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California's Forest Products Industry: A Descriptive Analysis

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Abstract

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This report traces the flow of California's 2000 timber harvest through the wood-using industries; provides a description of the structure, operations, and condition of California's primary forest products industry; and briefly summarizes timber inventory and growth. Historical wood products industry changes are discussed, as well as trends in harvest, production, and sales. Employment and worker earnings in the state's forest products industry also are examined, and an industry leaders' assessment of past and future operating conditions is provided.

Keywords: Forest products, California, timber harvest, employment, bioenergy.

Highlights

- A total of 93 primary forest products plants operated in California in 2000. These plants included 47 sawmills, 25 bioenergy plants, 10 bark and mulch plants, 5 reconstituted board plants, 2 veneer plants, 2 pulp and paper mills, and 2 manufacturers of other primary wood products.
- Total sales value for California's primary forest products was about $2.3 billion in 2000, with lumber accounting for 65 percent of the total. The majority (62 percent) of all products were sold in California, whereas other Far Western States received the majority of exports (11 percent of total sales).
- Three sectors accounted for 97 percent of industry sales: sawmills, residue-utilizing plants, and bioenergy plants.
- California sawmills produced 3,100 million board feet (MMBF) of lumber in 2000, just under 9 percent of U.S. production of softwood lumber and nearly 6 percent of U.S. consumption.
- California's timber harvest was 2,250 MMBF Scribner in 2000, less than 68 percent of the average annual harvest for the past 20 years. The 2001 harvest was 2,180 MMBF. These declines are largely attributable to reductions in national forest harvest levels since the late 1980s. State regulations and, more recently, market conditions have reduced timber harvest from private lands.
- California's forest products industry's annual capacity to process sawtimber has decreased 60 percent, from 6,000 MMBF in the late 1980s to 2,400 MMBF in 2002.
- Approximately 112,700 workers, earning $4.5 billion annually, are employed in the primary and secondary wood and paper products industry in California. Twenty-five thousand of these employees are in harvesting and processing of timber or in private sector land management, and they earn about $900 million annually in labor income.
- Most industry leaders expressed a positive outlook for the industry over the next 5 years, expecting improved product markets. They indicated strongest concerns about energy costs, state regulations, and timber availability.

Contents

Introduction

This report describes the structure, operations, and condition of California's primary forest products industry for 2000, and briefly discusses timber inventory, growth, and harvest. Primary forest product manufacturers are firms that process timber into (manufactured) products such as lumber, as well as facilities like pulp mills and particleboard plants that use the wood fiber residue directly from timber processors.

The report discusses long-term historical trends, trends since 2000, and results from a survey of industry leaders conducted in December 2002. The primary focus is on the trends and changes in the industry since the late 1980s—a recent watershed period with sizeable declines in federal timber availability and increasing forest management regulation in California. However, for historical perspective, some discussion is offered of industry changes throughout the last half of the 20th century.

The major source of data for this report is a statewide census of California's primary forest products industry and mills in adjacent states that received timber from California during calendar year 2000. The census represents a cooperative effort between the University of Montana's Bureau of Business and Economic Research (BBER) and the USDA Forest Service, Pacific Northwest (PNW) Research Station, Forest Inventory and Analysis (FIA) Program called the Forest Industries Data Collection System (FIDACS). Firms were identified through telephone directories, directories of the forest products industries (Miller Freeman, Inc. 1999, Paperloop 2000, Random Lengths 2001), and with the assistance of the California Forestry Association, the Forest Resource Council, and the California Forest Products Commission. Firms cooperating in the 2000 California census, including out-of-state mills, processed all of California's commercial timber harvest. Inventory data, including standing volumes and growth, were provided by the PNW Research Station FIA Program.

Forest Industries Data Collection System

The BBER, in cooperation with the FIA programs in the Rocky Mountain and PNW Research Stations, has developed FIDACS to collect, compile, and make available state and county information on the operations of the forest products industry. The FIDACS is based on a census of primary forest product manufacturers located in a given state. Through a written questionnaire or phone interview, manufacturers provide the following information for each of their plants for a given calendar year:

- Plant production capacity and employment
- Volume of raw material received, by county and ownership
- Species of timber received
- Finished product volumes, types, sales value, and market locations
- Utilization and marketing of manufacturing residue

This effort is the first complete application of FIDACS in California. The BBER and the Forest Service research stations have been conducting censuses in the west coast and Rocky Mountain states periodically for over 25 years. The state of Washington, in cooperation with the PNW Research Station, reports on periodic censuses of that state's industry.

Information collected through FIDACS is stored at the BBER in Missoula, Montana. Additional information is available by request; however, individual firm-level data are confidential and will not be released.

Overview of California's Forest Products Industry

Operating Environment: 1945–1989

Interrelated factors of markets, technology, the timber resource, and public policy have shaped the primary forest products industry in California, a major producer of wood products since statehood in 1850. It emerged as the Nation's third leading softwood lumber-producing state in the 1940s, and since then has ranked second or third in the Nation, along with Oregon and Washington (Steer 1948, WWPA 1964-2002). Two major structural changes in California's forest products industry between 1945 and 1989 were the development and then near disappearance of the plywood and veneer industries, and the development of major industries (i.e., pulp and paper, reconstituted board plants, decorative bark and mulch, and bioenergy) based on mill residue from sawmills and other major timber-processing facilities.

Following World War II, timber harvest volumes expanded in response to the large increases in U.S. home building. Harvest peaked at about 6 billion board feet in 1955 with private lands supplying over 75 percent of the harvest volume. The 1950s and early 1960s was a period of diversification for the California wood products industry (Barrette et al. 1970), especially with the expansion of the plywood, pulp and paper, and reconstituted board sectors. During the 1950s and 1960s, plywood and veneer manufacturing consumed up to 12 percent of California's timber harvest, whereas lumber consistently used about 86 percent. The 1960s was also a period of modest harvest declines, with annual harvests averaging about 5 billion board feet (Bolsinger 1980). Reductions in total harvest and reduced plywood production during the mid to late 1960s were apparently due to inventory declines

of larger Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) on private lands (Howard 1974).

Through the 1970s and 1980s, the predominant factors influencing California's forest products industry were market conditions. Harvest volume generally increased during good market years and declined during years with weak markets. The 1970s was a period of strong wood products markets driven by a strong U.S. economy, with housing starts exceeding 2 million units annually for several years. Harvest in California exceeded 5 billion board feet in 1972 and averaged 4.7 billion board feet annually for the decade (Ruderman1975-1984, Warren 1985-2000).

The strong markets of the 1970s ended abruptly in late 1979. High interest rates caused a sharp drop in the U.S. housing and construction industries through 1982, when the California timber harvest declined to 2.5 billion board feet. By 1983, conditions in the construction and housing industries had improved, but wood product prices remained low owing to a high-valued U.S. dollar, which in turn led to decreased U.S. exports and increased Canadian imports. Meanwhile, as substitute products (i.e., oriented strand board) increased their market share, the plywood sector continued its decline, producing well under 200 million square feet annually for most of the 1980s, compared to more than 800 million square feet annually throughout the 1960s and 1970s.

It was not until the last half of the 1980s that markets started to improve, with prices of wood products increasing owing to a strong economy and a lower valued U.S. dollar. Mills in California had substantial uncut volumes under contract as a result of the weak markets of the early 1980s and experienced what proved to be a temporary abundance of timber during the late 1980s. Mills made use of this available timber while markets were good, and California's timber harvest increased to nearly 5 billion board feet annually during this period.

Operating Environment: 1990 and Beyond

Restricted timber availability, particularly on federal lands, exerted a major influence on California's forest products industry after the 1980s. Harvests from federal timberland (mainly national forest land) in California declined more than 80 percent owing to numerous policy and legal constraints on harvesting. These constraints included protection of threatened and endangered species, restrictions on harvesting old growth and operating in unroaded areas, and appeals and litigation of timber sales (McWilliams and Goldman 1994, Stone 2003). Private harvest was also lower in the 1990s, resulting largely from increasing state regulation (see "California Forest Products Leaders Survey and Outlook" section)(California Department of Forestry 2003, Dicus and Delfino 2003). Overall, California's timber

harvest volume fell sharply throughout the 1990s, finishing the decade at just over 2 billion board feet annually, less than 50 percent of the harvest levels of the late 1980s.

This is not to say that economic conditions had no effect on the forest products industry in the 1990s. Against the backdrop of decreasing timber availability, changes in U.S. and global economies had a strong influence on product prices. The Gulf War-induced recession of 1990 and 1991 brought about low prices. However, by 1993, the market was at the other extreme; lumber prices rose to near record highs owing to increased demand driven by stronger U.S. and global economies as well as significant nationwide reductions in federal timber availability.

Markets in 1995 weakened as a result of a slowdown in U.S. and international economies and rising imports of Canadian lumber. Lumber prices fell approximately 20 percent, although still remaining above the prices of the late 1980s. Beginning in 1996, lumber prices rebounded, reaching new record-high levels in the first half of 1997, owing to a much-improved U.S. economy, improved overseas markets, and a quota system regulating Canadian softwood lumber entering the United States. However, in the second half of 1997, although the U.S. economy remained strong, Japan and a number of other Asian countries experienced sharp declines in economic activity. With reduced global demand, lumber prices fell. The Asian economic crisis also further weakened the Canadian dollar, improving the competitiveness of Canadian products in the United States.

In 1999, markets improved considerably owing to the U.S. economy's continued strong performance and some improvement in the global economy. This improvement was short lived, however, and the years 2000 through 2002 saw weak U.S. and global economies, including a U.S. recession in 2001. Curiously, even during the 2001 recession, U.S. home building and lumber consumption remained high as a result of low interest rates. Low lumber prices in 2000 through 2002 were due to abundant lumber supplies on the U.S. market caused by a number of factors:

- Poor economic conditions throughout much of the world
- Increased wood products manufacturing capacity worldwide
- A high-valued U.S. dollar in 2000 and 2001
- Increased average mill size and capital intensity with higher fixed costs (and often debt)—making managers reluctant to curtail production
- Weakness in other sectors of the U.S. economy (e.g., manufacturing)—impacting markets for other wood and paper products

In addition to a weaker market situation, very high and volatile electricity prices in 2000 and 2001 created problems for some California wood and paper products producers and opportunities for others. Mills buying power from outside sources, especially those buying electricity on the spot market, were faced with substantially

higher operating costs. In contrast, a number of facilities using wood to produce energy benefited from high electricity prices by selling electricity to other users. Like timber availability, regulations, and market conditions, electricity rates will continue to influence California's primary wood products industry.

California's Timber Harvest, Products, and Flow

This section discusses historical trends in California's timber harvest and the wood products industry's use of timber, focusing on the year 2000. It presents ownership and geographic sources of timber, species composition, types of timber products harvested and processed, utilization of wood fiber from the harvest, and movement of timber products within California, and between California and other states. The relationships among standing volume, harvest, and net growth also are examined.

Similar timber harvest characterizations are available from several sources, including the California State Board of Equalization (annually) and the PNW Research Station of the USDA Forest Service (annually and periodically), and these sources were used for historical comparisons. However, detailed harvest volumes presented in this report for calendar year 2000 are from the FIDACS census of California and out-of-state mills receiving timber harvested in California during 2000. Differences may exist between the numbers published here and those published by other sources. These small differences are often due to varying reporting units and conversion factors, rounding error, scaling discrepancies among timber sellers (agencies and private owners) and between sellers and buyers, and other reporting variations.

Standing volume and growth were calculated by PNW FIA for all nonreserved forest land, including lands rated noncommercial forest. Total aboveground stem volume and growth, net of cull and mortality, was calculated on a cubic-foot basis for all trees larger than 1-inch diameter at breast height (d.b.h.). Scribner board-foot volume, net of mortality, was calculated for all trees larger than 10 inches d.b.h. Growth-to-harvest ratios reported here were made on a board-foot basis.

Timber harvested from California timberland and manufactured into wood products in 2000 came from three broad land ownership categories: industrial timberland, nonindustrial private forest (NIPF) land, and public lands. California's timber harvest consisted largely of Douglas-fir and true firs (*Abies* spp.). Most timber used by California's industry was harvested from within the state, with additional volume coming from Oregon, Washington, and Utah. Some smaller volumes came from as far away as Texas and Canada.

California's Timberlands

California has approximately 99.823 million acres of land area, of which 38.547 million acres are forested (Smith et al. 2001). About 17.952 million acres (46.6 percent) of California's forest land are classified by the USDA Forest Service as timberland, 5.968 million acres are reserved from timber harvesting, and 14.627 million acres are "unproductive" forest land (Smith et al. 2001). Of nonreserved timberland in California, the forest industry owns 2.982 million acres (16.6 percent), NIPF landowners hold 4.455 million acres (24.8 percent), and public lands account for 10.515 million acres (58.6 percent) (fig. 1). Approximately 20.654 million acres of forest land in California are managed by the USDA Forest Service in national forests; less than half (10.086 million acres) of that forest land is nonreserved timberland.

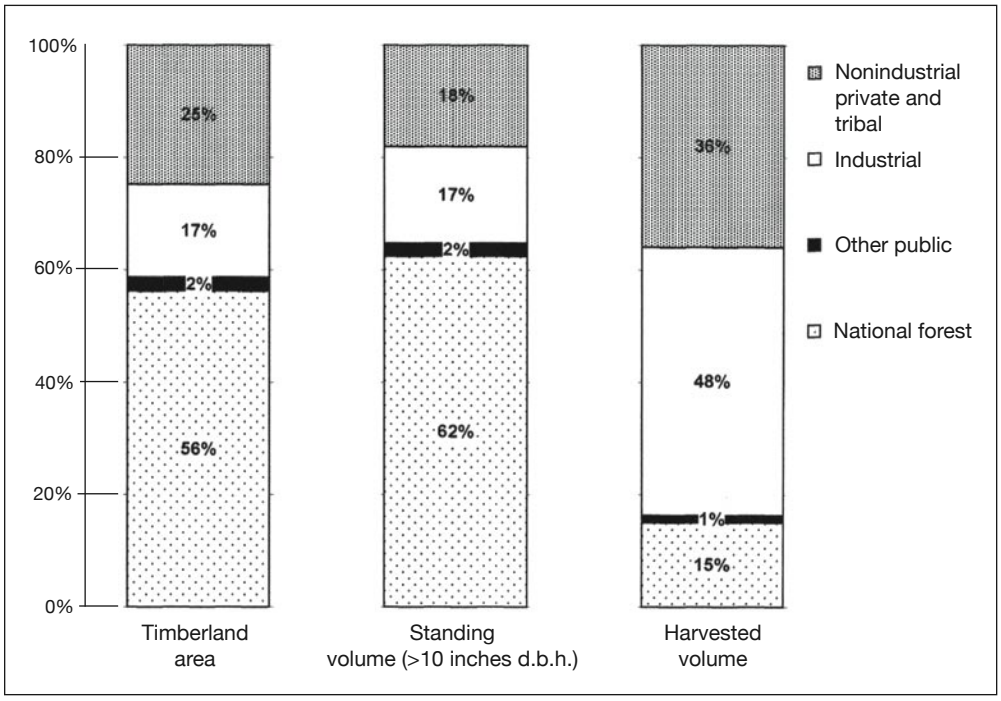

Figure 1—Characteristics of California's nonreserved timberland by ownership class, 2000.

