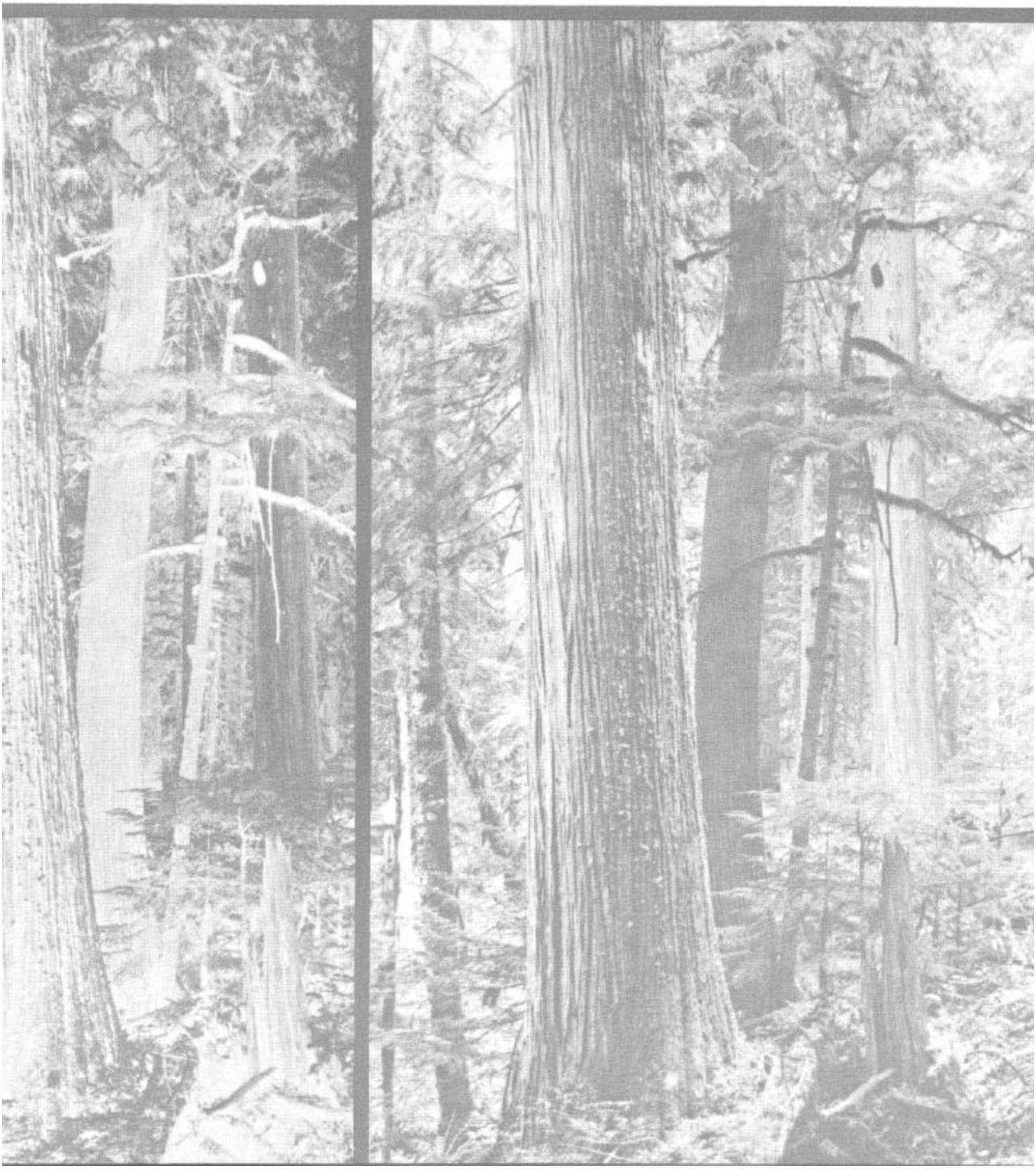
RESOURCE BULLETIN PNW-85
AUGUST 1979

Pacific Northwest Forest and
Range Experiment Station
U.S. Department of Agriculture
Forest Service

WESTERN RECEDAR - A FOREST RESOURCE IN TRANSITION

by Charles L. Bolsinger



CONTENTS

WESTERN REDCEDAR-A FOREST RESOURCE IN TRANSITION

Reference Abstract

Bolsinger, Charles L.
1979. Western redcedar--a forest resource in transition. USDA For. Serv. Resour. Bull. PNW-85, 24 p., illus. Pacific Northwest Forest and Range Experiment Station, Portland, Oregon.

Available information on inventory, growth, price, and consumption trends for western redcedar in Western United States is compiled. The future of western redcedar as a product resource and component of the forest is discussed.

KEYWORDS: Western redcedar, Pacific Northwest forest resources, timber supply, shake and shingle industry, forest statistics.

RESEARCH SUMMARY
Resource Bulletin PNW-85
1979

The prices and consumption rate of western redcedar products have increased more rapidly than most other west coast woods. Long important to the Northwest's timber economy, western redcedar is currently being used more rapidly than it is being replaced in the forests, especially in Washington and Oregon. Most products are currently manufactured from old-growth cedar; and in Washington, which contains about 40 per cent of the resource, old-growth cedar will soon become scarce on lands outside National Forests. The shake and shingle industry, which consumes about 38 percent of the total cedar harvested in all States and 45 percent of the cedar harvested in Washington, depends almost entirely on old-growth cedar and will be forced to curtail production before most other cedar-using industries. Although young-growth cedar is suitable for some products, the total amount of cedar that will be available in the future is expected to be considerably less than is now

being consumed. Very little cedar is being planted, although some cedar is naturally restocking logged areas. Most forest managers are featuring other species in timber management plans. The species is not threatened or endangered, however, and has several traits that could be used by resource managers--its ability to grow on very moist soils and under tree or brush canopy, for example.

Relocation of cedar processing facilities and reduction of output are likely in the near future, especially in western Washington and Oregon. The depletion rate in other States is negligible. British Columbia's tremendous inventory of redcedar--three and a half times the volume in the United States--assures that high quality old-growth cedar will not soon disappear. It remains to be seen how much will be available for industrial use and consumption in the United States.

