

T H E S I S

on

ECONOMIC FACTORS AFFECTING LUMBER PRICE  
IN THE PACIFIC NORTHWEST

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Jason Kermit Brandeberry

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Introduction

The belief passed down from generation to generation that our forests are unexhaustible is at last recognized as a fallacy. Just when this thought had its inception we do not know, but certainly it must have been very early. Probably Cabot's seamen used the word, inexhaustible, and like as not, emphasized it with quaint Shakesperian profanity.

With the idea favorably launched in the world, for long years courts appeared to confirm it, and nothing called it in question. Men pushed back from the seaboard and found everywhere--forests. Forests that swept on in an unbroken wave over the crests of the Appalachians and beyond; that flared out to the north in seemingly infinite stands of pine in the lake country, and to the south in a coniferous exhibition of even greater impressiveness.

The forest news was cumulative. Men were constantly learning that great as they had thought the forest, it was, in fact, even greater. True, there were the great plains in the interior, with their unnumbered buffalo and the barbarous Sioux; but the word came back from the wandering hunters that the forests began again beyond them. In the late 1700's, venturesome Yankee skippers had penetrated lonely seas to barter useless

articles for furs in Nootka Sound; and thence across the Pacific to convert them into silks and teas at Canton. They returned to Boston and Salem with more than holds full of princely profits, for they told of northwestern forest that dwarfed both in tree bulk and forest density anything of a like nature along the Atlantic.

For many generations the American was not merely told the forest was inexhaustible, but he was given, according to the standards of the time, unimpeachable proofs that it was so. It was very natural that by the time the nineteenth century had got well under way, the idea of forest inexhaustibility was not longer merely a belief with the average American; it was an enthusiastic conviction; it was almost a tenet of his religion. As the century passed, the idea was continually emphasized; the printed word passed it along; the spell-binder peddled it; the Fourth-of-July oration were not complete without flowery bouquets concerning "our inexhaustible ree-sources" and "our boundless forests," a theme lending itself readily to the lugging-in of a collateral popular proposition to the effect that America had enough room and resources to spare not only for her own people but for the so-called "down-trodden and oppressed" of every land under the sun.

The nineteenth century was much more than half gone before the idea was seriously challenged. Even in the colonial days, there had been a few mutterings, but these for the most part had been incoherent. The heresy did not gain general attention until well into the seventies, and then not in a powerful sense.

With the close of the Civil War, the energies of the lusty young nation, temporarily diverted to destruction, were turned to construction. Material development surged westward like a wave, and coincidentally came a great rush of immigration. There was a veritable epidemic of railroad building, and new towns and cities by the score made the art of preparing maps a feverish trade. All this required a great deal of wood. It was found ready in the forest of Michigan and Wisconsin, lordly stands of the finest white pine the world has ever seen. The foundations of the future greatness of the mighty Central West of to-day were laid in a very real sense in the forest of the lake states. That development was dependent upon good, cheap, and unlimited quantities of wood.

But this raging rush of unprecedented development meant more than wood; it meant the beginning of the taking of a forest toll that made all the immense toll-takings that had gone before look puny. Forests melted

away like snow before the sun. The increased and ever-increasing demand for wood stimulated the invention of ever more efficient and increasingly large-scale mill machinery. It likewise made for ever greater extravagance in the harvesting of that gigantic forest crop which had been growing in America during the centuries, waiting until the Anglo-Saxon should sail westward to realize his destiny.

Some comprehended this new and greater utilization and cried out a warning. The mutterings increased, but still their sum was negligible. To the average American the forests were still inexhaustible; even to the one who was more than average. It was not until the forests of the East, South, and Lake States had been depleted and the main resource was the Pacific Northwest that the American people realized the inevitable outcome.

#### Growth of the Lumber Industry on the Pacific Coast.

Before undertaking to further analyze the economic factors affecting lumber prices, a short resumé will be made of the lumber industry on the Pacific Coast.

The development of the lumber industry on the Pacific Coast, our last great coniferous timber reserve, has already progressed far. The first sawmill in the Northwest began operation on Puget Sound in 1845. Within

a decade lumbering became, and still is, the chief industry in this part of the country. The cut for a good many years was used locally or shipped into California or exported. Not very much timber was cut until after the completion of the Northern Pacific Railway in 1882, and then for a number of years only in special grades. Twelve years later lower freight rates were made on eastern lumber shipments and the pronounced development of the west coast industry began.

Very little lumber was cut in California prior to the beginning of gold mining in 1849. Lumbering in the redwood belt began about 1860 and grew steadily. In 1899 Washington, Oregon, and California cut a little more than 2,900,000,000 board feet. Production increased slowly until in 1918 the total was slightly in excess of 8,590,000,000 and at the time of the last publication of the United States Statistical Bulletin No. 21, 1928, the three states were cutting 13,300,000,000 board feet. An interesting point to note is that according to C. C. Crow in "Crows Digest" of January 31, 1929, Oregon and Washington mills are producing 9,335,343,000 board feet, which is nearly 900,000,000 board feet above the production of the three states ten years ago.

The commercial forest area of the Pacific Coast region by 1920 had been reduced from 77,120,000 acres

to approximately 59,100,000. A large percentage, about 39,683,000 acres, is in virgin stands. Not all, however, is accessible high grade timber, as there is a large percentage of relatively inferior and inaccessible areas. This is an important factor which is often overlooked in the consideration of the western timber supply. Second growth of saw-timber size covers about 5,292,000 acres and smaller growth or cordwood 7,425,000, while nonrestocking areas cover 6,500,000 acres.

Of the volume of the original forest no satisfactory statistics are available. The present stand, however, is about 1,141,031 million board feet, or practically half of the remaining saw timber in the United States. Oregon leads with a total stand of 495,600 million feet; that of Washington is 334 billion; and that of California 313,331 million. More than half of the total amount or 686 billion occurs in the Douglas fir belt of Western Oregon and Washington.

#### Life of the Industry on the Pacific Coast.

A study of the local timber supply indicates that in certain localities a large proportion has been cut off and that logging operations are being pushed back to the less accessible timber in the rougher mountainous regions. The exhaustion of local supplies is a



vital matter of local prosperity and development. It means the cessation of a local industry, the abandonment of improvements, rapid depreciation of investment, and other losses which the industry, the community, and the consumer must shoulder. One authority estimates that only a third of the original privately owned timber tributary to Puget Sound remains. The situation in Grays Harbor County illustrates the rapid exploitation which in a surprisingly short time is to end the industry locally. About 20 years ago there were in this country 750,000 acres of timber and only about 75,000 acres of cuttings. Now there are 355,000 acres of stumps. One-sixteenth of the county's private timberland is being cut over annually. In 25 years the supply of privately owned virgin timber will be gone.

King and Snohomish Counties, Washington, the scene of the earliest lumbering operations in the Northwest, also illustrates local exhaustion of virgin timber in the not very remote future. Forty billion of the origin 80 billion feet of commercial timber has been cut. Of the remaining 30 billion is in private ownership, and is now being felled at the rate of 800,000,000 feet annually. Indications are that this private timber will be gone in about 35 years.

One authority on the lumber supplies of Washington has studied the rate of exhaustion from the annually de-

creasing acreages of private land assessed as "timberland." He found that from 1909 to 1919 there was a decrease in the acreage of timberland in Western Washington of about 850,000 acres, or 85,000 acres annually, and in eastern Washington of about 390,000 or 39,000 acres annually. On the basis of 3,585,686 acres assessed as timberland in 1919 in western Washington, privately owned old-growth would last forty-two years at the rate of cutting at that time. Adjusting these statistics to provide for additional land which was classified as timberland in 1919 but not in 1909, it is the belief that a faster rate of cutting of the private stumpage is indicated, and that, disregarding increment in second-growth stands and without allowing for the expected increased cut, the private virgin timber will last only twenty years unless forest policies are changed.

Bend, Oregon, is the center of one of the most extensive and famous of Oregon's yellow pine belts. A few years ago an unbroken forest of virgin yellow pine extended to the very edges of the city. At present, cutting has left a practically unbroken waste of six to seven miles to the west and south. The operating territory surrounding Bend has a radius of from twenty to thirty miles and occupies an area of 382,000 acres of merchantable forest, carrying 5½ billion feet of com-

mercial timber, of which 231,000 acres carrying 3½ billion feet is privately owned. The present rate of cutting, which is likely to continue, will exhaust the privately owned stumpage in approximately twenty-five years.

Depletion in Washington has gone much further than in Oregon, and while an expansion of the industry in Washington under increased demands from eastern markets may reasonably be expected, by far the greater of the expansion may be looked for in Oregon. The reason for the slower development in Oregon lies in the greater inaccessibility of its Douglas fir stands. Many operations now being seriously considered for Oregon will require transportation and other investments running into the millions of dollars before any timber can be taken out.

The lumber cut for the Pacific Coast as a whole has increased materially during the past ten years. Local demands have also increased, but not in proportion to the cut. A gradual increase in logging costs have been inevitable as the more accessible stands have been cut out and it has become more and more necessary to extend operations to the rougher mountainous logging chances, with lighter and more broken stands and larger percentages of the less desirable species. The timber resources of the Pacific Coast States are very large, but it would

be very unwise to overestimate them, for much less than the total stand is readily available.