Ownership distribution of standing (live) timber volume differs slightly from land ownership. Total standing volume on California's nonreserved lands is approximately 87.0 billion cubic feet, with trees greater than 10 inches d.b.h. accounting for approximately 71.1 billion cubic feet (295.6 billion board feet, Scribner) or 81.8 percent. The majority (62.4 percent) of the volume of trees greater than 10 inches d.b.h. is in national forests, whereas 18.1 percent is on NIPF lands, 17.2 percent is located on industrial land, and 2.3 percent is on other public lands.

Harvest by Ownership

In 2000, 2.2 billion board feet (Scribner) of industrial wood (timber) was harvested from California forests and sent to mills for processing (fig. 2). This harvest volume represents 0.8 percent of the approximately 295.6 billion board feet of standing volume greater than 10 inches d.b.h. In an historical context, California's calendar year 2000 timber harvest was less than 68 percent of the average annual harvest for the previous 20 years, and only 51 percent of the 50-year average. This substantial decline is due largely to reductions in national forest harvest levels, with most of the reductions taking place since the late 1980s. By 2001, timber volume harvested from national forests had decreased 86 percent from its recent peak (2.18 billion board feet) in 1988. Harvest volumes from private lands also had decreased, but at a slower rate—43 percent (2.6 to 1.5 billion board feet) over the same period.

Although private lands have always provided the majority of California's timber (fig. 3), national forest harvest reductions over the past dozen years have led to a distinct shift in the proportion of timber coming from public versus private sources. Most (83.8 percent) of the 2,250 MMBF of timber harvested from California timberlands in 2000 came from industrial, nonindustrial private, and tribal timberlands (table 1). National forests accounted for 15 percent of the harvest, and all other public sources combined made up the remaining 1.2 percent. Since 2000, timber harvests from national forests have averaged 298 MMBF annually, less than 20 percent of the state's estimated total annual harvest.

The current harvest ownership disparity, characteristic of national forest versus private timber harvest volumes throughout the 1990s, has not existed in California since the 1950s, when private harvests were more than four times that of the national forests (fig. 3). Since the 1950s, the proportion of total timber harvest coming from public lands has fluctuated widely (Bolsinger 1980). In California during the early 1950s, harvest was done primarily on private lands (87 percent in 1952), with the remainder coming from public lands (12 percent from national forest lands in 1952). From 1963 through 1987, 58 percent of California's annual timber harvest came from private lands and 40 percent came from national forests. The share of harvest from national forest lands peaked in 1988 with 46 percent (2,364 MMBF), but fell to 36 percent in 1990. Through the 1990s, volume harvested from national forest lands continued its steady decline, and by 2000, the share was reduced to 15 percent. The shift away from national forests as a nearly equal provider of timber means that today 85 percent of timber harvested in California is coming from less than 44 percent of the state's nonreserved timberlands.

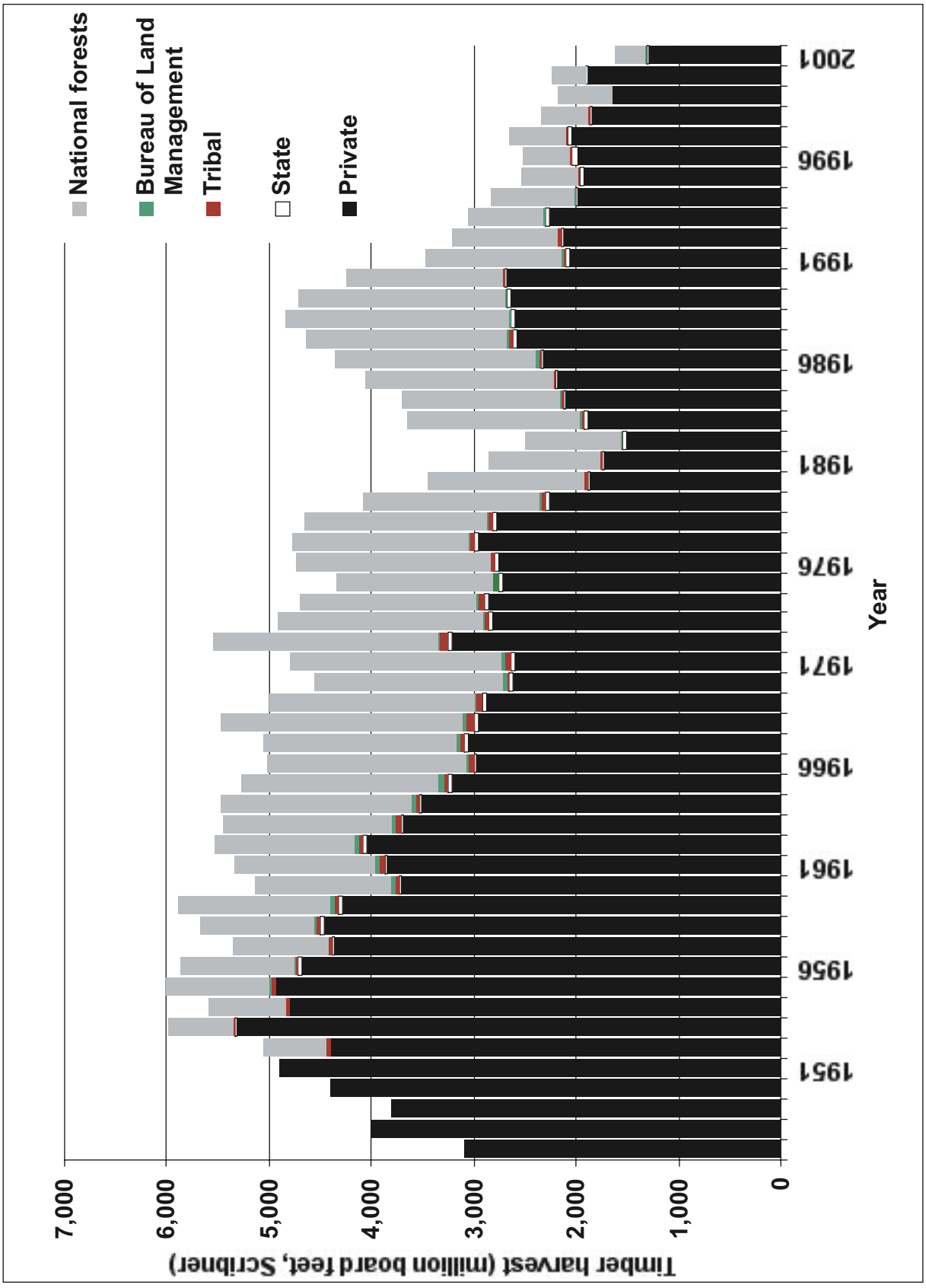

Figure 2—California's timber harvest by ownership class, 1947-2001.

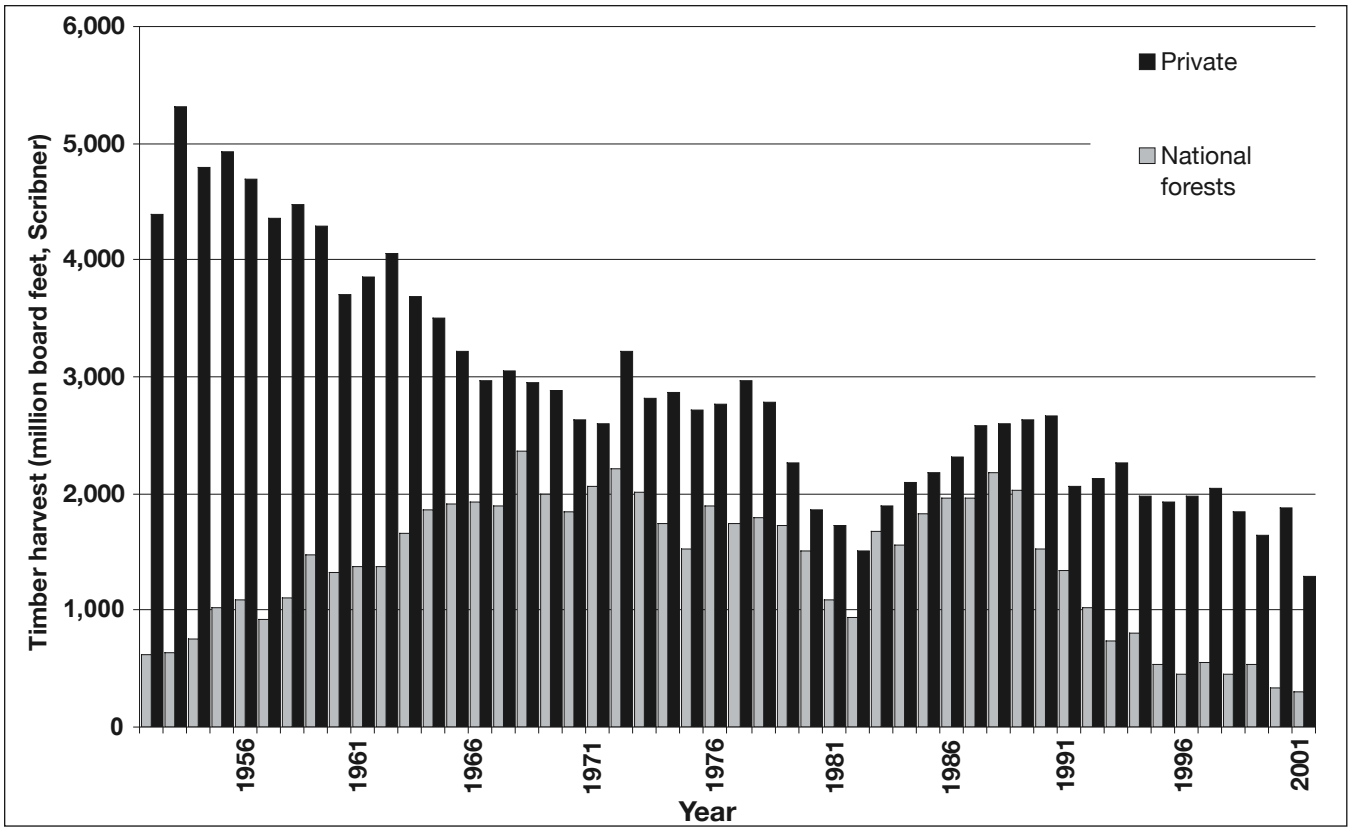

Figure 3—California timber harvest on private and national forest lands, 1952-2001.

Table 1—California's timber harvest by ownership class, 2000

Ownership	Harvest	Percentage of total
	Million board feet[a]	
Industrial	1,075.2	47.79
Nonindustrial private	800.7	35.59
National forest	337.1	14.98
State	18.6	.83
Tribal	9.9	.44
Bureau of Land Management	7.7	.34
Other public	.5	.02
Total	2,249.7	100.00

[a] Volume in Scribner Decimal C Log Rule for the east side.

At the state level, growth exceeded harvest for every ownership class, with growth-to-harvest ratios ranging from 1.5:1 on industrial forest land and 1.6:1 on nonindustrial private, to 5.9:1 on national forests and 6.2:1 on other public lands (table 2). These statistics would seem to indicate substantial underutilization on public lands, but they do not describe growth-to-harvest differences that may exist within the >10-inch category (e.g., growth-to-harvest ratios for 11- to 12-inch trees versus 32- to 40-inch trees), nor do they reflect de facto reservations resulting from riparian rules and management overlays that guide or restrict harvest activities.

Table 2—California's timber harvest, standing volume, growth, and growth:harvest ratio by ownership class, 2000

Ownership	Harvest	Percentage of total	Standing	Percentage of total	Growth	Percentage of total	Growth: harvest
	MMBF[a]		*MMBF*[a]		*MMBF*[a]		
Industrial	1,075.2	47.8	50,907.0	17.2	1,564.7	31.2	1.5
Nonindustrial private	800.7	35.6	50,116.0	17.0	1,245.9	24.9	1.6
National forest	337.1	15.0	184,409.3	62.4	1,986.2	39.6	5.9
Other public	26.8	1.2	6,930.0	2.3	165.0	3.3	6.2
Tribal	9.9	.4	3,194.0	1.1	50.7	1.0	5.1
Total	2,249.7	100.0	295,556.3	100.0	5,012.6	100.0	2.2

[a] Volume in Scribner Decimal C Log Rule for the east side. MMBF = million board feet.

Harvest by Geographic Source

California has historically been divided into two major wood-producing regions, Coastal and Interior, with the Coastal Region defined as counties lying west of the crest of the Coast Range from the Oregon border south to Monterey County (fig. 4), and the Interior Region consisting of all remaining counties (Barrette et al. 1970). The Coastal Region consists of two resource areas, the North Coast Resource Area and Central Coast Resource Area. The Interior Region is divided into four resource areas: Northern Interior, Sacramento, San Joaquin, and Southern California. The majority of California's timber harvest consistently comes from the northern coastal and interior counties (Barrette et al. 1970; California State Board of Equalization 1992-2001; Hiserote and Howard 1978; Howard 1974, 1984; Howard and Ward 1988, 1991; Ward 1995, 1997).

Figure 4—California's forest resource areas.

In 2000, five counties accounted for nearly 55 percent of the timber harvested in California, each having over 190 MMBF harvested (table 3). Humboldt County led timber harvest in 2000 with more than 435 MMBF; Siskiyou County's harvest was nearly 210 MMBF, whereas Shasta, Plumas, and Mendocino Counties rounded out the top five with about 194 MMBF each. Historically, about 20 percent of California's timber came from Humboldt County, which has been the leading timber-producing county in the state for over four decades (table 4). Five other northern counties also have continued to be top timber producers: Mendocino, Plumas, Shasta, Siskiyou, and Trinity (Barrette et al. 1970; Hiserote and Howard 1978; Howard 1974, 1984; Howard and Ward 1988, 1991; Ward 1995, 1997). Redwood (*Sequoia sempervirens* (D. Don) Endl.), which only grows in the two coastal resource areas, accounted for about half (309 MMBF) of the timber harvested from Humboldt and Mendocino Counties in 2000.

Growth exceeded harvest by a minimum of 70 percent in every resource area in 2000 (table 5), even ignoring the growth in trees 10 inches d.b.h. or less. With the exception of Southern California, which had no industrial timber harvest, the Central Coast Resource Area had the greatest growth-to-harvest ratio at 7.0:1. The Sacramento Resource Area, with about 31 percent of the harvest, had the lowest growth-to-harvest ratio of 1.7:1.

Harvest by Species

Douglas-fir was the leading species harvested for timber in California during 2000. Douglas-fir accounted for 620.7 MMBF, or nearly 28 percent of the total, followed by true firs, ponderosa pine (*Pinus ponderosa* Dougl. ex Laws.) and redwood, accounting for 19, 18, and 17 percent of the harvest, respectively (table 6). The remainder of the harvest was composed of sugar pine (*Pinus lambertiana* Dougl.), western hemlock (*Tsuga heterophylla* (Raf.) Sarg.), incense-cedar (*Calocedrus decurrens* Torr. Florin), and other species and species groups, each accounting for less than 6 percent of the harvest. Hardwoods accounted for less than 0.5 percent of harvest.

Historically, the relative proportions of timber harvested by species and species groups have been similar to those of 2000 (table 7), with true firs, Douglas-fir, ponderosa pine, and redwood providing the largest share (Barrette et al. 1970; California State Board of Equalization 1992-2001; Hiserote and Howard 1978; Howard 1974, 1984; Howard and Ward 1988, 1991; Ward 1995, 1997). With the exceptions of 1982 and 1992, when yellow pines and redwood, respectively, were the leading species harvested, Douglas-fir has been the most harvested species by volume.

