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Reconsidering Price Projections for Selected Grades of Douglas-Fir, Coast Hem-Fir, Inland Hem-Fir, and Ponderosa Pine Lumber

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Abstract

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Grade-specific price projections were once again developed for Douglas-fir, coast hem-fir, inland hem-fir, and ponderosa pine lumber. These grade-specific price projections can be used to demonstrate the returns to land management of practices that lead to high-quality logs that produce a larger proportion of high grades of lumber. The price ratios among low, medium, and high grade groupings have been consistent, and interest in these "high-quality" forestry regimes has been persistent.

Keywords: Lumber prices, Douglas-fir, coast hem-fir, inland hem-fir, ponderosa pine.

Summary

Projections of lumber prices by grade were developed to help forest managers and owners determine if there is an opportunity to manage for higher quality timber. The results support the thought that increasing scarcity of high-quality material will result in higher lumber prices and allow lumber producers to pay higher prices for logs. These higher prices provide an incentive for stumpage owners and agency land managers to modify management regimes to produce higher quality logs. The extent to which regimes are modified depends on individual assessments of the relative costs and expected returns. The price projections in this paper provide a basis on which to value changes in wood quality when estimating expected returns.

Introduction

Silviculturists and forest managers have long been concerned about the quality and value of managed softwood timber. Often these concerns are expressed as an interest in growing timber that will yield a larger proportion of high-value lumber.[1] But different perceptions exist about the perceived price premiums for managing for high-quality timber. On one hand, many forest managers assume little price premium for quality and focus on volume production as an overriding consideration. In the Pacific Northwest this has resulted in stands being managed on relatively short rotations (30 to 50 years) with relatively wide initial spacing (fewer than 300 trees per acre) to achieve rapid volume production and reduce management costs. On the other hand, while the quantity of high-quality lumber has declined dramatically over the past 30 years, the real price of high-quality lumber has increased. These sustained price premiums for high-quality lumber have led some landowners and managers to expect higher returns for producing quality saw logs.

Real prices for lumber are projected (see Haynes 2003) to show a long-term upward trend, which may increase the difference, or premium, between grades. These projections reflect projected increases in per capita income and in residential construction that suggest continued growth in demand for all grades of softwood lumber. Given past experience, we can expect that the prices of higher grades will tend to increase more than the price of lower grades and continue to influence some owners and managers to consider wood quality in the selection of management regimes.

This paper presents both historical data and projections for prices (and production) by grade categories for major Pacific Northwest species or groups of species: Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco), coast hem-fir (western hemlock and true firs [*Tsuga heterophylla* (Raf.) Sarg. and *Abies*]), inland hem-fir, and ponderosa pine (*Pinus ponderosa* Dougl. ex Laws). It updates the projections of lumber prices by grade made in the early 1990s for these same species (Haynes and Fight 1992). These projections are intended to help the forestry community assess management regimes that will produce timber best meeting future needs for lumber and other wood products.

The methods, data sources, and overall approach are similar to those used in earlier studies but have been updated to include price data for the past decade and the latest projections for softwood lumber prices in the Pacific Northwest (from Haynes 2003). The various grade categories are the same as those for which prices

[1] The notions of what constitutes high-value lumber are different for different species but generally involve either appearance or strength.

are published annually in Warren (2003). The specific assignments of grades to categories are shown in appendix 1. Appendix 2 contains all original price and volume data.

Recent Trends

Several trends in the 1990s impacted all softwood lumber prices. Figure 1 shows the volume-weighted average (across all grades) softwood lumber prices for the coast and inland regions. The volatility in these prices (see Sohngen and Haynes 1994 for a more complete discussion) reflects changes in the markets owing to economic cycles and changes in federal timber harvest resulting from shifting goals for federal land management.[2] In the 18 years portrayed in figure 1, there have been several recessions and economic expansions as well as substantial changes in federal land management policies. In 1991, for example, Federal District Judge William Dwyer shut down virtually the entire timber sale program on nine national forests in Washington and Oregon until the Forest Service could demonstrate compliance with various environmental laws. This led in 1994 to the adoption of the Northwest Forest Plan "for a sustainable economy and a sustainable environment" covering federal timber management in the range of the northern spotted owl (*Strix occidentalis caurina*). The Northwest Forest Plan led to reductions in federal harvest flows such that total harvest in Washington and Oregon fell by 30 percent during the 1990s and the federal share fell from 29 to less than 5 percent of annual harvest. As expected, the harvest reductions in the early 1990s drove lumber prices up sharply (see again Sohngen and Haynes 1994) until capacity and other market adjustments reduced production and log demand to better fit available supplies. By the end of the 1990s, prices had declined substantially, but were still somewhat above the levels observed in mid-1980s as shown in figure 1. Throughout this period, the price differences among grades of lumber (for an example see table 1) were largely maintained.

All these changes altered the basic expectations for future lumber prices. In 1990, softwood lumber prices were expected to increase by an average of 0.7 percent per year for the next 50 years; by 2000, the comparable figure was 0.4 percent.[3] But as figure 1 shows, the starting prices for the two projections (1987

[2] Price volatility also changes perceptions of land managers and investors about planned rotation lengths and the mix of management activities.

[3] These price projections are taken from the timber assessments prepared each decade as required by the Forest and Rangeland Renewable Resources Planning Act (RPA 1974) (see Haynes 1990, 2003 for actual projections).

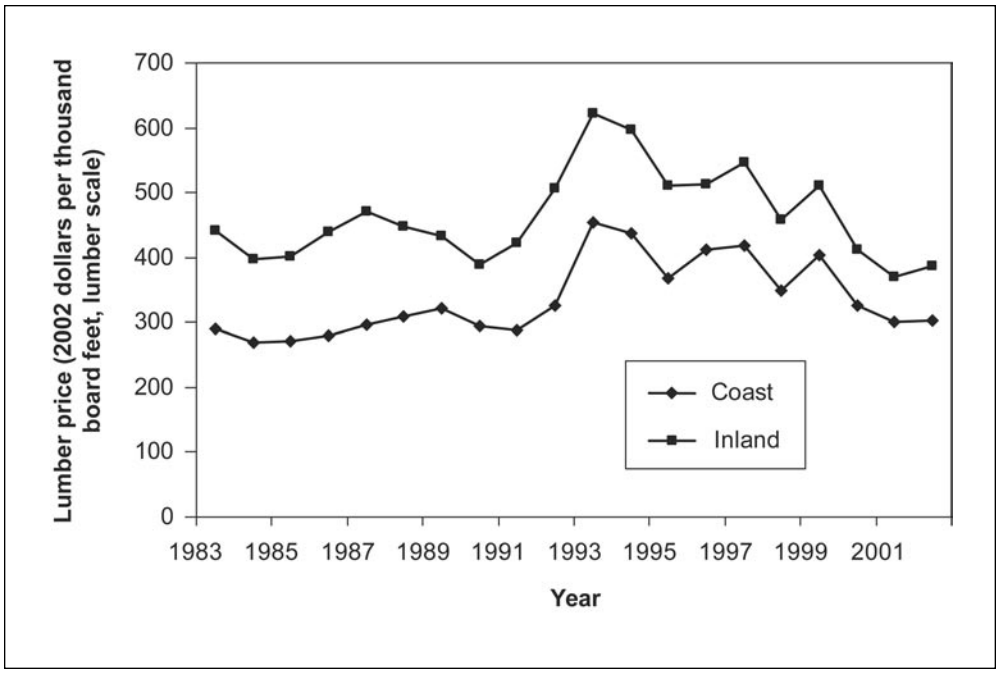

Figure 1—Weighted average f.o.b. (free on board) mill prices for coast (Douglas-fir and hem-fir) and inland (ponderosa pine and hem-fir) lumber.

and 1997) were different, with 1997 on average 49 percent higher than in 1987. The consequence is that the overall softwood lumber price index is now expected to be 16 percent higher in 2040 than what was predicted by the 1990 projections.

There are two other changes that impact the prices for the high-quality grades of lumber. Both of these were relatively unintended consequences from the reductions in federal harvest flows. The first change was that the higher prices for solid wood products in the early 1990s led to the rapid diffusion of engineered wood products, especially in the wide (2 by 10 inches and wider) markets. These new products quickly gained consumer acceptance especially in the flooring market where wooden "I" beams replaced the wider 2 by 12s used for floor joists. As will be discussed later, these new products have reduced the proportion of heavy framing lumber (for all species combinations except Douglas-fir where the proportion has remained relatively stable) and, consequently, all grade prices. The second change was that high U.S. lumber prices suppressed lumber exports, which were already reduced as a result of weak markets in Japan and in the rest of Asia after 1997 (see Warren 2003). These changes further affected the proportion of material in the higher quality markets by reducing the volumes of export Clear and export Common lumber included in the C and D Select groupings.

Douglas-Fir

Douglas-fir lumber is grouped into seven categories with two perceived as high quality: C Select, and D Select and Shop (table 1). Two other categories (structural and heavy framing) also command premium prices. During the 1980s, the proportion of volume graded Select and Utility declined, and the proportion of volume

Table 1—Real prices for Douglas-fir lumber, coast mills, 1971–2002[a]

Year	C Select	D Select and Shop	Structural items	Heavy framing	Light framing	Utility	Economy
			2002 dollars per thousand board feet[b]				
1971	792	507	438	424	365	257	115
1972	931	546	476	469	419	309	136
1973	1,386	636	618	583	474	344	197
1974	1,173	589	589	455	349	203	116
1975	920	510	419	374	315	190	102
1976	1,053	598	496	470	377	238	106
1977	1,028	698	590	439	439	302	124
1978	1,123	769	616	748	445	322	163
1979	1,499	808	690	562	414	301	145
1980	1,370	746	538	400	305	221	125
1981	1,009	576	444	355	261	185	112
1982	858	497	375	262	211	167	103
1983	895	557	342	290	263	212	114
1984	878	520	318	285	241	175	92
1985	861	526	319	290	244	168	87
1986	959	535	317	303	252	174	89
1987	1,078	529	331	332	265	178	85
1988	1,155	590	370	355	273	172	106
1989	1,279	597	386	392	292	199	131
1990	1,413	596	349	354	265	178	117
1991	1,364	608	359	348	261	180	115
1992	1,522	650	392	394	308	231	139
1993	1,332	900	569	575	437	328	195
1994	1,550	825	524	532	422	322	162
1995	1,236	737	473	466	348	236	150
1996	—	695	540	504	408	271	139
1997	—	737	550	517	411	284	170
1998	—	695	447	406	345	282	152
1999	—	708	485	489	408	280	143
2000	—	620	417	405	333	216	123
2001	—	583	380	373	311	196	108
2002	—	666	361	367	309	201	119

Note: — = There is no longer any production in this category.