SOURCE OF INFORMATION

Information in this publication was compiled from various sources. Published references are listed on page 21. Timber inventory and growth data were obtained from Resources Evaluation offices in Anchorage, Alaska; Ogden, Utah; and Portland, Oregon. Inventory volume of live redcedar in western Washington was updated to 1977 by the author using growth factors and reported harvest of live redcedar since the field data were collected in 1963 to 1967. Other information from unpublished sources was compiled by the author and is filed at the Pacific Northwest Forest and Range Experiment Station, Portland, Oregon. Some of the background information is based on the author's experience and conversations and suggestions from scientists, retailers, mill operators, nursery managers, foresters, loggers, and representatives of companies and industrial associations. Special thanks for information and/or helpful suggestions are due to:

Alan Green, Intermountain For. and Range Exp. Stn, Ogden, Utah Theodore Setzer, Forest Survey for Alaska, Pac. Northwest For. and Range Exp. Stn., Anchorage, Alaska Irene Allen, Region 1, USDA For. Serv., Missoula, Montana Gary Lindell, Pac. Northwest For. and Range Exp. Stn., Portland, Oreg. James Cahill, Pac. Northwest For. and Range Exp. Stn., Portland, Oreg. Thomas Snellgrove, Pac. Northwest For. and Range Exp. Stn., Portland, Oreg.
Alaska; Ogden, Utah; and Portland,

Charles McKetta, Univ. of Idaho, Moscow, Idaho
Rex Johnson, Idaho State Dep. of Lands, Coeur d'Alene, Idaho
V. G. Peterson, Red Cedar and Handsplit Shake Bureau, Bellevue, Washington
John Harris, Canadian For. Prod. Ltd., Vancouver, B. C.
Michael Sullivan, Industrial Forestry Assoc., Portland, Oreg.
Frank Ter Bush, Region 6, USDA For. Serv., Portland, Oreg.
Lee Winner, USDI Bureau of Indian Affairs, Portland, Oreg.
Ed Mather, the MacGillis and Gibbs Company, Beaverton, Oreg.
Loren Gee, Washington State Dep. of Natural Resources, Olympia, Washington
Gary Morishima, Quinault Indian Nation, Taholah, Washington.

INTRODUCTION

Western redcedar (Thuja pZ2cata Donn) is a major tree species in the forests of Northwestern North America. Its range extends from southeastern Alaska to northwestern California and inland to Idaho, Montana, and eastern British Columbia. It rarely occurs in extensive pure stands but is commonly associated with several other tree species. In Pacific coast forests it grows with Douglasfir, western hemlock, Sitka spruce, Pacific silver and noble firs, and red alder, to name a few. In the Rocky Mountains it is usually found with western white pine, western larch, grand fir, western hemlock, Douglas-fir, and Engelmann spruce (USDA Forest Service 1965).

Forest inventory data show that cedar tends to grow slowly--trees are smaller in diameter and shorter than Douglas-fir and hemlock trees of the same age in young-growth stands on most sites. On some moist sites, however, redcedar is capable of growing more rapidly than other conifers, and it can survive in areas that are too wet for most species.

Western redcedar is highly resistant to tree-killing diseases and has the ability to recover from severe damage by many agents. So, despite the species slow growth, it can live several hundred years and attain large sizes.

Demand for western redcedar products has increased rapidly over the past 10 years. Consumption rate and prices of cedar have risen more sharply than for other northwestern woods. As the quantity of cedar consumed has increased, many people have begun to wonder about the future of the resource. Cedar product manufacturers, resource managers,

planners, and legislators have been examining the cedar situation. They are asking questions like: Can the supply keep up with the demand? What are the trends in various cedar products? How long will cedar last at the present consumption rate-especially high quality old-growth cedar? Can production be increased? Is the species being replenished in the forests? Should cedar allocation policies be altered? Is the species threatened or endangered?

This study was done to provide decision-makers with information on the western redcedar resource. Included are statistics on consumption, prices, forest inventory, growth rates, and a discussion of western redcedar's future.

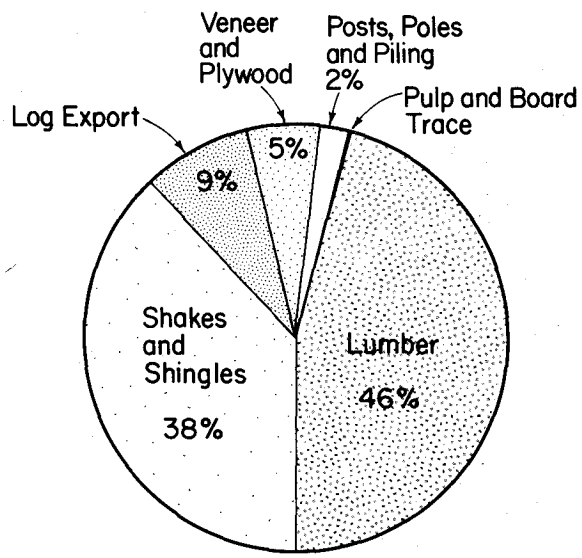


Figure 1.--Distribution of western redcedar timber harvested in the United States in 1976 by product.

How Is Western Redcedar Used?

Western redcedar is used in a variety of products, including shakes and shingles, siding, poles and posts, fence material, casket stock, outdoor furniture, paneling, and many specialty items.

Lumber production ranks first in total consumption of cedar in all Western States, and shake and shingle production ranks a close second (fig. 1). These two broad product categories accounted for 84 percent of the redcedar processed by mills in 1976. Lumber accounted for over 70 percent of the cedar processed in Montana and Oregon (table 1) and 65 percent in Idaho.1/

1/ Based on reported lumber production for Idaho and derived total cedar production using total U.S. shake and shingle production, National Forest timber sale data, and product conversion factors.

Table 1--Volume and percent of western redcedar logs processed by forest industries in Oregon, Washington, and Montana, by industry category in 1976[1/]

Industry category	Oregon		Washington		Montana	
	Thousand board feet[2/]	Percent	Thousand board feet[2/]	Percent	Thousand board feet[2/]	Percent
Lumber	122,136	72	194,204	31	9,837	74
Veneer and plywood	6,766	4	48,953	8	0	0
Pulp and board	0	0	400	trace	0	0
Shake and shingle	36,116	21	286,092	45	[3/]3,420	25
Export	4,763	3	91,683	14	0	0
Pole, post, piling	614	trace	15,388	2	106	1
All industry categories	170,395	100	636,720	100	13,363	100

Sources: Bergvall, Bullington, and Gee (1977), Howard and Hiserote (1978). Data on file at the Pacific Northwest Forest and Range Experiment Station, Portland, Oregon.

[1/] Data not available for Alaska, Idaho, and California.

[2/] Scribner log scale.

[3/] Includes house logs and specialty items.

In Washington the picture changes: Shakes and shingles ranked first, amounting to 45 percent of total production; lumber accounted for 31 percent. Northwestern Washington has the greatest concentration of cedar shake-and shingle producers, located near sources of high-quality old-growth timber. Log exports from Washington and Oregon accounted for 9 percent of the total cedar harvested in all States. Most of the redcedar harvested in Alaska--less than 2 percent of total harvested in the United States--was shipped in the form of logs to Oregon and Washington. It is not considered export. Veneer and plywood, posts, poles and piling, and pulp and board production amounted. to about 7 percent of the total cedar processed. Most of this was in Washington.

What Are The Production Trends Of Various Redcedar Products?

Shake and shingle production has increased more rapidly than production of other cedar products. In 1976, 3.9 million squares were produced in the United States, a 160-percent increase from 1970. Cedar lumber production in Oregon, Washington, Idaho, and Montana increased from 415 million board feet in 1970 to 552 million board feet in 1976, about 33 percent (fig. 2). The increase in lumber production for all species in these States was only 9 percent (fig. 3)._2/ Cedar log exports have fluctuated considerably; in 1976 they were 32 percent lower than in 1970 and 10 percent higher than in 1974.

