Trees and Men
A Survey of Forestry and the Lumber Industry in Washington

Division of Education
WPA
State of Washington
TREES AND MEN

by

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FOREWORD AND ACKNOWLEDGMENT

This is the second of a series of studies dealing with the natural resources of the State of Washington. The first, "Power in the State of Washington," was a survey of the present power situation, the potential future hydro-electric power development within the State and the public problems surrounding the industry. The following survey of Forestry also deals with the present status of the industry, its potential future, and the present public problems and future objectives of forestry within the region, and its affiliated industries.

While the problem in the Power Survey was one of transmuting a highly technical subject into the language of the layman, the problem in the present study is one of condensing a subject, vast in its implications and ramifications, into a moderate sized volume and still present a comprehensive picture of the subject as a whole.

Like the Power Survey, this study is bound to raise controversial issues. However, it has been the desire of the author to keep this volume as free as possible from prejudicial influences, and with that thought in mind he has been very cautious in selecting the sources of his material, to which the bibliography will attest. The writer has also adopted the same method of approach that he used in his Power Survey; presenting first the forestry
situation from the national viewpoint, including a brief history of its problems, and then reviewing the same material from the local viewpoint. In the sections under Part III specific problems and objectives are then discussed. While the meat of the entire study will be found in Part III, the writer felt that the rather lengthy presentation of basic material in Parts I and II was absolutely necessary for the reader to have a proper comprehension of the problems involved.

Up until a few years ago the people of Washington and the entire Northwest showed an indifferent attitude toward their great heritage in natural resources, and especially their forests. Despite the warnings of conservationists and forestry officials, the people as a whole paid little heed. They are now showing evidence of an aroused interest, which gives this survey at least the element of timeliness. The time has come when the people of Washington must know their forestry if they hope to preserve their greatest single asset.

The writer wishes to especially thank Mr. Irving M. Clark for his kindly interest and suggestions, and Senator Homer T. Bone for his prompt helpfulness in securing necessary government documents. He is also indebted to Mr. Harold Pritchett, President of the International Woodworkers of America, and Mr. Kenneth Davis and Mr. John Stanioch, officials of the Sawmill and Lumber Workers' Union, for their help in preparing the chapter on Labor Relations. He is also grateful for the splendid cooperation of government
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Herbert A. Resner
I. INTRODUCTION

I can do no better in beginning this study than to quote from an address delivered in Seattle some years ago by Harlean James, Executive Secretary, of the American Civic Association:

"...As a people we are sick, and no doctor has been able to give us a complete diagnosis of our troubles -- most of our medical men gravely tell us that we are suffering from a complication of diseases of which unemployment and inability to earn and collect an adequate living seem to be the principal symptoms.

"The land economists tell us that our public land policy has been all wrong. The political scientists tell us that we have governed ourselves too laxly. The sociologists declare that we have permitted our wealth to accumulate in the hands of the few leaving want and misery for the many. The conservationists point to our wasteful use and misuse of our natural resources. Those who love the wilderness and fine natural scenery say that we have stultified our spirits by destroying the beauty of our country and shutting ourselves into those ugliest and most incomprehensible places of living which we call American cities. Looking at the smoke-laden air which penetrates into the further corners of most of our cities -- gazing sadly on the miserable slums and overcrowded tenement houses -- dodging motor cars driven by careless, reckless persons -- looking at ugliness incarnate -- seeking out those living in want and sordidness -- it does take a penetrating dye to discover the elements in city life out of which we may build a new civilization possessed of a culture shared in some part by all. Certainly all of the ugliness and insanitary lapses are not to be found in the urban communities -- it has been proven that fresh sunlit air is frequently just as hard to introduce into a farm home as into the over-heated city apartment. And when one contemplates the blight of bill boards and ugly filling stations which have broken out along our rural highways like an unwanted rash, one can hardly help reaching the conclusion that the thoughtless mind and the careless hand of man have brought down on our God-given land a pestilence of which we must rid ourselves.

"Where is our vaunted independence? We are no longer free. We are the victims of our collective heedlessness and our concentrated greed."
It is because of this "thoughtless mind and careless hand" that the public, not only of Washington but of the entire country, must have an enlightened understanding and intelligent interest in our forest problems. In order to gain that enlightened understanding and intelligent interest we must first become conscious of the changing philosophy of our governed society as to their relation to their natural resources. This changed philosophy replaces the modern perversion of rugged individualism with collectivism. This new philosophy refuses to accept blindly the status quo as the divinely-ordered world which cannot be changed by any effort of man. It refuses to allow itself to be lulled asleep by a supine inertia, to complain without intelligent action, or to act unaided by all the modern technique and wealth of mechanical discoveries at its disposal. But the eventual success of this new collectivism as it affects our natural heritage lies along the lines of planning. No worthwhile structure was ever erected without a plan -- not even the Universe if we may believe the scientists or the theologians, or both. "But planning presupposes knowledge -- as O. Henry once said -- knowledge of information. Before we can plan adequately for the future we must know the present and the past, for life is not static. It is ever moving and it is just as important to apprehend direction and gauge speed as it is to recognize substance." So in order to better understand our present forest problems it might be well to take a short glance into the past.

II. A LOOK INTO THE PAST

The depletion of America's forest resources may be largely attributed to the national conception of the rights of the private citizen and to the policies set up to protect those rights even at the expense of public welfare. That such a situation has developed is readily understandable when we consider the traditional heritage of the Nation.

For three centuries America has been regarded as a land of freedom and opportunity. To the new world came millions of settlers who sought to free themselves from political or religious persecution, or from the restraint imposed by economic and social conditions in the Old World. America was the land of golden opportunity for those who had the initiative and the strength to take what they wanted. Rugged individualism was the common characteristic of the men who settled this country. This background explains how the ideals of freedom and unrestricted rights of citizenship became embodied in the American philosophy of government and in American laws and policies.

The country's vastness of area and wealth of resources contributed to similar ideals and policies in trade, business, and industry. The American frontier was extended steadily westward; the early explorers were followed by fur traders and trappers, and these in turn by pioneers seeking fertile virgin lands to clear and cultivate.
The development of communities provided opportunities for trade and business. The discovery of mineral wealth and the need for drawing upon new timber resources as those of the settled east became depleted, resulted in the extension of these industries, and, with them of necessary transportation systems.