Table 3—California's timber harvest by county, 2000

County	Volume[a]	Percentage of total
	Million board feet	*Percent*
Amador	22.8	1.01
Butte	86.4	3.84
Calaveras	67.0	2.98
Del Norte	50.4	2.24
El Dorado	106.7	4.74
Fresno	19.8	.88
Glenn	24.7	1.10
Humboldt	435.3	19.35
Kern	3.6	.16
Lake	9.6	.43
Lassen	69.3	3.08
Madera	4.8	.22
Mariposa	3.6	.16
Mendocino	193.5	8.60
Merced	.3	.01
Modoc	49.9	2.22
Nevada	59.6	2.65
Placer	40.4	1.80
Plumas	193.8	8.62
San Mateo	5.6	.25
Santa Clara	4.2	.19
Santa Cruz	19.6	.87
Shasta	194.3	8.63
Sierra	33.1	1.47
Siskiyou	209.7	9.32
Sonoma	28.1	1.25
Tehama	105.3	4.68
Trinity	99.6	4.43
Tulare	8.9	.40
Tuolumne	60.7	2.70
Yolo	2.6	.11
Yuba	36.9	1.64
Total	2,249.7	100.00

[a] Volume in Scribner Decimal C Log Rule for the east side.

Table 4—Percentage of total harvest for California's leading timber harvest counties, 1968-2000

County	Total	Percentage of total
	1968	
Humboldt	1,186.8	21.7
Mendocino	533.4	9.7
Siskiyou	502.6	9.2
Trinity	431.6	7.9
Shasta	381.1	7.0
Total county	3,035.5	55.5
California total	5,473.0	
	1972	
Humboldt	1,079.0	19.9
Mendocino	523.1	9.6
Siskiyou	518.7	9.5
Del Norte	354.5	6.5
Shasta	349.9	6.4
Total county	2,852.2	52.0
California total	5,435.2	
	1976	
Humboldt	1,073.3	22.7
Mendocino	489.2	10.3
Shasta	359.3	7.6
Siskiyou	337.1	7.1
Del Norte	236.4	5.0
Total county	2,495.3	52.7
California total	4,731.0	
	1982	
Humboldt	456.2	18.3
Mendocino	448.1	17.9
Plumas	164.7	6.6
Trinity	161.2	6.5
Tehama	148.3	5.9
Total county	1,378.6	55.2
California total	2,497.0	
	1985	
Humboldt	608.1	15.0
Mendocino	435.1	10.7
Shasta	204.1	5.0
Plumas	202.2	5.0
Siskiyou	201.8	5.0
Total county	1,651.3	40.7
California total	4,056.0	

County	Total	Percentage of total
	1988	
Humboldt	769.0	15.9
Mendocino	499.1	10.3
Siskiyou	295.6	6.1
Trinity	272.1	5.6
Plumas	271.5	5.6
Total county	2,107.3	43.5
California total	4,840.0	
	1992	
Humboldt	502.2	15.6
Mendocino	271.6	8.5
El Dorado	195.1	6.1
Lassen	158.8	4.9
Shasta	142.9	4.4
Total county	1,270.6	39.5
California total	3,214.0	
	1994	
Humboldt	559.6	19.7
Plumas	163.5	5.8
Shasta	147.5	5.2
Lassen	123.3	4.3
Trinity	117.2	4.1
Total county	1,111.1	39.1
California total	2,839.0	
	2000	
Humboldt	435.3	19.3
Siskiyou	209.7	9.3
Shasta	194.3	8.6
Plumas	193.8	8.6
Mendocino	193.5	8.6
Total county	1,226.6	54.5
California total	2,249.7	

Table 5—California's timber harvest, standing volume, growth, and growth: harvest ratio by resource area, 2000

Resource area	Harvest[a]	Standing volume (>10 inch d.b.h.)	Growth (>10 inch d.b.h.)	Growth: harvest
		Million board feet		
North Coast	707.2	60,157.2	1,655.6	2.3
Central Coast	29.4	10,824.4	207.6	7.0
North Interior	622.6	92,525.0	1,466.5	2.4
Sacramento	699.0	84,358.9	1,174.8	1.7
San Joaquin	191.4	44,340.3	472.2	2.5
Southern California	—	3,346.0	36.3	[b]
Total	2,249.7	295,551.9	5,013.0	2.2

— = no wood harvested.
[a] Volume in Scribner Decimal C Log Rule for the east side.
[b] With no harvest, growth:harvest ratio is undefined.

Table 6—California's timber harvest by species, 2000

Species	Volume[a]	Percentage of total
	Million board feet	*Percent*
Douglas-fir	621	27.59
True firs	428	19.00
Ponderosa pine	407	18.10
Redwood	375	16.66
Sugar pine	128	5.70
Western hemlock	121	5.40
Incense-cedar	107	4.75
Other softwoods	52	2.32
Hardwoods	11	.48
All species	2,250	100.00

[a] Volume in Scribner Decimal C Log Rule for the east side.

Growth-to-harvest ratios by species ranged from 1.1:1 for true firs to 38.1:1 for hardwoods (table 8), indicating that nearly all net growth of true firs was captured by harvest, and that the hardwood resource was minimally utilized. Hardwood harvest made up only 0.5 percent of statewide harvest but accounted for over 9 percent of statewide standing volume and over 8 percent of statewide growth. Statewide, redwood accounted for 8 percent of standing volume but represented nearly 17 percent of harvest and over 15 percent of statewide growth. The growth-to-harvest ratio of 2.1:1 for redwood suggests no lack of sustainability in aggregate. The 1.1:1 ratio for the comparatively slow-growing true firs was due to high mortality, particularly in the older and larger (>10 inches d.b.h.) trees. On a cubic-foot-volume basis, 31 percent of the annual net growth in true fir volume occurred

in trees 10 inches d.b.h. or smaller and was thus not accounted for in the stated growth-to-harvest ratio.

Table 7—Percentage of California's timber harvest by species, 1968-2000

Species	1968	1972	1976	1982	1985	1988	1992	1994	2000
					Percent				
Douglas-fir	32.2	26.9	27.4	22.9	24.1	26.5	23.2	26.7	27.6
True firs	22.4	21.8	19.9	21.1	22.0	23.0	22.9	25.6	19.0
Ponderosa and sugar pine	23.7	25.3	25.4	27.0	26.3	26.9	23.4	22.0	23.8
Redwood	18.2	18.7	19.5	24.3	22.6	18.2	24.9	21.9	16.7
Incense-cedar	[a]	4.1	4.1	3.9	3.0	3.7	4.3	2.4	4.7
Other softwoods [b]	3.3	3.0	3.6	.5	1.4	1.3	1.3	1.3	7.7
Hardwoods	.2	.2	.2	.4	.5	.5	[c]	[c]	.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Harvest for years prior to 2000 does not include timber delivered to out-of-state mills.
[a] Included in "Other softwoods."
[b] Other softwoods include western hemlock, lodgepole pine, spruces, and other coniferous species.
[c] Less than 0.05 percent.

Table 8—California's timber harvest, standing volume, growth, and growth:harvest ratio by species, 2000

Species	Harvest[a]	Percentage of total	Standing[a]	Percentage of total	Growth[a]	Percentage of total	Growth: harvest
		MMBF[b]		*MMBF*[b]		*MMBF*[b]	
Douglas-fir	620.7	27.6	85,418.2	28.9	1,674.6	33.4	2.7
True firs	427.5	19.0	65,562.4	22.2	458.4	9.1	1.1
Ponderosa pine	407.3	18.1	35,776.3	12.1	744.9	14.9	1.8
Redwood	374.8	16.7	23,707.9	8.0	772.8	15.4	2.1
Other softwoods	408.6	18.2	57,952.9	19.6	955.1	19.1	2.3
Hardwoods	10.7	.5	27,138.7	9.2	406.8	8.1	38.1
All species	2,249.7	100.0	295,556.3	100.0	5,012.6	100.0	2.2

[a] Volume in Scribner Decimal C Log Rule for the east side.
[b] MMBF = million board feet.

Harvest by Product Type

Timber used in the direct manufacture of products is the focus of this report. Products directly manufactured from timber, also referred to as "primary products," include lumber, plywood, veneer, posts and poles, pilings and timbers, and cedar shakes and shingles. Products made from chipping or grinding timber, as well as from the residues (e.g., bark, sawdust, and planer shavings) generated in the production of primary products, also are included. These "reconstituted" primary products include pulp and paper, particleboard, medium-density fiberboard, hardboard, and

energy. Derivative, or "secondary" products (goods made from primary products) such as window frames, doors, trusses, and furniture are not included in this report. The following section, "The Structure of California's Forest Products Industry," focuses on four general categories of primary products: saw logs (timber sawn to produce lumber), veneer logs (timber sliced or peeled to make veneer for plywood or laminated veneer lumber), bioenergy (timber burned industrially to generate electricity or steam for energy), and other products (timber used to manufacture pulp and paper, cedar shakes and shingles, and utility poles). Timber harvested for export is addressed under the "Timber Flow" section of this report.

Past studies of California's wood products industry (Barrette et al. 1970; Hiserote and Howard 1978; Howard 1974, 1984; Howard and Ward 1988, 1991; Ward 1995, 1997) indicate that saw logs have consistently been the leading component of the state's timber harvest and timber volume used by California mills, accounting for more than 85 percent of the total annually (table 9). From the late 1940s until the late 1970s, logs harvested for plywood and veneer production composed about 11 percent of the harvest. However, since the 1980s, veneer logs have accounted for only 4 to 8 percent of California's annual timber harvest.

Table 9—Percentage of California's timber harvest by product type (excluding bioenergy), 1968-2000[a]

Product type	1968	1972	1976	1982	1985	1988	1992	1994	2000
					Percent				
Sawlogs	86.0	86.0	86.0	91.2	92.0	92.5	99.3	92.9	92.0
Veneer logs	10.0	12.0	11.5	6.1	5.0	4.7	[b]	5.2	7.6
Pulpwood	1.0	1.5	.1	1.1	.8	1.1	[c]	[c]	[c]
Other [d]	3.0	.5	2.4	1.6	2.2	1.7	.7	1.9	.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[a] Harvest for years prior to 2000 does not include timber delivered to out-of-state mills.
[b] Included in "Sawlogs."
[c] Included in "Other."
[d] Includes shakes and shingles, posts and poles, and log export; does not include bioenergy.

Timber harvested for products other than saw and veneer logs have typically represented very small portions of California's total annual timber harvest. Because of the pulp and board sector's extensive use of mill residues, timber for that sector has typically represented less than 2 percent of California's timber harvest. Volumes of logs harvested for other products, including shakes and shingles, posts and poles, and international exports, have varied through the years but typically have accounted for less than 5 percent of annual harvest (table 9).

In 2000, saw and veneer logs together accounted for 97.2 percent (2,186 MMBF) of California's timber harvest for commercial products (table 10). Saw logs composed 89.8 percent (2,019 MMBF) of the total timber harvest, and veneer logs made up 7.4 percent (167 MMBF) of the harvest. Bioenergy, a burgeoning user of California timber, accounted for 2.4 percent (54.6 MMBF) of timber harvested in California in 2000, and all other primary products accounted for the remaining 0.4 percent (8.8 MMBF).

Table 10—California's timber harvest by ownership class and product type, 2000

Ownership source	Saw and veneer logs	Reconstituted board[a]	Bioenergy	Other products[b]	All products
		Million board feet [c]			
Private timberlands:					
Industrial	1,029.5	—	37.0	8.7	1,075.2
Nonindustrial	796.4	—	4.3	<.05	800.7
Tribal	9.9	—	—	—	9.9
Total, private timberlands	1,835.8	—	41.2	8.7	1,885.8
Public timberlands:					
National forests	323.7	—	13.3	.1	337.1
Other public	26.8	—	—	—	26.8
Total, public timberlands	350.5	—	13.3	.1	363.9

— = no timber harvested.
[a] No timber was harvested for production of reconstituted boards; only mill residues were used.
[b] Other product types include posts, poles and pilings, shakes and shingles, and pulp and paper.
[c] Volume in Scribner Decimal C Log Rule for the east side.

Product type by ownership class—

Timber harvest by product type and ownership source combined followed the same general trend as harvest by ownership source or product type alone. Private timberland provided the majority of volume for each product type, and saw logs were the leading product harvested from each ownership class (table 10). Private timberland supplied 84 percent (1,835.8 MMBF) of California's 2000 saw and veneer log harvest, whereas public forest land provided 16 percent (350.5 MMBF). Timber from industrial timberland composed 1,029.5 MMBF of the private saw and veneer log harvest, and national forest was the primary public supplier of saw and veneer logs at 323.7 MMBF. Industry-owned land was also the primary source of timber used for bioenergy and other products, accounting for 68 and 99 percent of the timber delivered to these sectors, respectively. National forests provided 24 percent of the bioenergy harvest and 1 percent of timber for all other products.

Because of flows of timber into and out of California, slight differences exist between California's timber harvest and receipts of timber by California mills (tables 10 and 11). California's sawmills and veneer plants received 2,217.4 MMBF of logs in 2000. Over 83 percent of that volume came from private lands (47 percent from industry lands, 36 percent from NIPF owners), 14 percent came from national forests, and less than 3 percent from all other lands. The bioenergy sector received 54.9 MMBF of timber; over 67 percent came from industrial lands, 24 percent from national forests, and the remainder from NIPF. Over 98 percent of the 8.9 MMBF of timber used by other industry sectors in California came from industry lands. The reconstituted board sector, which manufactures medium-density fiberboard, particleboard, and hardboard, as well as decorative bark producers received no timber and used mill residues as their sole source of wood fiber.

Table 11—Timber products delivered to California's forest industry sectors by ownership class, 2000

Ownership source	Saw and veneer logs	Reconstituted board[a]	Bioenergy	Other products[b]	All products
			Million board feet[c]		
Private timberlands:					
Industrial	1,052.6	—	37.0	8.7	1,098.4
Nonindustrial	789.8	—	4.6	<.05	794.4
Tribal	9.9	—	—	—	9.9
Total, private timberlands	1,852.3	—	41.6	8.8	1,902.6
Public timberlands:					
National forests	313.1	—	13.3	.1	326.5
Other public	31.5	—	—	—	31.5
Total, public timberlands	344.6	—	13.3	.1	358.0
Canada	20.5	—	—	<.05	20.6
Total	2,217.4	—	54.9	8.9	2,281.2

— = no timber harvested.
[a] No timber was harvested for production of reconstituted boards; only mill residues were used.
[b] Other product types include posts, poles and pilings, shakes and shingles, and pulp and paper.
[c] Volume in Scribner Decimal C Log Rule for the east side.

Product type by species—

Product type varied more by species than by ownership source. Although Douglas-fir and true firs led harvest volumes among saw and veneer logs, true firs and ponderosa pine led the bioenergy harvest, and hardwoods dominated harvest volumes for "other products." Douglas-fir accounted for 28.2 percent (615.8 MMBF) of the saw logs harvested from California in 2000 (table 12). True firs, ponderosa pine, and redwood were next with approximately 18 percent each. True firs filled 48

percent of the bioenergy harvest volume, followed by ponderosa pine at 23 percent, and by incense-cedar and Douglas-fir at 8 and 7 percent, respectively. All other species combined accounted for about 14 percent of timber harvested for energy. Hardwoods composed 68 percent of the harvest for other products, followed by Douglas-fir and ponderosa pine, at 14 and 10 percent, respectively. Redwood accounted for about 6 percent and cedar for less than 1 percent of timber harvested for other products.

