

**FOREST RESOURCES
OF THE PACIFIC NORTHWEST**

MARCH 1938

NATIONAL RESOURCES COMMITTEE

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FOREST RESOURCES OF THE PACIFIC NORTHWEST

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A REPORT
BY THE
PACIFIC NORTHWEST REGIONAL PLANNING COMMISSION

NATIONAL RESOURCES COMMITTEE

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NATIONAL RESOURCES COMMITTEE

NORTH INTERIOR BUILDING

WASHINGTON

May 14, 1938.

The PRESIDENT,
The White House.

MY DEAR MR. PRESIDENT: We have the honor to transmit herewith a report on "Forest Resources of the Pacific Northwest" prepared by the Pacific Northwest Regional Planning Commission in cooperation with various private, State, and Federal agencies interested in forestry in the region. It aims to avoid controversial matters, concentrating for the present upon the many points on which there is substantial agreement.

The report stresses the importance of establishing sustained-yield practices of forest management in the area where our largest remaining forest resources are concentrated. It is significant that the Regional Planning Commission in the area with representatives from each of the States concerned joins with the responsible Federal agencies in urging the general adoption of these conservation policies.

Sincerely yours,

HAROLD L. ICKES
Secretary of the Interior, Chairman

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Secretary of War.
HENRY A. WALLACE,
Secretary of Agriculture.
DANIEL C. ROPER,
Secretary of Commerce.
FRANCES PERKINS,
Secretary of Labor.

HARRY L. HOPKINS,
Works Progress Administrator.
FREDERIC A. DELANO.
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FOREST RESOURCES OF THE PACIFIC NORTHWEST
Problems and Program for Conservation and Utilization

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REPORT OF THE
PACIFIC NORTHWEST REGIONAL PLANNING COMMISSION

PACIFIC NORTHWEST REGIONAL PLANNING COMMISSION

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National Resources Committee, for its support of the project, including the employment of special consultants.

PACIFIC NORTHWEST REGIONAL PLANNING COMMISSION.

¹ From September 14, 1937. Marshall N. Dana was chairman until July 1, 1936, date of resignation.

² Succeeded J. S. James, November 1936.

³ From July 1, 1937.

⁴ Until April 1, 1937, date of resignation.

⁵ Represented in part by Fred Brundage, U. S. Forest Service, Portland.

⁶ Represented by J. B. Woods, West Coast Lumberman's Association, Seattle.

I. REPORT OF PACIFIC NORTHWEST REGIONAL PLANNING COMMISSION

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THE PACIFIC NORTHWEST FOREST RESOURCE AND A FOREST PROGRAM

The Resource

The Pacific Northwest forest resource includes most of the remainder of the Nation's great virgin forests. Not only is it the greatest national forest resource, but one of the greatest national resources of any kind.

This Region (for purposes of this study the States of Washington, Oregon, Idaho, and Montana) has about 93 million acres of forest land, containing about 900 billion board feet (lumber tally) of standing saw timber, or about one-half of that remaining in the United States. Forest land comprises over one-third of the area of the four States, heaviest concentrations being in western Montana, northern Idaho, western Oregon, and western Washington. Two-thirds of the Region's timber lies west of the summit of the Cascade Mountains, where about five-sixths of the area is forest land.

In the past quarter century, the national demand upon forests of this region has increased greatly, the percentage of the total national lumber production furnished having risen from 15 percent to 39 percent in the 25 years prior to 1934. The 1929 production required the removal of nearly 16 billion feet of saw timber from the forests of the region, a rate which, under present forest conditions and practices, would rather rapidly deplete the economically available supply. The average annual cut for the 9 years, 1925-33, was well over 10 billion feet. Threats to the forest resource from fire and disease also have grown with the increased occupancy and use of the region and of the forests. Depletion from these causes alone averaged another 2½ billions of board feet per annum during the 9-year period.

On the other hand, current net annual growth is only about 4 billion feet. However, the rate of growth is increasing, as the virgin stands, with no current net growth, are progressively converted into second-growth stands. The growth capacity, with good forest management and improved protection, is probably at least 16 billion feet annually, but it would be well over a century before any such capacity could be attained.

The Problem

In general terms, the problem involved is one of conservation and social and economic utilization of the resources included in the country's greatest remaining timber reservoir.

The problem is not only that of avoiding direct losses of existing and potential timber and in capitalized value of continuously productive land, but also one of avoiding the auxiliary effects of depletion—dislocation of economic and social life, including great losses in direct and indirect employment, and in industrial, commercial, service, and recreational activities.

To illustrate, it will be necessary in the Pacific Northwest, to avoid consequences similar to those experienced in other areas upon depletion of forest resource. It may be assumed that the depletion of this, the last of the greater timber stands, would be more serious in many ways to the Nation, as well as to the region immediately affected, than in any other instance. In this region there is a higher rate of dependency upon the resource and less ability to make adjustments to its loss—less ability to replace promptly the lost productive and business opportunities.

It is distinctly a public problem. Private ownership and industry have obligations and opportunities in it, but the public, as a whole, will suffer from failure to solve it, and only the public, through its governmental organization, can reconcile conflicting interests and provide the overall plans, leaderships, pressures, and controls that will make solution possible.

The general solution is the application of what is generally known as sustained-yield management.

The Regional Planning Commission does not think of sustained yield in a narrow or technical sense, nor as a rigid system necessarily always to be applied to every acre, community, or district. Rather, it considers it as a broad principle to be applied over sizable areas to prevent depletion by cutting, fire, and disease at a greater rate than the land will produce, and which will provide continuous compensation, in reasonable form, for each use or loss of valuable forest resources, and which will also provide continuous income from the forest resource, thereby maintaining permanent employment, wages, and purchasing power and stabilizing industrial communities.

Sustained yield should not be considered as an immediately available, specific cure, but as a general remedy which should be applied specifically as rapidly as possible. The lumber industry as a rule has been migratory, moving on to uncut stands whenever one area was cut over, leaving behind abandoned commu-

*sustained
yield*

migratory

nities and public facilities. The end of the virgin timber is in sight in many parts of the Region. The idea of sustained yield is to supply local industry with raw material in perpetuity in order that dependent industries may operate continuously. Sustained yield, therefore, is the general designation for the strategy of a long campaign to be put into full effect promptly and prosecuted scientifically, systematically, relentlessly, resourcefully, and yet flexibly, over a long period of years, to solve this problem.

Sustained yield should be recognized as including not merely control over the rate of cutting, but such essential companion measures as the reproduction of the forest, protection from fire and disease, reduction of waste, and more complete utilization of the production. Also, it should be recognized as covering not only the maintenance of the yield of timber and other wood products and byproducts, but also the conservation of the great multiple-use values of forest land, including recreation, range, wildlife, soil conservation, watershed protection, and so on.

This general problem has had, for several decades, recognition by many persons interested in forest and general conservation. From the beginning, a few years ago, of the present movement in public works and resources planning in the United States, the subject has had augmented attention from overall national, regional, and State planning viewpoints. The forest problem has been recognized from the first, by the planning boards of this region, as one of the major questions requiring attention.

However, it is believed that the general forest problem, with its serious threat of eventual depletion, has had far from enough public, political, governmental, and industrial recognition and action. The obtaining of necessary broader recognition, and the demonstration of the relationships of this resource to other problems of conservation and social and economic advancement are conceived as logical objectives of the present planning work of the State, regional, and national planning agencies.

The Columbia Basin study, of 1935, made by the Regional Planning Commission, gave considerable attention to the forest resource and the forest problem. A basic article on the forest resource, its problems and requirements, was prepared in collaboration with the Forest Service.¹ The staff report of the Columbia Basin study² emphasized the importance of the forest resource in the economy of the Pacific Northwest; the prospect of its depletion and the economic significance of such depletion. Sustained-yield management was

¹ Appendix N, Columbia Basin study, *The Forestry Problem in the Columbia River Basin States*, October 15, 1935 (Pacific Northwest Regional Planning Commission).

² *Regional Planning, Part I—Pacific Northwest* (National Resources Committee, May 1936).

discussed as the logical approach to the solution of the problem—generally substituting stabilization for present insecurity, permanent communities for characteristic migratory towns, permanent capital and tax structures for vanishing financial resources, and, in short, substituting a system of “living off” forest income for one of “living off” forest capital.

The Regional Planning Commission, in its general view of the future of the region included in the same report, envisioned the possible depletion of the forest resource as the most serious threat to normal and logical regional progress and as the negative factor most likely, without the establishment of sustained yield, to offset the many favorable factors which should influence Pacific Northwest regional development.

In its covering statement for the same study, the National Resources Committee recorded that it was “impressed by the present key importance of the forest industry in the economy of the Pacific Northwest Region”; that this resource is “the basic supply for the Nation of this great raw material”; that it supports a high percentage of the population of the region, and that “the maintenance of the timber industry is of crucial importance to the welfare of the region.” It also emphasized the high ratio of depletion to current annual growth.

The Regional Planning Commission cannot stress too strongly the seriousness of the threat of depletion, and the urgent need for conservation of the resource. The Commission has not been unaware of the frequently expressed sophistry that when one source of energy is exhausted another will be found to take its place. This theory reduces to absurdity. Losses of basic resources, such as those of the soil, are certain to be felt in the long run, as is amply proven in the history of many great areas and civilizations. Although science and technology may compensate in part for losses, wastes of basic resources are concrete and the general result, if not apparent net loss, is an actual loss through failure to realize full potential gains in real wealth and human well-being. There can be no justification for needless waste.

In the case of the forest resource, many values to be lost through depletion are irreplaceable. This truth would become increasingly evident as the resource were diminished. Even more definitely irreplaceable than those of the wood and its industrial products are the accessory physical-geographic, economic, and social values involved in the forests.

The Study

The present study of the forest resource of the Pacific Northwest has grown out of the general Columbia Basin study. The wide scope of the earlier study and the

Sustained
yield

very short space of time available for it prevented concurrent consideration of and agreement with findings of its forestry section by various professional, business, official, and public interests of the Region. In view of the high importance of the resource, its broad economic significance, and the complex problems involved, subsequent thought has indicated the desirability of a reconsideration of the problem in order that the former report might be amplified where necessary and that a definite program, with a wider range of support, might be formulated.

Therefore, with the approval of the National Resources Committee, the Regional Planning Commission and its Forest Advisory Committee have had the subject under consideration since early in 1936. In this consideration, major objectives have been reorganization of factual material bearing upon the problem, together with further study of the extent of economic dependency upon the resource and of steps which must be taken to make sustained-yield forest management practicable. A further major objective was to ascertain prevailing opinion among interested groups within the region and to present for early action a program approved by the various forest interests and the public.

The report includes three major parts. In reverse order, they are:

Staff Report—Pacific Northwest Forest Resources.
Forest Advisory Committee Report—A Pacific Northwest Forest Program.

Covering Report of the Pacific Northwest Regional Planning Commission.

The staff report is based largely on a review of several forest reports and studies, including the (Copeland) report on a national plan for forestry,³ the report of the Forest Service and the National Resources Board,⁴ and the Columbia Basin reports, previously mentioned. It is intended to set out the basic factual data, arranged specifically for the purposes of this general presentation. It is the work of the special consultants employed by the National Resources Committee, assisted by a forester assigned by the Forest Service and by members of the Regional Planning Commission staff as augmented by a Works Progress Administration project.

The regional offices and experiment stations of the Forest Service have cooperated in furnishing data and in consulting with the advisory committee.

The Forest Advisory Committee itself is composed of a small group of professional men, expert in forest matters and thoroughly familiar with forest conditions and needs in the Pacific Northwest. The membership

is directly representative of the forest activities of the region's four State planning boards and incidentally has comprised representatives of Federal and State, public, private, and educational interests in the forest field.

The Committee has endeavored, throughout its several months of work, to develop a well-balanced program. To this end it has corresponded and consulted with representatives of all major Federal, State, private, and public interests concerned with the forest resource in the Region. It has made every practicable effort to keep organizations and many individuals informed of proposals, and to secure and meet the suggestions and points of view of every important interest dealing directly or indirectly with forest problems.

It has held three open meetings on the subject. At one of these, about 75 representatives—of lumber, logging, conservation, and protective associations; of Federal services (including Forest Service, Indian Service, Park Service, Soil Conservation Service, Biological Survey, Bureau of Entomology, Bureau of Fisheries, Resettlement Administration, Corps of Engineers); of State forestry departments; of forestry schools; and of the pulp and paper industry, railroads, banks, range management, agriculture, water resources, recreation, and wildlife—constituted, in effect, an augmented committee for the consideration of a tentative program.

The program has been formulated also with due regard for the recommendations of the several State planning boards in the Region and those of the National Forestry Conference of 1933 and 1934.

Effort has been made to avoid controversial matters, concentrating, for the present, upon the many points upon which there is substantial agreement. In view of this method of procedure, it may be expected that the program of action proposed by the Committee will have full cooperation from the many interests involved. If exceptions should develop, it is believed they will be of relatively small importance and can, in most cases, be reasonably well reconciled.

Effort has been made to deal primarily with the more essential phases of the forest problem relating more essentially to commercial timber. The program deals quite thoroughly with matters pertaining to the use of the forest as a source of wood supply, but, necessarily, gives less detailed attention to such matters as recreation, grazing, and water conservation. Such phases, while very important within the forest areas, also extend far beyond and require, in their treatment, cooperation with still other interests and agencies.

In view of the number of critical problems existing at the present time, and the need for prompt steps toward

³ *A National Plan for American Forestry*, Doc. No. 12, 73d Cong., 1st sess.

⁴ *Forest Land Resources, Requirements, Problems, and Policy, Part VIII* of the Supplementary Report of the Land Planning Committee to the National Resources Board, November 1934.

wider establishment of conservation and sustained-yield management operations, the greater emphasis in the program has been placed upon proposals for immediate action.

The report of the Regional Planning Commission itself is a covering statement intended to summarize its view of the situation, the more urgent needs, and the findings and recommendations of the whole study.

Findings and Recommendations

The forests are of the utmost importance to the region, not only furnishing livelihood for a large proportion of the population, but constituting important support to business and service activities and to local agricultural enterprise and providing the chief means of payment for the products of other areas.⁵ Furthermore, they enter intimately into the life of the entire population through such channels as protection of water supplies, flood mitigation, and soil conservation. The range livestock industry, important both locally and nationally, depends to a great extent upon forest land for summer range. Development of the recreational assets of the region is largely dependent upon the continued existence of the forests, and the destiny of this region as a forest-growing territory seems further influenced by the fact that a major part of the 94 million acres of forest land in the region is also used extensively for recreational purposes.

The facts that half the remaining timber supply and 40 percent of the water power resources of the United States are located in this Region would necessarily compel attention from a national standpoint. But the additional facts that these resources exist in an area of strategic importance as a gateway to future foreign and domestic commerce, an area of considerable industrial promise, and one significant from the standpoint of equable and attractive living conditions, would seem to demand that they be given permanent places in the national development plan and economic structure.

The Regional Planning Commission believes the situation with respect to this forest resource is critical, that the threat of loss of a resource of incalculable value is a serious one, and that solution of the problem will be increasingly difficult with the passage of each year in which some substantial progress in conservation, including protection and improved management, is not made.

Depletion is no mere fantasy. In spite of their strategic importance, the forests are being depleted at a dangerous rate, and the region is approaching a crisis which promises to be as severe as it was in any of the forest-impooverished regions of the East. The generally recognized remedy of sustained-yield forest

management is not being widely applied—no definite, widespread attempt to adjust forest cutting to forest growth is being made. The national significance of these trends is greater than it was in the East because this Pacific Northwest Region marks the end of the trail so far as virgin timber is concerned.

So far as merchantable timber and the timber industry are concerned, substantial depletion may come about in a relatively short time with respect to the national lifetime. At the rates of production of the 1920's, this may occur perhaps in 5 or 6 decades. Considering only the portion of the timber economically accessible, the time of substantial depletion is far more difficult to estimate, but would be considerably shorter—perhaps a matter of only 3 to 4 decades so far as a major timber industry is concerned. Depletion of some large sub-areas of the Region is proceeding at such rates that the life of a major timber industry therein seems to be limited in instances to a comparatively few years—say, a single decade. In other subareas the time of depletion may vary upward to a considerable period of time.

Some species, such as the very valuable Idaho white pine, may be substantially gone, at present rates of cut, in a matter of only 2 decades. The Port Orford cedar, of still higher quality and unit value, but much more limited as to quantity and annual cut, will be about gone in little more than a decade if current rates prevail.

The danger of resource depletion should be of deep concern to the public and the industry; it warrants the keenest concern of governmental and private interests. If depletion is not arrested, serious economic dislocations within parts of the Region, the Region as a whole, and the entire Nation are involved. Within the Region, substantial depletion of the resource would be a calamity which might be only partially and belatedly offset, if offset at all, by development and growth of new means of economic subsistence.

Sustained-yield management, as broadly defined, seems to present the complete general answer to the forest problem. If forest land is managed so as to produce its maximum yield and if total consumption of forest products balances this yield, the maximum of community benefits is bound to result. With sustained yield the varied forest uses are developed and coordinated under a broad system—the timber industry tends toward stabilization; recreational facilities and development are assured of continuation; wilderness areas are perpetuated; wildlife is managed to prevent undue losses; livestock grazing is maintained; industry and communities receive protection of water supplies; and potential losses from erosion and flood are substantially reduced.

One may possibly be misled, through a merely casual reading of the report, into a feeling of security by the rather imposing totals of remaining public timber.

⁵ See Staff Report, sec. 2.

The watershed, soil protective, and scenic values of this timber may be very great, but much of its present industrial value is questionable on account of relative quality and inaccessibility. Supporting an uncomfortable conclusion of relative insecurity is the fact that not even all publicly owned timber is yet being handled on a sustained-yield basis.

Although only 33 percent of the forest land and 43 percent of the timber of the Region are privately owned, it is clear that the initial stages of the battle for sustained timber management will be won or lost on what are now privately owned lands. The privately owned land includes the major portion of commercially accessible timber, the best timber-growing sites, and therefore, the land which, under sustained-yield management, can in the long run best compete with timber-growing sections of the world.

Bearing in mind the strategic importance of the privately owned forests, there may be found in them a number of conditions inimical to the attainment of sustained yield. The widest divergence from sustained-yield method exists in this ownership bracket. In the first place, there are lacks of long-time planning and of continuity of management policy. Contributing to lack of adequate plans and policies are fear of the future in connection with the long period of years required to grow forest crops, the fact that pride of ownership in well-managed forest land is not yet widely awakened, and the fact that the responsibilities of private owners to use their properties for the greatest good in the long run are not clearly established in the scheme of forest operations. Generally, the industry is not set up, nor are its ownerships blocked up, for permanent or long-term operation. Much of the private investment and financing is based upon quick liquidation of capital. This basis is accepted by tax-levying agencies whose policies add still further to the pressure for rapid depletion. There is an absolute need of legal and economic measures to encourage the development of the more desirable private ownership policies and practices.

The pressure for liquidation results in overproduction, cut-throat competition, practices of haste and waste which may not be desired by the operator, but which seem to be forced on him by economic conditions. Moreover, from the standpoint of eventual remedy, there is inadequate protection—with hundreds of thousands of acres of future potential timber crops being destroyed by fire and disease in the average year.

The public, nationally and locally, has a tremendous stake in the forest resource. Therefore the public must expect to take the lead in this vital program for establishment of sustained-yield policies and the energy with which it pursues its task will determine the future of Northwest forests. The better stabilization of forests,

forest industries and communities directly dependent upon forests will be accompanied by improved stability of States and counties, of agriculture, of service activities such as railroads and supply houses, of financial institutions, of cities and ports, and of all the cultural and educational institutions. On the other hand, experience has shown that depletion will have widely disastrous effects.

This emphasis upon the public interest does not imply our lack of recognition of the responsibilities of the private ownerships in the forests and forest industries. On the contrary, the public interest in the perpetuation of the forests is considered so great that private ownership must, increasingly, carry with it clear cut sense of trust or stewardship for a national resource. After all is said and done, we are all compelled to recognize the age-old principle that private ownership, as an institution, is dependent on the use of property for the public good in the long run, and if private ownership is unable to meet this standard, public action of one form or another becomes necessary. Further progress toward such an attitude, and consequently toward improved control of the conservation and utilization of the forest resources, is a matter for action by the industry and the private owners of forest land, as rapidly as legislative, economic, and technical progress will permit, as well as by the public.

The whole situation clearly warrants the prompt application of fundamental changes by which the timber industry and its dependent communities will stop the unsound practice of consuming forest capital. This calls for an understanding appraisal of the problems of private forest land owners, to the end that fairness may be practiced and the burdens equitably distributed, bringing about a prompt shift from present undesirable practices to the urgently desired ones.

Recommendations.—The Regional Planning Commission commends the accompanying staff report to wide consideration as an assembly, arrangement and interpretation of factual information pertinent to this study of the forest resource and to a program of needed action.

The Regional Planning Commission endorses, and recommends—for consideration on the part of the Federal Government and its several branches and departments, the State governments, forest-land owners and operators, the forest and related industries, various economic and social groups, and the general public—the report and recommendations of its Forest Advisory Committee.

A forest program for the Pacific Northwest, which is the subject of this committee report, must inevitably be an extremely significant part of any plan for the social and economic future of the country as a whole.

For greater emphasis, the Regional Planning Com-

mission invites especial attention to the following considerations:

The program has pointed strongly toward stabilizing communities and industries. The necessity for sustained-yield management as an essential for stabilized communities and industry is pointed out. But it is also recognized that the present condition of forest resources does not make sustained-yield management universally applicable within the region. Furthermore, important economic obstacles need to be overcome so as to facilitate extended application of this method, especially, insofar as possible, to make the ownership and management of forest land on a sustained-yield basis attractive to private enterprise.

The program recognizes the desirability of a distribution of responsibility for action between private owners, the State and Federal Government. The program definitely recommends that private forest owners continue to progress in the development and application of the Forest Practice Rules developed under the Lumber Code, which provide (a) for forest protection, (b) for conservation of immature trees and young growth from unnecessary logging damage, (c) for restocking the land after logging, (d) for technical study of forest properties and operations with the object of developing forest plans and practices most suitable to local conditions, and with the object of applying selective logging in forest types which permit, and also of applying the principle of sustained yield wherever practicable.

There is recognition of the fact that public action is required in the removal of unreasonable economic obstacles in order that private owners may be enabled to perform their part. Admittedly, only the public can remove some of these obstacles. The States should do all they can in the program, and substantial and direct supporting Federal action is required to meet public responsibility beyond the States' power. It is also recognized by the Commission that there is a responsibility resting on the private owners of forest lands to utilize the advantages, accruing by virtue of removal of these obstacles through public action, to further the practice of sustained-yield management.

Summarized, the proposed urgent legislative and administrative program for placing forest land under sustained-yield management includes:

- (1) Provision for putting all publicly owned land on a sustained-yield basis.
- (2) Provision for the organization and operation of cooperative sustained-yield units which include both public and private land under contracts providing adequate protection of public interests involved.
- (3) Provision for long-term public credits at low interest rates, for timber operators working on a sustained-yield basis.

(4) An increase of public fire protection appropriations sufficient to insure adequate fire protection.

(5) An authorization and appropriation of sufficient public funds adequately to combat, in cooperation with private owners, the ravages of timber-destroying insects and diseases.

(6) Authorization and provision of funds for public acquisition of both timbered and cut-over private lands where such acquisition is necessary for effective sustained-yield forest practice.

(7) A change in the taxation system so as to relieve timber properties from pressure for immediate liquidation and at the same time provide funds for the adequate conduct of local tax-supported units.

(8) Increased public appropriations for research in determining more effective methods of forest management and more complete utilization of wood and wood waste.

(9) Classification and zoning of land suitable chiefly for forest uses.

(10) Provide all practicable safeguards in public legislation, policy and administration to bring about full use of public contributions in the promotion of sound forest practices, including sustained-yield management.

Several immediate, outstanding objectives will be evident in the proposals of the report: Checking of present trends of destruction by fire and disease; preparation of lands for future production; improvement and extension of practices of sound forestry; and setting up of sustained-yield operating units.

One of the essential measures for the attainment of these objectives is further provision for public acquisition of forest land. Every attempt should be made to induce private timber operators to adopt sustained-yield practice. However, as the report points out, it is not reasonable to expect these operators, in all cases, even with the inducement of low taxes and interest, to carry sufficient timber land to make sustained-yield operation practicable. The report in effect recognizes that past public land disposal policy has placed more forest land in private ownership than private owners are now able and willing to manage for continuous production upon a basis approaching a sustained yield. It also recognizes that there are broad areas of land, cut over or in second growth, unmanaged and likely to be abandoned by their private owners. It also points out that, under the present pattern of ownership, private and public forest lands are in many places intermingled to such an extent that independent sustained-yield management is impractical. It suggests, therefore, an attack upon this problem by the public along two principal lines: (1) Acquisition by the public of substantial holdings of mature and second-growth stands; and (2) the management of some public and private lands, as cooperative sustained-yield units, under a contractual relationship.

Forest
Practice
Rules

II. REPORT OF FOREST ADVISORY COMMITTEE

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PACIFIC NORTHWEST REGIONAL FOREST PROGRAM

Introduction

In response to the request of the Pacific Northwest Regional Planning Commission, its forest committee¹ has prepared this forest program for the region. In order that the program might be made as sound, fair, and well-balanced as practicable before final recommendation to the Commission, the committee, after a series of meetings and much work on its own part, sought the advice and constructive criticism (a) of many well-informed persons of all points of view directly and indirectly interested in the problems involved, and (b) of the principal interested public and private organizations.

This statement is not a full, detailed discussion of the facts of and the remedies for the forest situation of the region; on the contrary it is intended to outline, as briefly as practicable, the more important facts drawn from the immense mass of material available. This statement is supplemented with a much more complete statement of the basic facts of the situation. The program of action recommended is carefully coordinated with thought developed in the region and with the program recommended by the National Forestry Conference of 1934. At that time, a large group of competent men, representing all angles of public and industry point of view, developed, after months of study, a well-balanced national program.

It is emphasized that this regional program is not an effort to impose a plan upon the several States of the region. Rather it is the result of united study by men from each of the States, giving due consideration to national, regional, State, industry, and other relationships and suggesting to the Nation, to the several States of the region, to industry and to other groups for careful study and suitable action the more important things which require attention. Joint effort by the people and States of the region will aid powerfully in securing needed federal action. Mutual regional study is an important aid in concentrating attention and action within each of the States upon matters of really prime importance. The regional program merely suggests; it is hoped that Nation, States, timber-land owners, and others will study and act appropriately.

¹ The forest committee consists of David T. Mason, Portland, Oreg., chairman; and of C. J. Buck, Forest Service, Portland, Oreg.; Dean D. S. Jeffers, University of Idaho, Moscow, Idaho; Dean T. C. Spaulding, University of Montana, Missoula, Mont.; and Dean Hugo Winkenwerder, University of Washington, Seattle, Wash. The four last named are the chairmen of the forest advisory committees of the State Planning Boards of the respective States of the region. Mr. Buck was represented in part by F. Brundage, and Dean Winkenwerder by J. B. Woods, in this work.

Services Rendered by Forests

Regional forest resources perform certain services, some essential, others extremely important to the economic and social welfare of the people of the region, and in less degree to the people of the whole United States. These services would be most perfectly performed if the forest resources were under "sustained-yield forest management." The following statement indicates the nature of such management as well as the nature of the services which forests can render continuously if properly managed.

The most important service is the stabilization of communities dependent upon the forests. Such communities can be maintained only through sustained-yield forest management. A local community, consisting of many economic elements, such as labor, farms, stores, garages, banks, railroads, etc., is often completely or mainly dependent for its existence upon the economic activity connected with the harvesting, manufacture, and transportation of forest products. Such a community can have stable life only if the forest land upon which it depends is so managed that the forest is protected, reproduced, and harvested at a sufficiently moderate annual rate to permit new growth to replace what is cut, thus giving a continuous, permanent output of forest products. This is sustained-yield forest management, which has as a major purpose community maintenance through timber cutting adjusted to forest resources and growth capacity. No other kind of forest management provides for community and forest industries' stability.

The regional and national forest products supply can be provided for consumption most efficiently through sustained-yield management, since such management avoids many forms of waste and extra expense involved in the migratory forest industry and which are inevitable without such management.

In this region, the water resources are among the most important; the beneficent influence of forest cover in regulating and conserving stream flow and water supply is generally recognized. Forests are effective in conserving soil, preventing its erosion and consequent silting of reservoirs and stream channels. Forests ameliorate climate. Forests afford protection and suitable habitat for many game animals and for other wild life. Forests are among the most important places of recreation. Much of the forest land, east of the Cascades, furnishes forage for domestic livestock without damage to the forest.

Each of these "services" furnished by the forest is important. They vary in relative importance from place to place; but all together they are of high importance. A forest under sustained-yield management for timber production, automatically and with relatively little special adjustment, provides a sustained yield of the other important services. This is the so-called multiple use forest, continuously supplying wood, water, grazing, recreation, soil control, climatic influence, and wildlife refuge. Consequently the forest under sustained-yield management, furnishing regularly these many services, is doing its utmost in a well-balanced way to supply the needs of man. Even forests for which sustained-yield timber management is not now practicable may be managed for a sustained yield of the other important services.

Although sustained-yield forest management is highly important to Region and Nation, comparatively little of the present timber supply is being harvested from forests under such management. In some parts of the Region the supply of merchantable timber is wholly or nearly exhausted with consequent reduction of logging and sawmill operations. In other localities sawmill capacity and operations greatly exceed forest capacity, so that such operations must greatly diminish within a few years. In other places mill capacity does not exceed forest capacity, but the application of sustained-yield management is retarded or impeded by serious economic obstacles. Such obstacles, discussed in some detail later, should be removed so that such management may begin promptly where timber resources permit. Where timber resources are now insufficient, there should be adequate provision for forest reproduction and for forest protection so that eventually, even though after many years, there may be established a stable forest industry with production in balance with forest capacity.

The continued existence of the forests of the region requires forest protection. The restoration of forests damaged by fire, cutting or other cause requires forest reproduction, for which protection is essential. The maintenance of communities and industries dependent upon the use of the forests requires sustained-yield management, for which protection and reproduction are absolutely essential. The reader should keep clearly in mind that protection, reproduction, and sustained yield are not themselves objectives, but are merely the means by which certain purposes may be achieved.

Economic Dependency Upon the Forests

Nearly every one realizes that the forests play an important part in the economy of the region; but few realize how extremely important that part is. A thorough analysis of the situation should be made in

order to determine rather accurately the degree of dependence of the people of the region upon the various services rendered by the forests.

The best investigation of this kind previously available, for Oregon, is based on the 1929 Census. In it the gainfully employed are divided into two great classes: the "basic industry" class, and the "service industry" class. The "basic industries" are defined as those the products of which are mostly exported from the State. The "service industries" are those which exist upon services rendered to both basic industries and other service industries and to the people. The service industries include retail and wholesale distribution, professional, domestic, and personal service, all forms of transportation and communication, building, public service utilities, hotels, amusements, banking, etc. The basic industries include agriculture, forest industries, textiles, fishing, mining, etc. It is shown that in Oregon 60 percent of the gainfully employed are in the service industries while 40 percent are in the basic industries. Of those in the basic industries, 53 percent are in agriculture and 34 percent in the forest industries, thus leaving only about 13 percent in all other basic industries. It is probable that further analysis will show that the forest industries are "basic" to a higher degree than agriculture, as a result of their shipping out of the State a higher proportion of their total product. Furthermore, it appears that the forest industries are a better "market" than is agriculture for the services of the service industries and also for the services of other basic industries. This is probable because agriculturists are generally much more nearly self-subsisting than are the employees of the forest industries, and, also, because the forest industries require unusual service in certain important fields—for example, about two-thirds of both the rail and water-borne tonnage originating in Oregon and Washington consists of forest products.

The subject of the economic importance of the forest industries and of the Region's economic dependence on them is developed further in the staff report.

Based on 1929 production of forest products and 1930 population, it appears that the forest industries are of about the same relative importance in Washington as in Oregon. In Idaho the forest industries are about half as important relatively as in Oregon or Washington, and in Montana about one-sixth as important. Nevertheless, even in Idaho and Montana the forest industries are among the most important.

Forests render many services besides that of timber supply, but no attempt will be made here to express in any definite way the extent of economic dependency arising from such services. However, it will readily be recognized that the forests are also of outstanding importance in these other fields.

The Regional Forest Situation

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The four States of the Region have 93 million acres of forest land, or 37 percent of their land area. The percentage of land in forest in the several States is: Montana, 22; Idaho, 42; Oregon, 46; Washington, 55. The forest lands are heavily concentrated in western Montana, northern Idaho, western Oregon, and western Washington; about five-sixths of the area west of the summit of the Cascades in Oregon and Washington is forest land. In the respective States, the percentage of the forest land privately owned is: Montana, 20; Idaho, 20; Oregon, 41; and Washington, 46.

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There are about 900 billion board feet (lumber tally) of standing saw timber in the forests of the region. This is 48 percent of all of the saw timber in the United States and is 55 percent of the country's softwood saw timber. (One billion board feet is the equivalent of 40,000 average freight carloads of lumber.) More than two-thirds of the timber in the region is west of the summit of the Cascades. The quantity of timber in the region is distributed among the several States in the indicated percentages: Montana, 6; Idaho, 11; Oregon, 48; and Washington, 35.

Of the total quantity of timber in the region, 42 percent is in the national forests, 6 percent is the revested Federal timber in western Oregon, and 2 percent is other Federal timber—a total of 50 percent Federal. Five percent of the timber is owned by the States, counties, and municipalities. Three percent is the property of the Indians, but managed for them by the Federal government. The remaining 42 percent of the timber is privately owned. The percentage of the timber in private ownership in the several States is: Montana, 26; Idaho, 28; Oregon, 44; and Washington, 48.

Before the coming of the white man the quantity of timber in the forests of the region was kept roughly constant by great natural constructive and destructive forces; the growth (which takes place each year in each living tree) being offset by destructive agencies, the chief of which were fire, insects, and diseases. Since the white settlement of the Region, this balance has been seriously disturbed, especially in recent decades, by increasingly rapid cutting of timber followed by partial but on the whole insufficient reproduction.

During the past 3 decades especially, increasing human occupancy and use of the forests have greatly increased the number of fires, and the increasing areas of cut-over land have created more hazardous conditions. Fire protective organizations have been developed and greatly improved, but, in many parts of the Region at least, these organizations are still insufficiently financed and manned to reduce average annual fire losses to a reasonable figure.

For the region as a whole, insects are a less serious problem than fire, although in some localities—especially in eastern Oregon—insects do more damage than fire. Much less progress has been made toward solution of the insect problem than of the fire problem.

Tree diseases constitute a serious threat to the forests. They are less spectacular but more insidious than fire. The white pine blister rust for several years has been so strongly established in northern Idaho that it threatens destruction of such of the white pine in that and adjoining States as has not yet been protected. It has recently become established in the sugar pine and western white pine stands of southern Oregon and is spreading southward into the extensive sugar pine stands of California. This threat to all the white pine and sugar pine stands of the Western States is being met with energetic action which must be vigorously continued because of the rapidity of the spread of infection and the necessity of completing the work of protection of the stands before the pine becomes generally infected.

Other fungous diseases, by rotting the wood inside standing trees, destroy annually substantial quantities of forest material. This damage, mostly hidden until individual trees are felled for utilization, is so difficult to combat that little can be done, practically, in the case of virgin timber.

The early settlers cut a little timber for their simple needs. But after 1849, the growing California and foreign markets absorbed more and more of the forest products of the Region. During the present century the greatly reduced production of lumber in the Lake States and the South, due to approaching exhaustion of virgin timber supplies in those regions, has caused the great lumber consuming regions of the country to rely more and more heavily upon the Pacific Northwest Region as the important source of supply. The completion of the Panama Canal has further accentuated the demand upon the forests of this Region. In 1909 the Pacific Northwest supplied 15 percent of the total national lumber production. By 1929 this figure had risen to 36 percent, and in 1934 the trend was still upward, placing the figure at 39 percent.

It is estimated that the 1929 production of lumber and other forest products required the removal of about 15.6 billion feet of saw timber from the regional forests. During the depression production was greatly diminished, but with the return of prosperity it is expected that the annual cut will return to predepression proportions.

Based (1) on existing stands of old growth and second growth timber, (2) on moderately good forest management (substantially better than that at present), (3) on expected growth, and (4) on estimated losses with

reasonably improved forest protection, it is estimated that the forests of the Region have the capacity to produce continuously in the future about 16 billion feet of timber yearly.

The national forests and the Indian forests are by declared policy managed on a sustained-yield basis.² The other forest land in the Region, both public and private, with rare exceptions, is not managed on a sustained-yield basis, but usually on the basis of marketing the merchantable timber as rapidly as practicable.

It should be noted that the 900 billion feet of timber in the Region is not all equally available for manufacture. Some of it is located in the National parks and in State parks where there is to be no cutting. Probably about one-half is so remotely located or is of such low quality as to be economically inaccessible at the present or even at the reasonably good predepression market prices. However, it is anticipated that future transportation and economic changes will eventually make available much, but not nearly all, of this currently inaccessible timber.

A large proportion of the most accessible timber is in private ownership, and consequently most of the present timber cutting is on private forest land; for example, about 90 percent of the 1929 cut came from private forests. Since the future productivity of forests will be greatly affected by the manner in which logging operations are carried on, the manner of logging private timber is, at present, far more important than the manner of logging public timber.

Under the lumber code, a conference of experts, some representing public agencies and some representing private timber owners and operators, recommended a program of action for private operators with the object of securing better and reasonably good forest practice in logging operations. This conference also recommended a program of public action to remove unreasonable economic obstacles and to create more favorable economic conditions for the practice of forestry on private lands. At the same time this conference definitely recognized and emphasized that the public program must move hand in hand with the program of industrial action in order that really satisfactory results might be attained. The industry has made, both during and since the code, moderately good progress in applying its program, but the public program has made relatively far less progress, even though the dual program is of far greater importance to the public than to the industry. Public fire protection contributions

through Civilian Conservation Corps, etc., have been substantial, but far more is needed. Federal legislative programs have been slow; State programs, on the whole, have been somewhat better.

Within the Region the thousands of private owners have about \$700,000,000 invested in timber. Much of this timber is held by nonoperating owners. Probably more than half of the private timber has not changed ownership within the past 25 years. In addition to the timber, the forest industries, all privately owned, have about \$500,000,000 invested in logging railways and equipment, sawmills, pulp and paper mills, and other woodworking plants. This heavy investment, with relatively small return or none at all, is pressing strongly for liquidation and for larger volume of annual output.

On the standing timber alone the annual tax bill to the many thousand private forest owners is roughly \$10,000,000. This bill is so heavy that it tends to force premature cutting, and in many instances has, together with other causes, forced tax delinquency. Tax delinquent forest land which has passed into the ownership of the counties is a serious and rapidly expanding problem. The forest tax problem is highly complicated and difficult, being involved with the tax problem as a whole.

Forest fire protection is costing the private forest owners about \$1,000,000 per year. Actual losses through fire and insects are a heavy burden. Potential but unknown future losses of this character are a still heavier psychological burden upon the private owners.

Debt on nonoperating timber properties as well as on operating forest industry enterprises is substantial.

Competition among the many hundred lumber manufacturers in the Region is intense and often is destructive to a reasonable price level.

Operating returns in predepression years were very moderate relative to the investment. Depression losses have been extremely heavy.

The burden of unproductive investment, taxes, interest on debt, protection costs, fire and financial losses, have for years exerted great pressure for timber liquidation. This pressure has resulted in excessive lumber production, which in turn, coupled with intense competition, has depressed prices obtainable for the product. Depressed lumber prices have led to the leaving in the woods of much material which would have been marketable if prices had been higher—thus bringing about unnecessary waste of the natural resources. Since lumber is the chief product which is exported from the region, depressed prices have meant that the people of the region are less able to buy goods imported into the region. Depressed prices have resulted in

² Latterly the Congress has declared a policy of sustained-yield management for the revested lands of the Oregon and California Railroad and reconveyed Coos Bay Wagon Road grant lands in the State of Oregon.

reduced funds with which to meet pay rolls and consequent lower wages, although wages are higher in the forest industries of this region than anywhere else. Depressed prices have reduced the forest industries' ability to buy supplies and services, to make improvements, to intensify utilization and refinement of products, to develop by-product industries, to practice better forestry. Depressed prices have also lowered the income of most of the people of the Region, so many of whom are directly or indirectly, wholly or partly, dependent upon the forest industry. Overproduction and depressed prices for the lumber products of this region have tended to hinder the practice of forestry throughout the United States.

Sustained-yield forest management, although essential to continued community support, is at present an ideal far from attainment in this Region. Yet, it is not an idle dream, since it has been applied for generations in older countries where the necessity for sound forest management was recognized sooner than in America. The principle has been applied to the management of the national forests within the region for many years. It is being applied on some private lands here, is in the process of being initiated on others, and should eventually be applied to most of them.

Sustained yield in practical procedure must be applied to moderate-sized forest units, and mill capacity in the long run must be adjusted to this. In many places in the region sawmills have cut all the available timber and have disappeared; while in other places the present sawmill capacity is greatly in excess of the sustained-yield capacity of the remaining available forest land. In such places, sustained yield is not likely to become practicable until, after many years of little or no forest operations, new forests have grown to constitute a new source of supply for new mills which may then be established. However, there are many places in the region where it is possible to establish a balance between the sustained-yield capacity of the local forest and the already existing local mills, or the mills which may be built in the future. Early application of the principle will, of course, be crude, but nevertheless effective. With passing years, practices will be improved as reproduction and protection methods become more effective, and as a better distribution of forest age classes is secured. It will at best require several human generations to attain reasonably good, general application of the principle in every part of the region, but this does not preclude substantial progress being made in many localities in the immediate future.

It should be emphasized that sustained-yield management requires, as a minimum, (1) that the forest be reproduced after cutting operations, (2) that the forest

be protected before, during, and after cutting operations, (3) that the average annual cut be adjusted to the sustained-yield capacity of the forest, and (4) that there be stable forest ownership. Furthermore, it should be kept in mind that the better the condition in which the forest is left after cutting and the more effective the protection, the greater the sustained-yield capacity.

Transition from the present rather general liquidation policy to one of sustained yield is especially difficult in this Region because generally there is relatively too much nongrowing, high value, old growth timber, and too little young forest growing rapidly in quantity, quality, and value. Sustained yield will be easier to maintain after a good distribution of age classes has been secured, thus creating a low-investment, currently productive forest. While the application of the principle is difficult, it is essential. Fortunately, it is not necessary to do everything perfectly at once, but rather to know the goal and to proceed step by step in that direction as rapidly as possible. In order that the Region may benefit by such management, proper economic conditions should be created promptly by public and private action: (1) to encourage the application of sustained yield where it is practicable, (2) to discourage development of mill capacity in excess of forest capacity, and (3) elsewhere, through protection and provision for reseedling, to secure the best feasible forest management short of sustained yield so that eventually it may become practicable.

Fortunately for some communities, as in northwestern Washington, where sawmill operations have greatly reduced forest resources, there have developed other forest-using industries, such as pulp and paper, which support a given number of people on less forest resources than required by the lumber industry. It is highly important that, where practicable and to the extent that the forest can permanently support them, there be established special wood-using industries which will refine wood products more highly than at present, and which will utilize material not now merchantable. This will make the forest more fully productive, more profitable, and will at the same time employ more people per acre of forest.

Private timber management generally, as well as much public timber management, is based on the idea of early liquidation, and, as previously indicated, there are powerful pressures tending to force such liquidation. These pressures must be lessened in order to secure conditions favorable for sound forest management. Unreasonable forest land tax burdens are generally recognized as an extremely serious hindrance to good forest management. But forest taxation is a highly complicated subject which cannot be

dealt with uniformly throughout the Region because of differences in State constitutions, in State tax systems and machinery, and in State forest and other conditions.

Forest protection should be greatly improved so as to reduce losses and fears of losses. Because the public is responsible for the starting of many fires, and because the public derives from forests many benefits which do not accrue to the private owner, the public, both Federal and State, in order to do its fair share, should pay a much larger portion of the cost of forest protection than at present. Federal forest lands are administered by many bureaus including the Forest Service, Indian Service, Resettlement Administration, Park Service, Land Office, and others. Funds have not always been provided for forest fire protection of some of these Federal lands. Consequently, other fire protection agencies have been forced to pay for protection of these unprotected Federal lands in order that their own adjacent forest land be protected. The forested land in the unreserved public domain is an outstanding example. Recent acquisitions of forest lands and proposed acquisitions by the Farm Security Administration (Resettlement Administration) further emphasize the necessity for adequate protection of all federally owned forest land. Similarly, all State, county, and municipal forest lands should be adequately protected.

It is generally considered impracticable by most of the industry under present conditions to own more than 20 years' supply of timber; most of them own much less. But sustained-yield management requires a timber supply which will last long enough to permit new growth to replace what is cut, and, according to local conditions, this may require from 40 to 80 years' supply of old-growth timber, or far more than many operators now feel can be successfully carried by them. It is desirable, insofar as possible, to bring about conditions which will make it practical and economical for more of the industry and nonoperator owners to continue to own timberland and manage it on a sustained-yield basis. Nevertheless, there will be many instances where private owner-operators will not be able to carry sufficient land for this purpose. This condition, and the large amount of publicly owned forest land in many of the prospective sustained-yield units, points to the desirability of cooperation between private and public owners in setting up and managing such units. Such cooperation will require careful planning and long-term contracts between the several parties to secure the necessary continuity of policy. The managers of public forest lands, such as the national forest lands, the re-vested grant lands, State forest lands, etc., should be authorized by law to enter into such contracts, which,

of course, should provide ample safeguards for protection of the public interest.