The entire movement and development, if the resulting exploitation may properly be called development, has been characterized by a national policy of bestowing extremely liberal property rights on those who appropriated lands and land resources. Since 1785, Congress has donated over 200 million acres of the public domain to the states, and approximately 94 million acres to the railroads, to enable them to raise funds for their development. Little limitation was imposed upon the disposal of these lands, which were for the most part sold indiscriminately to individuals who proceeded to reap a rich harvest. At the same time the government has given or sold vast areas of mineral, forest and farm lands to private owners, until approximately nine-tenths of the 1,441,000,000 acres of original public domain have been disposed of. Any thought of responsibility for the future, any disposition to conserve a part of these resources was largely submerged by the policies of an enthusiastic young nation in the process of growing up.

The story of forest and wild-life depletion, extensive land devastation, uncontrolled streams and wasted water resources, eroded and abandoned farm lands, declining forest industries, decadent communities, alarming tax delinquency with virtual bankruptcy of local government in many regions, has all been told before. It is, of course, obvious that this situation cannot continue if the nation is to thrive. It is equally obvious that most of these serious ills have been caused directly by the national policy of allowing the private owner of land to exploit its resources at will for his own immediate gain, with few restrictions in the interests of public welfare. Our American assumption has always been that private initiative, through self-interest, would find ways of keeping land productive. We now discover that this same self-interest, together with lack of concern for the public of the future, has caused the ruin of land by the millions of acres. Many owners have disavowed any further responsibility by abandoning their lands to the public as a liability. The nation is faced with a situation that demands realization and acceptance of responsibility for remedial action.

III. THE BEGINNING OF A NEW ERA

While America was still in the expansion stage of development, with abundant resources at every hand, the dangers into which its land policies were leading were obscured by national optimism. We were a free people with plenty for all. It was easier, and apparently better economy, to cultivate new soils after the fertility of the used areas became exhausted than to maintain soil productivity by
more conservative and somewhat costly methods of cultivation. Apparently there was no need to worry about a second crop of timber from out-over lands, with a cheap and presumably inexhaustible supply of virgin timber at hand. The extensive measures of expansion had nothing in common with the intensive measures of conservation.

Gradually, toward the end of the 19th century, a perception of the inevitable outcome of these policies began to develop. In some regions the depletion or exhaustion of resources caused certain individuals to think of the future, and the idea of conservation was born. With the 20th century development of transportation and communication, world trade as well as increased local consumption of products speeded up the process of exploitation, and at the same time better opportunities were provided for observing and appreciating the extent to which these processes had been carried. As a result the demand for conservation became stronger and constructive action began. The creation of national forests, by withdrawals from the public domain, and the establishment of federal and state forestry organizations were among the first steps taken. Other conservation agencies came into being and gradually extended their influence. However, the progress made by the pioneer foresters was accomplished against difficult odds, and despite public indifference or even antipathy.

Experiences of the World War period and the years immediately following emphasized the national importance of basic resources, and the necessity for conserving and restoring them. As a result forestry programs were strengthened, although during the years of inflated prosperity which followed the war, the average citizen was too much engrossed with making and spending money to give much attention to public welfare enterprises such as conservation. The progress that was made can be credited chiefly to organized minorities of conservationists.

Within our nation, astonishing contrasts of organization and disorganization have always existed; splendid technical proficiency in some incredible skyscraper is found side by side with distressing backwardness in some equally incredible city slum, a marvelous bridge spans a river of uncontrolled waters, and a modern concrete highway leads through the desolate ruins of once-productive forest. That such contrasts exist is evidence of the precarious status of our national development.

In 1929 came the depression. Faced with its serious consequences, we have started with characteristic energy to determine the social and economic facts contributing to the situation, and the possibilities for remedial action. The depression has emphasized the necessity for a national inventory of resources such as that of the forest resources which is under way, and the need of a change of policy in their management. This survey is a humble contribution toward facing the facts of the forest situation in this country, and especially in Washington, and its relation to land use, flood control, wild-life preservation and other problems.
IV. THE ECONOMIC IMPORTANCE OF FORESTS

Nearly one-third of the country's land area, or approximately 600 million acres, is forest land of one sort or another. This is greater an area than all of the United States east of the Mississippi River. It is half again as large as all of our crop land. In 32 states the area of forest land exceeds the combined areas of crop land and plowable pasture, and in 23 of these it is from twice to more than twenty times as great. According to Zon and Sparhawk of the Forestry Service, one-third of the land area should be in productive forest.

The annual value of our forests and primary forest industries has been estimated at something over 10 billion dollars. The gross value of products averaged close to 2 billion dollars a year just prior to 1929. During the last 100 years the value at the mill of sawed lumber alone has aggregated between 30 and 35 billion dollars, and the value of all products was certainly not less than 50 billion.

In 1929 the forest and wood working industries employed directly 1,300,000 workers, or about 2½% of the gainfully employed persons in the United States. The building industries, which to a considerable extent depend upon forest products in one form or another, gave employment to more than 2,500,000 persons. In each of 20 states more than 30,000 workers were employed directly by the forest and woodworking industries (including pulp and paper manufacture), Washington and Oregon leading with approximately 135,000 persons so employed in each state.

Imports of forest products, including paper, amounted to more than $400,000,000 in 1929, or nearly one-tenth of all our imports. This was only partially balanced by exports, valued at approximately $250,000,000.

Forest products make up about 8 percent of all the revenue freight carried by our railroads, and the supplies, equipment, and other materials used by the forest industries account for a large additional tonnage. In recent years the railroads have required 80 to 90 million ties a year to keep up their tracks, and have paid around $120,000,000 a year for these and other timber.

Some $45,000,000 a year is paid for the timber used to mine our coal and other minerals, not including the large quantities used in the oil fields. It would, of course, be superfluous here to dwell at any length upon the importance that wood and wooden products play in the construction and furnishing of our homes and farm buildings, as raw material for our newspapers, books and magazines and in countless other articles used in our daily living.
 Practically all the streams used for municipal water supply, power or irrigation have their sources and considerable portions of their catchment basins in forest lands. Millions of our people look to the forests and the associated rivers and lakes for the health and enjoyment obtained from outdoor recreation. If it were not for their forest cover, many of our hills and mountain sides would become barren, rocky wastes and their soil covering would bury the farm lands in the valleys or would fill the reservoirs and irrigation ditches or clog the navigable channels below. Such has been the experience in the Tennessee Valley which the government is belatedly trying to correct.

The economic and social welfare of the Pacific Northwest is inseparably connected with and dependent upon the utilization of our natural resources: land, water, forests, minerals, fish and game. The greater the wisdom with which these resources are utilized, the more abundant will be our social and economic wealth.

A large part of the productive area of the Columbia Basin states consists of forest land which contains more than half the remaining timber supply of the United States and furnishes 36 percent of the nation's lumber. No attempt to improve the social and economic status of the people of the United States can leave out of consideration this important industry which ranks fourth in importance in the nation for value of product and number of persons employed. The industry in the Pacific Northwest region supports more than one-fourth of the population.