In analyzing this topic, the most important phases have been developed only in the broad way. The factors taken into consideration are, the effect of forest depletion, lumber exports, wood substitutes, water and rail transportation, and concentration of timber ownership. In formulating the data, one will find the condition somewhat abnormal immediately following the war on account of the depleted condition of the manufactured products. Aside from this fact, the topics have been brought up to date from approximately the beginning of the twentieth century which marks the beginning of this industry to any marked extent in the Pacific Northwest.

# Average Lumber Price in Eastern Markets

1904-1925



EFFECTS OF SCARCITY AND HIGH PRICES OF FOREST PRODUCTS  
UPON REPRESENTATIVE INDUSTRIES

The general situation may be illustrated by presenting the principle facts regarding a few industries. These industries are chosen on account of their demands on raw material, their basic character industrially, and the way in which they touch, directly or indirectly, the life of our entire population. They are general building and construction, farming, railroads, the veneer industry and producers of news print. The data used in this case for the entire population can be used to show the effect on our Pacific Northwest, and although the latest figures in all items cannot be presented, the collected facts can indicate the trend of to-day in comparison with the periods before and after the World War.

In listing the above industries using raw material, general building and construction is by far the most important. In normal years probably 28 to 30 billion board feet is used in this way out of an average annual cut of 40 billion feet. 2

For the first five years before the war, the average annual building bill of the country, shown by building permits, was approximately \$670,000,000. After

dropping to \$445,549,493 in 1918, it rose to \$1,326,935,702 in 1919; but with building costs increased 100 per cent or more in 1919, actual construction did not, if any, exceed the prewar average. A shortage in housing accommodations that is almost world wide has brought home vividly the close relation of building to the comfort, health, and general welfare of the public. Apparently all construction work in the United States is behind requirements, but the greatest deficit is in dwelling houses.

The building permits issued in 21 cities of various sizes, widely distributed over the country, show that, in value, housing construction formed 36 per cent of all building in 1913, 21 per cent in 1918, 27 per cent in 1919. The falling off in house construction generally appears to have been particularly marked since the latter part in 1919, when the greatest upward movement of prices began. In 1913 the Pittsburgh contractor paid \$27.00 per thousand board feet for his 2 x 4, No. 1 Common for framing, and \$72.00 in 1920; \$26.00 for No. 2 Common Yellow Pine to use as sheathing and \$80.00 in 1920. Yellow Pine finish lumber increased from \$42.00 to \$140.00; siding from \$36.00 to \$120.00; B & Btr. Flat Grained flooring \$38.00 to \$142.00.

The total cost of houses has increased proportionally. A frame house built in Washington, D. C., in 1917

for \$6250 is in the spring of 1920 duplicated for \$12,250. At St. Paul and architect reported that a house was built for \$4240 in 1915, not including plumbing, heating, and wiring, and that a house built from the same plans in the late winter and early spring of 1920 cost \$11,820 or 179 per cent over the 1915 price.

Since 1920, prices of the different grades of lumber have decreased as the public has gradually readjusted itself after the World War. Prices now have not descended to the same level as in 1913, but have stopped within both of the previous limits. The 2 x 4, No. 1 Common in Pittsburgh, which cost \$72.00 in 1920, could be bought for approximately \$42.00 in 1928, and No. 2 Common Yellow Pine sheathing for \$39.00. The following curve and table will illustrate average lumber prices and their trend over a period of twenty-five years.



LUMBER PRICES: AVERAGE PER M BOARDFeet in Eastern Markets of the United States

Year	Average Quality 1 inch	Year	Average Quality 1 inch
1900	\$21.50	1913	\$27.88
1901	21.32	1914	25.19
1902	-----	1915	24.68
1903	20.40	1916	26.86
1904	21.20	1917	29.09
1905	22.00	1918	39.90
1906	24.99	1919	44.42
1907	27.87	1920	73.26
1908	27.14	1921	58.98
1909	25.44	1922	53.13
1910	24.60	1923	51.02
1911	24.52	1924	46.69
1912	25.29	1925	44.46

Lumber prices alone do not tell the whole story. The person who builds a house faces a series of difficulties in securing his material. There will be delays, many of which enter materially into increasing costs. Many of the grades desired, particularly the better ones, can not be secured easily, sometimes not at all. Very often the lumber secured is not dried for good, practical work, and comparatively inferior and unsatisfactory construction results. This situation, combined with delays in material, labor difficulties, and other probable complications makes the construction of a dwelling house a highly uncertain and speculative venture, takes it entirely out of the reach of a large number of people, and leads to a gradual lowering of

lowering of standards of living. Such statements as these may draw criticism from some people of the Pacific Northwest. Of course such conditions are not so much thought of in or near the mills, but with a little observation in Eastern Oregon or Idaho away from the mills one will find such conditions existing in a far more noticeable degree. Many classes of industrial construction which can go forward regardless of uncertainties are able to pay lumber prices which the ordinary home builder can not afford.

### Farming

Farms consume a very large part of the construction lumber. Cheap high grade building material aided powerfully in the rapid development of farm lands. The Middle West, for example, was built up largely with the output of white pine lumber from the Lake States. In the eighties first quality white pine lumber such as can now hardly be found in any part of the country, commonly retailed for \$15.00 to \$20.00 per thousand. In February 1920 the farmer in Kansas paid \$70.00 per thousand for Yellow Pine framing and about the same for Douglas Fir. At this time for No. 2 Common lumber suitable for temporary sheds and construction, either fir or yellow pine, he paid \$72.50, along with \$147.50 for B & Btr. Yellow Pine finish lumber for house construction.

During this high peak in prices in 1920, questionnaires were sent to a large number of agricultural county agents, employed cooperatively by the Federal Government and the States, in thirty-three states east of the Rocky Mountains, and similar questionnaires were also sent to a large number of retail lumber dealers in several Middle Western States.

Throughout practically this entire territory, county agents reported a marked suspension in new construction and even in farm improvements and repairing. Out of approximately 250 counties only five or six reported more building than in previous years. In the Prairie States, from Illinois north and west, repairs were reported to be only 32 per cent of normal, and new construction more than 50 per cent below normal. Such conditions as those mentioned above were almost uniformly laid to high lumber prices and shortage of labor.

An attempt was also made at the time indicated above to get a normal and probable future lumber requirement of the farming industry. The estimates of county agents indicated that the average annual utilization in 1920 was 2000 board feet per capita. For practically the entire region covered, an increased future demand was predicted in order to take care of improvements, provision for increasing population, and the development of new

farm units. This is an important factor in the face of falling lumber productions in all parts of the country except the extreme West.

With those predictions of 1920 in mind it is found that there is at the present time an ever increasing demand by the farmers for farm lumber. During the last few years, particularly since 1923, farm lumber has decreased in price along with other building material. From the reports of county agents it appears that the farmers of the Middle West and the Pacific Northwest are receiving the most benefits. If one would take an afternoon ride in the farming district of the West, he would find the farmer doing some kind of improvement on his tract of land, developing it to a higher degree of efficiency, being able to buy his improvement material at a more reasonable level.

### Railroads

One of our greatest users of woods are the railroads. They have particularly bought our hardwoods, especially white oak, for their ties. The normal demand for railroad ties is approximately 100 to 125 million annually. In the early stages of railroad building, species were found within a short distance of the track and the demand was easily supplied. With the increasing

uses for wood and the gradual development throughout the country such conditions became the thing of the past.

Since the World War, Douglas Fir has found a place as tie material. It is not as durable as most hardwoods, but with a preservative treatment which has increased its life to approximately ten years, it has become a good substitute for the species which were once dominant in the Southern States. Douglas fir ties are now said to be costing eastern roads from \$1.75 to \$2.00 each at their treating plants or on their rights of way. In other words, oak ties, cut within a few miles of the right of way and bearing practically no freight charge, and southern pine ties, are now being replaced by fir ties handled overland or shipped through the Panama Canal.

To supply their general lumber requirements, the railroads have an obvious advantage in the purchase of lumber along their lines, and increases in prices have been far less pronounced than for other industries. Under the great financial burdens of readjustment and reconstruction following the war, added costs of important materials delayed even the most needed repairs and betterments and added to transportation difficulties, which reacted upon all industries and customers. Uncertainty as to securing adequate supplies of desired materials at the

time wanted has made it necessary for railroad companies in general to hold comparatively large surpluses, a tendency which serves to accentuate shortage for all purchasing industries. Railroads operating in the forest regions a few years ago ordinarily carried but one or two weeks supplies, since stock could be replenished quickly, while other roads carried stocks sufficient to last several months. Now the timber roads are carrying from six to nine months. A table from the latest Statistical Bulletin No. 21 will show the ups and downs of the tie market.