[a] Figures are f.o.b. (free on board) prices computed as a volume-weighted average of green and dry surfaced and rough grades.

[b] Prices were deflated by using a rebased (from 1982 to 2002) producer price index for industrial commodities from *Economic Report of the President 2003.*

Source: Warren 2003.

in structural items and heavy framing and light framing categories has increased (fig. 2)—likely the result of several factors. One of the foremost is a decline in the quality of logs being sawn. During the 1980s this was attributed to the exporting of logs of higher than average quality, but now, with the decrease in the export market and reductions in national forest harvests, it reflects decline in the quality of timber being harvested. The decline in the proportion of Utility grade reflects a diminishing amount of lumber being sawn from highly defective material that comes from harvest of older stands (Howard and Ward 1988, Larsen 1990). The increase in the proportion of volume in structural items and heavy framing during the 1980s was most likely a market-driven phenomenon in which the real price of light framing lumber experienced wide swings and was substantially below the 1970s prices. This provided an incentive for producers to change sawing patterns to produce more heavy framing material. In the 1990s, however, the rapid diffusion of engineered wood products especially in the wide (2 by 10 inches and wider) markets reduced the incentive for and stabilized the proportion of Douglas-fir heavy framing lumber. During the 1990s, the proportion in structural items declined, and the proportion in light framing grades continued its upward trend, likely the result of continued decline in log quality and changes in consumer tastes.

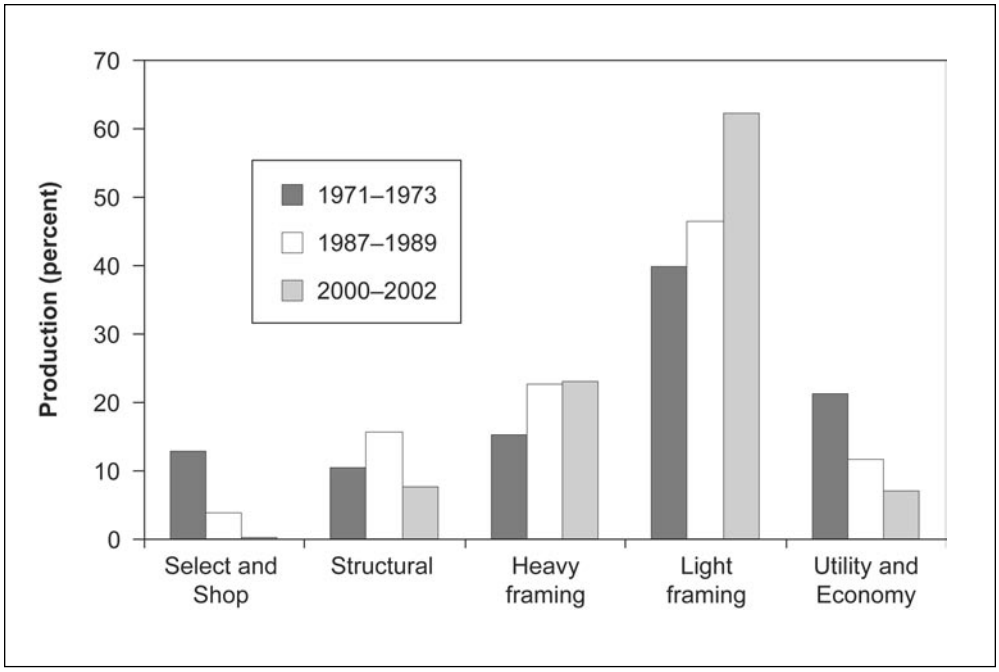

Figure 2—Douglas-fir volume production by groups of grades for coastal Oregon, Washington, and northern California.

Coast Hem-Fir

Price trends for coast hem-fir (table 2) are similar to those for Douglas-fir for the various grades and probably reflect substitution across species groups resulting from price arbitrage. Through the 1980s, the grade distribution of coast hem-fir lumber shifted from higher grades and the Utility grades to light and heavy framing grades (fig. 3), as Douglas-fir lumber did. Although the Select grades were never a large part of the market, both C and D Select have disappeared almost completely. During the 1980s, the shift of production to structural items and heavy framing was much less pronounced in coast hem-fir than in Douglas-fir, probably owing to a market preference for Douglas-fir because of its greater strength. However, in the 1990s, the slight increase in heavy framing probably came as consumers substituted hemlock for Douglas-fir in some applications. Finally, the loss of export markets, especially for the white woods (hemlock), affected both the volumes and prices for hem-fir heavy framing (which includes export Common lumber).

Inland Hem-Fir

Inland hem-fir (table 3) prices move in tandem with those for coast hem-fir. This is particularly true since 1977 when heavy framing was separated from light framing lumber in inland hem-fir grades. The clear inland hem-fir goes into moulding and has substituted for coast hem-fir in some applications including structural applications. During the 1990s inland hem-fir showed increases in production proportions for light framing (fig. 4). Inland hem-fir is not a significant player in the market for structural items, but it is a major player in the market for heavy framing gaining market share in the 1980s.

Ponderosa Pine

Ponderosa pine is divided into 16 groups (table 4) representing several broad categories: 4/4 Select and No. 1 Shop, 5/4 and thicker moulding and Shop, 4/4 Common and 8/4 Standard and better, and low value. Like Douglas-fir, the highest ponderosa pine prices are for grades in which production shares have nearly disappeared. Prices for No. 2 and 3 Shop grades have increased, but not as much as those for the higher grades. During the past two decades, a shift in production has occurred from Select, moulding, and No. 1 Shop to No. 2 and 3 Shop lumber, and in the last decade to 4/4 Common (fig. 5). This trend is a result of a long-term decline in the quality of ponderosa pine being harvested. This trend likely will continue and will greatly accelerate as the harvest of ponderosa pine shifts more to thinnings and mature young-growth stands. These changes are stimulating major changes in

Table 2—Real prices for hem-fir lumber, coast mills, 1971–2002[a]

Year	C Select	D Select and Shop	Structural items	Heavy framing	Light framing	Utility	Economy
			2002 dollars per thousand board feet[b]				
1971	719	480	438	400	351	247	118
1972	802	502	492	459	406	299	136
1973	1,012	615	568	533	462	332	182
1974	1,089	577	443	443	346	200	109
1975	796	472	372	365	302	179	95
1976	925	559	436	446	355	230	104
1977	924	585	467	481	392	275	118
1978	1,112	654	490	485	421	310	162
1979	1,138	674	488	509	394	269	131
1980	1,059	597	379	361	287	194	114
1981	893	488	309	330	247	177	107
1982	943	423	267	277	209	162	93
1983	964	504	320	314	268	204	127
1984	872	445	289	291	239	164	101
1985	819	432	290	298	243	158	101
1986	800	454	319	328	261	170	99
1987	774	533	351	368	276	168	98
1988	789	574	340	360	275	171	111
1989	852	553	326	353	277	184	125
1990	938	572	309	324	256	172	111
1991	909	526	322	315	261	167	109
1992	996	550	362	352	300	212	145
1993	—	712	482	493	406	265	199
1994	—	654	478	496	421	294	180
1995	—	622	377	419	329	220	162
1996	—	617	441	453	391	253	154
1997	—	580	468	486	388	273	182
1998	—	529	394	364	333	241	162
1999	—	594	456	458	376	267	151
2000	—	512	368	351	295	205	132
2001	—	385	335	298	273	182	121
2002	—	448	341	309	280	187	132

Note: — = There is no longer any production in this category.

[a] Figures are f.o.b. (free on board) prices computed as a volume-weighted average of green and dry surfaced and rough grades.

[b] Prices were deflated by using a rebased (from 1982 to 2002) producer price index for industrial commodities from *Economic Report of the President 2003.*

Source: Warren 2003.

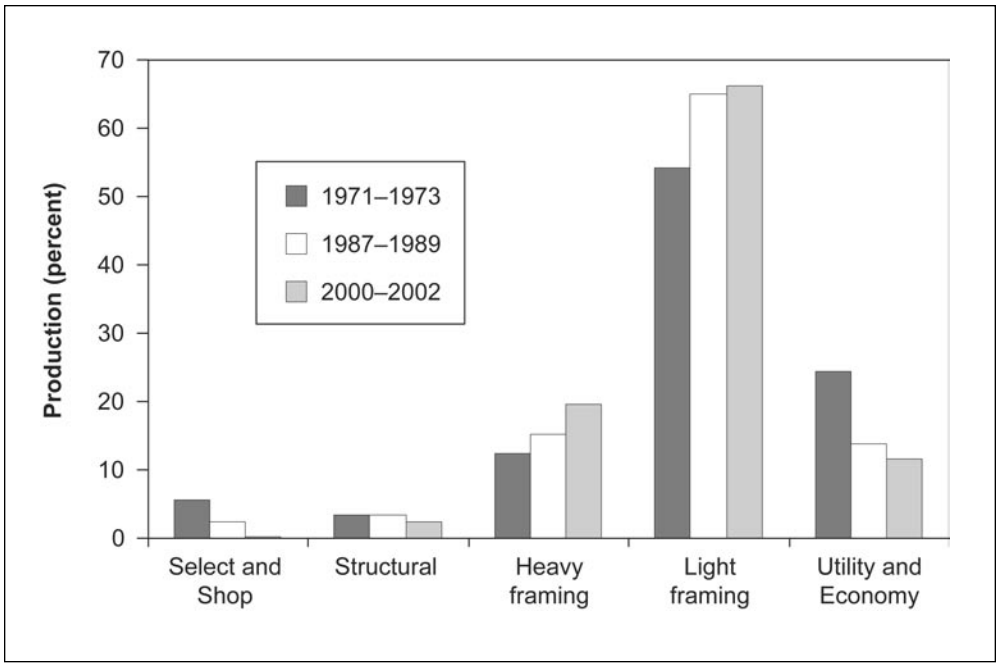

Figure 3—Coast hem-fir volume production by groups of grades for coastal Oregon, Washington, and northern California.