Forest lands in the four Columbia Basin states (Washington, Oregon, Idaho and Montana) cover 93,000,000 acres. Half of this area is in national forest; a third of it is privately owned; and the balance is in some other form of public ownership. Though the national forests contain a 50 percent greater area than private forests, they possess no more timber, and part of the merchantable timber which they do possess is in commercially inaccessible locations. Some sectors of the publicly owned forest areas are valuable chiefly for recreation or for flood and erosion control.

The Columbia Basin area (four states) has 917 billion board feet of merchantable timber as against a total of only 1,668 billion feet for the entire country. It has an amount equal to about 90 percent of the timber in the entire Dominion of Canada.*

Under scientific protection and management this valuable timber resource is capable of supplying a permanent livelihood to nearly a million people. Under the planless system now being pursued it is destined to early extinction, with the same consequent disruptions of the social and economic structure, which have followed in the wake of timber operations all the way from the Atlantic to the Pacific coast. At the present rate of depletion it is estimated that commercially available stands of old growth high-quality timber in private ownership in this area will be exhausted within a generation or even less.

*"Regional Planning -- Part I -- Pacific Northwest" issued May, 1936, by National Resources Committee -- p. 57.
The economic significance of this prospective timber depletion cannot scarcely be over emphasized. The taxable private investment in timber and operating improvements is somewhere near a billion dollars. This investment, in 1929, produced an income of $585,000,000, or 40 percent of the total income of the four states.

In Oregon and Washington forest industries employed 59 percent of all persons employed in manufacturing. The forests of these two states directly and indirectly furnish a livelihood for 776,000 people. They supply 65 percent of the out-bound inter-coastal tonnage by water,*

In spite of their vital importance, the forests here are largely managed in the same prodigal fashion which has produced disaster in other parts of the country. The lessons in water conservation, in flood and erosion control, have been painfully learned in the East. In this region there is equal reason for immediate concern for the conservation of our basic resources.

V. INTERRELATIONS OF FORESTRY WITH OTHER LAND USE FACTORS

In any discussion dealing with forestry one must consider its interrelations with other land use factors, such as: timber production, agriculture, grazing, water storage and watersheds, recreation, wildlife, water power, land classification, etc. In the Northwest, forests play a particularly important part in agriculture, flood control, recreation and wildlife preservation in addition to the value of the forest products themselves.

The function of land use, therefore, is no longer a problem of the individual owner, "The suggested increase in our local population, the national importance of our recreation and our wildlife have removed our land use from personal whim to the importance of a public utility," states T. C. Spaulding, Dean, School of Forestry, University of Montana. This statement may also apply to our crop production soils and to those devoted to pasturage. Its validity is apparent when the surface of the soil must have a multiple use. Forest soils, that is, those surfaces whose highest economic value lies in forest production and the direct and indirect benefits flowing therefrom, have numerous concurrent uses, all of public benefit.

The role of our permanent forest area is complex. Primarily, its major benefits are now, and will continue to be, the production of wood. Elsewhere it may be assumed that water conservation is of primary importance, with wood production secondary in the regional and national economy. Except in a few areas, irrigation is necessary for agriculture. Water power is an industrial requirement. Regula-

*"Regional Planning -- Part I -- Pacific Northwest" p. 57, issued May, 1936, by National Resources Committee. See also, excerpt from report of Pac. N. W. Reg, Planning Comm. entitled, "Columbia Basin Study."
tion of the water flow is accomplished; first, by the retardation of the surface runoff by the vegetative cover of the soil; second, by the costly construction of storage dams; and third, by both -- the dam being complementary to the initial forest conservation. The protection forest of this type will not only provide for a retardation of the water flow, but also, by wise management, create or maintain a permanent woods industry and at the same time allow controlled pasturage.

The importance of the forest range is evident. It provides, spring, summer and fall pasture for the farm livestock during the crop growing season. It also furnishes summer range for the stockman when forage growth or aridity prevent the use of the open-range lands.

A well planned forest land use program then provides the following direct financial advantages to the community: (a) A permanent forest industry, (b) water conservation affecting the success of both agriculture and industry, (c) forage to meet the need of diversified farming and the livestock industry, (d) forest recreation.

In addition, the Northwest is becoming noted as one of the playgrounds of the nation. Yellowstone, Glacier, Rainier, and Crater Lake National Parks, the Olympic Peninsula, Mt. Hood and other centralized recreational areas serve as focal points for nature enthusiasts of the world. With an augmented local population and the national and international playgrounds, we may well plan on a continuous use of our forest soils from a recreational standpoint. Properly guided, this form of forest-land use will become more than a minor use.

Hand in hand with recreation is the development of our wild-life -- game animals and fish, for sport and recreation -- fur bearers and fish as the basis of permanent industries. Our remaining game and fur-bearing animals have their home within the forest. This is also partly true of the upland birds. Our recreational fishermen finds the true sport in the mountain lakes and streams, with one exception -- Puget Sound. The water conservation of a well-managed forest land also increases the capacity of commercial fishing in the lower reaches of our rivers.

Forest lands then must be maintained in such measure that the community may obtain each of the five major uses flowing from competent forest land management.

A. FORESTRY AND AGRICULTURE

The perpetuation of forests is of particularly vital concern to the agricultural industry. These two major forms of land use, once regarded as competitive, are no longer so. Instead, with the advance of forest depletion and the gradual retreat of agriculture from the poorer lands it is coming to be realized that the two uses are complementary and to a considerable degree interdependent.
Directly or indirectly, the rural population has always used the greater share of our forest products. In the settlement of the forested regions the timber furnished a ready-to-hand material for building and fencing and fuel which required little or no cash outlay. The phenomenally rapid settlement of our great treeless central region would have been much slower had there not been a readily available and reasonably cheap timber supply in the Lake States. In most parts of the country, farm dwellings and barns and other buildings are still built largely of wood, and their continued use requires wood for repairs and upkeep. In spite of the growing use of steel and cement, the bulk of fencing still requires wooden posts. Wooden boxes, barrels and crates are used in enormous quantities for the shipment of farm products. Tool handles, farm wagons, and many sorts of farm equipment are made of wood. In common with other citizens, farmers consume wood in the form of paper, furniture and a multitude of wooden products. Millions of farmers still depend chiefly or wholly upon wood for fuel.