COSTS TIES PURCHASED BY RAILROADS 1905-1925

Year	By Steam Railroads	By Electric Railroads	Total
1905	77,981,227	-----	77,981,227
1906	93,477,625	9,356,417	102,834,042
1907	144,085,680	9,613,940	153,699,620
1908	106,038,081	6,425,368	112,463,449
1909	115,432,000	8,319,000	123,751,000
1910	139,596,000	8,635,000	148,231,000
1911	126,155,990	8,898,000	125,053,000
1915	88,498,655	8,607,996	97,106,651
1923	129,133,347	6,842,770	135,976,117
1925	105,153,800	6,187,959	111,341,759

Veneer Industry

Veneer manufacture is a rapidly growing industry which supplies furniture makers, manufacturers of musical instruments, the automobile industry, box makers,

and many others. For high-grade veneer, hardwood has been principally used. Since the World War, however, Douglas fir has taken a prominent part in the manufacture of automobile parts, box making, and plywood panels. The industry now uses about 780 million board feet of high-grade material. The demand among hardwoods is chiefly red gum, and secondly for white oak. One section of the industry, which uses such northern hardwoods are maple, birch, and basswood, is located in the Lake States. At the present time the Pacific Northwest is becoming the center of the veneer industry, although it does not contain a very large amount of hardwood.

VENEERS: WOOD CONSUMED IN MANUFACTURE FROM 1905-1925

Kind of wood	1905	1906	1907	1908
Domestic	Bd.Ft.	Bd.Ft.	Bd.Ft.	Bd.Ft.
Red Gum	39,573	73,062	102,932	119,485
Yellow Pine	12,688	45,581	32,450	42,342
Birch	12,643	16,823	18,079	17,769
Cottonwood	16,357	29,063	33,174	33,964
Tupelo	314	8,311	15,097	16,442
Yellow Poplar	26,164	21,619	28,764	22,898
Douglas fir	---	370	90	333
White Oak	16,129	38,848	23,872	20,700
Maple	26,246	30,084	28,175	27,886
Total of all Woods	181,146	329,186	348,523	382,542

(Con)

Kind of wood	1909	1910	1911	1919
Domestic	Bd.Ft.	Bd.Ft.	Bd.Ft.	Bd.Ft.
Red Gum	129,930	158,157	136,542	198,641
Yellow Pine	48,143	40,324	35,400	67,071
Birch	24,643	27,633	24,208	54,079
Cottonwood	30,842	33,149	34,911	36,739
Tupelo	18,476	26,548	20,476	34,175
Yellow Popular	28,826	33,812	25,835	32,653
Douglas Fir	1,111	2,006	6,262	10,604
White Oak	28,742	53,005	41,742	30,654
Maple	35,444	39,471	29,762	15,723
Total of all Woods	435,981	477,479	444,886	576,581

(Con.)

Kind of Wood	1921	1923	1925
Domestic	Bd.Ft.	Bd.Ft.	Bd.Ft.
Red Gum	146,740	220,703	237,465
Yellow Pine	42,195	65,100	45,818
Birch	37,070	43,936	51,490
Cottonwood	27,882	40,404	39,869
Tupelo	21,494	36,396	48,311
Yellow Popular	18,370	45,376	50,770
Douglas Fir	16,518	55,123	101,869
White Oak	11,852	12,940	20,661
Maple	10,619	23,310	23,222
Total of all Woods	400,388	645,793	734,599

The veneer situation is similar to that described for other forest products--short supplies, abnormal demands, and competition, in this case among such consumers as phonograph makers, manufacturers of other musical instruments, the automobile industry, and furniture makers.



Since 1916 veneer prices as well as log prices have been advanced from three to four times; for example, white oak logs have increased from \$75 to \$200. The veneer industry requires a high-grade material. It takes practically clear logs generally 16 inches and more in diameter at the small end. The industry must, for its higher grades of products, depend very largely on the fine old timber found almost entirely in virgin stands, and for this reason the Pacific Northwest with the last of the large virgin stands is looked upon to fill a large part of the demands.

#### Producers of News Print

High prices and serious difficulties as to supplies are by no means confined to lumber. The news print situation has been very much in the foreground, particularly during 1919-1921. Practically the only newspapers in the United States, from the large metropolitan dailies to the small country weekly newspaper, which have not experienced serious difficulties are those having long term contracts or those fortunate enough to produce their own newsprint. Since 1921, however, the situation has subsided considerably and is not now thought as such a problem as during the peak of reconstruction and re-

adjustment. At the present time more species are being used, and large lumber companies are encouraging going over their timber land, either just before or just after logging, to cut out the small stuff for pulpwood. Among the most prominent companies of the Pacific Northwest advocating this action is the Crown-Willamette-Zellerbach consolidated company. Many of the colleges are doing research along the line of paper making, and newsprint manufacture, which can aid in taking care of the future demands of the country. Curves showing the species used and price received for paper will show the trend of the market over the past twenty-five years.

#### The Situation Summarized.

Now that we have discussed a few of our wood using industries a summary should be made. In 1920, William B. Greeley, of the Federal Forest Service, summarized the conditions clearly existing among the wood using industries up to that time. His report reads, "If the industries considered are representative of the general conditions, and there are every reason to believe that they are, the lumber situation of the past few months has, for many industries and many classes of consumers,

been one of serious shortages of supplies of great demand, and of uncertainties in securing satisfactory amounts of desired materials. Rapid rising prices have reached the highest points that they have known for lumber and for practically every other forest product consumed in the United States. Market conditions have been unstable, and it has been impossible for many consumers to plan with any certainty on cost of materials. The output of industries which depend upon lumber and other wood products has been very much reduced, and in an extreme case has gone as low as 50 per cent of normal.

"The entire nature of competition in the case of forest products has changed. Prior to the war the producers of lumber, newsprint paper, and other forest products competed with others for business. Competition during the past few months has been largely among consumers for general inadequate supplies. Under any conditions such a reversal in the fundamental situation would result in higher prices; but the shortage and demands have been so extreme that wholesome restraints as top prices which might safely be paid have been removed, and in many cases it has been possible to pass on to the consumer, and even to augment, almost any lumber price increase. This has not been universally true. There

has been some difference between industries in the extent to which they could go. Apparently limitations have been felt more by industries producing necessities than by those with products which fall rather in the class of luxuries."

Since 1920, competitive conditions have changed. It is found, at the present time, that the mills in the different sections of the Northwest are running at full capacity and manufacturing as much as the public demands, and even at time flooding the market. The main cause of this situation is that during the rise in price beginning in 1915, mills expanded their entire operations to meet the conditions at that time as well as estimating the demands of the future. As a result many mills must now liquidate their assets and move as much as possible of their products to meet their obligations.

Such conditions can not go on forever. As long as the mills place on the market as much of their material as the public can consume, the prices are assured to be on a fairly low level. Prices then are not a true criterion of the seriousness of the conditions. Curves showing the present day stand of timber can probably visualize the situation in the best manner.

Our only hope in the future is a certain curtailment in manufactured lumber products, and drastic action as to the carrying on of reforestation. Near the

end of this paper, more explanation will be given to this important factor in the timber situation.

### LUMBER EXPORTS

Another important factor effecting lumber prices in the Pacific Northwest is the matter of lumber exports. With the development of the Pacific Coast States, trade with other countries bordering on the same large ocean has been fostered. The Eastern and Southern States, from the very beginning in the lumber business, have shipped their products by water, and now much of that trade has been converted to this last vast region of timber.

Before going very far with the idea of exports, let us consider lumber exporting methods. At the early stages of the exportation of lumber from this country, the large export mills frequently operated their own sailing vessels and thus brought themselves into direct contact with the importers in foreign countries. With the advent of steamships, the number of mill-owned sailing vessels decreased every year. A steamer cargo is generally considerably larger than that of a sailing vessel, requires a quicker dispatch, and involves heavy charges for demurrage. A cargo sent by steamer frequently had to split between two or more

mills, and it became necessary to have a middleman who could bunch several orders to make up a cargo and attend to the details of clearing the steamer. It is mainly since the steamers were used in carrying lumber cargoes that the export middlemen have had a strong foothold in the American lumber export trade, particularly the last few years on the Pacific Coast. Some mills are exporting their products direct to foreign markets, but by far the greater part of the American lumber trade passes through the hands of export middlemen.

The sawmill operators cutting for export, generally realize that it is necessary to maintain a special sales force to handle the export business satisfactorily. Very few of them, however, are able to go the expense of maintaining such a selling force and call upon the middlemen to take the lumber for export off their hands. There are two classes of export middlemen in this country--the export agent and the export merchant.

The export agents buy and sell lumber on a commission basis; or to explain it in another manner, they are commission men between the exporter in the producing country and the foreign importer, or even between the domestic export merchant and the trading company. Their main asset is the local knowledge that they must possess in order to buy as cheaply as possible because competition

is strong. Upon receiving an order the export agent communicates with his mill connections and often divides an order among various mills where he can buy the cheapest. He then assembles the cargo in a convenient port or instructs the ship to pick up the cargo lots at various ports. In many sections the agents have their own inspectors to pass on the grades shipped. The financial arrangement between the export agent and his broker connections varies a great deal but generally stipulates the division of the commission obtained or the payment of a fixed amount per thousand board feet. The export agent sometimes obtains a commission both from the mills and the purchaser, usually  $2\frac{1}{2}$  per cent from each party. Sometimes one or several competing mills may appoint an export agent to handle their total export business on a commission basis. The agent arranges for tonnage, clearing the vessel, and insurance. The freight problem often leads to speculation, and many agents charter their own steamers for speculative purposes.

