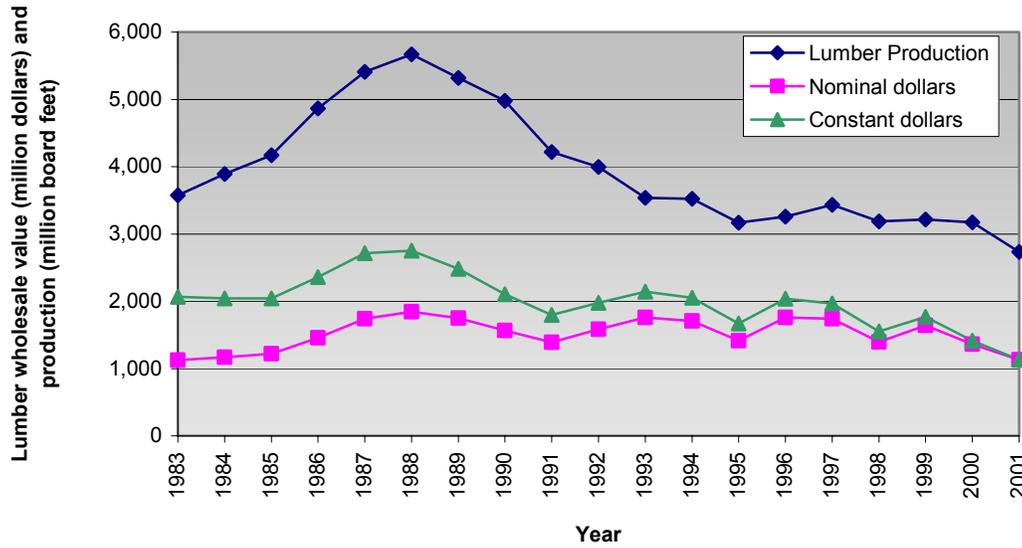
**Harvest levels in the United States:** At the national level, harvests from federal forest lands are now at their lowest level in 50 years and comprise less than 10 percent of the United States timber supply. Output from private forests has grown and 80 percent of United States roundwood production is now east of the Mississippi. The South has become the dominant wood products producer. See the online document [The Outlook for U.S. Solid Wood Exports in an Increasingly Competitive World Market, Part 1](#) for more information (Freese, 2000).

Harvest is projected to increase substantially in the South but not in the West. After 2010, pine plantations in the South will be maturing and the pace of Southern softwood harvest is projected to increase. Hardwood harvest in the South is projected to rise more slowly or to even decline on some ownerships (USFS, 2002b).

## Lumber production

By value, lumber is the most important forest product in California. The amount of lumber that can be produced is closely related to the total timber harvested and has tended to reflect the same general cycle. Lumber production in California reached a low in 2001 of just over 2.7 million board feet with an approximate wholesale value of \$1.1 billion dollars (Figure 20). This is the lowest year in the last two decades, continuing to follow an overall downward trend both in number of sawmills and lumber output.

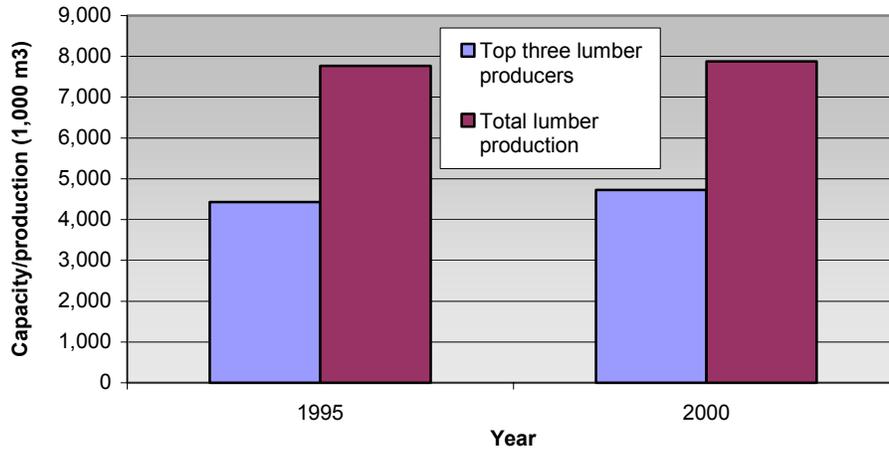
Figure 20. Lumber production and wholesale value in current and 1990 constant dollars, 1983-2001



Source: Western Wood Products Association, 2002

As mills have closed, lumber-producing capacity has concentrated in a smaller number of firms (Figure 21).

Figure 21. Volume of lumber produced from the top three softwood lumber producers and volume of total softwood lumber production in California, 1995 and 2000



Source: Spelter and McKeever, 1999

During the last decade, Douglas-fir was the most commonly milled species (Table 8).