Besides their functions as suppliers of raw materials, forests in many regions, particularly in the West, serve agriculture through their influence on water supplies. Without dependable supplies of water it would be impossible successfully to cultivate the 19 million acres of irrigated land. In the 11 western states, more than 240,000 farms, or almost half of the total number, depend on irrigation water. Approximately 17,500,000 acres are irrigated in these states. With the completion of Grand Coulee Dam another 1,200,000 acres will be added to the above figure. The total value of these irrigated farms in 1930 was $4,500,000,000 and more than $900,000,000 has been invested in the irrigation works. A large proportion of the water used in irrigation originates on forest land. Without the forest cover the flow of water would become less regular, larger and more costly reservoirs would be necessary, and great expense would be entailed in removing silt from the reservoirs and ditches and, in many instances, in rebuilding dams.

Another way in which forests serve agriculture is by holding in place the soil on slopes and along the banks of streams. Many thousands of acres of rich agricultural bottom-land, in the East as well as the West, have been ruined by the deposition of silt, sand, gravel and boulders which were washed down from the hillsides after the forests were destroyed. Hundreds of thousands of acres have been cut to pieces by deep gullies which could have been prevented by preserving the forest cover at the critical points. Forests are the farmers' greatest protection from soil erosion.

Invariably farm abandonment follows forest destruction. In many regions where agricultural settlement was directly associated with the utilisation of the forests, the exhaustion of the timber and withdrawal of the industries has worked great hardship on the farmer. The lack of opportunities for supplementary work, the loss of local
markets for farm produce, the dismantling of railroads following cessation of the timber traffic, and the increased burden of taxation with a narrowing of the tax base, have made it impossible for many settlers to continue. Widespread abandonment of farms and virtual depopulation have followed, even in localities where permanent agricultural utilization of part of the land would be economically justified.

When we gaze upon our heavily timbered mountainsides, we must always bear in mind that down in the valley lives the farmer, rancher, stockmen and city dweller. The farmer is naturally interested in how the forest hinterland is managed, because he is dependent upon its proper management in many ways—grazing possibilities, water supply and a clear and uniform watershed flow so that floods do not destroy him. And in the present day he is more than usually interested in preventing cheap water power from going to waste.

Mistakes made in forest management do not merely affect the individual who might own the forest, but the others who surround him, including the farmer, and the city dweller. That is why forest conservation and sustained yield management have a public significance and affect the community as a whole. Therefore, the average farmer and the forester have a natural and common meeting ground.

B. FORESTRY AND RECREATION

The only contact with our forests which most of us make is through some form of recreation. As long as the fishing and hunting is good and beautiful camp-sites present themselves, the forests have served their purpose. Our concern in preserving them has been negligible because we have failed to realize that we had a direct responsibility in the matter.

The available figures for recreational use of public lands during 1931 indicate that there were more than three million visitors to national parks, about 32 million to national forests, and probably 50 million to state parks and forests. While there is a certain amount of duplication in the above figures, it is evident that a very material proportion of our population made some use of state and federal forest lands for recreation. The number who had recourse to municipal, county, and private forests can only be conjectured, but it must have been very large. Recreation, then, is a tremendously important forest use today, and according to the greatly-increased tourist travel of the past two years indicates an ever-growing volume in the future.

Since the beginning of recreational developments in the Intermountain Region of the Northwest, which was initiated in 1923, the planning of recreation areas has gone forward with due regard to the development of a well-balanced system. One of the underlying policies in making the forest recreation areas accessible to the public is that of keeping the improvements on a simple and natural basis with the rate of
development gauged upon the demonstrated public needs and requirements. There are, for example, many spots of rare scenic beauty within the national forests, places which afford visitors all they desire in the way of beauty, interest and inspirations. These places have been designated as "Primitive Areas."

The public has long been in favor of preserving primitive conditions in representative areas, and in deference to public demand, the Forest Service long ago initiated the policy of designating primitive areas. Under that policy 87 tracts aggregating almost 10,000,000 acres have been set aside. These figures have increased materially within the past five years and especially, in recreation areas. There is good reason to anticipate a great increase in the future. The factors which will cause this growth include an increasing population, shorter working hours, a probable rising standard of living, the increasing ease of transportation, and the increasing necessity, as society becomes more and more mechanized, for some possibility of escape to the primitive.

In this connection, it may be well to refer to the Walgren Bill for a moment. This bill endeavors to set aside a considerable portion of the Olympic Peninsula as a National Park. This "last frontier" of the United States proper is undoubtedly one of the finest primitive areas left within the boundaries of the country. There are even portions of it that have never been explored. Yet, Congressman Walgren is encountering considerable opposition in preserving this territory in its wild state for posterity. Because of the opposition the boundaries have been lessened from those included in the Original Bill, but still do not meet the objections of the lumber interests, some citizens who claim school lands are involved, the planning council and many of the sportsmen. This is an opportunity for recreationists to take an active part in preserving these beautiful playgrounds for themselves and their children. There may be room for debate over the exact boundaries of the Olympic Park, but, nevertheless, it is clear that the people of the Northwest must wake up to the fact that our recreational resources are one of our greatest heritages and must be preserved.

C. FORESTRY AND WILD LIFE

The value of wild life -- deer, elk, fur-bearing animals, upland game birds, water-fowl, song and insectivorous birds, and fish -- is too well known in this region to need explanation. We all know of how much importance wild animals have always been to mankind. As late as the settlement of North America by the white race, the native fauna of the continent was the chief source of meat and clothing supply. The "Winning of the West" was only made possible by the presence of countless thousands of buffalo, elk, antelope, beaver and other species of wild life.

The sport of hunting was of minor import to the early pioneers of North America. Except in the most isolated instances, however, hunting is now strictly a sport and as such is of tremendous importance. There are about 13,500,000 people who annually purchase hunt-
ing and fishing licenses in the United States. The amount spent for these licenses is about $30,000,000. It is estimated that these 13,500,000 people spend about one billion dollars annually in following the sport of hunting and fishing. Besides this commercial value of the wild animal, there are other values such as the recreational and esthetic values. The sport of hunting and fishing is an outdoor sport that returns much in the way of better health of both mind and body to the participant. Wild life exists where it has a suitable habitat furnishing water, food and shelter. Destroy wild life environment; pollute the waters and dry up the streams; remove the vegetation that provides food, the tree and the brush that provide shelter -- and you have a condition under which wild life cannot exist. You have then also, and almost immediately, a condition under which the human family cannot exist. The fate of wild life is inseparably linked with problems of soil erosion, dust storms, stream pollution, ground cover on watersheds, destruction of forests and denuding of grazing lands.

Mr. G. W. Grebe, Director, General Wild-life Federation of America, asks the question: "Why are more and more people coming into the Pacific Northwest within the next few years?" He answers: "They are not all coming here to fish and hunt. They are coming here because the natural environment for wild life is a healthful and pleasant environment for human beings."