Table 12—California's timber harvest by species and product type, 2000

Ownership source	Saw and veneer logs	Reconstituted board[a]	Bioenergy	Other products[b]	All products
			Million board feet[c]		
Douglas-fir	615.8	—	3.7	1.2	620.7
True firs	401.3	—	26.2	—	427.5
Ponderosa pine	393.9	—	12.5	.9	407.3
Redwood	374.3	—	—	.6	374.8
Sugar pine	127.0	—	1.3	—	128.3
Western hemlock	119.4	—	2.1	—	121.5
Incense-cedar	102.5	—	4.3	<.05	106.8
Other softwoods	50.3	—	1.7	.1	52.1
Hardwoods	2.0	—	2.7	6.0	10.7
All species	2,186.3	—	54.6	8.8	2,249.7

— = no timber harvested.
[a] No timber was harvested for production of medium-density fiberboard, hardboard, and particleboard; only mill residues were used.
[b] Other product types include posts, poles and pilings, shakes and shingles, and pulp and paper.
[c] Volume in Scribner Decimal C Log Rule for the east side.

End Uses of California's 2000 Timber Harvest

This section traces California's timber harvest through the various manufacturing sectors. Because both timber products and mill residues from manufacturing facilities are presented, volumes are expressed in cubic feet rather than in board feet Scribner. To account for all the wood fiber harvested and used, both bole wood and bark are included. On average, 85 percent of the wood fiber in the timber harvested was bole wood, and 15 percent was bark. Timber harvest volumes of bole wood were generally reported in board feet Scribner Decimal C Log Rule for the east side. Differences in conversion factors were due to size and quality differences in logs mills reported receiving. The following conversion factors were used to convert bole volume to cubic-foot volume:

- 5.2 board feet per cubic foot for saw and veneer logs
- 1.0 board feet per cubic foot for bioenergy logs
- 3.0 board feet per cubic foot for other products

The volume of bark was converted to cubic feet based on residue volumes reported in BDUs (2,400 pounds of ovendry wood) by using a conversion of 96 cubic feet per BDU.

The following figures refer to California's timber harvest and include timber products shipped to out-of-state mills. The figures do not include timber that was harvested in other states and processed in California. Figures for the pulp and board and other sectors were combined to avoid disclosing information on individual firms. Wood used for energy is displayed separately to distinguish internal use by sawmills and veneer plants versus wood used by other facilities to generate electricity, heat, or steam.

In 2000, California's timber harvest was approximately 558 million cubic feet (MMCF), 477 MMCF of bole volume and 81 MMCF of bark (fig. 5). Of this volume, 452 MMCF (80 percent) went as timber to sawmills; 37 MMCF (6 percent)

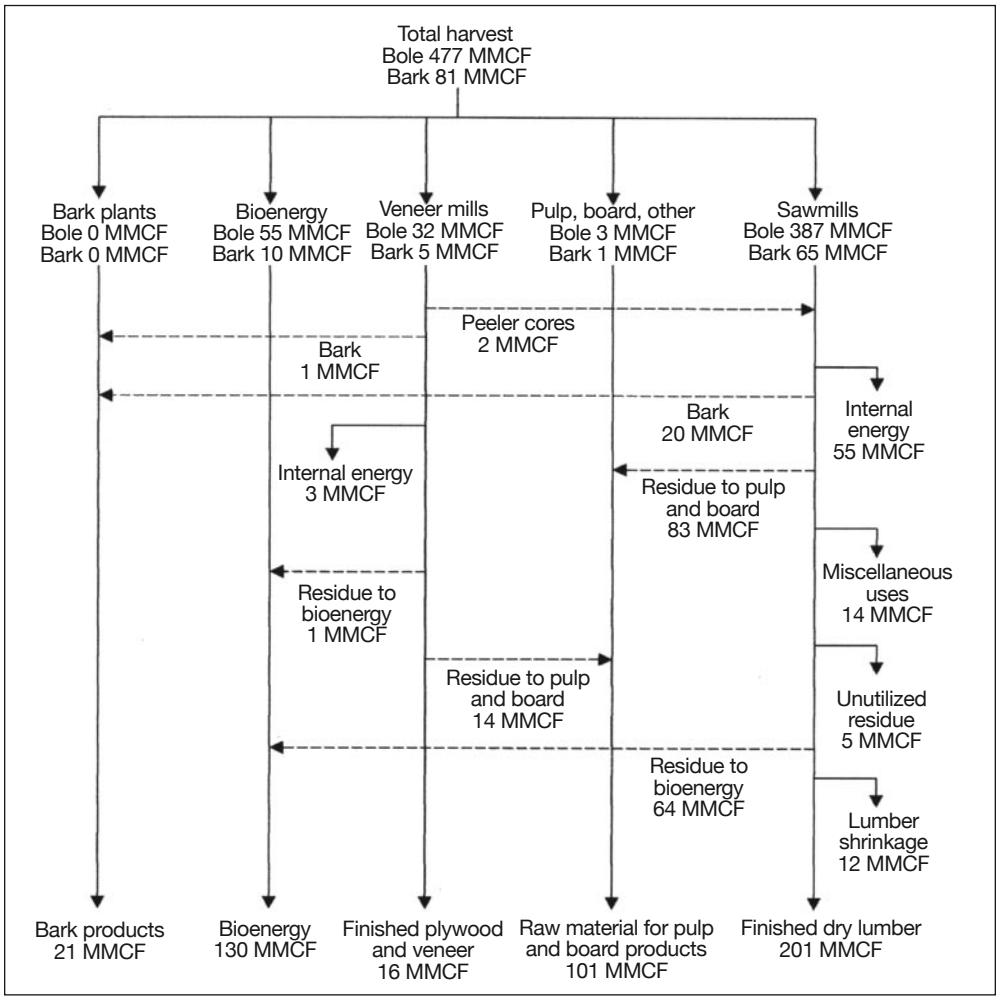

Figure 5—Utilization of California's timber harvest, 2000. MMCF = million cubic feet.

went as timber to veneer and plywood plants; 4 MMCF went as timber to pulp, board, and miscellaneous other mills; and 65 MMCF went as timber to energy facilities.

Of the 452 MMCF of timber and 2 MMCF of peeler cores delivered to sawmills, 201 MMCF (52 percent of bole volume and 44 percent of total volume) actually became finished lumber or another sawn product, 241 MMCF of wood fiber became mill residue, and 12 MMCF were lost from shrinkage of green lumber. About 83 MMCF of sawmill residue were sold as raw material to manufacturers of pulp and paper and particleboard, medium-density fiberboard, and hardboard in California and other states. Fifty-five (55) MMCF were used as fuel by the sawmill producing it, whereas 64 MMCF were sold to other facilities generating electricity or other forms of energy. Bark and mulch processors received about 20 MMCF, and 14 MMCF were used for miscellaneous other purposes such as livestock bedding. About 5 MMCF of material went unused.

Of the 37 MMCF of California's timber harvest received by veneer plants in California and other states, 43 percent (16 MMCF) of total timber volume (50 percent of bole volume) became veneer, and 57 percent (21 MMCF) became residue. Of the 21 MMCF that became residue, about 14 MMCF was sold as raw material to pulp and paper and board manufacturers, 3 MMCF was used internally as fuel, 1 MMCF was sold to other facilities generating electricity or other forms of energy, 2 MMCF was peeler cores further processed by sawmills into lumber, and 1 MMCF in bark went to bark plants.

About 4 MMCF of California's timber harvest was in the form of other industrial wood products—mostly pulpwood that was chipped and used to manufacture pulp and paper. Less than 1 MMCF of this timber was used internally as a source of energy. Pulp, paper, and reconstituted board facilities received an additional 97 MMCF of mill residues from sawmills and plywood plants for use as raw material.

About 130 MMCF of wood fiber from California's timber harvest was purchased to generate electricity, heat, or steam. Half of this volume came from timber that was hogged or chipped specifically to generate electricity, and the other half came as mill residue from sawmills and veneer plants.

In total, 558 MMCF of wood fiber, including bark, was harvested from California timberlands in 2000. Its uses were as follows:

- 201 MMCF became finished lumber
- 188 MMCF were used to generate energy, usually in the form of steam or electricity
- 101 MMCF were used as raw material to produce pulp and paper or reconstituted board products such as particleboard or medium-density fiberboard

- 21 MMCF were used by decorative bark/landscaping firms
- 16 MMCF became veneer or plywood
- 14 MMCF went to other uses such as animal bedding
- 12 MMCF were lost in shrinkage from green to dry lumber
- 5 MMCF were unused.

Timber Flow

This section briefly details the movement of timber among California's wood-producing regions, resource areas, and individual counties, as well as between California and other states. California timber-processing mills received over 2,281 MMBF of timber for processing in 2000. Slightly more than 151 MMBF (6.6 percent of timber processed in California) came from out of state, whereas slightly less than 120 MMBF (5.3 percent of California's timber harvest) was exported for processing in Oregon, making California a net importer of about 31 MMBF of timber in 2000 (table 13). Not surprisingly, practically all (99.7 percent) the timber imported into California and all the timber exported was saw and veneer logs. These export volumes do not include approximately 9 MMBF of logs exported internationally from California's customs districts (WWPA 2000-2002).

Table 13—California's timber imports and exports to other states, 2000

Timber products	Imports	Exports	Net imports (net exports)
		Million board feet[a]	
Saw and veneer logs	150.7	(119.6)	31.1
Bioenergy logs and pulpwood	.4	—	.4
Other logs[b]	<.05	—	<.05
Total	151.1	(119.6)	31.5

[a] Volume in Scribner Decimal C Log Rule for the east side.
[b] Other logs include timber harvested for posts and poles and shakes and shingles.

Historical accounts of California's forest products industry have focused solely on timber volumes received and used by mills in California (Barrette et al. 1970; Hiserote and Howard 1978; Howard 1974, 1984; Howard and Ward 1988, 1991; Ward 1995, 1997). In 2000, California's figures for total timber harvested and total timber processed were different because of timber flows into and out of the state. The net difference between harvest and use volumes by ownership source and timber product type is relatively small, making these volumes proportionately identical (tables 10 and 11).

International and interstate timber flows—

In 2000, California was a net importer of foreign timber, a shift from historical trends. Past reports (Barrette et al. 1970; Hiserote and Howard 1978; Howard 1974; Howard and Ward 1988, 1991; Ward 1995) do not indicate any timber entering California from international sources, although timber entering California from other states increased dramatically from the late 1960s through the 1990s. International imports of timber came solely from Canada in 2000, and at 20.6 MMBF, accounted for 0.9 percent of the timber processed in California (table 14).

Table 14—Ownership class of timber products received by California mills, 2000

Ownership source	Volume	Percentage of total
	Million board feet [a]	*Percent*
Private timberlands:		
Industrial	1,098.4	48.1
Nonindustrial	794.4	34.8
Tribal	9.9	.4
Total, private timberlands	1,902.6	83.4
Public timberlands:		
National forests	326.5	14.3
Other	31.5	1.4
Total, public timberlands	358.0	15.7
Canada	20.6	.9
Total	2,281.2	100.0

[a] Volume in Scribner Decimal C Log Rule for the east side.

In 1968, out-of-state timber accounted for less than 0.2 percent of the timber processed in California. Imports of timber from other states for processing in California increased 110 percent from the late 1960s through the mid-1980s. Meanwhile in-state timber harvest decreased by 26 percent, and total timber volume processed in-state declined about 40 percent (fig. 6). The trends for in-state harvest and total volume processed reversed in the late 1980s, growing by 19 and 26 percent, respectively, as volumes of timber imported for processing declined by 37 percent. However, between 1988 and 2000, California timber harvest and processed volumes dropped off by 54 and 45 percent, respectively, and imports of timber for processing in California increased 995 percent. Thus, out-of-state timber has accounted for over 6 percent of the annual volume processed in California during recent years. These trends indicate that, more than ever, California's mills are searching a larger geographic area for timber.

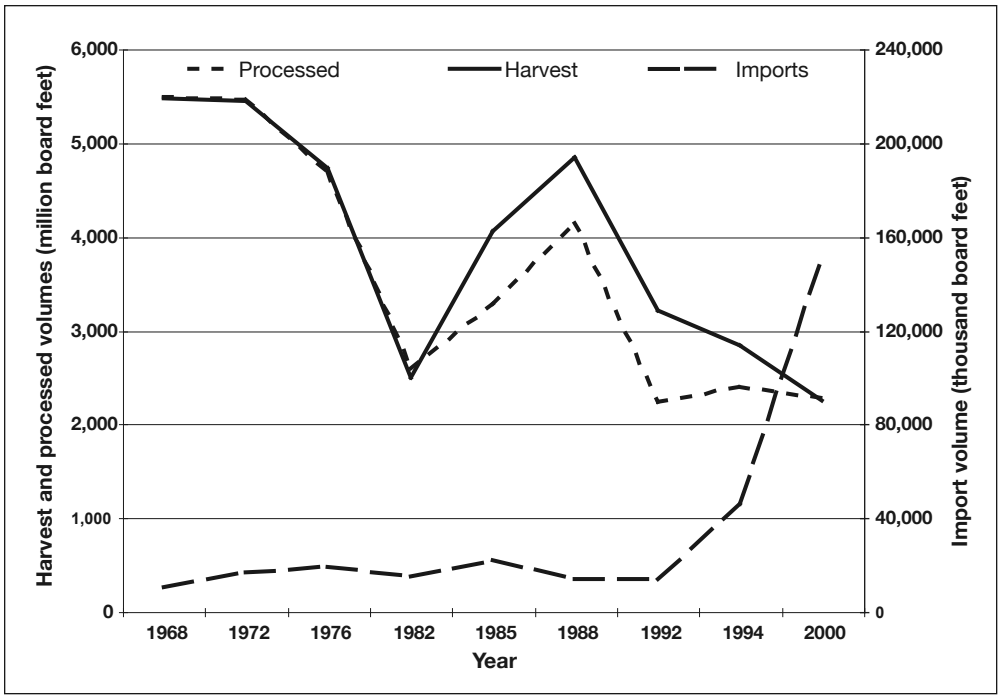

Figure 6—California timber volumes: harvested, processed, and imported.

International exports of timber from California ports averaged 9.3 MMBF from 1999 to 2001 (WWPA 2000-2002). This volume would represent less than 0.5 percent of California's annual timber harvest during the same period, although the reporting body does not indicate how much, if any, of the wood was actually harvested in California. The volume of timber exported from California to international destinations has decreased sharply over the last four decades (fig. 7). Likewise, the relative share of California's timber harvest volume that is exported has decreased. In 1968, the peak year for California timber exports, 202.4 MMBF or about 4 percent of California's timber harvest was exported, whereas in 1985, 64 MMBF or 1.6 percent of the state's harvest was exported (Barrette 1970, Howard and Ward 1988). Today it is estimated that less than 0.5 percent is exported.