A large program of public forest acquisition should be undertaken in order to make such cooperative sustained-yield units more widely practicable through establishment of a reasonable balance between public and private forest ownership within each unit. This program should have as its main purpose the acquisition of forest land of such amount, character, and location as will effectively contribute to the development of such cooperative units. In applying this policy, emphasis should be placed upon the acquisition of well-developed but immature second-growth timber. This timber will be sorely needed to support industry in future years, and its present cutting brings into market an undesirable low grade of material, and thereby prevents the marketing of an equal quantity of over-mature, deteriorating timber greatly in need of cutting. (At present in western Oregon and western Washington, there is being cut about one-half billion feet annually of such immature, rapidly growing Douglas fir.)

In addition, the public acquisition program should take over forest land unsuited to private management. This would include substantial areas so seriously denuded of forest growth by fire or cutting that expensive restoration work is required if they are again to become productive forest lands.

The purposes here indicated may be aided by a wide application and more liberal use of the authority which the Forest Service now has to make exchanges. The large public acquisitions here contemplated raise additional tax problems; but wise forest land use in the public interest should be the major objective, together with such equitable redistribution of the tax burden as may be necessary.

One means of encouraging long-time private forest management would be through action by the Federal Government to organize "forest credits" in about the same way farm credits are organized, thus making capital available at the minimum practicable interest rates. It is highly desirable, also, that the public encourage systems of insuring forest growth against loss from fire, at rates which may be attractive to private operators and owners. The Federal forest credits proposal includes provision for insurance, applicable to forests contained within sustained-yield units. Inasmuch as protection organizations function over large areas and represent cooperative arrangements applying to mixed ownerships, and inasmuch as broader coverage may well cheapen the rates and increase the security, it appears desirable that insurance be extended to other forest areas, properly protected.

Action along these several lines would greatly facilitate the application of sustained-yield management to

private forest lands. There is some, and probably there will be more, application of such management without taking any of these steps; but the more fully such steps are taken the greater the encouragement and the more prompt the application. Each possible unit has many features which make it a special problem in itself, different from all others. There can be no set formula for developing such units, but obviously the more favorable the conditions the more readily and promptly any given unit will be developed. Once reasonably favorable conditions are established, operators and forest owners will be able to progress toward the desired end; some will move rapidly, others slowly, and with actual developments will come a change in attitude which will make such enterprises still more practicable.

Services of the Forest Other Than Timber Production

The foregoing lays great emphasis upon production of timber. This is partly because this particular service of the forest is most important in giving direct and indirect support to the economic fabric of the Region. The forest advisory committee considers that the primary problem with which it has to deal is the forest as a producer of wood. The committee clearly recognizes that there are several other highly important "services" which also require attention. These other services include (1) the regulation of stream flow and water supply, (2) the conservation and up-building of soil, (3) opportunities for recreation, (4) the grazing use, and (5) the protection of wildlife. In the case of each of these "other services" it is pointed out (1) that the problem extends into areas far beyond the boundaries of the forests (and consequently beyond the boundaries of the functions of the committee), and (2) that if the forest land is given sound technical management for timber production, such management will incidentally go far toward enabling the forest to render effectively each of the "other services." With this in mind, the forest committee has felt that it should limit its attention mainly to the forest land and the timber production problem, but that it should also be careful to make its suggestions such that they will aid in the solution of the problems relating to the "other services."

Water Conservation

Undoubtedly, the regulation of stream flow and water supply is one of the foremost problems of the Region. Forests which are well managed for the production of timber will incidentally perform their function as conservers of water. In some inaccessible areas and in some areas of extremely slow timber growth, forests are of little or no value for timber production, but are valuable for water-shed protection, and also for others of the "other services." The water conservation problem is also of importance outside forest

boundaries. The problem of water conservation deserves careful investigation by the regional forest experiment stations acting in cooperation with water supply engineers and others engaged in this field.

Soil Conservation

Forests well managed for the production of timber are highly effective in conserving soil and in building up its fertility. One of the best means of stopping soil erosion is by tree planting on lands suitable for forest growth, and this means is being used extensively by the Soil Conservation Service in connection with farms. The policy should be extended to all lands chiefly valuable for forest production and actually managed for that purpose wherever such cooperation is desired by the owner.

Recreation

Within the region, millions of recreationists spend scores of millions of dollars yearly. This highly important activity has increased rapidly in recent years and evidently is destined for much further increase. The recreational opportunities of the Region have large spiritual values for our own people and in addition constitute one of our most important economic resources. The forest itself makes up a large share of the recreational resources. Sound technical management of the forest will maintain and enhance to a high degree the recreational values of the forest. But in addition, recreationists need camp sites, summer home sites, roadside forests to maintain highway beauty, wilderness areas, etc. All of these additional requirements can be provided at relatively small additional expense; they are largely matters for the attention of recreation experts working in close cooperation with forest managers. Recreation is so important that the States should provide liberally for it, especially for the maintenance of such values as those in roadside beauty.

The present mining laws, as affecting the national forests, allow areas of high recreational value to be entered and in some cases patented even where the mineral values are far less than the demonstrable recreational values. Similarly, other important forest uses are sometimes adversely affected in much the same way. Without in any way preventing the development of bona fide mining discoveries, action is needed to segregate the subsurface rights from the surface rights, thus preventing loss to the public of valuable recreational lands and other forest uses through perversion of the present liberal mining law.

Grazing

The livestock industry, with its investment of about \$700,000,000 in about 15 million head of livestock, lands, equipment, etc., is one of the important economic groups

of the Region. Much of the summer range is found within the forests. Overgrazing is harmful to forest reproduction, to watershed values, to soil conservation, to recreation, and to wildlife conservation, as well as to the livestock industry itself. But wisely regulated grazing helps to reduce the fire hazard in the forests, and is not harmful to forest reproduction or to the "other services." Growing trees tend to limit livestock range while cutting of trees, in many localities, tends temporarily at least to increase range. Most forest lands are more valuable for timber production than for forage, though some undoubtedly are more valuable for grazing. This suggests the need for zoning, especially in the Douglas fir region. Sound technical management and close cooperation between forest and range managers and research men are required to reconcile and adjust properly the forest and range needs and secure the best net results.

Wildlife

The forest well managed for timber production, with but slight additional adjustment, serves well in the protection of wildlife. Here again the experts in the two fields must cooperate closely in order to secure satisfactory and well-balanced results for each.

It must be clearly recognized that the different kinds of service rendered by the forest vary greatly in relative importance in different parts of the region. Actually, the grazing use may be more important than the timber or any other use in some localities, the recreational use may be the most important in others, and so on. All of these services are so important that strong effort should be made to balance the uses, coordinating each with the others. This approach avoids devoting the forest exclusively to any one use, aiming rather at the greatest total benefit from all of the services combined, and thus secures in fact the "multiple-use forest."

Research

Within the region, some progress has been made through research toward securing scientific information needed for sound technical management of forest lands. However, it must be recognized that much more work still remains to be done to establish an adequate scientific basis. The field of needed research is a broad one, including especially work in the protection of forests from insects, diseases, and fire; emphatically, work in the economics of forest ownership, logging, markets, utilization of low grade and waste material; and also work in silviculture, forest soils, stream flow relationships, and range management. Especially in the forests of western Oregon and western Washington, present-day logging, because of economic conditions, necessarily leaves behind great quantities of wood not now marketable; development of profitable uses for such material will be a

great aid toward sound forest management and stable industry.

The only research laboratory of the organized lumber industry of the United States is maintained by the Western Pine Association in Portland, Oreg. The forest industries should undertake more aggressively to solve their more pressing research problems. And the State forest schools should be enabled to help substantially in this field. But, after all, the dependence must be mainly upon wood utilization research conducted by the United States Forest Service within the region and especially at its Madison, Wis., laboratory. To secure efficient application of available research funds to the most pressing problems, and to secure prompt application of results of research, there is need for closer cooperation between industry and State and Forest Service forest research workers.

Distribution of Responsibility

The program herein outlined is planned to rely, in securing a reasonably prompt and adequate solution of our forest problem, upon private forest ownership, management, and operation to the maximum extent practicable, with public action to the extent necessary (a) to remove unreasonable economic obstacles and to create reasonably favorable conditions for sound private forest management, (b) to acquire forest land of such character and location as to contribute effectively to the development of "cooperative sustained-yield units," and (c) to acquire forest lands of such character as to be impracticable for private ownership and management. The private owner should do and should be encouraged to do as much as practicable; of that which the private owner cannot do the State should do all that it can; the Federal Government should do what cannot be done by the other two. It is impossible to say now what will be the ultimate ownership proportion of each, for at best a number of years will be required for the realization of the program recommended, and during that time there will be substantial changes in economic conditions and in the mental attitude of the several agencies. Let a joint cooperative program start promptly and vigorously, and continue until there is satisfactory forest management on a stable ownership basis.

It should be stated with great emphasis and all should clearly recognize (a) that the tax burden is controlled by public action, (b) that only a very small percentage of fires are started by forest owners or their employees, (c) that the public as a whole, rather than the private forest owner as such, benefits from the community maintenance, recreation, conservation of soil, water and wildlife values of the forest. Consequently, the public should promptly remove unreasonable obstacles and liberally aid the private owner in protecting his forest

land. In the case of forest land already badly denuded by fire or other causes, and at the same time of such character as to be impracticable for private forest ownership, the public should undertake the work of protection and restoration. In the matter of fire protection especially, there is most urgent need for vigorous enforcement of the present reasonably good laws which are supported by strong public sentiment. No matter who may eventually own the forest land, it must be adequately protected in order that natural growth may not be destroyed, and that the public may receive the many benefits which far outweigh the cost of protection.

Cooperation

The successful making and carrying out of plans depends upon cooperation. During the past 3 years, public agencies responsible for forestry matters and forest industries have developed far better cooperation than ever before. These groups have developed mutually approved programs of public and industry action. In order to secure effective application of these programs,

it is essential as the next step that hearty cooperation between public forest agencies and the forest industries be maintained and strengthened. But it is also essential that similar cooperation be established between (a) these two groups on the one hand and (b) other economic and social groups and the general public on the other, and that such cooperation be put in effect promptly.

Time to Act

It takes many years to grow saw-timber trees. Timber resources must be planned and prepared many years ahead in order to secure continuous operations and permanent communities. Already many communities in the region have faded away and it is already too late to make others permanent. But there is still time to provide permanently for many other communities. The rapid passage of time and the swift progress of forest operations makes it extremely important that there be prompt consideration of and action upon this program.

RECOMMENDED PROGRAM OF ACTION

The following recommendations state briefly the action which should be taken by the Federal Government, by the several States, by the industry, and by the general public.

Recommended Federal Action

Legislation

1. Authorize establishment of Cooperative Sustained-Yield Units consisting of national forest, other Federal, State, and/or private forest lands, under contracts (a) requiring of private and other cooperators suitable provision for forest protection, forest reproduction, and cutting with due regard for the sustained-yield capacity of the forest, and (b) otherwise suitably protecting the public interest.

2. Establish new branch of Farm Credit Administration to organize "Forest Credits" in order that funds may be available at a minimum practicable interest rate for these private forest owners engaging in sustained-yield forest management.

3. Amend Clarke-McNary Act (which provides Federal funds to be used in cooperation with State and private funds in protecting State and private forest land from fire) by (a) extending scope to include insect and disease protection, erosion control, and flood prevention; (b) increasing annual fire protection authorization and providing a new authorization for forest insect and disease protection; the estimated needs of the

Pacific Northwest region are \$850,000 and \$190,000, annually, for fire protection and for insect and disease protection, respectively; the corresponding national needs would be approximately \$5,000,000 (an increase from \$2,500,000) and approximately \$1,000,000, respectively.

4. Authorize, for a period of 10 years, an annual appropriation, to be available until expended, for the acquisition of forest land for national forests. Due consideration should be given in making such purchases to the encouragement of management of private lands for sustained production and to the development of Cooperative Sustained-Yield Units through the acquisition of lands of such character and location as will contribute to the establishment of such units. The needs of the Pacific Northwest Region alone for this purpose are estimated as at least \$9,000,000 per annum.

5. Amend present law (under which 25 percent of all national forest receipts are paid to the counties for their school and road fund) so that more suitable methods may be devised, if practicable, for making contributions to counties in lieu of an economically sound and equitable tax income not obtainable because of land in Federal ownership. This course is required in view of (a) relatively delayed utilization of most national forest timber and (b) proposed substantial increases in national forest areas.

6. Amend McNary-McSweeney Act by increasing total authorization for the Forest Survey, authorizing

annual appropriations of sums necessary to complete this survey at an early date, and providing an additional appropriation annually for its maintenance. It is estimated that an annual expenditure of \$150,000 is required for 2 years to complete the Forest Survey in the Pacific Northwest Region, while \$55,000 is needed annually for its maintenance. Nationally, increase of total authorization from \$3,000,000 to about \$6,000,000, and an annual appropriation for maintenance of about \$250,000, would be involved.

7. Amend Clarke-McNary Act (as it relates to United States' acceptance of donations of forest lands) by permitting United States to pay taxes due on such lands. Also amend National Forest Land Exchange Act (which permits exchange of national forest land and/or timber for other forest land within national forest boundaries) by extending area within which such other land may be located to include all lands within 6 miles of the boundaries of the national forests as they now exist.

8. Amend existing Revested Land Grant legislation to provide (a) for sustained-yield forest management, (including authorization to participate in Cooperative Sustained-Yield Units), and (b) for homestead settlement only upon lands applied for and found to be desirable primarily for agricultural use.³

9. Authorize presidential proclamation of suitable unreserved public domain lands as national forests.

10. Legislation to provide adequate fire protection for all forest lands in Federal ownership.

11. Amend existing law to provide larger funds for (a) research in forest products, silviculture, forest soils, stream flow, range management, and especially in economic fields, including community stabilization; the estimated needs of the Pacific Northwest region for this increased research are \$745,000 per annum; and for (b) extension work in connection with utilization of farm woodlots and small timber ownerships; the estimated needs of the region for this purpose are \$65,000 per annum.

12. Legislation similar to No. 1, above, authorizing participation of Indian forest lands in Cooperative Sustained-Yield Units.

13. Legislation authorizing the Secretary of Agriculture to develop and make available for public use and enjoyment the recreational, educational, and related values of the national forests compatible with the purpose for which they were originally created and with the proper management and conservation of their scenic and wildlife resources.

14. Legislation for all national forest lands separating subsurface mineral rights from surface rights in order to protect public recreation and other forest uses.

15. Legislation which will authorize the Secretary of Agriculture to prohibit entry on, and regulate occupancy and use of, national forest lands located in watersheds used as a source of municipal water supply.

16. Legislation making the Civilian Conservation Corps (C C C) a permanent organization.

Federal Policy

1. It is recommended that the Federal Government promptly, so far as desirable, and so far as practicable under existing legislation, extend the sustained-yield management of the forest lands under its control to participation in Cooperative Sustained-Yield Units.

2. It is recommended that full use be made of existing national forest exchange legislation, without limiting the applications to 10 percent of the national forest receipts, to encourage private owners, whose cut-over lands are likely to be acquired, to leave such lands in suitable condition for forest management, and to encourage leaving residual stands.

3. In making plans for forest acquisition and for forest management, especially of sustained-yield units, it is urged that in each State all agencies managing public lands cooperate with each other and with private owners in order that there may be suitable coordination of effort.

4. In the administration of Federal lands of all categories it should be the policy to safeguard the aesthetic and recreational values of the natural forest on areas of outstanding or predominant value for these purposes, such as the immediate borders of principal highways, recreational centers, lake shores, and so on.

5. Continuation of programs for classification of land as to its best long-time use to indicate (a) submarginal agricultural lands in predominately forest areas which should be retired from agricultural use, with provision of opportunity for relocation of the settlers now on such lands, and to indicate (b) areas in which further agricultural settlement should or should not be encouraged.

6. Continue the policy followed during the past few years in the initial control of the white pine blister rust on private as well as public lands.

7. Establish in the region a larger number of CCC forest camps as consistent with the importance of the regional forest resource.

Recommended State Legislation

1. Adequate appropriations for protection of State, county, and private forest land from fire, insects, and disease.

2. Legislation authorizing management of State and county forest land as part of Cooperative Sustained-Yield Units.

3. Substantial appropriations for the purchase of forest land (a) which will facilitate the establishment of

³ The Congress has passed such legislation since preparation of this program.

Cooperative Sustained-Yield Units, or (b) which in private ownership will not receive suitable management.

4. Legislation enabling the States of the Region under the terms of the Federal "Fulmer Act" to enter into agreement with the United States for the purchase, management and development of State forests.

5. Amendment of taxation system to extent necessary to remove unreasonable obstacles to sound management of private forests, including action designed to encourage sustained-yield forest management.

6. Legislation providing for the transfer of county foreclosed tax-delinquent nonagricultural forest lands to the State to be managed as State forests. (Similar to Washington Act.)

7. Legislation, authorizing the zoning of rural lands, whereby lands primarily valuable for forest purposes may be so designated, and nonconforming uses therein restricted and regulated in a manner designed to promote sound forest practice, public health, safety and general welfare.

8. Legislation authorizing States, counties or other minor political subdivisions to exchange lands with other owners with purpose of consolidating their forest holdings.

9. Legislation authorizing the States (a) to administer forest areas primarily or preeminently valuable for aesthetic or recreational use, such as the borders of principal highways, river and lake shores, and recreational centers, so as to safeguard these values, and (b) to acquire such lands by exchange, purchase, donation or otherwise.

10. Legislation directing that all State-owned lands chiefly valuable for the production of forest crops be protected and managed for continuous forest productivity; and, where necessary, that legislatures seek to obtain from the Congress such amendment of grant acts or other pertinent statutes as may permit such State legislation or action.

Recommended Action to be Taken by Private Forest Land Owners and Operators, and by Forest Industries

1. Improve and continue to apply and to make progress in the skill of application of the "Forest Practice Rules" developed by the industry under Article X and Schedule C of the Lumber Code. The Forest Practice Rules provide in detail for measures (a) to secure fire protection during and immediately following logging [with specific provision for (1) spark arresters, (2) communication system, (3) patrol, (4) fire fighting equipment, prevention of (5) friction fires and (6)

blasting fires, (7) smoking in the woods, (8) organized prevention, detection and suppression of fires, (9) forecasts of dangerous fire weather, (10) falling of snags, disposal of (11) especially hazardous inflammable debris and (12) ordinary logging debris, (13) fighting logging fires, and (14) correlation of the logging operation protection system with the general protection system]; (b) to secure extension and coordination of cooperation in protection against fire, insects and disease; (c) to secure the conservation of immature trees and young growth from unnecessary logging damage; and (d) to secure the restocking of the land after logging (with specific provision for adequate seed supply from seed trees, partial cutting, areas of uncut timber, direct seeding or for planting).

2. With technical guidance, carefully study individual forest properties and operations with the objects, (a) of developing forest plans and practices most suitable to the local conditions, (b) of applying selective logging in forest types which permit, and also of applying the principles of "sustained yield" under circumstances which make it practicable, and (c) of developing a sound land ownership policy and thus to increase the area under stable management. In drawing contracts for the sale of timber, in cases in which the land is reserved from sale, include clauses providing for the application of the "Forest Practice Rules."

3. Make provision, so far as practicable, either on their own resources or in cooperation with Federal and State agencies, for the protection of their forest holdings against preventable losses from insects and plant diseases.

4. Conduct research in manufacture and utilization to lend stability to their industries, to improve techniques and to increase the usefulness and distribution of their products. Conduct an aggressive trade promotion campaign to maintain and extend wood use in competition with substitutes.

5. Aid in securing the State and Federal legislation recommended in this program; carry on sustained efforts to inform the public about the problems involved and about practicable solutions.

Recommended Action to be Taken by Others

(a) Economic or social groups (not directly engaged in forest operations) including the following: Railroads, agriculture, banks, mines, labor, service clubs, chambers of commerce, grazing, recreation, wildlife, conservation of forests, soil and water, etc., etc.

(b) Members of the general public.

1. Study this program carefully, and, for the common good, assist in putting it into effect.

III. STAFF REPORT

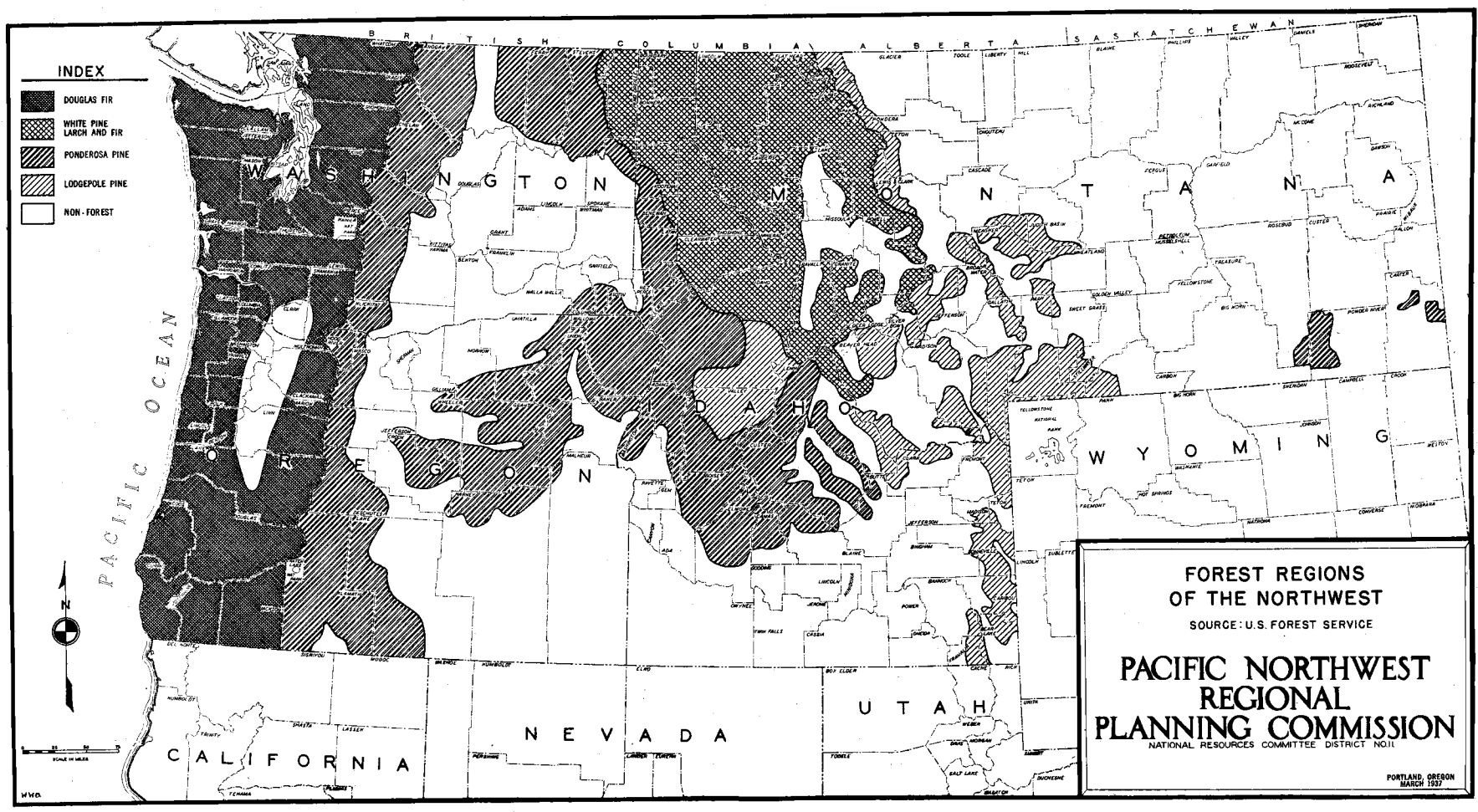
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SECTION 1. CONDITIONS AND PROBLEMS

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SECTION 1. CONDITIONS AND PROBLEMS

By Donald Bruce¹

The Area Covered by This Report

The forests of the Columbia River Region, or the Pacific Northwest, contain about half of the standing timber remaining in the United States. They are of great importance to the Nation as a source of supply of lumber and other forest products. They are of even greater importance to the four States which approximately constitute this Region, as a vast natural resource on which their economic prosperity depends.

The boundaries of the four States, Montana, Idaho, Oregon, and Washington, do not, of course, correspond with the divides which bound the Columbia Drainage Basin. The headwaters of the Columbia River system extend for short distances into the States lying immediately to the south, and there is a major extension north into British Columbia. Conversely, a considerable portion of the four States is drained by other rivers; the most important examples are that part of Montana east of the Continental Divide, and the coastal regions of Washington and Oregon.

Most of the available statistics bearing on the forest problems of this Region have been compiled by States, and it is practically impossible to break them down by watersheds. For this reason, and because any adequate solution of the problems connected with these forests will unquestionably require State legislation, the data presented in this report will apply to a Region consisting of the group of four States.

While these four States have much in common, the forest situation is far from uniform. The Douglas fir region, which lies west of the Cascades in Oregon and Washington, is completely different in climate, and, consequently, in character of timber, from the pine regions to the east. Even within the pine region there are striking differences between States and between eastern and western Montana. To present the facts clearly, it has, therefore, been necessary to recognize just as completely as the available statistics permit, the following subdivisions:

Pine region.—Eastern Montana; western Montana; Idaho; eastern Oregon; eastern Washington.

Fir region.—Western Oregon; western Washington.

¹ Many officers of the Forest Service in Regions I, IV, and VI, and of the Branch of Research of that Service have aided greatly in the preparation of this report. R. W. Putnam, of Region VI, assigned to the study by the Forest Service, has made important and direct contribution. Representatives of trade associations and State officials have been equally helpful. To all of these, and to many members of the staff of the Pacific Northwest Regional Planning Commission, who also assisted, sincere thanks are offered.

The Importance of the Columbia Basin States to the Nation

Figure 1 shows in graphic form the relation of the four Columbia Basin States to the Nation as a whole in area, in population, and in timber resources. It will be seen that the four States constitute 13 percent of the area of the United States, yet support but 3 percent of its population. They contain only a little more than their share of the Nation's forest land, or 15 percent, but on this land stands 55 percent of the Nation's remaining timber. From this timber reserve is produced annually about 47 percent of the softwood lumber consumed by the 48 States, but the 4 States themselves, on account of their scanty population, consume only 16 percent of the Nation's total.

RELATION OF COLUMBIA BASIN STATES TO UNITED STATES

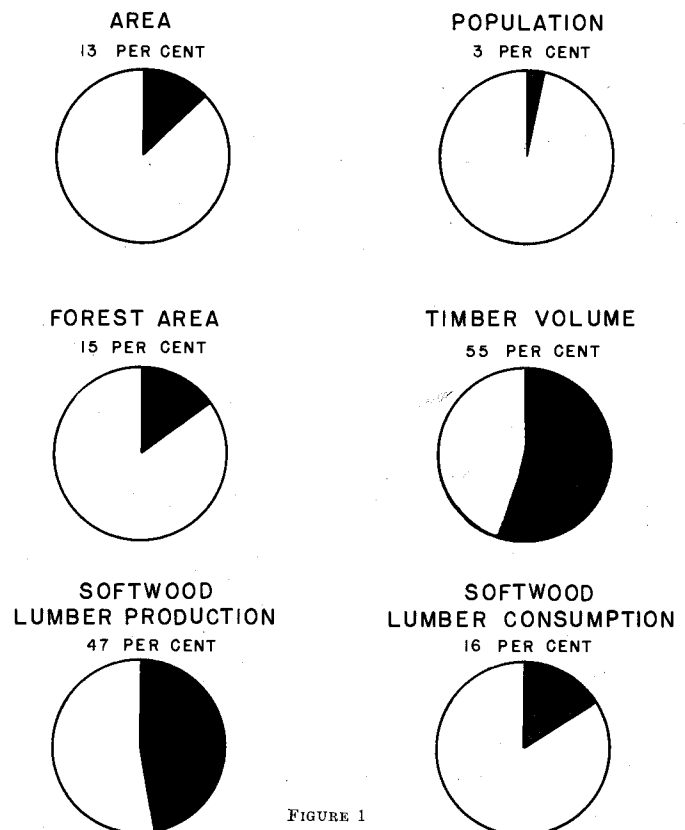


FIGURE 1

This dominant position in the lumber industry is a development of relatively recent years. About 30 years ago, when the Nation was consuming more lumber than ever before or since, this Region's contribution was but 13 percent of the total. The gradual exhaustion of eastern timber supplies has made increasing demands on the forests of the Pacific Northwest. Today, they stand between the Nation and a serious shortage of forest products. Therefore, the wise handling of this great natural resource is a matter of national concern.

The Forest Area of the Region

For several years the Research Branch of the Forest Service has been making a survey of the forest resources of the Nation. Work in the Douglas fir region has been finished; that in the pine region of eastern Oregon and Washington, and the northern part of Idaho is also rapidly approaching completion; but, as yet, southern Idaho and Montana are practically untouched. The figures available for areas of forest land for volumes of timber, are, therefore, of varying reliability, and any regional totals are inevitably a summation of reasonably precise figures and of approximations which can be little more than intelligent guesses.

According to these figures, 38 percent of the Region is forest land, including not only the area bearing mer-

chantable or second growth timber, but also all burned-over or cut-over land which has not been converted to agricultural use, and the high mountain slopes on which grow forests of no present or prospective industrial value.

The proportion of the land area which is thus classified as forest land varies widely within the Region. It is much heavier in the fir region than in the pine, the percentages being 84 and 30 percent, respectively. There is little difference between western Washington and western Oregon, but the subdivisions of the pine region are quite diverse in this respect. The lowest figure is for eastern Montana (12.5 percent) while the highest is for Idaho (42 percent).

Figure 2 presents the facts in graphic form. The large square which forms this graph represents the entire land area of the Region. This is divided by horizontal lines into seven rectangles which have areas proportional to the land areas of the seven subdivisions of the Region. The arrangement is roughly geographic, eastern Montana being at the top and western Oregon and Washington at the bottom. Each of these rectangles is again subdivided, the cross-hatched left-hand end representing the forest land while the unhatched portion represents all other land.

The seven shaded rectangles, then, represent by their area the forest land in each subdivision. Their lengths, measured horizontally, represent the proportion of each subregion which is forest land. This can be read in percentage by means of the scale below the graph. Since the diverse shapes of the rectangles make visual comparisons of their areas somewhat difficult, the area which each represents has been entered therein in figures which are to be read as millions of acres.

The statistics represented by this and subsequent figures are also presented in tabular form in the appendix.

The forest land has been classified into five types, as follows:

- Land bearing mature saw timber (softwood).
- Land bearing second growth (softwood).
- Land which is unstocked as a result of cutting or fire.
- Land bearing hardwood.
- Land bearing noncommercial stands.

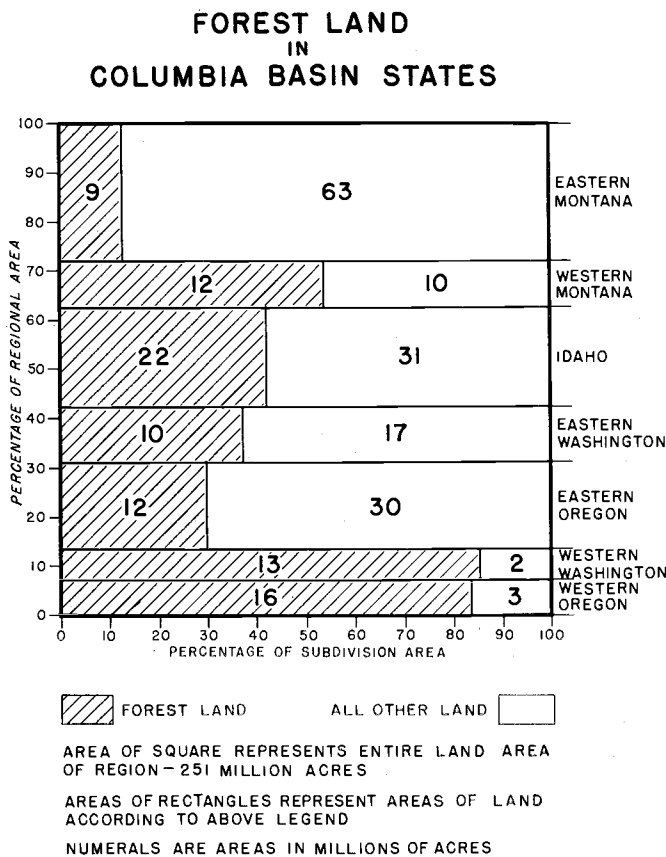


FIGURE 2

Figure 3 shows this classification within each subdivision of the Region. This graph is similar in construction to figure 2. The main square now represents only the forest land, that is, the shaded area of figure 2. The rectangles representing the seven subdivisions, consequently, have changed in proportionate area, as can best be seen by comparing on the two graphs; first, eastern Montana, at the top, which has become relatively small, and second, western Oregon, at the bot-

tom, which has more than doubled in relative importance. Each of the seven rectangles is now subdivided into five types, arranged in the order already stated, from left to right. The areas of the small rectangles are again entered in millions of acres.

Nearly half of the forest land bears merchantable timber, over a quarter bears second growth timber which will become merchantable later on, less than a tenth of the land is unstocked and more than a tenth is definitely and permanently noncommercial in character; the hardwood land is negligible. But these proportions apply to the Region as a whole without being reflected in any of the subdivisions. Only in Oregon does mature saw timber predominate. Montana and Idaho have more than their share of second growth, while more than half of the unstocked land is concentrated in the two subdivisions that compose the fir region. The largest proportions of noncommercial land are found in Montana and Idaho, while the small area of hardwoods is entirely west of the Cascades.

The Volume of Timber in the Region

900

On this forest land stand over 900 billion board feet of timber (lumber tally)² of many different species. Douglas fir is by far the most important species from the standpoint of volume, nearly half of the timber being of this species. Ponderosa pine, the basis for the lumber industry of eastern Oregon and Washington, is a poor second with about 15 percent of the total. But a fraction of a percent behind it comes hemlock, which has always been considered, somewhat unjustly, as inferior for lumber manufacture, but which is unquestionably an excellent pulpwood (pulpwood being the raw material from which wood pulp is manufactured). Grouped together under the heading "pulpwood species" are a number of species of fir, etc., which are of value chiefly as pulpwood, but this classification has been used only in the case of the region west of the Cascades where there is a thriving wood-pulp industry; these species account for some 6 percent of the total. The valuable Idaho white pine is almost insignificant in its volume, being only 2.5 percent. Classed as "miscellaneous" are a great number of species, many of which have little commercial value, except possibly for local use.

Nearly half of the timber is in the State of Oregon, and over two-thirds of it is in the Douglas fir region of Oregon and Washington. These proportions are widely different from those of forested area already shown in figure 1, and these differences reflect the fact that the stands per acre are far greater in the western subdivisions. Washington has about a third of the timber;

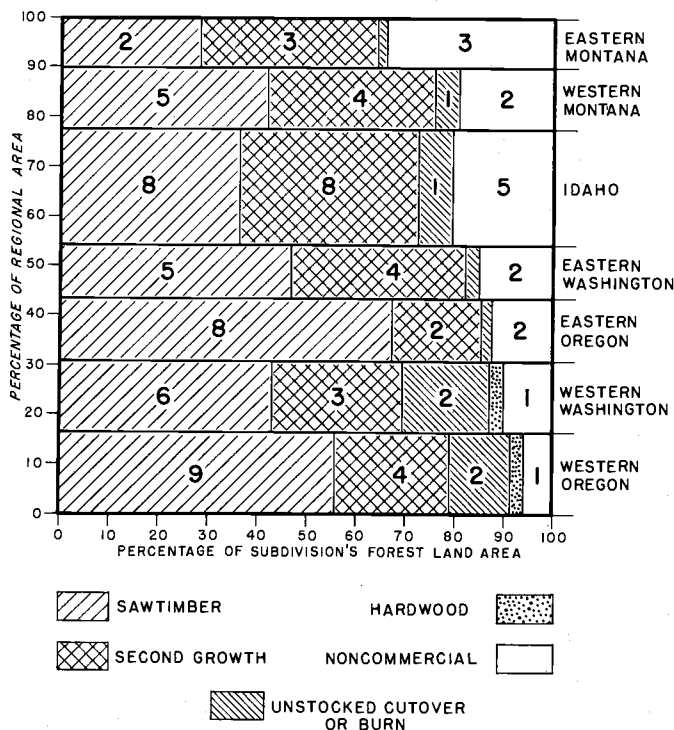
² Volumes of standing timber are commonly cited in board feet, log scale, while lumber production statistics are in board feet, lumber tally. The two units of measure differ by from 10 percent to 30 percent, depending on species and size. For simplicity, all figures in this report are on a lumber tally basis.

Idaho, about a tenth; while Montana has only 6 percent, most of it west of the Continental Divide.

These interrelations can be more readily grasped, however, by an inspection of figure 4, which is similar to figures 2 and 3 in its construction. The major square now represents the 935 billion feet of timber in the entire Region, the horizontal lines divide this volume in proportion to its distribution between the regional subdivisions, while the interior rectangles show, by their hatchings, the proportions of the different species. The predominance of the Douglas fir and its concentration in western Oregon and Washington are obvious at a glance, as well as its association with hemlock and other pulp species. Western Washington, however, has a much greater proportion of the pulpwood and less of the Douglas fir, due in part to heavy cutting of the latter. The bulk of the ponderosa pine is in eastern Oregon, where it makes up over three quarters of the entire stand. Idaho white pine is concentrated in Idaho (actually in the northern part of this State), but is a very small part of the stand. The "miscellaneous species" of low value account for about half of the timber in western Montana, and 90 percent in eastern Montana.

932

**TYPES OF FOREST LAND
IN
COLUMBIA BASIN STATES**



AREA OF SQUARE REPRESENTS FOREST LAND OF REGION OR 95 MILLION ACRES
AREAS OF RECTANGLES REPRESENT AREAS OF FOREST TYPES ACCORDING TO ABOVE LEGEND
NUMERALS ARE AREAS IN MILLIONS OF ACRES

FIGURE 3

VOLUME OF TIMBER BY SPECIES IN COLUMBIA BASIN STATES

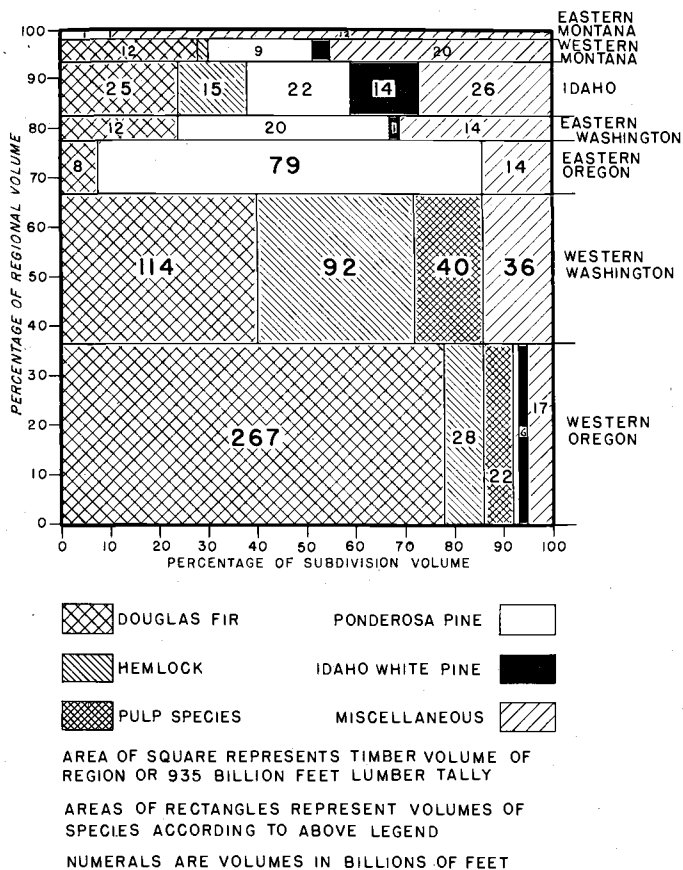


FIGURE 4.

Importance of the Forest Industries to the Region

The forest resource furnishes the raw materials for lumber, pulp and paper and many other wood-using industries. These are of vital importance to the Region. While only 10 percent of the Region's gainfully employed are on the pay rolls of these industries, they constitute 56 percent of all manufacturing employment. Yet both these figures are misleading. In addition to those directly employed, forest industries support indirectly and in varying degrees a large number of allied or service industries. For example, in many a sawmill town a major proportion of the merchants and professional people depend substantially on the sawmill pay roll, while nearby farmers find an increased market for their produce because the sawmill workers are there.

The interrelationships between forest industries and other economic activities of the Pacific Northwest are so complex that an accurate and comprehensive

appraisal of their importance is impossible. However, in a few striking instances reasonably exact information has been analyzed and can be cited.³

This analysis shows that the Region is far from being a self-sustaining economic unit. It is dependent on the remainder of the United States and on other nations for a great many commodities which cannot be raised or economically manufactured within the Region. If these commodities are to be imported, they must, of course, be paid for with credits derived from exports. Of the total net exports of the four States, 71 percent (by weight) are forest products. Expressed on a value basis, the corresponding figure is 41 percent, a difference which reflects the fact that forest products are, on the average, less valuable per ton than are many farm and mineral products.

The forest industries are of great importance to the railroads, as is illustrated by the fact that about 63

³ From sec. 2 of this report, *Economic Importance of the Forest Industries of the Pacific Northwest*, by Blair Stewart.

IMPORTANCE OF FOREST INDUSTRIES TO COLUMBIA BASIN STATES

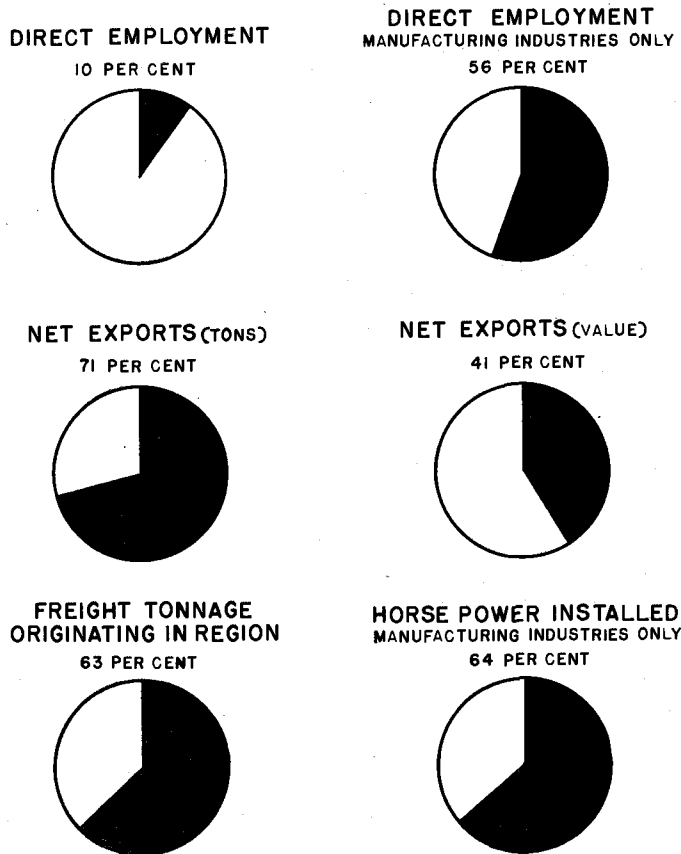


FIGURE 5.

percent of all freight tonnage originating in the four States consists of lumber and other timber products. As a further evidence of the importance of forest industries, 64 percent (by rated capacity) of the power equipment installed in manufacturing plants of the Region is used by them.

These facts are graphically illustrated by figure 5.

The Annual Production of Forest Products

The forest industries on which the regional prosperity is so largely based are cutting each year a very large quantity of timber and are converting it into lumber, woodpulp, shingles, railroad ties, veneer, and many other commodities. The quantities thus cut have varied widely from year to year. The most accurate statistics are available for lumber and for pulpwood, which are also the most important products in volume and total value.

The annual production of these two commodities since 1869, the first date for which good figures can be found, is shown in figure 6. The early figures for lumber are at 10-year intervals, but the record is

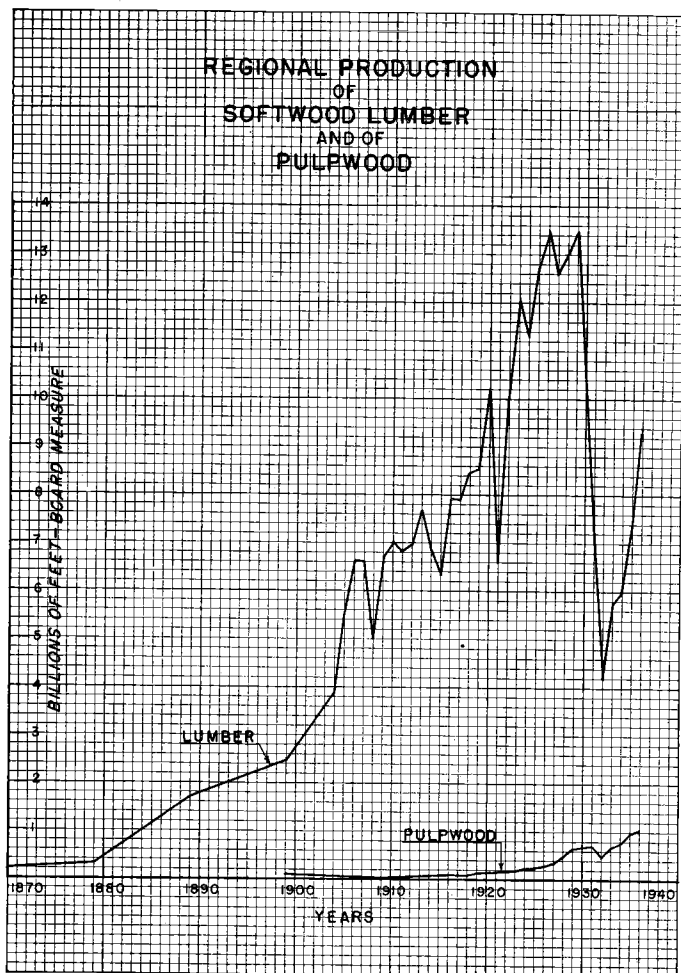


FIGURE 6.