The same destructive agencies that caused wild life to vanish from many eastern and mid western states is the destructive force that causes thousands of families to abandon their homes and farms and flee from the denuded fields and blinding dust. The same thing can occur here as well. It is true, nevertheless, that in the western national forests deer and elk, in many cases, are now too numerous for the natural food supply in their restricted winter ranges -- that is, on the lower ranges that are devoted to agriculture. Winter feed, in numerous instances, and not summer range in the forests is a problem.

However, this resource has been so badly managed in the past, just as have our forests, grazing land, agricultural lands, mineral deposits and all other natural resources, that it is today in an extremely precarious position. Fortunately, nearly all forms of wild life are exceedingly tenacious against the mistreatment of mankind -- they have the instinct and adaptability necessary to withstand adversity. Perhaps the most fortunate thing about the whole wild-life problem is the ease with which wild life can be perpetuated, expanded and utilized by sound planning. Hardly any other resource will respond so readily to scientific planning and management.
The preservation of our forests today is the absolute basis for the preservation of our wild life. As industry and agriculture moved westward the natural ranges of wild life species were more and more restricted to the forest regions until today a great part of our wild life, with the exception of migratory wild fowl and certain upland game birds, is dependent on forest and wooded land in one form or another for all or part of its habitat. Most, if not all, of the forest land of the United States is susceptible to the production of one or more species of wild life having social or economic values. In the Northwest the forests harbor the greatest variety of wild life in the United States.

A detailed study of this subject will be taken up later in the survey.

VI. MAJOR FOREST PROBLEMS

No attempt will be made at this time to take up all of the major forest problems, nor to discuss any of them in great detail. Rather, we are presenting here a few of these problems in brief to assist the reader in securing a proper background of the forestry situation in general. In fact, the entire contents of Part I are presented for that specific purpose, so that when we reach a detailed study of our local problems we may approach their solution more intelligently.

A. PRIVATELY OWNED FOREST LANDS

According to the "Copeland Report," "practically all of the major problems of American forestry center in, or have grown out of, private ownership." From this same report we find that nearly 400 million acres of commercial forest land are in private ownership, of which 270 are in industrial holdings and 127 millions in farm wood lands. Private ownership is by far the most important class because of its great area and also because it includes the great bulk of the most highly productive, the most accessible, and most easily logged forest land in the country. Nearly 60 percent of the most accessible remaining saw timber is on private lands.

Of the 83 million acres of devastated or poorly stocked forest land, 74 million, or nine tenths is privately owned, and an appreciable part of the remainder reached this condition before coming into public ownership or as a direct result of private operations and ownership. Of the 850,000 acres devastated each year about 95 percent is in private ownership. At least 36 million acres of forest deteriorates annually, primarily as a result of poor silvicultural practice and unsatisfactory fire protection.

The extent to which private ownership is responsible is shown by the fact that more than 98 percent of the 10 million acres cut over each year is privately owned, that fully 95 percent of the private cutting
is probably made without any conscious regard to the future productivity of the forest, and that nearly all the cutting on publicly owned forests is designed to perpetuate the forest. It is shown further by the fact that nearly all of the 191 million acres of forest land needing but not given protection is in private ownership, and that at least 41 million acres, or about 98 percent of the area burned annually during the last few years, is privately owned.

Because of the long time required to grow forest crops and the necessity for long-time planning and continuity of policy, stable land ownership is a necessity to the successful practices of scientific forestry. The instability of private ownership is evidenced by the fact that about 25 million acres of forest land, largely commercial timber, is now tax delinquent in three regions alone — the Lake, Southern, and Pacific Coast States. The instability of private ownership is also evidenced by donations of land to public agencies or offers of donations in large blocks and by offers of exchange and of sale at bargain prices.

A new public domain of great magnitude is being created, before the problem of the existing public domain has been solved. It is no exaggeration to say that there is virtually a break-down of private forest-land ownership. The cause lies in the public policy of passing excessive areas to private ownership, in the cut-out and get-out policy which has wrecked the productivity of the land, and in the resulting inability of owners to pay taxes on non-productive lands.

The most serious problem involved in the perpetuation of the Columbia Basin forests is the existing forced liquidation of valuable stands on privately owned lands. While only one-third of the forest area is privately owned, this one-third contains 43 percent of the timber volume; and on account of the superior quality and accessibility of this timber, it holds decidedly the dominant position. Private capitalists made heavy investments in timber and operating improvements at a time when the importance of continuous operations was little understood. Those investments, in many cases heavily mortgaged, were not promised upon long-term holding required for sustained-yield operation. They were made on a basis of quick conversion, in other words, the contrary of conservation. Sums required to meet interest on mortgage and bonded debt and taxes are now forcing liquidation and precluding sustained-yield operation. It is a vicious circle, and the present procedure of liquidation accentuates its own abuses.

High carrying charges and taxes force overproduction of lumber. A lower market further stimulates the desire for volume production in the grades and sizes most cheaply available. Top and small logs, slightly defective logs, and marginal trees are left fallen in the woods, knocked down in the ruthless struggle to hand up volume production records, and of no further use. A Forest Service study of woods waste in the Pacific Northwest shows that in normal times there is wasted on the ground 20 percent of the volume taken by the mills.
In the Copeland Report, titled "A National Plan for American Forestry" (Senate Document #12, 73rd Congress, First Session), we find the following significant statements:

"The possibilities and limitations of private effort must be judged in part from past results.... In general, however, they have been very seriously detrimental to the owners and the forest industries, to the productivity of the forest, and to the public interest. Constructive management is conspicuous largely by its absence, except in fire protection. "The only way private forestry could be a success would be for the government to pay practically all the expense of starting, developing, and protecting the forests, leaving to the owners only the harvesting of the profit. Such a scheme is obviously preposterous, and there is no social justification for the government to use the resources of all the people simply to make possible the continuance of private ownership. Far better it is for the government itself to take over private woodlands and to manage them in that competent way which it has, during nearly 50 years of practical experience, more than amply demonstrated."


"The results indicated are so universal that they raise the question if they are not almost inevitable in the system of private ownership particularly under American conditions and expectations for quick business turnover and large profits.... It is difficult to escape the conclusion that there is nothing in past experience or definitely in sight for the future which gives reason for hope that private ownership can be depended on for anything approaching the contribution to American forestry that has been expected of it during the past 20 years."

"At least until very recently, however, the cooperation has been mostly on the part of the government, and while the lumber operators have been perfectly willing to accept the government help, they have not made any substantial effort to do their part."