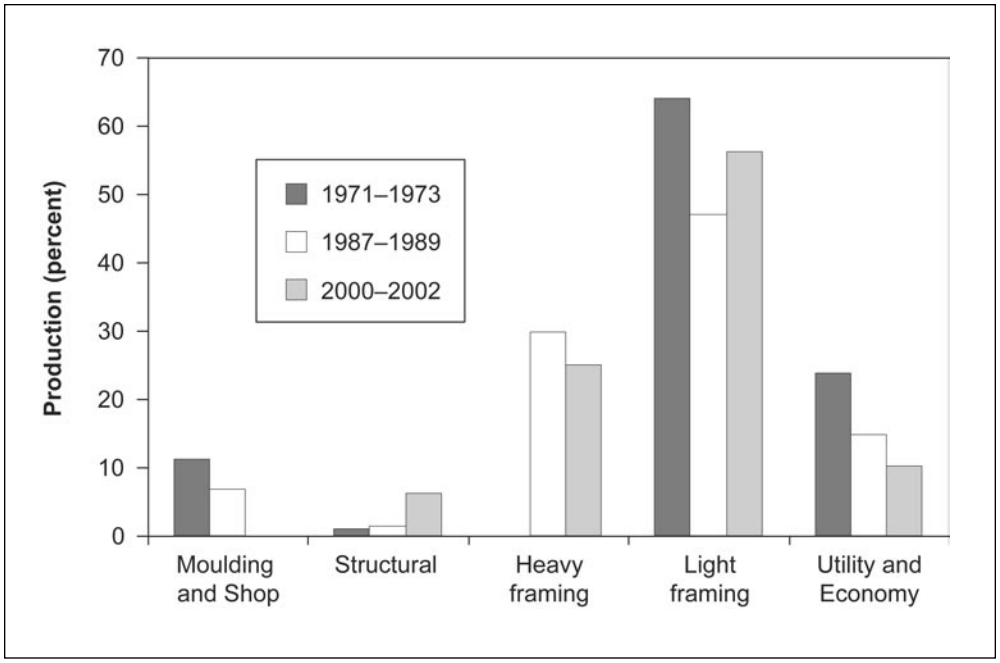

Figure 4—Inland hem-fir volume production by groups of grades for the interior West.

Table 3—Real prices for hem-fir lumber, inland mills, 1971–2002[a]

Year	Moulding	Shop	Structural items	Heavy framing	Light framing	Utility	Economy
			2002 dollars per thousand board feet[b]				
1971	726	511	431	0	354	247	125
1972	768	536	506	0	426	303	156
1973	900	662	538	0	485	353	212
1974	765	473	418	0	366	208	119
1975	617	340	356	0	313	184	104
1976	804	524	446	0	377	236	113
1977	841	543	500	461	390	269	122
1978	1,055	586	497	476	418	299	162
1979	1,100	574	473	497	401	262	143
1980	876	432	334	326	289	194	121
1981	813	430	293	315	250	174	120
1982	773	324	245	250	216	153	102
1983	856	452	322	298	266	202	117
1984	709	344	287	268	237	164	98
1985	655	415	289	283	242	164	97
1986	799	407	317	320	262	174	95
1987	909	456	336	361	275	170	96
1988	887	436	336	341	267	167	106
1989	882	466	329	331	273	183	122
1990	1,040	456	324	297	253	163	106
1991	898	490	320	301	257	158	108
1992	1,013	549	356	345	306	210	148
1993	1,421	738	494	488	415	307	201
1994	1,219	713	514	495	437	329	168
1995	1,195	635	429	421	343	257	148
1996	1,195	607	472	448	408	251	146
1997	990	665	507	497	411	271	180
1998	1,014	525	394	355	352	238	159
1999	1,114	631	469	461	397	249	149
2000	1,008	552	380	346	317	202	133
2001	714	427	339	303	295	184	112
2002	858	537	351	313	299	191	124

[a] Figures are f.o.b. (free on board) prices computed as a volume-weighted average of green and dry surfaced and rough grades.

[b] Prices were deflated by using a rebased (from 1982 to 2002) producer price index for industrial commodities from *Economic Report of the President 2003.*

Source: Warren 2003.

Table 4—Real prices for ponderosa pine lumber, inland mills, 1971–2002[a]

	4/4 Select and No. 1 Shop					5/4 and thicker moulding and Shop					4/4 Common and 8/4 Standard and better				Low value	
Year	C and better 6–12 in	D 12 in	C and better 4 in and D 6–10 in	D 4 in	No. 1 Shop	Moulding and better	No. 1 Shop	No. 2 Shop	No. 3 Shop	Shopout[b]	No. 2 Common 12 in	No. 2 Common 4–10 in	No. 3 Common 6–12 in and 8/4 dimension	No. 3 Common 4 in and No. 4 Common 4–12 in	No. 3 and Utility	No. 5 and Economy
	2002 dollars per thousand board feet[c]															
1971	1,335	1,067	910	685	472	1,047	766	550	463	296	465	394	324	261	254	130
1972	1,338	1,111	944	700	524	1,046	821	615	521	355	549	460	402	336	299	166
1973	1,410	1,206	1,086	839	610	1,154	865	682	573	467	713	609	482	423	341	231
1974	1,515	1,361	1,235	754	519	1,062	777	623	515	329	669	523	350	264	182	142
1975	1,464	1,238	1,029	582	393	1,082	630	467	347	220	558	426	282	200	166	107
1976	1,535	1,333	962	724	505	1,150	863	706	538	310	588	475	361	279	213	125
1977	1,665	1,478	1,049	734	571	1,119	927	782	583	352	676	554	400	298	251	146
1978	1,895	1,715	1,271	926	660	1,768	997	876	626	390	707	623	440	348	273	185
1979	2,351	2,111	1,690	894	560	1,607	931	810	511	353	741	603	442	310	244	161
1980	1,750	1,276	900	592	486	1,198	810	698	453	299	663	426	349	244	179	129
1981	1,500	1,304	822	631	450	1,104	796	687	480	294	520	376	330	221	171	121
1982	1,571	1,146	808	531	437	1,076	727	626	407	269	595	383	313	219	161	116
1983	1,586	1,835	862	670	474	1,380	865	745	524	294	508	398	291	209	202	118
1984	1,741	1,484	925	637	469	1,212	794	646	445	259	552	407	300	190	158	106
1985	1,877	1,107	1,000	649	439	1,395	788	639	470	262	585	401	267	184	162	97
1986	1,994	1,545	1,349	864	506	1,444	910	761	534	274	568	430	300	216	171	104
1987	2,013	1,721	1,402	906	569	1,682	982	830	532	288	576	472	318	226	169	102
1988	2,357	1,881	1,340	858	564	1,597	929	779	511	286	630	452	306	217	171	108
1989	2,141	1,807	1,205	878	520	1,501	866	699	515	306	631	393	310	224	184	125
1990	1,690	1,661	1,139	781	497	1,202	774	620	473	282	611	407	284	214	166	113
1991	1,517	1,431	1,035	743	483	1,239	904	744	588	294	594	423	309	209	167	113
1992	1,972	1,674	1,348	965	701	1,546	1,094	953	712	378	774	477	380	255	221	150
1993	2,446	2,125	1,680	1,134	779	2,177	1,323	1,178	824	497	785	554	424	322	278	194
1994	2,575	2,570	1,444	965	878	1,923	1,256	1,116	769	491	881	624	453	331	279	172
1995	1,991	2,091	1,155	778	580	1,573	1,149	1,025	697	433	733	535	387	265	227	167
1996	1,632	1,301	1,114	834	608	1,436	1,045	935	720	444	710	566	375	260	233	147
1997	2,201	1,629	1,416	939	697	1,720	1,183	1,062	794	500	855	624	443	313	257	175
1998	2,245	1,706	1,275	754	490	1,570	1,067	946	652	439	727	546	358	295	226	164
1999	2,228	1,690	1,325	833	588	1,653	1,084	956	727	479	846	574	403	288	229	150
2000	1,874	1,454	1,086	692	497	1,403	1,006	877	600	369	664	485	322	238	184	134
2001	1,650	1,405	976	670	472	1,636	1,022	900	587	317	667	442	276	196	160	107
2002	2,076	1,500	1,059	618	436	1,710	1,092	954	620	355	720	492	294	228	167	126

[a] Figures are f.o.b. (free on board) prices computed as a volume-weighted average of green and dry surfaced and rough grades.

[b] Shopout is shop material that does not meet No. 3 Shop requirements.

[c] Prices were deflated by using a rebased (from 1982 to 2002) producer price index for industrial commodities from *Economic Report of the President 2003.*

Source: Warren 2003.

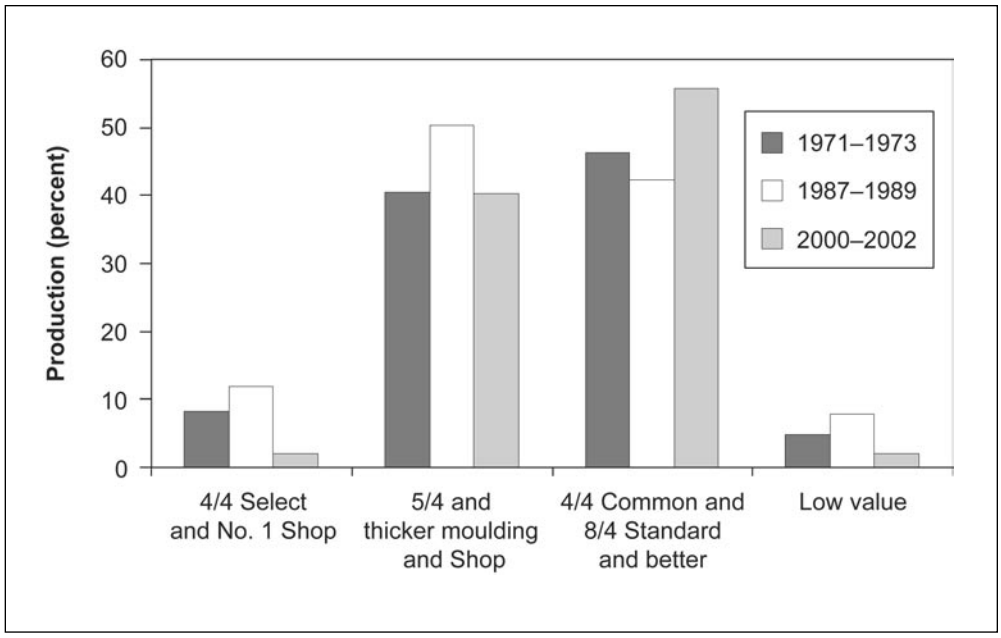

Figure 5—Ponderosa pine volume production by groups of grades for the interior West.

the moulding and millwork industry, which is adapting to new species (e.g., radiata pine [*Pinus radiata* D. Don] from Chile or loblolly [*Pinus taeda* L.], called tropical pine, from Brazil), engineered wood products, and plastic woodfiber composites.

Data, Assumptions, and Methods

All historical data on the various species and grades were obtained from Western Wood Products Association (2003) reports. Projections of all-species, all-grade lumber prices were obtained from *An Analysis of the Timber Situation in the United States: 1952–2050* (Haynes 2003). The basic method for developing grade-specific prices is similar to the method developed for projecting the prices of national forest stumpage by individual species (Haynes et al. 1980). The method was used for selected grades of Douglas-fir lumber (Haynes et al. 1988) and modified to project the prices for selected grades of Douglas-fir, coast hem-fir, inland hem-fir, and ponderosa pine (Haynes and Fight 1992).