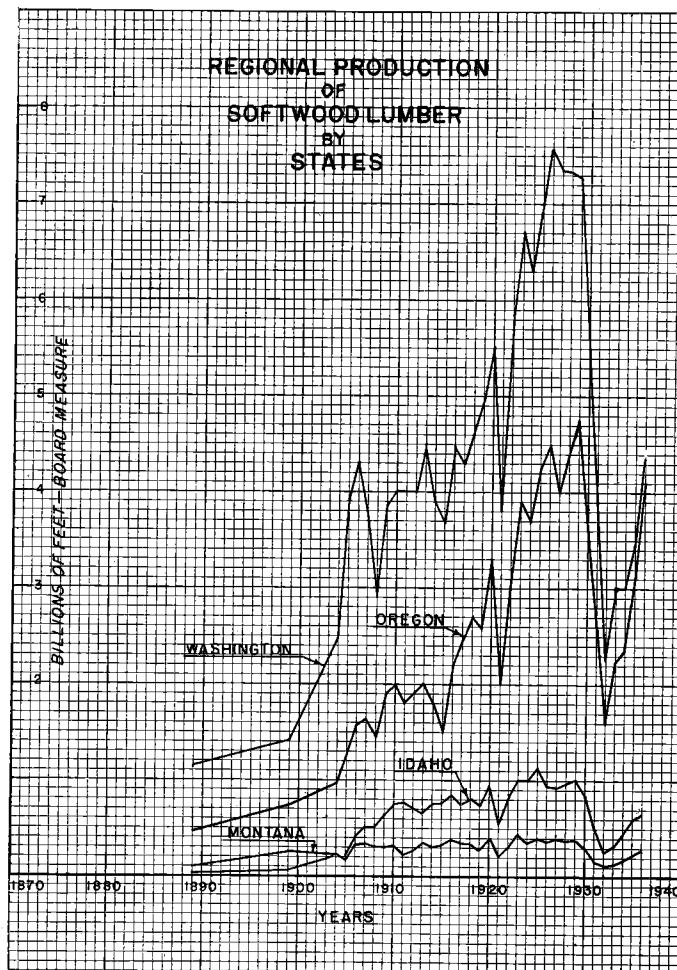


FIGURE 7.

complete starting with 1904. In the case of pulpwood, only scattered figures are extant until 1916, when the continuous record begins. Although pulpwood is commonly measured in cords, the figures have been converted into board feet (at 2 cords per thousand board feet) to make apparent the relative importance of the raw materials used.

A glance at this chart will disclose the complete lack of any stability in the annual production of lumber. There was a rapidly rising trend up to 1929, accompanied by wide fluctuations from year to year, but during the depression the production shrank to the levels of two and a half decades earlier. Pulpwood use began later, but its increase has been much steadier. Effect of the depression on quantity of pulpwood produced was relatively slight, and by 1934 new high figures were being reported. Nevertheless, the total quantities of wood used for pulp are even yet very small as compared to lumber.

The distribution of lumber production between the four States of the Region is shown in figure 7. Washington has been in the leading position continuously

since the regional lumber industry became important, but in the last few years Oregon has been closing the gap between these two States. Montana built up its industry early, but has made no substantial increases in the past 2 decades. Idaho started late, rapidly overtook and passed Montana, but has shown no such capacity for expansion as have Oregon and Washington; the obvious explanation for this will be seen by referring back to figure 4.

Figure 8 shows the percentage of the regional production in each State. In relative terms, Washington and Montana have been declining for the past 3 or 4 decades, and Idaho for the last 20 years, while Oregon alone has been increasing. The basic reasons for this can be found in figure 4, for it will be remembered that Oregon has about half of the timber in the Region but has never contributed that proportion of the production.

Fluctuations within each State, however, are ample evidence that the primary control of the regional production is not the quantity of timber available. The limiting factors have been, primarily, the national demand for softwood lumber, the Region's competitive position with reference to eastern forest areas, and its

opportunities for export trade. It is pertinent to examine in this connection the statistics of national consumption.

These are shown in figure 9, in which it will be seen that the Nation's consumption of softwood lumber increased very rapidly from the first date for which statistics are available until about 1904, but that since then it has declined, although with violent fluctuations which coincide with periods of national prosperity and depression. The Nation's consumption of pulpwood, however, has increased steadily with only minor fluctuations, and shows no indication of having yet reached its peak.

International trade in lumber has been of relatively small importance to the United States as a whole. For the past decade and a half, the total softwood export, have been about 8 percent of the national production, and this has been offset by imports amounting to about 5 percent, making the net exports only about 3 percent.

The situation is radically different in the case of pulpwood. This is the raw material for the paper industry, and comes into competition directly with Canadian pulpwood, and indirectly with imports of

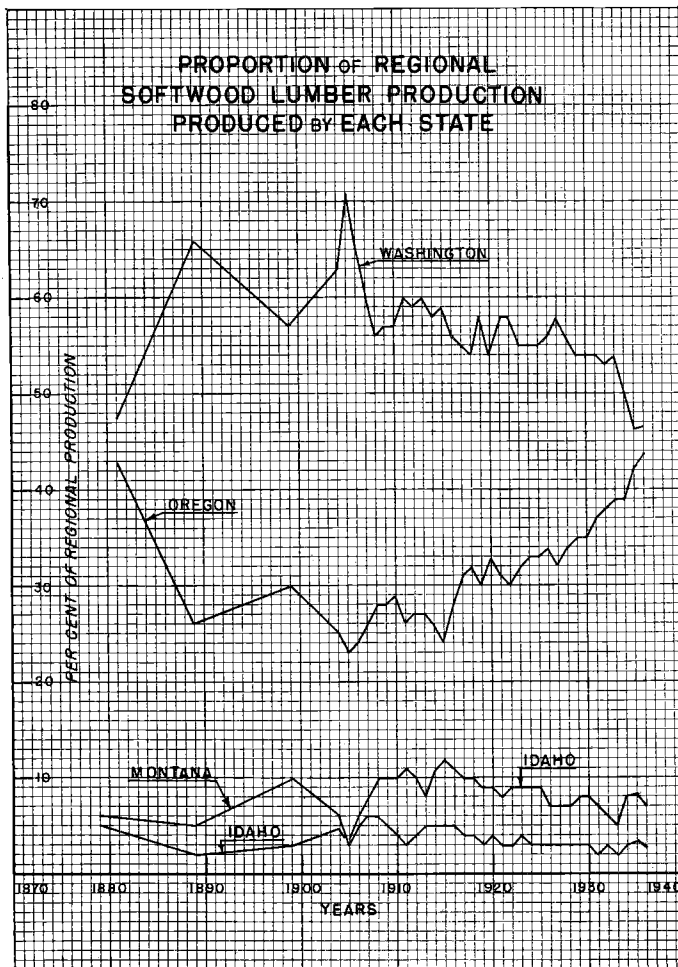


FIGURE 8.

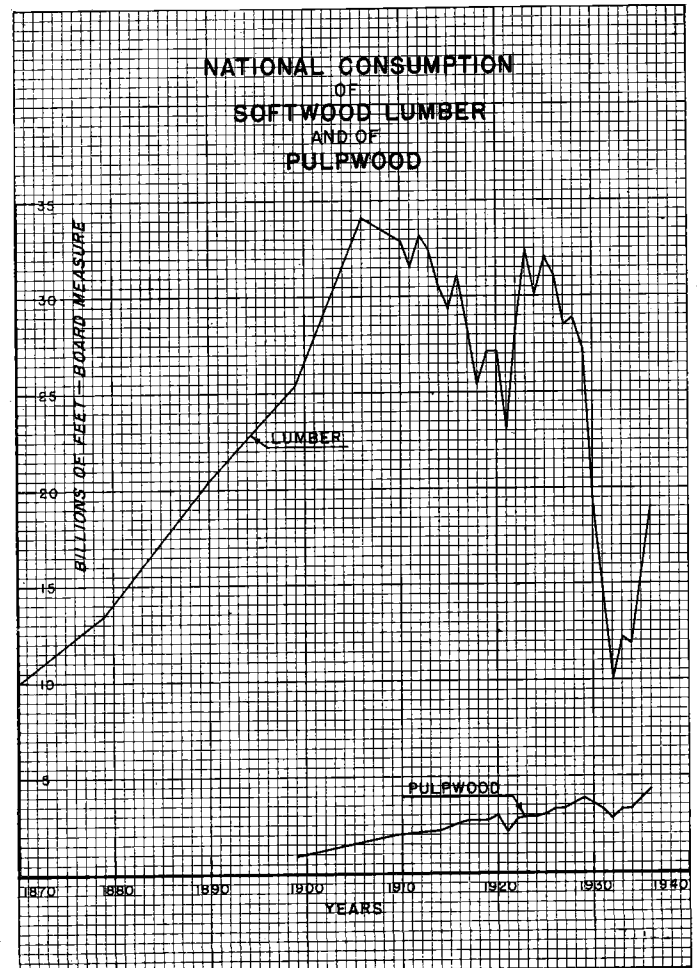


FIGURE 9.

both pulp and paper itself, coming from both Canada and northern Europe. For many years, over half of the paper requirements of the United States have been imported in one form or another. Our exports have been negligible in proportion.

Since the Nation's population has been steadily increasing, the decline in lumber consumption must have been the result of an even greater decrease in the per capita consumption. Figure 10 shows the facts. It will be seen that until 1904 both population and per capita consumption were rising, which explains the remarkable increase in lumber consumption of the Nation. But beginning in 1904, the trend of per capita consumption was sharply reversed, and its fall was even more rapid than had been its rise. This fall was, it is true, interrupted by a moderate gain during the post-war period of business activity, but the depression brought it down to levels never before reached during the periods for which statistics are available.

Meanwhile, the per capita pulpwood consumption has been showing a moderate but fairly steady increase, with the depression causing only a slight interruption. The gain in this material, however, is as yet

inconsiderable as compared to the loss in lumber.

The production of this Region has been strongly influenced by the national consumption, but has not followed the same trend. Its proportion of the national consumption has greatly increased as a consequence of the partial exhaustion of the timber supply in some of the eastern competing regions. This increase is shown by figure 11. In 1900 the four Northwestern States were producing only about 10 percent of the softwood lumber used by the Nation, but during the following three decades this proportion increased fairly steadily to over half. During the depression, the eastern producing regions were able to supply a greater proportion of the reduced demand, and their competitive advantage of low freight charges to the points of consumption cut down the western share of the meager business, and the 1930 peak has not since been equalled.

In the same figure are shown the available pulpwood statistics. During the last 10 years, the relative importance of the Region in the production of pulpwood has been rising very rapidly, and with only a minor interruption during the depression. It is still, however, low as compared with lumber.

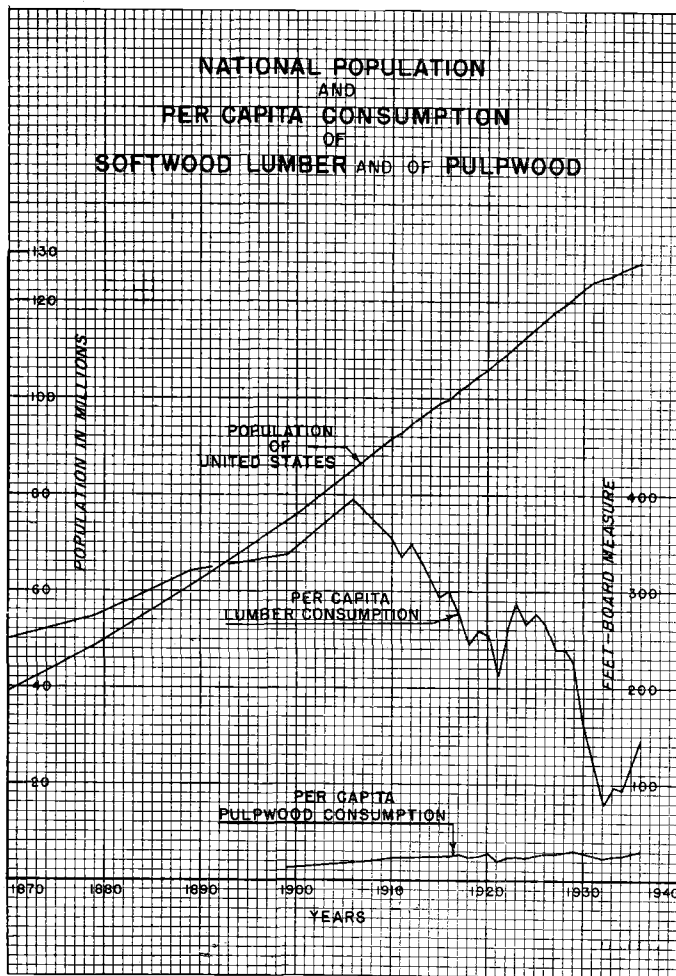


FIGURE 10.

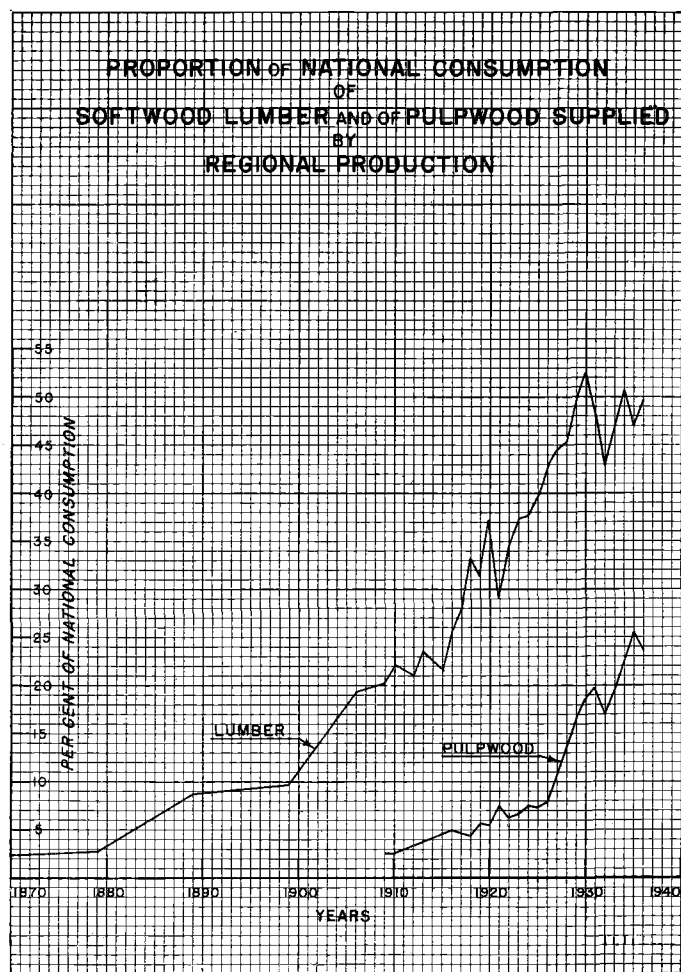


FIGURE 11.

Future demands on the Region can be better anticipated if production statistics by species are studied. Each species has qualities which make it particularly suitable for certain markets, and the demands of these markets may not necessarily follow the trends of national consumption as a whole. Each species produced in the region must encounter the competition of certain eastern species of similar technical qualities, and variations in this competition are to be expected.

Figure 12 shows the annual regional production by major species. Figure 13 shows the proportion of the Nation's consumption which each of these figures represents. The most important species, by far, is Douglas fir and its importance increased steadily up to 1930; this increase can be attributed to a decrease in the competition of southern pine, a wood which has similar uses. Since 1930, the rising trend seems to have been arrested, although, of course, no definite conclusions should be drawn from this appearance. Second in importance is ponderosa pine. This species, also, has been gaining in importance, and its proportionate gain has been even greater than that of Douglas fir. Its percentage has been nearly quadrupled in the last 25 years,

while that of Douglas fir has been about doubled. There is less appearance of a leveling off of its rising trend since 1930. Except in very recent years, hemlock has been third in importance, at times approaching ponderosa pine very closely. Since 1930, it has lost ground and has dropped to fourth place. Its former position has been taken by Idaho white pine, which has shown a fairly substantial rise. The miscellaneous species have not changed much in importance in recent years, although their relative peak was during the World War, when spruce was in great demand.

Although international trade in lumber has been nationally unimportant, the tidewater sawmills of the Douglas fir industry have supplied a substantial part of the export business. To them, this business has been of importance, but they have been in direct competition with similar sawmills in British Columbia, which have even sold some lumber in this country. Artificial barriers in the form of tariffs have been raised and lowered. At present, export lumber is very limited in quantity, and certain quotas of Canadian lumber are admitted to the United States. Without risking a prediction as to the future, it is at least evident that

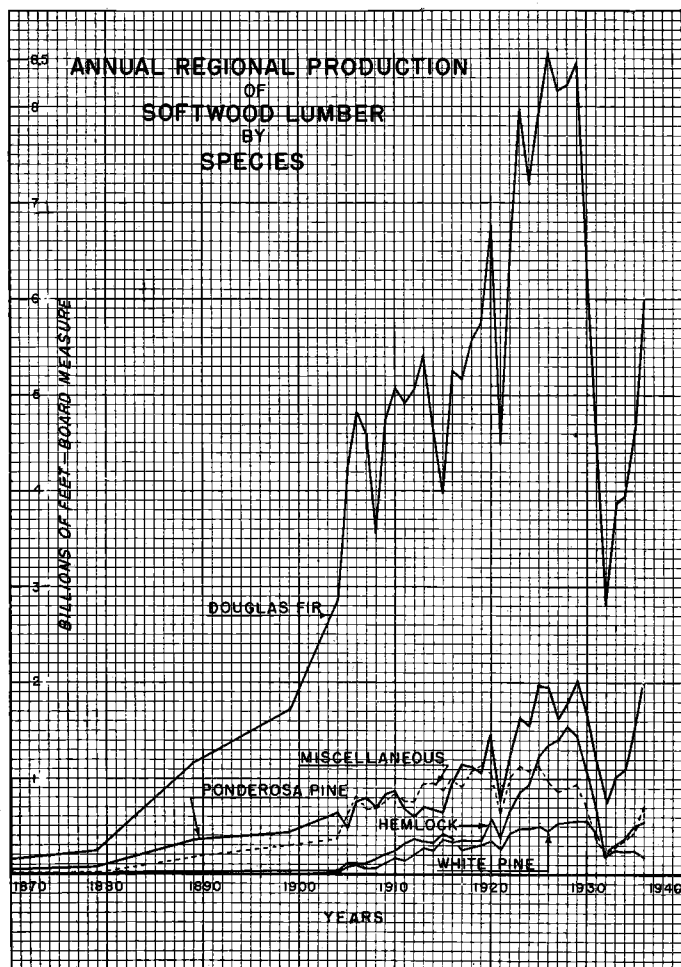


FIGURE 12.

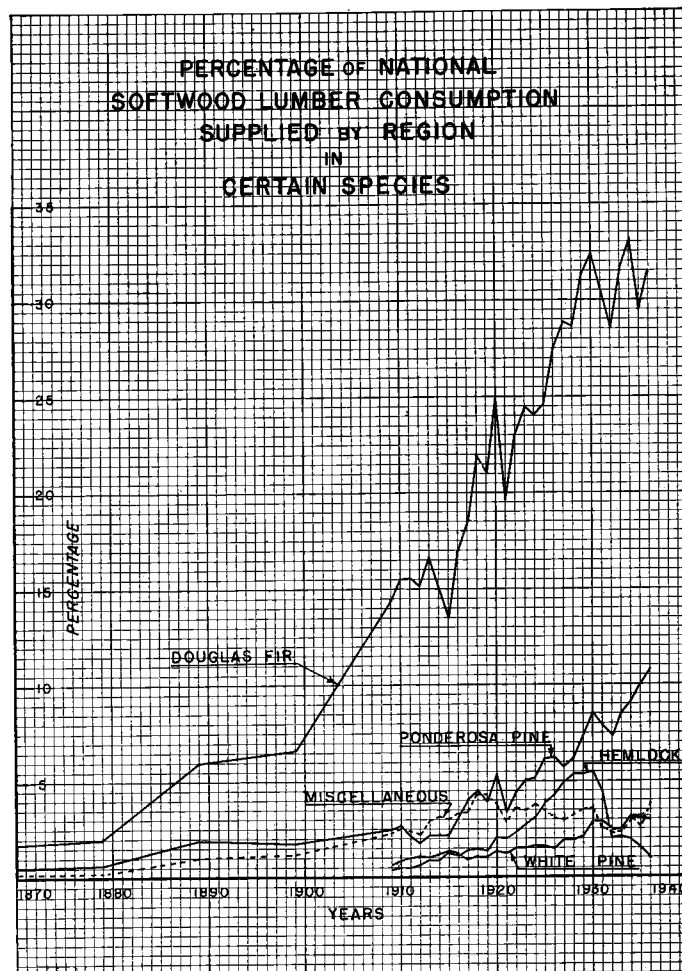


FIGURE 13.

for many years the regional efforts to enter world trade will be in the face of severe competition from Canadian manufacturers.

The statistics thus far presented have been for lumber and pulpwood only. There are many other uses for which timber is being cut. Most of them are of minor importance, and no adequate records of the quantities are kept. In recent years, the estimated production in the four States of these other forms of wood use was as follows:

	Million feet
Shingles.....	374
Fuelwood (from saw timber).....	601
Veneer.....	198
Piling.....	35
Poles.....	33
Fence posts.....	31
Mine timbers.....	24
Mine stulls, etc.....	8
Hewed ties.....	9
Excelsior.....	2
Total.....	1,315

Most of this material is cut from trees of saw timber size, and is, therefore, withdrawn from the quantities

**FOREST GROWTH
IN
OREGON AND WASHINGTON**

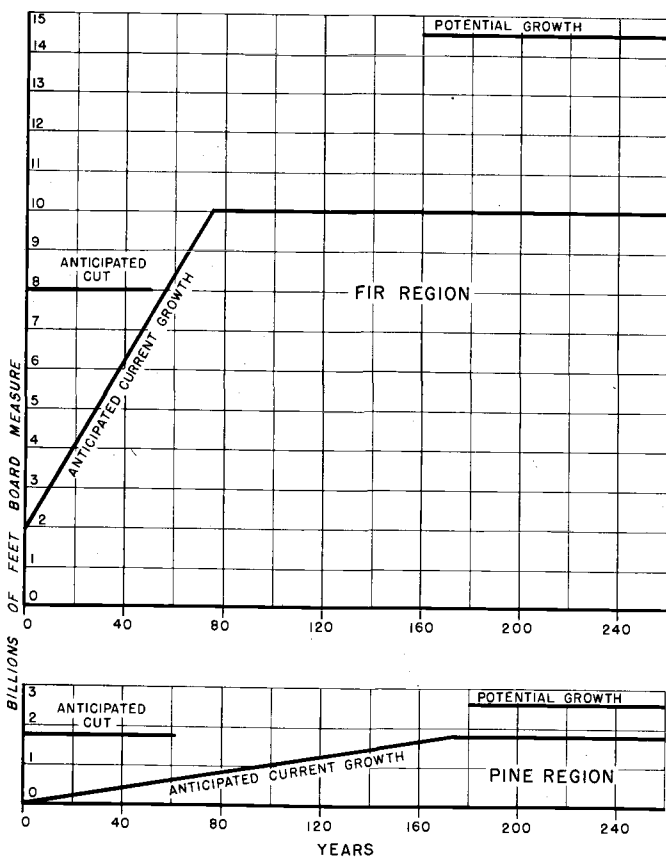


FIGURE 14.

already stated. Its total is about 14 percent of the quantity now used for lumber in these States. In addition, there is a lesser amount of material taken in trees of less than saw log size.

The figures which have been presented on all forms of material drawn from the regional forest resource obviously suggest no certain estimate of the future demands thereon. The significant facts are that the Nation's per capita consumption of lumber has been decreasing for the past 3 decades much more rapidly than the population has been increasing, that the declining demand for lumber has been partially offset by an increasing demand for pulpwood and that this Region has been able to secure an increasing share of the Nation's wood-product business. These three trends are all strong, but they are conflicting in their effect.

The high point in per capita consumption coincided with the era of great agricultural development. Lumber was an ideal material for farm buildings and was used lavishly for that purpose. After the great agricultural sections of the country had been built up, this demand fell off sharply. At about the same time,

**OWNERSHIP OF FOREST LAND
IN
COLUMBIA BASIN STATES**

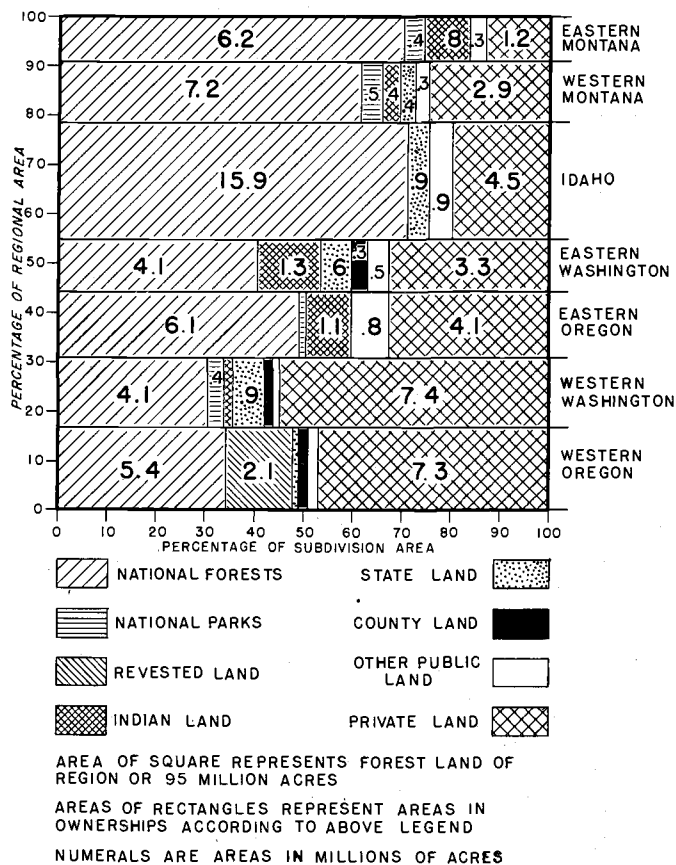


FIGURE 15.

many substitutes for lumber began to be marketed aggressively; concrete sidewalks replacing boardwalks, wire fences, stucco houses, composition roofing, fiber boxes, are but a few examples. Research intended to promote the use of wood unearthed some new uses, but in such fields as wood preservation contributed to reduce the annual consumption by prolonging the life of the material used. Meanwhile, lumber was becoming more expensive to the consumer on account of the exhaustion of the nearby forests and the increased freight which he had to pay.

While these reasons explain the sudden decline in per capita consumption, they hardly clarify the future. European experience is a sufficient proof that per capita consumption is not approaching a vanishing point. Sooner or later it will become stabilized, although probably at a low level as compared with our past. At just what level, it is, of course, impossible to say.

Some of the substitution for lumber has been of other forest products. The increasing pulp demand has already been mentioned and in the case of composition boards, such as firtex, fiber boxes, etc., wood fiber in one form is merely being replaced by the same material in another form. The tendency in this direction has led to speculations as to whether lumber may not ultimately be replaced rather completely by synthetic materials which have wood fiber as a base. This Region has a substantial proportion of woods suitable for sulphite pulp of the highest grade, and should not suffer from any transition which may be anticipated for many years to come. Veneer is another instance of the substitution of wood in a somewhat different form for lumber, and the Douglas fir region is rapidly developing a veneer industry.

The extent to which this Region can secure an increasing share in the country's wood-product business depends primarily on the future of eastern forest regions, particularly the Southeastern States. A comprehensive Federal survey of the forest resources of this southern-pine territory is now under way. Until it has been completed, only guesses are possible as to the future lumber production of these species, past estimates having been notably discordant.

As a hypothesis, it does not seem unrealistic to assume that for some time to come the total softwood lumber consumption of the United States will approximate the average of the past 15 years, a period which includes all of the post-war boom as well as the depression; this quantity is, in round numbers, 23 billion feet. The share of this business which may be anticipated by this Region may perhaps be assumed as an average of the proportions secured during the past 5 years, the shorter period being obviously necessitated by the trends exhibited in figure 11. If these two hypotheses are followed out to their conclusions, with an adjustment

in the case of Douglas fir between Oregon and Washington which is obviously necessitated by the latest statistics, the following figures are reached as the anticipated softwood lumber demands on this Region. They are presented here because some basis is necessary for the calculations which are to follow rather than in any spirit of prophecy.

Hypothetical future softwood lumber production of Region, in millions of feet

Species	Idaho	Montana	Oregon	Washington	Total
Douglas fir.....	50	50	3,500	3,500	7,100
Hemlock.....			90	460	550
Ponderosa pine.....	160	140	1,300	440	2,040
Idaho white pine and sugar pine.....	480	20	20	110	630
Miscellaneous.....	50	90	190	250	580
Total.....	740	300	5,100	4,760	10,900

To these figures must be added the uses of timber other than lumber. On account of the rising use of pulpwood, it seems conservative to assume an annual cut of this material of a billion feet, board measure. The minor uses, already discussed, can be assumed as remaining approximately at their recent level. With these additions, the hypothetical future production of the Region becomes as follows:

Hypothetical future production of lumber and other forest products in millions of feet

Species	Idaho	Montana	Oregon	Washington	Total
Douglas fir.....	90	70	3,700	3,800	7,660
Hemlock.....			340	1,200	1,540
Ponderosa pine.....	190	170	1,320	460	2,140
Idaho white and sugar pine.....	480	20	20	110	630
Miscellaneous.....	110	160	260	660	1,190
Total.....	870	420	5,640	6,230	13,160

The Life of the Forest Industries If the Supply Is Treated as an Exhaustible Resource

The calculation of the expected life of the forest industries of the Region, by dividing the volume of timber shown in figure 4 by the rate of depletion indicated in the preceding schedule, is grossly misleading. The 71 years which is obtained in this manner seems more a matter for ultimate concern than immediate alarm, but such calculation ignores many essential factors. Among these are the unmerchantable character of much of the timber through low quality or inaccessible location, and the fact that a substantial proportion of it is in government ownership and not available for unlimited exploitation.

Even similar crude calculations, made by States and by species within each State, show clearly why any such average figure as 71 years is meaningless. The apparent life for the four States is: Idaho, 117 years; Montana, 135 years; Oregon, 93 years; and Washington, 47 years. By species, similar calculations indicate an apparent

life of Douglas fir (in the fir region) of 51 years; hemlock and pulp species, 118 years; ponderosa pine, 66 years; Idaho white pine, 30 years; and miscellaneous, 156 years. Furthermore, while the apparent life of the timber industries of Idaho is 117 years, that of Idaho's white pine is only 30 years, and this most valuable species is the backbone of the lumber industry in that State. It cannot be assumed that, as soon as this is gone, an equal quantity of the less desirable species can be marketed.

A life of 71 years, then, is impossible unless it be assumed that industry can migrate freely from place to place and can market all species with equal ease. This assumption is, of course, denied by the present concentration of the industry in certain States (see fig. 8) and its specialization on certain species (see fig. 13). Just how much migration and just how much species interchange will later be practicable is a matter for conjecture. If a real national timber famine develops, the consuming public will doubtless waive many of its present prejudices in favor of the better woods and will pay the additional cost of lumber manufacture in the more expensive territory. If eastern competition remains an important factor, the Region's less desirable species and more costly locations will be seriously handicapped.

Some shifting, however, is inevitable. The hypothetical life of the Douglas fir industry in Washington is 30 years, and in Oregon is 72 years. This contrast assures an important continuation of the migration from the former to the latter, even though the expansion of the pulp industry in western Washington may maintain many of its existing communities. The uses of Idaho white and ponderosa pine are sufficiently alike to make it believable that when the cut of the former is reduced the cut of the latter, in other States, will take up the slack, although California's sugar pine is a more logical successor. Some of the species classed as miscellaneous, because of their present status in marketing, produce lumber of very satisfactory character, and at least some transfer of the regional industry to them can be anticipated.

What the foregoing figures really show, however, is that within about 25 to 30 years certain important parts of the Region's lumber industry will be devoid of raw materials unless the annual depletion is sharply reduced before that time has expired. Thereafter, the regional industry can be maintained for another 20 or 30 years only by much migration and considerable substitution.

But even these figures are far too optimistic. There is a great variation in the accessibility of the Region's timber. The proportion of this timber which can be brought to market only at substantially higher costs is not precisely known, but well-informed opinion seems to agree that about half of it (probably much less in

Montana and Idaho) can enter production only if lumber prices are materially increased. If competition from eastern forest regions and from substitutes for lumber will not permit such an increase, then the periods of time mentioned in the last paragraph must be cut roughly in half.

Nor will the migration of the industry await the end of these periods. It has, in fact, already begun. Within the forests of a given species in each State, many sawmills have already cut all the standing timber economically accessible to their locations. Grays Harbor's many mills produced over 17 billion feet of lumber in the past 25 years, but now have only about 11 billion feet of standing timber of the lumber species available for future cutting, a considerable part of which is inaccessible. For several years prior to the depression, these mills were producing close to 1½ billion feet a year, but if this rate were to be continued from now on, the entire supply would be exhausted in about 7 years. Many sawmills have been dismantled, and their cut has been absorbed by Oregon producers. Fortunately, the available supply of pulpwood in this case is large and a pulp mill (which requires more labor per unit of raw material than does a sawmill) has maintained employment for the population; consequently, the migration is, in this case, one of industry rather than of people. In the region of Pend Oreille Lake, the original stand of 8½ billion feet of pine was reduced by 1935 to 2½ billion feet, much of which was decidedly inferior, and several mills have already been shut down for lack of further timber, or because the remaining timber which was available was so inferior or inaccessible as to prevent profitable operation. These are but two of the many instances which might be cited.

Growth and Losses from Fire, Insects and Other Causes

The periods of time mentioned in the last section were calculated without regard to the fact that trees are living things which continuously increase in volume until they die. The growth of an individual tree seems slow. The annual increase in volume of the stand on an acre of land is not impressive. But the vast area of forest land in the Region can be put to use in raising very large crops of timber.

The forest industries are operating on timber which grew without care or attention and was found virtually in its present condition by the first white settlers. Had these white settlers arrived a century earlier, they would have found almost exactly the same volume of timber. This means that whatever growth had been added during that century had been neutralized by losses from fire, insects, disease and other enemies of the trees. As a broad generalization, it may be said that in any stand of virgin timber, growth and losses

are essentially in equilibrium for large areas and long periods of time.

The settlement of the country and the development of its forest industries have upset this equilibrium. To the natural losses have been added the trees felled by the lumberjacks' saws; fires have increased in number but have been fought by organized protective systems, and overmature forests have been partially replaced by thrifty young stands. Up to the present, use has far exceeded growth, minus natural losses, so that the forest capital of the Region has been heavily reduced.

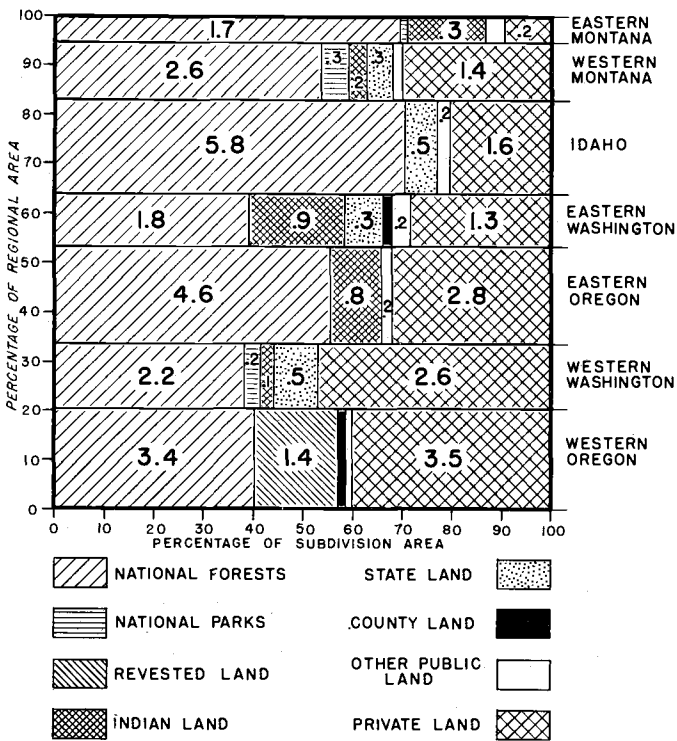
The net growth is, however, increasing rapidly. This is an inevitable outcome of the progressive cutting of the overmature timber, in which there is no net growth, and the establishment in its place, with the aid of organized fire protection, of thrifty second-growth stands. There is little reliable information even on the present rate of growth of the Region, either gross or net, and many guesses published in recent years have been ambiguous. A study of growth is one of the projects of the Federal Forest Survey, now in progress, but to date only the Douglas fir region of western Oregon and Washington has been completed.

In this Douglas fir region, the current growth per year is found to be only 2.6 billion feet⁴ a year (1.6 in Oregon and 1.0 in Washington). This is not the gross growth, for it ignores the growth accruing on the vast areas of mature timber, it being assumed that in these stands growth is completely neutralized by losses from disease, insects and other causes. On the other hand, it is not the net growth, for no allowance has been made for losses by fire occurring in the stands of growing age nor for the wiping out of mature stands by fire. While statistics on fire losses have been kept for a number of years, it is impossible to calculate a reliable average loss per annum; the assumed frequency of such catastrophes as the Tillamook burn, which destroyed some 11 billion feet in a few days, overshadows the average losses of more normal years. Allowing for a considerable salvage of Douglas fir from burned areas, a deduction of 700 million feet per annum seems not unreasonable, leaving the net growth at 1.9 billion feet (1.1 in Oregon and 0.8 in Washington).

This figure is insignificant when compared to the

⁴ Lumber tally.

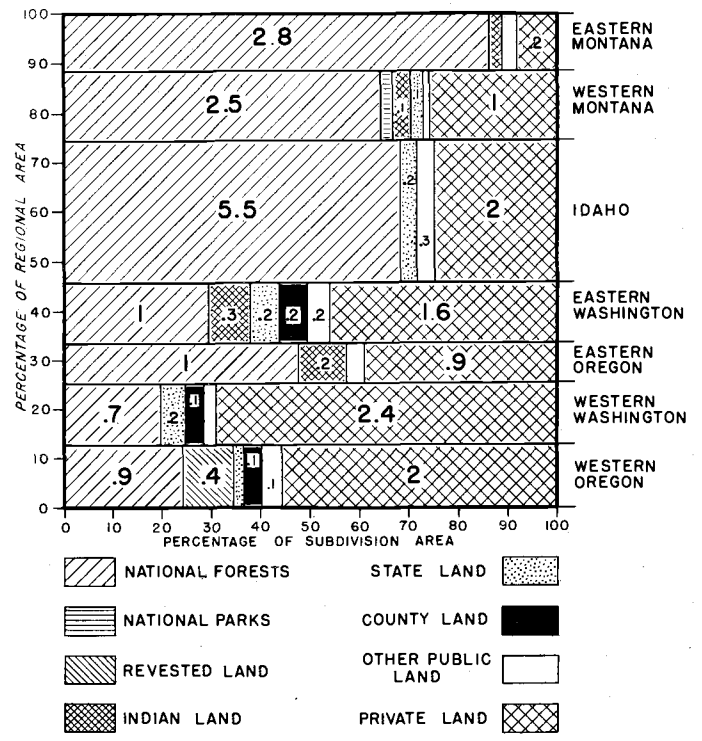
**OWNERSHIP OF MATURE CONIFEROUS
TIMBER LAND
IN COLUMBIA BASIN STATES**



AREA OF SQUARE REPRESENTS MATURE CONIFEROUS
TIMBER LAND OF REGION OR 43 MILLION ACRES
AREAS OF RECTANGLES REPRESENT AREAS IN
OWNERSHIPS ACCORDING TO ABOVE LEGEND
NUMERALS ARE AREAS IN MILLIONS OF ACRES

FIGURE 16.

**OWNERSHIP OF SECOND GROWTH
TIMBER LAND
IN COLUMBIA BASIN STATES**



AREA OF SQUARE REPRESENTS SECOND GROWTH TIMBER
LAND OF REGION OR 28 MILLION ACRES
AREAS OF RECTANGLES REPRESENT AREAS IN
OWNERSHIPS ACCORDING TO ABOVE LEGEND
NUMERALS ARE AREAS IN MILLIONS OF ACRES

FIGURE 17.

anticipated cut of 8 billion feet. This is partly because over half of the commercial timber area is still covered by mature stands with no net growth, and partly because many of the growing stands are still too young to bear trees of merchantable size, so that their growth cannot yet be expressed in board feet.

The potential growth in the fir region is estimated at 14.5 billion feet if the future stands can eventually be logged as closely as are similar stands in the older eastern forest regions today. These figures are net, since a substantial reduction factor (25 percent) has been applied to the theoretical figures.

This figure is well above the anticipated demand, but the potential growth is an abstraction which can be attained, if at all, only after centuries of forestry. How rapidly current growth will increase and how closely it will ultimately approach potential growth depends on the forestry measures practiced by the land owners. If it can be raised to the level of the cut by the time the present stands are exhausted, this cut can be continued indefinitely.

On the basis of past performance, 82 percent of the land, from which mature timber is harvested, eventually is restocked with second growth, and these second growth stands are more lightly stocked by an average of 16 percent than was assumed in the potential growth calculation. If the figure for potential growth is appropriately reduced for these two reasons, the indicated figure attainable without recourse to measures other than those in effect in the past, is 10 billion feet, 54 percent in Oregon and 46 percent in Washington. These figures are net, since young stands are relatively immune to insects and disease, and since it has been assumed that 18 percent of the forest area will remain continuously unstocked, an ample allowance for fire.

If it is assumed that this figure can be attained in 75 years (somewhat later than the 51 years which is the life of the present supply at the hypothetical rate of cut because immediately after that time there will be a somewhat too great proportion of the younger age classes which are not yet showing any growth in board feet) the situation can be shown diagrammatically as in figure 14. It will be seen that the current growth at 50 years will be somewhat short of the anticipated demand, which, apparently, will have to be curtailed by a moderate percentage and for a short time. There are no insuperable difficulties in avoiding even this curtailment.

Within the Region, however; growth is entirely inadequate to prevent the migration which has been referred to under the preceding section. The mature Douglas fir in Washington would be completely cut, at the hypothetical rate of production, in 25 years, and within that time the Washington growth rate cannot reach its ultimate rate; too many of the second growth stands will

OWNERSHIP OF UNSTOCKED CUTOVER OR BURN TIMBER LAND IN COLUMBIA BASIN STATES

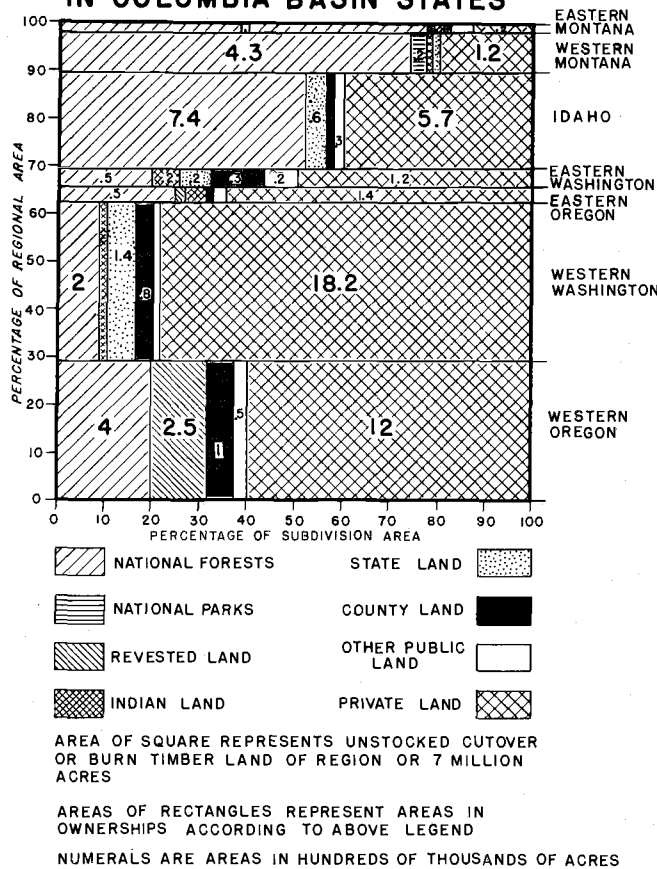


FIGURE 18.

still be far too young to be harvested. Within each State, many of the producing areas are exaggerated examples of the same situation.