On the Pacific Coast several strong firms of export agents are found, particularly in San Francisco. They often maintain branch offices in several of the important shipping ports on the coast to enable them to keep in close touch with the mills, and to attend

to the loading and inspection of cargoes. Some of these agents have developed a very extensive business, and may operate their own steamers.

While the export agent sells and buys lumber on a commission basis, the export merchant stands for the importer as an independent exporter operating in his own name. These export merchants are strongly entrenched on the Gulf Coast, where a number of firms are found in various shipping ports. Naturally a thorough knowledge of local conditions is essential in this business which is entirely limited to buying and selling. On the Pacific Coast the merchant is not so prominent, as direct exporting is more frequently done in his place.

The export merchants generally make arrangements with one or more foreign brokers to represent them in the various countries, and they look to them for orders. The merchant is the executor of the order and the broker the salesman who actually controls the business. The terms between them vary considerably, but the commission charged by the broker on all orders booked through him is generally from 4 to 8 per cent, including his guaranty for the payment of all accounts that he initiates (del credere). If any amounts are advanced by the broker to the export merchant, 6 per



cent, interest is usually charged. The broker sometimes acts as the export merchant's representative in cases of dispute regarding the quality of the lumber shipped.

The broker seldom places any restrictions upon the export merchant regarding the source of supply and allows him considerably latitude in filling the orders where he can buy the cheapest. The merchant either buys outright from the mills or speculates by contracting the output of a mill during a certain period. It is evident that the export merchant's profit is entirely dependent upon his ability as a buyer and his knowledge of conditions at the different mills.

The export middlemen are generally called upon to submit a c. i. f. offer; that is to say, an offer including the cost of the lumber at the port of loading, ocean freight to its destination, and insurance. In obtaining freight space they may either approach a ship broker or communicate direct with a shipping concern operating regular liners to the importing country. However, the lack of direct shipping facilities from this country to foreign countries has greatly handicapped the lumber export trade. Many times upon submitting a c. i. f. quotation, the middleman takes a chance on

obtaining the freight space when the order is placed. If the market should go up in the meantime, he may have to face a heavy loss, and he may not be able to secure the necessary tonnage at all.

On the other hand if the middleman operates near ports with direct steamship connections with foreign countries, he is often in a better position to secure occasional cheaper rates to complete a cargo than a sawmill operator not in constant touch with the freight market. In some cases the middlemen charter their own steamers, and it has been contended that during the last few years more money has been made by them in this way than by selling lumber.

#### Consignments and Shipment Direct

Sawmill operators or export merchants frequently desire to dispose of their stocks without waiting for orders to come in. They, therefore, establish connections with a concern in some foreign port where they plan to ship their goods from time to time, and call upon this correspondent to advise them as to the prospects for consigning their stock. Upon advise from him the consignors ship their lumber which is taken care of upon its arrival by the firm acting as consignee. It is customary for the consignee to guarantee within six

months the sale of lumber consigned to him. Consignments from this country are often delayed several weeks in transit and the market may change considerably while the goods are en route. If the market is good, the cargo may be sold while in transit or the consignee may succeed in disposing of it at a profit as soon as it is received; but as a rule conditions are not so favorable. The time of arrival may not be the proper time to dispose of the cargo. Odd sizes are frequently consigned and also small lots left over from previous shipments, which often find little or no market. Many other conditions may direct the consignor to have his lumber stored by the consignee. The latter often possesses large yards for this purpose with docks and facilities for handling lumber cargoes. If the lumber is kept for some time in storage, the charges of handling, storage, insurance, and other expenses may not only entirely consume the expected profit but may not result in a direct loss. Often times lumber in storage has a depressing effect on the market.

The consignment business is confined almost entirely to hardwoods. They are made chiefly to the principal European ports, such as London, Liverpool, Hamburg, Rotterdam, and Antwerp. Buyers from other countries frequently visit these cities and have the lumber trans-

shipped.

Prior to 1918, hardwoods dominated the softwoods in the business of shipping direct. Since that time the large mills particularly of the Pacific Northwest, cutting an enormous amount of softwoods, have taken to this means of doing business which is the most practical for them. In 1925 softwoods totaling \$57,275,402. were exported to all parts of the world, shipping mainly from Portland, Tacoma, Seattle, and some of the smaller Puget Sound cities, in comparison with hardwoods valued at \$25,752,445.

Direct exporting, if conducted properly, is the ideal way of doing business. Firms giving a direct export business in this country are generally mills of good financial standing with a large output and able to guarantee delivery at a specified time. Unfortunately American exporters do not have the same facilities for extending credit and for obtaining credit information through American banks as other countries, and as a result, the American export manufacturer almost invariably demands cash against documents often before the cargo leaves the port. If the importer accedes to such terms, he must have able confidence in the exporter. Direct shipping offers the mills many advantages, especially by enabling them to exercise better control of their business. Other advantageous features

are that the commission charged by one or more middlemen is eliminated and also the danger of having the grades tampered with.

Some American mills have taken steps to establish branch offices abroad to take charge of the selling and distribution of cargos. Such steps are taken, however, only after thorough investigation in the countries where they desire to operate with special attention paid to the consuming power of the country, competition with other countries, the expense of developing trade and credit extension. The advantages that such an arrangement offers the mill are apparent. The branch office is in constant touch with the importers and the market, and can supervise the unloading of cargoes and the settling of controversies arising from defective shipment. It is also in a position to place the lumber to the best advantage, to report whether or not the grades shipped satisfy the requirements, and offer suggestions for improvement. Further, the exporter can obtain credit information direct through his branch office without using middlemen. In case of an arrival of defective shipments the branch office may take charge of them, place the lumber on the market when conditions seem favorable. Without such representation on the spot, the exporter many times is willing to accept any kind of settlement because he is at the mercy of the importer.

### Joint Selling Agencies

With the keener competition in the export trade, the reduction of selling expense plays an important part in securing orders. Some export mills have combined to sell their output through a joint agency and separate the selling from the manufacturing of lumber in order to increase the efficiency of both production and marketing. Here and there a mill would form a separate selling organization to dispose of its entire output. Where the business developed beyond the capacity of the mill to fill, lumber was bought from outside mills producing approximately the same class of lumber. This situation in several localities developed into an amalgamation of such groups of saw-mill operators, each bearing a proportionate share of the cost of the selling agency.

In certain sections, several mills located in the same territory and producing the same class of lumber have made arrangements with export merchants to handle their combine output. Such arrangements have been beneficial to these mills through their increased ability to take care of important orders that one mill would have found difficult to execute alone, and through the elimination of a certain amount of competition among the export agencies.

Countries Shipped to and Amount Shipped

Now that the methods of exporting have been explained, the products shipped and their destination should be taken into consideration. From the United States Department of Agriculture Statistical Bulletin No. 21, one will find in 1925 that Argentina, Japan, Australia, United Kingdom, Cuba, and Mexico were receiving the greatest amount of our export lumber products. During the same year figures of our lumber exports totaled \$83,027,847 (1,947,809,000 board feet) of which \$57,275,402 (1,585,725,000 board feet) were softwoods, and approximately 60 per cent were sent from the Pacific Northwest.

EXPORTS FROM OREGON AND WASHINGTON IN 1928

	Washington Exports	Oregon Exports
Africa(South)	9,229,846	1,274,088
Australia	126,876,093	55,079,494
Central America	500,947	2,271
China	120,646,464	95,247,647
East Indies	79,019	
India	2,239,245	1,913,552
Japan	593,254,487	183,104,804
Mexico	9,550,770	1,339,083
South America (E.C.)	39,151,182	31,233,546
South America (N.C.)	57,514,065	25,682,419
South Sea Islands	3,367,610	127,800
N.K. and Continent	156,865,202	78,707,003
West Indies	9,988,907	542,868
New Zealand		2,862,082
Unclassified	141,080	
	<u>1,137,395,451</u>	<u>492,116,657</u>

The species shipped as lumber exports are southern pine (701,046,000 board feet), Douglas fir (607,208,000 board feet), hemlock (126,072,000 board feet), redwood (46,235,000 board feet), spruce (26,701,000 board feet), and other softwoods (75,863,000 board feet).

Along with the lumber other products are transported across the ocean to various foreign countries. In 1926, 161,533,000 board feet were shipped as logs and hewn timbers, 554,519,000 board feet as sawed timber, 97,015,032,000 board feet as box shooks, and 3,105,166 pieces as railroad ties.

During the past few years the shipment of "Jap Squares" has increased rapidly. A "Jap Square" is merely a sawed timber from 6 x 6 to 36 x 36 inches, which is shipped to the Orient and is then remanufactured in different sizes to meet the different building conditions existing there. For example, for standing in a house in either China or Japan, one will find a 2 x 2 or 2 x 3 used in place of the standard 2 x 4 of the United States. Innumerable mills near shipping ports, particularly in Washington, utilize their logs so that they may accumulate different sizes of "Jap Squares" for their foreign trade.