The general method is based on the assumption that projected lumber prices represent the market equilibrium prices of the average of all lumber (all grades and species) produced within a region. This price is the volume-weighted average of species and grades produced, and the method used in this study assumes that it can be decomposed into its individual component parts (prices for each grade and species). A key underlying assumption is the premise of price arbitrage; that is, lumber prices of different species and grades differ with each other in some fixed

proportion. Prices of one species and grade will not exceed prices for other species of a similar grade because of the possibilities of substitution. If the price of one species and grade rises (or falls) out of proportion to another species of similar grade, then consumers will substitute the lower priced species for another as long as possible. Another form of this arbitrage is between similar grades. In ponderosa pine, for example, the prices for various grades of Common or Shop differ in proportion to each other fixed, in part, by their degree of substitutability.

This decomposition process is based on two sets of relations. The first are sets of relations (shown in tables 5 and 6) that for each species or species group relate individual grade prices to some determinant, most commonly the price of the grade that constitutes the largest proportion of production (called hereafter the dominant grade). The second set of relations (shown in table 7) describes the trends in shares of production by grade. The data in tables 1 to 4 (and app. 2, tables 9 to 16) were used to develop these relations.

Light framing was selected as the dominant grade for Douglas-fir and hem-fir species. This is the major category (accounting for at least 40 percent of total production during the last two decades). Although no single grade dominates ponderosa pine, as is the case for Douglas-fir or hem-fir, the No. 3 Shop grade (5/4 and thicker) was selected as the dominant grade for ponderosa pine. As before, the relations between the price for the dominant grade and other grades and proportions of total lumber produced in each grade are relatively consistent, and the various statistical properties are robust. The estimated price relations are summarized in table 5. Estimation methods follow those used in the past except that the serial correlation present in several of the relations was not corrected because only the estimated coefficients are used in estimating prices, and the presence of serial correlation does not bias estimated coefficients.

Several species and grade relations could not be acceptably estimated. In these cases, relations[4] were estimated between a grade and a similar grade within the species (such as the case for several ponderosa pine grades) or against similar grades in different species groups. We argue, in both cases, that the justification is price arbitrage of similar grades or uses or both. Relations for inland hem-fir could not be directly estimated, and instead these were estimated (in the form of price markup rules) as functions of coast hem-fir prices. Equations for these species and grades are shown in table 6.

[4] This form of relation is called a price markup rule and is used to explain the relation between two price series (see Haynes 1977, Haynes and Fight 1992). The significance of the estimated coefficients makes a statement about the form of the relation.

Table 5—Estimated price relations, by species and grade [a]

Species and grade	Equation coefficients					Base price
	b_1	b_2	b_3	R^2	Durbin Watson	
Douglas-fir:						
C Select[b]						
D Select		1.9490		.891727	.820773	Light framing
Structural items	39.0719	1.1805		.907323	.693038	Light framing
Heavy framing		1.2584		.947240	1.870045	Light framing
Utility		.7014		.953860	1.174479	Light framing
Economy		.3895		.896071	1.228117	Light framing
Coast hem-fir:						
C Select[b]						
D Select		1.7061		.849792	.809640	Light framing
Structural items	17.8880	1.1320		.989849	1.210892	Light framing
Heavy framing		1.1912		.909517	1.925462	Light framing
Utility		.6982		.837433	2.232874	Light framing
Economy	-21.1898	.5094		.932623	1.857065	Light framing
Ponderosa pine:						
D Select, 12 inch	733.33*	1.5446	-960.2351	.784099	1.122949	5/4 No. 3 Shop
D Select, 4 inch		1.285		.82297	.402579	5/4 No. 3 Shop
4/4 No. 1 Shop		.8582	13.3966	.89339	1.33898	5/4 No. 3 Shop
5/4 No. 1 Shop		1.6248		.96986	1.0488	5/4 No. 3 Shop
5/4 No. 2 Shop		1.4097		.975049	1.105347	5/4 No. 3 Shop
4/4 No. 2 Common, 12 inch	66.39297	.987438		.94134	2.0601	5/4 No. 3 Shop

[a] The general equation is $s_{jt} = b_1 + b_2 * s_{1t} + b_3 * w_{jt}$, where s_{jt} is the regressed price for the j^{th} species and grade in year t and w_{jt} is the proportion of total lumber production in year t that comes from j^{th} species and grade.

[b] No equation was estimated because there is no longer any production.

* Significant at less than the 95-percent level.

The projected production proportions are shown in table 7. In our process, the proportions were projected independently of expected price changes. Except for some of the ponderosa pine grades, most grades were projected as a continuation of current and recent trends. These show declines in the highest grades and increases in framing (both light and heavy). For ponderosa pine, these projections reflect an expected shift from Shop to Common grades. This shift is contrary to recent historical trends but reflects product recovery studies for the young-growth ponderosa pine that will increasingly dominate production.

The all-species, all-grade lumber price projections for the Douglas-fir and ponderosa pine subregions were taken from *An Analysis of the Timber Situation in the United States: 1952–2050* (Haynes 2003). The relevant price projections were those for the Douglas-fir and ponderosa pine subregions of the Pacific Northwest. The next step involved the relation between the regional all-species, all-grade prices (from Haynes 2003) and the various all-grade prices for each of the four

Table 6—Estimated price relations using the price markup equation form, by species and grade[a]

Species and grade	Equation coefficients				Base price
	b_1	b_2	R^2	Durbin Watson	
Inland hem-fir:					
Moulding	-158.442	2.128	.967	1.281	Coast hem-fir D Select
Shop	-57.125*	1.094	.895	.710	Coast hem-fir D Select
Structural items	-28.126	1.112	.984	1.084	Coast hem-fir Structural
Heavy framing	-137.423	1.371	.828	1.115	Coast hem-fir heavy framing
Light framing	-9.231	1.067	.993	.393	Coast hem-fir light framing
Utility	16.972*	.885	.831	1.922	Coast hem-fir Utility
Economy	7.395	.918	.985	1.274	Coast hem-fir Economy
Ponderosa pine:					
4/4 C Select and better, 6–12 inch		1.171	.875	1.374	4/4 D, 12 inch
4/4 C Select and better, 4 inch, D Select 6–10 inch		.712023	.817	1.376	4/4 D, 12 inch
5/4 moulding and better		.907787	.84791	1.4759	4/4 D, 12 inch
5/4 shopout	-55.6004	1.3044	.94932	1.06068	Douglas-fir light framing
4/4 No. 2 Common, 4–10 inch		1.471341	.928638	1.34082	Douglas-fir light framing
4/4 Common, No. 3 Common, 6–12 inch, 8/4 dimension		1.044212	.890371	1.101740	Douglas-fir light framing
4/4 Common, No. 3 Common, 4 inch, No. 4 Common, 4–12 inch	21.57203	.678444	.921654	1.622021	Douglas-fir light framing
No. 3 Common, Utility		.617156	.912085	.817725	Douglas-fir light framing
No. 5 Common, Economy		.413614	.900108	1.806125	Douglas-fir light framing

Note: Shopout is shop material that does not meet No. 3 Shop requirements.

[a] The general equation is $s_{jt} = b_1 + b_2 *$ base price$_{jt}$.

* Significant at less than the 95-percent level.

species groups considered. The all-grade price for Douglas-fir (reflecting the experience of the past two decades) is assumed to be equal to the all-species, all-grade price in the Douglas-fir subregion. Coast hem-fir prices (excluding the C Select grades estimated by using the price markup equation form) were fairly consistent at about 80 percent of the all-grade Douglas-fir price. This relation is expected to continue into the future (fig. 6). The average price for grades of ponderosa pine estimated with the general price equation[5] reflects a substantial price premium (it has averaged 42 percent over the past three decades) relative to the average lumber prices for the subregion (fig. 6). This premium is expected to continue for the foreseeable future.

[5] Specifically, D Select, 12 inch and 4 inch; 4/4, No. 1 Shop; 5/4, Nos. 1, 2, and 3 Shop; and 4/4 Common, 12 inch.

Table 7—Historical and projected production percentages by species and grade, 1997–2050

	Historical			Projected				
Species and grade	**1989**	**1997**	**2002**	**2010**	**2020**	**2030**	**2040**	**2050**
				Percent				
Douglas-fir:								
C Select	1.0	0	0	0	0	0	0	0
D Select and Shop	1.6	.4	.1	.2	.3	.4	.5	.5
Structural items	15.9	9.1	8.6	8.3	8.0	7.5	7.0	7.0
Heavy framing	22.9	23.2	23.5	23.5	23.5	23.0	22.5	22.5
Light framing	47.4	59.9	61.4	61.4	61.5	62.5	63.5	63.5
Utility	7.0	3.4	3.3	3.3	3.2	3.1	3.0	3.0
Economy	4.2	4.0	3.0	3.2	3.5	3.5	3.5	3.5
Coast hem-fir:								
C Select	.3	0	0	0	0	0	0	0
D Select and Shop	2.0	.4	.1	.1	.1	.1	.1	.1
Structural items	4.2	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Heavy framing	16.9	20.0	19.1	19.5	20.0	20.0	20.0	20.0
Light framing	63.6	62.1	66.8	66.9	67.0	67.1	67.1	67.2
Utility	7.4	7.9	5.8	5.4	4.9	4.9	4.9	4.9
Economy	5.8	7.2	5.7	5.6	5.5	5.4	5.4	5.3
Inland hem-fir:								
Moulding	1.9	.8	.3	.3	.3	.3	.4	.4
Shop	5.6	3.6	2.0	2.0	2.0	2.3	2.7	3.0
Structural items	1.9	3.4	6.6	7.0	7.5	8.0	8.5	9.0
Heavy framing	30.4	30.0	22.7	22.3	21.8	21.3	20.8	20.3
Light framing	46.1	50.1	58.3	58.3	58.3	57.9	57.6	57.2
Utility	9.3	7.5	5.2	5.2	5.3	5.3	5.3	5.3
Economy	4.9	4.7	4.9	4.9	4.9	4.8	4.8	4.8
Ponderosa pine:								
4/4 Select and No. 1 Shop—								
C and better 6–12 inch	.6	.2	.2	.2	.2	.2	.2	.2
D 12 inch	.2	.1	0	0	0	0	0	0
C and better 4 inch, D 6–10 inch	.3	.2	.1	.1	.1	.1	.1	.1
D 4 inch	.7	.4	.5	.5	.5	.5	.5	.5
No. 1 Shop	2.2	1.5	1.2	1.1	1.0	1.3	1.4	1.5
5/4 and thicker moulding and Shop—								
Moulding and better	5.6	2.4	1.6	1.4	1.2	1.2	1.2	1.2
No. 1 Shop	2.9	1.0	.7	.6	.5	.5	.5	.5
No. 2 Shop	17.8	7.8	7.0	6.9	6.8	6.8	6.8	6.8
No. 3 Shop	19.9	19.6	18.7	19.3	20.0	20.0	20.0	20.0
Shopout	6.7	16.0	9.6	9.8	10.0	10.0	10.0	10.0
4/4 Common and 8/4 Standard and better—								
No. 2 Common 12 inch	3.8	4.0	4.5	4.7	5.0	5.5	5.8	6.0
No. 2 Common 4–10 inch	5.8	14.6	17.2	18.4	20.0	22.5	23.8	25.0
No. 3 Common 6–12 inch, 8/4 dimension	25.9	23.5	29.0	27.2	25.0	21.4	19.6	17.8
No. 3 Common 4 inch, No. 4 Common 4–12 inch	5.0	6.7	7.9	7.9	8.0	8.5	8.8	9.0
Low value:								
No. 3 and Utility	1.2	1.0	.9	.9	.8	.8	.7	.7
No. 5 Common and Economy	1.4	1.2	1.0	1.0	.9	.8	.8	.7

Note: Shopout is shop material that does not meet No. 3 Shop requirements.