Table 8. Percentage of species cut in California mills (approximate percentage of total), 1991, 1996, and 2001

Species sawn	1991	1996	2001
Douglas-fir	28	26	34
Hemlock-fir	25	25	24
Ponderosa pine	17	17	14
Redwood	22	24	18
Other	8	8	10

Prior to 2001, figures reflect volumes cut in Nevada mills; 2001 figures do not include Nevada mills.  
Source: Western Wood Products Association, 2002

On the production side, with fewer sawmills, nominal average annual pay increased in all major subsectors between 1997 and 2000. In 2000, the highest average annual pay in the wood products sector was in sawmills and planing mills, with an average of \$37,457. The lowest was in wood container manufacturing with an average annual pay of \$23,965. The highest average annual pay in the paper industry was in paper mills with an average of \$53,504 (Table 9).

Table 9. Value of average annual wages in the forest products industry by SIC code, 1997 and 2000

SIC Code	Detailed industry title	1997	2000
2411	Logging	29,865	31,795
242	Sawmills and planing mills	36,507	37,457
243	Millwork, plywood and structural members	25,607	29,267
244	Wood containers	22,102	23,965
245	Wood buildings and mobile homes	34,729	35,016
249	Miscellaneous wood products	24,212	26,655
61	Pulp mills	NA	51,809
262	Paper mills	49,083	53,504
263	Paperboard mills	NA	46,190

NA – not available  
Source: EDD, 2000a

Between 1995 and 2000, the lumber and wood products industry experienced around one percent of the total industrial fatalities in California. In all but one year, fatalities related to logging comprised the majority of the total (Table 10).

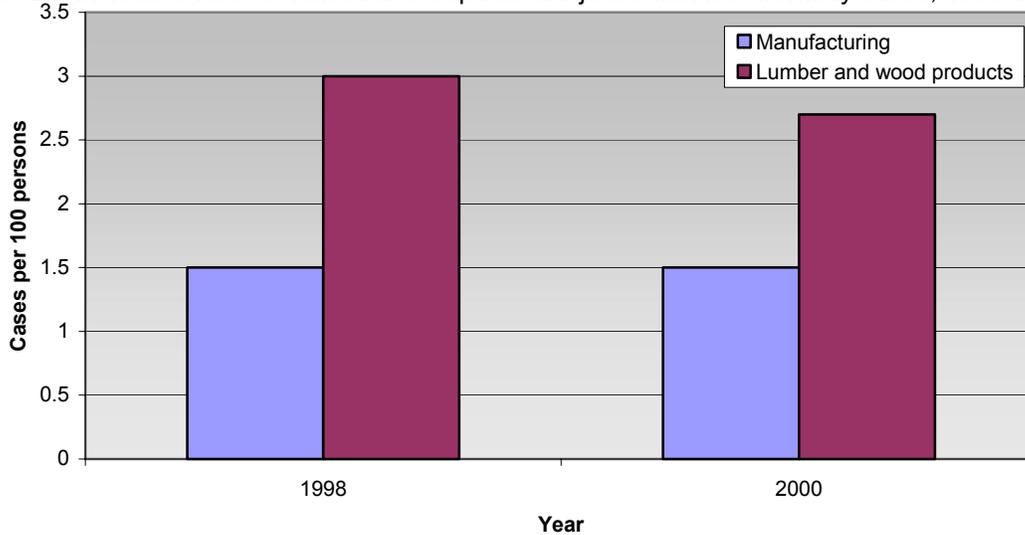
Table 10. Number of fatalities in lumber and wood product industries and as a percent of total fatal occupational injuries in California industries, 1995-2000

Industry	1995		1996		1997		1998		1999		2000	
	Fatalities	Percent										
Lumber and wood products	10	1.5	5	0.8	7	1.1	8	1.3	10	1.7	6	1.1
Logging	7	1.1	4	0.7	4	0.6	6	1.0	3	0.5	4	0.7

Source: California Department of Industrial Relations, 2000

In 1998 and 2000, the lumber and wood products industry experienced a greater incidence rate of days of work lost per 100 persons by injuries and illness than the average in the overall durable goods sector and total manufacturing sector (Figure 22).

Figure 22. Incidence rates of non-fatal occupational injuries with lost workday cases, 1998 and 2000



Source: California Department of Industrial Relations, 2000

Sawmills and planing mills had higher injury incidence rates than the rest of the lumber and wood products industry. The paper and allied products industry had rates higher than the average for durables and manufacturing in 1998 and lower in 2000 (Table 11).