It is only proper to state at this time, however, that a considerable portion of the lumber industry has experienced a sudden awakening within the past few years as to its responsibility in the field of conservation, as witness their annual Forest Conservation Conferences held under the auspices of the National Lumber Manufacturers Association. In this regard the statements of Wilson Compton, Secretary-Manager of the N.L.M.A. in an address before the delegates of the above Conference, are significant: "We want conservation and sustained production of forest resources and the perpetuation of the sources of livelihood of our industry; we want to arrive at a constructive solution and so far as practicable we want to arrive at it by the voluntary act of intelligent and well-disposed forest owners in cooperation with an intelligent and well-disposed government; we want to do our part and we want the public to do its part."

*PF. 58-59
But the whole problem hinges upon the interpretation of, "What is the public's part?" It is true that private owners of forest land have been and still are faced with mounting costs of land ownership brought about by increasing local taxation. Fire, insects, and disease continue to take or threaten to take a heavy toll of timber values. The per capita consumption of wood, and particularly of lumber, has declined and other products have cut greatly into former demands for wood. Under the existing system of unrestrained, competitive liquidation of forest values, the returns in many instances are less than the amount that was invested. "It is perhaps natural, therefore, that the forest owner should view the future with grave doubts, and question whether forestry is for him."

It is also true that the public has a responsibility, especially in the protection of the forests from fire and other destructive forces, and also in the revamping of the forest taxation system. As long as we have private ownership, the public must give some assistance if it wishes to curtail indiscriminate liquidation of the forests. It is either that or complete public ownership.*

B. THE TAXATION PROBLEM

Another difficult phase of this same program lies in the tax situation. In the Douglas Fir Region of Washington and Oregon annual taxes on standing timber average about 2 cents per thousand board-feet. The timber tax has been taken for granted as an invariable source of revenue. As the timber is depleted the tax on the remaining stand is increased to provide an undiminished total return. From an average of 70 cents per acre in the heavily timbered counties, the tax increased to as high as $3 or $4 per acre in depleted counties. Counties have clung to the policy of completely draining the resource, shutting their eyes to the inevitable collapse which must follow this "goose-killing procedure."

It is obvious that under the general property tax system there will be more property to tax with productive forests than with idle land, and that this will tend to result in lower tax burdens on all property within the same taxing unit. This additional property will include not merely the forests themselves, if they are privately owned, but also the sawmills, pulp and paper mills, and other plants dependent on the forest for raw material. It will include the homes and other property of persons employed in the forest-products industries, and the homes and businesses of persons who serve the forest-

*The State Planning Council suggests that a gradual evolution in forest practices is taking place. Mr. R. K. Tiffany, Executive Officer, of the Council asks, "What will happen if we attempt to force to quick a revolution?" And answers the question by stating that it will work "hardships to operators and workers" alike. He suggests that it may be better to assist and guide this evolution than to take the extreme steps involved in complete public ownership.
industry population. It will include the summer homes, resorts and other recreation facilities that exist because of the forest. It will include the farms and villages whose existence depends on the forest. In the West it may include immense agricultural values that depend on the water from forest lands. These dependent values may, and often do, considerably exceed the values of the forests themselves.

In Wisconsin, for instance, the value of the pulp and paper plants is around $100,000,000. The wood for these plants could be supplied by about 2,000,000 acres of managed forest which at present valuation would probably be worth not more than $50,000,000. In Grays Harbor County of this State, forests and cut-over land are assessed at around $12,000,000 and lumber and woodworking plants at nearly $8,000,000. Of the remaining property, assessed at $18,000,000, at least 90 percent owes its value to the existence of the forest industries. Even the farms, now worth one million dollars, would lose much of their value if the forest industries should close down permanently.

In cases like these, even if the forests themselves were entirely exempt from taxation they would indirectly return much greater revenues to the public treasury than would the same area of idle land. The same thing would be true if taxes were based partly or wholly upon incomes, instead of property. All of the varied industries and businesses sustained by productive forests are capable of yielding incomes, but idle land produces none.

It does not take much erudition to see that if the private owner is to be encouraged in going on a sustained-yield basis, our taxation system must be such that we do not force him to liquidate his holdings in order to get out from under. We can also readily see by the above examples the really tremendous importance permanency in the lumber industry means.

"Representatives of the lumber industry in both the Douglas fir and the pine regions of the Columbia Basin States have evinced their desire to formulate and observe rules of forest practice designed to keep their lands in a productive condition," according to the National Resources Committee. "However, under present economic conditions private owners cannot carry for the necessary period the large timber land investment required for sustained-yield operations. Adequate control of production and the operation on sustained-yield basis cannot be secured without powerful government aid. Most timberland owners are forced to liquidate by reason of economic conditions beyond their control. Tax reform and other measures designed to remove present obstacles to sustained-yield operation are bound to be slow. This complex situation can be remolded only through a substantial shifting of forest land from private to public ownership."

*Regional Planning -- Part I -- Pacific Northwest P. 59 -- Issued May, 1936, by National Resource Board.\"
C. FOREST DEVASTATION

(1) Destruction From Fire

Systematic and organized control against forest fires was begun in many forest regions about 25 years ago. Considerable progress has been made and partial success attained; but taking all the forest regions together, as reflected in the record for 1926-30, the average burned over areas of 41½ million acres annually on national forests, state and private lands, fire must be considered as a widespread national problem.

In spite of 25 years of educational effort the number of human-caused fires, over 90% of the total, is still surprisingly high. We are still confronted with a severe handicap in attempting to protect forests from fires, simply because the public along with the private interests have thus far failed to grasp the nature and extent of the protection problem and accordingly have made little progress toward eliminating the causes of fire.

The data briefly indicate that on the 417 million acres constituting the major forest regions, outside of the national forests, requiring protection against fire, 11 times as much damage was done by fire as this area can suffer and still retain the desired degree of productivity. On the 96 million acres of national forest land requiring protection as a whole, on the contrary, damage was held down practically to the acceptable maximum. The extremely high ratio (11 to 1) for the areas outside the national forests is due in a large measure to the existence of millions of acres of forest land where, because of the lack of funds, no protection is afforded. A large percentage of this is cut-over land stocked with young trees. At the same time, large areas exist in every region where fire-protection work is fairly adequately financed and the results are relatively satisfactory. But even in the forest regions where current expenditures are large, as for example in the Pacific Coast, further intensification of fire control effort is needed if the objectives are to be met.

The economic necessity for preventing or controlling forest fires is not yet universally recognized or accepted in all forest regions of the United States. Especially is that true of the Pacific Northwest region. The very extensiveness of the original forests has created a false assurance of their inexhaustibility. Thus, through the years there has grown up a public disregard, disinterest, and indifference towards the forests, particularly the immature forests containing little or no merchantable timber.