The production of western redcedar veneer and plywood has increased modestly, but amounts to a relatively insignificant part of the total cedar consumption.

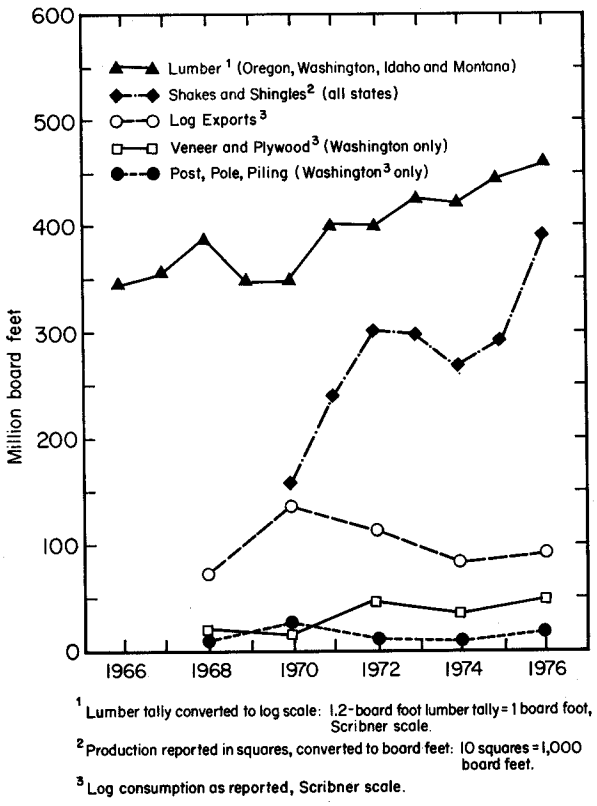


Figure 2.--Western redcedar production trends by product category.

2/ Because 1970 was a year of low construction activity, the absolute magnitude of these changes may be exaggerated. Comparison of change by species is considered valid.

In Washington, the 1976 production of redcedar posts, poles, and piling was down from 1970. Production trends are not available for cedar posts, poles, and piling in Idaho and Montana; production is thought to be increasing.

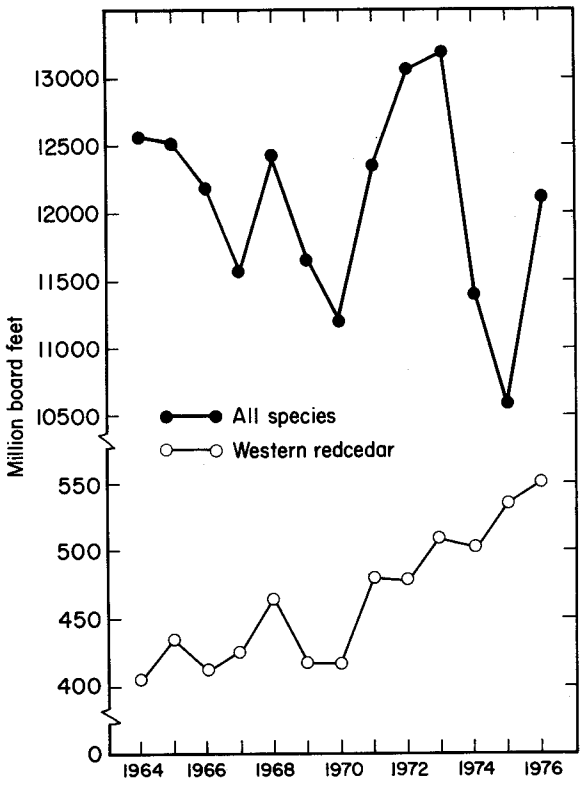


Figure 3.--Lumber production in Idaho, Montana, Oregon, and Washington, 1964-1976--all species and western redcedar.

Have Redcedar Prices Increased More Rapidly Than Prices Of Other Species?

In 1977 the average price paid for all sales of western redcedar logs in western Washington and northwest Oregon was $320.80 per thousand board feet compared with $57.30 in 1965. The average annual increase over that period was 15 percent. Douglas-fir and hemlock sawlog prices increased by 12 percent during the same period. Western redcedar prices have increased even more rapidly than other species recently as shown in the following tabulation (Ruderman 1978):

Species	Average annual price increase for all log sales 1975-77
	Percent
Western redcedar	35
Sitka spruce	29
White fir	11
Western hemlock	13
Douglas-fir saw logs	20
Douglas-fir peeler logs	8

Stumpage prices for timber sold on National Forests in Idaho and Montana have also increased more rapidly for western redcedar than for most other species. The average annual increase in western redcedar

prices 1965 to 1977 (from $10.10 per thousand board feet to $72) was slightly higher than the average annual price increase for all species (from $9 to $53.20).

Prices for western redcedar logs for export are currently higher than for logs purchased for domestic use. In 1977 the average price for domestic logs was $301.10 per thousand board feet, compared with $418.70 for export logs (Ruderman 1978). Since 1970, the difference between domestic log prices and export log prices has narrowed for most log grades (fig. 4) .

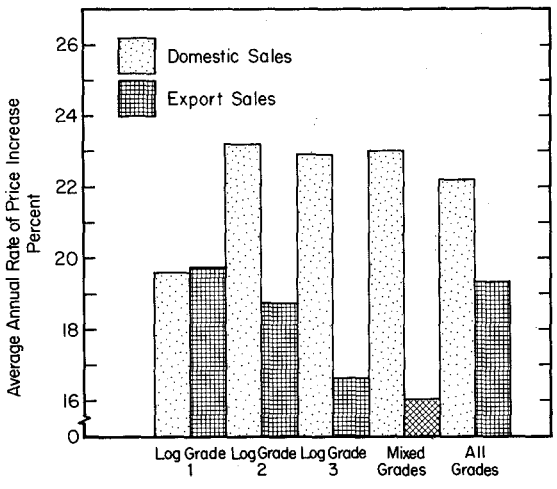


Figure 4.--Average annual rate of price increase of western redcedar logs in western Washington and northwest Oregon for domestic and export sales, by log grade, 1970 to first half of 1978.

How Much Western Redcedar Timber Is There?

The total estimated volume of western redcedar in the United States in live trees that are at least 25 percent sound is 34 billion board feet (Scribner log rule) and 9 billion cubic feet (see tables 2 and 3). British Columbia has over 120 billion board feet, 32 times the volume in the States (British Columbia Forest Service 1972). Nearly 40 percent of the western redcedar in the United States is in Washington. Idaho ranks second with 23 percent; Alaska is third with 19 percent; and Oregon is fourth with 15 percent. Montana has 4 percent and California has a trace (see fig. 5 and tables 2 and 3).

The greatest concentration of western redcedar in the United States is on Washington's Olympic Peninsula in Clallam, Grays Harbor, and Jefferson Counties. In 1966 these three counties contained about 6 billion board feet of live redcedar, gone-fourth of the total in Oregon and Washington. The net effect of timber harvesting and growth reduced the cedar sawtimber inventory in these counties to about 3.4 billion board feet by 1977.