Within the fir region as a whole, moreover, the cutting of the virgin timber at the postulated rate cannot continue for 51 years unless the consuming public can be induced to pay considerably increased prices to compensate for the greater costs which may be necessary to produce lumber from the more inaccessible stands. If it is true that only about half of the timber can be profitably marketed at present price levels, it is conceivable that the commercially available timber will be exhausted in as little as 26 years. Figure 14 shows that by the end of this period the anticipated current growth will have attained a level of only about half of the anticipated cut, so that a drastic curtailment would be necessary. The anticipated cut can be maintained, then, only if all the mature timber can be harvested and then only by major migrations of the industry from one part of the Region to another. Actually, some future curtailment seems inevitable and its severity will depend on whether or not future losses are reduced and future growth rates are improved.

In the ponderosa pine region of eastern Oregon and Washington, little exact information on growth is yet available. The following figures, while based on the best information which could be found, are no more than rough approximations.

Ponderosa pine stands are dissimilar to the fir stands in many ways, of which three are important in the present discussion. Their growth is very much slower. Mature pine stands, in contrast to fir stands which are approximately even-aged, always contain a considerable proportion of young trees. When such stands are logged, many of the young trees ordinarily are cut along with the old, leaving the cut-over land in a condition of very slow growth for many years thereafter.

Pine stands are relatively resistant to fire, but are very susceptible to attacks of the dendroctonus beetle. This pest is a native of the pine forests and has always been a persistent, though inconspicuous, killer of over-mature trees. About 20 years ago, its attacks suddenly became abnormally severe, and in some recent years it has destroyed more timber than has been cut. This unprecedentedly severe epidemic is apparently nearing its end, and entomologists are hopeful that the future will see only local outbreaks. It is logical to

expect a net growth in virgin timber for several decades, since this timber has been heavily thinned of its least vigorous trees, but figures are not available as to the rate of this growth.

If this possible growth is ignored, the current growth (on the second growth stands) is only about 200 million feet. This growth is being offset by losses caused by beetles and fire, so that the net current growth today is negligible. As time goes on, the entire mature area will be converted into second growth stands and, gradually, the trees in these stands will attain an age at which their growth can be expressed in board feet.

The net potential growth of the pine territory is estimated to be 2.7 billion feet. The current annual growth that will ultimately be attained merely through a continuation of present cutting methods and of fire protection is estimated at 1.8 billion feet. The attainment of this ultimate current growth will be long delayed, both because of the condition in which the cut lands are now being left and because of the slow growth of the species. It is estimated that this growth level will be reached in about 175 years. Figure 14 shows diagrammatically the expected course of events. It will be seen that if the anticipated demand is met completely as long as timber is available, the existing stands will be gone in about 50 years, and that by that time the current growth will amount to only about ½ billion feet, so that a drastic curtailment is inevitable.

Ponderosa pine is much more nearly uniform in accessibility than is fir, and so these periods need less discount for inaccessibility. Still, in many localities the situation with regard to depletion is already acute.

There is little precise information yet available on growth in the State of Idaho. Favorable factors are that while the southern section of this State is somewhat similar to the pine region of eastern Oregon and Washington, the northern "Panhandle" is a region of fairly heavy rainfall and rapid timber growth. There are also large areas of fast-growing second growth Idaho white pine, but many of these are of merchantable size, and are being rapidly cut. Another unfavorable fact is that during dry summers, which are of frequent occurrence, fire protection is exceptionally difficult. The white pine is, moreover, menaced by a parasitic plant causing the white pine blister rust. This is most deadly to the very young trees, and while it is not, perhaps, a serious menace to the existing stand of mature timber (which will probably be cut before the rust damages it very severely) it will, if not checked, almost eliminate the valuable white pine from future forests.

The present net current growth of the entire State is about 1.6 billion feet. The potential growth is about 4.3 billion feet. The level to which the current growth will probably rise without any marked change in present practices is about 3 billion feet, but this figure will not

OWNERSHIP OF TIMBER IN COLUMBIA BASIN STATES

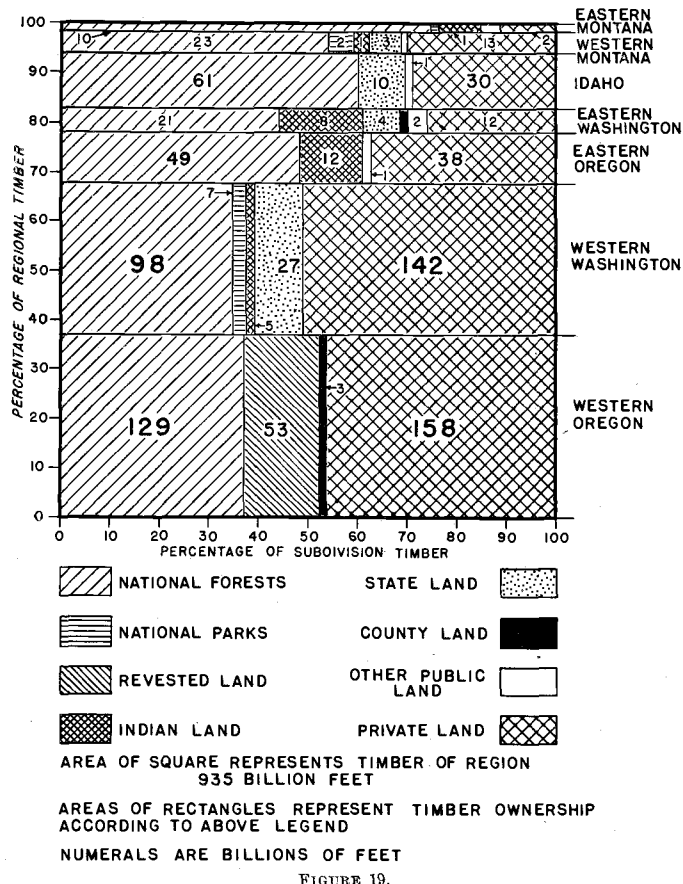


FIGURE 19.

be reached for centuries. The delay will be greater than in Oregon and Washington because, in Idaho, present logging is almost exclusively confined to the Idaho white pine and ponderosa pine types; at the rate of cut postulated in the preceding section, the expected life of the miscellaneous species in Idaho would be over 300 years.

The situation in northern Idaho is obviously serious. The life of the Idaho white pine at the hypothetical rate of cut is only 30 years, and this period is based on complete utilization of the badly scattered and inaccessible remnants of the original stand. The growing capacity of the lands on which Idaho white pine can grow is adequate to support the present industry, but there will, apparently, inevitably be a period in the near future during which lumber operations must be heavily curtailed.

Montana is, in general, a region of slow growth. A principal enemy of the forests of this State is the mountain pine beetle, which at times decimates large areas of overmature lodgepole pine. Since lodgepole pine is cut only in small quantities for local use, the economic loss from this pest is as yet of minor importance.

The present current growth of the forests of this State is only 0.2 billion feet, while the potential growth is about 2.1 billion feet. The timber is being cut so slowly that the current growth will rise very gradually to an ultimate level of about 1.5 billion feet. This is far above the hypothetical cut, so that shortages of timber probably will be entirely local in their importance.

The foregoing discussion of net growth has diverted attention from the extent of the losses from fire and other destructive agencies. It has already been explained that reliable annual averages, suitable for purposes of prediction, are impossible to obtain. However, according to Forest Service estimates, the annual losses of the past decade from all causes have approximated 3½ billion feet.

To recapitulate, the net current growth of the Region as a whole, after deduction of all losses, is about 3.7 billion feet, or slightly over one-fourth of the assumed demand. This current growth will rise more or less rapidly to somewhat over 16 billion feet, a figure which is somewhat over the assumed demand, but this rise will not be rapid enough to prevent many local shortages of timber and many industrial migrations. The potential growth of the Region is over 23 billion feet, or nearly twice as much as the foreseen need, so that intensive forestry on the poorest and least accessible lands is of speculative advisability. If, however, the Region's timber requirements are to be produced on the best half of the land (best in fertility and accessibility) so as to maintain the most favorable position for competition with eastern timber producing regions, intensive forestry must be practiced on these lands.

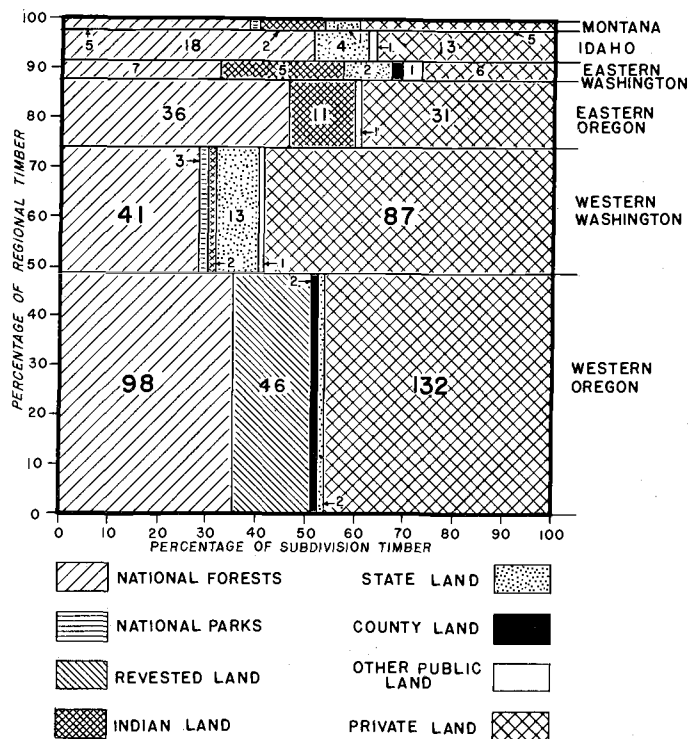
Policies of Forest Land Owners

If forest land is so managed that the forest is protected, reproduced, and harvested at an annual rate that will permit a continuous, permanent output of forest products, it is said to be under "sustained-yield management." It is not necessary that each and every annual cut be identical in amount, for fluctuations in market demand must, of course, be followed. It is not necessary to restrict the cut to the current growth, if the anticipated future growth is adequate to prevent a future shortage.

The most obvious advantages of sustained-yield management are that it assures a continuous supply of forest products to the consuming public of the Nation, that it assures the Region a continuous quantity of export commodities which will permit the purchase and importation of other needed commodities and that it will perpetuate the communities built around the wood-using industries, thus permitting a more substantial development and a higher standard of living.

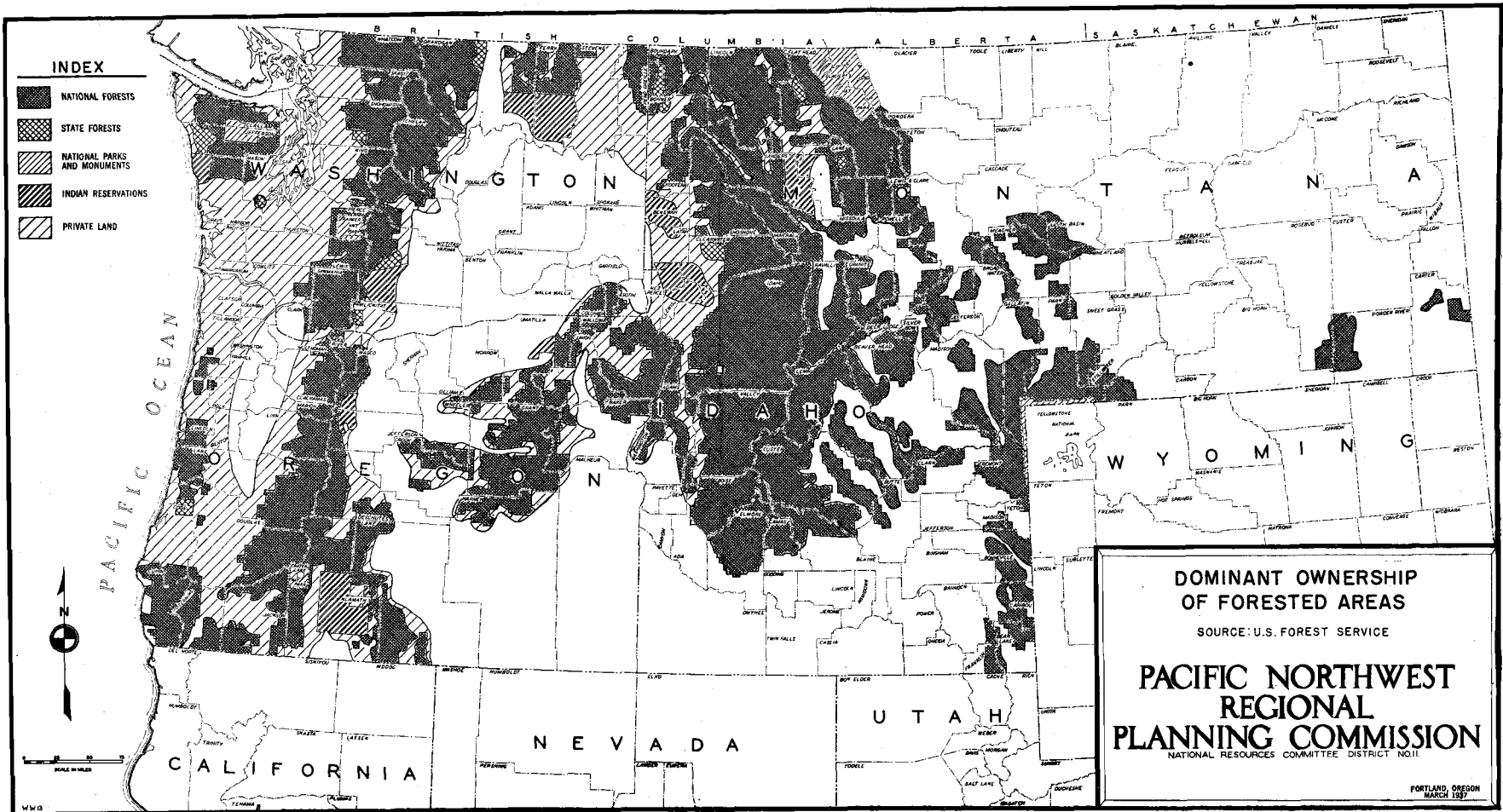
There are many difficulties in the path of establishing this form of management on an area of previously

OWNERSHIP OF MORE VALUABLE SPECIES OF TIMBER IN COLUMBIA BASIN STATES



AREA OF SQUARE REPRESENTS MORE VALUABLE SPECIES OF TIMBER IN REGION—576 BILLION FEET
 AREAS OF RECTANGLES REPRESENT TIMBER OWNERSHIP ACCORDING TO ABOVE LEGEND
 NUMERALS ARE BILLIONS OF FEET

FIGURE 20.



unmanaged forest, and during the inevitable transition period, the policies of the owners are all-important.

The forest resource of this Region is in many ownerships, and the policies of these owners are diverse. Figures 15 to 20 show by States the ownership of all forest land, of the mature timber land, of the second growth timber land, of the unstocked cut-over or burned timber land, of the timber volume, and of the timber volume of the more valuable species. These figures are similar in construction to figures 2 to 4, which have already been presented.

Recapitulating this information for the entire four States, we have table I. In each and every category, over 80 percent of the forest resource is either in the national forests or in private ownership. None of the six other forms of public ownership or control is very important, for the Region as a whole, although in certain localities they may, of course, be dominant. The national forests occupy over half of the area, and almost the same proportion of the mature timber land and of the second growth. About a third of each of these classifications is in private ownership. The better timber, however, is concentrated in private hands so that on a volume basis the two are about equal. In terms of the more valuable species which form the basis of the present lumber industry, the private ownership is found to hold nearly half, while the national forests have a little over a third, and this third is generally less accessible, much of it being noncommercial under present economic conditions.

TABLE I.—Percentage of forest resource in different ownerships

	Forest area	Mature timber land area	Second growth area	Non-stocked cut or burned land area	Volume	Volume of more valuable species
National forest.....	51.8	51.8	51.5	28.6	41.9	35.5
National parks.....	1.5	1.1	0.4	0.6	1.1	0.5
Revested Oregon and California.....	2.3	3.4	1.3	3.6	5.7	8.0
Indian.....	4.2	5.7	2.8	1.0	2.9	3.5
State.....	3.2	4.0	2.9	3.4	4.7	3.6
County.....	1.3	0.7	2.0	3.5	0.6	0.6
Other public.....	3.5	2.0	3.0	2.1	1.0	0.8
Private.....	32.2	31.3	36.1	57.3	42.1	47.5
Total.....	100.0	100.0	100.0	100.0	100.0	100.0

Source: U. S. Forest Service.

The national forests are in the main under sustained-yield management, although some areas, relatively small in total quantity involved, are reserved from all cutting for recreational purposes. Silvicultural practices are required by all timber sale contracts, and a comprehensive system of fire protection is in effect.

The national parks are managed for recreation only and are permanently withdrawn from commercial lumbering. They contain but 1 percent of the Region's timber.

The revested Oregon and California and Coos Bay Wagon Road land grants are only about 2 percent of the entire forest area, but contain 8 percent of the timber volume of the more valuable species. Being concentrated in the fir region of western Oregon, they form a very important element in the forest resource of that subregion. These lands are administered by the Interior Department under specific legislation which contemplates prompt liquidation rather than any form of continued forest management.⁵ Timber is sold under competitive bids. Forty-acre subdivisions with a light stand of timber are classified as agricultural regardless of terrain, and were open to homestead entry until about 2 years ago when they were withdrawn from entry pending some change in policy. This timber is protected from fire, but no efforts are made to secure a new stand of timber after cutting.

The Indian reservations have been managed by the Indian Service for the benefit of the Indians. Fire protection and forest regeneration have been capably handled. Sustained yield has been recognized as an objective, but since receipts from timber sales are distributed among the Indians, they naturally exert constant pressure for immediate revenue.

The State-owned forest lands are handled under somewhat varying policies in the four States of the Region.

In Oregon most of the original grant was sold many years ago. The remaining forest land has since been consolidated by exchange with the national forests into a State forest which is principally small second growth as yet not ready for harvesting. Sustained-yield management must, therefore, be in the distant future.

In Washington most of the original land grant is still in State ownership, but much of it has been consolidated by exchanges with the national forests. A substantial block has been designated by the legislature as a sustained-yield forest, but it lies in an as yet undeveloped territory on the west side of the Olympic Peninsula and no definite management plan has yet been perfected. Outside of this forest there is a tendency to liquidate timber values as rapidly as market conditions permit, on account of the provisions of existing legislation. On the other hand, some 200,000 acres of cut-over land, which had passed into county ownership through tax delinquency, has been taken over by the State for management on a sustained-yield basis.

Idaho and Montana have retained most of their original land grants, and have partially consolidated them by exchanges with the national forests. Timber is sold therefrom without definite plans for sustained-yield management and with a tendency to liquidate as rapidly as the stumpage market permits. State

⁵ Since preparation of this report the Congress and the Interior Department have adopted policies of sustained-yield management for these lands.

appropriations do not permit a wholly adequate fire or blister rust protection, but slash disposal and forest regeneration are reasonably well cared for in timber sale contracts.

The county ownership of about 1,200,000 acres appears insignificant, but is far more important than the figures imply. It includes the land to which title has been taken by the counties through tax foreclosure. Exact figures on the areas are unobtainable, because foreclosures are constantly changing the situation. County ownership is important and increasing in western Washington and Oregon, in northern Idaho and the adjacent parts of eastern Washington. In a number of counties within these sections, county ownership has more than doubled within the past 5 years. Furthermore, there is about six times as much tax delinquent land as has already passed into county ownership, and much of this is long delinquent. The counties have no plans for forest management and often inadequate protection is provided. Where the lumber industry is well developed, the lands which revert to the counties are largely cut-over, with or without a crop of young trees already started thereon, but in some of the more inaccessible sections of southern Oregon large areas of merchantable timber are being abandoned by private owners.

Under "other public ownership" are the moderately large areas of public domain, on which there is little timber of any value and a few small areas of land owned by cities for water supply purposes. The former are completely uncared for, while the latter are managed primarily or exclusively for their watershed value.

That great part of the forest resource which is privately owned is divided between a very great number of corporations and individuals. This industry is handicapped by a frequent inability to take concerted action. Any uniformity in the policies of the various owners of timber must be attributed to the pressure of uniform economic conditions. Lumber Associations represent most of the operators, but a much smaller proportion of the standing timber, and their sphere of activity is circumscribed by the Sherman Act. The general policy of the private owners is to liquidate their investments as rapidly as possible, rather than to manage their properties on a sustained-yield basis. Good systems of fire protection have been organized through a number of fire-protective associations, but their objective being primarily to protect mature timber and logging equipment, there is a tendency to relax the intensiveness of protective measures on cut-over lands where future timber crops must be raised.

Some companies have spent much money for the protection of their timber from insects and other enemies, but this type of effort has been less universal than fire protection. Since the days of the Lumber Code, forest

practice rules which are designed to leave the cut-land in fairly good condition for further growth have been very generally followed. Much of this cut-land, however, seems to be headed back into public ownership, through tax delinquency, and into a form of public ownership where it will have no better care than before.

Sustained-yield forest management is, therefore, now in effect on only a little over half of the forest area—largely that in public ownership—and this half is the poorest half in density of stand and in quality and accessibility of the timber. The most important part of the Region's forest resource—largely that in private ownership—is being managed under a policy of liquidation as rapidly as the market will permit.

Obstacles to Sustained-Yield Management

It must not be inferred that the private timber owner is refraining from sustained-yield forest management because he is opposed to the long-time welfare of the region. Could he see his way clear to adopt it, he would naturally be delighted to thus insure the future of his industry. But, in general, the obstacles seem to him to far outweigh the benefits, and in many cases to be insuperable.

CONVENTIONALIZED REPRESENTATION OF TREND OF STUMPAGE PRICES IN REGION

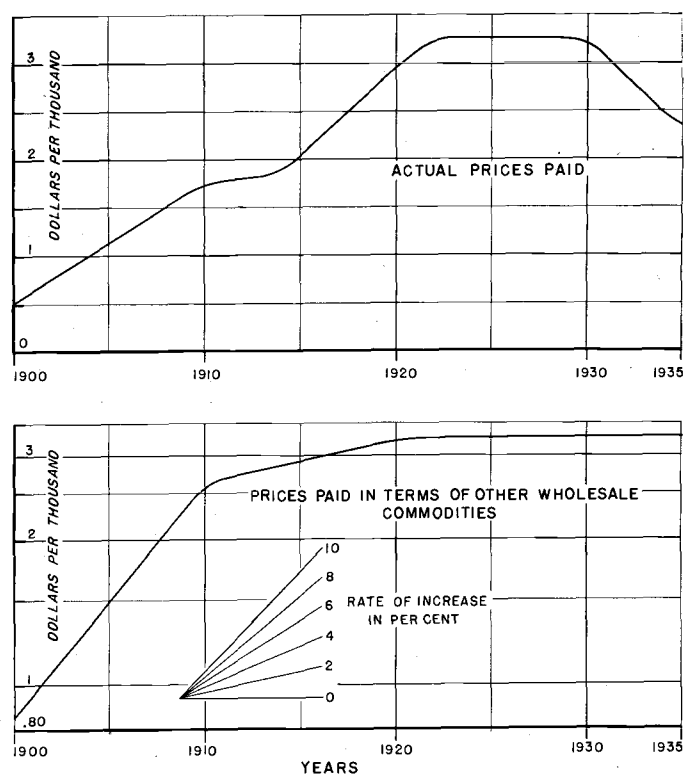


FIGURE 21.

To understand them, it is necessary to know something about the background of the industry. Its principal profits have been derived from appreciation in value of the timber owned. Sales of stumpage (standing timber) have been so diverse in conditions of sale, and in quality and accessibility of the timber involved that average stumpage prices have but little meaning. The upper part of figure 21, however, which is a composite derived from a number of sources, gives a substantially correct, though conventionalized, picture of the variation in values since the beginning of large-scale lumber operations in the Region. There was a rapid rise during the first decade of this century, followed by a marked flattening. There followed a second rise during the World War, which, however, was associated with the general rise of all commodity prices. Throughout this period the tradition arose that stumpage prices never declined. The depression exposed the fallacy of this generalization, for the fall which ensued was drastic, although it is true that the movements were small and that relatively little of the best timber was thrown onto the market. Prices now seem to have stabilized, at least temporarily, at levels that are only a little higher than those of 20 years ago.

The variations in the levels of the upper portion of figure 21 are in part a consequence of variations in the purchasing power of the dollar. In this figure, moreover, the relative importance of the two periods of rise is not obvious, the percentage gain during the first period being far greater. Therefore, the lower part of figure 21, which is derived from the upper, is an equally conventionalized curve in which (a) the actual stumpage values have been adjusted for the trend of wholesale commodity prices, and (b) a logarithmic vertical scale has been used which makes the slope of the line exactly proportional to the rate of increase. It will be seen that, broadly speaking, the first decade of the century saw an increase in relative stumpage price of some 10 percent per annum; the second, an increase of only about 2 percent per annum, while subsequently, there has been practically no increase at all.

Most of the stumpage now in private ownership passed into that status within a very few years after the beginning of the century, and fortunes were made in the next few years through rising stumpage prices. The appreciation which was inevitable in a developing region was artificially stimulated by a general, but unfounded, fear of a timber famine within 2 or 3 decades. The purchase of timber was, therefore, considered one of the safest of long-time investments.

With the decline of lumber consumption by the Nation, it gradually became evident that not only was there no danger of an early timber famine, but that assets frozen in a large supply of timber could be thawed out only at a very moderate rate. The rise

in stumpage prices was checked, stumpage buyers became less numerous, stumpage owners began to seek liquidation through the manufacture and sale of lumber. Too many sawmills were built, and potential overproduction of lumber maintained a buyers' market. Unsatisfactory profits in lumber manufacture tended to prevent further stumpage price increases.

There is some exaggeration in the foregoing picture, because the average stumpage sold today is inferior in quality or accessibility as compared with that sold 30 years ago. Nevertheless, it is not surprising that investors no longer look on timber as a desirable speculative investment. If mature timber is liquidated today, the money received therefor can be invested in some other enterprise which will, presumably, earn at least a moderate interest rate. Unless stumpage values increase at comparable rates, it is obviously better to liquidate as soon as possible. But, today, the probability of any such rise in stumpage values seems small. The urge for immediate liquidation is correspondingly great.

Taxation

The way in which standing timber is taxed contributes largely to this urge. In the early days, timber taxes were very low, but as the country developed and the financial needs of local governmental agencies increased, taxes increased with them. By 1928, the Forest Service tax inquiry found that the average tax rates per thousand for the fir region were 2.5 cents for Oregon and 3.9 cents for Washington. For the pine regions of these same States, the averages were 2.2 cents and 3.2 cents, respectively. These do not seem, at first glance, exorbitant rates on stumpage worth about \$3 per thousand, but the rate has been increasing; it nearly trebled in the 12 years preceding 1928. It is true that this was partially a consequence of the rise in stumpage prices, but it is also a result of the higher costs of government, and of the reduction of the tax base in many counties through the approaching exhaustion of standing timber. There are wide variations between counties, even within a single State. Where lumbering has already substantially depleted the tax base, rates are more than double those already cited. Further increases therefore seem probable.

A very large proportion of the forest resource is owned by nonoperators. Taxes are current cash expenditures, and owners of this class have no current revenues from their forest holdings from which to derive the necessary moneys. It may be easier to become reconciled to a disappointing future profit than to continue annual payments of even relatively small magnitude.

Even among operating owners, the application of the present system of property taxation definitely handi-

caps any long-life operation, and particularly, of course, an operation with sufficient mature timber to permit the immediate adoption of sustained-yield management. For purposes of illustration: if two operations are compared, identical in every way except in the quantity of timber owned, that which has but 5 years' supply of timber will pay (at 3 cents per thousand on the standing timber) 15 cents per thousand on the annual cut, while that which has 50 years' supply will pay \$1.50. Yet these two plants must sell their lumber in the same competitive market.

To offset this, the plant with the longer life may properly charge depreciation on its plant facilities at a lesser rate. It has generally been considered by operators that about 15 to 20 years' supply represents the best compromise. But on such a supply, sustained yield is impossible.

It may be difficult to prove that the forest resource as a whole is paying more than its just share of taxation, but it is obvious that the distribution of the burden within the industry is completely at variance with ability to pay. Since this ability is greatest in the case of rapidly liquidating operators, the present tax system distinctly discourages sustained-yield management and even simpler forms of conservative use.

Diversity of Ownership

No amount of pressure can force liquidation at a rate faster than the consuming public will buy the forest products. It has already been shown that a reasonable hypothesis as to future demands indicates that very considerable delays in the process of liquidation are inevitable. The present worth of the last of the virgin timber to be liquidated is obviously insignificant, and possibly negative. Private owners as a whole have assumed this handicap and can only escape it by letting a substantial part of their holdings revert to public ownership through tax foreclosure. Even this method would be largely ineffective because tax delinquency may merely load taxes more heavily on the timber land which is retained.

While the rate of liquidation is fixed primarily by the consumer demand rather than by the pressure for liquidation, just which owners are to profit, relatively, by fairly prompt liquidation and which are to lose through excessive delay is a problem which defies exact solution. Physical facts exert a strong influence, it is true; inaccessible timber of low quality cannot be forced onto the present market with any return to stumpage at all. But there are many borderline cases, and in these cases aggressiveness and operating efficiency may outweigh physical and economic handicaps. Attempted overproduction naturally results.

If the bulk of the forest resource were owned by a single owner, a reasonable solution might be hoped for.

Actually, it is owned by countless individuals and corporations, often in very small lots. The situation differs radically in different parts of the Region, and comprehensive ownership figures are not available. It is known, however, that there are at least half a dozen counties in Oregon and Washington in which over half of the forest land is owned in lots of less than a thousand acres. There are some 25,000 timber owners in Oregon and 15,000 in Washington. Even the largest ownerships throughout the Region are widely scattered. In most of the logical sustained-yield units in the Region, diversity of private ownership results in conflicting interests which are difficult to reconcile.

Low Returns on Industrial Investment

The lumber industry, which is the major forest industry of the Region, has not made large profits except those which have already been mentioned as resulting from the rise in stumpage values during the early years of this century. From 1916 to 1933, inclusive, the average profit ratio (ratio of net income to gross income) of the lumber industry of the United States was only 62 percent of that of all other manufacturing industries.⁶ In a single representative year, the lumber industry of the States of this Region had a profit ratio which was only 62 percent of that of the lumber industry of the Nation as a whole. This indicates that the Region's lumber industry has been on the average less than 40 percent as profitable as the other manufacturing industries of the country.

While it may be true that the low profits are a direct result of the rush to liquidate and the consequent maintenance of a buyers' market for lumber, the fact remains that the lumber industry is not in a good immediate financial position to assume the additional burdens that may be necessary in connection with sustained-yield management. In addition, there is small incentive to perpetuate an industry which has been no more attractive financially.

Fortunately, the rapidly developing pulp industry seems to be on a sounder basis. No precise figures are available, but the profit ratio of the allied paper industry has been slightly higher than the average for all manufacturing industry, and in this advantageous condition the pulp industry seems to share. This industry, then, has greater incentives for self-perpetuation and is in a financial position which facilitates the necessary measures.

Conflict Between Sustained-Yield Objectives

It has been seen that the maximum prolongation of the present production can be accomplished only by a considerable migration of the industry within the

⁶ W. L. Crum, *Corporate Earning Power*, pp. 327-338; and *Corporate Earning Power in the Current Depression*, Business Research Studies No. 10, Harvard Graduate School of Business Administration, p. 16.

Region. From the standpoint of the consuming public, this is of no consequence; its interest is in the maintenance of the annual supply of forest products, regardless of source. From the standpoint of the local producing communities, this migration is harmful; these communities are often left with no supporting industries, unless some substitute industry such as that based on wood pulp can be found.

The Douglas fir lumber industry at its present rates of depletion has but a relatively short life left in the State of Washington. If the regional production is to be maintained, it will be necessary after a few more years to move the industry in large measure into Oregon, and then overcut that State. Later on, when Oregon's timber is exhausted, the growth in Washington during the period of suspended operations will permit a remigration back into this State. This pendulumlike swing back and forth between States—and, of course, within States as well—will supply the consumer as adequately as is possible, but will mean a minimum of community stability.

On the other hand, if sustained-yield units were immediately developed in Oregon, wherever physically possible, there would be a minimum of overcutting of the Oregon resource, and a maximum of local stability in that State, but the Region's production would have to be sharply curtailed, in spite of a stimulation of overcutting in Washington. Later on, when the temporarily depleted areas had recuperated, there would be an opportunity for expansion. The maximum stabilization of local communities would have been accomplished at the expense of a fluctuation in the regional production.

Distribution of Benefits and Burdens of Sustained-Yield Management

Finally, the heavy burdens of putting private forests under sustained-yield management are, under existing conditions, largely concentrated on the private owner; while the immediate benefits, particularly during the transition period, seem to accrue for the most part to the public. The owner is, of course, a part of this public, and thereby shares in the general welfare. But his share therein, whatever it may be, is usually insufficient to induce him to undertake all of the burdens necessary to bring about a system of management of which the public is a chief beneficiary. Public agencies may contend that private ownership of a great natural resource entails definite responsibilities to the public for its proper management. Private owners may accept this principle, but many of them seem to feel that when the public collects taxes on a basis which urges prompt liquidation, it has relinquished its claim upon them.

The Risks in Prolonged Timber Holding

Despite good fire protection, it has been seen that there are occasional conflagrations which sweep vast areas with highly destructive effects. Epidemic attacks of insects and disease may cause heavy losses. The longer the timber is held, the greater is the chance for loss. The normal business procedure would be to insure against these losses, but timber insurance is not yet available in this Region.

Equally disturbing are the uncertainties in the economic future of the regional forest industries. The declining trend of national lumber consumption leaves a doubt as to whether future demand may not have been overestimated. The possibility that eastern forest areas may come back into production and, through their proximity to heavy concentrations of population, win back some part of their former proportion of the Nation's lumber business cannot be ignored.

These possibilities all impel an early liquidation of mature timber. The additional fact that the present competitive situation of the Region's lumber industry is based on the large proportion of select grades of lumber which comes from centuries-old timber, and that second growth stands cannot maintain this advantage, is a discouraging element in calculations involving sustained-yield management.

The seriousness of this future decline in quality can be somewhat reduced by the application of the system of selective logging wherever it is practicable. In this system, only a portion of the stand is removed at the first cutting, and many fairly large trees are left as a part of the growing stock. When the land is recut after a lapse of years there will obviously be a greater range of tree sizes available, and a greater diversity of lumber grades obtainable than would be the case if an even-aged second-growth stand, grown after an original clean cut, were being harvested.

This system of cutting also permits the liquidation of a major portion of the value in a timber stand in a shorter period of time, leaving for growth the trees which have little or no present value. Unfortunately, this system has serious draw-backs under many conditions which are interfering with its widespread adoption. It is being experimented with by many operators.

A Program to Remove or Minimize Obstacles to Sustained Yield

The immediately preceding pages deal with the hazards and difficulties involved in the application of sustained yield to private forests; these difficulties must be clearly recognized before intelligent plans may be made for their removal. In part II of this report are made specific recommendations for the removal of

obstacles and for the creation of conditions more favorable to the application of this form of management on privatelands. There are substantial advantages therein for the private owner, as well as for the public. These advantages, when the obstacles have been removed, and when more favorable conditions have been created, will strongly promote the application of sustained yield.

Uses of Forests Other Than for the Production of Commercial Timber

There are many other uses of forest lands besides those connected with production of lumber and other forms of wood. The lumber, pulp, and other allied industries are of primary importance to the Region as a whole, but there are many localities within the Region where they are unimportant and in which such other benefits as grazing, recreation, etc., may be of far greater consequence. In still other parts, two or more of the various possible uses may be of more or less equal importance.

Grazing

Beneath the more open forests of the pine region grow many grasses and other species of forage plants. This forage makes these forest lands of great importance to the livestock industry.

This is one of the most important industries of the Pacific Northwest. There are about 3,300,000 cattle and 8,200,000 sheep in the four States. The aggregate value of all the livestock is over \$200,000,000. The quality of this stock is generally excellent. The well-bred herds of range cattle produce beef animals of high grade and the Region's mutton lambs are recognized by buyers as the best the country produces.

The range livestock industry produced an annual income in 1930 (the last year for which estimates are available) of \$84,000,000. In many counties it was the primary source of income, and in certain counties it amounted to as much as 55 percent of the total gross agricultural income.

The area devoted to grazing is 170 million acres for the four States, or 68 percent of the total area of the Region. It is concentrated in the pine region of eastern Oregon and Washington, of southern Idaho, and of eastern Montana. In eastern Oregon and Washington 87 percent of the entire area is grazed by livestock.

The summer range of the livestock is within or immediately adjacent to the forests. As these are at the higher altitudes, the forage is buried in snow during the winter, early spring, and late fall. Spring and fall grazing must, therefore, be found at lower altitudes, while winter feed must be provided on aftermath and other pasture lands in the valleys. The aggregate area of the summer range is 78 million acres, or about 47 percent of the grazing area, while the spring and fall range is 44 percent and the winter range about 9 per-

cent. The ability of any given locality to produce range livestock efficiently is dependent in large measure upon the availability of these different seasonal classes of range. Quite often, especially in eastern Oregon, most efficient production is limited by shortage of forest summer range.

The lease of grazing privileges provides, in many localities, a supplemental income to the timber-land owner which is often sufficient to pay the current taxes and a part of the other carrying charges. In a measure, therefore, it relieves the pressure for early liquidation of timber values.

While the growing of timber and the grazing of range livestock can be carried on simultaneously and harmoniously on the same forest land, dense forests contain less forage than do the more open stands. Where forest range controls the extent of the livestock industry, careful planning is necessary to harmonize the interests of the two industries, and to secure the maximum combined benefits to the public welfare.

Watershed Protection

Most of the streams of the Region have their sources in forest land. The effects of forest cover on stream flow are so complex that accurate predictions of the results of a removal of forest cover are impossible. It is clear, however, that radical changes in the amount and kind of vegetation on the catchment basins of the streams will disturb the run-off either in total quantity, in height of flood water, in distribution of flow through the year, in quantity of silt carried, or in some combinations of these.

A substantial part of the Region has a semiarid climate. In 1930, after some 50 years of development, nearly 5 million acres had been put under irrigation projects with over \$200,000,000 invested in irrigation works. Large additional developments are contemplated. Any disturbances in the flow of the streams furnishing water to these lands may cause heavy economic losses.

Other parts of the Region have a very heavy annual precipitation. Steep stream gradients and the magnificent possibilities of the Columbia River itself, which are now being partially developed through the Bonneville and Grand Coulee Dams, make the Region exceptionally rich in water-power possibilities. Well-regulated streams, carrying a minimum quantity of the silt, which eventually may destroy expensive water storage facilities, are highly important.

Most of the cities and towns of the Region derive their water for domestic use from streams originating on forest lands, and are justly proud of its quality.

There is little conflict between the interests of the water users and of the consumers of the wood products of the forests, even in the parts of the Region where both

uses are highly important. Those city watersheds, from which it may seem advisable to bar all commercial cutting, occupy in the aggregate an infinitesimal part of the forest area. From the standpoint of irrigation and water power, logging operations may have a transiently detrimental effect, but under sustained-yield forest management, the area logged in any 1 year is but a very small percentage of the whole unit which is under management, and care is taken that the vegetative cover be promptly restored. Under a policy of rapid liquidation, the disturbance of the forest cover may be more highly concentrated and prolonged. However, the most serious effects are undoubtedly caused by fire. In general, then, adequate protection of watershed values is a byproduct of forest management.

Recreation

The forest lands of the Region are also of high importance as recreational areas. In their very nature, forests are favorite resorts not only of the hunter and the fisherman, but of the nature lover who is merely seeking a beautiful spot for camping or picnicking. The regional forests are exceptionally attractive in their diversity. The open, parklike stands of ponderosa pine contrast sharply with the dense, dark forests of Douglas fir and with the broken and diversified timber of the higher mountains. The rugged mountain peaks of the Region characteristically have their lower slopes covered with forests, within which are innumerable swift streams and quiet lakes.

The value of the forests for recreational use cannot be expressed in commercial terms, although there is, undoubtedly, a large economic return to the Region. They are the playground of the Region, although their beauties are enjoyed by large numbers who come each year from every State of the Union.

Certain areas of outstanding scenic beauty have been set aside as national parks. These are Glacier National Park in Montana; Rainier, in Washington; and Crater Lake, in Oregon. These parks have been intensively developed for tourist use, with excellent hotels and other facilities. They are visited annually by some 700,000 people, and this number is rapidly increasing from year to year.

Other areas of unusual beauty or interest have been set aside as national monuments and many of these are forested. The only large national monument within the four States is that which includes the central mass of the Olympic Mountains, in Washington. Commercial development is carefully regulated on such an area in order that its scenic beauty may be unharmed.

Still other areas, within the national forests, have been set aside as primitive areas. The aggregate area so set aside is about 7,000,000 acres.

By no means all of the beautiful portions of the

Region's forests, however, have been thus set aside as parks, monuments, or primitive areas. Throughout the four States the forest land contains countless spots which, through their charm, attract millions of recreationists. The Forest Service has developed a great many of these areas along lines which correlate enjoyment of hunting, fishing, and the scenery itself, along with the commercial uses. Sites for summer homes or resorts can be leased at reasonable rates, and camp grounds and picnic grounds have been prepared for the convenience of the visitor. Estimates by the Forest Service indicate that there are over 3 million visitors to the Region's national forests each year, classified as follows:

Summer home permittees and their guests.....	100,000
Hotel and resort guests.....	375,000
Campers.....	710,000
Picnickers.....	1,100,000
Other.....	1,100,000
Total.....	3,385,000

This is on the national forests alone, which, it will be remembered, include only about half of the forest area of the Region. If statistics were available for the private land, their inclusion would greatly increase the foregoing figures.

The segregation of exceptional areas for exclusively recreational use suggests that there is some conflict between this and commercial lumbering, and grazing. It is easy to exaggerate this conflict. The immediate effect of the logging operation is to make the land unsightly, but under proper forestry practices, the unsightly condition lasts but a few years. Particularly if sustained-yield management is put into effect, the proportion of the area cut in any year is exceedingly small and the proportion which is unsightly at any given time will be unimportant.

Fish and Game

Much of the recreational use of the Region's forest land is in connection with the opportunities for hunting and fishing which these lands afford. Judging by the number of game licenses issued, about 1 out of every 10 of the inhabitants of the 4 States participates in these sports, many varieties of which are to be found at their best on forest land.

While accurate figures on the wildlife population of all the area are obviously unobtainable, rough estimates have been compiled for the national forests. For the Region, these estimates are as follows:

Deer.....	275,000
Elk.....	58,000
Moose.....	2,000
Goats.....	13,000
Sheep.....	4,000
Bear.....	24,000
Total.....	376,000

In addition to this "big game," there are said to be some 320,000 fur-bearing animals such as weasel, martin, mink, beaver, etc. These numbers are for the national forests only, and if figures were available for the other half of the forest land, their addition would, of course, greatly increase the totals.

An interesting fact in this connection is that the big game seems to be increasing in numbers. The above figures are about 20 percent higher than the corresponding figures of 5 years before. Contributing to this increase are the very extensive game refuges of various sorts, which occupy an area of over 14 million acres. In the national parks, also, hunting is entirely prohibited.

While there are local shortages of game, due to overhunting or illegal hunting, there are other areas in which the game refuges have resulted in an overproduction. Forest lands, are, after all, merely the natural summer range of such animals as deer and elk; their natural winter range has much of it long since been fenced for agriculture or pasturage. It is, generally, the capacity of the remaining winter range which limits the population of these animals, although this fact is usually not understood by the general public.

Because of this fact, there is little conflict between the interests of the sportsman and of the other users of the forests. Hunting and fishing are a highly desirable byproduct of timber growing.

Present Activities Which Are Improving Forest Situation

It has been seen that the present condition of the Region's vast forest resource is unsatisfactory. The lumber industry, on which local prosperity is so largely based, cannot long be continued on its present scale. It has failed to make satisfactory profits in the past. It must make uneconomic migrations within the Region in the future, although in western Washington expansion of the pulp and paper industry probably will maintain many of the existing communities. Only about half of the forest land is being managed with regard to the future welfare of the public. The ownership and tax situation is a deterrent to any such management on most of the remaining half.

Much is already being done to improve the situation. Along certain lines accomplishment is already substantial, while along others a beginning has hardly been made.

The Progress of Forestry

For some three decades technically trained foresters have been working on the problems of this Region. In the early days these technicians were almost exclusively in Federal governmental positions, principally in the United States Forest Service, but today a sub-

stantial number are to be found in State services, educational institutions, and in industry. The Region has forestry branches in four colleges or universities, one in each State, so that increasing numbers of trained foresters are available. Many more are drawn from educational institutions outside of the Region.

Not only has the work of this body of technical men resulted in substantial progress along lines, some of which will presently be described, but it has made the public increasingly aware of the importance of forestry to the Pacific Northwest. While a quarter of a century ago forestry was an almost unknown word to the average citizen, today he recognizes its general importance, although he may know little of its technique.

The following may be cited as leading examples of lines along which forestry technique and education has made substantial contributions, or has, in some cases, merely started along constructive lines.

Increasing the Growth Rate

With the exception of the revested Oregon and California lands, most of the public timber has for many years been cut in such a manner as to leave the forests in good condition for future growth. At the time the Lumber Code was formulated (under the National Industrial Recovery Act of 1933), the lumber industry assumed the obligation to take whatever steps were practicable along the same line. "Forest practice rules" were adopted and made a part of the Code (art. X). These differed with the forest conditions encountered, but their uniform purpose was to leave enough trees to serve as a source of seed or a nucleus for a second timber crop, and also to dispose of the slash resulting from logging in such a manner as to facilitate the protection of this future crop. These rules have been continued voluntarily through activities of lumber trade associations. In Idaho the legislature has made compliance with these rules mandatory within all forest protective districts. Neither the rules themselves nor the compliance therewith are perfect, but they represent a substantial accomplishment, although the growth rate which can be expected under them leaves something to be desired.