The first task, therefore in any adequate fire-control program is to stimulate by carefully designed educational means a proper and sympathetic public attitude towards forest values, and to build up among the leaders of opinion in the community, along with the general public, an intelligent understanding of the damage that fires may inflict and the means whereby their destruction may be checked.
When the writer refers to human-caused fires, he does not necessarily refer to fires caused by the general public. It is a commonly acknowledged fact that the greatest amount of damage by fire is from fires in connection with, or following, logging operations. Roads and "truck trails" also increase the fire hazard by letting in the sun to dry out the litter, and by bringing people in. So, while the general public should daily become more cognizant of the forest-fire hazard, the private interests should also take more precautions in their logging operations.

(2) Destruction By Insects

Insects cause losses in forest stands and in forest products estimated at over $100,000,000 annually. They lower timber yields and retard the growth of young stands. Frequently they change the composition of the forest to such an extent as to necessitate complete reshaping of management plans. They create serious forest-fire hazards. They also damage and destroy finished wood products.

Although the forest-fire problem far outshadows the problem caused by insects and tree disease, yet in the Ponderosa pine forests of eastern Oregon and Washington the western pine beetle is destroying substantially more timber than fires. This insect during peak epidemic periods is taking a toll from the pine forests comparable to that taken by the sawmills. In this area the continued support of timber-dependent communities is threatened by an attack which can only be met by scientific approach and thorough and expensive effort. This question will be taken up more fully in Part II.

3. Destruction From Disease

Timber killed by disease, insects, wind, and drought, and not utilized during the years 1920 to 1929 inclusive, amounted nationally to over 985 million cubic feet annually. A large percentage of the above figure was caused by some form of tree disease.

Each of the many valuable tree species of the United States is subject to attack by one or more species of parasitic fungi. Some of the great number are capable of killing trees, others merely injure them or destroy the wood they produce, and others retard their growth. Some attack the seedling, others the mature tree. To identify the many different diseases that attack trees, to determine the cause of their spread or the conditions or management practices that affect it, and to ascertain what strains or varieties are resistant to them for even the 25 most important timber species, at the rate possible to the present force of investigators, would require not less than half a century.

The annual cost to public agencies at the present time for forest disease protection is estimated at approximately $3,750,000. The Federal Government must continue to bear much of the expense of investigating forest tree diseases to determine principles for this
control. This is indirect aid which is properly a federal function since many forest diseases, just as forest trees, are regional in their distribution. However, this fact does not relieve the states nor the private interests of their responsibility in investigating and financing their own activities for the solution of pathological problems. Heretofore, too much dependence has been placed upon the Federal Government. At the time that this is written great concern is felt over the spread of blister rust in the white pine region of Eastern Washington, Idaho, Montana and Oregon. According to H. E. Swanson, senior pathologist of the Department of Agriculture, in charge of blister rust control in the above mentioned states; White pine blister rust is no longer merely a threat in this region; extensive damage as a result of this disease is actually taking place. The spread of the blister rust disease is rapidly outstripping progress of control measures and unless the initial control work is completed within two years, extensive losses in young white pine will occur in those white pine areas which remain unprotected at that time.

4. Logging Devastation

While fire, disease and insects take an enormous toll annually of our forest products, wasteful and careless logging methods also account for much of our forest waste. And while the first three "destroyers" are at times excusable and unpreventable, the latter form of devastation is the outcome of national tradition, economic factors and carelessness. This is especially true of the Douglas Fir region of Washington and Oregon, and has long been the concern of the Forest Service in this district. The problem is of such importance that it can merely be mentioned here, but will again be taken up in considerable detail in Part II of this survey.

D. THE PROBLEM OF FOREST EMPLOYMENT

Forestry and the lumber industry directly employed an average of 850,000 workers in the United States in 1929. This did not include the large amount of part-time work by 2,500,000 farmers who got out wood and timber from their own land and worked it up for their own use or hauled it to market. Another 650,000 were employed in woodworking plants of various sorts and in the pulp and paper industry. The persons employed in the transportation and merchandising of lumber and other forest products are not included in the above figures.

Employment in the forest and related industries has been decreasing for more than 20 years. So far, this has been due only in small part to increased output per man. The principal reason is the decrease in total output. For instance, the number of wage earners employed in what the Bureau of Census classified as "the principal lumber industries" decreased 23 percent between 1909 and 1922, while the output of sawed lumber decreased 17 percent. In 1899 the ratio of
tota]. lumber cut to number of wage earners in logging camps and sawmills was 85,000 board feet per man. In 1909 the ratio fell to 81,000 feet, and in 1919 to 72,000. In 1929 it rose to 88,000 feet. It is quite possible that the future will see considerable technological advance in the processes of harvesting and fabricating wood products, and that this will tend to reduce the quantity of labor per unit of output. However, this is questioned by many forestry experts.

To the extent that this takes place, and to the extent that a decreased output represents a reduction in our capacity to consume timber products or to sell them abroad, a corresponding reduction in employment must be expected. However, if we can eliminate the wastes involved in the present system of forest exploitations and migratory industries, there is reason to believe that it will be possible to reduce costs and in the long run materially to increase the consumption and export of timber products. If this should come about, the forest industries might require an even larger number of workers than are employed now.

Let us take a look for a moment at the employment figures of some of the European countries where many forests have been under sustained yield management for a long time:

In Denmark the forests furnished full-time employment for one worker to every 125 acres of forest; in Sweden, employment averages about one man to 400 acres in the South and one man to 1,400 acres in the less productive forests of the North; in Prussia one man is employed to every 167 acres; in Austria about one person for every 100 acres of forest is engaged in forest work, and if transportation, manufacture and wood-working industries are included, one for every 30 acres; for Czechoslovakia, including the industries, there is one worker for every 55 to 50 acres; and the British Forestry Commission estimates that in England on the average, forests in the planting stage require one full-time worker for 100 acres and forests in the productive state, one worker to 50 acres, and if you include hauling and the wood-working industry, one person for every 25 acres.

There is little information in this country to indicate just how many persons might be employed in our forest industries. However, a very rough estimate of the aggregate possibilities for employment in American forests may be derived as follows: In 1929 there were employed in forestry, logging and wood manufacture an average of 1,300,000 persons. Including the part-time work of farmers, the total was equivalent to possibly 1,500,000 full-time workers. The total cut of timber (not including small trees cut for firewood, etc.) was approximately 37 billion board feet, or 24,000 board feet for each person engaged in the industries. Our forest land, averaging poor and good sites together, can probably grow timber at the rate of 100 to 150 board feet or more per acre per annum. At the present rate of employment this would give full-time work to one man for every 240 to 360 acres. Inasmuch as the present employment includes very

little silvicultural work, and since a considerable amount of work in connection with the utilization of range and recreational resources is not included in the above figure, it is feasible that our forests, when fully productive, may give direct employment to at least one person for every 250 acres, or the equivalent of full time work for some 2,000,000 persons in all.