#### Effects of Exports Upon Domestic Timber Supplies and Prices

The depletion of the virgin forests of the United States is making itself felt, first, though the growing scarcity of timbers of high quality, which are the products cut from large, clear logs representing the cream of



of our virgin forests. During the past 35 years such products have arisen in price more rapidly than the common grades of lumber. The most serious effect of the foreign trade will be to increase the shortage of high quality products, because it is exactly such products which are short the world over and which lumber importing nations will in the long run most desire to obtain from the United States.

This effect will be recognized in the case of the American hardwoods. The foreign demand for such species not only includes cabinet, furniture making, and finishing woods of special beauty, like walnut or quartered oak, but also many woods used in manufacturing essentials of commerce and industry, like oak and hickory wagon stock, hickory spokes, high grade car stock, ash and hickory handles, woods used in agricultural implements, and many others. The supply of old growth hardwoods from which most of these products are obtained is nearing its end. Our domestic industries are securing such materials with increasing difficulty and cost. Except as substitute woods or other materials may be found, the growing shortage of these products must in any event seriously handicap American industry and commerce.

Another important bearing of foreign shipments is upon the remaining supply of high grade southern pine

which up to a few years ago had furnished about half of the total lumber exports. The materials which the foreign consumer demands include a large proportion of high grade flooring and other forms of finish and large timbers for ship-building and other structural purposes. The situation of the supply of these products is less serious in many ways, and quite unlike that which hold true of the hardwoods. The total production of yellow pine lumber will probably decline steadily during the next fifteen years, and the production of high quality products will drop still more rapidly. Such high grade products will, however, continue to be cut from particular localities or holdings, though in diminished amounts, for thirty to forty years, and the substitution of western softwoods for both export and domestic products now made of southern pine is entirely possible and probable.

The third important factor, which is of the greatest interest to us at the present time, is that export demand is striking a large hole in the supplies of high quality softwood timber in the Western States. The Pacific coast carries on a gradually increasing trade with the Orient, Australia, South America, and Europe. It is logically replacing the exports of southern pine as that timber is further depleted. Here, again, the

foreign demand takes mainly high grade products, particularly large structural timbers, shipbuilding materials, and the better grades of clear flooring and other forms of finish. With this demand for high grade material, varying quantities of railroad ties and general utility lumber is being supplied.

The large virgin forests of the West will sustain the maximum demand made upon them by the export trade a few years without serious effect upon the domestic markets. The domestic demand for high quality timber products for the West will increase with rapidity as the production in the South falls off. In the West, as in the South, the first evidence of depletion will be a scarcity of products of high quality. There is this marked difference, however, in the West, that the existence of large National Forests where timber is cut under careful restriction, afford a means of reserving reasonable quantities of high quality timber and for producing stumpage of this grade.

It must therefore be recognized that a material increase in the export lumber trade will accentuate the shortage of high quality products available to American consumers. The problem presented by lumber exports proves serious from the standpoint of quantity and will probably prove serious from the standpoint of quality. Scarcity of the high quality pro-

ducts essential to our ship and car building and many other industries is the first and one of the most serious effects of timber depletion.

The eventual solution of the problem presented by an active foreign trade is therefore identical with the remedy for depletion through domestic consumption, namely, not to restrict the use, but to increase the production of timber by getting all forest-growing land at work. It must be recognized, however, that this remedy in itself will not entirely meet the need for timber of high quality. With some exception, such material can not be grown in less than 150 years; and if every acre of denuded land in the United States were planted to-morrow, a long time would elapse before the depletion of high quality stumpage which has been cut so freely from our virgin forests could be made good. Furthermore, the private landowner can seldom afford to carry timber crops during the long periods necessary to produce material of high quality. The most effective means of overcoming the shortage of high-grade timber is the creation of public forests which can be utilized to the extent necessary for the production of large timber or special products.

The bulk of the high quality timber produced in France and other countries of Continental Europe is

grown in public forests, it being a recognized function of the Government to produce on its forest lands the classes of material which will not be grown in sufficient quantity on private lands because of the time and cost involved. This policy has already been applied to the hardwood forests acquired by the United States in the southern Appalachians pursuant to the Weeks Act. As far as practicable, these forests will be handled so as to produce high quality hardwoods rather than railroad ties and common lumber, so that they may be at least a factor in meeting the shortage of such products. But no adequate provision for the growing of high-grade eastern woods has yet been made. It can be made only by largely extending the public forests in the Eastern States.

### Wood Substitutes

Before dealing with the question of wood substitutes, it might be advisable to mention a few of the reasons why wood is used as a manufactured article. Wood is preferred because it is easily worked, and is light in weight. In many positions it is as strong as iron. For example, the tensile strength of a bar of hickory may exceed the tensile strength of a similar bar of wrought iron. When it is dry it is a poor conductor of heat and electricity, and is not homogenous like metal and stone. Such factors as these have made wood a very desirable article for man's use with the result that the lumber industry has become a large and powerful manufacturing unit.

Only in the last twenty-five years has the matter of wood substitutes been heard of <sup>the</sup> in lumber industry. Since 1914 substitutes in all lines of lumber have been doubled, and even in some instances trebled.

Such a rapidly increasing substitution for a product would not come about without certain causes. The social and economic changes affecting the use of the wood are as follows:

- (1) High values and the demand for the best service in dense centers have necessitated increasingly intensive use of space, and have lead to a remarkable modification in forms of construction.

(2) Cost and utility of the competing articles and the products into which they go, which is due very largely in the lumber industry, (a) to the diminishing purchasing power of money and, (b) to the gradual decrease in price of cement and lower costs of substitutes.

(3) Marketing of substitutes has been in most cases more aggressive and more efficiently directed in all its numerous bearings.

(4) Industries manufacturing substitutes have offered increased services in the form of exact data regarding the properties of their materials while for lumber such information is lacking.

(5) Substitutions resulting from mechanical inventions, e.g., steam engines, have helped for making possible the immense steel hull of modern ships. To show the effect of such causes on the consumption per capita of lumber in the United States, 516 board feet were used in 1906 in comparison to about 325 board feet in recent years.

The extent of the social and economic changes affecting the use of lumber and the direction these changes will take in the future, have an important bearing upon the utilization of the forest resources, upon the stability and development of lumbering and other wood-using industries, and upon the whole problem of

insuring an adequate future supply of basic raw materials.

There are three distinct groups or classes of substitutes. In the first group is building construction material, which includes primarily, planing mill products, general mill work, rough and temporary construction material, building material, sawed mining timbers, and sawed railroad ties; and secondly, fencing, sidewalk material, and roofing and lath. The second group deals with various special manufacturer of wood products in which the substitute has replaced either lumber, or wood in other forms, or both. This group includes wood material used for boxes, railway cars, furniture, vehicles, ships, silos, windmills, fuel, and miscellaneous articles. The third group in the main includes forms of utilization in which the use of wood is growing in competition with other materials and the process of substitution is reversed. It includes the wooden stove pipe, paving blocks, and wood pulp.

The general principle followed in this study has been to consider the replacement of lumber or other forms of wood in use for which it is now or was formerly employed, by other materials, including fiber and veneer products whose base substance is wood. This includes



also the curtailment of the normal expansion of the market for lumber, as broadly indicated by production of the substitute.

Substitution is, therefore, only in part the replacement of wood by other basic materials. Various new wood-using industries are competing actively with the old, the veneer and fiber package with the wooden or shark box, the veneer barrel and the paper sack with the slack barrel. Thus the total replacement of wood in a form for use, may be much less than the replacement of some one of the older wood products, such as lumber. New forms of construction for which wood is not suitable are not regarded as substitutions, and no attempt is made to estimate the extent to which such changes or innovations have prevented the use of wood or absorbed markets which otherwise it might have supplied. Thus the steel used in the skeleton of the sky-scraper and in the mammoth steamship of to-day is not regarded as a substitute, although unquestionably in both cases it has limited the use of wood. The general process of substitution has not necessarily involved diminished demand for wood in each of its many uses. In several forms of utilization, such as furniture, silo and windmill manufacture, the total consumption of wood has been increased, although obviously in a smaller amount than if there had been no re-

placement.

To go into detail to find out what time substitution began, and to what extent it is being carried on, building construction material may be taken first. In thinking of this group, fencing, sidewalks, material, roofing and lath should not be included. The materials used in the United States for building construction are lumber, concrete, steel, brick, and clay products other than bricks. There are several economic reasons why these substitutes are brought on the market in competition with lumber.