Even on the best managed public forests, there is a chance for betterment. The United States Forest Service is conducting silvicultural investigations and studying growth rates, and from this research much is to be expected.

It has been shown that no very large proportion of the Region's forest area is unstocked with young trees as the result of cutting or burn, but the total unstocked acreage is large, and in some localities this type of land is important in its proportions, and exceptionally accessible to natural industrial centers. On account of the ownership situation, little is as yet being done to

rehabilitate these lands, although the State of Washington has a nursery for planting on State-owned lands, and a little reforestation has been done by some private owners.

Much of the unstocked or poorly stocked land is the result of the use of high-powered steam machinery in logging. In the early days of the lumber industry, logs were pulled to tidewater by bull teams, and since only the best trees were felled, a considerable stand was left which, in most cases, adequately and promptly restocked the land. After steam donkey engines and skidders came into use, vast areas were stripped of their timber, even the unmerchantable trees being knocked down in the course of logging. Under such conditions, particularly if the logging was followed by repeated fires, the establishment of an adequate number of seedlings on the land is slow and uncertain. With the advent of the crawler type of tractor has come a form of logging more like that of the days of the bull team, for considerable numbers of small and defective trees are left standing, and a prompt and adequate restocking of the land can be expected. This type of logging involves problems in brush disposal which are as yet not satisfactorily solved, and is generally considered inefficient in many situations. But it promises substantial improvement in increasing the regional growth rate.

The same type of equipment is even more commonly employed in the pine region. Here, the change is less marked, as steam machinery was never extensively used. The combination of tractors and trucks, however, by reducing the investment in railroad building, encourages selective logging and the leaving of heavier growing stocks on cut-over lands.

Decreasing the Losses

Fire protection has been, in general, reasonably well handled for many years. The national forests, Indian reservations, and national parks, in particular, have developed excellent systems for prevention, detection, and control. Many private associations have an equally good record. Even the best systems occasionally break down, however, under exceptionally severe weather conditions. Some publicly owned timber is inadequately protected or not protected at all, and the private owners do not work with equal efficiency throughout the Region. In particular, those privately owned cut-over lands which are presumably on their way back into public ownership through tax delinquency may be poorly protected. Idaho, Oregon, and Washington have legislation compelling fire protection, but enforcement often is so difficult that inadequate results are obtained.

About two-thirds of all forest fires are man-caused. Those that result from logging operations are usually

taken care of with efficiency, and a substantial proportion of the fires that cause the most trouble are due to negligence by the general public rather than by the land owner. The Federal Government has recognized that fire prevention on privately owned lands is largely a matter of public responsibility and of national concern, and, through the Clarke-McNary Act, contributes to the protection of private lands on which the owners are already expending substantial sums. The total current national appropriation for this purpose is, however, only \$1,655,000 a year. In addition, the Federal Government is contributing materially to fire protection on State and private lands through the Civilian Conservation Corps. Truck and horse trails, lookout houses and towers, telephone lines, fire breaks, and many other types of protective improvements have been built by this organization, which aid in prompt detection and action on fires; and in addition it has contributed many thousands of hours on the fire line in the actual suppression of fires. The lumber industry in the four States of the Region is spending about a million dollars annually for fire protection. In addition, on privately owned lands, the timber owners in recent years have spent about \$530,000 a year through the protective associations and special State fire-patrol levies, as compared with \$280,000 of direct expenditure by the Federal Government and only \$160,000 by the States.

Improved efficiency in the expenditures of these sums is being sought through research into such matters as the weather conditions indicating exceptional hazard, the inflammability of various natural fuels, and the technique of fire detection and suppression. Such research has been carried on by the Forest Service and is being continued.

Less successful have been the efforts to combat the attacks of the several species of insects, particularly the dendroctonus beetles, which have killed billions of feet of timber in the past decade. Efforts of owners have been more sporadic and less well coordinated than in the case of fire. Technical advice on insect control has been given by the United States Bureau of Entomology and Plant Quarantine.

A vigorous defense has been organized against the white pine blister rust, the most serious disease menacing the Region's forests at the present time, within the white pine territory of northern Idaho and adjoining portions of Washington and Montana where its menace is greatest. About 60 percent of the area endangered has been given a first treatment through the eradication of the wild currant and gooseberry plants which are the alternate hosts of the disease. The Civilian Conservation Corps has done much to aid in combatting this disease, but cannot adequately cover all that needs to be done. Technical direction is

supplied by the United States Bureau of Entomology and Plant Quarantine. As the disease threatens the future welfare of the Region rather than that of the private owners of mature timber, its control, even on private lands, is a matter of public concern.

Decreasing the Waste in Lumbering

The Forest Products Laboratory of the United States Forest Service at Madison, Wis., is the central investigative agency which is studying the better utilization of wood. The experiment stations, the lumber associations, and the State educational institutions are working along similar lines. While some progress has been made, the volumetric waste remains very high. Recent investigations, in fact, have tended to increase it by showing that in the past some material had been removed from the forests at a loss. The present trend in logging methods, however, may facilitate leaving the submarginal material in the form of growing trees rather than of debris.

Development of New Industries to Replace or Supplement Existing Industry

The rapid growth of the regional pulp industry near tidewater has already been mentioned. Particularly when associated with the paper industry, this is especially welcome because of its relatively high ratio of labor to raw material. Pulp of the highest grade, such as that suitable for rayon and cellophane, is being made from hemlock pulpwood. The rapidly increasing use of rayon and other new products based on cellulose suggests that this growth of industry can be continued.

Many other new uses for wood and its constituent materials are being developed in the laboratories of governmental agencies and of industrial organizations. There is promise of growth of other important industries, based upon waste wood and upon lignin and distillates, as well as cellulose. While such uses are in their infancy as commercial ventures, they also represent potential progress toward continuing forest industries in localities where they cannot be continued at their present level if based on lumbering alone.

Controlling Overproduction

The Lumber Code made production control mandatory upon the industry. In spite of many administrative difficulties, compliance was nearly universal within this region. When the N. I. R. A. was declared unconstitutional, even voluntary control was considered a possible violation of the Sherman Antitrust Law. The trade associations have collected and distributed information on such matters as stocks on hand, shipments, and anticipated future demand which give the individual operator a better basis for determining his rate of cut, but the result leaves much to be desired.

Sustained yield exerts an effective control on that part of the timber supply which is under this form of management. Too much of the cut comes from timber which is not thus managed to make this control of much present help to the industry.

Tax Reform

In three of the four States, some progress has been made in connection with the taxation of young, growing timber.

In Idaho, by agreement between the owner and the State Board of Forestry, land classified as reforestation land is assessed at not to exceed \$1 per acre. In addition to the annual tax on this basis, the owner pays a 12½ percent yield tax when the young crop of timber has matured and is cut. About 130,000 acres have been thus classified. By recent legislation, trees left uncut under the forest practice rules are exempt from taxation, but must be left standing for 15 years.

In Oregon, lands classified by the State tax commission as reforestation lands pay an annual fee per acre of 5 cents in the fir region and 4 cents in the pine. An additional yield tax of 12½ percent is paid when the timber is finally cut. About a million acres have been thus classified.

In Washington, lands classified as reforestation lands are assessed at \$1 per acre if in the fir region and at 50 cents per acre if in the pine region. In addition to the annual tax thus determined, a yield tax of 12½ percent must be paid on all timber cut 12 years or more after the time of classification, and according to a sliding scale of lesser percentages if the timber is cut more promptly. About 200,000 acres have been thus classified. In addition, the possibility of classification has in many counties reduced excessive valuations on cutover lands.

Various proposals have been introduced into the State legislatures for a revision of the tax system as applied to mature timber, but none has been adopted.

Stabilization of Ownership

In the State of Washington alone has substantial progress been made in managing tax-foreclosed forest lands. This State may insist that such lands be turned over to the State Forester for management. The revenues are then turned back to the counties, after a deduction of the costs of management and of an additional 10 percent which goes into the State forest development fund. This right has been exercised only where there is no objection on the part of the counties, but nevertheless about 200,000 acres have already been put under State control.

Oregon has a somewhat similar law authorizing management by the State, provided, however, that the counties must offer the land and the State accept it.

In Oregon, the State is to pay the county an annual 5 cents per acre plus 12½ percent of the final yield, the remainder of the revenues going to the State irreducible school fund. Although this law has been in effect since 1931, no action has been taken thereunder, partly through county inertia and partly because of lack of State appropriations.

Idaho has legislation as yet too recent to have been put into effect, which provides for a classification of lands to determine which are chiefly valuable for State forests. The county commissioners are authorized either to give county-owned lands to the State, or to sell them to the State for the amount of delinquent taxes due. Net revenues are to be shared equally between the State and the counties.

There is as yet no similar law in Montana.

Federal aid has been extended to the States in solving this problem. Under the Fulmer Act, the United States may buy land and turn it over to the State for administration. The State must then pay all current administration costs, and pay the United States 50 percent of the gross income derived therefrom, until eventually title is secured by completely repaying the Federal outlay. Furthermore, where the State acquires tax delinquent land, the Federal Government may pay half of the cost of administration. In order to receive this aid, the State must (a) have authority to manage State forests, (b) have a machinery for taking over tax-foreclosed lands, and (c) have a satisfactory State forester. All purchases under this act must be approved by the National Forest Reservation Commission. Idaho has qualified under this act by appropriate legislation. No Federal appropriation under this act has been made, and hence, no accomplishment has as yet been possible.

For many years, the Forest Service has been making exchanges of timber land within the national forests and in some localities (through special legislation) adjacent thereto for the purpose of concentrating ownership. It has also exchanged timber (to be cut under the usual regulations) for cutover land, thus increasing the national forest area. These latter exchanges are restricted in quantity by the limitation of the cut from the national forests, under sustained yield, and by the unwillingness of the Forest Service seriously to reduce its contribution to county support (25 percent of the gross revenues from the national forests).

The National Forest Reservation Commission is also administering a policy of outright purchase of

merchantable timber, wherever such purchases will contribute to the establishment of sustained-yield units, or, in some regions, serve as demonstration forests. The total appropriations have been small as compared with the magnitude of the task, and have been largely expended in the eastern States. Only one such purchase, involving about 6,600 acres, has as yet been made within this Region.

Inauguration of Sustained-Yield Management

Because of diversified ownership, sustained-yield management must in most cases be a cooperative affair. In a very few instances, public timber so dominates the situation that the Forest Service can assure this type of management more or less regardless of the attitude of the operator, who is, in this circumstance, favorably disposed. In cases where the natural management units are almost exclusively in private ownership, the reasons already stated have prevented any action. In the majority of instances, however, there is a division of ownership between private corporations and public interests which greatly improves the opportunity. While some progress has been made in a few of these cases, there is as yet little actual accomplishment. Progress has at times been blocked as much by a lack, on the part of some of the public agencies, either of a proper policy or of authority to enter into the necessary agreements, as it has been by the handicaps of the private owners.

A Regional Program

The foregoing section of the staff report does not attempt to formulate a program, but is limited to a bare statement of the more significant facts of the forest situation of the Pacific Northwest.

Any factual statement may lead to diverse conclusions by those who read it. The discouraging nature of some of the facts of this report may engender an attitude of defeatism in the minds of some, but to the majority they will be a challenge to prompt and aggressive action.

Based on these facts as to conditions in this Region, the Forest Advisory Committee of the Pacific Northwest Regional Planning Commission, in consultation with representatives of the major public and private interests in the resource, has formulated a constructive program.⁷

⁷ Part II, Report of Forest Advisory Committee, *Pacific Northwest Regional Forest Program*.

SECTION 1. APPENDIX—TABLES

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TABLE A.—Areas of forest land in Columbia Basin States
[Areas in millions of acres]

Location	Total land area	Forest total area	Percentage of total which is forest land
Idaho.....	53.3	22.5	42.2
Montana:			
Eastern.....	71.6	8.9	12.5
Western.....	21.9	11.7	53.4
Total.....	93.5	20.7	22.1
Oregon:			
Eastern.....	42.3	12.5	29.5
Western.....	18.9	15.6	82.6
Total.....	61.2	28.1	45.9
Washington:			
Eastern.....	27.1	10.0	36.9
Western.....	15.7	13.4	85.3
Total.....	42.8	23.4	54.6
Subtotal:			
Fir region.....	34.6	29.0	83.9
Pine region.....	216.3	65.7	30.4
Grand total.....	250.8	94.7	37.8

Source: U. S. Forest Service.

TABLE B.—Types of forest land in Columbia Basin States
[Areas in thousands of acres]

Location	Saw timber	Second ¹ growth	Non-stocked cut-over and burn	Hard-wood	Subtotals		Grand total
					Com-mercial	Non-com-mercial	
Idaho:							
Area.....	8,232	8,083	1,425		17,740	4,750	22,490
Percent.....	36.6	36.0	6.3		78.9	21.1	100.0
Montana:							
Eastern:							
Area.....	2,489	3,214	150		5,853	3,093	8,946
Percent.....	27.8	35.9	1.7		65.4	34.6	100.0

TABLE C.—Volume of timber in Columbia Basin States
[Volumes in millions of board feet, lumber tally]

Location	Douglas fir	Ponderosa pine	Hemlock	Pulpwood species	Cedar	Western white and sugar pine	Sitka spruce	Miscellaneous conifers	Hardwood	Total	Percent of total
Idaho.....	24,898	21,669	14,567		4,887	14,272		21,634		101,927	10.9
Montana:											
Eastern.....		1,350								13,548	1.5
Western.....		9,091	922		569	1,391				43,345	4.6
Total.....		12,651	10,441	922	569	1,391		30,919		56,893	6.1
Oregon:											
Eastern.....	7,800	79,339				387		14,172		101,698	10.9
Western.....	266,742	5,565	28,275	21,537	8,812	5,606	5,701	273	3,585	346,096	37.0
Total.....	274,542	84,904	28,275	21,537	8,812	5,993	5,701	14,445	3,585	447,794	47.9
Washington:											
Eastern.....	11,610	20,090				1,010		13,910		46,620	5.0
Western.....	114,313	116	91,969	40,213	24,835	1,722	7,738	37	1,098	282,041	30.1
Total.....	125,923	20,206	91,969	40,213	24,835	2,732	7,738	13,947	1,098	328,661	35.1
Subtotal:											
Fir region.....	381,055	5,681	120,244	61,750	33,647	7,328	13,439	310	4,683	628,137	67.2
Pine region.....	56,959	131,539	15,489		5,456	17,060		80,635		307,138	32.8
Grand total.....	438,014	137,220	135,733	61,750	39,103	24,388	13,439	80,945	4,683	935,275	100.0
Percent of total.....	46.8	14.7	14.5	6.6	4.2	2.6	1.4	8.7	0.5	100.0	

¹ Includes white fir.
Source: U. S. Forest Service.

TABLE B.—Types of forest land in Columbia Basin States—Con.

Location	Saw timber	Second ¹ growth	Non-stocked cut-over and burn	Hard-wood	Subtotals		Grand total
					Com-mercial	Non-com-mercial	
Montana—Continued.							
Western:							
Area.....	4,870	3,982	579		9,431	2,310	11,741
Percent.....	41.5	33.9	4.9		80.3	19.7	100.0
Total:							
Area.....	7,359	7,196	729		15,284	6,403	20,687
Percent.....	35.6	34.8	3.5		73.9	26.1	100.0
Oregon:							
Eastern:							
Area.....	8,414	2,241	214		10,869	1,626	12,495
Percent.....	67.4	17.9	1.7		87.0	13.0	100.0
Western:							
Area.....	8,701	3,560	2,028	400	14,689	888	15,577
Percent.....	55.8	22.9	13.0	2.6	94.3	5.7	100.0
Total:							
Area.....	17,115	5,801	2,242	400	25,558	2,514	28,072
Percent.....	61.0	20.7	8.0	1.4	91.0	9.0	100.0
Washington:							
Eastern:							
Area.....	4,715	3,504	253		8,472	1,561	10,033
Percent.....	47.0	34.9	2.5		84.4	15.6	100.0
Western:							
Area.....	5,827	3,489	2,333	353	12,002	1,423	13,425
Percent.....	43.4	26.0	17.4	2.6	89.4	10.6	100.0
Total:							
Area.....	10,542	6,993	2,586	353	20,474	2,984	23,458
Percent.....	44.9	29.8	11.0	1.5	87.3	12.7	100.0
Subtotal:							
Fir region:							
Area.....	14,528	7,049	4,361	753	26,691	2,311	29,002
Percent.....	50.1	24.3	15.0	2.6	92.0	8.0	100.0
Pine region:							
Area.....	28,720	21,024	2,621		52,365	13,340	65,705
Percent.....	43.7	32.0	4.0		79.7	20.3	100.0
Grand total:							
Area.....	43,248	28,073	6,982	753	79,056	15,651	94,707
Percent.....	45.7	29.6	7.4	0.8	83.5	16.5	100.0

¹ Division between saw timber and second growth is based on an average diameter of 12 inches in the pine and 20 inches in the fir region.

Source: U. S. Forest Service.

TABLE D.—Annual production of softwood lumber and pulpwood by four States of region

[Quantities in millions of board feet]

Year	Lumber	Pulpwood	Year	Lumber	Pulpwood
1869	218		1919	8,588	155
1879	373		1920	10,208	167
1889	1,742		1921	6,605	172
1899	2,475	83	1922	10,013	173
1904	3,915		1923	12,131	198
1905	5,531		1924	11,289	218
1906	6,642		1925	12,763	225
1907	6,261		1926	13,314	259
1908	5,202		1927	12,615	356
1909	6,705	52	1928	13,019	480
1910	7,237	55	1929	13,465	648
1911	6,850	60	1930	10,263	675
1912	6,986	60	1931	7,170	673
1913	7,691		1932	4,209	476
1914	6,834		1933	5,767	660
1915	6,323		1934	6,036	763
1916	7,938	130	1935	7,393	975
1917	7,880	131	1936 (estimated)	9,393	1,050
1918	8,432	120			

Source: U. S. Forest Service, U. S. Department of Commerce, and Lumber Trade Associations.

TABLE E.—Softwood lumber production of region by States and years

[Quantities in millions of board feet]

Year	Idaho	Montana	Oregon	Washington
1869	2	13	74	129
1879	18	21	175	159
1889	31	93	461	1,157
1899	65	254	732	1,423
1904	211	236	983	2,486
1905	184	176	1,256	3,915
1906	416	324	1,598	4,304
1907	511	344	1,631	3,775
1908	515	311	1,463	2,913
1909	640	308	1,896	3,861
1910	746	319	2,080	4,092
1911	765	228	1,796	4,061
1912	712	272	1,904	4,098
1913	652	358	2,090	4,590
1914	763	318	1,809	3,944
1915	769	324	1,505	3,726
1916	845	384	2,216	4,491
1917	749	347	2,480	4,304
1918	802	355	2,695	4,600
1919	765	287	2,575	4,961
1920	969	408	3,307	5,524
1921	542	214	2,018	3,831
1922	860	310	3,029	5,856
1923	1,072	435	3,991	6,706
1924	1,017	357	3,711	6,306
1925	1,140	392	4,256	7,059
1926	947	379	4,507	7,581
1927	923	396	4,034	7,355
1928	977	388	4,401	7,338
1929	1,029	389	4,772	7,275
1930	840	297	3,635	5,491
1931	500	153	2,617	3,894
1932	248	111	1,595	2,255
1933	316	125	2,235	3,091
1934	457	172	2,361	3,046
1935	609	234	3,126	3,424
1936 (estimated)	658	262	4,109	4,364

Source: U. S. Forest Service and Lumber Trade Associations.

TABLE F.—National consumption of softwood lumber and pulpwood

[Quantities in millions of board feet]

Year	Lumber	Pulpwood	Total
1869	9,397		
1879	13,392		
1889	19,875		
1899	25,443	993	26,436
1906	34,036		

TABLE F.—National consumption of softwood lumber and pulpwood—Continued

Year	Lumber	Pulpwood	Total
1909	32,977	2,001	34,978
1910	32,800	2,047	34,847
1911	31,500	2,164	33,664
1912	33,200		
1913	32,378		
1914	30,500	2,235	32,735
1915	29,300		
1916	31,100	2,614	33,714
1917	28,200	2,740	30,940
1918	25,300	2,625	27,925
1919	27,266	2,739	30,005
1920	27,277	3,057	30,334
1921	22,961	2,279	25,240
1922	28,773	2,774	31,547
1923	32,511	2,936	35,447
1924	29,947	2,884	32,831
1925	32,094	3,046	35,140
1926	31,000	3,383	34,383
1927	28,361	3,375	31,736
1928	28,781	3,580	32,361
1929	27,104	3,822	30,926
1930	19,439	3,598	23,037
1931	14,862	3,361	18,223
1932	9,846	2,817	12,663
1933	12,232	3,272	15,504
1934	11,907	3,398	15,305
1935	15,730	3,814	19,544
1936 (estimated)	19,009	4,400	23,409

Source: U. S. Forest Service, U. S. Department of Commerce, and Trade Associations.

TABLE G.—Proportion of national consumption of softwood lumber and of pulpwood supplied by regional production

[Quantities in millions of board feet]

Year	Softwood lumber			Pulpwood		
	National consumption	Regional production	Per cent	National consumption	Regional production	Per cent
1869	9,397	218	2.3			
1879	13,392	373	2.8			
1889	19,875	1,742	8.8			
1899	25,443	2,475	9.7	993	83	8.4
1906	34,036	6,642	19.5			
1909	32,977	6,705	20.3	2,001	52	2.6
1910	32,800	7,237	22.1	2,047	55	2.7
1911	31,500	6,850	21.7	2,164	60	2.8
1912	33,200	6,986	21.0			
1913	32,378	7,691	23.8			
1914	30,500	6,834	22.4			
1915	29,300	6,323	21.6			
1916	31,100	7,938	25.5	2,614	130	5.0
1917	28,200	7,880	27.9	2,740	131	4.8
1918	25,300	8,432	33.3	2,625	120	4.6
1919	27,266	8,588	31.5	2,739	155	5.7
1920	27,277	10,208	37.4	3,057	167	5.5
1921	22,961	6,005	26.8	2,279	172	7.5
1922	28,773	10,013	34.8	2,774	173	6.2
1923	32,511	12,131	37.3	2,936	198	6.7
1924	29,947	11,289	37.7	2,884	218	7.6
1925	32,094	12,763	39.8	3,046	225	7.4
1926	31,000	13,314	42.9	3,383	269	8.0
1927	28,361	12,615	44.5	3,375	356	10.5
1928	28,781	13,019	45.2	3,580	480	13.4
1929	27,104	13,465	49.7	3,822	648	17.0
1930	19,439	10,263	52.8	3,598	675	18.8
1931	14,862	7,170	48.2	3,361	673	20.0
1932	9,846	4,209	42.7	2,817	476	16.9
1933	12,232	5,767	47.1	3,272	660	20.2
1934	11,907	6,036	50.7	3,398	763	22.5
1935	15,730	7,393	47.0	3,814	975	25.6
1936 (estimated)	19,009	9,393	49.4	4,400	1,050	23.9

¹ Estimated.

Source: U. S. Forest Service, U. S. Department of Commerce, and Trade Associations.

TABLE H.—Annual regional production of softwood lumber by species

[Quantities in millions of board feet]

Year	[Quantities in millions of board feet]				
	Douglas fir	Ponderosa pine	Idaho white pine	Hemlock	Miscellaneous
1869	166	44	1	-----	7
1879	264	82	2	-----	25
1889	1,181	360	5	-----	196
1899	1,721	435	12	-----	307
1904	2,866	639	22	22	366
1905	4,218	488	119	96	610
1906	4,830	773	117	104	818
1907	4,594	802	112	73	680
1908	3,569	702	154	77	700
1909	4,750	837	213	129	776
1910	5,090	883	250	172	842
1911	4,929	689	327	148	757
1912	5,062	604	364	200	756
1913	5,421	708	342	284	936
1914	4,610	681	330	264	939
1915	3,990	659	420	370	884
1916	5,258	965	382	337	996
1917	5,185	1,152	261	368	914
1918	5,585	1,138	286	344	1,079
1919	5,746	1,062	303	342	1,135
1920	6,784	1,450	343	584	1,047
1921	4,500	788	277	398	642
1922	6,629	1,259	420	674	1,031
1923	7,983	1,649	483	873	1,143
1924	7,216	1,555	482	944	1,092
1925	7,918	1,976	498	1,235	1,136
1926	8,572	1,956	462	1,351	973
1927	8,175	1,621	528	1,416	875
1928	8,229	1,795	546	1,547	902
1929	8,465	2,026	561	1,461	952
1930	6,292	1,649	553	1,065	704
1931	4,524	1,178	417	671	380
1932	2,820	734	236	198	221
1933	3,888	1,036	304	258	281
1934	3,949	1,101	386	242	358
1935	4,648	1,571	501	249	424
1936 (estimated)	5,984	1,968	554	184	703

Source: U. S. Forest Service and Trade Associations.

TABLE I.—Percentage of national softwood lumber consumption supplied by region in certain species

[Quantities in millions of board feet]

Year	[Quantities in millions of board feet]				
	Douglas fir	Ponderosa pine	Hemlock	Idaho white pine	Miscellaneous
1869	1.8	0.5	-----	-----	0.1
1879	2.0	.6	-----	-----	.2
1889	6.0	1.8	-----	-----	1.0
1899	6.7	1.7	-----	-----	1.2
1909	14.4	2.5	0.4	0.6	2.3
1910	15.5	2.7	.5	.8	2.5
1911	15.6	2.2	.5	1.0	2.4
1912	15.2	1.8	.6	1.1	2.2
1913	16.7	2.2	.9	1.0	2.9
1914	15.1	2.2	.9	1.1	3.1
1915	13.6	2.2	1.3	1.4	3.0
1916	16.9	3.1	1.1	1.2	3.2
1917	18.4	4.1	1.3	.9	3.3
1918	22.0	4.5	1.4	1.1	4.3
1919	21.1	3.9	1.3	1.1	4.2
1920	24.9	5.3	2.1	1.3	3.8
1921	19.6	3.4	2.0	1.2	2.8
1922	23.0	4.4	2.3	1.5	3.6
1923	24.5	5.1	2.7	1.5	3.5
1924	24.1	5.2	3.1	1.6	3.7
1925	24.7	6.2	3.9	1.6	3.5
1926	27.6	6.3	4.3	1.5	3.1
1927	28.8	5.7	5.0	1.9	3.0
1928	28.6	6.2	5.4	1.9	3.2
1929	31.3	7.5	5.4	2.1	3.5
1930	32.4	8.5	5.5	2.9	3.6
1931	30.4	7.9	4.5	2.8	2.6
1932	28.6	7.4	2.0	2.4	2.2
1933	31.7	8.5	2.1	2.5	2.3
1934	33.2	9.2	2.0	3.2	3.0
1935	29.5	10.0	1.6	3.2	2.6
1936 (estimated)	31.5	10.7	1.0	2.9	3.7

Source: U. S. Forest Service and Trade Associations.

TABLE J.—Ownership of forest land

[Areas in thousands of acres]

	Idaho	Montana		Oregon		Washington		Total	Percent
		East-ern	West-ern	East-ern	West-ern	East-ern	West-ern		
National parks	17	371	510	134	47	-----	417	1,449	1.5
Revested land	-----	-----	-----	47	2,115	-----	-----	2,162	2.3
Indian land	48	826	424	1,162	17	1,275	243	3,995	4.2
State land	962	51	388	44	114	621	853	3,033	3.2
County land	111	10	40	76	377	327	253	1,194	1.3
Other public	906	281	310	828	304	494	157	3,280	3.5
Private	4,504	1,160	2,877	4,067	7,285	3,260	7,369	30,522	32.2
Total	22,490	8,946	11,741	12,495	15,577	10,033	13,425	94,707	100.0
Percent	23.8	9.4	12.4	13.2	16.4	10.6	14.2	100.0	-----

Source: U. S. Forest Service.

TABLE K.—Ownership of mature conifer timber land

[Areas in thousands of acres]

	Idaho	Montana		Oregon		Washington		Total	Percent
		East-ern	West-ern	East-ern	West-ern	East-ern	West-ern		
National parks	-----	30	267	31	1,434	-----	189	486	1.1
Revested land	-----	-----	-----	31	1,434	-----	-----	1,465	3.4
Indian land	16	387	158	860	10	904	136	2,471	5.7
State land	545	20	260	8	23	349	519	1,724	4.0
County land	20	8	23	11	116	81	40	299	.7
Other public	232	95	85	169	83	177	38	869	2.0
Private	1,607	215	1,472	2,663	3,544	1,363	2,685	13,539	31.3
Total	8,232	2,489	4,870	8,414	8,701	4,715	5,827	43,248	100.0
Percent	19.0	5.7	11.3	19.5	20.1	10.9	13.5	100.0	-----

Source: U. S. Forest Service.

TABLE L.—Ownership of second growth timber land

[Areas in thousands of acres]

	Idaho	Montana		Oregon		Washington		Total	Percent
		East-ern	West-ern	East-ern	West-ern	East-ern	West-ern		
National parks	-----	6	95	-----	364	-----	13	114	.4
Revested land	-----	-----	-----	7	-----	-----	-----	371	1.3
Indian land	24	84	144	212	4	292	19	779	2.8
State land	249	17	101	4	70	208	169	818	2.9
County land	72	2	17	15	120	200	122	545	2.0
Other public	254	93	36	69	137	156	84	829	3.0
Private	1,977	244	1,034	864	2,009	1,631	2,400	10,159	36.1
Total	8,083	3,214	3,982	2,241	3,561	3,503	3,490	28,074	100.0
Percent	28.8	11.4	14.2	8.0	13.0	12.5	12.4	100.0	-----

Source: U. S. Forest Service.

TABLE M.—Ownership of unstocked, cut-over or burn

[Areas in thousands of acres]

	Idaho	Montana		Oregon		Washington		Total	Percent
		East-ern	West-ern	East-ern	West-ern	East-ern	West-ern		
National parks	-----	2	19	-----	-----	-----	18	39	0.6
Revested land	-----	-----	-----	4	246	-----	-----	250	3.6
Indian land	1	3	5	9	2	15	38	73	1.0
State land	60	2	9	-----	11	17	140	239	3.4
County land	18	-----	-----	3	110	28	83	242	3.5
Other public	31	7	3	6	52	20	27	146	2.1
Private	573	20	116	139	1,206	123	1,821	3,998	57.3
Total	1,425	150	579	214	2,028	253	2,333	6,982	100.0
Percent	20.4	2.1	8.3	3.1	29.0	5.1	33.4	100.0	-----

Source: U. S. Forest Service.

TABLE N.—Ownership of timber
[Quantities in millions of board feet, lumber tally]

	Idaho	Montana		Oregon		Washington		Total	Per-cent
		East-ern	West-ern	East-ern	West-ern	East-ern	West-ern		
National forest...	61,223	10,093	23,444	49,030	129,489	20,630	98,065	391,974	41.9
National parks	198	2,226	664	-----	-----	7,353	10,441	10,441	1.1
Revested land	-----	-----	397	52,755	-----	-----	53,152	53,152	5.7
Indian land	106	1,098	1,241	12,049	294	7,860	4,758	27,406	2.9
State land	9,629	112	2,780	184	853	3,560	26,627	43,745	4.7
County land	-----	-----	-----	187	2,873	620	1,423	5,103	0.5
Other public	1,358	400	415	1,192	2,049	1,960	1,585	8,959	1.0
Private	29,611	1,600	13,286	37,995	157,783	11,990	142,230	394,495	42.2
Total	101,927	13,501	43,392	101,698	346,096	46,620	282,041	935,275	100.0
Percent	10.9	1.4	4.6	10.9	37.0	5.0	30.2	100.0	-----

Source: U. S. Forest Service.

TABLE O.—Ownership of timber of more valuable species¹
[Quantities in millions of board feet, lumber tally]

	Idaho	Montana	Oregon		Washington		Total	Per-cent
			East-ern	West-ern	East-ern	West-ern		
National forest	18,421	4,534	35,737	97,889	6,670	41,135	204,386	35.5
National parks	-----	200	186	-----	-----	2,628	3,014	0.5
Revested land	-----	-----	196	46,056	-----	-----	46,252	8.0
Indian land	72	1,526	10,767	263	5,300	2,425	20,353	3.5
State land	3,993	845	144	770	2,200	12,735	20,687	3.6
County land	-----	-----	148	2,305	380	724	3,557	0.6
Other public	579	87	977	1,562	800	630	4,635	0.8
Private	12,876	4,640	31,184	132,411	5,750	86,610	273,471	47.4
Total	35,941	11,832	79,339	281,256	21,100	146,887	576,355	100.0
Percent	6.2	2.1	13.8	48.8	3.7	25.5	100.0	-----

¹ Douglas fir, cedar and spruce in the fir region, and Idaho white and ponderosa pine in the pine region are included.

Source: U. S. Forest Service.

SECTION 2. ECONOMIC IMPORTANCE OF THE FOREST INDUSTRIES OF THE PACIFIC NORTHWEST

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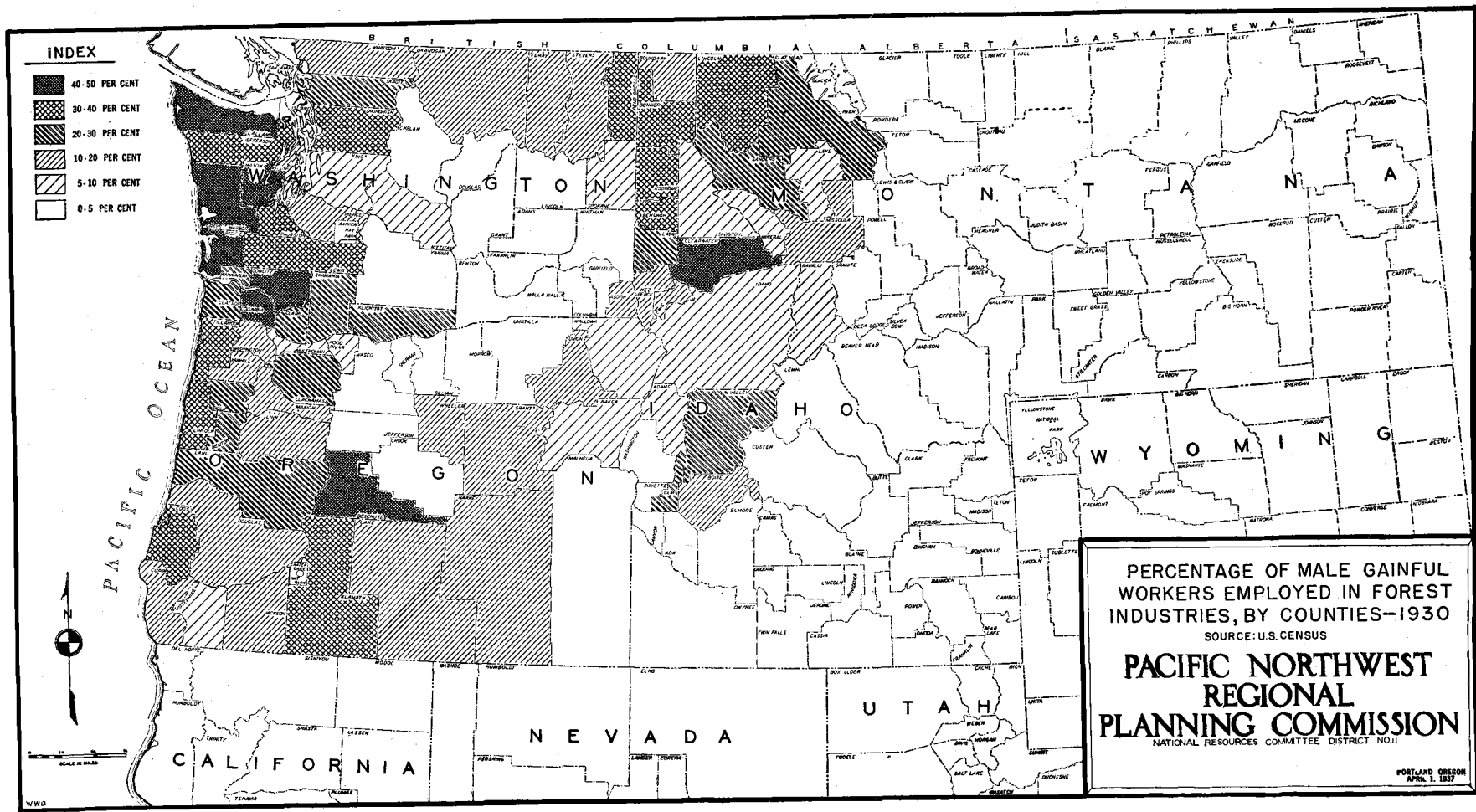


FIGURE 1.

SECTION 2. ECONOMIC IMPORTANCE OF THE FOREST INDUSTRIES OF THE PACIFIC NORTHWEST

By Blair Stewart¹

There can be no question as to the importance of the forest industries in the economy of the Pacific Northwest. It is not easy, however, to indicate with any precision the degree of that importance. A quantitative expression of the significance of the forest industries can be secured only if some measurable characteristic is accepted as a proper test. No completely satisfactory single measure has been found, and it has thus been necessary to consider a number of different tests, and to present a picture which is a mosaic, the pieces of which are drawn from different sources.

It is none the less a realistic picture, and from it certain significant, if broad, conclusions can be drawn. Forest industries provide the Region's pay rolls as does no other single line of endeavor. One out of every ten persons gainfully employed is engaged directly in a forest industry. The proportion is larger when males only are considered, and this gives added significance to forest industries, because men on the average have more dependents than women.

Among manufacturing industries in the Region, the production of forest products is of overwhelming importance. They employ half of the workers engaged in manufacturing, and the proportion would be still higher if those industries which are directly dependent upon forest industries were included in the forest industries group.

In a complex industrial civilization, it is essential that every region have products to send to other areas to pay for the wide variety of products which make possible the complex consumption patterns characteristic of the American standard of living. For the Pacific Northwest, the forest industries perform this function in an outstanding manner. Forest products provide more than 40 percent of the balance secured by the shipment of goods from the Pacific Northwest.

The activities dependent upon the forest resource of the Pacific Northwest provide employment for many service industries. Transportation may be taken as an example: 63 percent of the freight tonnage originating on railroads in the Pacific Northwest consists of forest products. Inland navigation is even more completely dependent on movement of forest products, almost 87 percent of the tonnage of inland water car-

riers of the Pacific Northwest being made up of such commodities. Forest products' manufacturing plants are also very important customers of electric power industry—consuming over 40 percent of the power purchased by manufacturing plants in the Region.

The rise and fall of communities in the Pacific Northwest is to be explained in almost every case in terms of the exploitation and depletion of the forest resource.

The basis on which the above statements regarding the economic importance of the forest industries of the Pacific Northwest is set forth in more detail in what follows. An attempt is made also to indicate some of the implications of these broad statements.

Employment in the Forest Industries of the Pacific Northwest

At first glance the number of persons engaged in an industry seems a valid measure of its economic importance, and certainly no discussion of the problem would be complete if this information were not included. One person out of every ten gainfully employed in the Pacific Northwest is directly engaged in some forest industry.² In Oregon and Washington the proportion is approximately 1 in 8, in Idaho about 1 in 14 or 15, and in Montana only about 1 in 42 or 43. Employment figures by industries are shown in table A, which may be found in the Appendix to this section. Since many of the manufacturing and mechanical industries are in reality service activities, agriculture and forest products stand out as the overwhelmingly important basic activities.

If men only are considered, the relative importance of the forest industries is still greater. The proportions of all gainfully employed males working in forest products' industries were as follows in 1930: Idaho, 1 in 12.6; Montana, 1 in 37.6; Oregon, 1 in 6.7; Washington, 1 in 6.7; Pacific Northwest, 1 in 8.2. More detailed information on employment of males by industry is given in table B (in Appendix to Section 2).

The dependence of population of the Pacific Northwest on forest industries for employment varies greatly within the Region, and within the States. This is strikingly shown in Figure 1, which shows the percentage of all gainfully employed males who were employed in the forest products' industries in 1930. It may be seen that the entire area west of the Cascade

² Based on 1930 Census subtracting classes A and B unemployed from total "gainful workers."

¹ The statistical work for this section was supervised by Frank J. Hong, and many suggestions were made by him and other members of the staff of the Pacific Northwest Regional Planning Commission. The State planning boards of Idaho, Montana, Oregon, and Washington assisted in the assembly of data. Acknowledgment is made, also, of the assistance of various governmental agencies, including the utilities commissions of the four Pacific Northwest States.

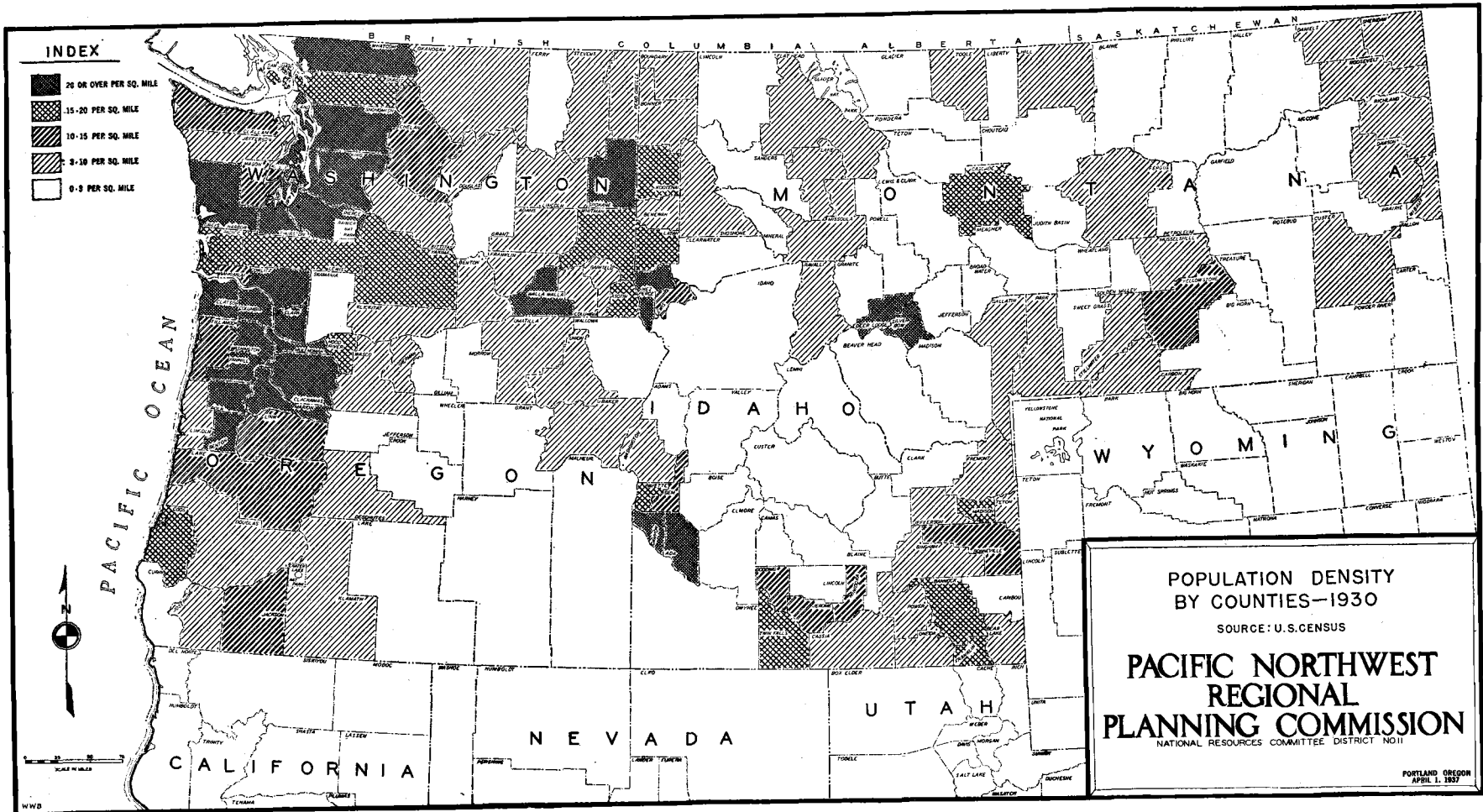


FIGURE 2.

Mountains, in both Oregon and Washington, is very heavily dependent on forestry; in five western Washington counties and one western Oregon county more than 40 percent of the gainfully employed males work in forest industries. East of the Cascades, the important producing areas stand out clearly, the counties most exclusively devoted to lumbering being Deschutes in Oregon and Clearwater in Idaho. Deschutes and Klamath are the two eastern Oregon counties most largely dependent upon lumbering, while a group of counties in northern Idaho, northeastern Washington and northwestern Montana is very heavily dependent upon forest industries. The only counties of southern Idaho in which lumbering is of large importance are Gem, Valley, and Boise.

There is an evident connection between the location of forest industries and Regional population distribution. This is shown by a comparison between the map showing the proportion of the gainfully employed engaged in forest products' industries (fig. 1) and the map showing the density of population by counties (fig. 2). It indicates that there is a general tendency for areas of dense population to fall in districts where lumbering is the outstanding activity. The most striking exceptions to this general rule are in southern Idaho, in Montana, and in eastern Washington; areas supporting considerable populations largely by agriculture or mining rather than lumbering. It is an interesting fact that every city in the Pacific Northwest with a population of over 20,000, with the exception of Butte and Great Falls, Mont., Yakima, Wash., and Boise, Idaho, is located in a region where lumbering is the outstanding economic activity.