Overseas and domestic markets for wood products, as well as legal and policy restrictions, affect year-to-year changes in timber exports and have profound effects on timber export volumes. From 1926 to 1968, the federal government did not restrict the export of logs from any land ownership class in the United States, whereas from 1968 to 1990, timber exports from federally owned or managed lands in the Western United States were capped (Gorte and Thomas 1993). Because overseas markets (particularly in Japan and Asia) were strong from the mid-1960s through the 1980s, the peak in California's total log exports in 1968 appears to be a direct response of log exporters to the cap, whereas a complete ban on the export

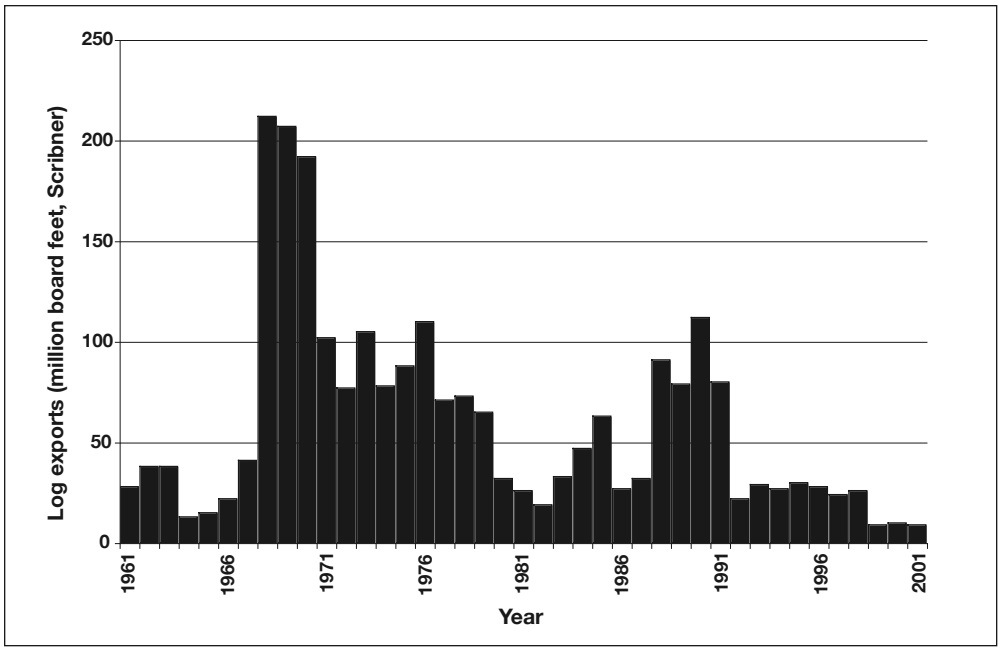

Figure 7—California's international log exports, 1961-2001 (WWPA 1964-2002).

of western redcedar (*Thuja plicata* Donn ex D. Don) logs in 1979 appears to have contributed to a 50-percent decrease in California log exports between 1979 and 1980. The 1990 Forest Resource Conservation and Shortage Relief Act (signed into law in 1993) banning log exports from Western federal lands (excluding Alaska) altogether, along with economic hardships in Japan and Asia (since the 1990s) have contributed to very low levels of log exports in recent years.

Intrastate timber flow—

This section briefly examines the flow of California timber harvested in 2000 to mills within the state. Because mill surveys capture actual county-to-county timber transfer volumes, the FIDACS was able to summarize the intercounty timber flow as well as the net difference between volumes processed and harvested in each county. However, numerous counties have too few timber-processing facilities to avoid disclosure of firm-level data, so individual county statistics are not reported for all counties. Instead, the Coastal and Interior wood-producing regions previously defined and several resource areas consisting of county groups within each region (Barrette et al. 1970) are discussed.

Timber harvested and processed within California is moving further today than in the past. In 1968, 74 percent of the volume used by California mills was processed in the county where it was harvested, and 92 percent in the same resource area or county group (Barrette et al. 1970). The in-area proportion was 92 percent in 1976 and in 1988 (Hiserote and Howard 1978, Howard and Ward 1991). In 1992,

the in-area proportion was 87 percent (Ward 1995). In 2000, 11 California counties processed more timber than they harvested, making them net importers of timber. Meanwhile, twice as many counties (22) were net exporters of timber, with harvest volumes exceeding processed volumes. Only 50 percent of California's 2000 timber harvest volume was processed in the county where it was harvested, and 82 percent in the resource area where it was harvested.

In 2000, the majority of timber processed in each of California's resource areas tended to originate in that area (table 15). Most of the volume not processed in-area tended to move to a more northerly or westerly resource area, or to Oregon. The Sacramento and Northern Interior Resource Areas shipped the largest volumes of timber to be processed out of area. The Sacramento Resource Area shipped nearly 161 MMBF, primarily to the Northern Interior; and the Northern Interior Resource Area shipped 133 MMBF, primarily to Oregon.

Table 15—California timber flow by resource area, 2000

	Processing area					
Harvest area	**North Coast and Central Coast[a]**	**North Interior**	**Sacramento**	**San Joaquin**	**Out of state**	**Total harvest**
	Million board feet Scribner					
North Coast and Central Coast[a]	694.3	26.5	2.2	—	13.7	736.7
North Interior	18.2	489.2	16.9	—	98.2	622.6
Sacramento	29.5	120.4	538.3	3.1	7.7	699.0
San Joaquin	.3	—	20.2	171.0	—	191.4
Out of state	88.2	61.3	1.6	—	NA	151.1
Total processed	830.5	697.4	579.2	174.1	119.6	

— = no timber harvested/processed.
NA = not applicable.
[a] North Coast and Central Coast resource areas combined to avoid disclosure of firm-level data.

Structure of California's Forest Products Industry

The 2000 census identified 93 active primary forest products plants in California (table 16). These plants produce an array of products including lumber and other sawn products, medium-density fiberboard, particleboard, hardboard, bioenergy, pulp and paper, shakes and shingles, decorative bark and mulch, and posts, poles, and pilings.

The slightly higher number of forest plants in 2000 versus the last survey in 1994 (Ward 1997) was due primarily to the inclusion of the bioenergy and decorative bark sectors in the 2000 census, offsetting a decline in the number of sawmills and pulp and board facilities. Not reported in 1994, the bioenergy and decorative

bark sectors included 25 and 10 facilities, respectively, in 2000. The number of sawmills dropped by 6, the number of veneer facilities dropped by 2, pulp and board facilities decreased by 5, and producers of other products dropped by 4 from 1994 to 2000.

Table 16—Active California primary wood products facilities by sector, 1968-2000

Industry sector	1968	1972	1976	1982	1985	1988	1992	1994	2000
Sawmills	216	176	142	101	89	93	56	53	47
Veneer and Plywood	26	25	21	10	6	6	3	4	2
Pulp and board	17	18	7	10	11	11	9	12	7
Bioenergy[a]	—	—	—	—	—	—	—	—	25
Decorative bark[a]	—	—	—	—	—	—	—	—	10
Other[b]	3	13	13	9	9	9	5	6	2
Total	262	232	183	130	115	119	73	75	93

[a] data unavailable for bioenergy and decorative bark sectors for 1968-94.
[b] Other includes shake and shingle manufacturers as well as post, pole, and piling manufacturers.

The number of active plants in recent years is in sharp contrast to the number of plants that have operated in California in the past (table 16). In 1956, 695 sawmills were in operation (Barrette et al. 1970); however, the last 50 years have witnessed extensive closures of smaller and less competitive mills, especially those unable to handle smaller logs, leading to the concentration of production capacity into larger, more efficient mills. Between 1988 and 2000, the continued reduction in the number of mills was due primarily to reduced timber availability, with a considerable number of larger mills closing. Since 2000, about a dozen primary wood products facilities have closed (Ehinger 2002, Spelter and Alderman 2002).

Wood and paper product manufacturing facilities operated in 28 of California's 58 counties in calendar year 2000 (table 17). Humboldt County contained 15 active timber-processing facilities (including 12 sawmills and one bioenergy plant) in 2000, followed by Shasta County with 14 facilities (including five mills and seven bioenergy plants). Only three other counties had more than five active facilities: Mendocino with eight (including six sawmills and one bioenergy plant), Sonoma with six (four sawmills and two bark plants), and Tuolumne with six (three sawmills, two bioenergy facilities, and one bark plant).

Historical sales value figures for the output of California's forest products industry are available on a consistent basis only for lumber. Based on reported lumber sales (WWPA 1964-2002), historical production data, and descriptions of other industry sectors in previous industry studies, the annual sales value of California's primary forest products (free on board the producing mill) would have exceeded

$4 billion (in constant 2000 dollars) for a number of years in the 1960s and 1970s. As recently as 1988, sales value was approximately $4 billion. The total sales value of California's primary forest products plants in 2000 was about $2.3 billion (table 18).

Table 17—Active California primary wood products facilities by county and sector, 2000

County	Sawmills	Veneer	Medium-density fiberboard and particleboard	Bioenergy	Decorative bark	Other [a]	Total
Amador	—	—	1	1	—	—	2
Butte	—	—	—	1	—	—	1
Del Norte	—	—	1	—	—	1	2
El Dorado	2	—	—	—	—	—	2
Fresno	—	—	—	2	—	—	2
Glenn	—	—	—	—	1	—	1
Humboldt	12	—	1	1	—	1	15
Kern	—	—	—	1	1	—	2
Lassen	2	—	—	3	—	—	5
Mendocino	6	—	1	1	—	—	8
Nevada	1	—	—	-	—	—	1
Placer	1	—	1	2	—	—	4
Plumas	2	—	—	2	—	—	4
Riverside	—	—	—	1	—	—	1
San Joaquin	—	—	—	—	2	—	2
Santa Clara	1	—	—	—	—	—	1
Santa Cruz	1	—	—	—	—	—	1
Shasta	5	—	—	7	—	2	14
Sierra	1	—	—	—	—	—	1
Siskiyou	1	2	—	—	1	—	4
Sonoma	4	—	—	—	2	—	6
Sutter	1	—	—	—	—	—	1
Tehama	—	—	—	—	1	—	1
Trinity	1	—	—	—	—	—	1
Tulare	1	—	—	—	1	—	2
Tuolomne	3	—	—	2	1	—	6
Yolo	—	—	—	1	—	—	1
Yuba	2	—	—	—	—	—	2
All counties	47	2	5	25	10	4	93

[a] Other facilities include pulp and paper mills, shake and shingle manufacturers, and post, pole, and piling facilities.

Table 18—Sales value of California's primary wood products, 2000

Product	2000 sales
	Thousand U.S. Dollars
Lumber, timbers, and associated products	1,492,190
Residue-utilizing sector [a]	463,990
Energy and electric	260,235
Other primary wood products [b]	77,044
Total, primary wood products	2,293,459

[a] Residue-utilizing sector includes pulp, paper, and board manufacturers, and decorative bark.
[b] Other products include veneer, shakes and shingles, and posts, poles, and pilings.

Sawmill Sector

Based on sales value (table 18) and amount of timber processed (table 11), sawmills remain the largest component of California's forest products industry. California lumber production volume in the late 1950s peaked at 6.06 billion board feet (fig. 8), corresponding with high harvest levels and strong demand as part of the post-World War II housing boom. Production was at about 5 billion board feet annually through the 1960s and 1970s. Increased lumber recovery per million board feet of timber processed somewhat offset slightly lower harvest levels and increased use of timber by the plywood industry during the 1960s.

With very strong markets throughout the 1970s, annual average lumber production exceeded 5 billion board feet (fig. 8), and annual sales value exceeded $3.5 billion during 4 years of the decade (fig. 9). In late 1979, there was an abrupt and extreme downward shift in wood products markets brought on by the most severe recession of the post-World War II period. The early 1980s were a time of very low prices, and in the severe recession of 1982, lumber production fell to 2,987 MMBF, with sales of $1.4 billion. In 1988, California sawmills rebounded with lumber production of 5,671 MMBF and sales of $2.6 billion, owing to a strong national economy, a temporary abundance of timber, and continued increases in lumber recovery per unit of timber processed.

Declining timber availability led to mill closures and declines in lumber production throughout the 1990s, whereas high prices supported a somewhat lesser decline in sales value (figs. 8 and 9). Weakening markets and continuing constraints on timber availability caused output to drop to 3.1 billion board feet in 2000 with a value of $1.4 billion and further declines to 2.7 billion board feet and sales of $1.2 billion in 2001. In 2000, California's 47 active sawmills produced just under 9 percent of U.S. production of softwood lumber, or nearly 6 percent of U.S. consumption (WWPA 2000-2002).

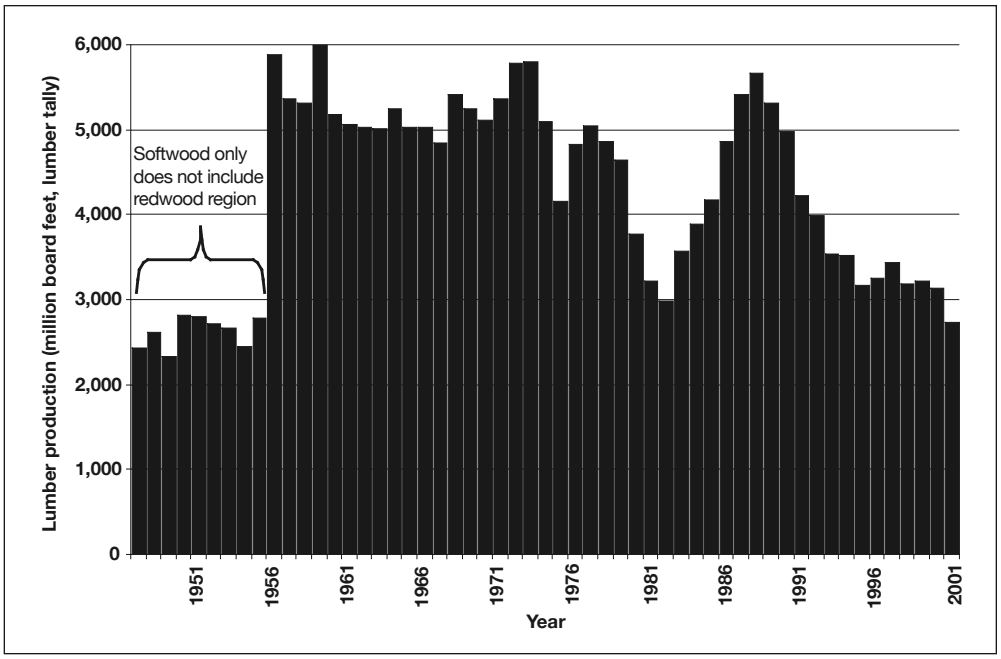

Figure 8—California's lumber production, 1947-2001 (WPA 1954, WWPA 1964-2002).