The first reason lies in the fact that the various stages in the settlement of different agricultural sections have overlapped, so that general statistics of construction for the entire country include old as well as new regions. To illustrate this point more fully, it is found that the per capita consumption of lumber in the old states, New York and Pennsylvania, is 230 and 225 board feet respectively, while in Washington it is 890, California 890, and in Oregon 905 feet. The second economic factor, the movement of population from the country to the city, has had a much greater effect upon the character of construction. With the dividing line at towns of 2,500 population the proportion of urban population has increased from 29.5 in 1880 to 46.3 in 1910, and is still higher in 1925. In the cities

the growing recognition of the common fire menace, and the growing insistence upon safety of construction, have lead to increasingly stringent public regulation of buildings. Another phase of this is found in the fact that in the building codes of to-day there is a lack of authentic information on which to base scientifically the requirements in the use of woods. Not much can be expected in the lumber industry if the standard sizes are different. To illustrate this point, one may take the most used stick in manufactured lumber, the 2 x 4. According to one practice this piece should be  $1\frac{5}{8} \times 3\frac{3}{4}$ . Lumber cannot be shipped from one district to another, and used with lumber of that particular district. Another factor is the comparative utility of service. Scientific investigation will in time furnish exact information upon which to base judgment as to the comparative suitability of competing materials for various purposes because of their properties and their relative susceptibility to damage and destruction by fire. Utility or service, depends in part upon the inherent properties of the materials themselves and the extent to which these properties can be improved through scientific development. In part it depends also on manufacturing specifications, which in the case of lumber are called grade rules, the adher-

ence in manufacturing to standard specifications, and the extent to which the properties of the material and manner in which it can best be used are made common by knowledge among customers. The case of many substitutes it is possible to control and improve the basic properties, a factor acting to the disadvantage of wood which is a natural rather than a manufactured product. The last factor which might cause substitution is cost. From the data arranged over the period from 1890 to 1925, we find that the cost of lumber has increased approximately 190 per cent while the principle competitors of substitution have remained stationary or have decreased.

Statistics for production, consumption and substitution fall into four classes; (1) production or consumption of the principal building materials, lumber, cement, steel, brick, and clay products other than brick; (2) building permits; (3) estimates of substitution by retail lumber dealers, and (4) the replacement of wood in certain special uses, particularly in interior house trimming, bridge, cross ties, and mine props. The lumber consumed in general building and construction during the year 1915 was estimated by 27 billion board feet, or 71 per cent of the total lumber consumption. Assuming that approximately the same percentage holds for other years, about 32 billion board feet were used in general building and construc-

tion in 1907, probably the year of maximum lumber production and use in the United States. On this base of falling-off in the amount of lumber used exceeded 15 per cent. This does not mean that substitutes have reduced the consumption of this entire amount. The decrease, no doubt, is due partly to other causes. The decline in lumber consumption since 1907 has been remarkably uniform. Per capita consumption fell from 516 board feet in 1906 to 375 board feet in 1915. In looking over the consumption of brick for this time it is found that it has fallen-off about 27 per cent since 1909. For the consumption of iron and steel structural shapes, it has been found to have increased 285 per cent from 1898 to 1913. Natural cement is the only structural material which shows a rapid and practically unbroken increase in consumption. During the period when the consumption of lumber fell over 15 per cent, cement increased 49 per cent.

Next in line to be considered are the building permits. From the material gathered from permits of twenty large cities, it was found that lumber, so far as town construction was concerned, was the most stable of all building materials. This is undoubtedly due to the larger proportion of small residences built of wood, the demand for which is less dependable upon the finan-

cial barometer.

The third class to be taken into account is concerned with the extent of substitution for lumber and other lumber products. In 1910 the Forest Service sent an inquiry to 3000 representative lumber dealers in Ohio, Indiana, Illinois, Missouri, Kansas, Oklahoma, Nebraska, Iowa, North Dakota, and South Dakota, requesting information as to the amount of substitution in their line of commodities. The estimates received were from approximately 1,200 dealers.

TABLE I.--Substitution for wood 1907-1909, as estimated by retail lumber dealers.

MATERIAL	%DECREASE IN SALES DUE TO SUB.	MATERIAL	%DECREASE IN SALES DUE TO SUB.
Dimension			
Stuff	5.4	Fence Posts	3.7
Sheathing	2.4	Common Lumber	5.3
Siding	4.1	Fencing	13.7
Finish	.9	Lath	16.2
Flooring	6.0	? Shingles	3.0
		Pickets	9.4

By inspection you can see that fencing and shingles are substituted for the most, and interior finish the least. A rapid increase in the use of practically all cases of substitutes was predicted by the dealers.

TABLE II.-- Comparative Substitution in City and County Markets, 1907-1909, Estimated by retail lumber dealers.

MATERIAL	% CITY(27) reports	%TOWN & COUNTY (316)reports
Dimension	7.89	6.24
Sheathing	5.26	2.27
Siding	9.37	4.71
Finish	1.52	1.14
Flooring	6.37	7.22
Common Lumber	6.59	7.07
Fencing	12.96	17.88
Shingles	26.67	19.65
Lath	4.19	2.85
Pickets	21.00	12.06
Fence Posts	10.10	4.00

TABLE III.--SUBSTITUTION FOR WOOD PRODUCTS, 1907-1914  
Estimated by retail lumber dealers.

MATERIAL	ESTIMATED DECREASE IN SALES IN %.
Dimension Stuff	13.4
Siding	15.0
Finish	3.0
Flooring	14.1
Fence Posts	11.9
Fencing	42.3
Shingles	35.0

The fourth class of statistics deals with the production of metal, trim for interior, sash, doors, and the like, and mine timbers. The first item in this class is metal trim. It is used in fire-proof cons-

truction. It has been estimated that metal trim is substituted for 50,000,000 board feet annually. On the item of bridges, culverts and trestles, we find that there is an annual substitution of 850,000,000 board feet. This amount is comparatively large. The item of cross ties stands alone in its particular field. Approximately 850,000,000 wood ties are in service with only 2,400,000 substitutes. Of these 2,000,000 are steel, and 400,000 are cement. The substitution for mining timbers is very slight, probably less than seven tenths of 1 per cent.

Partial substitution and actual increases in the consumption of lumber in connection with the use of materials must be considered before a conclusion in general can be drawn concerning building and construction. With the modern type of bigger construction, the building of higher and larger building, partial substitution is found absolutely necessary. However, that does not decrease the use of lumber because it must be used for forms and framework. In general, partial substitution has not necessarily effected the market of the lumber, or, to any great extent, prevented the normal increase in its use.

To summarize the data on building and construction, a conclusion can be drawn that substitution is large and is increasing.



It is difficult to realize the extent of substitution in fencing until one compares data of the past with that of the present. Difference in circumstances prevailed in the past. Wood was plentiful in all regions and could be put into use at a low cost. The increase in land values, the increasing cost of farm labor, and the growing realization that the rail fence formed a refuge for weeds and insects, created a demand for other material. The annual consumption in the United States of barbed and woven wire is 660,623 tons. It is believed that one ton of wire will replace 6,000 board feet. That, then, is a substitution for 3,300,333,000 board feet. Of the posts about 10 per cent of steel and cement are used for a substitute, a total of 2,500,000,000 board feet. Since creosote has come into market, cement and steel posts have not caused any decrease in the markets for wood posts, for the reason that the life of the wood post has been increased considerably.

A thing of the past, in most cities, is the wood sidewalk. There is probably no other use in which wood has disappeared so completely in so short a time. About .09 of 1 per cent, 4,614 square yards, out of 5,025,904, are constructed of wood. Concrete has been taken as the chief substitute and will probably continue as such, except in places where first cost is the

main or only consideration.

Roofing has had the war of the substitutes to a greater extent than most wood products. The war has been waged more intensively upon the wooden shingle than upon any other forest product. Both the agitation and the large replacement which has taken place are due in part to the fire hazard attached to roofing in urban construction. The increase in substitutes from 1904 until 1915 was 200 per cent. At the present time about 50 per cent of the roofing material is made up of some form of substitution. To get some idea of amount of substitution, it may be assumed that there are  $3\frac{1}{2}$  shingles in thickness per inch, and about 833 shingles per square, i.e., 100 square feet, as a result the total substitution now amounts to approximately 1,440,000,000 board feet.

Wall and plaster board and metal lath are replacing the wooden lath. The new forms of construction demanded by present-day tastes, advertising, comparative costs and utility, are causing substitutions. By wall board is meant those stiff composition boards made up of three or more plies of wood pulp or paper board. They are usually intended to form interior walls with panel effects. By plaster board is meant those composition boards consisting principally of mineral plast-

er with or without liners of paper board. They are usually intended to be plastered over for interior finish on walls and ceilings, although at times they may be used without additional plaster as in the case of wall board. In the last ten years the production of wall and plaster board has increased from practically zero to 300 per cent. During the years 1909-1914 the increase was 200 per cent. At a later date the substitution for lath was 22,615,915 square yards of metal lath and 34,246,089 square yards of wall and plaster board for approximately 210,000,000 board feet annually. The one redeeming feature is that lath is a by-product of lumber, so the effect is not so great; and wall board which is about 35 per cent of the substitution, is a wood product.

There are other products of wood which have competitive substitutes to contend. However, the trend of wood substitutes in these cases is found to be in the same direction as those which have been discussed. Substitutions are coming into more prominence in the manufacture of boxes, railroad cars, silos, steamships, and so forth.