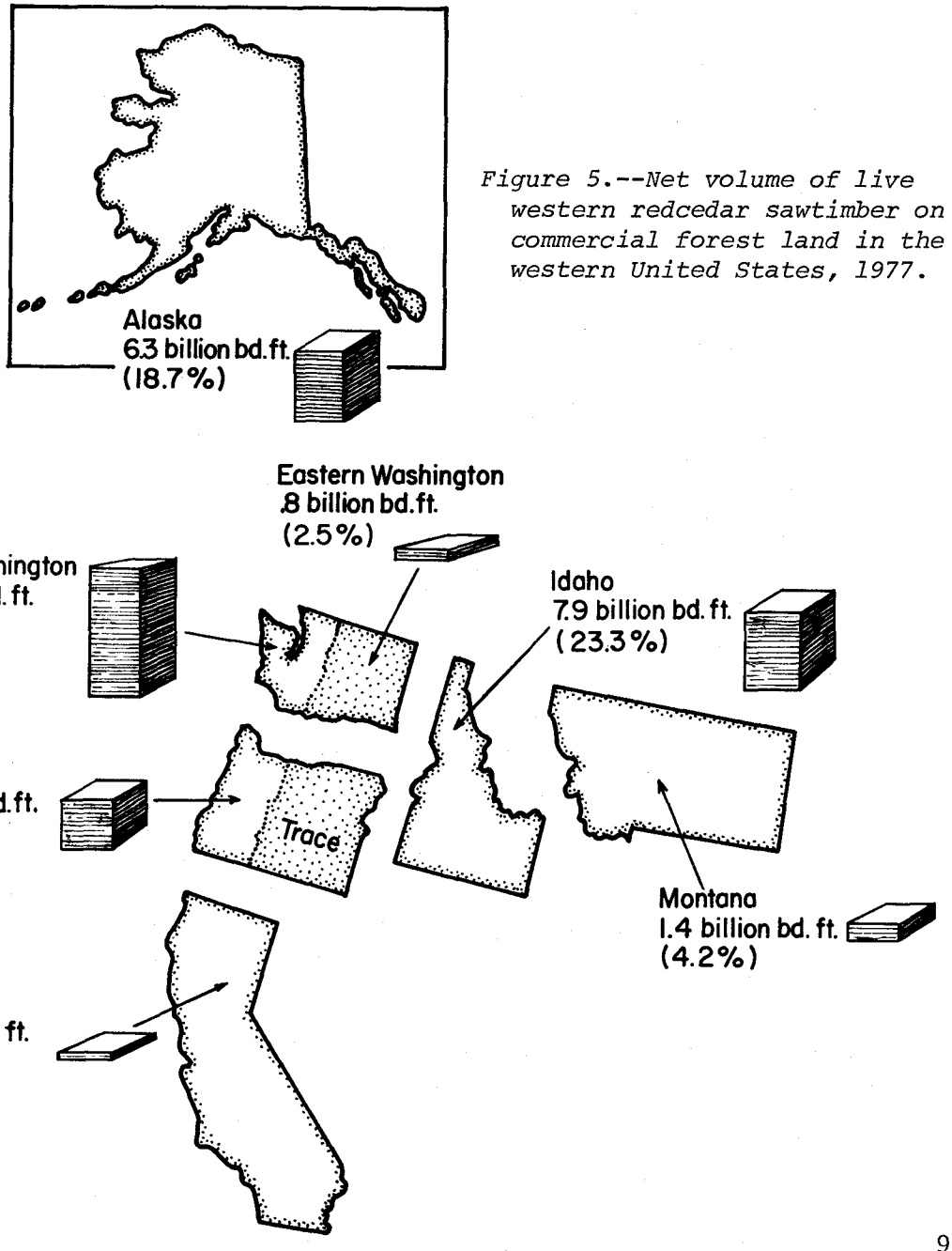


Figure 5.--Net volume of live western redcedar sawtimber on commercial forest land in the western United States, 1977.

Table 2--Net volume of live western redcedar sawtimber on commercial forest land in the United States, by State or half-State and ownership, 1977

State or half-State	National Forest	Other public	Private	All ownerships
	Million board feet (Scribner rule)			
Western Washington	5,673	2,418	4,111	12,202
Eastern Washington	412	157	277	846
Total Washington	6,085	2,575	4,388	13,048
Western Oregon	2,427	828	1,739	4,994
Eastern Oregon	20	14	0	34
Total Oregon	2,447	842	1,739	5,028
Alaska	5,926	322	76	6,324
Idaho	4,760	[1] 3,092		7,852
Montana	1,210	[1] 208		1,418
California	32	[2]	44	76
All States	20,460	[1] 13,286		33,746

[1] Other public and private combined.

[2] Less than 0.5 million board feet.

What About Salvable Dead Cedar?

Because of the durability of western redcedar heartwood, trees that have been dead for many years-even many decades--generally contain usable wood. A substantial portion of the cedar used in shakes and shingles is from dead trees, down logs, and broken pieces. In western Wahington, the estimated volumes of usable wood on dead cedar trees that are at least 25 percent sound is 1.2 billion board feet. This is about 10 percent of the volume in live cedar in western Washington,

Table 3--Net volume of western redcedar growing stock on commercial forest land in the United States, by State or half-State and ownership, 1977

State or half-State	National Forest	Other public	Private	All ownerships
	Million cubic feet			
Western Washington	1,053	844	1,438	3,335
Eastern Washington	93	49	88	230
Total Washington	1,146	893	1,526	3,565
Western Oregon	598	188	451	1,237
Eastern Oregon	4	3	1/	7
Total Oregon	602	191	451	1,244
Alaska	1,517	83	19	1,619
Idaho	1,135	2/ 872		2,007
Montana	233	2/ 66		299
California	7	1/	11	18
All States	4,640	2/ 4,112		8,752

1/ Less than 0.5 million cubic feet.

2/ Other public and private combined.

enough material to supply the State's shake and shingle mills for about 4 years if it all could be recovered. The amount of usable western redcedar wood in trees that are less than 25 percent sound and in broken chunks and pieces has not been determined but is substantial in some areas. Howard (1973) found that residue in clearcut cedar stands averaged 3,400 cubic feet per acre, including 668 cubic feet in pieces greater than 36 inches in diameter. Cedar "residue" from stands logged during the past several years is being salvaged on a regular basis.

Cedar cutters, working with chain saws, splitting wedges, mallets, and froes, can use pieces of a variety of sizes and shapes so long as they will produce 24-inch-long shake boards or blocks.

Who Owns The Western Redcedar Resource?

Three-fifths of the total sawtimber volume of redcedar is in National Forests. In Oregon and western Washington, however, National Forests contain less than half of the cedar volume. In Oregon, 17 percent is on State and Bureau of Land Management lands, and 35 percent is on private lands. In western Washington, 20 percent is on State and Indian lands, and 34 percent is on private lands (tables 2 and 3). About 56 percent of Idaho's and 78 percent of Montana's cedar is in National Forests. Details are not available on the ownership of cedar outside National Forests in Idaho and Montana. Most of the western redcedar in Alaska is in the Tongass National Forest.

What Are The Quality And Size Characteristics Of The Cedar Resource?