TABLE I.—Relative employment¹ by various forest products' industries, Pacific Northwest States, 1930

	Idaho		Montana	
	Number	Percent	Number	Percent
Forestry (including logging).....	5, 193	48. 4	2, 448	51. 7
Saw and planing mills.....	2 5, 534	51. 6	2 2, 287	48. 3
Other wood working and furniture industry..				
Total, forest products' industries.....	10, 727	100. 0	4, 735	100. 0

	Oregon		Washington		Pacific Northwest	
	Number	Percent	Number	Percent	Number	Percent
Forestry (including logging).....	16, 557	35. 4	26, 764	35. 0	50, 962	36. 8
Saw and planing mills.....	23, 048	49. 3	36, 465	47. 8		
Other wood working and furniture industry.....	4, 049	8. 6	6, 553	8. 6	277, 936	56. 2
Paper and allied industries.....	3, 115	6. 7	6, 559	8. 6		
Total, forest products' industries.....	46, 769	100. 0	76, 341	100. 0	138, 572	100. 0

¹ Gainful workers less unemployed. (Unemployed includes: Class A, persons out of a job, able to work and looking for a job; class B, persons having jobs, but on lay-off without pay, excluding those sick or voluntarily idle.)

² Saw and planing mills and other wood working and furniture combined.

Source: Census of 1930, Unemployment, volume I.

The amount of employment provided by different forest product industries is shown in table I. In Idaho and Montana approximately one man is engaged in forestry and logging for each person employed in planing mills or other woodworking factories. In Oregon and Washington, on the other hand, while approximately half those engaged in forest products' industries work in saw and planing mills, only 35 percent of the total are engaged in forestry and logging, and roughly 15 percent of the gainful workers are employed in other woodworking and furniture industries, and in the paper and allied industries. The figures are very similar for Oregon and Washington, except that the paper industry is relatively less important in Oregon than in Washington. It is difficult to explain the differences between the pine and Douglas fir regions in these data which seem to indicate that relatively fewer persons are engaged in the woods than in the mills in the Douglas fir region.

Wages and Salaries Paid by Forest Products Industries

Another measure of the importance of forest industries is found in wages and salaries paid. Table II compares the average number of employees and total salaries and wages paid in forest industries in 1929 with employees, wages and salaries in all other manufacturing industries. The figures given here for number of employees differ from those given in table A (Appendix 2), because they record average employment throughout the year rather than the number gainfully employed. Furthermore, the classification of "manufacturing" is more restricted than that of "manufacturing and mechanical industries" used in table A. The most important item included in the latter classification and not in the former is the building industry.

From table II it may be seen that forest industries employ more than half of the persons engaged in manufacture, and pay wages and salaries almost exactly proportional to the numbers employed. In other words, the manufacture of forest products is more important in the Pacific Northwest than all other manufacturing put together.

The Importance of Forest Industries in the External Trade of the Pacific Northwest

The data presented above considerably understate the importance of forests in the economy of the Pacific Northwest. There can be no doubt that if the present forests were to vanish or lose entirely their value, more than 1 person in 10 in the Pacific Northwest would be out of a job, and manufacturing employment and pay rolls would shrink to much less than half their present volume. This would result from the

fact that basic industries such as those based on the exploitation of our forest resources support a complex superstructure of service industries. Unfortunately, there seems to be no satisfactory way of determining just what this superstructure contains. There are undoubtedly businesses not included in the forest industries' classification above, which find their market entirely in the forest industries. There are other concerns which do a large share of their business with forest industries. Then, there are those who supply these directly dependent businesses with goods and services, and so on indefinitely. A similar chain is made up of those supplying the employees of forest industries with goods and services. Information is not available for satisfactory estimates of the potential effects of the disappearance of the forest industries, and it is impossible, therefore, to give any short and convenient answer to the question of their importance to the economic life of the Region.

One way by which some appreciation of the significance of the forests to the Pacific Northwest may be

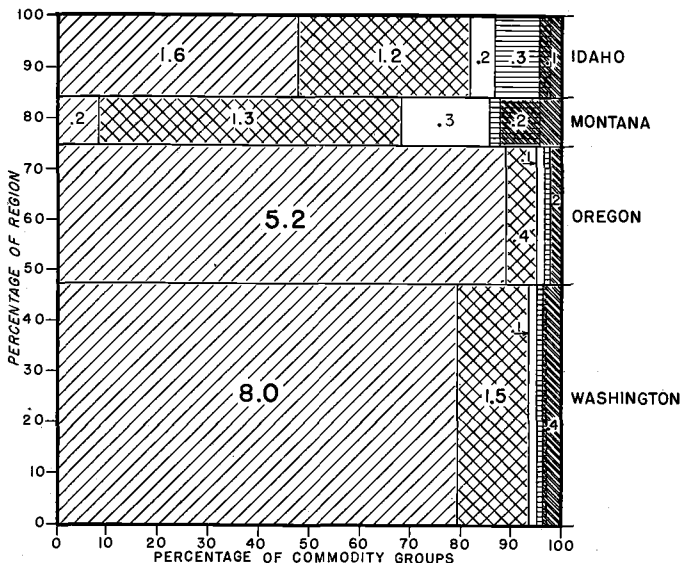
TABLE II.—Average number of employees and total salaries and wages paid in forest industries and all other manufacturing, 1929

	Employees				Salaries and wages			
	Forest industries		All other manufacturing		Forest industries		All other manufacturing	
	Number	Per cent	Number	Per cent	Dollars	Per cent	Dollars	Per cent
Idaho.....	11,917	70.0	5,106	30.0	17,660,608	69.3	7,827,209	30.7
Montana.....	3,925	22.9	13,210	77.1	5,439,788	18.5	24,029,719	81.5
Oregon.....	43,144	58.4	30,721	41.6	63,096,566	59.4	43,144,973	40.6
Washington.....	74,893	58.2	53,847	41.8	112,284,581	57.1	84,290,893	42.9
Pacific Northwest.....	133,879	56.5	102,884	43.5	198,477,543	55.5	159,292,794	44.5

Source: Census of Manufactures, 1929.

secured is to consider their contribution to the process of securing goods and services from other areas. The Pacific Northwest is far from self-sufficient. It participates in a process of geographical division of labor in which products from other areas, and markets in other regions, are indispensable to the maintenance of life in the modern manner. The clothes worn in the Region, the cars driven, the citrus fruits eaten—in fact a large

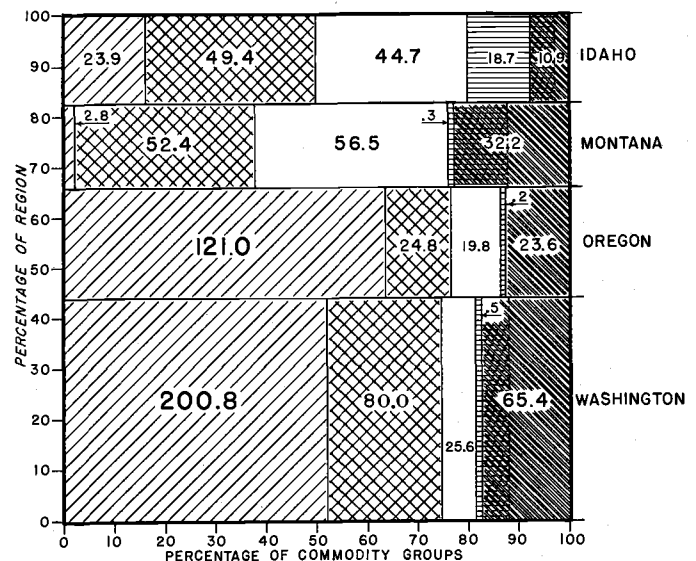
TONNAGE OF NET EXPORTS FROM THE PACIFIC NORTHWEST STATES IN 1929



AREA OF SQUARE REPRESENTS TONNAGE OF TOTALS OF NET EXPORTS OF THE PACIFIC NORTHWEST STATES - 21.3 MILLION TONS
 AREAS OF RECTANGLES REPRESENT TONNAGE OF NET EXPORTS OF EACH STATE ACCORDING TO ABOVE LEGEND
 NUMERALS ARE TONNAGE IN MILLIONS OF TONS
 RECTANGLES WITHOUT NUMERALS REPRESENT A TONNAGE LESS THAN .05 MILLION TONS

FIGURE 3.

ESTIMATED VALUE OF NET EXPORTS FROM THE PACIFIC NORTHWEST STATES IN 1929



AREA OF SQUARE REPRESENTS VALUES OF TOTALS OF NET EXPORTS OF THE PACIFIC NORTHWEST STATES - 853.5 MILLION DOLLARS
 AREAS OF RECTANGLES REPRESENT VALUE OF NET EXPORTS OF EACH STATE ACCORDING TO ABOVE LEGEND
 NUMERALS ARE VALUES IN MILLIONS OF DOLLARS

FIGURE 4.

majority of the goods consumed—come from other States or other countries. The industries which provide materials to be sold in these other regions thus come to have a special significance. It is because of them that it is possible to support a population in the Pacific Northwest at the standard of living to which it has become accustomed. As a consequence, a measure of the contributions of different industries to the export trade of the Region provides a most useful gage of economic importance. Export trade in this instance means export to other areas in the United States as well as to foreign countries.

Tonnage of Net Exports From the Pacific Northwest States

Unfortunately, the information on internal movements of commodities is not adequate for a complete and accurate statement of the movement of goods from an area such as the Pacific Northwest. It is possible, however, to make a study of the net movement (by weight) of particular commodities into and out of each State, and thus to get a somewhat impressionistic picture of the relative importance of different commodities in the trade of the individual States, and so of the Region as a whole.

A study of the net tonnage movement by commodities, for the Pacific Northwest States, was made for the year 1929. The results are shown by broad commodity groupings in Appendix 2, table C, and in figure 3.³ In tonnage terms, the net movement of forest products was overwhelmingly more important than that of any other group of products. Over 70 percent of the net tonnage exports of the Pacific Northwest were made up of forest products; the percentage being as high as 89 percent for Oregon, 80 percent for Washington, and 48 percent for Idaho. Only for Montana was the tonnage movement of forest products unimportant as compared with other exported commodities. However, it must be remembered that Montana is divided geographically into two highly different sections. The eastern and larger part belongs physically and economically to the Great Plains, and contains little forest area. Forest industries are largely confined to the western portion. But, in Montana as a whole, forest products comprised less than 9 percent of the net tonnage. Altogether, it is clear that the movement of forest products out of the Region is one of the most important tasks of the transportation systems of the area.

Value of Net Exports from the Pacific Northwest States

The tonnage figures given above are probably sufficiently accurate for present purposes, although the

nature of the information, particularly that on coastwise and intercoastal movements, is such that accuracy in the strictest sense is not possible. Statements must be even more approximate when the value of the export movement is being considered. The value of a ton of a particular commodity imported will not be the same as that of a ton of the export movement of the same commodity, but in arriving at the net movement (by weight) it has been necessary to balance the outgoing against incoming tonnage. To the distortion caused by this procedure, there is added the difficulty of securing satisfactory value figures to apply to the net tonnage figures. Considerable care has been taken to discover a price per ton that seemed to be a good statement of the value of the goods exported. It is probable that the errors in the value figures for the commodity groupings are not in excess of 20 percent. In general, the important differences are so clear that the conclusions would not be greatly different even if the errors were as much as 20 percent.

Since the value per ton of forest products averages less than that of other products exported, the value of net exports of forest products is proportionately somewhat less impressive than the net tonnage of exports. Nevertheless, forest products stand out clearly as the most important source for the Region of income with which to buy the products of other areas. (See fig. 4, and Appendix 2, table D.)⁴ Forest products contribute practically 64 percent of the value of all net exports from Oregon, and 54 percent for Washington; and for the Pacific Northwest as a whole they amount to about 41 percent of the value of all net exports. The percentage for Idaho is only 16; and for Montana, only about 2 percent. For reasons previously explained, the relative dependence of the different States on the export of forest products is thus seen to vary considerably, Oregon being the most dependent upon forest industries, and Montana, as a whole, being very slightly dependent upon them.

Agriculture is second to forest industries as a source of net exports. Agricultural and animal products combined provided almost exactly the same proportion as forest products of total net exports for the Region as a whole. These two groups were very much less important than forest products in Oregon and Washington, but much more important in Montana and Idaho. More than 75 percent of the value of the net exports of Montana were represented by agricultural and animal products, while the corresponding figure is approximately 64 percent for Idaho.

These values of net export figures are designed to give some indication of the basic importance of different resources when providing export balances for the Region. In general, they do give such a picture, al-

³ For net tonnage movement by commodities see Appendix 2, table G.

⁴ For estimated value of net exports by commodities see Appendix 2, table G.

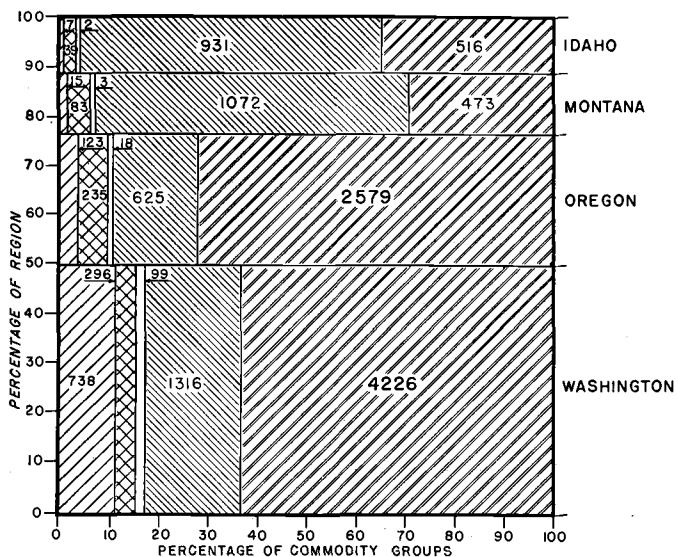
though the importance of manufacturing is probably overstated, because, in some instances, the raw materials are imported from outside the Region. In such a circumstance, the net import of raw material should be balanced against the net export of finished products to secure the export balance made available by any particular activity. In a minor sense, this applies even to forest products. Washington, for example, which had net exports of over \$200,000,000 in the forest-products group, imported approximately \$500,000 worth of logs. In the manufacturing group, Oregon, which is a wheat-surplus producing State, nevertheless had net imports of wheat worth something more than \$400,000, and net exports of flour valued at approximately \$15,500,000. While a large proportion of the value of the net export of flour can be attributed to the natural resources of Oregon, the true net export balance provided by the production and milling of wheat would be approximately \$400,000 less than the amount included as the net export value of flour.

A more striking case is to be found in Washington, where refined copper and manufactured copper and

bronze exports amounted to over \$30,000,000. These were based, however, on an estimated net import of copper ores and concentrates valued at almost \$18,000,000. The net export balance provided by this manufacturing industry, therefore, was closer to \$10,000,000 than the \$30,000,000 which was included in the net exports of manufactures from Washington.

The situation in Washington may be contrasted with that of Montana where processing of copper, lead, and zinc ores is so great that Montana had very small exports of products of mines. The mining products appeared very largely as manufactures. In fact, \$29,000,000 of the net exports of the manufactured products from Montana was made up of refined copper, lead, or zinc, and their products. On the chart the classification "refined copper, lead, or zinc" has been given a different shading for Idaho, Montana, and Washington to distinguish it from other manufactured products. The more highly processed copper, brass, and bronze has not been so included, since manufacture of these products would involve unknown quantities of imports of other materials.

TONNAGE OF NET IMPORTS OF PACIFIC NORTHWEST STATES, 1929



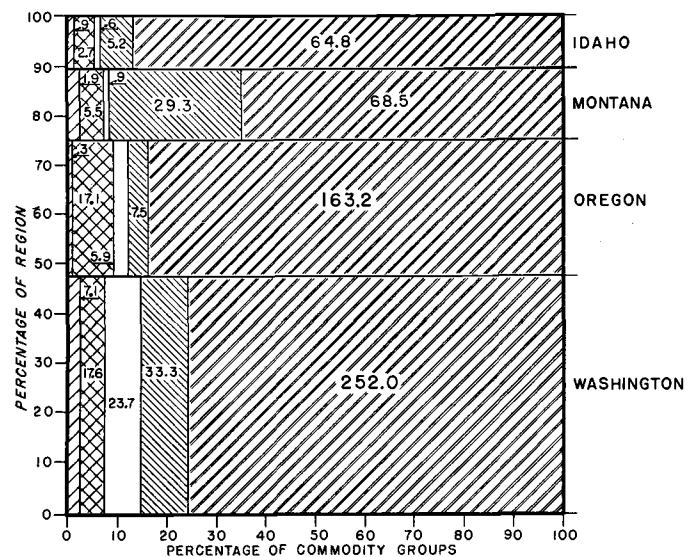
AREA OF SQUARE REPRESENTS TONNAGE OF TOTALS OF NET IMPORTS OF THE PACIFIC NORTHWEST STATES—13,396 THOUSAND TONS

AREAS OF RECTANGLES REPRESENT TONNAGE OF NET IMPORTS OF EACH STATE ACCORDING TO ABOVE LEGEND

NUMERALS ARE TONNAGE IN THOUSANDS OF TONS

FIGURE 5.

ESTIMATED VALUE OF NET IMPORTS OF PACIFIC NORTHWEST STATES, 1929



AREA OF SQUARE REPRESENTS ESTIMATED VALUE OF TOTALS OF NET IMPORTS OF THE PACIFIC NORTHWEST STATES—708 MILLION DOLLARS

AREAS OF RECTANGLES REPRESENT VALUE OF NET IMPORTS OF EACH STATE ACCORDING TO ABOVE LEGEND

NUMERALS ARE VALUES IN MILLIONS OF DOLLARS

FIGURE 6.

If time were available for a sufficiently elaborate study, it might be possible to make necessary corrections of this type and thus secure figures which reflect more accurately the basic importance of the different industries. For purposes of this report, however, such refinement does not seem to be necessary.

In summary, it may be said that in building up export surpluses the Pacific Northwest has its eggs almost entirely in two baskets: Forest products and agricultural and animal products. These two baskets are almost equally important for the Region as a whole, but not for individual States. The percentages of total net exports represented by these two classifications may be shown by States, as follows:

	Idaho	Montana	Oregon	Washington
Agricultural and animal products.....	63.8	75.5	23.6	28.4
Forest products.....	16.2	2.0	63.9	53.9
Total.....	80.0	77.5	87.5	82.3

The total dependence upon these two activities is greatest in Oregon (87.5 percent), and least for Montana

(77.5 percent). Forest products are 2.7 times as important as agriculture for Oregon by this test, and 1.9 as important for Washington.

In Idaho, agricultural and animal products very greatly outrank forest products, while in Montana the latter group is almost totally eclipsed by the former.

Goods Purchased by Pacific Northwest Exports

The types of commodities purchased by the Pacific Northwest States, with the balances built up so largely by exports of forest and agricultural products, are shown in figures 5 and 6 (Appendix 2, tables E and F).⁵ The most important broad category of commodities shipped into the Region is manufactured goods, which come from more highly industrialized areas. The value of net imports of manufactures totals 77 percent of the value of all net imports for the Region. The inward movement of manufactures is relatively most important in Idaho (87.2 percent), and least important in Montana (64.5 percent). The smallness of the Montana figure is largely explained by the movement of mine products into the state for processing.

⁵ For tonnage and estimated value of net imports by commodities see Appendix 2, table G.

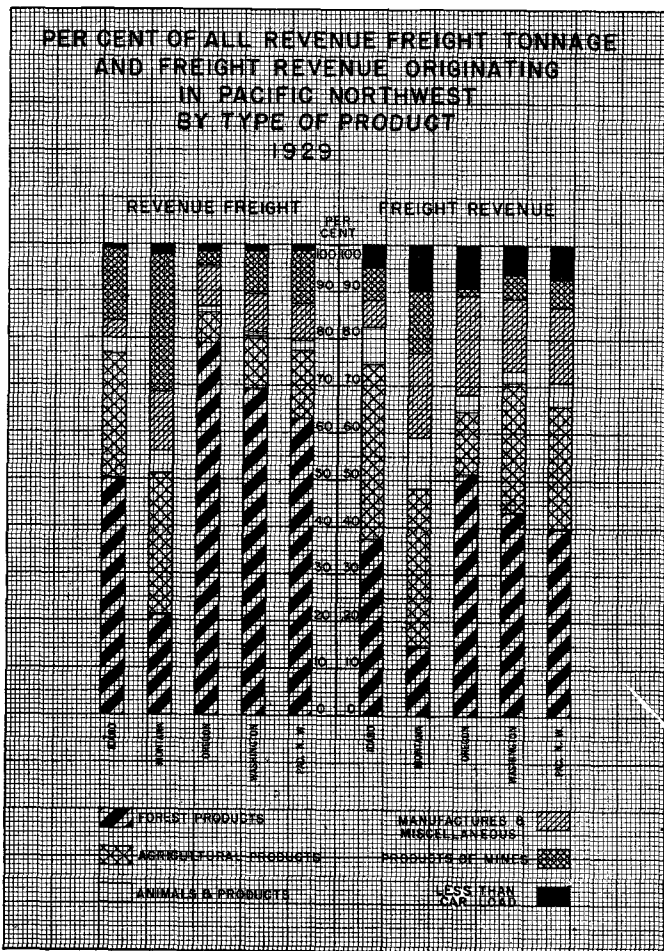


FIGURE 7.

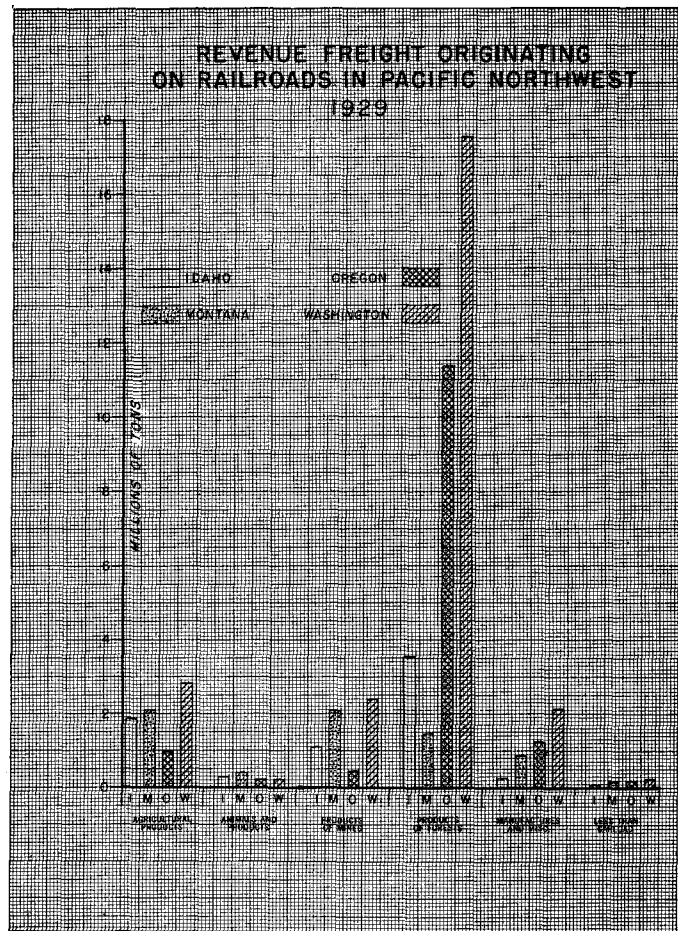


FIGURE 8.

Importance of Forest Industries to the Railroads of the Pacific Northwest

A conceivable extension of the analysis of the importance of an industry as a source of exports from the Region is to divide all workers into those engaged in export, or basic industries, and those engaged in service occupations. The number of persons dependent upon a particular export industry might then be conceived of as those directly supported by the industry, plus a proportion of the service population determined by the relation between the total service population and the total basic industry population. The difficulty with this approach is that export industries are also service industries, supplying their products to the local population as well as to the outside world. In many cases it is impossible to secure an acceptable estimate of the relative importance to a basic industry of the export and local markets. This difficulty may be illustrated by the case of agriculture. In 1930, there were over 330,000 persons gainfully employed in agriculture in the Pacific Northwest. How many of these were engaged in producing agricultural products for consump-

tion within the Region, and how many were producing goods to be consumed in other areas? Or how may a farmer be classified who produces wheat and cattle, products exported from the Pacific Northwest, although extensively consumed here also; and corn, barley, and rye, commodities imported into the area? Data are not available to answer these questions.

It is possible, however, to secure some idea of the importance of a basic industry to a closely related service industry by estimating the proportion of the business of the service industry which comes directly from the basic industry. This can be done most readily in the case of transportation agencies. It illustrates the way in which the activities of one industry affect another business. The influence of a basic industry is communicated to other businesses in an ever-widening circle, but with continually diminishing force. The effects of the basic industry on other activities thus reach out in an almost infinite series, the sum of which cannot be determined. The attempt to add to those directly engaged in the forest industries, for example those engaged in supplying services and commodities to forest industries, plus those engaged in furnishing

FREIGHT ORIGINATING ON RAILROADS IN THE PACIFIC NORTHWEST IN 1929

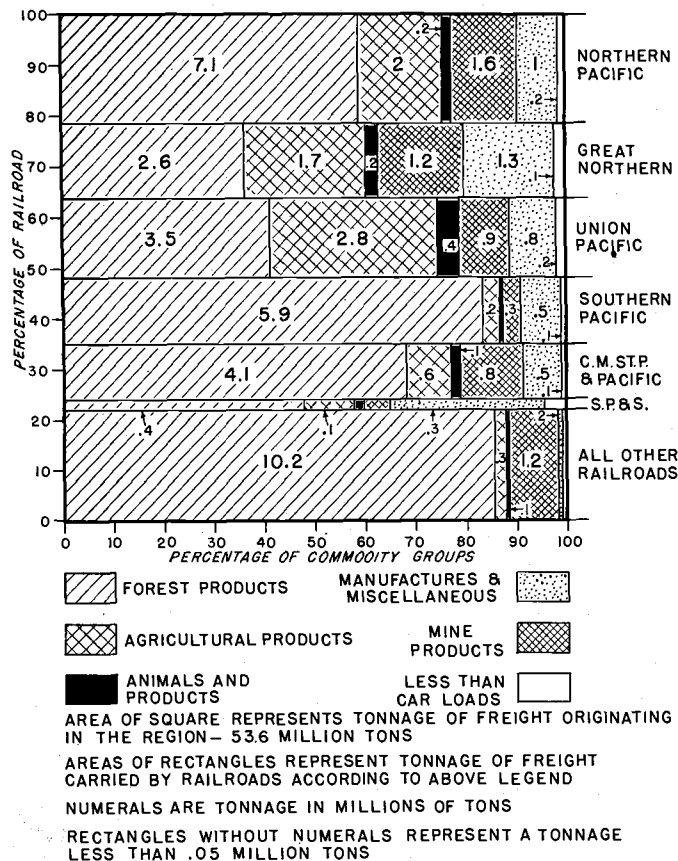


FIGURE 9.

FREIGHT REVENUE EARNED ON FREIGHT ORIGINATING IN PACIFIC NORTHWEST 1929

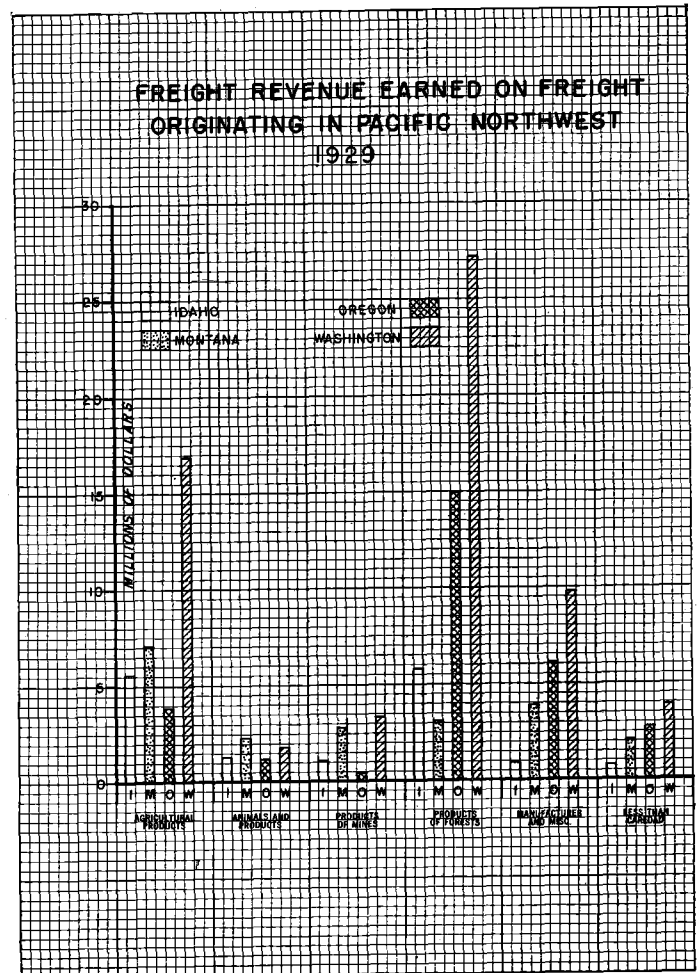


FIGURE 10.

these suppliers with services and commodities, plus * * * could go on indefinitely. While each step would add to the measure of importance of the forest industry, it would also add to the questionableness of the conclusions. It is possible, however, to speak with confidence of the importance of the forest industries to an immediately related service, such as that of transporting the products of forests. Such a presentation will understate, rather than overstate, the importance of the basic industry considered.

Importance for Railroad Traffic

Forest products are responsible for more of the freight tonnage originating in the Pacific Northwest than all other commodities combined. This may be seen from figures 7 and 8 (and Appendix 2, table I) which show the tonnage of different categories of freight originating in the Region.⁶ More than 63 percent of the revenue freight originating in the Pacific Northwest consisted of forest products. The highest relative importance was in Oregon, where 79 percent of the freight originating consisted of products of forests. In Washington the percentage was 69, while in Idaho it was 50, and in Montana 21. The significance of these products to particular railroads may be seen in figure 9, data for which are to be found in Appendix 2, table K. It may be seen that the movement of forest products is most important for the Southern Pacific Railway. Of the tonnage originating on the Southern Pacific lines in the Pacific Northwest, 83.7 percent consisted of forest products, and this constituted 12.5 percent of the traffic originating on the Southern Pacific system. Of traffic originating on the Canadian Pacific, in the four Pacific Northwest States, 76.8 percent was forest products, although this tonnage accounted for only 2 percent of the total movement on the Canadian Pacific as a whole. In terms of the entire system, the forest products originating in the Pacific Northwest were most important for the Northern Pacific. Of the tonnage originating in the Pacific Northwest on this railroad, 59 percent was forest products, and 42 percent of the tonnage originating anywhere on the Northern Pacific system was made up of forest products originating in the Pacific Northwest. In summary for the railroads serving the Pacific Northwest, 63 percent of the tonnage originating in this area was forest products, and almost 16 percent of the traffic originating on the entire systems of these railroads was contributed by forest products in this Region.

⁶ The classification of commodities used is that followed in the annual report forms prepared by the Interstate Commerce Commission, and used by the railroads in reporting to the public utility commissions of the various States, except that the following commodities, classed as Manufactures and Miscellaneous, have been entered as Forest Products: furniture, other than metal; newsprint paper; printing paper, n. o. s.; paper bags and wrapping paper; paperboard, pulpboard and wall-board (paper); and building woodwork (millwork).

Importance for Railroad Revenues

When we turn to the estimates of revenue earned in hauling various classes of commodities, the picture is somewhat changed. These estimates were made by computing the average revenue earned per ton by each railroad on each commodity hauled. It was then assumed that the revenue earned by the railroad on products originating in the Pacific Northwest was the average amount earned on that commodity on the entire system. In some cases this may have led to considerable error since the average length of haul for Pacific Northwest products might be greater or less than the average for the system as a whole. It seems likely, however, that when the results are combined by commodity classes, the total error is not large, and there is some reason to believe that revenues from forest products are underestimated rather than overestimated.

The tonnage of forest products was greater than that of any other commodity group. In every State but Montana, where products of mines and agricultural products were both more important than forest prod-

ESTIMATED REVENUE EARNED BY RAILROADS ON FREIGHT ORIGINATING IN THE PACIFIC NORTHWEST IN 1929

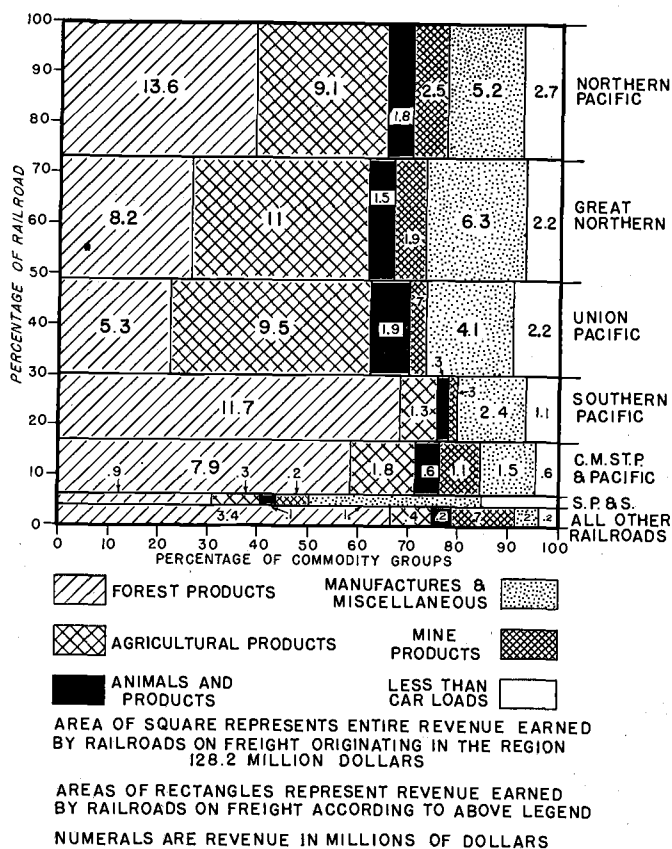


FIGURE 11.

ucts, the revenue earned shows the same picture, although the relative importance of agricultural products is considerably increased. The same is true of the manufactures and miscellaneous and the less than carload classifications. Perhaps the most striking difference in relative importance is to be found in agricultural products in Washington. Although agricultural products constituted only 11 percent of the tonnage in Washington, they contributed an estimated 27 percent of the total revenue earned on traffic originating in that State. This is largely to be explained by the relatively high freights paid by fruit products, which constitute a rather high proportion of the total tonnage of agricultural products moved in the State of Washington. The general picture for revenue earned may be seen from figures 7 and 10 (and Appendix 2, table J).

From figure 11 (and Appendix 2, table L) it is possible to get an impression of the relative importance of different commodity groups in the revenue earned on traffic originating on the different railroads. Forest products are most important for the Southern Pacific Railroad, contributing 68.4 percent of the total revenue earned on tonnage originating in the Pacific Northwest. The

corresponding percentages for the other roads were: The Milwaukee, 58.4; Canadian Pacific, 58.2; the Northern Pacific, 39.0; Great Northern, 26.3; and the Union Pacific, 22.3. For railroads whose operations were confined to the Pacific Northwest, the total revenue earned on forest products was 56.6. The average for the Pacific Northwest was approximately 40 percent. The strongest competitor to forest products as a source of revenue for the railroads was agricultural products, which, in terms of revenue, are more important than forest products only for the Great Northern and Union Pacific railroads. For all the railroads combined, agricultural products originating in the Pacific Northwest provided about 26 percent of the revenue earned on all traffic originating in this Region.⁷

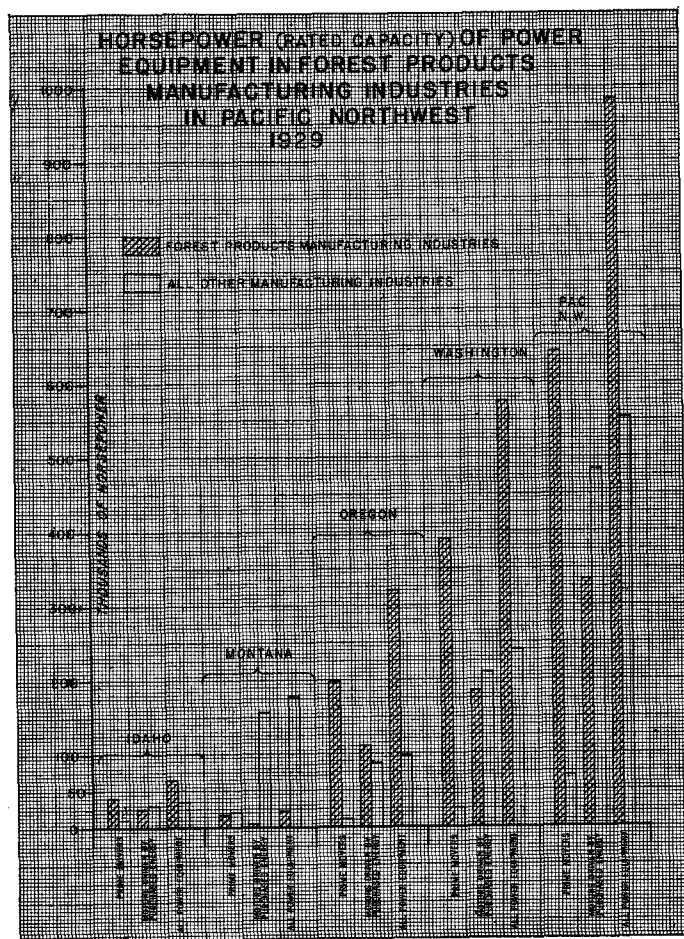
The relation of the forest products' industries to railroad transportation may be summarized as follows: No other group of commodities is so important to the railroad industry as forest products. They provide more than six-tenths of the tonnage originating in the Region, and four-tenths of the revenue earned on such tonnage. Without the forest industries, the traffic and revenue situations of all the railroads would be vastly changed, and on some railroads the remaining traffic would be so small that the maintenance of transportation by rail could probably not be economically justified.

Importance of Forest Products' Industries to Inland Water Transportation in the Pacific Northwest

Internal movement of goods by water is another form of transportation greatly dependent upon the forest industries in the Pacific Northwest. Estimates of this internal movement by classes of commodities in 1929 are shown in table III. Forest products constituted almost 87 percent of the tonnage of inland water carriers in the Pacific Northwest, movement of other commodities being of relatively little importance.

Importance of Forest Products' Industries to the Electric Power Industry

An incidental measure of the importance of a manufacturing industry is to be found in the power equipment used in its operations. The accompanying chart, figure 12 (and Appendix 2, table U), compares the rated capacity of power equipment in forest products' manufacturing plants with the capacity installed in all other manufacturing establishments in 1929. Except in Montana, forest products' manufacture utilizes more power equipment than all other manufacturing industries combined. The relative importance of forest products' industries by this measure is greatest in Oregon, where almost 77 percent of the rated capacity of power equipment in manufacturing is found in plants processing forest



⁷ Detailed statements of tonnage originating in each state, and revenue earned on such traffic by railroads and commodity groups, are to be found in Appendix 2, tables M to T, inclusive.

products. For the other States, the percentages were: Washington, 71; Idaho, 63; and Montana, 10.

TABLE III.—Total tonnage of various products carried in inland navigation on rivers, harbors, and canals in Pacific Northwest, 1929

[In thousand short tons]

Products	Tons	Percent
FOREST PRODUCTS		
Logs, and piling, rafted and floated.....	26,502	77.2
Lumber, shingles and millwork.....	1,393	4.1
Paper and woodpulp.....	698	2.0
Pulp wood.....	180	.5
Fuel wood and hogfuel.....	1,080	3.1
Total.....	29,853	86.9
OTHER PRODUCTS		
Animal and animal products.....	48	.1
Vegetable food products.....	85	.3
Products of mines and mines manufactures.....	4,260	12.4
Manufactured products.....	38	.1
Unclassified and miscellaneous.....		.2
Total.....	4,494	13.1
Total all commodities.....	34,347	100.0

Source: Annual Report of Chief of Engineers, U. S. Army, 1930.

The predominance of forest manufactures is most striking in the comparison of rated capacity of prime movers (power developed within the plant). The total for the entire Region, in 1929, was 643,936 horsepower in forest products' manufacturing plants, and only 69,505 for all other manufacturing concerns. By this measure, the importance of forest products is nine times that of other manufacturing. This great disproportion in capacity of prime movers may be explained by the common practice of lumber mills of using waste materials for power generation.

Even on the basis of capacity of motors driven by purchased energy, power in forest products' manufacturing is important; although it outranks all other manufacturing by this measure only in Oregon. For the four States, the percentages of rated capacity of all motors driven by purchased energy found in forest products' manufacturing plants are: 59 for Oregon, 48 for Idaho, 47 for Washington, and only 3 for Montana. For the entire Region, 41 percent of motors using purchased power in manufacturing plants were found in the forest products' industries. Except in Montana, the total purchases of electricity by forest products' manufacturing plants are probably not much less than the purchases of all other manufacturing industries combined. The process of reducing wood to useful products is one of the important sources of demand for the output of electric generating and distributing systems in the Pacific Northwest.

Importance of Forest Products Industries to Pacific Northwest Communities

One further method by which the economic importance of forest industries might be studied would be to observe the effects on economic life of communities of the rise and fall of forest industries. Particularly where the forest industry disappears, the effect on economic and social conditions in the locality may give a good picture of the importance of the industry. Some attempt has been made in this study to approach the problem from this direction, and it has been discovered that there are at least 76 instances in which towns devoted to wood products industries have completely disappeared. Another list of 77 towns was compiled of mill towns in which decline in population has been associated with the abandonment of mills.

To secure an accurate picture, however, of the importance of the mills in the lives of these towns and of other communities would require a series of case studies. Such studies, if properly conducted, could, in all likelihood, reveal far more about the full effects of the rise and fall in the rate of exploitation of our lumber resource than can be secured by any other means. Figures of numbers gainfully employed, of significance in the export balance of the Region, and of importance to transportation agencies, emphasize the importance of the forest resource in the economy of the Pacific Northwest. They provide, however, entirely inadequate bases for judgment as to the effects of depletion of this resource on the livelihood of the people. Where forests are treated as exhaustible resources, many of the communities started are doomed to be short-lived. It is impossible under such conditions to provide the types of social services, housing, and other facilities necessary for a satisfactory social environment. There is also some reason to believe that with the passing of an industry, population does not decline as rapidly as employment, and tends to linger on at a reduced standard of living.

The cost involved in this process of building up and then abandoning temporary communities is very difficult to determine. There can be no question, however, that they are very real and that the economic importance of the forest industries to the population of the Pacific Northwest can be greatly increased if a forest program can be developed which will make possible stable populations in stable communities.

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TABLE A.—Employment by industries in Pacific Northwest in 1930

Industry group	Idaho			
	Gainful workers	Unem- ployed classes A and B ¹	Gainful workers minus classes A and B ¹	
	Number	Number	Number	Percent
Agriculture.....	65,561	1,260	64,301	41.6
Fishing.....	² 26		² 26	0
Extraction of minerals.....	6,514	648	5,866	3.8
Manufacturing and mechanical industries— except forest products.....	15,484	1,196	14,288	9.2
Forest products industries.....	11,928	1,201	10,727	6.9
Transportation.....	14,034	586	13,448	8.7
Trade.....	18,947	527	18,420	11.9
Public service (n. e. c.) ³	2,575	32	2,543	1.6
Professional service.....	12,127	192	11,935	7.7
Domestic and personal.....	10,132	511	9,621	6.3
Industry not specified.....	4,395	1,316	3,079	2.3
Total.....	162,223	7,469	154,754	100.0

Industry group	Montana			
	Gainful workers	Unem- ployed classes A and B ¹	Gainful workers minus classes A and B ¹	
	Number	Number	Number	Percent
Agriculture.....	79,678	1,966	77,712	38.6
Fishing.....	² 31		² 31	0
Extraction of minerals.....	17,655	3,977	13,678	6.8
Manufacturing and mechanical industries— except forest products.....	24,403	2,754	21,649	10.8
Forest products industries.....	5,526	791	4,735	2.3
Transportation.....	23,379	1,476	21,903	10.8
Trade.....	24,303	858	23,445	11.6
Public service (n. e. c.) ³	4,469	120	4,349	2.2
Professional service.....	15,802	305	15,497	7.7
Domestic and personal.....	16,202	970	15,232	7.6
Industry not specified.....	5,023	1,790	3,233	1.6
Total.....	216,471	15,007	201,464	100.0

Industry group	Oregon			
	Gainful workers	Unem- ployed classes A and B ¹	Gainful workers minus classes A and B ¹	
	Number	Number	Number	Percent
Agriculture.....	82,031	2,475	79,556	20.9
Fishing.....	2,081	254	1,827	.5
Extraction of minerals.....	2,644	446	2,198	.6
Manufacturing and mechanical industries— except forest products.....	66,587	5,700	60,887	16.0
Forest products industries.....	52,171	5,402	46,769	12.2
Transportation.....	44,670	3,078	41,592	10.9
Trade.....	67,893	2,739	65,154	17.1
Public service (n. e. c.) ³	8,143	203	7,940	2.0
Professional service.....	34,175	1,115	33,060	8.7
Domestic and personal.....	37,029	2,575	34,454	9.0
Industry not specified.....	12,256	4,770	7,486	2.0
Total.....	409,680	28,722	380,958	100.0

Industry group	Washington			
	Gainful workers	Unem- ployed classes A and B ¹	Gainful workers minus classes A and B ¹	
	Number	Number	Number	Percent
Agriculture.....	104,294	2,390	101,904	16.5
Fishing.....	5,694	888	4,806	.8

TABLE A.—Employment by industries in Pacific Northwest in 1930—Continued

Industry group	Washington			
	Gainful workers	Unem- ployed classes A and B ¹	Gainful workers minus classes A and B ¹	
	Number	Number	Number	Percent
Extraction of minerals.....	6,862	1,224	5,638	0.9
Manufacturing and mechanical industries— except forest products.....	120,572	12,116	108,456	17.5
Forest products industries.....	84,897	8,556	76,341	12.4
Transportation.....	72,768	4,621	68,147	11.0
Trade.....	115,788	4,384	111,404	18.0
Public service (n. e. c.) ³	19,517	296	19,221	3.1
Professional service.....	51,586	1,503	50,083	8.1
Domestic and personal.....	60,191	3,796	56,395	9.1
Industry not specified.....	22,644	6,663	15,981	2.6
Total.....	664,813	46,437	618,376	100.0

Industry group	Pacific Northwest			
	Gainful workers	Unem- ployed classes A and B ¹	Gainful workers minus classes A and B ¹	
	Number	Number	Number	Percent
Agriculture.....	331,564	8,091	323,473	23.8
Fishing.....	7,832	1,142	6,690	.5
Extraction of minerals.....	35,645	6,295	27,380	2.0
Manufacturing and mechanical industries— except forest products.....	227,046	21,766	205,280	15.1
Forest products industries.....	154,522	15,950	138,572	10.3
Transportation.....	154,851	9,761	145,090	10.7
Trade.....	226,931	8,508	218,423	16.1
Public service (n. e. c.) ³	34,704	651	34,053	2.5
Professional service.....	113,690	3,115	110,575	8.2
Domestic and personal.....	123,554	7,852	115,702	8.6
Industry not specified.....	44,818	14,539	30,279	2.2
Total.....	1,453,187	97,640	1,355,547	100.0

¹ Class A Unemployed, "Persons out of a job, able to work, and looking for a job."
² Class B Unemployed, "Persons having jobs, but on lay-off without pay, excluding those sick or voluntarily idle."
³ Census of 1930, Occupation Statistics.
⁴ Not elsewhere classified.
 Source: Census of 1930, Unemployment, Volume I.