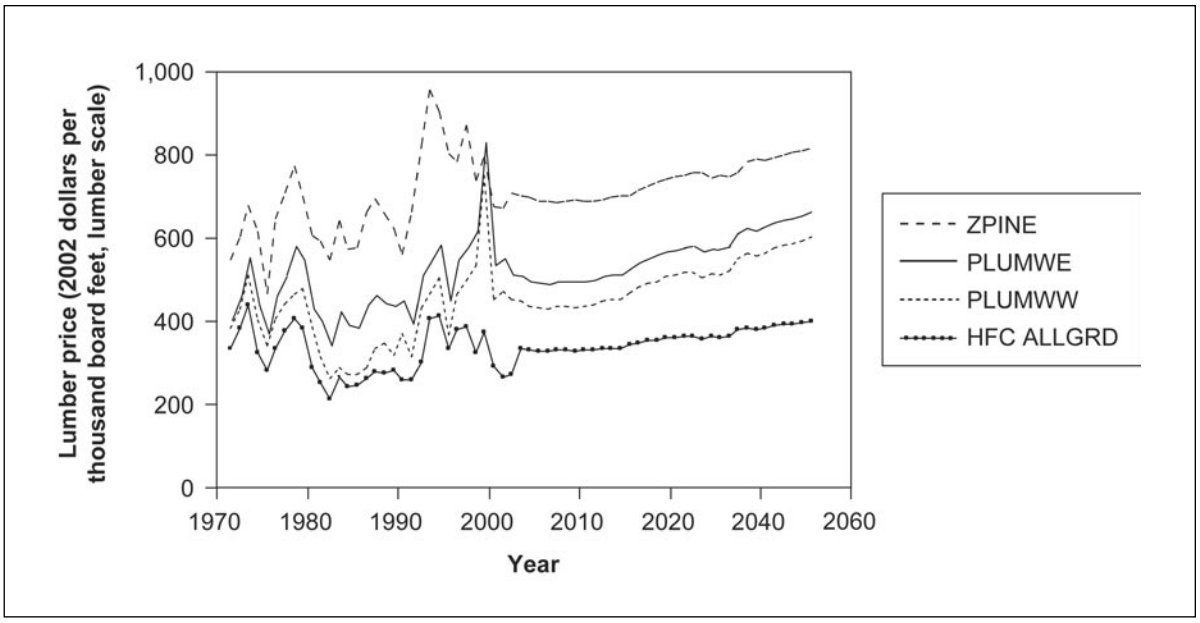

Figure 6—Pacific Northwest softwood lumber prices by year: ZPINE = average price for selected grades of ponderosa pine; PLUMWE = east-side average price for all species, all grades; PLUMWW = west-side average prices for all species, all grades; HFC ALLGRD = coast hem-fir average price, all grades except for C Select.

Demands for lumber are expected to change. Total softwood lumber consumption is expected to increase roughly 0.6 percent per year while production in U.S. regions increases by 0.4 percent per year (Haynes 2003). The bulk of lumber consumption is used in new residential construction and in residential upkeep and alteration. By 2010, the relative shares of the two end uses will change in that upkeep and alteration of existing housing will take a larger share of lumber than will new construction. These market changes suggest continued strong markets for dimension lumber and lumber grades favored in millwork and other finish applications.

In the Pacific Northwest, lumber production is expected to increase, especially in areas where Douglas-fir and coast hem-fir are produced. Production of all products decreased during the 1990s as federal harvests declined, as there was increased substitution among solidwood and engineered products, and because of the loss of export markets. In the next several decades, the Douglas-fir region is expected to become less diversified, producing primarily softwood lumber. After 2030, the region is expected to have production levels exceeding the peak of the 1950s.

Results

Price projections by species and grade are shown in table 8. Unlike our past projections, there are no projections for the highest grade (C Select) of both Douglas-fir and coast hem-fir as there has been no reported production in those grades since the mid-1990s (see app. 2 tables 10 and 12). The results for the other grades mostly are consistent with the various assumptions and estimated relations.

The results support the notion that increasing scarcity of high-quality material will result in higher prices. In general, the relative price position for each grade remains unchanged. The grades historically priced highest will remain so in the future; in general, they show continued price increases but lower rates of price growth. Price arbitrage and substitution between products act to limit the extent that prices for selected species and grades will increase. The fact that prices of higher priced items generally increase more than those of lower priced items is significant to forest land management decisions; it is the dollar difference, not the percentage difference, that determines how much can be spent in forest management to increase quality. We believe that the current and projected premiums for quality and the growing volume of lower grade material globally are sufficient to warrant recognition by the forestry community of the importance of wood quality and may encourage an adjustment in the rotation ages and management regimes commonly employed.

Although trends in price ratios (shown in fig. 7) of high to low or medium grades of lumber are somewhat mixed, substantial premiums have persisted over the past several decades and are expected to continue for the foreseeable future.

Finally, the persistent higher prices for higher grades will continue to be used by advocates of alternative management regimes to argue for high-quality forestry (Barbour et al. 2003, Waggener and Fight 1999, Weigand et al. 1994). The heart of their argument is that management actions that lead to higher quality saw logs that produce a larger proportion of higher graded lumber will increase returns to land management.[6] The various management actions in these alternative regimes include stocking and pruning strategies and longer rotations coupled with more frequent thinning. These higher prices also assume that sufficient niche markets exist to take advantage of the unique aspects of higher quality timber.

A specific example shows how price premiums for high grades of lumber that are produced from pruned trees compare to previous projections. A financial analysis of pruning (Fight et al. 1993) showed the cost per tree that would yield a

[6] Assuming perfect competition, increases in economic returns to lumber producers would be reflected in higher values paid for stumpage (a factor in the production of lumber).

Table 8—Historical and projected prices by species and grade, 1997–2050

Species and grade	Historical			Projected				
	1989	1997	2002	2010	2020	2030	2040	2050
	2002 dollars per thousand board feet							
Douglas-fir:								
C Select	1,279	—	—	—	—	—	—	—
D Select and Shop	597	737	666	804	947	945	1,049	1,116
Structural items	386	550	361	539	625	624	687	728
Heavy framing	392	517	367	519	612	610	677	720
Light framing	292	411	309	412	486	485	538	573
Utility	199	284	201	289	340	340	377	401
Economy	131	170	119	160	189	189	209	224
Coast hem-fir:								
C Select	852	—	—	—	—	—	—	—
D Select and Shop	553	580	448	565	620	618	657	683
Structural items	326	468	341	399	434	433	459	477
Heavy framing	353	486	309	395	432	432	459	477
Light framing	277	388	280	331	363	361	385	401
Utility	184	273	187	232	253	253	269	279
Economy	125	182	132	140	156	156	168	176
Inland hem-fir:								
Moulding	882	990	858	993	1,108	1,104	1,189	1,245
Shop	466	665	537	543	602	600	643	673
Structural items	329	507	351	406	446	445	474	494
Heavy framing	331	497	313	359	410	409	448	473
Light framing	273	411	299	342	375	375	399	416
Utility	183	271	191	228	246	2,446	261	270
Economy	122	180	124	139	154	154	164	171
Ponderosa pine:								
4/4 Select and No. 1 Shop—								
C and better 6–12 inch	2,141	2,201	2,076	2,297	2,385	2,408	2,476	2,533
D 12 inch	1,807	1,629	1,500	1,962	2,036	2,056	2,114	2,163
C and better 4 inch, D 6–10 inch	1,205	1,417	1,059	1,397	1,450	1,464	1,505	1,540
D 4 inch	878	939	618	824	886	902	949	990
No. 1 Shop	520	697	436	549	592	602	634	662
5/4 and thicker moulding and Shop—								
Moulding and better	1,501	1,720	1,710	1,781	1,848	1,867	1,918	1,963
No. 1 Shop	866	1,183	1,092	1,041	1,120	1,140	1,201	1,253
No. 2 Shop	699	1,062	954	903	970	989	1,041	1,086
No. 3 Shop	515	794	620	641	690	702	739	771
Shopout	306	500	355	465	560	559	628	674
4/4 Common and 8/4 Standard and better—								
No. 2 Common 12 inch	631	855	720	720	768	781	818	849
No. 2 Common 4–10 inch	393	624	492	606	715	714	792	842
No. 3 Common 6–12 inch, 8/4 dimension	310	443	294	430	507	506	561	598
No. 3 Common 4 inch, No. 4 Common 4–12 inch	224	313	228	282	332	332	368	392
Low value:								
No. 3 and Utility	184	257	167	254	299	299	332	354
No. 5 Common and Economy	125	175	126	171	201	200	222	237

Note: — = No projections were made because no production has been reported since the mid-1990s.

Shopout is shop material that does not meet No. 3 Shop requirements.