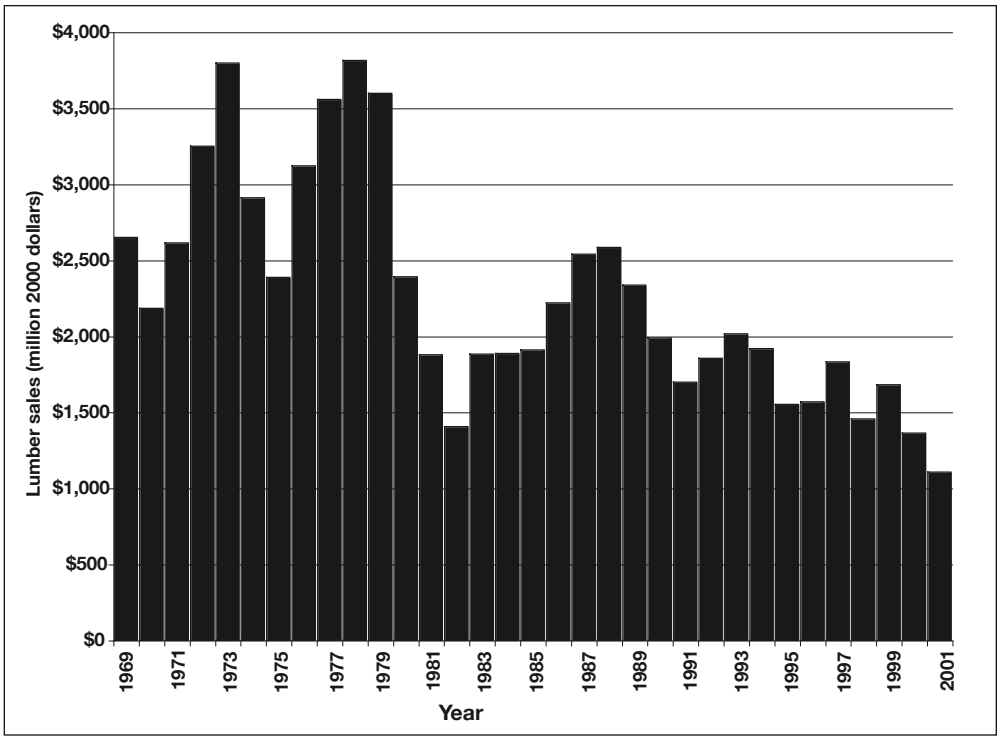

Figure 9—California's inflation-adjusted lumber sales, 1969-2001.

Plywood and Veneer Sector

California's plywood and veneer sector rapidly emerged, climaxed, and has all but disappeared over the past 60 years. Plywood production grew steadily from the late 1940s, peaking at 1.3 billion square feet in 1964 (fig. 10). Production then began a steady decline until 1992--the last year plywood production was reported for a California mill.

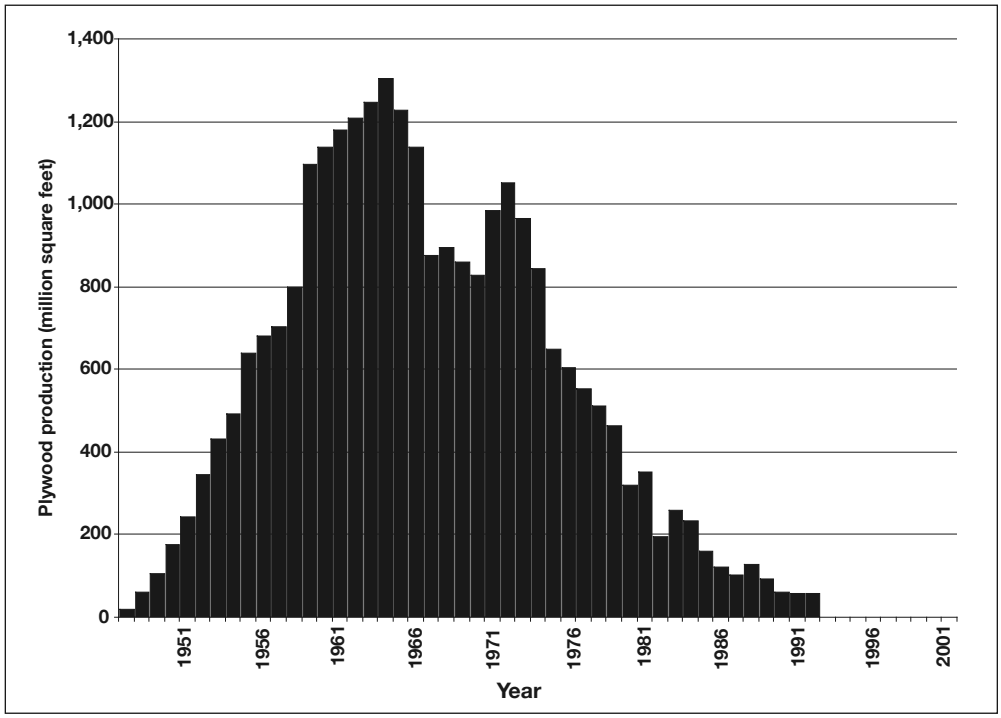

Figure 10—California's plywood production, 1947-2001.

A number of reasons appear to account for the decline and disappearance of California's plywood industry. Howard (1974) indicates reduced availability of large-diameter Douglas-fir as a factor leading to subsequent decreases in plywood manufacture. Additionally, a spike in log exports in the late 1960s and early 1970s also potentially brought increased competition for logs. Longer term market conditions, in particular increasing competition with oriented strand board during the 1980s, led to plywood plant closures, especially in the high-cost producing regions in the Western United States (Adams 2002). There are currently only two mills in California producing veneer for further manufacture into plywood by mills operating in Oregon. Additional detail about these facilities cannot be provided without disclosing firm-level data.

Bioenergy Sector

California's bioenergy sector in 2000 comprised plants ranging from cogeneration facilities at sawmills, producing steam and electricity, to stand-alone facilities using mixtures of urban, agricultural, and mill wastes, timber, and even geothermal energy to generate and sell electricity. Of the more than 30 bioenergy facilities operating in California in 2000, 25 were identified as using some type of wood fiber, including roundwood, forest chips (i.e., trees chipped in the forest), slash, and mill residues. Only two facilities operated solely on mill residues, six used a mixture of agricultural and urban wastes and mill residues but no forest chips, and 17 facilities used the full complement of biomass sources including mill residues, forest chips, and agricultural and urban wastes. Other facilities using only urban or agricultural wastes (including rice hulls or walnut shells) were not included in this analysis.

California's bioenergy sector used almost 55 MMBF of timber in 2000, about 2.4 percent of the state's timber harvest. About 360,000 board feet (0.7 percent) of the timber used came from out of state. Of the timber harvested for bioenergy in California, 76 percent came from private lands and the remainder from national forests. True firs and ponderosa pine were the species most often harvested for bioenergy.

Consuming almost half (1.4 million BDUs) of wood residues generated by California's primary wood products industry, the bioenergy sector is quite important to the forest products industry, especially given recent declines in the state's pulp, paper, and board sectors. Without these bioenergy facilities, sawmills would face disposal costs for residues that may otherwise go unused. Instead, the bioenergy sector purchases the residues and produces energy, providing the wood products industry with additional revenue.

The total energy-producing capacity of the 25 wood-using bioenergy facilities operating in 2000 exceeded 470 MW: seven facilities rated at 10 MW or less, six between 10 and 20 MW, and 12 greater than 20 MW. These facilities generated and sold over 3.1 million megawatt hours (MWh) of power in 2000. One MWh represents one month's power consumption for about 1,000 typical Californian homes (California Energy Commission 2003). Not surprisingly, nearly all the energy generated by the bioenergy facilities in 2000 was sold in California. Sales value of this energy totaled aproximately $260 million (table 18), or about $ 0.0825 per kilowatt hour (kWh) on average. During the energy crisis of 2000, spot market prices for electricity ranged from $0.03 to $0.30 per kWh. Current contract prices for electricity from bioenergy facilities range from $0.05 to $0.08 per kWh.

Other Sectors

Included in the "other sectors" category of the primary wood products industry in California are residue-utilizing manufacturers, bark and mulch processors, and other manufacturers who make shakes, shingles, and utility poles from timber. Relatively small volumes of timber were processed by these other sector firms in 2000, but they utilized much of the mill residues generated by sawmills and other timber processors. Additional detail on the volumes of residues used by these firms can be found in the "End Uses of California's 2000 Timber Harvest" and "Mill Residue" sections of this paper. Sales for the residue-utilizing and other primary wood products totaled nearly $541 million in 2000 (table 18). Sales values for some of the separate sectors are withheld to avoid disclosure of firm-level data.

Residue-utilizing manufacturers—

The number of residue-utilizing manufacturers operating in California has generally been declining over the past four decades (table 16). In 1994, there were 12 pulp and paper and board firms, whereas in 1972 there were 18 (9 pulp and paper mills and 9 board facilities). In 2000, California's residue-utilizing manufacturers included three particleboard plants, one pulp mill, one pulp and paper mill, one medium-density fiberboard facility, and one hardboard manufacturer. Sales from these seven firms totaled about $418 million in 2000. Based on published annual and (8-hour) shift capacities (Miller Freeman, Inc. 1999, Paperloop 2000, Random Lengths 2001), annual capacity of the reconstituted board manufacturers totaled about 715 million square feet in 2000, and capacity of the pulp and paper mills totaled 420 thousand tons of pulp and paper in 2000. As of January 2003, the hardboard facility had closed, one pulp and paper mill had closed, and one particleboard plant was sold but is operating under new ownership.

Bark and mulch processors—

Prior to the early 1970s, the bark removed from timber during the production of lumber and other primary products was usually burned on site for fuel, buried in landfills, or burned as waste. A market developed by the nursery and gardening industry led to the establishment of 3 decorative bark mills by 1975; this number had grown to 10 by 2000. Sales from these producers totaled about $46 million. Bark and mulch manufacturers produced a variety of products from the raw material, including decorative bark, landscape bark, utility chips, and mulch, sold in both bulk and bagged form. Sales from these bark and mulch facilities have continued to grow and exceeded $63 million in 2002.

Other manufacturers—
The remaining primary wood products manufacturers surveyed in 2000 included one shake and shingle manufacturer and a utility pole producer. The number and variety of facilities composing California's "other" (wood product) manufacturers have varied throughout the years (table 16). Surveys have not always been successful at determining the total number of facilities operating, and cooperation, as well as production, by many of these smaller timber users has been sporadic. These producers typically are very small, family-run operations that come and go as local demand for their products waxes or wanes. Because of the limited number of facilities, no production data are reported for these firms in 2000.

Plant Capacity

This section focuses on capacity to process timber—specifically sawtimber—from 1988 through 2001 and the utilized proportion of that capacity. Sawtimber is timber of "sufficient size and quality to be suitable for conversion into lumber" (Random Lengths 1993). California's sawtimber processing plants include sawmills, veneer mills, and utility pole plants. Capacity for 2000 was developed from this census of California's forest products industry; capacity for previous years was estimated based on changes from the 2000 base by using reported mill closures (Ehinger 2002, Spelter and McKeever 2002) and previous industry censuses, which provide some data on capacity in units of output such as board feet of lumber (Howard and Ward 1991, Ward 1995).

Sawtimber Processing Capacity

Through the FIDACS census, California mills were asked for their 8-hour shift and annual production capacities, given sufficient supplies of raw materials and firm market demand for their products. Most mills estimated annual capacity equal to two 8- or 9-hour shifts daily for 220 to 260 days per year. Some of the larger mills expressed capacity comparable to three 8-hour shifts or 120 hours per week. Smaller mills generally reported annual capacity at only one shift per day, for not more than 240 days per year.

Sawmill capacity was reported in thousand board feet, lumber tally. Veneer capacity was reported in thousands of square feet on a 3/8-inch basis, and utility pole capacity was reported in lineal feet of poles. To combine the capacity figures for the state's sawtimber users and to estimate the industry's total capacity to process sawtimber, capacity was expressed in units of raw material input (million board feet of timber Scribner Decimal C) and called processing capacity. Sawmill capacity figures were adjusted to million board feet of timber Scribner Decimal C

log scale by dividing production capacity in lumber tally by each mill's lumber recovery per board foot Scribner of timber processed. Veneer capacity figures were adjusted to million board feet Scribner by dividing production capacity in square feet of 3/8-inch veneer by each mill's veneer recovery figure. Capacities for utility pole plants were adjusted to thousand board feet Scribner by multiplying capacity in lineal feet by an average Scribner board-foot volume per piece or per lineal foot.

California's capacity to process timber in 2000 was an estimated 2.68 billion board feet Scribner, of which 83 percent was utilized with mills processing just over 2.2 billion board feet (fig. 11). Several mill closures in 2001 reduced capacity to 2.5 billion board feet Scribner, processing about 1.9 billion board feet. In 2002, three additional sawmill closures were announced. Although this decline was somewhat offset by expansion at a number of existing facilities, it appears that in 2002, capacity to process sawtimber fell to about 2.4 billion board feet.

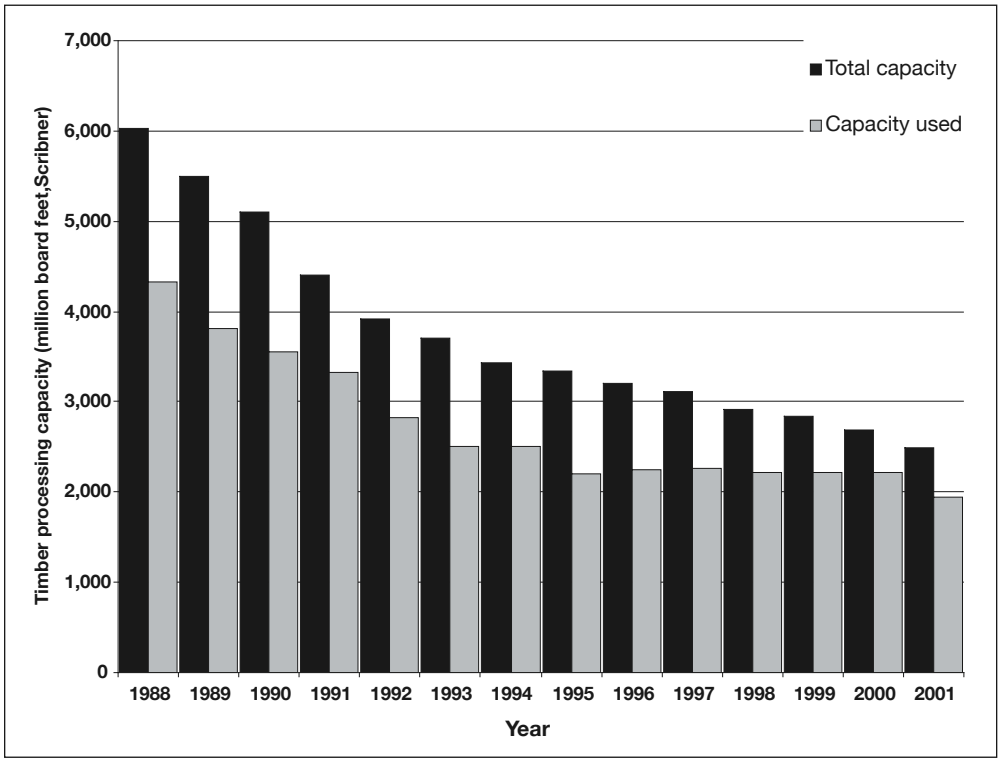

Figure 11—California's capacity for processing sawtimber, 1988-2001.

Certainly the poor lumber markets of the last 3 years have contributed to these recent declines in timber-processing capacity, but they are a continuation of steady substantial declines since the late 1980s. Annual timber-processing capacity in California was an estimated 6 billion board feet Scribner in 1988, when the state's

sawtimber users processed over 4 billion board feet. With the impacts described earlier, but in particular because of declining federal timber offerings and increased state regulations, capacity dropped consistently through the 1990s, even in years with lumber prices (Random Lengths 1976-2001) at or near record-high levels.