TABLE B.—Employment of males by industries in the Pacific Northwest in 1930

Industry group	Idaho			
	Gainful workers	Unem- ployed classes A and B ¹	Gainful workers minus classes A and B ¹	
	Number	Number	Number	Percent net work- ers
Agriculture.....	64,121	1,217	62,904	47.1
Fishing.....	²⁶		²⁶	0
Extraction of minerals.....	6,454	647	5,807	4.4
Manufacturing and mechanical industries— except forest products.....	13,927	1,051	12,876	9.7
Forest products industries.....	11,784	1,191	10,593	7.9
Transportation.....	12,857	556	12,301	9.3
Trade.....	14,909	325	14,584	10.9
Public service (n. e. c.) ²	2,076	31	2,045	1.5
Professional service.....	5,663	82	5,581	4.2
Domestic and personal.....	3,514	162	3,352	2.5
Industry not specified.....	4,541	1,249	3,292	2.5
Total.....	139,872	6,511	133,361	100.0

¹ Class A unemployed, "Persons out of a job, able to work, and looking for a job."
² Class B unemployed, "Persons having jobs, but on layoff without pay, excluding those sick or voluntarily idle."
³ Not elsewhere classified.

TABLE B.—Employment of males by industries in the Pacific Northwest in 1930—Continued

Industry group	Montana			
	Gainful workers	Unem- ployed classes A and B ¹	Gainful workers minus classes A and B ¹	Percent net work- ers
	Number	Number	Number	
Agriculture.....	77,523	1,927	75,596	44.4
Fishing.....	30		30	0
Extraction of minerals.....	17,540	3,973	13,567	8.0
Manufacturing and mechanical indus- tries—except forest products.....	22,602	2,651	19,951	11.7
Forest products industries.....	5,445	787	4,658	2.7
Transportation.....	21,767	1,439	20,328	11.9
Trade.....	18,965	608	18,357	10.8
Public service (n. e. c.) ²	3,755	112	3,643	2.1
Professional service.....	6,545	143	6,402	3.8
Domestic and personal.....	5,357	371	4,986	2.9
Industry not specified.....	4,588	1,690	2,898	1.7
Total.....	184,117	13,701	170,416	100.0

Industry group	Oregon			
	Gainful workers	Unem- ployed classes A and B ¹	Gainful workers minus classes A and B ¹	Percent net work- ers
	Number	Number	Number	
Agriculture.....	78,869	2,294	76,575	25.3
Fishing.....	2,074	254	1,820	.6
Extraction of minerals.....	2,607	442	2,165	.7
Manufacturing and mechanical indus- tries—except forest products.....	56,729	7,170	49,559	16.4
Forest products industries.....	50,470	5,219	45,251	15.0
Transportation.....	40,503	2,947	37,556	12.4
Trade.....	50,667	1,915	48,752	16.2
Public service (n. e. c.) ²	6,896	173	6,723	2.2
Professional service.....	15,647	464	15,183	5.0
Domestic and personal.....	12,953	864	12,089	4.0
Industry not specified.....	10,944	4,467	6,477	2.2
Total.....	328,359	26,209	302,150	100.0

¹ Class A unemployed, "Persons out of a job, able to work, and looking for a job."
Class B unemployed, "Persons having jobs, but on layoff without pay, excluding those sick or voluntarily idle."
² Not elsewhere classified.

TABLE B.—Employment of males by industries in the Pacific Northwest in 1930—Continued

Industry group	Washington			
	Gainful workers	Unem- ployed classes A and B ¹	Gainful workers minus classes A and B ¹	Percent net work- ers
	Number	Number	Number	
Agriculture.....	99,523	2,276	97,247	19.5
Fishing.....	5,631	884	4,747	1.0
Extraction of minerals.....	6,768	1,221	5,547	1.1
Manufacturing and mechanical indus- tries—except forest products.....	106,788	11,128	95,660	19.2
Forest products industries.....	82,297	8,361	73,936	14.8
Transportation.....	66,156	4,400	61,696	12.4
Trade.....	86,401	2,850	83,551	16.8
Public service (n. e. c.) ²	17,688	261	17,427	3.5
Professional service.....	24,766	745	24,021	4.8
Domestic and personal.....	22,117	1,380	20,737	4.2
Industry not specified.....	19,581	6,016	13,565	2.7
Total.....	537,716	39,582	498,134	100.0

Industry group	Pacific Northwest			
	Gainful workers	Unem- ployed classes A and B ¹	Gainful workers minus classes A and B ¹	Percent net work- ers
	Number	Number	Number	
Agriculture.....	320,036	7,714	312,322	28.3
Fishing.....	7,761	1,138	6,623	.6
Extraction of minerals.....	33,369	6,283	27,086	2.5
Manufacturing and mechanical indus- tries—except forest products.....	200,046	22,000	178,046	16.1
Forest products industries.....	149,996	15,558	134,438	12.2
Transportation.....	141,283	9,402	131,881	11.9
Trade.....	170,942	5,698	165,244	15.0
Public service (n. e. c.) ²	30,415	577	29,838	2.7
Professional service.....	52,621	1,434	51,187	4.6
Domestic and personal.....	43,941	2,777	41,164	3.7
Industry not specified.....	39,654	13,422	26,232	2.4
Total.....	1,190,064	86,063	1,104,061	100.0

¹ Class A unemployed, "Persons out of a job, able to work, and looking for a job."
Class B unemployed, "Persons having jobs, but on layoff without pay, excluding those sick or voluntarily idle."

Source: Census of 1930, Unemployment, Volume I.

TABLE C.—Tonnage of totals of net exports of Pacific Northwest States by commodity groups, 1929

[In thousand short tons]

Location	Agricultural products	Percent	Animals and products	Percent	Mine products	Percent	Forest products	Percent	Manufactures and miscellaneous	Percent	Total	Percent
Idaho.....	1,176	34.5	155	4.5	305	9.0	1,630	47.9	140	4.1	3,406	100
Montana.....	1,308	65.3	253	12.7	28	1.4	171	8.6	240	12.0	1,995	100
Oregon.....	396	6.8	74	1.3	3	(1)	5,229	89.2	157	2.7	5,859	100
Washington.....	1,455	14.5	64	.7	52	.5	8,036	80.2	412	4.1	10,018	100
Total.....	4,330	20.3	546	2.6	388	1.8	15,066	70.8	949	4.5	21,278	100

¹ Less than 0.5 percent.

TABLE D.—Estimated value of totals of net exports of Pacific Northwest States by commodity groups, 1929

[In thousand dollars]

Location	Agricultural products	Percent	Animals and products	Percent	Mine products	Percent	Forest products	Percent	Manufactures and miscellaneous	Percent	Total	Percent
Idaho.....	49,436	33.5	44,698	30.3	18,713	12.7	23,876	16.2	10,866	7.3	147,589	100
Montana.....	52,351	36.3	56,483	39.2	332	.2	2,829	2.0	32,164	22.3	144,159	100
Oregon.....	24,846	13.1	19,780	10.5	192	.1	120,982	63.9	23,560	12.4	189,360	100
Washington.....	80,012	21.5	25,601	6.9	471	.1	200,845	53.9	65,435	17.6	372,364	100
Total.....	206,645	24.2	146,562	17.2	19,708	2.3	348,532	40.8	132,025	15.5	853,472	100

Sources: I. C. C. Freight Commodity Statistics, 1929. Railroad Reports to State Public Utilities Commissioners, 1929. Foreign Commerce and Navigation, 1929, Bureau of Foreign and Domestic Commerce. Annual Report of the Chief of Engineers, U. S. Army, 1930. Harbor Reports of Tacoma and Seattle, Wash., and Portland, Oreg., 1930. Further sources for value figures, listed in Appendix No. 2, table H.

TABLE E.—Tonnage of totals of net imports of Pacific Northwest States by Commodity groups, 1929

[In thousand short tons]

Location	Agricultural products	Percent	Animals and products	Percent	Mine products	Percent	Forest products	Percent	Manufactures and miscellaneous	Percent	Total	Percent
Idaho.....	39	2.6	2	0.1	931	62.3	7	0.5	516	34.5	1,495	100
Montana.....	83	5.1	3	.2	1,072	65.1	15	.9	473	28.7	1,646	100
Oregon.....	235	6.6	18	.5	625	17.5	123	3.4	2,579	72.0	3,580	100
Washington.....	296	4.4	99	1.5	1,316	19.7	738	11.1	4,226	63.3	6,675	100
Total.....	653	4.9	122	.9	3,944	29.4	883	6.6	7,794	58.2	13,396	100

TABLE F.—Estimated value of totals of net imports of Pacific Northwest States by commodity groups, 1929

[In thousand dollars]

Location	Agricultural products	Percent	Animals and products	Percent	Mine products	Percent	Forest products	Percent	Manufactures and miscellaneous	Percent	Total	Percent
Idaho.....	2,714	3.7	635	0.9	5,230	7.0	923	1.2	64,770	87.2	74,272	100
Montana.....	5,532	5.2	938	.9	29,283	27.6	1,950	1.8	68,543	64.5	106,246	100
Oregon.....	17,062	8.8	5,858	3.0	7,517	3.9	348	.2	163,202	84.1	193,987	100
Washington.....	17,649	5.3	23,743	7.1	33,340	10.0	7,092	2.1	251,998	75.5	333,822	100
Total.....	42,957	6.1	31,174	4.4	75,370	10.6	10,313	1.5	548,513	77.4	708,327	100

Sources: I. C. C. Freight Commodity Statistics, 1929. Railroad Reports to State Public Utilities Commissioners, 1929. Foreign Commerce and Navigation, 1929, Bureau of Foreign and Domestic Commerce. Annual Report of the Chief of Engineers, U. S. Army, 1930. Harbor Reports of Tacoma and Seattle, Wash., and Portland, Oreg., 1930. Further sources for value figures listed in Appendix No. 2, table H.

TABLE G.—Tonnage and estimated value of net exports and net imports of Pacific Northwest States in 1929, by commodities and States

NOTE.—Net exports and net imports by commodities in this table are subject to any errors in the original sources used. Two additional sources of error should be mentioned: (1) No adjustment was made for stocks on hand at the beginning and end of the year. As a result, net exports are shown in some instances for commodities not produced in the region. Examples are: Cotton, anthracite coal, and petroleum products, not elsewhere specified. (2) For some of the small railroads, data were not available by commodities, and the movement on these roads was not included. Most of these roads were connected with forest industries, and traffic originating on them frequently terminated on other lines in the area. As a result, some commodities produced in the area are shown with net imports. Examples are: Fuel wood; pulpwood; gravel and sand; and stone, ground or crushed. In the case of copper and copper products originating on the Butte, Anaconda & Pacific R. R. in Montana, it was possible to estimate the tonnage from the reports of "received from connecting carrier" made by other railroads.

[In thousands of dollars and in short tons]

Class No.	Commodity	Idaho				Montana				Oregon				Washington				Pacific Northwest			
		Net exports		Net imports		Net exports		Net imports		Net exports		Net imports		Net exports		Net imports		Net exports		Net imports	
		Tons	Dollars	Tons	Dollars	Tons	Dollars	Tons	Dollars	Tons	Dollars	Tons	Dollars	Tons	Dollars	Tons	Dollars	Tons	Dollars	Tons	Dollars
GROUP I, PRODUCTS OF AGRICULTURE																					
110	Wheat	510,241	17,006			1,035,558	34,173														
111	Corn			21,466	791																
112	Oats	6,730	202			7,168	211														
113	Barley and rye	9,101	247			8,794	227														
114	Rice																				
119	Rice, n. o. s.																				
120	Flour, wheat	218	9			21	1														
121	Meal, corn	43,106	2,471			134,432	8,147			261,732	15,450			403,082	23,895			842,352	49,963		
122	Flour and meal, edible, n. o. s.																				
123	Cereal food preparations, edible, n. o. s.	45	3																		
129	Mill products, n. o. s.																				
130	Hay and alfalfa	8,045	264			38,703	1,227			4,044	174			44,682	1,960			95,474	3,625		
131	Straw	6,785	71			15,234	180							4,749	72			20,841	253		
140	Tobacco, leaf	13	(1)			114	1														
150	Cotton, in bales, linters, etc.																				
151	Cottonseed																				
152	Cottonseed meal and cake																				
160	Citrus fruits																				
161	Apples, fresh																				
162	Berries, fresh	99,424	4,494			262	16			41,917	1,978			558,574	30,163			700,177	36,651		
163	Grapes, fresh									5,504	822			5,557	922			10,586	1,658		
164	Peaches, fresh																				
165	Watermelons	856	48																		
166	Cantaloupes and melons, n. o. s.																				
167	Fruits, fresh, domestic, n. o. s.																				
168	Bananas	24,158	935							52,762	3,026			92,371	6,372			164,937	10,012		
169	Fruits, fresh, tropical, n. o. s.																				
170	Potatoes	366,487	15,147			1,800	105														
171	Cabbage																				
172	Onions	8,555	150																		
173	Tomatoes																				
179	Vegetables, fresh, n. o. s.																				
180	Fruits, dried and evaporated	2,121	92																		
186	Beans and peas, dried	841	109																		
189	Vegetables, dried, n. o. s.	70,093	7,687			20,088	1,948			22,419	3,139										
190	Peanuts																				
191	Flaxseed																				
192	Sugar beets																				
193	Vegetable oil cake and meal (except cottonseed)	17,836	128																		
199	Products of agriculture, n. o. s.	1,245	372																		
1000	Total, products of agriculture	1,175,900	49,436	38,954	2,714	1,302,533	52,351	83,024	5,532	396,323	24,846	235,231	17,062	1,455,361	80,012	296,140	17,649	4,206,916	197,113	530,148	33,826
GROUP II. ANIMALS AND ANIMAL PRODUCTS																					
201	Horses, mules, ponies, asses	3,418	649			25,568	3,762														
210	Cattle and calves	42,236	7,166			121,862	22,559			10,161	1,873			3,135	708			28,887	4,561		
220	Sheep and lambs	55,666	11,470			38,095	7,879			44,498	9,014			10,832	2,204			135,791	24,406		
230	Hogs	17,314	3,151			37,400	6,582											149,691	30,568		
240	Meats, fresh, n. o. s.																				
245	Meats, cured, dried or smoked																				
249	Packing-house products, edible, n. o. s. (not including canned meats)																				
250	Poultry, live																				
251	Poultry, dressed	216	75																		
260	Eggs	3,309	1,302																		
270	Butter	3,849	1,386																		
275	Cheese	9,698	8,808																		
280	Butterine and margarine	5,462	2,509																		
290	Wool	10,614	6,674																		

¹ Less than 0.5 thousand dollars.

TABLE G.—Tonnage and estimated value of net exports and net imports of Pacific Northwest States in 1929, by commodities and States—Continued

Class No.	Commodity	Idaho				Montana				Oregon				Washington				Pacific Northwest			
		Net exports		Net imports		Net exports		Net imports		Net exports		Net imports		Net exports		Net imports		Net exports		Net imports	
		Tons	Dollars	Tons	Dollars	Tons	Dollars	Tons	Dollars	Tons	Dollars	Tons	Dollars	Tons	Dollars	Tons	Dollars	Tons	Dollars	Tons	Dollars
GROUP II. ANIMALS AND ANIMAL PRODUCTS—continued																					
292	Hides, green	1,255	326			3,437	894			3,105	807			6,580	1,711			14,377	3,738		
296	Fish or sea-animal oil							13	2	122	21				1,349	229			1,240	210	
299	Animals and products, n. o. s. (other than fertilizers and fertilizer materials)	2,247	1,181			3,123	1,642							4,995	2,676			8,179	4,653		
2000	Total, animals and animal products	155,374	44,698	2,210	635	252,831	56,483	2,847	938	74,308	19,780	18,096	5,859	63,511	25,601	98,963	23,743	445,966	122,800	22,058	7,414
GROUP III. PRODUCTS OF MINES																					
301	Anthracite coal			1,955	35			221	4			227	4	6,596	105			4,193	63		
305	Bituminous coal			860,645	4,785			595,050	3,904			280,940	2,194			622,536	5,204		2,359,171	16,087	
310	Coke			23,032	209			41,356	416			5,041	57			17,788	206		87,217	887	
320	Iron ore													153	(1)			153	(1)	492,503	26,876
330	Ores and concentrates, n. o. s.	250,395	18,306					323,183	23,799	2,677	192										
340	Gravel and sand (other than glass or molding)			7,655	6	11,028	3					24,857	27			46,788	45		68,272	75	
350	Stone, broken, ground or crushed			19,220	24	1,995	2					880	1			3,382	5		21,487	28	
360	Stone, rough and finished, n. o. s.	6,386	15			2,958	7					2,763	29			7,081	125		500	133	
370	Petroleum, crude	123	1					81,880	841			161,425	1,291	8,966	72				234,216	2,059	
380	Asphalt (natural, byproduct, or petroleum)			2,628	40			10,624	161			11,992	144			14,446	173		39,690	518	
390	Salt			15,082	117			19,914	149			29,378	241	35,000	287				29,374	220	
392	Phosphate rock, crude	39,952	141			1,940	17					128	1	1,139	6			42,903	164	47,230	1,464
394	Sulphur (brimstone)			426	13							22,669	703			23,834	739		223,657	7,540	
399	Products of mines, n. o. s.	8,250	249			10,041	303					84,456	2,825			157,492	5,268				
3000	Total, products of mines	305,106	18,713	930,643	5,230	27,962	332	1,072,529	29,283	2,677	192	624,756	7,517	51,854	471	1,315,739	33,340	47,249	227	3,603,317	55,889
GROUP IV. PRODUCTS OF FORESTS																					
401	Logs	553,398	2,009			8,644	27					18,789	72			147,936	549	395,317	1,415		
402	Posts, poles, and piling	83,872	600			51,716	370			57,316	502			129,869	1,136			322,773	2,609		
410	Wood (fuel)	30,599	61			805	2					83,520	132			127,008	201		179,124	270	
420	Ties, railroad	63,705	520			13,832	113			136,304	1,581			98,463	1,111			312,304	3,325		
430	Pulpwood	141,950	606			6,112	26					18,522	79			393,854	1,682	12,208,392	254,028	264,314	1,129
440	Lumber, shingles, and lath	731,088	18,482			85,980	1,881			4,470,306	91,507			6,921,018	142,158			176,932	16,966		
443	Building woodwork (millwork)			556	55	3,970	381			46,842	4,492			126,676	12,148			591,127	9,774		
445	Box, crate, and cooperage materials	18,632	321					1,104	22	280,229	4,823			293,370	4,653			91,535	6,645		
447	Veneer and built-up wood	638	46							5,592	406			85,305	6,193			6,078	1,943		
450	Furniture, wood			1,470	508			3,250	1,122	9,747	3,220								6,101		
460	Wood pulp									176,225	9,974			173,929	6,166			172,203	6,101		
470	Newsprint paper			2,165	135			5,476	327	176,225	9,974					60,501	3,876	108,083	5,637		
474	Paper bags and wrapping paper			1,683	158			3,153	298	34,771	3,090					8,570	762	21,365	1,872		
476	Paperboard, pulpboard, and wallboard (paper)			1,089	61			1,527	83	3,134	159					467	24	51			8
479	Paper, n. o. s.			89	11			791	98	4,878	586			175,229	21,050			179,227	21,527		
499	Products of forests, n. o. s.	6,303	1,230			151	29			3,358	642			30,770	5,882			40,582	7,784		
4000	Total, products of forests	1,630,185	23,876	7,052	923	171,210	2,829	15,301	1,950	5,228,702	120,982	122,557	348	8,035,680	200,845	738,336	7,092	14,625,969	339,626	443,438	1,407
GROUP V. MANUFACTURES AND MISCELLANEOUS																					
501	Petroleum oils, refined, and all other gasolines			193,319	7,153			184,332	6,525			442,879	15,430			1,086,478	37,853		1,907,008	66,961	
503	Fuel, road, and petroleum residual oils, n. o. s.			36,228	441			18,637	203			1,367,092	14,997			2,060,454	22,603		3,482,411	38,245	
506	Lubricating oil and greases			11,225	838			16,301	1,218			29,343	2,045			90,860	6,333		147,729	10,434	
509	Petroleum products, n. o. s.			63	6			166	16			1,735	161			255,022	23,049		253,008	22,866	
510	Canned food products, n. o. s.			3,644	646			22,108	4,017	86,624	14,589			53,800	9,514			114,672	19,440		
520	Sugar (beet or cane)	44,074	4,130			22,493	2,108					72,023	7,496			100,034	11,639		105,490	12,897	
524	Table sirups and edible molasses			1,855	150			1,617	131			9,250	685			35,369	2,618		48,091	3,584	
528	Molasses and beet residual			192	1	4,898	21					2,484	14	4,787	26			7,009	32		
530	Iron, pig			316	8			303	8			4,291	115			12,442	333		17,352	465	
531	Iron and steel, rated sixth class in I. C. C. official classification, n. o. s.											125,436	6,765			342	18		125,778	6,783	

532	Rails, fastenings, frogs, and switches.....			1,907	127			1,440	96			10,424	695			1,601	107			15,372	1,025
533	Railway car wheels, axles, and trucks.....			625	69			1,332	147			1,310	144	84	9					3,183	351
534	Cast-iron pipes and fittings.....			1,872	118			2,708	171			3,642	230			13,199	835			21,421	1,355
535	Iron and steel pipes and fittings, n. o. s.....			3,878	390			25,078	2,703			591	64			49,773	5,366			79,120	8,529
536	Iron and steel: Nail and wire not woven.....			4,001	357			4,712	421			12,383	1,105			12,094	1,079			33,190	2,962
537	Iron and steel: Rated fifth class in I. C. C. official classification, n. o. s. (also tin and terne plate).....			11,166	819			12,225	897			54,635	4,010			27,996	2,055			106,022	7,781
538	Scrap iron and scrap steel.....	11,614	290					526	13	31,328	782				12,010	300	30,406	759			
540	Copper: Ingot, pig, or slab.....	1,830	663			13,281	4,808					13,480	3,278	49,410	17,815						
541	Copper, brass, and bronze: Bar, sheet, and pipe.....	45	19			32,652	13,823			8,297	3,694			29,187	12,356			70,181	29,891		
545	Lead and zinc: Ingot, pig, or bar.....	79,723	5,710			145,726	10,438			8,164	714					23,167	1,991	210,446	14,872		
548	Aluminum: Ingot, pig, or slab.....					110	55									110	55				
550	Cement, Portland (building).....			30,125	344			2,173	25			40,451	462	9,108	104					63,641	727
552	Brick, common.....			9,991	82			233	3			2,213	24			1,181	13			13,618	122
553	Brick, n. o. s. and building tile.....	1,834	24					3,702	67			18,325	333			33,965	617			54,158	993
554	Sewer pipe and drain tile (not metal).....			2,507	36			5,029	82			4,734	77			1,511	25			13,781	219
555	Artificial stone, n. o. s.....			381	8			485	6			1,641	22	1,002	10					1,705	26
557	Lime, common (quick or slaked).....	85	1					418	5			6,744	75			757	8			7,834	87
558	Plaster (stucco or wall) and dry kalso- mine.....			6,566	74	17,047	152					16,079	190			28,622	339			34,220	451
560	Tractors and parts.....			3,159	1,713			11,880	6,440			4,176	2,290			4,593	2,518			23,808	12,961
562	Agricultural implements and parts, n. o. s.....			8,334	2,460			26,230	8,226			6,014	1,822			7,850	2,498			48,428	15,005
567	Automobiles and autotrucks and parts n. o. s.....			26,229	14,058			37,660	20,239			65,727	39,677			89,273	54,010			218,889	127,985
568	Automobile and autotruck tires.....			479	415			1,491	1,291			3,455	3,114			4,091	3,568			9,516	8,387
570	Fertilizers, n. o. s.....			59	3	396	9					17,595	912			191,226	11,366			208,484	12,272
571	Alcohol, denatured or wood.....			386	62			298	48	73	11					886	135			1,497	234
572	Sulphuric acid.....			1,202	28			2,338	55			1,065	19			507	8			5,112	111
573	Explosives, n. o. s.....			3,356	972			2,263	719			2,738	762	9,532	2,551			1,175	98		
575	Paints, pigments, and varnishes.....			829	191			1,925	442			10,044	2,309			14,304	3,288			27,102	6,230
576	Rosin.....			19	3			31	2			3,495	256			1,676	122			5,202	380
577	Turpentine.....			3,059	466			111	18			156	25			129	21			415	67
578	Soap and washing compounds.....			4,999	761			4,999	761			11,159	1,484			17,487	2,325			36,704	5,036
580	Dry goods and wearing apparel, n. o. s.....			15	19			15	19			615	793			7,095	9,150			7,725	9,963
585	Bagging and bags, burlap, gunny or jute.....			5,352	1,551			1,245	361			2,233	638			7,544	2,155			16,374	4,704
590	Tobacco, manufactured products.....	20	25			593	746					5,679	9,882			4,549	6,823			9,615	15,935
591	Glass: Flat; bottles, jars; and jelly glasses.....			2,510	430			2,806	480			12,039	2,060			13,145	2,249			30,500	5,219
592	Cottonseed oil.....			422	86			96	18			943	172			1,300	238			2,339	427
593	Linseed oil.....			46	8			363	74	3,978	814					1,327	271	1,866	382		
594	Vegetable oils, n. o. s.....			93	15			46	8	18,503	2,957					5,941	1,362	12,423	1,572		
596	Ice.....	995	4					14,866	72			2,804	15			1,988	9			18,663	91
597	Furnace slag.....			190	(1)	2,483	3											2,295	3		
598	Prepared roofing materials (not forest).....			5,312	356			6,302	423			22,516	1,510		2	(1)					
599	Manufactures and miscellaneous, n. o. s.....			135,418	30,286			54,076	12,094			165,629	37,043			14,358	963			48,488	3,251
5000	Total manufactures and miscella- neous.....	140,220	10,866	516,269	64,770	239,679	32,164	472,566	68,544	156,967	23,560	2,579,317	163,202	411,934	65,435	4,225,960	251,998	754,522	109,923	7,599,834	526,411

¹ Less than 0.5 thousand dollars.

Sources: I. C. C. freight commodity statistics; railroad reports to State Public Utilities Commission; foreign commerce and navigation, Bureau of Foreign and Domestic Commerce; Annual Report, Chief Engineers, U. S. Army; Harbor reports, Tacoma, Seattle, and Portland; further sources for value data, listed appendix 2, table H.

TABLE H.—Commodities and types of prices used in determining values of imports and exports by commodity groups

No.	Commodities and prices	Sources for prices
GROUP I. PRODUCTS OF AGRICULTURE		
110	Wheat. Farm prices—Idaho, Montana, Oregon, and Washington.	Farm Value, Gross Income, and Cash Income From Farm Production, 1929, Bureau of Agricultural Economics, U. S. Department of Agriculture.
111	Corn. Weighted average farm price 12 Midwestern States, plus freight and marketing.	Do.
112	Oats. Farm prices—Idaho, Montana, Oregon, and Washington.	Do.
113	Barley and rye. Weighted average farm prices—Idaho, Montana, Oregon, and Washington.	Do.
114	Rice, blue rose, clean. Average wholesale price—New Orleans, plus freight.	Yearbook, 1930, U. S. Department of Agriculture.
119	Buckwheat. United States estimated farm price.	Do.
120	Flour, wheat. Average price, f. o. b. mills—Idaho, Montana, Oregon, and Washington.	Census of Manufactures, 1929, U. S. Department of Commerce.
121	Meal, corn. United States average wholesale price, f. o. b. mill, plus freight from Midwest points.	Census of Distribution, 1929, U. S. Department of Commerce.
122	Rye flour. United States average wholesale price, f. o. b. mill.	Do.
123	Corn breakfast foods ready to eat, oat meal, flaked and rolled oats, wheat breakfast foods to be cooked, wheat breakfast foods ready to eat, and cereal foods, n. e. s. Weighted average United States wholesale price, plus freight from Midwest points.	Statistical Abstract, 1930, U. S. Department of Commerce.
129	Mixed dairy and poultry feeds, prepared and mixed feeds and other feeds, including screenings. Weighted average prices, f. o. b. mills—Idaho, Montana, Oregon, and Washington.	Census of Manufactures, 1929, U. S. Department of Commerce.
130	All hay. Farm prices—Idaho, Montana, Oregon, and Washington.	Farm Value, Gross Income, and Cash Income From Farm Production, 1929, Bureau of Agricultural Economics, U. S. Department of Agriculture.
131	Straw. Wholesale prices in Idaho, Montana, Oregon, and Washington. (Average wholesale prices in large cities in respective States.)	Trade associations.
140	Tobacco, leaf. Average United States wholesale price, plus freight from Kentucky and Virginia.	Yearbook, 1930, U. S. Department of Agriculture.
150	Cotton, middling and linters. Wholesale prices—New Orleans, plus freight.	Statistical Abstract, 1930, U. S. Department of Commerce.
151	Cottonseed. Weighted average United States farm price, plus freight from Memphis and marketing costs.	Farm Value, Gross Income, and Cash Income From Farm Production, 1929, Bureau of Agricultural Economics, U. S. Department of Agriculture.
152	Cottonseed meal, prime. Wholesale price—Memphis, plus freight.	Statistical Abstract, 1930, U. S. Department of Commerce.
160	Citrus fruits. Weighted average farm price—oranges, 7 States; grapefruit, 4 States; and lemons and limes, 1 State; plus freight and marketing.	Crops and Markets, 1930, U. S. Department of Agriculture.
161	Apples. Farm prices—Idaho, Montana, Oregon, and Washington.	Farm Value, Gross Income, and Cash Income From Farm Production, 1929, Bureau of Agricultural Economics, U. S. Department of Agriculture.
162	Strawberries and cranberries. Oregon and Washington—weighted average farm prices respective States; Idaho and Montana—average Oregon, Washington, and Utah farm prices, plus freight and marketing.	Do.
163	Grapes. California farm price, plus freight and marketing.	Do.
164	Peaches. Idaho and Washington—farm prices respective States; Montana and Oregon—average California, Idaho, and Washington farm prices, plus freight and marketing.	Do.
165	Watermelons. Weighted average farm prices for early and late California's, plus freight and marketing.	Crops and Markets, 1930, U. S. Department of Agriculture.
167	Cherries, pears, and prunes. Idaho, Oregon, and Washington—weighted average farm prices respective States; Montana—average Idaho, Oregon, and Washington farm prices, plus freight and marketing.	Crops and Markets, 1929, U. S. Department of Agriculture.
168	Bananas. Foreign import value, plus freight and marketing.	Statistical Abstract, 1930, U. S. Department of Commerce.
169	Figs and olives, California, and pineapples, Florida. Weighted average farm prices, plus freight and marketing.	Farm Value, Gross Income, and Cash Income From Farm Production, 1929, Bureau of Agricultural Economics, U. S. Department of Agriculture.

TABLE H.—Commodities and types of prices used in determining values of imports and exports by commodity groups—Continued

No.	Commodities and prices	Sources for prices
GROUP I. PRODUCTS OF AGRICULTURE—contd.		
170	Potatoes, white. Farm prices—Idaho, Montana, Oregon, and Washington.	Farm Value, Gross Income, and Cash Income From Farm Production, 1929, Bureau of Agricultural Economics, U. S. Department of Agriculture.
171	Cabbage. Average California, Colorado, Texas, and Utah farm prices, plus freight and marketing.	Do.
172	Onions. Idaho, Oregon, and Washington—farm prices respective States; Montana—average Idaho, Oregon, and Washington farm prices, plus freight and marketing.	Do.
173	Tomatoes (market). Idaho and Montana—average California and Utah farm prices, plus freight and marketing; Oregon and Washington—California farm price plus freight and marketing.	Do.
179	Idaho—celery and lettuce. Weighted average farm price.	Crops and Markets, 1929, U. S. Department of Agriculture.
180	Washington—asparagus, lettuce, spinach, snap beans, and cucumbers. Weighted average farm price.	
186	Montana and Oregon—asparagus (Washington), snap beans (California, Texas, and Washington), cauliflower (California and Utah), carrots (California and Texas), celery (California, Idaho, and Utah), cucumbers (California and Texas), eggplant (Texas), green peas (California), lettuce (California, Idaho, Washington, and Texas), peppers (California and Texas), and spinach (California, Washington, and Texas). Weighted average farm prices, plus freight and marketing.	
189	Idaho and Oregon—dried prunes. Farm prices respective States.	Farm Value, Gross Income, and Cash Income From Farm Production, 1929, Bureau of Agricultural Economics, U. S. Department of Agriculture.
190	Washington—figs and raisins, California. Farm prices plus freight and marketing.	
191	Montana—Dried prunes (Idaho and Oregon) and figs and raisins (California). Average farm price, plus freight and marketing.	Crops and Markets, 1929 and 1930, U. S. Department of Agriculture.
192	Beans, dry. Idaho and Montana—farm price respective States; Oregon and Washington—average Idaho and Montana farm prices, plus freight and marketing.	Farm Value, Gross Income, and Cash Income From Farm Production, 1929, Bureau of Agricultural Economics, U. S. Department of Agriculture.
193	Sweetpotatoes and beets. Weighted average United States farm prices, plus freight and marketing.	Crops and Markets, 1929, U. S. Department of Agriculture.
194	Peanuts. Wholesale price, Norfolk, Va., plus freight and marketing.	Statistical Abstract, 1930, U. S. Department of Commerce.
195	Flaxseed. Montana—farm price. Idaho and Washington—Montana farm price, plus freight and marketing; Oregon—weighted average Montana farm price, plus freight and marketing; and foreign import value, plus duty.	Farm Value, Gross Income, and Cash Income From Farm Production, 1929, Bureau of Agricultural Economics, U. S. Department of Agriculture; and Foreign Commerce and Navigation, 1929, Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce.
196	Sugar beets. Idaho and Montana—farm prices respective States; Oregon and Washington—average Idaho and Montana farm prices, plus freight and marketing.	Farm Value, Gross Income, and Cash Income From Farm Production, 1929, Bureau of Agricultural Economics, U. S. Department of Agriculture.
197	Copra meal, linseed meal and cake, soybean meal and cake, and other oil cake. Washington—weighted average foreign import value; Idaho and Montana—weighted average United States wholesale price, plus freight from Pacific coast.	Foreign Commerce and Navigation, 1929, Bureau of Foreign and Domestic Commerce; and Statistical Abstract, 1930, U. S. Department of Commerce.
198	Idaho—weighted average farm price red and alsike cloverseed, alfalfa seed, and popcorn. Montana—weighted average farm price emmer and spelt, sweet cloverseed, and alfalfa seed.	Farm Value, Gross Income, and Cash Income From Farm Production, 1929, Bureau of Agricultural Economics, and Crops and Markets, 1929, U. S. Department of Agriculture, and Foreign Commerce and Navigation, 1929, Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce.
199	Oregon—weighted average United States farm prices of grain sorghums, emmer and spelt, sweet sorghum, hemp, red cloverseed, alsike cloverseed, alfalfa seed, timothy seed, sweet cloverseed, soybeans, and cowpeas, plus freight and marketing, and foreign import values of spices, seeds, coffee beans, tea, and other foreign vegetables, n. e. s.	
	Washington—weighted average foreign import values of spices, seeds, mushrooms, coffee beans, tea, currants, dates, citron peel, ginger root, nuts, and other vegetables, n. e. s.	

TABLE H.—Commodities and types of prices used in determining values of imports and exports by commodity groups—Continued

No.	Commodities and prices	Sources for prices
GROUP II. ANIMALS AND ANIMAL PRODUCTS		
201	Horses and mules. Weighted average farm prices—Idaho, Montana, Oregon, and Washington.	Farm Value, Gross Income, and Cash Income From Farm Production, 1929, Bureau of Agricultural Economics, U. S. Department of Agriculture.
210	Cattle and calves. Idaho, Montana, and Oregon—weighted average farm prices respective States; Washington—average Idaho, Montana, and Oregon farm prices, plus freight and marketing.	Do.
220	Sheep and lambs. Weighted average farm prices—Idaho, Montana, Oregon, and Washington.	Do.
230	Hogs. Idaho and Montana—farm prices respective States; Oregon and Washington—average Idaho and Montana farm prices, plus freight and marketing.	Do.
240	Fresh veal, lamb, mutton, steer carcasses, and pork loins, hams, and shoulders. Weighted average wholesale price, Chicago plus freight.	Yearbook, 1930, U. S. Department of Agriculture.
245	Beef—pickled and other cured; pork—pickled, dry-salted, and dry-cured, smoked and not smoked, and cook hams. Weighted average United States wholesale price, plus freight from Chicago.	Census of Distribution, 1929, U. S. Department of Commerce.
249	Sausage; meat puddings; headcheese; sausage casings, hog, beef, and other; lard; neutral lard, lard compounds, oleo oil and stock; and stearin (oleo and other). Weighted average United States wholesale price, plus freight from Chicago.	Do.
250	Chickens, live. Farm prices—Idaho, Montana, Oregon, and Washington.	Farm Value, Gross Income, and Cash Income From Farm Production, 1929, Bureau of Agricultural Economics, U. S. Department of Agriculture.
251	Chickens, dressed. Farm prices—Idaho, Montana, Oregon, and Washington.	Do.
260	Eggs. Farm prices—Idaho, Montana, Oregon, and Washington.	Do.
270	Butter. Average wholesale price, San Francisco; Idaho and Montana—San Francisco price, minus freight; Oregon and Washington—San Francisco price, plus freight.	Yearbook, 1930, U. S. Department of Agriculture.
275	Cheese. Average wholesale price, San Francisco; Idaho, Montana, and Oregon—San Francisco price, minus freight; Washington—San Francisco, price plus freight.	Do.
280	Oleomargarine, standard, uncolored. Wholesale price, Chicago; Montana and Oregon—Chicago price, minus freight; Washington—Chicago price, plus freight.	Statistical Abstract, 1930, U. S. Department of Commerce.
290	Wool, unwashed. Estimated farm prices—Idaho, Montana, Oregon, and Washington.	Crops and Markets, 1929, U. S. Department of Agriculture.
292	Hides, country. Estimated United States farm price.	Yearbook, 1930, U. S. Department of Agriculture.
296	Fish oils. Oregon and Washington—average United States wholesale price; Montana—average United States wholesale price, plus freight from Pacific coast.	Statistical Abstract, 1930, U. S. Department of Commerce.
299	Idaho, Montana, and Oregon—butterfat; fish; bones, hoofs, and horns, unmanufactured; milk and cream; honey; gelatin; glue; beeswax; feather, crude; rabbits and other game; hair, hog, and other; animal furs; neats'-foot oil; and other animal oils; Idaho and Montana—weighted average United States wholesale price; Oregon—United States price, plus freight. Washington—milk and cream; fresh salmon and other fish; shellfish; salted, pickled, smoked or dry-cured fish; egg yolks, frozen, canned, or dried; gelatin; glue; animal furs, bones, hoofs and horns; feathers, crude; animal hair; honey, beeswax, sponges; and meat extracts and bullion cubes. Weighted average Washington export price.	Census of Manufactures, 1929; Census of Distribution, 1929; Statistical Abstract, 1930; and Foreign Commerce and Navigation, 1929, Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce.
GROUP III. PRODUCTS OF MINES		
301	Anthracite coal—lump and broken, egg, stove, chestnut, and pea. Weighted average United States price, f. o. b. mine, plus freight (rail and water) from eastern States.	Mineral Resources, 1929, Bureau of Mines, U. S. Department of Commerce.
305	Bituminous coal—Wyoming and Utah. Average price, f. o. b. mine, plus freight.	Do.
310	Coke—byproduct and beehive. Weighted average United States price, f. o. b. ovens, plus freight.	Do.
320	Iron ore. Mine values—Montana and Washington.	Do.

TABLE H.—Commodities and types of prices used in determining values of imports and exports by commodity groups—Continued

No.	Commodities and prices	Sources for prices
GROUP III. PRODUCTS OF MINES—continued		
330	Ores and concentrates—copper, lead, zinc, gold, and silver; Idaho—mine value less freight to smelters in Montana and Utah; Oregon—mine value less freight to smelters in Washington and Utah; Montana—mine value Idaho ores and concentrates; Washington—weighted average mine value Alaska, Oregon, and foreign ores and concentrates.	Mineral Resources, 1929, Bureau of Mines, U. S. Department of Commerce.
340	Building sand, paving sand, grinding and polishing sand, fire or furnace sand, engine sand, filter sand, and other sands; and building gravel, paving gravel, and railroad ballast gravel. Weighted average mine and quarry prices—Idaho, Montana, Oregon, and Washington.	Do.
350	Crushed stone—weighted average granite, basalt, limestone, sandstone, and miscellaneous varieties of concrete and road metal and railroad ballast. Mine and quarry prices—Idaho, Montana, Oregon, and Washington.	Mineral Resources, 1929, Bureau of Mines, U. S. Department of Commerce.
360	Stone, rough and finished, N. O. S. Weighted average United States price—building stone, monumental stone, paving blocks curbing, flagging, rubble, riprap, furnace flux, refractory stone, agricultural limestone, manufacturing limestone and marble, and other uses of stone, n. e. s., f. o. b. mines and quarries.	Do.
370	Petroleum, crude. Idaho—average price Rocky Mountain fields; Montana—average price Wyoming fields, plus freight; Oregon and Washington—average price California and Texas fields, plus freight.	Do.
380	Asphalt, bulk. United States price, f. o. b. refinery and mine, plus freight.	Do.
390	Salt. Evaporated, in brine, and rock salt. Weighted average United States price, f. o. b. mine or refinery, plus freight.	Do.
392	Phosphate rock, crude. Idaho and Montana—mine prices, respective States; Oregon and Washington—average price Western States, plus freight from mines.	Do.
394	Sulphur, crude. United States mine price plus freight.	Do.
399	Products of mines, N. O. S. Fluorspar, foreign and domestic; oilstones, whetstones, hones, scythestones, and rubbing stones; pumice and pumicite; emery; feldspar, crude; clay—kaolin or China, ball slip, fire, stoneware, and miscellaneous clays; pyrites, asbestos, barite, crude; talc and soapstone, crude; mica—sheet and scrap; gypsum, foreign and domestic; dolomite; calcium chloride; grindstone and pulpstone; abrasive garnet; tripoli, crude; quartz, crude; and graphite, foreign. Idaho and Montana—weighted average United States mine prices; Oregon and Washington—weighted average United States mine prices and foreign prices, plus freight.	Do.
GROUP IV. PRODUCTS OF FORESTS		
401	Logs, spruce, Douglas fir, pine, cedar, hemlock, and other softwoods. Weighted average prices in the woods—Idaho, Montana, Oregon, and Washington.	Census of Manufactures 1929, U. S. Department of Commerce.
402	Posts, poles, and pilings. Weighted average prices in the woods—Idaho, Montana, Oregon, and Washington.	Do.
410	Wood (fuel). Weighted average prices in the woods—Idaho, Montana, Oregon, and Washington.	Do.
420	Railroad ties, hewed, sawed, and creosoted. Weighted average prices at the point of production—Idaho, Montana, Oregon, and Washington.	Census of Manufactures, 1929, U. S. Department of Commerce; trade associations; and Foreign Commerce and Navigation, 1929, Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce.
430	Pulpwood. Average prices, f. o. b. mills—Idaho, Montana, Oregon, and Washington.	Census of Manufactures, 1929, U. S. Department of Commerce.
440	Lumber, shingles, and lath. Weighted average prices, f. o. b. mills—Idaho, Montana, Oregon, and Washington.	Do.
443	Moulding sash, millwork, and doors. Weighted average prices, f. o. b. mills.	Census of Manufactures, 1929, U. S. Department of Commerce; trade associations; and Foreign Commerce and Navigation, 1929, Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce.