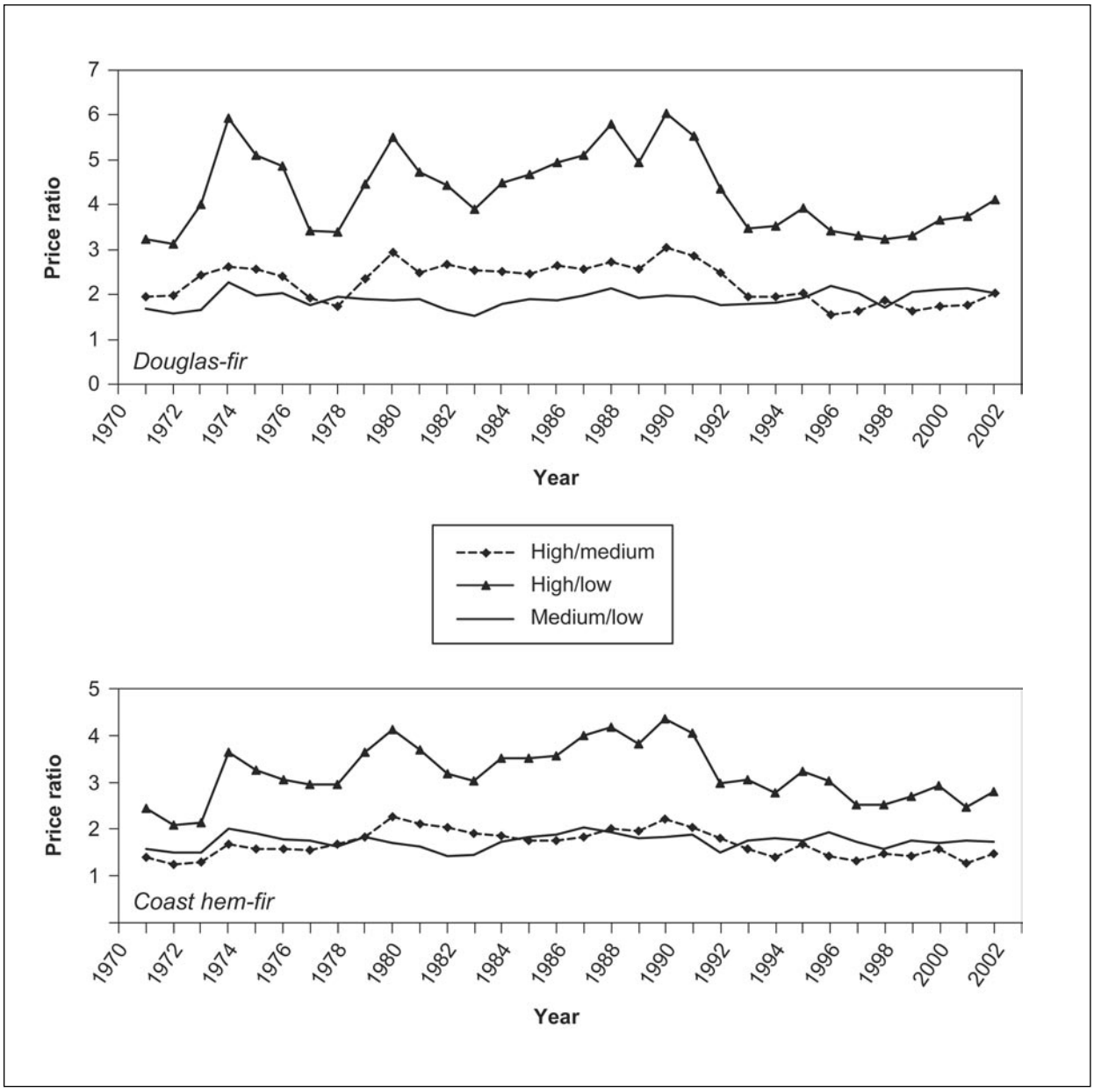

Figure 7—Douglas-fir and coast hem-fir price ratios for grade groups.

4 percent real rate of return. That analysis was updated to 2002 dollars, and the new projected prices for 2040 were used for comparison. The new projected prices show a slightly higher break-even cost for pruning than the earlier ones (see fig. 8). This reinforces the conclusion that the best available empirical evidence suggests that substantial premiums for high-quality grades of lumber will persist for the foreseeable future and have the potential to increase the return to investments in management activities designed to improve timber quality.

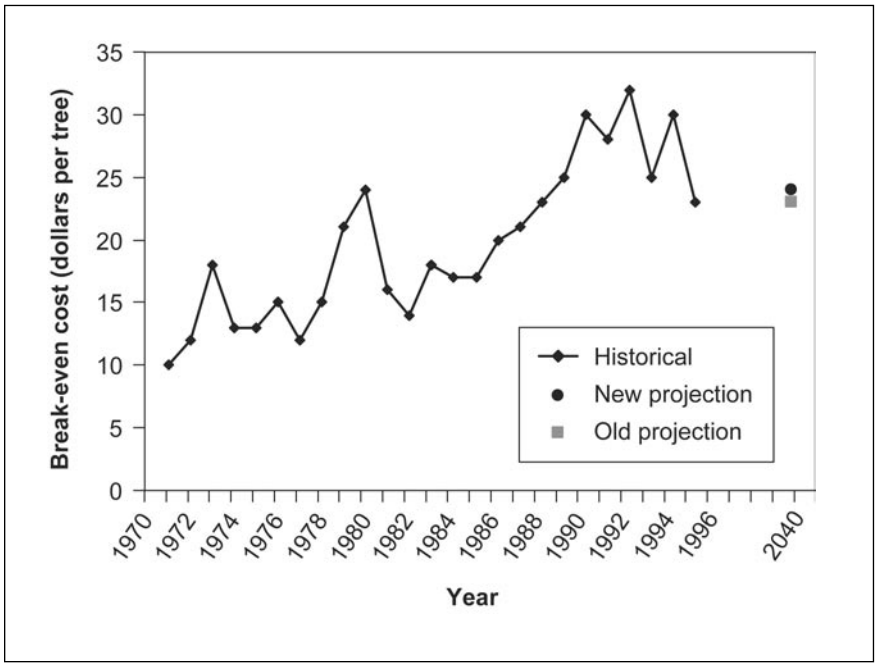

Figure 8—Break-even cost of pruning Douglas-fir.

Acknowledgments

Our thanks to Judy Mikowski and Debra Warren for assembling 30 years of price data from Western Wood Products Association quarterly reports, combining them into grade groupings, and estimating the various grade equations, including numerous revisions of grade groupings and equation forms.

Metric Equivalents

When you know:	Multiply by:	To find:
Inches	2.54	Centimeters
Acres	.405	Hectares

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Appendix 1

Grouping	Group and items combined in group
Douglas-fir and coast hem-fir:	
C Select	C Select; export Clear
D Select and Shop	D Select; D and better; all Shop grades
Structural items	All laminating stock; all machine-stress-rated lumber; 2-inch Select Structural; 2-inch No. 1; 3-inch and thicker Select Structural; crossarms; scaffold planks; export Commons
Heavy framing	2 by 10 and wider No. 2 and better; 3-inch and thicker No. 2 and better; ties
Light framing	All studs; Standard and better light framing; 2 by 6 and 2 by 8 No. 2 and better; 1 by 4 and 1 by 6 Utility and better; 4 by 4 Utility and better; 4 by 4 Standard and better
Utility	All Utility; all No. 3 grade lumber
Economy	All Economy lumber
Inland hem-fir:	
Moulding	Moulding and better
Shop	All Shop grades
Structural items	All machine-stress-rated lumber; 2-inch Select Structural
Heavy framing	2 by 10 and wider No. 2 and better
Light framing	All studs; Standard and better light framing; 2 by 6 and 2 by 8 No. 2 and better; 1 by 4 and 1 by 6 Utility and better
Utility	All Utility; all No. 3 grade; shopouts
Economy	All Economy lumber
Ponderosa pine:	
4/4 Select and No. 1 Shop—	
C and better 6-12 inch	C and better Select 6-12-inch widths
D 12 inch	D Select 12-inch width
C and better 4 inch, D 6-10 inch	C and better Select 4-inch width; D Select 6-10-inch widths
D 4 inch	D Select; 4-inch width; all 4/4 moulding
No. 1 Shop	No. 1 Shop; No. 3 Clear
5/4 and thicker moulding and Shop—	
Moulding and better	Moulding and better; C and better Select; D Select
No. 1 Shop	No. 1 Shop; 3 Clear
No. 2 Shop	No. 2 Shop
No. 3 Shop	No. 3 Shop; stained Shop; No. 2 and better Common
Shopout	Shopout; No. 3, 4, 5 Common; resaw; box
4/4 Common and 8/4 Standard and better—	
No. 2 Common 12 inch	No. 2 Common; 12-inch width
No. 2 Common 4-10 inch	No. 2 Common; 4-10-inch widths; No. 2 and 3 Common patterns
No. 3 Common 6-12 inch, 8/4 dimension	No. 3 Common; 6-12-inch widths; 8/4 No. 2 and better; 8/4 stud grade; 8/4 Standard and better studs; 8/4 Select decking; Standard and better 4/4 No. 2 Shop
No. 3 Common 4 inch, No. 4 common 4-12 inch	No. 3 Common 4-inch width; No. 4 Common 4-12-inch widths; 4/4 shopout
Low value:	
No. 3 and Utility	No. 3; Utility 4-inch width
No. 5 Common and Economy	No. 5 Common; Economy grade

Appendix 2

Table 9—Nominal prices for Douglas-fir lumber, coast mills, 1971–2002[a]

Year	C Select	D Select and Shop	Structural items	Heavy framing	Light framing	Utility	Economy
			Dollars per thousand board feet				
1971	228	146	126	122	105	74	33
1972	280	164	143	141	126	93	41
1973	471	216	210	198	161	117	67
1974	474	238	238	184	141	82	47
1975	406	225	185	165	139	84	45
1976	486	276	229	217	174	110	49
1977	504	342	289	215	215	148	61
1978	593	406	325	395	235	170	86
1979	891	480	410	334	246	179	86
1980	929	506	365	271	207	150	85
1981	747	426	329	263	193	137	83
1982	648	375	283	198	159	126	78
1983	685	426	262	222	201	162	87
1984	688	407	249	223	189	137	72
1985	671	410	249	226	190	131	68
1986	726	405	240	229	191	132	67
1987	837	411	257	258	206	138	66
1988	927	474	297	285	219	138	85
1989	1,078	503	325	330	246	168	110
1990	1,236	521	305	310	232	156	102
1991	1,200	535	316	306	230	158	101
1992	1,350	576	348	349	273	205	123
1993	1,197	809	511	517	393	295	175
1994	1,413	752	478	485	385	294	148
1995	1,172	699	448	442	330	224	142
1996	—	668	519	485	392	261	134
1997	—	711	530	499	397	274	164
1998	—	655	421	383	325	266	143
1999	—	676	463	467	390	268	137
2000	—	631	425	412	339	220	125
2001	—	598	389	382	319	201	111
2002	—	666	361	367	309	201	119

Note: — = There is no longer any production in this category.

[a] Figures are f.o.b. (free on board) prices computed as a volume-weighted average of green and dry surfaced and rough grades.

Source: Warren 2003.