Lumber Recovery Factor and Overrun

Product recovery ratios, or the volume of output per unit of input, are reported for California's sawmills as lumber recovery factors (LRFs) and overrun. The LRF is the lumber output (in thousand board feet lumber tally) divided by the timber input (thousand cubic feet). The volume of sawtimber used by California's sawmills in 2000 was approximately 400 MMCF, and lumber production was about 3.1 billion board feet (lumber tally). Thus the statewide LRF for California sawmills in 2000 was 7.96 board feet of lumber per cubic foot of log input.

Between 1968 and 1988, there was a 30-percent increase in overrun, the board-foot volume of lumber produced per board foot (Scribner) of timber input. In 1988, California sawmills produced around 5,671 MMBF (lumber tally) by processing about 3,824 MMBF, Scribner Decimal C, of logs (Howard and Ward 1991) for an overrun of 1.48. This compares to overruns of 1.14 in 1968, 1.23 in 1972, 1.32 in 1976, 1.27 in 1982, and 1.39 in 1985 (Barrette et al. 1970; Hiserote and Howard 1978; Howard 1974, 1984; Howard and Ward 1988). Between 1988 and 2000, overrun increased another 3 percent. The volume-weighted statewide average overrun in 2000 was 1.53 board feet of lumber per board foot of timber.

Increases in overrun are attributable primarily to improvements in technology and smaller log sizes. Technological improvements have made California mills more efficient in numerous ways. Log size (diameter and length) sensing capabilities linked to computers determine the best sawing pattern for logs to recover either the greatest volume or greatest value from each log. Improved sawing accuracies have reduced the amount of size variation in sawn lumber increasing solid wood recovery. Thinner kerf saws reduce the proportion of the log that becomes sawdust. Additionally, the average log diameter has decreased over the past 50 years. As log diameters decrease, the Scribner log rule, which is used in California, underestimates by an increasing amount the volume of lumber that can be recovered from a log, thus increasing overrun.

Lumber Production Capacity

Capacity to produce lumber varies widely among California's 47 sawmills, and the proportion of capacity utilized is highly correlated with mill size (table 19). Total lumber production during 2000 was 3,138 MMBF, whereas production capacity was

slightly over 3,878 MMBF lumber tally. Thus, approximately 81 percent of California's total lumber-producing capacity was utilized. A majority, 2,259 MMBF (58.2 percent) of lumber-producing capacity, was aggregated among the 16 mills with capacity greater than 100 MMBF of lumber output. These largest mills accounted for 60.7 percent (1,903 MMBF) of lumber production, and utilized on average 84 percent of their lumber-producing capacity. Mills with capacities of 50 to 100 MMBF accounted for 1,467 MMBF (37.8 percent) of total capacity, produced 1,134 MMBF (36.1 percent) of the state's lumber, and on average utilized slightly less, about 77 percent, of their capacity. The remaining 13 sawmills accounted for less than 4 percent (153 MMBF) of lumber-producing capacity and less than 4 percent (100 MMBF) of total production. These smallest mills utilized the smallest proportion (about 66 percent) of their available lumber-producing capacity.

Mill Residue: Quantity, Type, and Use

As indicated earlier in this report, a substantial portion, about 60 percent, of the wood fiber (including bark) processed by primary forest products plants ends up as mill residue. Mill residue from primary wood products manufacturers can present difficult and expensive disposal problems, or it can be used to produce additional products and generate revenue. California's substantial bioenergy industry is the largest consumer of residues generated in the state, whereas sawmills are the largest residue producers.

Three types of wood residues are typically created by California's primary wood products industry: coarse or chippable residue consisting of slabs, edging, trim, log ends, and pieces of veneer; fine residue consisting primarily of planer shavings and sawdust; and bark. The 2000 census gathered information on volumes and uses of mill residue. Actual residue volumes, reported in BDUs, were obtained from facilities that sold all or most of their residues. All mills reported, on a percentage basis, how their residues were used. One BDU is the equivalent of 2,400 pounds of ovendry wood.

Residue volume factors, which express mill residue generated per unit of lumber produced, were derived from production, and from residue output volumes provided by mills. California's sawmill residue factors for 2000 are shown in table 20 and represent statewide averages. Sawmills accounted for 94.9 percent of all mill residues generated in California in 2000. In 2000, California sawmills generated more than 2.8 million BDUs of mill residue; 98.1 percent of this residue was utilized (table 21).

Other facilities produced 153,000 BDUs of residues, meaning all California timber processors generated about 3 billion BDUs of residue in 2000 (table 22).

Table 19—Number of active California swamills, capacity, production, and proportion of capacity utilized by capacity size class, 2000

Capacity size class	Number of mills	Capacity	Percentage total capacity	Average capacity per mill	Production	Percentage of total production	Average production per mill	Capacity utilized
		MMBF [a]	*Percent*	*MMBF* [a]	*MMBF* [a]	*Percent*	*MMBF* [a]	*Percent*
10 MMBF or less	6	11.6	0.3	1.9	7.3	0.2	1.2	62.9
Over 10 to 50 MMBF	7	141.0	3.6	20.1	93.1	3.0	13.3	66.1
Over 50 to 100 MMBF	18	1,467.1	37.8	81.5	1,134.1	36.1	63.0	77.3
Over 100 MMBF	16	2,258.8	58.2	141.2	1,903.2	60.7	119.0	84.3
Total	47	3,878.5	100.0	82.5	3,137.7	100.0	66.8	80.9

[a] MMBF = million board feet lumber tally.

Table 20—California's sawmill residue factors, 2000

Type of residue	Bone-dry units [a]
Per thousand board feet lumber tally	
Coarse	0.41
Sawdust	.15
Planer shavings	.13
Bark	.23
Total	.92

[a] Bone dry units (2,400 pounds of ovendry wood) of the various residue types generated for every 1,000 board feet of lumber manufactured.

Table 21—Volume of wood residue generated by California's sawmills, 2000

Residue type	Wood residue			Percentage of type		Percentage
	Used	Unused	Total	Used	Unused	of total
	Bone-dry units			*Percent*		
Coarse	1,265,090	26,000	1,291,090	98.0	2.0	45
Fine[a]	852,956	8,367	861,323	99.0	1.0	30
Bark	699,029	19,873	718,902	97.2	2.8	25
Total	2,817,075	54,240	2,871,315	98.1	1.9	100

[a] Fine residue includes sawdust and planer shavings.

Table 22—California's production and disposition of wood products residues, 2000

Type of residue	Total utilized	Reconstituted products	Hogfuel	Other uses	Unused	Total
			Bone-dry units			
Coarse[a]	1,359,053	902,537	395,681	60,835	26,000	1,385,053
Fine:[a]						
Sawdust	461,362	105,590	319,783	35,989	7,762	469,124
Planer shavings	398,792	222,324	117,266	59,202	605	399,397
Bark[a]	750,742	—	555,065	195,677	19,873	770,615
Total	2,969,949	1,230,451	1,387,795	351,703	54,240	3,024,189

[a] Includes residue from the manufacture of post and poles, as well as lumber and plywood.

Coarse residue was the state's largest wood products residue component (45.8 percent of all residues). California's primary wood products facilities produced 1.3 million BDUs of coarse residue, of which only 26,000 BDU (2 percent) were not utilized for some purpose. About 65 percent of coarse residues was chipped and used by the pulp and paper industry and reconstituted board plants, 29 percent was burned by the bioenergy sector, and about 4 percent was sold and used for other products.

Fine residues—sawdust and planer shavings—made up the second largest component (28.7 percent) of residues, 868,000 BDUs in 2000 (table 22). Sawdust composed 54 percent and planer shavings 46 percent of fine residues. All but 8,000 BDUs (1 percent) of fine residues were utilized in some fashion, primarily as fuel (437,000 BDUs) or in reconstituted products (328,000 BDUs). California facilities generated 771,000 BDUs of bark while processing timber in 2000—all but 3 percent of which was used by other sectors. Seventy-two percent of bark (555,000 BDUs) was used as hogfuel, and 25 percent (196,000 BDUs) was used as decorative bark or soil additives.

Forest Product Sales, Employment, and Worker Earnings

Product Markets and Sales Values

Mills responding to the FIDACS survey summarized their calendar year 2000 shipments of finished wood products, providing information on volume, sales value, and geographic destination. Mills usually distributed their products either through their own distribution channels or through independent wholesalers and selling agents. Because of subsequent transactions, the geographic destination reported here may not reflect final delivery points of shipments. The map in figure 12 shows the regions where California's manufactured wood products were distributed in 2000.

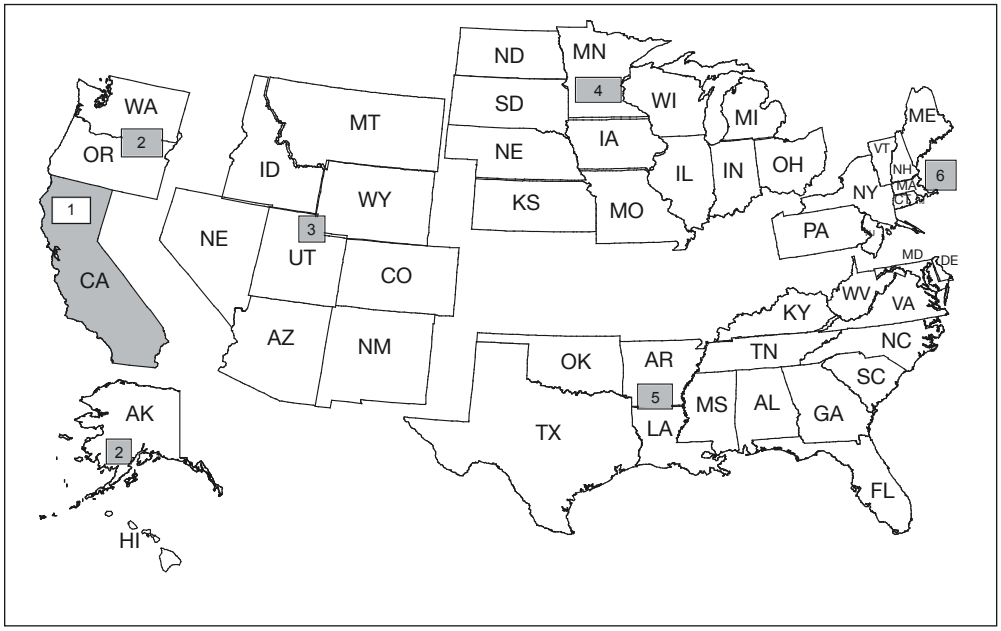

Figure 12—Shipment destinations of California's primary wood products. Regions are California (1), Far West (2), Rocky Mountain (3), North Central (4), South (5), and Northeast (6).

The 2000 census collected market information by geographic destination and product type (table 23). California's primary wood products sales, including bioenergy, totaled nearly $2.3 billion in 2000. Sales of lumber and sawn products accounted for 65 percent of total sales, slightly less than $1.5 billion. The residue-utilizing sector accounted for 20 percent ($464 million) of sales, bioenergy sales made up 11 percent ($260 million), and other products made up the remaining 4 percent ($77 million).

Table 23—Destination and value of California's primary wood products sales, 2000

Product	California	Far West	Rockies	North Central	Northeast	South	Canada	Pacific Rim	Total
				Thousands of dollars (2000 dollars)					
Lumber, timbers, and associated products	937,630	147,263	151,730	147,661	43,306	56,711	6,207	1,682	1,492,190
Residue-utilizing sector [a]	219,855	41,762	23,783	65,624	40,664	2,977	69,326	–	463,990
Energy and electric	260,235	–	–	–	–	–	–	–	260,235
Other primary wood products[b]	575	74,650	1,578	–	5	5	–	230	77,044
All primary wood products	1,418,295	263,675	177,091	213,285	83,975	59,693	75,533	1,912	2,293,459

[a] Residue-utilizing sector includes facilities that use residues from the manufacture of lumber and other products, including pulp mills, board facilities, and bark plants.
[b] Other products include veneer, shakes and shingles, and posts, poles, and pilings.

At $1.4 billion and 62 percent of total sales, California is its own largest market for wood and paper products. The majority (63 percent) of lumber remains in the state, whereas almost half (47 percent) of all products from the residue-utilizing sector are retained in-state. All energy and electricity produced by the bioenergy sector also are used in-state. "Other" primary wood products are sold in higher proportions out of state: California retains less than 1 percent while selling the majority (97 percent) of "other" products to the Far Western States.

The Far Western States, other than California, make up the second largest market for primary wood products, at close to $264 million or 11 percent of 2000 sales. Nearly 10 percent of all lumber is bought by users in these states, and lumber constitutes 56 percent of sales to the region.

The North Central States accounted for 9 percent of California's primary forest industry sales, the majority of it (69 percent) lumber. The Rocky Mountain states received 8 percent of total sales value, again most of it lumber (86 percent). Sales to the Northeast totaled close to $84 million, or 4 percent of total California primary wood product sales, while sales to the South approached $60 million, or almost 3 percent.

Exports constituted a small percentage of California's total primary wood products sales in 2000. An estimated $75.5 million in products went to Canada, 3.3 percent of total sales, the bulk of it from the residue-utilizing sector. An even smaller portion went to the Pacific Rim countries: $1.9 million, or less than 1 percent. Almost all of this volume was lumber.

Employment and Worker Earnings in California's Forest Products Industry

For this section, employment data developed as part of the FIDACS census was used in conjunction with employment and earnings data from the U.S. Department of Commerce, Regional Economic Information System (REIS) to identify employment and labor income for California's primary and secondary forest products industry. The primary forest products industry includes logging, processing logs into lumber and other wood products, processing wood residues from timber-processing plants into outputs such as paper or electricity, and private sector forest management services. The secondary industry, as defined in this report, includes the further processing of the outputs from the primary industry, although the outputs may be from California or elsewhere.

Most of the primary and secondary industry is reported in three standard industrial classifications (SIC) as defined by the U.S. Office of Management and Budget: SIC 08—forestry services; SIC 24—lumber and wood products; and SIC 26—pulp,

paper, and allied products. These classifications were used to estimate total employment and income to workers (labor income) in California's forest products industry. They provide a conservative representation of the wood and paper products industry, as they capture the majority of the primary and secondary activity. However, a number of activities, involving several thousand workers, are not included in these three classifications. These activities include the hauling of logs by independent truckers, hauling of finished products by truck, rail, or barge, and forest management activities related to timber production by government employees. Additionally, a portion of the secondary industry—wood furniture—is found in SIC 25, and thus is not included in this discussion.

Based on these three SICs (08, 24, and 26), approximately 112,700 workers, earning $4.5 billion annually, were directly employed in the primary and secondary wood and paper products industry in California in 2000 (USDC Bureau of Economic Analysis 2003). Approximately 25,000 of these were employed in the harvesting and processing of timber or in private sector land management, earning approximately $900 million dollars in labor income. The remaining component of the industry can be classified as secondary and employed 87,700 workers in 2000, with worker earnings of approximately $3.6 billion.

Total employment and inflation-adjusted labor income in California's wood and paper products industry have both increased since 1969; however, recent levels are below the peaks reached in the late 1970s and late 1980s (figs. 13 and 14). Furthermore, the majority of the volatility in employment and labor income in the wood and paper products industry is due primarily to fluctuations in SIC 24—lumber and wood products. Although SIC 26—paper and allied products—has remained stable throughout the past three decades, SIC 24 has fluctuated greatly, showing several peaks and troughs with more extreme variation. This suggests that SIC 24 is more sensitive than SIC 26 to recessionary periods such as those experienced in the early 1980s and early 1990s when declines in home construction reduced the demand for lumber and wood products (McWilliams and Goldman 1994). Additionally, labor income numbers have fluctuated more than employment numbers over the past 30 years, generally because firms tend to reduce their workers' hours rather than lay employees off should there be a drop in business.