TABLE H.—Commodities and types of prices used in determining values of imports and exports by commodity groups—Continued

No.	Commodities and prices	Sources for prices
GROUP IV. PRODUCTS OF FORESTS—continued		
445	Box, crate, and coeprage materials. Idaho Oregon, and Washington—weighted average prices, f. o. b. mills; Montana—average Idaho, Oregon, and Washington mill prices plus freight.	Trade associations; Foreign Commerce and Navigation, 1929, Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce.
447	Veneer and plywood. Idaho, Oregon, and Washington—weighted average price, f. o. b. mills.	Trade associations.
450	Furniture, wood. Average wholesale price Pacific Northwest.	Do.
460	Wood pulp, sulphite, sulphate, and other. Oregon and Washington—prices, f. o. b. mills.	Census of Manufactures, 1929, U. S. Department of Commerce.
470	Newprint paper. Oregon and Washington—price, f. o. b. mills; Idaho and Montana—average Oregon and Washington mill prices, plus freight.	Do.
474	Paper bags and wrapping paper. Oregon and Washington—price, f. o. b. mills; Idaho and Montana—average Oregon and Washington mill prices, plus freight.	Do.
476	Paperboard, wallboard (paper), and pulpboard. Oregon and Washington—average wholesale prices, f. o. b. mills; Idaho and Montana—average Oregon and Washington wholesale prices plus freight.	Do.
479	Book paper, not coated (printing); cover paper; greaseproof and waterproof paper; wrapping paper; surface-coated paper; tissue crepe paper; toilet paper; paper towels and napkins; blotting paper; wallpaper; writing paper; and other paper and paper products. Oregon and Washington—weighted average wholesale price, f. o. b. mills; Idaho and Montana—average Oregon and Washington wholesale prices, plus freight.	Trade associations.
499	Tar and pitch, other gums and resins, pine oil, other essential oils, boat oars, wagon stocks, hoe, shovel, and rake handles, striking tool handles; and other woodenware. Weighted average wholesale prices—Idaho, Montana, Oregon, and Washington.	Trade associations; Foreign Commerce and Navigation, 1929, Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce.
GROUP V. MANUFACTURES AND MISCELLANEOUS		
501	Illuminating oils, gasoline, naphtha, benzine, and tops. Weighted average price, f. o. b. refinery. Idaho—average for refineries in California, Montana, Oklahoma, Texas, and Wyoming, plus freight; Montana—average State refinery price; Oregon and Washington—average for refineries in California, Oklahoma, and Texas, plus freight.	Census of Manufactures, 1929, U. S. Department of Commerce.
503	Fuel oil, average price, f. o. b. refineries. Idaho—average for refineries in Wyoming and Montana; Montana—average State refinery price. Oregon and Washington—average for refineries in California, Oklahoma, and Texas, plus freight.	Do.
506	Lubricating oil and greases. Average price, f. o. b. refineries. Idaho and Montana—average for refineries in California, Oklahoma, Pennsylvania, Texas, and Wyoming, plus freight; Oregon and Washington—average for refineries in California, Oklahoma, Pennsylvania, and Texas, plus freight.	Do.
509	Paraffin wax and mineral spirits. Oregon and Washington—average United States wholesale prices; Idaho and Montana—average United States wholesale price plus freight from Pacific coast.	Wholesale prices, 1929, Bureau of Labor Statistics, U. S. Department of Labor.
510	Canned fruits, vegetables, milk (powdered, condensed, and evaporated), buttermilk (powdered and evaporated), clams, salmon, and other fish. Oregon and Washington—weighted average prices, f. o. b. canneries; Idaho and Montana—average Oregon and Washington wholesale prices, plus freight.	Census of Manufactures, 1929, U. S. Department of Commerce.
520	Sugar, beet and cane. Idaho and Montana—average United States wholesale price for beet sugar; Oregon and Washington—weighted averages of United States wholesale prices for beet and cane sugar.	Do.
524	Corn sirup and mixtures of corn and other sirups, cane sirup, cane-refiners sirup, and edible molasses. Weighted average United States wholesale price, plus freight from Midwest points.	Census of Distribution, 1929, U. S. Department of Commerce.
528	Beet molasses and beet pulp. Montana—weighted average United States price, f. o. b. refinery. Idaho, Oregon, and Washington—weighted average United States price, plus freight.	Do.
530	Pig iron, basic and Bessemer. Wholesale price, Pittsburgh, plus freight.	Engineering and Mining Journal.

TABLE H.—Commodities and types of prices used in determining values of imports and exports by commodity groups—Continued

No.	Commodities and prices	Sources for prices
GROUP V. MANUFACTURES AND MISCELLANEOUS—continued		
531	Open hearth steel billets. Wholesale price, Pittsburgh, plus freight.	Statistical Abstract, 1930, U. S. Department of Commerce.
532	Steel rails; rail joints and fastenings, tie plates, etc., and railroad spikes; and switches, frogs, and crossings. Weighted average United States price, f. o. b. mill, plus freight from Pittsburgh.	Census of Distribution, 1929, U. S. Department of Commerce.
533	Car and locomotive wheels and axles, rolled or forged. Weighted average United States price, f. o. b. mill, plus freight from Pittsburgh.	Do.
534	Cast-iron pipe and fittings—Bell and spigot pipe; flanged pipe, culvert pipe; soil and plumber's pipe and fittings; and cast-iron fittings for water, gas, steam, and other purposes. Weighted average United States price, f. o. b. mills, plus freight from Pittsburgh.	Do.
535	Wrought iron-steel pipes, tubes, and fittings (wrought, welded, and seamless). Weighted average United States price, f. o. b. mill, plus freight from Pittsburgh.	Do.
536	Plain wire; barbed wire; wire nails; wire tacks; and wire staples. Weighted average United States price, f. o. b. mill, plus freight from Pittsburgh.	Do.
537	Iron and steel—blooms, billets, and slabs; sheet and tin-plate bars; muck and scrap bars; structural shapes, light and heavy (not assembled or fabricated); concrete-reinforcing bars; open-hearth or Bessemer steel bars; electric-steel bars; iron bars; wire rods; bolt and nut rods, and spike and chain rods; crucible plate steel and saw plates; boiler and other plate; sheets (No. 13 and thinner, not coated)—automobile body, black, and plain; skelp; cotton ties; hot rolled strips for cold rolling; other hoops, bands, and strips; plate and armor, ordnance; rolled and forged iron and steel products, n. e. s.; cold rolled strip steel; cold finished steel bars; and tin and terne plate. Weighted average United States price, f. o. b. mill, plus freight from Pittsburgh.	Do.
538	Scrap iron and scrap steel. Weighted average United States price, f. o. b. mill; plus freight from Pittsburgh.	Do.
540	Copper, electrolytic, refinery. Idaho and Montana—refinery price; Oregon and Washington—refinery price plus freight.	Engineering and Mining Journal.
541	Brass and bronze bars; and brass, bronze, and copper rods, tubing (seamless) pipe, and castings. Idaho and Montana—weighted average United States price, f. o. b. mill; Oregon and Washington—weighted average United States price, plus freight from Butte.	Census of Distribution, 1929, U. S. Department of Commerce.
545	Lead, common, and zinc, prime, western, at East St. Louis. Idaho and Montana—weighted average price at St. Louis less freight; Oregon and Washington—St. Louis price, plus freight.	Engineering and Mining Journal.
548	Aluminum (No. 1 virgin 98-99 percent), New York. Montana—New York price; Oregon and Washington—New York price, plus freight.	Do.
550	Cement, Portland. Average United States price, f. o. b. plants, plus freight.	Wholesale prices, 1929, Bureau of Labor Statistics, U. S. Department of Labor.
552	Brick, common. Average United States price, f. o. b. yards, plus freight.	Do.
553	Vitrified, face, enameled, fire, silica, magnesite, and chrome bricks; and floor, ceramic, mosaic, enameled, faience, and wall tiles. Weighted average United States price, f. o. b. yards, plus freight.	Census of Distribution, 1929, U. S. Department of Commerce.
554	Clay sewer pipe and drain tile; concrete drain tile and sewer pipes, plain (4-inch to 24-inch) and reinforced (24-inch to 108-inch). Weighted average United States price, f. o. b. yards, plus freight.	Do.
555	Corundum (aluminous abrasives) and concrete products (brick, cast stone, cistern, and manhole blocks, silo blocks, staves and slabs, monuments and grave markers, burial vaults, and precast paving materials). Weighted average United States price, f. o. b. plants, plus freight.	Do.
557	Quick and hydrated lime. Weighted average United States price, f. o. b. kilns, plus freight.	Do.
558	Gypsum plaster, neat plaster (unfibred), sanded plaster, fibred plaster, gaging and finish plaster, plaster of paris, magnesite stucco, portland-cement stucco, and other plasters. Weighted average United States price, f. o. b. plants, plus freight.	Do.

TABLE H.—Commodities and types of prices used in determining values of imports and exports by commodity groups—Continued

No.	Commodities and prices	Sources for prices
GROUP V. MANUFACTURES AND MISCELLANEOUS—continued		
560	Tractors and parts. Average price, f. o. b. factory, plus freight.	Manufacturers' associations.
562	Agricultural implements and parts. Average price, f. o. b. factory, plus freight.	Do.
567	Automobiles and autotrucks, and parts. Average price, f. o. b. factory, plus freight.	Do.
568	Automobile and autotruck tires. Average price, f. o. b. factory, plus freight.	Do.
570	Nitrates, superphosphates, fish meal, bone-meal, and other fertilizers. Oregon and Washington—weighted average value of foreign and domestic imports; Idaho—average Oregon and Washington value, plus freight from Pacific coast; Montana—United States price at point of production.	Census of Distribution, 1929, U. S. Department of Commerce; Foreign Commerce and Navigation, 1929, Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce Wholesale Prices, 1929, Bureau of Labor Statistics, U. S. Department of Labor.
571	Alcohol, denatured. Wholesale prices in Idaho, Montana, Oregon, and Washington (average of wholesale prices in large cities in respective States).	Trade associations.
572	Sulphuric acid, 66°, New York. Washington—New York price; Idaho, Montana, and Oregon—New York price, plus freight from Du Pont, Wash.	Statistical Abstract, 1930, U. S. Department of Commerce.
573	Dynamite. Average 40- and 60-percent gelatin. Wholesale prices in carload lots at Coeur d'Alene, Idaho; Butte, Mont.; Portland, Oreg.; and Seattle, Wash.	Manufacturers' associations.
575	Pigments (white lead, lead oxide, zinc oxide, lithopone, iron oxides, other mineral colors, chrome yellow, chrome orange, prussian blue, ultramarine, vermilion, other fine colors, mortar colors, whiting, other dry colors, and pulp colors, sold moist), paints (in paste form, water paints, and kalsomine, and mixed ready for use), varnishes, japans, lacquers, fillers, putty, bleached shellac, and stains. Weighted average United States wholesale price, plus freight from Chicago.	Census of Distribution, 1929, U. S. Department of Commerce.
576	Rosin, Savannah, Ga., plus freight	Wholesale Prices, 1929, Bureau of Labor Statistics, U. S. Department of Labor.
577	Turpentine. Average, Savannah, Ga., plus freight.	Do.
578	Soap—toilet; foot, ships; laundry and other hard soaps; granulated and powdered; liquid; soft; paste; shaving; special soap articles; stock or base; and soap, n. e. s. Weighted average United States wholesale price plus freight.	Census of Distribution, 1929, U. S. Department of Commerce.
580	Cotton woven goods; cotton yarns; cotton thread; cotton twine; batting, wadding, and mattress felts; cotton card laps, sliver and roving; and cotton waste produced for sale; silk and rayon broad goods; silk threads and yarns; rayon threads and yarns; woolen and worsted goods; woolen and cotton blankets;	Do.

TABLE H.—Commodities and types of prices used in determining values of imports and exports by commodity groups—Continued

No.	Commodities and prices	Sources for prices
GROUP V. MANUFACTURES AND MISCELLANEOUS—continued		
585	wool upholsteries and draperies; wool yarns; wool card rolls, batts, and batting; wool tops and snubbings; wool noils and waste; and wearing apparel of cotton, wool, rayon, and silk. Weighted average United States wholesale price, plus freight from New England States.	Census of Distribution, 1929, U. S. Department of Commerce; Foreign Commerce and Navigation, 1929, Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce; Wholesale prices, 1929, Bureau of Labor Statistics, U. S. Department of Labor.
585	Bagging and bags, burlap or jute. Oregon and Washington—weighted average value of foreign and domestic imports; Idaho and Montana—average Oregon and Washington value, plus freight from Pacific coast.	Census of Distribution, 1929, U. S. Department of Commerce; Foreign Commerce and Navigation, 1929, Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce; Wholesale prices, 1929, Bureau of Labor Statistics, U. S. Department of Labor.
590	Cigarettes; chewing tobacco, plug and other; smoking tobacco, including cigar cuttings; and other tobacco manufactures. Idaho and Montana—value of manufactures in respective States; Oregon and Washington—weighted average United States factory price, plus freight from Kentucky and Virginia.	Manufacturers' associations; Census of Distribution, 1929, U. S. Department of Commerce; Wholesale prices, 1929, Bureau of Labor Statistics, U. S. Department of Labor.
591	Plate glass, window glass, bottles, jars, and jelly glasses. Average price, f. o. b. factory, plus freight.	Manufacturers' associations.
592	Cottonseed oil. Average United States price, f. o. b. refinery, plus freight from Kansas City.	Census of Distribution, 1929, U. S. Department of Commerce.
593	Linseed oil. Average United States price, f. o. b. refinery, plus freight from Kansas City.	Do.
594	Coconut oil, soybean oil, vegetable soup stock and other vegetable fats. Oregon and Washington—weighted average foreign and domestic import value; Montana and Idaho—average Oregon and Washington import value, plus freight from Pacific coast.	Foreign Commerce and Navigation, 1929, Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce; Wholesale prices, 1929, Bureau of Labor Statistics, U. S. Department of Labor.
596	Ice. Manufacturers' prices in Idaho, Montana, Oregon, and Washington.	Census of Manufactures 1929, U. S. Department of Commerce; manufacturers, associations.
597	Crushed slag. Montana and Washington—average United States price, f. o. b. mill; Idaho—United States price, plus freight from Montana.	Census of Manufactures 1929, U. S. Department of Commerce.
598	Sheathing, felts, asbestos-filled and asbestos paper. Weighted average United States price, f. o. b. mill, plus freight.	Census of Distribution, 1929 U. S. Department of Commerce.
599	Manufactures and miscellaneous, n. o. s. (including railroad l. c. l. freight). Average of Pacific Northwest export and import manufactures, items 500-598, inclusive.	Items 500-598, inclusive.

NOTE.—Freight and marketing costs of commodities are estimated. Freight based on blanket rate from the point of production to Pacific Northwest. Marketing costs based on estimates from trade sources.

TABLE I.—Revenue freight originating on railroads in Pacific Northwest by commodity groups, 1929
[In thousand short tons]

Location	Agricultural products		Animals and products		Mine products		Forest products		Manufactures and miscellaneous		Less than carload		Total	
	Value	Percent	Value	Percent	Value	Percent	Value	Percent	Value	Percent	Value	Percent	Value	Percent
Idaho	1,858	26.4	237	3.4	1,085	15.4	3,538	50.3	253	3.6	61	0.9	7,033	100
Montana	2,084	30.0	339	4.9	2,040	29.3	1,481	21.3	862	12.4	146	2.1	6,952	100
Oregon	939	6.5	188	1.3	430	3.0	11,367	79.2	1,246	8.7	192	1.3	14,361	100
Washington	2,795	11.1	168	.7	2,384	9.4	17,520	69.3	2,139	8.5	259	1.0	25,264	100
Pacific Northwest	7,676	14.3	932	1.7	5,939	11.1	33,905	63.3	4,501	8.4	658	1.2	53,610	100

TABLE J.—Freight revenue earned on freight originating in Pacific Northwest by commodity groups, 1929
[In thousand dollars]

Location	Agricultural products		Animals and products		Mine products		Forest products		Manufactures and miscellaneous		Less than carload		Total	
	Value	Percent	Value	Percent	Value	Percent	Value	Percent	Value	Percent	Value	Percent	Value	Percent
Idaho	5,611	36.6	1,226	8.0	1,076	7.0	5,767	37.7	890	5.8	744	4.9	15,315	100
Montana	7,032	33.3	2,323	11.0	2,693	12.8	3,109	14.8	3,847	18.2	2,097	9.9	21,100	100
Oregon	3,822	13.2	1,102	3.8	419	1.4	14,908	51.4	6,049	20.8	2,724	9.4	29,024	100
Washington	16,887	26.0	1,837	2.9	3,287	5.2	27,110	43.3	9,785	15.6	3,809	6.1	62,716	100
Pacific Northwest	33,352	26.0	6,489	5.1	7,476	5.8	50,894	39.7	20,571	16.1	9,373	7.3	128,155	100

Sources: I. C. C. Freight Commodity Statistics, 1929. Railroad Reports to State Public Utilities Commissioners, 1929.

TABLE K.—Freight originating in Pacific Northwest in 1929 by railroads and commodity groups with percentage each commodity group is of total traffic originating on railroad; (1) in Pacific Northwest; and (2) on entire system

[In short tons, 2,000 pounds]

Railroad	Agricultural products	Percent		Animals and products	Percent		Mine products	Percent		Forest products	Percent		Manufactures and miscellaneous	Percent		Less than car-loads	Percent		Total Pacific northwest	Percent		Total entire railroad system
		(1)	(2)		(1)	(2)		(1)	(2)		(1)	(2)		(1)	(2)		(1)	(2)				
Northern Pacific.....	2,016,828	16.7	11.8	186,446	1.5	1.1	1,603,901	13.3	9.5	7,139,008	59.0	42.1	976,072	8.1	5.8	169,230	1.4	1.0	12,091,485	100	71.3	16,947,574
Great Northern.....	1,741,856	24.1	5.4	174,376	2.4	.5	1,218,926	16.9	3.8	2,623,999	36.4	8.2	1,316,152	18.2	4.1	148,869	2.0	.4	7,224,178	100	22.4	32,184,509
Union Pacific.....	2,784,393	33.1	11.2	357,439	4.2	1.4	872,893	10.3	3.5	3,506,347	41.5	14.0	766,815	9.1	3.1	152,109	1.8	.6	8,439,996	100	33.8	24,984,411
Southern Pacific.....	217,637	3.1	.5	50,291	.7	.1	256,634	3.7	.5	5,850,472	83.7	12.5	542,269	7.8	1.2	72,249	1.0	.1	6,989,552	100	14.9	46,914,072
Chicago, Milwaukee, St. Paul & Pacific.....	552,519	9.1	1.6	87,896	1.5	.3	770,303	12.8	2.2	4,113,242	68.2	11.7	453,592	7.5	1.3	52,446	.9	.1	6,029,998	100	17.2	35,138,376
Canadian Pacific in the United States.....	39,268	9.8	.3	2,354	.6	(¹)	26,063	6.5	.2	306,679	76.8	2.0	21,626	5.4	.1	3,579	.9	(¹)	399,569	100	2.6	15,398,810
Chicago, Burlington & Quincy.....	81,274	72.0	.3	18,564	16.4	(¹)	3,339	3.0	(¹)	405	.4	(¹)	3,528	3.1	(¹)	5,799	5.1	(¹)	112,909	100	.4	31,160,754
Total.....	7,433,775	18.0	3.7	877,366	2.1	.4	4,752,059	11.5	2.4	23,540,156	57.0	11.6	4,080,054	9.9	2.0	604,281	1.5	.3	41,287,691	100	20.4	202,728,506
Intraregional railroads ²	242,368	2.0	2.0	54,228	.4	.4	1,186,749	9.7	9.7	10,364,493	84.1	84.1	420,500	3.4	3.4	53,535	.4	.4	12,321,873	100	100	12,321,873
Grand total.....	7,676,143	14.3	3.6	931,594	1.7	.4	5,938,808	11.1	2.7	33,904,649	63.3	15.8	4,500,554	8.4	2.1	657,816	1.2	.3	53,609,564	100	24.9	215,050,379

¹ Less than 0.05 percent.

² For all other railroads reporting tonnage carried by commodities or commodity groups.

Sources: Reports of railroads to the Public Utilities Commissioners of the States within the Region. I. C. C. Freight Commodity Statistics.

TABLE L.—Estimated revenue ¹ earned by railroads on freight originating in Pacific Northwest in 1929 by railroads and commodity groups with percentage each commodity group is of total traffic originating on railroad; (1) in Pacific Northwest; and (2) on entire system

Railroad	Agricultural products	Percent		Animals and products	Percent		Mine products	Percent		Forest products	Percent		Manufacturers and miscellaneous	Percent		Less than car-loads	Percent		Total Pacific Northwest	Percent		Total entire railroad system
		(1)	(2)		(1)	(2)		(1)	(2)		(1)	(2)		(1)	(2)		(1)	(2)				
Northern Pacific.....	9,091	26.0	16.2	1,822	5.2	3.2	2,487	7.1	4.4	13,627	39.0	24.2	5,180	14.8	9.2	2,744	7.9	4.9	34,951	100	62.1	56,266
Great Northern.....	11,011	35.4	13.4	1,530	4.9	1.8	1,946	6.3	2.4	8,182	26.3	10.0	6,259	20.1	7.6	2,193	7.0	2.7	31,121	100	37.9	82,070
Union Pacific.....	9,459	40.1	10.5	1,875	7.9	2.1	746	3.2	.8	5,266	22.3	5.8	4,096	17.3	4.5	2,169	9.2	2.4	23,611	100	26.1	90,444
Southern Pacific.....	1,292	7.6	.8	343	2.0	.2	310	1.8	.2	11,668	68.4	7.3	2,378	13.9	1.5	1,078	6.3	.6	17,069	100	10.6	160,446
Chicago, Milwaukee, St. Paul & Pacific.....	1,808	13.4	1.9	634	4.7	.7	1,111	8.2	1.1	7,895	58.4	8.1	1,487	11.0	1.5	590	4.3	.6	13,525	100	13.9	96,982
Canadian Pacific in the United States.....	99	23.2	.4	10	2.3	(¹)	12	2.8	(²)	249	58.2	.9	27	6.3	.1	31	7.2	.1	428	100	1.5	28,488
Chicago, Burlington & Quincy.....	198	53.8	.2	97	26.5	.1	3	.7	(²)	1	.3	(²)	12	3.2	(²)	57	15.5	.1	368	100	.4	88,185
Total.....	32,958	27.2	5.5	6,311	5.2	1.0	6,615	5.4	1.1	46,888	38.8	7.8	19,439	16.1	3.2	8,862	7.3	1.5	121,073	100	20.1	602,881
Intraregional Railroads ²	394	5.6	5.6	178	2.5	2.5	861	12.1	12.1	4,005	56.6	56.6	1,132	16.0	16.0	511	7.2	7.2	7,081	100	100	7,081
Grand total.....	33,352	26.0	5.5	6,489	5.1	1.1	7,476	5.8	1.2	50,893	39.7	8.3	20,571	16.1	3.4	9,373	7.3	1.5	128,154	100	21.0	609,962

¹ In thousands of dollars.

² Less than 0.05 percent.

³ For all other railroads reporting revenue by commodities or commodity groups.

Sources: Reports of railroads to the Public Utilities Commissioners of the States within the Region. I. C. C. Freight Commodity Statistics.

TABLE M.—Freight originating on railroads¹ in Idaho for the year 1929, by commodity groups and railroads

[In short tons]

Railroad	Agricultural products	Per-cent	Animals and products	Per-cent	Mine products	Per-cent	Forest products	Per-cent	Manufactures and miscellaneous	Per-cent	Less than carloads	Per-cent	Total	Per-cent
Oregon Short Line.....	1,580,980	60.8	209,775	8.1	176,163	6.8	451,128	17.3	138,137	5.3	45,857	1.7	2,602,040	100
Chicago, Milwaukee, St. Paul & Pacific.....	9,787	1.1	2,589	.3	122	(?)	837,353	97.8	5,034	.6	1,624	.2	856,509	100
Northern Pacific.....	139,532	17.4	8,559	1.1	384,487	48.0	250,298	31.3	14,709	1.8	3,140	.4	800,725	100
Oregon-Washington Railroad & Navigation.....	53,333	5.2	1,739	.2	491,405	47.8	392,098	38.2	85,492	8.3	3,186	.3	1,027,303	100
Great Northern.....	13,143	8.1	241	.1	51	(?)	147,873	90.8	746	.5	829	.5	162,883	100
Camas Prairie.....	8,787	1.7	522	.1	845	.2	486,245	96.9	1,669	.3	3,820	.8	501,888	100
Washington, Idaho & Montana.....	11,382	2.3	262	.1	53	(?)	478,918	97.2	1,664	.3	505	.1	492,784	100
Spokane International.....	6,064	2.0	406	.1	20,617	6.7	273,738	89.5	4,481	1.5	775	.2	306,081	100
Intermountain.....	481	.2	2,077	1.1	2,804	1.4	190,041	96.6	785	.4	518	.3	196,706	100
Pacific & Idaho Northern.....	12,302	44.6	6,017	21.8	4,670	17.0	3,498	12.7	363	1.3	703	2.6	27,553	100
Gilmore & Pittsburgh.....	2,857	25.0	4,520	39.4	3,706	32.3	20	.2	39	.3	324	2.8	11,466	100
Other roads ²	19,728	42.2	396	.9			26,398	56.6	135	.3	17	(?)	46,674	100
Total.....	1,858,426	26.4	237,103	3.4	1,084,923	15.4	3,537,608	50.3	253,254	3.6	61,298	.9	7,032,612	100

¹ For all railroads reporting tonnage by commodities or commodity groups.

² Less than 0.05 percent.

³ Boise & Western; Craig Mountain; Nez Perce & Idaho.

Sources: Reports of railroads to the Public Utilities Commissioner of the State of Idaho.

TABLE N.—Estimated revenue earned by railroads¹ in Idaho for the year 1929, by commodity groups and railroads

[In thousand dollars]

Railroad	Agricultural products	Per-cent	Animals and products	Per-cent	Mine products	Per-cent	Forest products	Per-cent	Manufactures and miscellaneous	Per-cent	Less than carloads	Per-cent	Total	Per-cent
Oregon Short Line.....	4,724	59.3	1,086	13.6	210	2.6	886	11.1	500	6.3	568	7.1	7,975	100
Chicago, Milwaukee, St. Paul & Pacific.....	34	2.0	18	1.0	(?)	.1	1,612	94.8	17	1.0	18	1.1	1,699	100
Northern Pacific.....	526	21.9	65	2.7	552	23.0	1,149	47.8	61	2.5	51	2.1	2,404	100
Oregon-Washington Railroad & Navigation.....	178	11.7	11	.7	291	19.1	712	46.7	282	18.6	49	3.2	1,523	100
Great Northern.....	57	10.0	2	.3	(?)	(?)	498	86.7	5	.9	12	2.1	575	100
Camas Prairie.....	15	4.3	2	.5	1	.4	293	84.7	8	2.2	27	7.9	346	100
Washington, Idaho & Montana.....	14	4.6	(?)	.1	(?)	(?)	290	93.7	2	.8	2	.8	309	100
Spokane International.....	11	4.2	1	.4	10	4.1	209	84.2	11	4.4	7	2.7	248	100
Intermountain.....	1	.5	5	3.9	2	1.4	112	89.7	2	1.6	4	2.9	125	100
Pacific & Idaho Northern.....	40	57.7	18	26.1	2	3.2	7	9.9	1	1.0	1	1.0	70	100
Gilmore & Pittsburgh.....	11	26.6	19	43.3	7	17.4	(?)	.3	(?)	.3	5	12.1	43	100
Total.....	5,611	36.6	1,226	8.0	1,076	7.0	5,767	37.7	890	5.8	744	4.9	15,315	100

¹ For all railroads reporting revenue by commodities or commodity groups.

² Less than \$500.

³ Less than 0.05 percent.

Sources: Reports of railroads to the Public Utilities Commissioner of the State of Idaho.

TABLE O.—Freight originating on railroads¹ in Montana for the year 1929, by commodity groups and railroads

[In short tons]

Railroad	Agricultural products	Per-cent	Animals and products	Per-cent	Mine products	Per-cent	Forest products	Per-cent	Manufactures and miscellaneous	Per-cent	Less than carloads	Per-cent	Total	Per-cent
Great Northern.....	1,028,203	36.1	119,644	4.2	775,996	27.3	459,273	16.1	401,466	14.1	63,380	2.2	2,847,962	100
Northern Pacific.....	550,271	30.9	108,896	6.1	199,897	11.2	620,076	34.9	250,209	14.1	50,668	2.8	1,780,017	100
Chicago, Milwaukee, St. Paul & Pacific.....	358,116	22.3	62,801	3.9	579,017	36.0	387,989	24.1	201,834	12.5	19,363	1.2	1,609,129	100
Chicago, Burlington & Quincy.....	81,274	72.0	18,564	16.4	3,339	3.0	405	.4	3,528	3.1	5,799	5.1	112,909	100
Montana, Wyoming & Southern.....	11,363	2.4	210	(?)	466,048	97.5			92	(?)	600	.1	478,313	100
Oregon Short Line.....	4,740	7.4	21,465	33.8	15,296	24.1	12,930	20.4	4,239	6.7	4,847	7.6	63,517	100
Milwaukee, St. Paul & Sault Ste. Marie.....	26,078	91.8	1,888	6.6	15	.1			137	.5	288	1.0	28,406	100
Gilmore & Pittsburgh.....			194	32.3	265	44.1	109	18.1			33	5.5	601	100
Other roads ²	24,448	78.6	5,239	16.8	36	.1	18	.1	726	2.3	635	2.1	31,102	100
Total.....	2,084,493	30.0	338,901	4.9	2,039,909	29.3	1,480,800	21.3	862,240	12.4	145,613	2.1	6,951,956	100

¹ For all railroads reporting tonnage by commodities or commodity groups.

² Less than 0.05 percent.

³ White Sulphur Springs & Yellowstone; Montana Western.

Sources: Reports of railroads to the Public Utilities Commissioner of the State of Montana.

TABLE P.—Estimated revenue earned by railroads¹ on freight originating in Montana for the year 1929, by commodity groups and railroads
[In thousand dollars]

Railroad	Agricultural products	Per cent	Animals and products	Per cent	Mine products	Per cent	Forest products	Per cent	Manufactures and miscellaneous	Per cent	Less than car-loads	Per cent	Total	Per cent
Great Northern.....	4,049	38.9	889	8.5	1,079	10.4	1,323	12.7	2,136	20.5	935	9.0	10,411	100
Northern Pacific.....	1,562	27.0	848	14.7	394	6.8	1,106	19.1	1,049	18.2	822	14.2	5,781	100
Chicago, Milwaukee, St. Paul & Pacific.....	1,142	29.1	389	9.9	901	22.9	645	16.4	638	16.2	218	5.5	3,933	100
Chicago, Burlington & Quincy.....	198	53.8	97	26.5	3	7	1	3	12	3.2	57	15.5	368	100
Montana, Wyoming & Southern.....	4	1.5	2	.5	299	97.7			(?)		1	.3	306	100
Oregon Short Line.....	13	5.9	88	39.4	17	7.6	34	15.1	11	5.0	60	27.0	223	100
Milwaukee, St. Paul & Sault Ste. Marie.....	63	83.2	9	12.0	(?)	.1			1	.7	3	4.0	76	100
Gilmore & Pittsburgh.....			1	38.0	1	24.7	(?)	13.9			1	23.4	2	100
Total.....	7,032	33.3	2,323	11.0	2,693	12.8	3,109	14.8	3,847	18.2	2,097	9.9	21,100	100

¹ For all railroads reporting revenue by commodities or commodity groups.

² Less than \$500.

³ Less than 0.05 percent.

Sources: Reports of railroads to the Public Utilities Commissioner of the State of Montana.

TABLE Q.—Freight originating on railroads¹ in Oregon for the year 1929, by commodity groups and railroads
[In short tons]

Railroad	Agricultural products	Per cent	Animals and products	Per cent	Mine products	Per cent	Forest products	Per cent	Manufactures and miscellaneous	Per cent	Less than car-loads	Per cent	Total	Per cent
Southern Pacific.....	217,637	3.1	50,291	0.7	256,634	3.7	5,850,472	83.7	542,269	7.8	72,249	1.0	6,989,552	100
Oregon-Washington Railroad & Navigation.....	519,817	28.2	72,702	4.0	70,719	3.8	768,281	41.7	352,940	19.2	58,121	3.1	1,842,580	100
Spokane, Portland & Seattle.....	25,889	4.6	7,404	1.3	17,389	3.1	231,457	41.4	245,479	43.8	32,571	5.8	560,189	100
Northern Pacific.....	101,048	62.5	3,184	2.0	1,449	.9	8,458	5.2	37,648	23.3	9,044	6.1	161,731	100
Great Northern.....	4,415	3.8	8,964	7.6	1,225	1.0	59,211	50.2	33,515	28.4	10,557	9.0	117,887	100
Oregon Trunk.....	12,869	6.7	4,203	2.2	1,057	.6	171,939	89.5	1,411	.7	586	.3	192,065	100
Oregon, California & Eastern.....	10,907	1.3	3,881	.5	4,693	.4	786,629	96.5	7,710	.9	1,330	.2	815,150	100
Sumpter Valley.....	1,472	.9	3,560	2.3	634	.4	150,216	95.0	1,459	.9	730	.5	158,071	100
Oregon Short Line.....	16,332	32.7	27,461	55.0	910	1.8	346	.7	2,063	4.1	2,859	5.7	49,971	100
Valley & Siletz.....	166	.1			100	(?)	240,765	99.0	692	.3	1,372	.6	243,095	100
Other roads ²	27,992	.9	5,875	.2	75,238	2.3	3,099,050	95.9	21,268	.7	1,675	(?)	3,231,098	100
Total.....	938,544	6.5	187,525	1.3	430,048	3.0	11,366,824	79.2	1,246,454	8.7	191,994	1.3	14,361,389	100

¹ For all railroads reporting tonnage by commodities or commodity groups.

² Less than 0.05 percent.

³ Astoria Southern; Big Creek & Telocaset; California & Oregon Coast; Carlton & Coast; City of Prineville; Condon, Kinzua & Southern; Coos Bay Lumber Co.; Gales Creek & Wilson River; Great Southern; K-P Lumber Co.; Mount Hood; Oregon, Pacific & Eastern; Portland & Southwestern; Union; Willamette Valley & Coast.

Sources: Reports of railroads to the Public Utilities Commissioner of the State of Oregon.

TABLE R.—Estimated revenue earned by railroads¹ on freight originating in Oregon for the year 1929, by commodity groups and railroads
[In thousand dollars]

Railroad	Agricultural products	Per cent	Animals and products	Per cent	Mine products	Per cent	Forest products	Per cent	Manufactures and miscellaneous	Per cent	Less than car-loads	Per cent	Total	Per cent
Southern Pacific.....	1,292	7.6	343	2.0	310	1.8	11,668	68.4	2,378	13.9	1,078	6.3	17,069	100
Oregon-Washington Railroad & Navigation.....	1,958	27.2	435	6.0	66	.9	1,487	20.6	2,378	33.0	888	12.3	7,212	100
Spokane, Portland & Seattle.....	85	4.5	56	3.0	33	1.8	469	24.9	867	46.0	373	19.8	1,883	100
Northern Pacific.....	347	44.1	36	4.6	2	.3	53	6.7	187	23.8	161	20.5	787	100
Great Northern.....	26	3.4	86	11.1	2	.3	306	39.4	199	25.7	156	20.1	775	100
Oregon Trunk.....	26	7.7	14	4.2	1	.3	284	85.7	2	.7	5	1.4	331	100
Oregon, California & Eastern.....	9	3.3	9	3.2	2	.7	232	81.3	24	8.3	9	3.2	285	100
Sumpter Valley.....	6	2.5	11	4.6	2	.7	211	87.3	3	1.4	9	3.5	242	100
Oregon Short Line.....	71	31.0	111	48.7	(?)	.4	1	.5	9	3.9	35	15.5	229	100
Valley & Siletz.....	(?)	.2			(?)	.1	198	93.9	2	1.0	10	4.8	211	100
Total.....	3,822	13.2	1,102	3.8	419	1.4	14,908	51.4	6,049	20.8	2,724	9.4	29,024	100

¹ For all railroads reporting revenue by commodities or commodity groups.

² Less than \$500.

Sources: Reports of railroads to the Public Utilities Commissioner of the State of Oregon.

TABLE S.—Freight originating on railroads¹ in Washington for the year 1929, by commodity groups and railroads

[In short tons]

Railroad	Agricultural products	Per cent	Animals and products	Per cent	Mine products	Per cent	Forest products	Per cent	Manufactures and miscellaneous	Per cent	Less than carloads	Per cent	Total	Per cent
Northern Pacific.....	1,225,977	13.1	65,807	0.7	1,018,068	10.9	6,260,176	67.0	673,506	7.2	105,478	1.1	9,349,012	100
Great Northern.....	606,095	17.0	45,527	1.1	441,654	10.8	1,957,642	47.8	880,425	21.5	74,103	1.8	4,095,446	100
Chicago, Milwaukee, St. Paul & Pacific.....	184,616	5.2	22,506	.6	191,164	5.4	2,887,900	81.0	246,724	6.9	31,459	.9	3,564,369	100
Oregon-Washington Railroad & Navigation.....	609,141	21.3	24,297	.9	118,400	4.2	1,881,564	65.9	183,944	6.4	37,239	1.3	2,854,585	100
Spokane, Portland & Seattle.....	63,930	18.9	9,170	2.7	31,587	9.3	200,138	59.0	30,217	8.9	4,160	1.2	339,203	100
Longview, Portland & Northern.....	853	.1	---	---	61,379	4.1	1,402,526	94.0	25,634	1.7	1,162	.2	1,491,554	100
Pacific Coast.....	237	(?)	---	---	506,896	82.2	52,312	8.5	55,937	9.1	1,347	.2	616,729	100
Port Angeles-Western.....	---	---	---	---	---	---	525,823	99.4	2,995	.5	358	.1	529,176	100
Peninsular Railway.....	---	---	---	---	8,195	.7	1,162,703	98.4	11,134	.9	---	---	1,182,032	100
Cowlitz, Chehalis & Cascade.....	14	(?)	---	---	207	.1	390,291	99.5	1,507	.4	194	(?)	392,213	100
Spokane International.....	7,126	11.0	60	.1	5,431	8.3	32,941	50.6	17,008	26.1	2,516	3.9	65,082	100
Camas Prairie.....	311	33.4	78	8.4	20	2.2	25	2.7	31	3.3	466	50.0	931	100
Other roads ³	6,380	.8	620	.1	927	.1	765,372	97.7	9,553	1.2	429	.1	783,281	100
Total.....	2,794,680	11.0	168,065	.7	2,383,928	9.4	17,519,417	69.4	2,138,615	8.5	258,911	1.0	25,263,616	100

¹ For all railroads reporting tonnage carried by commodities or commodity groups.

² Less than 0.05 percent.

³ Deer Park; Hartford Eastern; Kelso Eastern; Klickitat Log & Lumber; Newaukum Valley; Port Townsend & Puget Sound; Port Townsend Southern; Puget Sound & Cascade; Waterville; Washington Western; Puget Sound & Baker River.

Sources: Reports of railroads to the Public Utilities Commissioner of the State of Washington.

TABLE T.—Estimated revenue by railroads¹ on freight originating in Washington for the year 1929, by commodity groups and railroads

[In thousand dollars]

Railroad	Agricultural products	Per cent	Animals and products	Per cent	Mine products	Per cent	Forest products	Per cent	Manufactures and miscellaneous	Per cent	Less than carloads	Per cent	Total	Per cent
Northern Pacific.....	6,655	25.6	872	3.4	1,539	5.9	11,320	43.6	3,882	14.9	1,710	6.6	25,979	100
Great Northern.....	6,879	35.5	552	2.8	865	4.5	6,056	31.3	3,919	20.3	1,090	5.6	19,361	100
Chicago, Milwaukee, St. Paul & Pacific.....	632	8.0	228	2.9	209	2.7	5,638	71.4	832	10.5	354	4.5	7,893	100
Oregon-Washington Railroad & Navigation.....	2,514	39.0	144	2.2	161	2.5	2,146	33.3	916	14.2	569	8.8	6,450	100
Spokane, Portland & Seattle.....	180	19.2	40	4.3	152	16.2	406	43.4	111	11.9	48	5.1	937	100
Longview, Portland & Oregon.....	1	.1	---	---	31	4.5	614	88.8	42	6.0	4	.6	692	100
Pacific Coast.....	(?)	.1	---	---	327	76.6	42	9.8	53	12.4	5	1.1	427	100
Port Angeles-Western.....	---	---	---	---	---	---	309	95.9	10	3.1	3	1.0	322	100
Peninsular Railway.....	---	---	---	---	1	.4	307	98.7	3	.9	---	---	311	100
Cowlitz, Chehalis & Cascade.....	(?)	(?)	---	---	(?)	.1	231	98.7	2	.8	1	.4	234	100
Spokane International.....	25	24.5	(?)	.2	1	1.2	40	38.9	15	14.5	22	20.7	104	100
Camas Prairie.....	1	23.4	(?)	6.0	(?)	.5	(?)	.9	(?)	2.0	3	67.2	5	100
Total.....	16,887	26.9	1,837	2.9	3,287	5.2	27,109	43.3	9,785	15.6	3,809	6.1	62,715	100

¹ For all railroads reporting revenue by commodities or commodity group.

² Less than \$500.

³ Less than 0.05 percent.

Sources: Reports of railroads to the Public Utilities Commissioner of the State of Washington.

TABLE U.—Horsepower (rated capacity) of power equipment in forest products manufacturing industries in Pacific Northwest, 1929

States	Boxes, wooden, except cigar boxes	Cooper- age	Furniture, including store and office fixtures	Lumber and timber products n. e. c. ¹	Paper and pulp (wood and other fiber)	Planing mills products including general millwork	Wood preserv- ing	Wood, turned and shaped and other wooden goods, n. e. c. ¹	All forest products	All other	All manu- facturing industries
IDAHO											
Prime movers:											
Horsepower.....				39,468		24	720		40,212	9,951	50,163
Percent.....				78.68		0.04	1.42		80.16	19.84	100.00
Motor driven by purchased energy:											
Horsepower.....				25,925		153	425		26,503	29,121	55,624
Percent.....				46.61		0.23	0.76		47.65	52.35	100.00
All power equipment:											
Horsepower.....				65,393		177	1,145		66,715	39,072	105,787
Percent.....				61.81		0.17	1.08		63.06	36.94	100.00
MONTANA											
Prime movers:											
Horsepower.....				14,817		958			15,775	20,172	35,947
Percent.....				41.22		2.66			43.88	56.12	100.00
Motor driven by purchased energy:											
Horsepower.....				2,841		1,668			4,509	157,325	161,834
Percent.....				1.76		1.03			2.79	97.21	100.00
All power equipment:											
Horsepower.....				17,658		2,626			20,284	177,497	197,781
Percent.....				8.93		1.32			10.25	89.75	100.00
OREGON											
Prime movers:											
Horsepower.....	525		1,271	142,242	50,322	925	2,180	100	197,565	10,034	207,599
Percent.....	0.25		0.61	68.52	24.24	0.45	1.05	0.05	95.17	4.83	100.00
Motor driven by purchased energy:											
Horsepower.....	1,982	80	4,681	63,416	40,684	11,417	702	531	123,493	87,232	210,725
Percent.....	0.94	0.04	2.22	30.09	19.31	5.42	0.33	0.25	58.60	41.40	100.00
All power equipment:											
Horsepower.....	2,507	80	5,952	205,658	91,006	12,342	2,882	631	321,058	97,266	418,324
Percent.....	0.60	0.02	1.42	49.17	21.75	2.95	0.69	0.15	76.75	23.25	100.00
WASHINGTON											
Prime movers:											
Horsepower.....	1,586	1,325	520	321,744	59,068	4,621	1,320	200	390,384	29,348	419,732
Percent.....	0.38	0.32	0.12	76.66	14.07	1.10	0.31	0.05	93.01	6.99	100.00
Motor driven by purchased energy:											
Horsepower.....	1,820	1,259	4,626	71,690	82,534	20,649	1,529	1,129	185,236	209,923	395,159
Percent.....	0.46	0.32	1.17	18.14	20.89	5.22	0.39	0.29	46.88	53.12	100.00
All power equipment:											
Horsepower.....	3,406	2,584	5,146	393,434	141,602	25,270	2,849	1,329	575,620	239,271	814,891
Percent.....	0.42	0.32	0.63	48.23	17.38	3.10	0.35	0.16	70.64	29.36	100.00
PACIFIC NORTHWEST											
Prime movers:											
Horsepower.....	2,111	1,325	1,791	518,271	109,390	6,528	4,220	300	643,936	69,505	713,441
Percent.....	0.30	0.19	0.26	72.64	15.33	0.91	0.59	0.04	90.26	9.74	100.00
Motor driven by purchased energy:											
Horsepower.....	3,802	1,339	9,307	163,872	123,218	33,887	2,656	1,660	339,741	483,601	823,342
Percent.....	0.46	0.16	1.13	19.90	14.97	4.12	0.32	0.20	41.26	58.74	100.00
All power equipment:											
Horsepower.....	5,913	2,664	11,098	682,143	232,608	40,415	6,876	1,960	983,677	553,106	1,536,783
Percent.....	0.38	0.17	0.72	44.39	15.14	2.63	0.45	0.13	64.01	35.99	100.00

¹ N. e. c.=not elsewhere classified.

Source: Census of Manufactures, 1929.