Although western redcedar heartwood is resistant to decay, living trees are susceptible to attack by a number of wood-rotting fungi.3/ Root, butt, and trunk rots cause considerable cull and make trees vulnerable to windthrow and breakage. Fungi attack cedar trees of all ages, but their impact increases with the age of trees. Buckland (1946) found that 30 percent of 100-year-old cedar trees in coastal British Columbia were infected with wood-rotting fungi; 60 percent of 200year-old trees were infected; and 85 percent of 300-year-old trees were infected. In general, decay is more prevalent in the interior than in the coastal areas. Buckland found that 90 percent of the 200year-old trees in the interior were infected with decay, compared with 60 percent in coastal areas. Kimmey (1956) related board-foot cull to tree diameter in western redcedar in Alaska. For trees with no visible cull indicators, he found that cull

3/ For a discussion of the fungi that attack western redcedar, see Hepting 1972, p. 480-484.

ranged from about 40 percent in 11.0-inch trees to 57 percent in trees over 50 inches. For trees with visible indicators, cull ranged from 67 to 100 percent.

Despite the fact that large, old cedars are typically defective, these are the trees most in demand for most products and almost exclusively for shakes and shingles. The wood of old trees is tight-grained, high in oil content, relatively free of knots, and has a small proportion of sapwood. These characteristics enhance the workability of the wood and the attractiveness and durability of the products.

In all six States, 66 percent of the western redcedar volume is in trees 21 inches in d.b.h. and larger; 44 percent is in trees 29 inches and larger (table 4). Washington's cedar averages the largest; Idaho trees are the smallest (fig. 6).

Table 4--Net volume of western redcedar sawtimber on commercial forest land in the United States, by State and diameter class, 1977

State	Diameter class (inches at breast height)			
	11.0-20.9	21.0-28.9	29.0 +	All classes
	Million board feet (Scribner rule)			
Washington	2,817	2,337	7,894	13,048
Oregon	1,075	1,066	2,887	5,028
Alaska	2,530	1,960	1,834	6,324
Idaho	4,232	1,815	1,805	7,852
Montana	709	305	404	1,418
California	8	17	51	76
All States	11,371	7,500	14,875	33,746

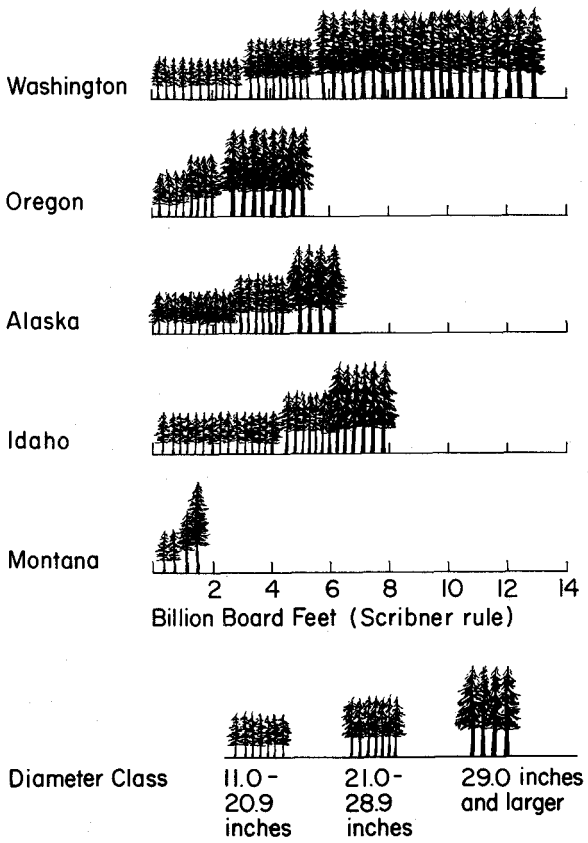


Figure 6.--Net volume of western redcedar sawtimber by State and diameter class, 1977.

How Much Western Redcedar Is Being Cut Annually?

The estimated annual western redcedar harvest in the United States for 1975 to 1976 was 950 million board feet. Washington, with 40 percent of the total cedar volume, contributed nearly 60 percent of the harvest. Idaho's cedar harvest amounted to 21 percent of the total, and Oregon's was 17 percent. About 86 percent of the cedar harvested in western Washington was from live trees over 100 years old; 7 percent was from salvaged dead trees; and 7 percent was from live trees under 100 years of age (fig. 7 and table 5).

The harvest of western redcedar in western Washington was disproportionate to the inventory volume by ownership, as shown in the following tabulation:

Ownership	Percent of inventory volume	Percent of harvest
U.S. Forest Service	46	12
Other public	20	34
Private	34	54
Total	100	100

For all ownerships in western Washington, there has been a slight upward trend in the cedar harvest since 1965. The cut on private lands has fluctuated less than on public lands (fig. 8).

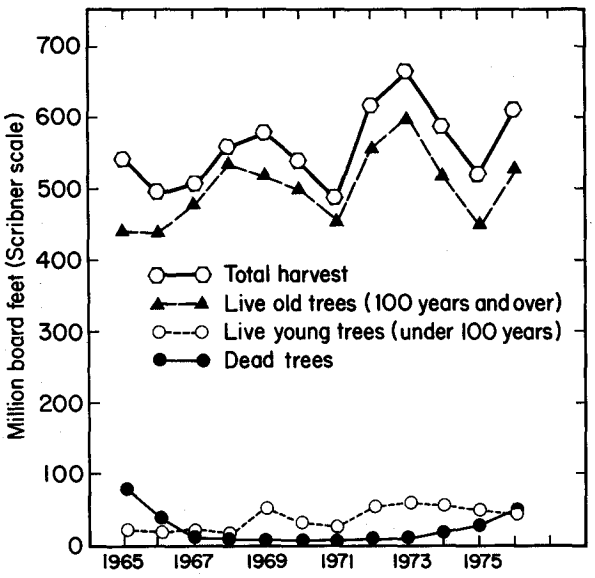


Figure 7.--Volume of western redcedar harvested in western Washington, 1965-1976, by age class.

Table 5--Volume of western redcedar harvested in western Washington in 1976 by ownership and age class

Ownership	Live trees 100 years +	Live trees under 100 years	Dead trees	Total
	- Million board feet (Scribner log scale) -			
National Forest	68.8	0.5	trace	69.3
Indian	117.8	.3	5.1	123.2
State	77.8	3.2	3.1	84.1
Other public	.6	.2	0	.8
Private	256.2	36.8	33.0	326.0
All ownerships	521.2	41.0	41.2	603.4

Source: Bergvall, Bullington, and Gee (1977).