Table 10—Percentage of total volume for Douglas-fir lumber, coast mills, 1971–2002

Year	C Select	D Select and Shop	Structural items	Heavy framing	Light framing	Utility	Economy
				Percent			
1971	13.4	2.2	8.0	15.8	40.3	16.7	3.5
1972	10.9	2.0	10.1	15.8	38.4	18.1	3.8
1973	8.5	1.4	13.4	14.2	40.9	17.8	3.8
1974	7.2	1.2	12.4	17.1	41.7	15.9	4.6
1975	7.9	.7	11.0	17.7	42.8	16.2	3.7
1976	8.2	.8	12.3	17.7	41.6	15.1	4.4
1977	6.5	4.2	11.5	19.7	36.3	17.0	4.8
1978	5.2	4.3	11.1	19.6	38.6	16.3	4.9
1979	5.4	4.7	12.1	18.1	37.5	16.8	5.4
1980	5.8	4.5	11.5	21.3	35.2	16.8	4.9
1981	4.5	4.1	12.9	22.0	37.7	14.8	4.0
1982	4.5	4.3	12.3	22.3	38.1	14.6	3.9
1983	3.3	3.5	12.4	23.8	42.4	10.6	3.9
1984	2.6	3.4	15.3	22.5	42.8	9.4	4.0
1985	2.4	3.2	16.4	23.9	41.8	8.5	3.8
1986	2.1	2.3	15.6	24.0	43.7	8.6	3.6
1987	2.0	2.8	14.5	23.3	45.4	8.2	3.8
1988	1.8	2.1	16.7	21.8	46.2	7.1	4.3
1989	1.0	1.6	15.9	22.9	47.4	7.0	4.2
1990	1.0	1.5	16.1	22.5	47.9	6.5	4.5
1991	.6	1.2	14.3	23.5	48.7	7.3	4.4
1992	.3	1.0	11.6	24.3	51.9	6.6	4.2
1993	.1	.7	11.2	24.2	54.7	5.4	3.7
1994	.1	.8	11.5	23.5	55.0	5.3	3.8
1995	.1	.7	12.2	21.9	57.2	4.9	3.0
1996	0	.7	10.1	21.8	60.1	3.5	3.8
1997	0	.4	9.1	23.2	59.9	3.4	4.0
1998	0	.4	9.2	24.1	59.0	3.6	3.7
1999	0	.2	8.6	23.6	60.3	3.7	3.6
2000	0	.2	7.5	22.1	62.6	3.8	3.8
2001	0	.1	7.0	23.3	62.8	3.7	3.2
2002	0	.1	8.6	23.5	61.4	3.3	3.0

Note: Figures are a volume-weighted average of green and dry surfaced and rough grades.
Source: Warren 2003.

Table 11—Nominal prices for hem-fir, coast mills, 1971–2002[a]

Year	C Select	D Select and Shop	Structural items	Heavy framing	Light framing	Utility	Economy
			Dollars per thousand board feet				
1971	207	138	126	115	101	71	34
1972	241	151	148	138	122	90	41
1973	344	209	193	181	157	113	62
1974	440	233	179	179	140	81	44
1975	351	208	164	161	133	79	42
1976	427	258	201	206	164	106	48
1977	453	287	229	236	192	135	58
1978	587	345	259	256	222	164	85
1979	676	400	290	302	234	160	78
1980	718	405	257	245	195	132	78
1981	661	362	229	244	183	131	79
1982	712	319	202	209	158	123	70
1983	737	386	245	240	205	156	97
1984	683	348	227	228	187	128	79
1985	638	337	226	232	189	123	79
1986	606	343	242	248	197	129	75
1987	601	414	273	286	215	131	76
1988	633	461	273	289	221	137	89
1989	718	466	274	298	234	155	105
1990	820	500	270	283	224	150	97
1991	800	463	283	277	230	147	96
1992	883	488	321	312	266	188	129
1993	—	640	433	443	365	238	179
1994	—	596	436	452	384	268	164
1995	—	590	357	397	312	209	154
1996	—	593	424	436	376	243	148
1997	—	560	451	469	375	263	176
1998	—	499	371	343	314	227	153
1999	—	568	436	438	359	255	144
2000	—	521	375	357	300	209	134
2001	—	395	343	305	280	187	124
2002	—	448	341	309	280	187	132

Note: — = There is no longer any production in this category.

[a] Figures are f.o.b. (free on board) prices computed as a volume-weighted average of green and dry surfaced and rough grades.

Source: Warren 2003.

Table 12—Percentage of total volume for hem-fir lumber, coast mills, 1971–2002

Year	C Select	D Select and Shop	Structural items	Heavy framing	Light framing	Utility	Economy
				Percent			
1971	1.5	4.2	3.6	12.9	54.8	18.2	4.8
1972	1.1	4.5	3.2	12.9	53.6	19.4	5.3
1973	.6	4.8	3.2	11.4	54.5	20.5	5.0
1974	.5	3.7	3.6	10.6	55.4	19.8	6.4
1975	.9	5.3	3.6	8.8	54.5	21.2	5.8
1976	.7	5.5	3.4	1.7	53.1	19.8	6.9
1977	1.4	4.8	6.2	8.7	56.7	15.0	7.2
1978	1.5	5.2	7.3	7.8	55.3	14.6	8.3
1979	1.5	5.1	7.7	5.3	58.3	13.8	8.3
1980	1.4	5.4	7.5	4.9	60.5	14.4	5.9
1981	1.2	5.4	6.2	7.8	58.0	14.6	6.8
1982	.4	4.9	6.0	7.2	59.1	17.1	5.3
1983	.4	4.0	5.6	8.8	61.6	13.8	5.8
1984	.4	4.2	5.3	12.9	60.8	10.0	6.3
1985	.4	4.0	3.3	15.0	63.0	8.4	6.0
1986	.4	2.5	3.1	16.2	64.0	8.4	5.4
1987	.3	2.3	2.9	14.8	64.9	9.3	5.3
1988	.3	2.2	3.2	14.2	66.4	8.2	5.5
1989	.3	2.0	4.2	16.9	63.6	7.4	5.8
1990	.2	1.5	5.5	16.4	62.8	7.5	6.1
1991	.2	1.6	4.8	16.3	62.3	8.7	6.2
1992	.1	1.5	5.8	17.3	62.5	6.9	6.0
1993	0	.8	6.7	17.4	61.8	7.2	6.1
1994	0	.6	4.1	19.0	62.6	6.7	7.0
1995	0	.5	3.7	22.9	59.1	7.6	6.2
1996	0	.5	3.4	20.5	61.2	7.4	7.0
1997	0	.3	2.5	20.0	62.1	7.9	7.2
1998	0	.2	2.3	21.3	62.8	7.9	5.5
1999	0	.1	2.0	19.6	65.8	7.3	5.1
2000	0	.2	2.0	19.5	65.7	7.4	5.3
2001	0	.1	2.6	20.3	66.3	6.0	4.8
2002	0	.1	2.5	19.1	66.8	5.8	5.7

Note: Figures are a volume-weighted average of green and dry surfaced and rough grades.
Source: Warren 2003.

Table 13—Nominal prices for hem-fir, inland mills, 1971–2002[a]

Year	Moulding	Shop	Structural items	Heavy framing	Light framing	Utility	Economy
			Dollars per thousand board feet				
1971	209	147	124	0	102	71	36
1972	231	161	152	0	128	91	47
1973	306	225	183	0	165	120	72
1974	309	191	169	0	148	84	48
1975	272	150	157	0	138	81	46
1976	371	242	206	0	174	109	52
1977	412	266	245	226	191	132	60
1978	557	309	262	251	221	158	85
1979	654	341	281	295	238	156	85
1980	594	293	227	221	196	131	82
1981	602	318	217	233	185	129	89
1982	584	245	185	189	163	116	77
1983	655	346	246	228	204	155	90
1984	555	269	225	210	185	129	76
1985	511	323	225	221	188	128	76
1986	605	308	240	242	198	132	72
1987	706	354	261	280	214	132	75
1988	712	350	270	274	215	134	85
1989	743	393	277	279	230	154	102
1990	910	399	283	260	221	143	93
1991	790	431	282	265	226	139	95
1992	898	487	316	306	271	186	131
1993	1,277	663	444	439	373	276	181
1994	1,111	650	469	451	398	300	153
1995	1,133	602	407	399	325	244	140
1996	1,149	584	454	431	392	241	140
1997	955	641	489	479	396	262	174
1998	956	495	371	335	332	224	150
1999	1,064	603	448	440	379	238	142
2000	1,026	562	387	352	323	206	135
2001	732	438	347	311	302	189	115
2002	858	537	351	313	299	191	124

[a] Figures are f.o.b. (free on board) prices computed as a volume-weighted average of green and dry surfaced and rough grades.

Source: Warren 2003.

Table 14—Percentage of total volume for hem-fir lumber, inland mills, 1971–2002

Year	Moulding	Shop	Structural items	Heavy framing	Light framing	Utility	Economy
				Percent			
1971	2.2	6.5	0.8	0	66.5	16.8	7.2
1972	3.2	9.2	1.0	0	62.9	16.4	7.3
1973	3.6	8.7	1.5	0	62.4	16.8	7.0
1974	3.2	8.3	.9	0	62.0	17.6	8.1
1975	3.8	9.2	.6	0	62.8	16.6	7.0
1976	3.4	8.1	.9	0	64.4	16.8	6.3
1977	2.6	8.1	1.8	15.2	48.9	16.9	6.5
1978	2.5	8.2	1.3	16.3	47.5	17.1	7.1
1979	2.2	6.8	.8	19.3	43.6	18.5	8.8
1980	2.6	8.9	.6	20.1	41.0	18.7	8.1
1981	2.4	8.9	.7	20.0	43.2	17.4	7.3
1982	1.8	6.4	.5	20.6	49.2	15.1	6.3
1983	1.9	7.0	.7	20.9	50.3	14.0	5.2
1984	2.2	6.4	.9	22.0	49.5	13.1	5.9
1985	1.7	5.7	.9	24.5	50.2	11.5	5.5
1986	1.9	4.8	.8	28.1	48.5	10.3	5.6
1987	1.7	4.9	.6	29.3	47.8	10.0	5.6
1988	1.7	4.8	1.6	29.7	47.3	9.6	5.3
1989	1.9	5.6	1.9	30.4	46.1	9.3	4.9
1990	1.4	5.4	1.8	29.7	47.6	8.8	5.1
1991	1.3	4.6	2.0	30.9	46.1	9.7	5.4
1992	1.4	5.3	3.1	31.3	44.9	8.9	5.1
1993	1.3	4.6	4.0	29.7	47.1	8.9	4.5
1994	1.0	3.8	3.9	29.3	48.4	9.1	4.5
1995	.8	3.9	3.8	29.1	48.1	10.1	4.3
1996	.8	4.2	3.5	25.6	53.7	7.4	4.9
1997	.8	3.6	3.4	30.0	50.1	7.5	4.7
1998	.6	2.8	4.3	26.2	54.9	6.9	4.3
1999	.6	2.1	5.2	28.0	53.3	6.8	4.1
2000	.6	2.1	5.6	26.8	54.6	6.0	4.3
2001	.5	1.6	6.4	25.7	55.5	5.8	4.5
2002	.3	2.0	6.6	22.7	58.3	5.2	4.9

Note: Figures are a volume-weighted average of green and dry surfaced and rough grades.
Source: Warren 2003.