The long-term increases have been due almost entirely to gains in the secondary industry, whereas the declines are attributable to losses in California's primary industry. For example, since the late 1980s, overall employment in California's wood and paper products industry declined by 6.5 percent, from 120,600 to 112,700 workers. Although there was growth in secondary manufacturing, primary industry employment went from over 40,000 workers in the late 1980s to about 25,000 in

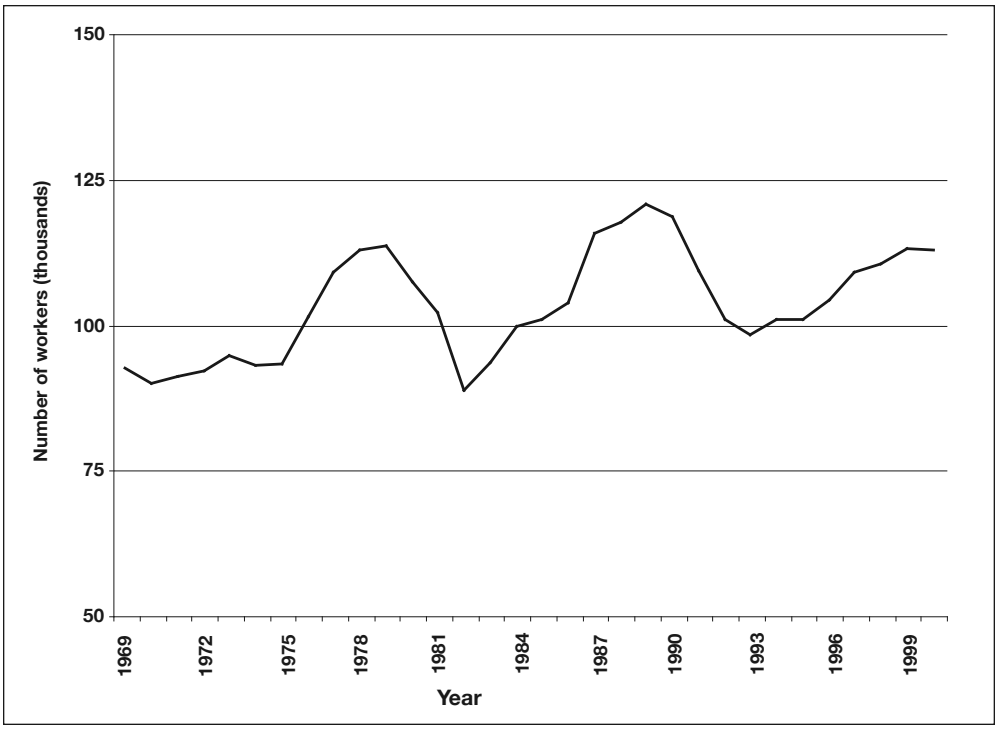

Figure 13—Employment in California's wood and paper products industry 1969-2000.

Figure 14—Adjusted labor income in California's wood and paper products industry, 1969-2000.

2000, a decline of nearly 40 percent, primarily because of reduced timber availability. The primary industry employment in 2000 was distributed in the following sectors:

- Logging and forest management 12,900
- Sawmills 8,100
- All other manufacturers 4,000

Forest Industry Labor Income in Northern California

The REIS is the only employment data available that includes self-employed workers, a significant portion of the primary industry. However, these data are not available at the 2-digit SIC level for individual counties and can thus only be provided at the state level. Labor income data, on the other hand, are available at the 2-digit level for each county and are used as substitutes to represent the relative size of the industry in substate regions. The proportionate contribution of the industry is expressed as labor income to workers in the industry as a percentage of total labor income in a given area (fig. 15). Currently, the most recent REIS data are for 2000.

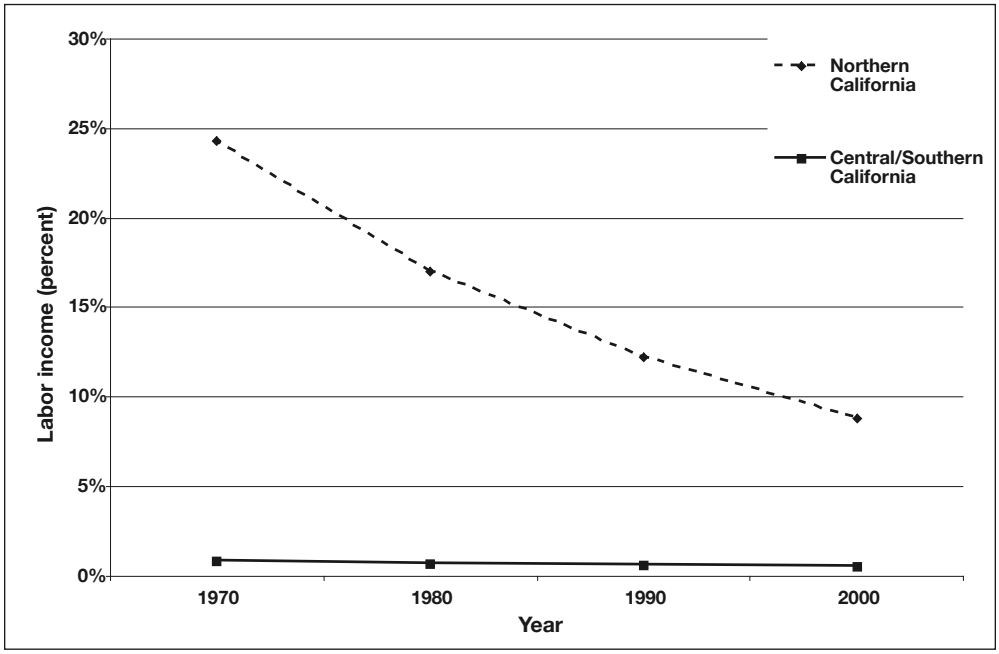

Figure 15—Labor income for wood and paper products industry as a percentage of all labor income in California.

The primary segments of the California wood and paper products industry are concentrated in the state's northern counties (i.e., Del Norte, Humboldt, Lassen, Mendocino, Modoc, Plumas, Shasta, Sierra, Siskiyou, Tehama, and Trinity). These 11 northern counties are home to only 1.8 percent of the state's population and about 1.0 percent of labor income. In 2000, 8.8 percent of the region's total labor income, $688 million, was directly in the wood and paper products industry. When indirect industries, such as transportation and business services, and spending of industry workers are considered, the wood and paper products industry accounted for about 15 percent of total labor income in these counties in 2000.

Historically, the industry has had a very substantial place in the economy of this region. In 1970, 24.3 percent of labor income was directly in the wood and paper products industry. When considering indirect and induced activities, the industry certainly provided over one-third of total labor income in these counties. However, with diversification of the region's economy and declines in wood and paper products, direct labor income had fallen to just over 12 percent in 1990.

Naturally, the industry has been more important in some counties than in others. Sierra County was and remains the most timber dependent. In 1970, the industry accounted for almost 73 percent of labor income in the least populated county in the northern region, indicating overwhelming dominance of the forest products industry in the county's economy. Again, with growth in other sectors and declines in wood products, the industry's relative proportion fell and now accounts for only 16.6 percent. However, this constitutes a larger share than in any of the other northern counties. Likewise, in 1970, 27.2 percent of Humboldt County's labor income was directly in the forest products industry. In 2000, this share had fallen to 12.7 percent, still the second largest share in the region. In terms of total labor income and population, Humboldt County is the second largest county in the northern region, but it has experienced one of the region's slowest growth rates for the past three decades, perhaps indicating the negative influence of a loss of over $100 million in forest industry labor income.

California Forest Products Leaders Survey and Outlook

To better understand the general operating climate of California's primary wood products industry, the BBER conducted an industry leaders survey in fall 2002 and spring 2003. The survey consisted of three sections and examined issues facing the industry at various times. The first section dealt with major issues affecting the forest products industry during the past 10 years. The second section considered current firm performance, comparing 2002 to 2001. The third section dealt with the industry outlook for the next 5 years. Approximately 40 individuals were identified

as industry leaders and received the survey electronically. Followup interviews of those who did not respond to the electronic survey were conducted via telephone. The final group of respondents included 32 mill managers, land managers, and other key executives.

Past 10 Years

Respondents were asked to rank six issues in terms of importance to their firm's operation during the past 10 years (table 24). Eighty-one percent of respondents ranked state of California regulations as the most important issue. Market conditions also ranked high, along with timber availability (all ownerships), and federal regulations. Improvements in harvesting and milling technology, as well as the availability of skilled labor, were indicated as less important to the industry over the past 10 years.

According to some industry leaders, stringent California regulations with respect to air and water quality, endangered species, and labor safety influenced factors such as timber availability, responsiveness to market conditions, and technological improvements. These industry leaders indicated that regulations hampered the competitiveness of the California forest products industry.

Current Conditions

The second section of the survey considered firm performance in calendar year 2002 relative to calendar year 2001, focusing on three different aspects: production (in units of output), gross sales, and profits (table 25). Thirty-one percent of respondents saw an increase in gross sales and profits, another 31 percent saw a decrease, and 38 percent saw no change in either variable. However, 37 percent experienced an increase in production, while 19 percent saw a decrease, and 44 percent saw production levels stay the same from 2001 to 2002. This reflected the very weak lumber markets in 2002, which caused some firms to increase production in the face of lower prices to show gross sales and profit levels about even with 2001.

When asked about investment expenditures in 2002, 38 percent of the respondents said their firm had made major capital expenditures on facilities and equipment during the year, whereas 62 percent had not.

Five-Year Outlook

The third section of the survey dealt with the outlook for California's forest products industry for the next 5 years. In terms of anticipated firm performance, most respondents expected an increase in the prices they receive for their products in the future (table 26). However, they also expect to have to pay more for their firm's major inputs. Gross sales are expected to increase somewhat, as are profits.

Table 24—Issues important to California's forest industry leaders, past 10 years

Rank	Importance of following issues over the last 10 years	Mean	Very unimportant -3	Mostly unimportant -2	Slightly unimportant -1	Neutral 0	Slightly important 1	Mostly important 2	Very important 3
						Percent			
1	State of California regulations	2.56	3	0	9	0	0	6	81
2	Market conditions	1.91	3	0	6	6	13	22	50
3	Timber availability	1.66	13	6	3	0	3	9	66
4	Federal regulations	1.34	3	6	3	16	16	25	31
5	Harvesting/milling technology	.75	3	6	9	19	31	19	13
6	Skilled labor availability	.53	9	0	16	22	25	12	16

Table 25—Expectations of California's forest industry leaders, calendar year 2002

Performance aspect	Increase	Stay same	Decrease
		Percent	
Gross sales	31	38	31
Production	37	44	19
Profits	31	38	31

Table 26—Expectations of California's forest industry leaders, next 5 years

Performance aspect	Increase over 2002	About same as 2002	Decrease from 2002
		Percent	
Prices received for firm's product	51	39	10
Cost of firm's major inputs	45	52	3
Firm's gross sales	55	23	23
Overall outlook for 2007	45	29	26
Firm's profits	50	18	32
Firm's production	40	37	23

The overall outlook for the next 5 years is generally positive, and most respondents expect their firm to make major capital expenditures between 2002 and 2007.

Respondents were then asked to rank the importance of a list of issues expected to influence firm performance in the coming years (table 27). Energy costs emerged at the top of the list. Recalling the highly volatile energy markets of recent years, respondents indicated that these costs will be the most important issue in the years to come as they are faced with the risk of changing electricity costs and increases in the cost of sources of energy.

Clearly, the regulation issues that were important in the past 10 years continue to be major concerns to the industry. California regulations rank second in importance, followed by timber availability from private ownerships, the state of domestic finished product markets, and skilled labor availability. The availability of skilled labor has not been a major issue in the past 10 years; however, it is expected to become one in the next 5 years, likely on account of high retirement turnover.

Other items ranked as relatively important by forest products industry leaders for the next 5 years include taxes (federal, state, and local) and the influence of environmental groups and urban societal values on natural resource management. Foreign competition ranked ninth, and the associated foreign finished products markets ranked 13th. Timber availability from federal lands ranked 10th, followed by labor costs and federal regulations. Of lesser importance for the next 5 years were domestic competition, harvesting and milling technology, and timber availability from ownerships other than federal or private. Quality of labor/management relations ranked last.

The relatively low importance of timber availability from federal lands is likely a result of California's large-scale mill closures in the 1990s. Many mills that did rely heavily on federal timber are no longer in business. Most current producers no longer consider federal lands a reliable source of timber, and instead plan their future operations based on timber from private land. However, several respondents clearly indicated that federal timber availability is important to their firms' futures. One respondent stated that a "federal timber supply will be a critical factor in maintaining a log supply in the coming years," and another volunteered that "if no federal timber [becomes] available, we will be out of business by [the] end of 2004."

When prompted for additional comments regarding the major issues facing their firms over the next 5 years, several respondents addressed regulatory issues. In the words of one respondent, "Cost of regulation makes it difficult to compete with other states, let alone other countries." Another respondent addressed the higher costs brought about by regulation, and others complained about increasing regulation and regulatory gridlock, as well as other problems associated with

Table 27—Issues important to California's forest industry leaders, next 5 years.

Rank	Issues	Mean	Very unimportant -3	Mostly unimportant -2	Slightly unimportant -1	Neutral 0	Slightly important 1	Mostly important 2	Very important 3
						Percent			
1	Energy costs	1.71	0	0	6	7	29	29	29
2	California regulations	1.60	3	0	0	6	23	42	26
3	Timber availability—private land	1.45	0	0	10	21	17	17	35
4	Domestic finished product markets	1.39	0	10	3	16	16	19	36
5	Availability of skilled labor	1.38	3	3	0	18	28	17	31
6	Urban value influences on resource mgmt. [a]	1.36	7	7	7	0	22	14	43
7	Environmental group influences on resource mgmt. [a]	1.36	7	0	0	7	36	29	21
8	Taxes (federal and/or state)	1.29	7	0	0	14	14	43	22
9	Foreign competition	1.26	19	0	3	3	7	23	45
10	Timber availability—federal land	1.17	10	0	0	24	10	28	28
11	Labor costs a	1.14	14	7	0	7	7	29	36
12	Federal regulations	1.02	0	3	10	3	37	40	7
13	Foreign finished product markets	.90	6	10	10	16	10	16	32
14	Domestic competition	.61	6	10	6	10	45	7	16
15	Harvesting/milling technology	.32	19	6	10	13	10	23	19
16	Timber availability—other ownerships	.26	15	7	11	18	15	19	15
17	Labor/management relations	.00	7	14	22	22	14	7	14

[a] Question only asked in online survey.

compliance. On a related issue, one respondent noted, "The constant manpower and money drain required to deal with anti-timber legislation is increasing costs and making us noncompetitive."

Metric Equivalents

When you know:	Multiply by:	To get:
Inches	2.54	Centimeters
Acres	.405	Hectares
Square feet	.0929	Square meters
Cubic feet	.0283	Cubic meters
Megawatts	859,845	Kilocalories per hour
Megawatt hours	859,845	Kilocalories
Kilowatt hours	859.845	Kilocalories
Pounds	.4536	Kilograms
Tons	.9072	Metric tonne
Bone-dry unit	1.2	Bone-dry ton (not metric)

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