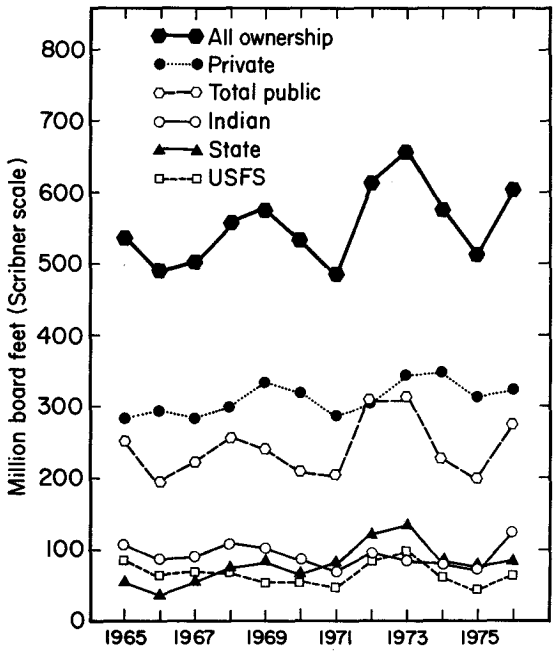


Figure 8.--Volume of western redcedar harvested in western Washington, 1965-1976, by ownership.

What Is The Annual Growth Rate Of Western Redcedar?

In all States the estimated net annual growth of redcedar is 457 million board feet (tables 6 and 7). Idaho and Montana, with a large proportion of small, young-growth redcedar (see figure 6), have higher growth rates than Oregon and Washington, which have a relatively small proportion of young growth cedar. Alaska, at the northern extremity of redcedar's natural range, has the lowest growth rate, as shown in the following tabulation:

State	Net annual growth as a percent of inventory	
	Cubic foot (trees 5.0 inches +)	Scribner board foot (trees 11.0 inches +)
Washington and Oregon	1.5	1.5
Idaho and Montana	2.5	2.0
Alaska	.1	.1

Table 6--Net annual growth of western redcedar growing stock on commercial forest land in the United States by State and half-State and ownership, 1977

State or half-State	National Forest	Other public and private	All ownerships
	- Million cubic feet (trees 5.0 inches +) -		
Western Washington	8	38	46
Eastern Washington	2	6	8
Total Washington	10	44	54
Western Oregon	6	13	19
Eastern Oregon	1	trace	1
Total Oregon	7	13	20
Alaska	1	trace	1
Idaho	22	28	50
Montana	6	1	7
California	trace	trace	trace
All States	46	86	132

Table 7--Net annual growth of western redcedar sawtimber on commercial forest land in the United States by State and half-State and ownership, 1977

State or half-State	National Forest	Other public and private	All ownerships
	- Million board feet[1/] (trees 11.0 inches +) -		
Western Washington	33	110	143
Eastern Washington	7	15	22
Total Washington	40	125	165
Western Oregon	25	58	83
Eastern Oregon	4	trace	4
Total Oregon	29	58	87
Alaska	4	trace	4
Idaho	94	85	179
Montana	18	3	21
California	trace	1	1
All States	185	272	457

[1/] Scribner rule.

Is The Redcedar Resource Being Depleted?

In all States combined, the net annual growth of western redcedar is about half the cutting rate (fig. 9). The net effect on the inventory volume is a 1.5-percent annual reduction. A closer examination shows that the depletion rates in Idaho and Alaska are negligible. Montana seems to be gaining cedar by a small amount annually. The situation is different for Washington and Oregon. At current growth and cutting rates, Washington's redcedar would last for little more than 30 years, and the old growth, expressed in volume of trees 21 inches and larger, would last about 20 years. Oregon's old-growth redcedar would be gone in about 50 years.

These are approximations. The relationship between the forest resource and the potential recoverable volume for products is poorly understood for redcedar. Among the factors are: (1) Redcedar is more variable in quality and defect than most western softwoods; cruising and scaling cedar is subjective, and results are often inconsistent among cruisers and scalers in one given locality, as well as from one area to another. (2) Milling efficiency is variable for cedar and has been changing as mill owners modernize their equipment and as the quality of available cedar has changed (Stirling 1979). (3) The volume of usable cedar in down logs, chunks, and pieces is unknown. This material has been accumulating for many decades to over a century. Once it is gone it cannot be replaced. (4) Accessibility of cedar is changing. Much of the forest resource that is left is in areas difficult to reach. The high prices of cedar have recently made it economical to log individual trees by helicopter, but this may not be a long-term option.

Research studies now underway or planned will help provide better information to answer some of these cedar resource questions.

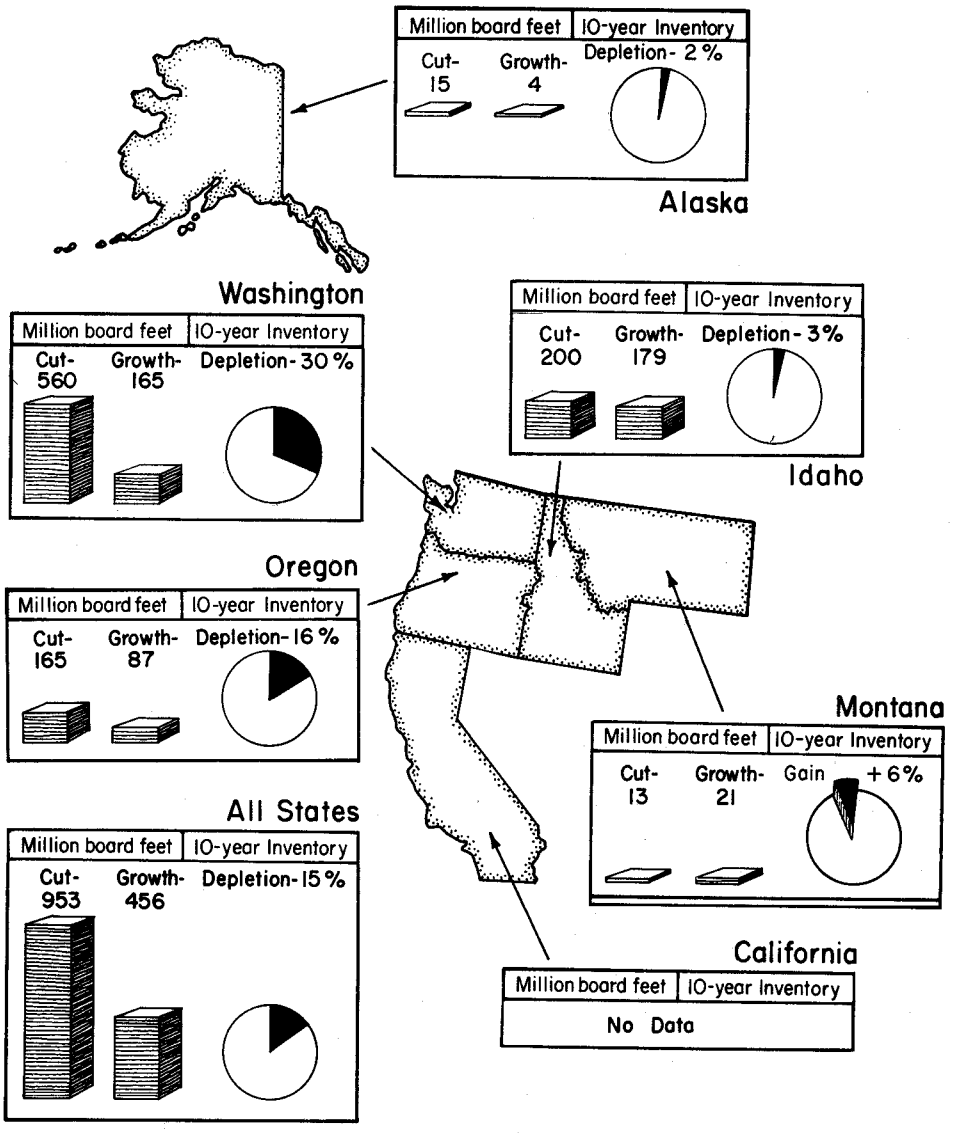


Figure 9.--Current annual cut, net annual growth, and 10-year inventory change of western redcedar in the western United States.