In summarizing all the data given we should say that it would be advantageous to the lumberman if he would publish information concerning his different

marketable products so that the public could make a fair comparison with the different substitutes. This would not eliminate the problem of substitutes but it would aid considerably in minimizing the effect of them. The substitute appears to be gaining ground gradually, but the advancement at present is not steady. To offset this advancement, the lumber man, through the aid of technical men, have found increasing uses for wood, so that the demand for wood in the future is not likely to decrease to any material extent.

TRANSPORTATION

Another factor which is becoming more important is the expense incurred in transportation. With the forest supply diminishing in the East and the country as a whole looking to the far West for its main source this factor is becoming a real problem.

At the present time mills of this part of the country are turning to two important means of reducing the expense incurred in shipment east by rail, or in a more technical way, they are refunding to themselves some transportation charges. These means are, under weights and scant sawing. With the development of rail shipment and standardization of different sizes of lumber, the railroad company established standard weights for the different manufactured articles. For example, the 2 x 4 surfaced according to eastern specification, either S1S1e, or S4S, would weigh 2500 per M board feet. By means of the dry kiln lumber fresh from the saw may be artificially dried under the "standard" weight per thousand board feet for that particular stock. The difference under the "standard" weight is known as the underweight. These mills are refunded the underweight at the freight rate to the destination of shipment. To explain it more fully, suppose that shipment is made on a 62½¢ rate and they have under-

weights of 200 pounds per thousand board feet, they would receive \$1.25 per thousand board feet. A practice which is being cultivated at the present time is the use of white fir lumber for shipment on long rates, almost entirely in dimension grades. White fir, when dried, will have considerably more underweights than Douglas fir, and can be used in place of it in many places.

As to the matter of scant sawing, one finds it more in the matter of bridge plank, and in some cases of common dimension. In scant sawing of small dimensions, mills usually scant saw the material one-sixteenth of an inch. This shortage reduces weight of the material considerably, at times as much as 300 to 400 pounds per thousand board feet. With the bridge plank, a practice has been developed in Nebraska for the standard, 3 x 12 plank sawed to  $2\frac{1}{2}$  x  $11\frac{1}{2}$ . The purchaser buys full sawn stock and the mill sells him the scant sawed material. As long as the purchaser is not aware of the condition and the material serves its purpose, the practice is justifiable.

Transportation to the east and south is not alone accomplished by rail. From ports on the Sound and the Columbia River, water trade has been developed at an extremely fast pace since the War. According to Crow's

Pacific Coast Lumber Digest of January 31, 1929, an increase in water shipments of 1.1 per cent for 1928. According to the same report, total water shipments of British Columbia are 765,556,122 board feet of which 384,174,589 is domestic shipment; Washington 3,501,320,157, of which 2,363,924,708 is domestic; Oregon 1,424,207,435, of which 932,090,778 is domestic. The years immediately following the war showed considerably higher increase following the war. A clearer idea of our present domestic trade can be given by showing the destination of our shipments from the Pacific Northwest.

## British Columbia

Atlantic Coast-----	282,294,438	Bd.Ft.
California-----	37,004,348	" "
Eastern Canada-----	64,110,257	" "
Hawaiin Islands-----	56,581	" "
Panama Canal Zone-----	698,865	" "
	<u>384,164,589</u>	

## Washington

Alaska-----	10,150,196	" "
Atlantic Coast-----	1,406,779,795	" "
California-----	852,715,973	" "
Eastern Canada-----	8,721,207	" "
Hawaiin Islands-----	74,636,157	" "
Panama Canal Zone-----	6,445,757	" "
Philippin Islands-----	4,012,687	" "
Unclassified-----	562,834	" "
	<u>2,373,924,706</u>	

## Oregon

Atlantic Coast-----	275,136,822	" "
California-----	752,277,732	" "
Hawaiin Islands-----	1,310,433	" "
Panama Canal Zone-----	2,563,307	" "
Philippine Islands-----	766,245	" "
Unclassified-----	26,239	" "
	<u>932,090,878</u>	

Of the domestic trade, one can easily see that the greatest business is done with Atlantic Coast shipments. Most of this stock which is shipped by water is of the lower grades because they can be delivered there at a much lower price. If one has had any kind of experience in the selling game, they would find that a slight variance in price in the lower grades of material, makes a considerably more important factor in disposing of the stock, than a fairly large variance in high grade clears. However, considerable clears are transported by water for the cities bordering the Atlantic Coast and for shipment to Europe.

With the big building program, which California has taken on in the past few years, keen competition has been developed into that region. Mills bordering water ports find that shipment to Southern California, and also to most points south of the Golden Gate can be reached more cheaply, and as efficiently, although somewhat longer in transit, by water. Inland mills are considerably handicapped for this trade since they must rely entirely on rail shipment for deliver.



## THE VALUE OF TIMBER OWNERSHIP

Present Situation as to Timber Ownership

A thorough investigation of timber ownership in the Lake States, the southern pine region, and the Pacific Northwest was made by the Bureau of Corporations in 1910. At that time these three great forest regions contained about 80 per cent of all the standing timber in the United States. The two most striking facts reported by the Bureau of Corporations, following its investigation, were the concentration of control of standing timber in comparatively few large holdings and the vast scale upon which the speculative purchase and holdings of timber in advance of its use had been conducted. Both of these conditions were attributed directly to the public-land policy of the United States. The Bureau of Corporations found that 48 per cent of the standing timber privately owned in these three regions, or 939.7 billion feet, was held or controlled by 195 owners. Three large corporations held between them 238 billion feet, or 11 per cent of all of the privately owned timber in the United States. The concentration of standing timber in large holdings was not fully developed in the Lake States and the Pacific Northwest.

In brief, the situation as to timber ownership has not changed materially from that reported by the Bureau of Corporations in 1910. Half of the privately owned timber in the United States is in the ownership of control of about 250 large companies. About 20 per cent of the total is owned by the government, while several of the Western States also rank as large holders. The ownership of the remaining timber is very widely distributed. There are 24,000 holdings of less than a billion feet in Oregon and Washington. In nearly every forested region the group totals of the principal owners have either practically remained stationary or decreased. The tendency on the part of these groups to acquire and maintain a relatively constant supply of standing timber as cutting progresses is marked in regions where the remaining resources permit. The decrease in the holdings of such groups in several of the eastern forests is a clear indication of timber depletion. In many individual cases, of course, a further concentration of timber-lands is in progress. This particularly marked in the soft-wood forests of the Northwest, spurred by the scarcity and high value of pulp woods.

A realization of the carrying charge of long-term timber investments, which may double the capital

cost of stumpage every seven or eight years, has retarded the movement for building up enormous speculative timber properties which was in full swing prior to 1910. The tendency of the present, with some exceptions, is to put the timber holding on an operating basis, adjusting its size to a practical scheme for underwriting the cost of particular mills and logging improvements, rather than to carry large surpluses beyond operating requirements. A number of companies, hitherto timber investors rather than lumber makers, are becoming operators through the necessity of obtaining a current revenue to meet carrying charges, and also because of the opportunities for profit afforded by the existing lumber markets. As a broad rule, therefore, particularly in the Northwest, timber lands are passing over from long-time speculations to blocks of raw material connected with particular manufacturing plants. As a phase of the process, the largest holdings are being reduced rather than increased.

On the other hand, this regrouping of timberlands is bringing new interests into the Western States, chiefly as operators. While often buying timberland from the larger owner who was there before them or taking over going sawmills, these new interests are also consolidating small holdings in order to block up

desirable operating units. As a result they become large or comparatively large timber owners themselves; and their establishments in the West tends to even off decreases in the holdings of the very large interests. By and large, the degree of concentration indicated in the findings of the Bureau of Corporations in 1910 has not been appreciably changed; but no general tendency is evident to extend control by increasing the larger holdings or by withholding timber from the saw. Indeed the opposite is true in many regions.

Two factors make the effect of timber concentration greater than it appears. The first is the ownership of key areas, strategically located at the outlets of valleys or other points, where they control to a considerable degree the operation of the back-lying or adjoining timberland. There are many cases where topography thus gives the owner of a key tract practical control over an adjoining quantity of timber which he may confidently expect to purchase more or less at his own terms when he is ready to log, but which in the meantime must be carried by others. Under the operation of the Timber and Stone Act and other land laws, many such tracts have been acquired within or adjoining National Forests which in effect control considerable quantities of publicly owned timber, and the same

situation frequently exists as regards private lands.

A second aid to timber control is the fact that the holdings of many, though not all, of the large owner comprise the most accessible timber in their regions, the timber most cheaply logged, and the timber of best quality. A considerable part of the western stumpage is so inaccessible and costly to log that it will not be a competitive factor in the lumber market for many years. This is true, particularly in much timber in the National Forests. Control of the more accessible and high grade timber will strength the position of many large interests aside from the actual volume of stumpage which they own.