Table 15—Nominal prices for ponderosa pine lumber, inland mills, 1971–2002[a]

	4/4 Select and No. 1 Shop					5/4 and thicker moulding and Shop					4/4 Common and 8/4 Standard and better				Low value	
Year	C and better 6–12 in	D 12 in	C and better 4 in and D 6–10 in	D 4 in	No. 1 Shop	Moulding and better	No. 1 Shop	No. 2 Shop	No. 3 Shop	Shopout	No. 2 Common 12 in	No. 2 Common 4–10 in	No. 3 Common 6–12 in and 8/4 dimension	No. 3 Common 4 in and No. 4 Common 4–12 in	No. 3 and Utility	No. 5 and Economy
	Dollars per thousand board feet															
1971	384	307	262	197	136	301	220	158	133	85	134	113	93	75	73	38
1972	402	334	284	210	157	314	247	185	157	107	165	138	121	101	90	50
1973	479	410	369	285	207	392	294	232	195	159	242	207	164	144	116	78
1974	612	550	499	305	210	429	314	252	208	133	270	211	141	107	73	57
1975	646	546	454	257	173	477	278	206	153	97	246	188	125	88	73	47
1976	708	615	444	334	233	531	398	326	248	143	272	219	166	129	98	58
1977	816	725	514	360	280	549	454	384	286	173	331	272	196	146	123	72
1978	1,001	906	671	489	349	934	526	462	331	206	373	329	232	184	144	98
1979	1,398	1,255	1,004	532	333	955	554	481	304	210	441	359	263	184	145	96
1980	1,187	865	610	401	330	813	549	473	308	203	450	289	237	165	122	87
1981	1,110	965	608	467	333	817	589	509	355	218	385	278	245	164	127	89
1982	1,187	865	610	401	330	813	549	473	308	203	450	289	237	165	122	87
1983	1,214	1,404	659	513	363	1,056	662	570	401	225	388	305	222	160	155	90
1984	1,363	1,163	724	499	368	949	622	506	349	203	432	319	235	149	124	83
1985	1,463	863	779	506	342	1,087	614	498	366	204	456	312	208	143	127	75
1986	1,509	1,169	1,021	654	636	1,093	688	576	404	207	430	325	227	163	130	79
1987	1,563	1,336	1,088	703	442	1,306	762	644	413	224	447	367	247	175	131	79
1988	1,892	1,510	1,076	689	452	1,282	746	625	411	229	505	363	246	174	137	87
1989	1,805	1,523	1,016	740	438	1,265	730	589	434	258	532	331	261	189	155	105
1990	1,478	1,453	996	683	435	1,051	677	542	414	247	534	356	248	187	145	99
1991	1,335	1,259	911	654	425	1,090	795	655	517	259	523	372	272	184	147	99
1992	1,749	1,484	1,195	856	622	1,371	970	845	631	335	686	423	337	226	196	133
1993	2,198	1,910	1,510	1,019	700	1,957	1,189	1,059	741	447	706	498	381	289	250	174
1994	2,347	2,343	1,316	880	800	1,753	1,145	1,017	701	448	803	569	413	302	254	157
1995	1,887	1,982	1,095	737	550	1,491	1,089	972	661	410	695	507	367	251	215	158
1996	1,569	1,251	1,071	802	585	1,381	1,005	899	692	427	683	544	361	250	224	141
1997	2,123	1,571	1,366	906	672	1,659	1,141	1,024	766	482	825	602	427	302	248	169
1998	2,116	1,608	1,202	711	462	1,480	1,006	892	615	414	685	515	337	278	213	155
1999	2,129	1,615	1,266	796	562	1,579	1,036	913	695	458	808	548	385	275	219	143
2000	1,908	1,480	1,106	705	506	1,428	1,024	893	611	376	676	494	328	242	187	136
2001	1,691	1,440	1,000	687	484	1,677	1,047	922	602	325	684	453	283	201	164	110
2002	2,076	1,500	1,059	618	436	1,710	1,092	954	620	355	720	492	294	228	167	126

Note: Shopout is shop material that does not meet No. 3 Shop requirements.

[a] Figures are f.o.b. (free on board) prices computed as a volume-weighted average of green and dry surfaced and rough grades.

Source: Warren 2003.

Table 16—Percentage of total volume for ponderosa pine lumber, 1971–2002

Year	4/4 Select and No. 1 Shop					5/4 and thicker moulding and Shop					4/4 Common and 8/4 Standard and better				Low value		Total volume, all grades
	C and better 6–12 in	D 12 in	C and better 4 in and D 6–10 in	D 4 in	No. 1 Shop	Moulding and better	No. 1 Shop	No. 2 Shop	No. 3 Shop	Shopout	No. 2 Common 12 in	No. 2 Common 4–10 in	No. 3 Common 6–12 in and 8/4 dimension	No. 3 Common 4 in and No. 4 Common 4–12 in	No. 3 and Utility	No. 5 and Economy	
										Percent							*Thousand board feet*
1971	1.6	0.5	1.2	1.1	3.8	7.1	4.3	14.3	8.6	5.6	4.3	2.4	29.2	11.2	2.4	2.3	1,995,778
1972	1.5	.5	1.1	1.3	4.1	6.6	4.0	14.8	10.4	5.2	3.7	2.0	30.1	10.0	2.5	2.2	2,029,950
1973	1.3	.4	.9	1.4	3.9	7.4	4.1	14.1	10.0	4.9	3.2	1.8	32.4	8.9	2.9	2.3	1,961,374
1974	1.3	.4	.9	1.5	4.0	6.4	3.4	12.7	9.3	5.0	3.1	2.2	34.6	10.3	2.3	2.6	1,691,282
1975	1.3	.4	.8	1.6	3.9	6.4	3.7	13.8	9.9	4.8	3.0	2.1	33.3	9.9	2.4	2.4	1,842,488
1976	1.3	.4	.9	1.5	4.1	6.5	3.7	14.2	11.2	5.2	3.0	2.4	31.7	10.0	1.9	2.2	2,046,066
1977	1.1	.4	.7	1.1	3.5	6.0	3.4	13.9	12.4	7.0	2.9	5.0	29.2	9.5	1.8	2.1	2,249,864
1978	.9	.3	.6	1.1	2.8	5.6	2.9	13.0	13.3	7.2	2.7	5.3	30.5	9.2	2.2	2.3	2,271,539
1979	.9	.3	.6	1.2	3.3	5.6	3.0	13.2	12.6	5.6	3.0	6.0	29.8	10.5	2.0	2.5	1,849,683
1980	1.0	.4	.8	1.3	3.3	6.5	3.2	14.4	12.8	4.7	3.2	6.9	27.3	9.9	2.1	2.3	1,614,864
1981	1.0	.3	.8	1.1	3.3	5.9	3.1	14.8	13.4	4.7	3.9	8.7	25.7	10.0	1.5	1.8	1,474,420
1982	1.1	.3	.7	.9	3.1	5.8	3.2	15.7	13.5	5.1	4.2	8.0	26.9	8.8	1.3	1.6	1,488,103
1983	1.0	.3	.7	.9	2.8	5.8	3.3	17.2	15.6	5.3	3.9	7.8	25.4	7.1	1.2	1.5	1,876,743
1984	1.0	.3	.6	.9	2.7	5.3	3.5	17.6	15.4	4.2	4.1	7.2	26.8	7.1	1.6	1.7	1,970,046
1985	.9	.3	.6	.9	2.7	5.1	3.4	18.2	16.2	4.1	3.8	7.2	26.7	7.0	1.4	1.4	2,018,896
1986	1.0	.3	.6	.8	2.8	4.9	3.3	17.9	16.6	4.5	4.3	6.7	27.6	6.1	1.4	1.3	2,164,591
1987	.9	.2	.4	.7	2.4	5.7	3.1	17.9	17.5	4.7	4.0	6.0	28.1	5.3	1.6	1.4	2,331,497
1988	.8	.2	.4	.7	2.7	5.8	2.7	17.2	18.0	5.4	3.9	5.5	28.4	5.2	1.7	1.5	2,252,696
1989	.6	.2	.3	.7	2.2	5.6	2.9	17.8	19.9	6.7	3.8	5.8	25.9	5.0	1.2	1.4	2,204,308
1990	.6	.1	.3	.6	2.0	5.3	2.7	17.8	21.3	7.0	3.7	5.4	25.0	5.2	1.1	1.7	2,045,830
1991	.7	.1	.3	.7	2.1	6.0	2.9	17.8	22.7	7.8	3.6	5.6	22.0	4.7	1.3	1.6	1,789,289
1992	.5	.1	.3	.7	1.8	5.9	2.5	16.5	23.2	9.8	3.1	7.0	20.9	4.9	1.1	1.4	1,643,951
1993	.3	.1	.2	.5	1.6	4.7	1.8	12.6	21.5	14.8	3.3	8.9	21.9	5.2	1.4	1.2	1,844,062
1994	.3	.1	.2	.5	1.4	4.1	1.5	10.8	20.8	14.7	3.4	10.4	23.5	5.5	1.3	1.5	1,712,968
1995	.3	.1	.2	.4	1.5	3.8	1.3	10.2	21.0	15.0	4.0	11.9	22.1	5.8	1.3	1.1	1,519,049
1996	.3	.1	.2	.4	1.5	3.3	1.2	9.4	20.8	17.7	3.5	12.1	21.2	6.2	1.1	1.1	1,421,090
1997	.2	.1	.2	.4	1.5	2.4	1.0	7.8	19.6	16.0	4.0	14.6	23.5	6.7	1.0	1.2	1,304,349
1998	.2	0	.2	.5	1.1	2.7	1.1	8.3	21.2	15.0	3.9	14.8	22.8	6.5	.8	1.0	1,281,067
1999	.2	0	.1	.4	1.2	2.4	.9	8.3	21.9	15.3	4.0	14.0	23.2	6.1	1.0	.9	1,277,164
2000	.2	0	.1	.4	1.1	2.4	.7	7.4	20.3	12.6	4.5	15.6	25.9	6.6	1.1	.9	1,159,786
2001	.2	0	.2	.4	1.2	1.8	.7	7.0	19.0	11.4	4.1	16.0	28.7	7.3	1.1	1.0	1,070,041
2002	.2	0	.1	.5	1.2	1.6	.7	7.0	18.7	9.6	4.5	17.2	29.0	7.9	.9	1.0	983,261

Note: Shopout is shop material that does not meet No. 3 Shop requirements.
Figures are a volume-weighted average of green and dry surfaced and rough grades.
Source: Warren 2003.

Pacific Northwest Research Station

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