Because much of the redcedar volume in both Washington and Oregon is on National Forests, which have closely regulated timber harvest ceilings, the total redcedar resource will not be depleted as the overall cut and growth relationships seem to indicate. What is likely to happen is this: Concentrated reserves of old-growth cedar on private lands will be exhausted as the remaining stands of old growth of all species are cut. This will happen in less than 20 years in most areas and in less than 10 years in some localities, A sharp drop in cedar production in Washington and Oregon will follow. Redcedar will be available from public lands indefinitely, but in lesser quantities than are now being consumed. The exact amount of redcedar that will be available in the future will depend mainly on the policy of the Forest Service, and to a lesser extent on the policies of the Bureau of Land Management in Oregon, the Department of Natural Resources in Washington, and the managers of the Quinault Indian Reservation on Washington's Olympic Peninsula.

Although timber harvests on National Forests are closely regulated, it is difficult to predict the amount of redcedar that will be available from these lands. Allowable harvests are calculated for all softwood species, and most of the redcedar comes from clearcutting operations in which all species are removed. Because the mix of species varies considerably from one drainage to another, the proportion of cedar harvested can vary from year to year depending on the kind of stands logged. Some redcedar is cut from National Forests in pre-logging and salvage logging operations and also on a selective basis in landscape management zones. The amount of cedar produced in these operations and the potential resource in areas amenable to these practices is not known.

What Are Western Redcedar's Survival Traits?

Western redcedar's desirable wood qualities combined with its slow growth characteristics have historically worked against its chances of surviving. It is a persistent species, however, with a number of features that could be used by forest resource managers. Among western redcedar's survival traits are: (1) frequent and heavy seed production, (2) seedbearing capability at a young age, (3) seeds that are eaten less by rodents that the seeds of many associates, (4) high rate of germination

on a variety of seedbeds and under tree or brush canopy, (5) ability to grow in a variety of sites over a wide elevational range and to thrive in moist soils where many softwoods would die, (6) ability to grow to full maturity in full shade or sunlight, and (7) ability to stay alive or even recover after being damaged by various agents.

Western redcedar's persistence has been noted by Forest Survey crews. Trees tallied on permanently established forest plots were still alive 15 years after having the tops killed and the bark girdled over 80 percent of the bole's girth. Uprooted trees have been found that survived as the branches became new trees: A grove of cedars originating vegetatively from one fallen tree. In the Olympic Peninsula layering is common--new trees originate where cedar branches touch the ground and take root.

With increasing concern for stream protection and a growing awareness of forest esthetics, western redcedar's characteristics could make the species more desirable in resource management. Its increasing value on the market may also make it a somewhat more attractive species for investment. A number of alternatives present themselves. Cedar could be featured in management on swampy sites where it outperforms other softwoods species. It could be grown in long rotations in narrow streamside protection zones in some areas and logged selectively in such a way as to minimize streambank disturbance. Three objectives would be accomplished: Stream protection, maintenance of forest cover for esthetic purposes, and production of high quality cedar wood for special products.

What Does The Future Look Like For Western Redcedar?

Although most cedar products are currently produced from the wood of old trees, all industries could, theoretically, use young cedar trees. The quality of the products and the way in which they are manufactured and used would have to change, however. For example, building codes would have to be changed to allow lower grades of cedar material to be used in house construction. The deteriorability of sapwood, which makes up a large proportion of young-growth cedar, could be compensated for by treating with preservatives. Treated cedar still offers some advantages over other treated woods because of its workability, appearance, light weight, and reputation on the market.

Whether or not these and other possibilities become realities depends on resource availability, economic factors, and market acceptability.

Even if development of manufacturing and utilization techniques make young-growth cedar products acceptable, the amount of cedar available will be considerably less than is now being consumed.

Private timber companies in western Oregon and Washington plan to grow trees in 40- to 60-year rotations in most areas. Douglas-fir and western hemlock are the major species. In 40 to 60 years, these two species can produce up to 12,000 cubic feet of wood per acre, in trees that average 10 to 18 inches in d.b.h., depending on soil productivity. Dominant trees will range from 12 to 26 inches in diameter and 70 to 150 feet in height. Western redcedar will produce much less wood in the same time period; few redcedar trees will be larger than 12 inches in well-stocked stands, and they will be considerably shorter than the Douglas-fir or hemlock. Private timber growers feel that it is not economical to manage for western redcedar production.

Western redcedar does naturally restock many logged areas where seed trees are present and conditions are suited to its survival. Logging and forestry practices of the past, though often not conducive to continuous high yields of softwood timber, did often promote redcedar stocking. For example, hundreds of thousands of acres that supported Douglas-fir stands in the Puget Sound lowlands, were logged in a way that left the sites unsuited to Douglas-fir restocking. Hardwoods--mostly red alder and maple--restocked much of this land. Because of redcedar's ability to germinate and develop under a hardwood canopy, it is a common component of these stands. Where extensive areas have been clearcut and burned then artificially reforested, western redcedar has become scarce. As the area of intensively managed forest-increases, the amount of western redcedar is likely to decrease.

CONCLUSION

Western redcedar is not a threatened or endangered tree species, but the harvest of cedar in the forests of the United States has been greater than can be sustained in the future. Currently, the depletion rate of redcedar is negligible in Idaho, Montana, and Alaska; in Washington and Oregon, cedar supply problems are in sight. The shake and shingle industry is most likely to feel the effect of the cedar supply pinch

first, because of its dependence on old-growth cedar. Other industries use old growth, but can also use young cedar. Young-growth cedar will be available in smaller quantities in the future than the total cedar volume now available. Eventually other industries that use cedar will also experience supply problems.

It appears that some relocation of cedar processing facilities is likely in the near future, as well as a reduction in cedar product output. The tremendous volume of western redcedar in British Columbia assures that high quality old-growth cedar wood will not disappear for a long time. Whether or not it is made available to the United States in quantities desired remains to be seen.