#### Concentration Tendencies in Lumber Manufacture and Marketing

During the last few years the most significant tendencies bearing upon the general question of timber concentration are not, in the ownership of stumpage alone, but concern a more highly organized control of sawmills and lumber marketing by groups of operations. During this same period of time the industry has become more closely knit through the development of regional associations and other cooperative enterprises. The census of 1910 reported some 45,000 operating mills, although it is doubtful if such a large number is found

at the present time. The study made by the Forest Service in 1914 indicated that the lumber industry was very individualistic in character. An enormous number of mills, large and small, operated independently, and the vast majority of lumber-making establishments manufactured and marketed their products as competing units. The sawmill capacity of the country was much greater than the volume of lumber which could be marketed. The bonded indebtedness of the industry was large and, in general, its financial structure was weak. The pressure of carrying charges and indebtedness on timberlands on investments in manufacturing capacity too large for the market, led to frequent periods of overproduction and of financial distress to many operators.

The change from these conditions which now appears to be in progress may be compared to the changes in the iron and steel industry for the period when the small foundries and steel plants were disappearing or being consolidated in a comparatively few large groups; or to changes in the transportation industry during the period following 1870, when many small railroads were absorbed into large trunk systems. These tendencies in the lumber industry manifest themselves in the creation of large operating groups of affiliated sawmills, greater financial strength of the lumber in-

dustry, concentration of lumber marketing and development of trade associations. These different points will be taken up in their order.

The necessity of manufacturing lumber in the vicinity of standing timber prevents the geographical concentration of plants to any degree comparable with most other industries. Nevertheless, there is a distinct tendency, particularly in the Western States, towards concentration of production through the central control of a considerable group of mills. Such control may be exercised through varying degrees of stock ownership, bonding or other financial relations, or affiliations of one form or another. These operating groups range from two or three sawmills to twelve or more, with a combined cut of from 200 million board feet annually up to a billion board feet. In several instances the group includes mills in two or three of the principal softwoods regions--the South, the Lake States, and the Northwest, and in some cases also embraces mills or timber properties in British Columbia or Mexico.

The movement of southern lumber interest into the Western States is one of the significant phases in this tendency in lumber manufacture. Several of the large southern operators have within the last

ten to fifteen years acquired mills or timber properties in the West. In some cases this represents an expansion of existing lumber-producing organizations; in others, the migration into new territory of operating units which have exhausted their former timber holdings.

With the development of such operating organizations there is a certain elimination of sawmills and timber holdings which heretofore have been unaffiliated. The tendency of the large operating groups is to consolidate the holdings, large and small, in their vicinity and thus acquire sufficient stumpage to supply their manufacturing plants from twenty to twenty-five years. The relation of the small mill to this general movement is a complex one and, as will be indicated later, works in different ways in different regions. But as regards the principal remaining timber resources of the United States in the West the present tendency is unquestionably toward a closer concentration of lumber manufacture in large units than has previously existed.

#### Greater financial Strength of the Lumber Industry

The study of the lumber industry in 1914 indicated that its financial structure was weak. Incomplete records of bonds and other forms of indebtedness on timber lands and operations in the southern pine region and the



West aggregated \$151,000,000. Stockholders' loans, current bank loans, and other forms of borrowing apparently had been carried beyond the point of safety. Interest and maturities on the various forms of indebtedness formed a heavy charge upon the average thousand feet of lumber manufactured, and notably forced many sawmills to continue cutting during periods when operation represented an actual loss and increased the overproduction which occasioned periodic demoralization of the industry. In the three years following 1912 there was a weeding out of weaker operators as a result of these conditions, and certain of the large timber holdings in the Northwest were broken up and passed into other control owing to the attempt to carry bonds and other forms of indebtedness beyond the capacity of the business.

Within the last 10 years the financial strength of the lumber industry has been radically improved, as a large volume of timber bonds has been retired. The flow of outside capital, particularly from the Southern States, into the western timber regions has eliminated a certain number of weakly financed timber owners and sawmill operators and has strengthened the financial backing of other concerns where no change in ownership was made. Higher profits in the manufacture of lumber during the past few years have enabled the industry, by

and large, to wipe out much old indebtedness and greatly improve its financial situation.

This change is cited because it is part of the general reconstruction of the lumber business which has been taking place, thus making it a better organized industry, and which tends to eliminate certain conditions which formerly made this industry one of the most highly competitive in the country. The indebtedness of timber owners and lumber producers was formerly a large factor in keeping up production with little reference to demand, and in causing the scramble to market the lumber cut at almost any price. To a certain extent the lumber industry now appears to be passing out of a condition where excessive competition was forced upon a large portion of its members by purely financial exigencies.

The fact remains that the nature of timber properties tends to compel the operator to manufacture lumber steadily at the full capacity of his plant and to dispose of his product currently as it is sawn. This results from the cost of carrying large supplies of raw material. The "stumpage load" has forced many timber owners in the West to become operators, and the very necessity of liquidating timberland investments compels continuous operations.

The carrying charges on timberland thus tend to keep the lumber industry competitive. In 1914 and 1923

they compelled many mills to operate at a loss for operation was still less costly than idleness. The greater financial strength of the lumber industry will minimize the effect of this basic factor to some extent, but can not eliminate it. Once let lumber stock equal or exceed the demand and it would again become a powerful competitive influence. <sup>7</sup> Another safeguard against possible monopolistic tendencies in lumber manufacture is the public ownership of a third of the timber in the Western States, in the National Forests. The sale of public stumpage under the restriction enforced will foster independent mills not affiliated with the large interests.

#### Concentration of lumber marketing

Probably the most significant phase in the reorganization of the lumber industry is the development of large marketing units which handle the output of a considerable number of plants, under central control. This has gone considerably beyond the concentration of production through the control of groups of mills. An agency in New York sells the product of eleven southern mills, amounting to some 200 million board feet annually. There are many other groups of mills whose cut is marketed jointly under management which may be identical

with the ownership or affiliation of the mills themselves or which may, in the form of a selling agency, be largely or wholly unconnected with the producing plants. One of the most common is the type of selling agency which markets the cut of two to fifteen small mills on a commission basis, giving the mills a more efficient selling department than they individually could afford.

The "line-yard" system of retailing lumber, although followed for a good many years, is an indication of the same movement toward closer organization of lumber marketing. In some cases large sawmills or groups of sawmills under the same financial control maintain their own line or retail lumber yards or are financially affiliated with companies operating "line-yard" systems. The large wholesaler who contracts for the entire cut of a number of mills, or the entire cut of certain grades of lumber, is another factor. Many small mills, particularly in the Southern States, while seemingly independent operating units are in fact grouped into relatively large marketing units through a single wholesaler who handles their product.

In the general lumber trade the large selling organization has often been a strong competitive factor. Reaching out for more business, it has not infrequently

brought effective competition into regions where formerly it was lacking and given better service to consumers in such ways as stabilization of lumber grades, offering new grades or dimensions especially adapted to local requirements, or furnishing plans for the construction of dwellings and farm improvements. In itself this form of organization may be beneficial rather than harmful to the public interests, particularly in an industry like lumber manufacture, which has been backward in the development and adaptation of its products to the requirements of consumers.

#### Development of trade associations

Regional association of lumber manufacturers have been in existence for many years. They have discharged certain functions of value both to producers and consumers of lumber, particularly in the standardization of lumber grades enforced by association inspectors and in correcting evils common in the industry. The associations have also largely handled the traffic interests of their members and have been the media through which various forms of statistical and other information has been assembled and distributed to the lumber producers comprising them.

The general reorganization of the lumber industry

has involved inevitably an expansion in the activities of such associations and has given them greater influence upon both the production and marketing of lumber. They have given emphasis, for example, to the formulation and adoption of uniform accounting systems, tending to unify the accounting practices of lumber manufacturers, which in former days were extremely diverse and often haphazard and inaccurate. They have been the foremost promoters of the movement for guaranteeing the quality of lumber products. Another activity of the associations during the past ten years is the assembling and distribution among members of the association or of a subsidiary organization of current reports on the prices received in lumber sales. The purposes of this work is to give the members of the association a common, up-to-date understanding of the market which they are supplying. Ignorance of current market prices, particularly on the part of the small mill operator, has been one of the reasons for the very unstable condition often prevailing in the lumber industry. This point is very evident in some parts of the country by the wide range in price for the same grades in the same locality.

The assembling and distributing of information obviously forms a possible medium for reaching more or less definite agreements and understandings controlling

the prices at which lumber is offered. The extent to which it may serve as a medium depends upon the policy followed by the particular association as to the degree of publicity given to data of this character, upon the efforts which the association may make to induce its members to price their product in conformity with the highest rates shown by current reports, and upon the extent to which the individual lumber producers or selling organizations may use the data as a basis for price control or informal understandings. Properly employed, particularly with a large degree of publicity, such information should serve to stabilize the lumber market to the advantage of both producer and consumer.

From the factors affecting lumber prices, which have been given in this paper, a summarizing thought might be drawn. "With the depletion of our virgin forests, increasing lumber exports, and other sources of drainage, prices will remain<sup>6</sup> a fairly constant high level. It will take a general stabilized organization of stumpage or timber ownership, the use of substitutes, along with research work in closer utilization to help aid in maintaining a level which will enable practically all classes of people to use this wonderful resource.

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