Table 11. Incidence rates of non-fatal occupational injuries and illnesses by industry, 1998 and 2000

Industry	1998				2000			
	Injuries and illnesses		Injuries		Injuries and illnesses		Injuries	
	Total cases	Lost work day cases	Total	Lost work day cases	Total	Lost work day cases	Total	Lost work day cases
Manufacturing	6.9	1.7	6.2	1.5	6.4	1.6	5.9	1.5
Durable goods	6.9	1.6	6.2	1.5	6.4	1.5	5.8	1.4
Lumber and wood products	12.2	3.0	11.9	3.0	9.3	2.8	9	2.7
Sawmills and planing mills	17.0	4.2	15.5	3.9	13.5	2.6	NA	2.5
Sawmills and planing mills, general	17.2	4.0	15.7	3.7	10.3	2.8	9.2	2.7
Millwork, plywood and structural members	11.0	2.2	11.0	2.2	7.3	NA	7.3	NA
Millwork	9.3	2.6	9.3	2.6	7.3	2.5	7.1	2.4
Paper and allied products	7.8	1.8	7.1	1.7	6.2	1.4	NA	1.3

Incidence rates represent the number of injuries and illnesses per 100

NA – not available

Source: California Department of Industrial Relations, 2000

### Other wood products

There is limited pulp (NAICS 32211), paper (NAICS 32212), and paper board (NAICS 32213) manufacturing in California. In 2000, there were 33 establishments, over half in southern California. Eleven were located in Los Angeles County with an estimated annual payroll of over \$54 million and nearly 1,100 employees. Within this total are only two operating pulp mills of any size in California. Both were in Humboldt County and had between 100-250 employees (U.S. Census Bureau, 2002d). There is a

total of 15 establishments in paper mills and 16 paperboard mills, primarily in the Bay Area and southern California (U.S. Census Bureau, 2002h and 2002i).

**The forest products industry in the United States:** The industry includes primary manufacturers and secondary manufacturers of solid wood products and furniture manufacturers. Primary and secondary manufacturers include: 1) sawing and planing mills; 2) veneer and plywood mills; 3) engineered wood and truss manufacturing; 4) door, flooring, moulding, and window manufacturers; 5) reconstituted wood product manufacturers; 6) wood container and pallet manufacturers; and 7) other solid wood product facilities or wood preservation firms. Furniture manufacturing includes: 1) non-upholstered wood household furniture manufacturers; 2) wood office furniture manufacturers; 3) wood television, radio, and sewing machine cabinet manufacturers; and 4) custom architectural woodwork and millwork manufacturing.

Based on sales, the United States forest and paper industry is the largest in the world. In 2000, United States sales of pulp and paper amounted to almost half of the world total (PricewaterhouseCoopers, 2001). Sales by larger firms cover over half of the United States market. In 2000, sales of the five largest firms (International Paper, Georgia-Pacific, Weyerhaeuser, Kimberly Clark, and Proctor and Gamble) comprised 61 percent of the United States total. In 1999, sales from the five largest firms comprised approximately 55 percent of the United States total.

In global terms, where the top five firms in industries such as automotive or energy control 80 percent of international sales, the wood products industry is very fragmented. The top five global forestry firms comprise nearly 30 percent of all sales (PricewaterhouseCoopers, 2001). This level of global fragmentation adds to global overcapacity, poor price discipline, and limited ability to control industry trends (PricewaterhouseCoopers, 2000).

Within the pulp and paper industry, there has been a concentration of production capacity between 1970 and 2000. In 1970, the ten largest companies accounted for 35 percent of the total paper, paperboard, and market pulp capacity in the United States. By 2000, the ten largest companies accounted for about half of the capacity. There have been greater increases in capacity in the South than in the West. See the online document [United States Paper, Paperboard, and Market Pulp Capacity Trends by Process and Location, 1970-2000](#) for more information (Ince et al., 2001).

Economists for the USFS project that United States forest product output will continue to expand in the decades ahead, including a 65 percent increase in the tonnage of all product output between 2000 and 2050. Pulp, paper and paperboard will account for a large share of growth in output with a projected increase in production of over 75 percent. To support this growth, there will be a substantial long run increase in capacity by 2050. The United States South will continue its dominance in production of lumber, wood panels, pulp, paper, and paperboard (USFS, 2002b).

It is probable that investment will continue in wood products facilities and timber management of pine plantations in the South. The East also is projected to have relatively significant supplies of wood fiber. In the West, little growth is projected in pulp or OSB capacity. This means that it is also probable that there will be little demand for small diameter timber for pulp. This will come at a time when there is a great effort to reduce fire hazards by thinning small diameter fuels from forests. Excess supply of small diameter materials and lack of timber sales or markets will present a major challenge (USFS, 2002b).

***Excess supply of small diameter materials and lack of timber sales or markets will present a major challenge to the forest products industry.***