REFERENCES

Bassett, Patricia M.
1977. Timber resources of southwest Oregon. USDA For. Serv. Resour. Bull. PNW-72, 29 p. Pac. Northwest For. and Range Exp. Stn., Portland, Oreg. Bergvall, John A., Darryl Bullington, and Loren Gee.
1977. Washington mill survey--wood consumption and characteristics, 1976. State of Washington Dep. of Nat. Resour., 135 p., illus. Olympia.
Bergvall, John A., and Donald R. Gedney.
1970. Washington mill survey-wood consumption and mill characteristics, 1968. A joint study by State of Wash. Dep. of Nat. Resour. and Pac. Northwest For. and Range Exp. Stn., 119 p., illus. Portland, Oreg.
Bergvall, John A., Loren Gee, and Robert Shindler.
1975. Washington mill survey--wood consumption and mill characteristics, 1974. State of Wash. Dep. of Nat. Resour., 119 p., illus., Olympia.
Bergvall, John A., and Ronald Holtcamp.
1971. Washington mill survey-wood consumption and mill characteristics, 1970. State of Wash. Dep. of Nat. Resour., 119 p., illus., Olympia.
Bergvall, John A., and George H. Ormrod.
1974. Washington mill survey-wood consumption and mill characteristics, 1972. State of Wash. Dep. of Nat. Resour., 118 p., illus., Olympia.

Bolsinger, Charles L.
1969. Timber resources of the Olympic Peninsula. USDA For. Serv. Resour. Bull. PNW-31, 60 p., illus. Pac. Northwest For. and Range Exp. Stn., Portland, Oreg.

Bolsinger, Charles L.
1971. Timber Resources of the Puget Sound Area, Washington. USDA For. Serv. Resour. Bull. PNW-36, 72 p., illus. Pac. Northwest For. and Range Exp. Stn., Portland, Oreg.

British Columbia Forest Service.
1972. Forest Inventory Statistics of British Columbia, 1970. Inventory Div. of B.C. For. Serv., Victoria.

Buckland, D. C.
1946. Investigations of decay in western redcedar in British Columbia. Contribution from Grad. School, Yale Univ., New Haven, Conn., and Div. of Botany and Plant Pathology (no. 686), Science Serv., Dep. of Agric., Ottawa, Canada.

Canfield, Elmer Russell.
1969. Ecology as a means of cull estimation in standing western redcedar. Ph.D. Dissertation, Univ. of Idaho Grad. School. 41 p., illus. Moscow.

Dean, William (Ed.)
1975-78. Random Lengths. (A weekly report on lumber and plywood prices and marketing.) Lester E. Anderson, Publ., Eugene, Oreg.

Hazard, John W.
1966. Timber resource statistics for southwest Washington. USDA For. Serv. Resour. Bull. PNW-15, 32 p. Pac. Northwest For. and Range Exp. Stn., Portland, Oreg.

Hepting, George H.
1972. Diseases of forest and shade trees of the United States. U.S. Dep. Agric. Agric. Handb. 386, 658 p. Washington, D.C.

Howard, James 0.
1973. Logging residue in Washington, Oregon and California-volume and characteristics. USDA For. Serv. Resour. Bull. PNW-44, 26 p., illus. Pacific Northwest For. and Range Exp. Stn., Portland, Oreg.

Howard, James 0., and Bruce Hiserote.
1978. Oregon's forest products industry, 1976. USDA For. Serv. Resour. Bull. PNW-79, 102 p. Pac. Northwest For. and Range Exp. Stn., Portland, Oreg.

Hutchison, 0. Keith.
1967. Alaska's forest resource. USDA For. Serv. Resour. Bull. PNW-19. Pac. Northwest For. and Range Exp. Stn., Inst. of North. For., Juneau, Alaska.

Jacobs, David M.
1978. Timber resources of west central Oregon. USDA For. Serv. Resour. Bull. PNW-76, 30 p. Pac. Northwest For. and Range Exp. Stn., Portland, Oreg.

Kimmey, James W.
1956. Cull factors for Sitka spruce, western hemlock, and western redcedar in southeast Alaska. USDA For. Serv., Alaska For. Res. Center, Stn. Pap. No. 6, 31 p., illus. Juneau.

Manock, Eugene R., Grover Choate, and Donald R. Gedney.
1970. Oregon timber industries-wood consumption and mill characteristics. Joint study by State of Oreg. Dep. of For., Salem, Oreg., and Pac. Northwest For. and Range Exp. Stn., Portland, Oreg. 122 p., illus.

Mei, Mary A.
1979. Timber resources of Northwest Oregon. USDA For. Serv. Resour. Bull. 82. 29 p., illus. Pac. Northwest For. and Range Exp. Stn., Portland, Oreg.

Minore, Don.
1972. Germination and early growth of coastal tree species on organic seed beds. USDA For. Serv. Res. Pap. PNW-135. Pac. Northwest For. and Range Exp. Stn., Portland, Oreg.

Phelps, Robert B.
1977. The demand and price situation for forest products, 1976-77. USDA For. Serv. Misc. Publ. No. 1357, 95 p., illus. Washington, D.C.

Quinault Tribal Council.
1978. Portrait of our land--a Quinault Tribal forestry perspective. 68 p., illus., Quinault Indian Nation. Taholah, Wash.

Red Cedar Shingle and Handsplit Shake Bureau.
1978. Buyer's guide/list of manufacturers/members of the Bureau, n.p. Bellevue, Wash.

Red Cedar Shingle and Handsplit Shake Bureau.
1978. Production of Certigrade shingles and certisplit shakes, by grade and types during 1975, 1976, and 1977. 4 p., w/map. Bellevue, Wash.

Ruderman, Florence K.
1978. Production, prices, employment, and trade in Northwest forest industries, second quarter, 1978. USDA For. Serv., Pac. Northwest For. and Range Exp. Stn., Portland, Oreg.

Russell, Jervis F.
1977. Cedar mill owners see supply dwindle. Article in Port Angeles Daily News, Port Angeles, Wash. 9/26/77.

Schuldt, John P., and James 0. Howard.
1974. Oregon forest industr wood ies--
characteristics. Joint study by State of Oreg. Dep. of For. and Pac. Northwest For. and Range Exp. Stn., Portland, Oreg., 113 p., illus.

Stirling, Jim.
1979. Decadent cedar posing problems--interior mill may have answer. Article in British Columbia Lumberman, Vol. 63, No. 1, Jan. 1979, 2 p., illus. Vancouver.

U.S. Department of Agriculture, Forest Service.
1965. Silvics of forest trees of the United States. U.S. Dep. Agric. Agric. Handb. 271, 762 p., illus. Washington, D.C. Washington, State of.

1965-1976. Timber harvest report, State of Wash., Dep. of Nat. Resour., Olympia. Western Wood Products Association.
1972-1976. Statistical yearbook (containing facts concerning the western lumber industry), Portland, Oreg.

* * * * * *

Bolsinger, Charles L.
1979. Western redcedar--a forest resource in transition. USDA For. Serv. Resour. Bull. PNW-85, 24 p., illus. Pacific Northwest Forest and Range Experiment Station, Portland, Oregon.

Available information on inventory, growth, price, and consumption trends for western redcedar in Western United States is compiled. The future of western redcedar as a product resource and component of the forest is discussed.

KEYWORDS: Western redcedar, Pacific Northwest forest resources, timber supply, shake and shingle industry, forest statistics.

Mailing address: Pacific Northwest Forest and Range Experiment Station
809 N.E. 6th Ave.
Portland, Oregon 97232

GPO 988-959