There is only one way to stabilize employment in the forest industries and that is through sustained-yield management. Permanently productive forests will not only give fairly steady work in protecting and caring for the forest and harvesting the crop, but they will also lead to the establishment in the same vicinity of wood-using industries which will also employ many workers. Although they may not contribute greatly toward relieving permanent technological unemployment in the urbanized industrial regions, they will be very helpful in taking up the slack in the immediate regions where they are located.

E. MISCELLANEOUS PROBLEMS

There are other forest problems besides those discussed heretofore, such as watershed protection, forest ranges, etc., but space does not allow for their further discussion at this time. But it may be well to insert a word here regarding "the problem of knowledge," or rather the lack of knowledge of our forestry problems. Lack of knowledge of the inevitable consequences has been one among the many factors responsible for the public policy of allowing excessive areas of forest land to go into private ownership. It has been partly responsible also for allowing large areas of land to go into agriculture which were submarginal for that purpose and which should have been kept in forest.

Lack of knowledge has been one of the factors which has led private owners to adopt the cut-out policy. This in turn led to oversized plants, far too short depreciation periods, excessive capital costs, the cutting of unprofitable timber, lack of provision for future crops, and the devastation or deterioration of a large part of the privately owned commercial forest land.

It has slowed down progress, impaired efficiency, and increased costs. In these ways, and perhaps still more by not anticipating the great losses caused by erroneous public and private policy and practices, it has been partly responsible for great public and private losses, and is still handicapping progress of the entire forestry movement. These losses can only be corrected by an enlightened public opinion as well as a greater understanding in the industry itself.

VII. THE SIGNIFICANCE OF APPLIED FORESTRY

Applied forestry has made its chief advance within the realm of public forests. Forestry on private lands has lagged far behind and is still non-existent on a vast aggregate acreage. Even public
forestry was brought about only after a long period of educational work. It then moved rapidly, largely because we had to do with a single owner, as the Nation or State, that looks to the widest benefits of the people and is in a position, if need be, to spread costs and returns over generations. The economic complexities of private forestry have caused a still longer period of preparatory work which it is hoped is now drawing to a close.

"One of the primary difficulties in private forestry" says Henry S. Graves of the American Forestry Ass’n, and Dean of the Yale School of Forestry, "lies in the character of ownership of the land. Hundreds of thousands of tracts, big, little and in between, are owned by individuals, corporations, and other agencies, each with distinctive objectives and distinctive economic and financial problems. Our Nation adopted the policy of distributing public land to individuals in small parcels. It was based on the purpose of building a nation of small owners of homes and farms; a splendid objective in laying the foundations for a sound democracy. But the principle of indiscriminate distribution of public forests unsuited to farming and home building has led to some of the most perplexing economic problems we face today in forest conservation. What happened was that as soon as title to land was obtained by individuals, carrying charges began, leading to pressure for realization through timber cutting or sale. This pressure increased as the years passed and inevitably led to haste in exploitation, sharp competition, periodic over-production and the various industrial and social consequences with which we are all familiar. No more effective device could have been found to deplete the forest resources of the country than that followed by the government and states in their policy of land distribution; no more effective device to cause instability of the industries and of the communities dependent on the forests."

Applied forestry generally involves four stages of development according to Mr. Graves. First, there is the necessity for sheer protection of forests from natural factors of destruction; from fire, insects, disease and other agencies. Considerable progress has been made in meeting this problem.

The next stage in forestry is the initiation of measures to insure a restocking of forests, after cutting, by stands of trees of prospective value. This is the problem of reproduction, or, as the phrase goes, keeping the forests in a productive condition. There is now a wider recognition of this principle and some effort in actual practice on private lands. This is the elementary beginning of silviculture; to provide for new growth by leaving an adequate supply of trees for natural seeding, or by planting where necessary. It is, however, only the beginning of forestry because mere forest replacement does not take into account continued use of the land to supply industry with raw materials and to supply owners with income during growth of new stands of trees to marketable dimensions.
Even if ample provision is made for restocking of the lands, lumbering may remove such a large part of the growing stock of intermediate and smaller trees that it will be many years before there can be further returns from timber.

This brings us to the third stage in applied forestry, which calls for the reservation on the ground of enough growing stock of intermediate and immature trees to constitute a basis for subsequent cuttings within reasonable periods. This is the objective of so-called selective logging, whatever form that may take. It is the foundation of sustained yield. It is an essential feature in bringing about stability of ownership. It provides for continued local supplies of raw material for industry and thus contributes to permanence of manufacturing plants, sustained employment, and stability of communities. If all forests in a given region are handled so that an ample growing stock is left on the ground and provisions made for protection and reproduction after cutting, the basis for a measure of regional sustained yield is created. Protection and reproduction may prevent forest devastation; these measures alone do not prevent economic forest depletion. What the public wants and is increasingly demanding is the prevention of forest depletion that leaves regions and communities for years without forest resources to contribute to industrial activities. In other words, the public demands a cessation of the "cut-out and get-out," "boom and bust" policies of the past. Many authorities, however, recognize the difficulty of selective logging measures in the fir forests, and feel that this form of applied forestry is at the present premature; yet they feel that some form of sustained yield is practicable.

The writer has never contended that a perfected form of selective logging is feasible at the moment. What he does deplore is the complete ignoring of the principle in general logging operations.

The final stage of forestry is the organization and management of forests for sustained yield. This involves the organization of a tract or group of tracts to provide a continuous supply of raw material for a specified market. This, of course, involves the principle of leaving enough growing stock to make possible repeated operations in specified areas of the forest at reasonable intervals. The quantity of material cut each year is governed by the yield capacity of the land. If the production from the mill is commensurate with the yield capacity of the land, there is a basis for permanence of operation. Sustained yield management of large forest property involves many complex problems of determination of growth, appropriate methods of silviculture, and systematic plans for cutting, all adapted to the requirements of the mill and the financial and other business problems of the owner.

If the present set-up of private ownership is to continue, the principle of sustained yield organization would work out something like this: If a given manufacturing plant is to have assurance of permanence, there is involved the necessity of organizing groups of
properties for sustained yield, with contractual arrangements with
the owners to sell to the manufacturer and to adjust the management
of their lands to the master plan for all the properties considered
as a unit. This may be called group sustained yield. Such an
undertaking offers to the manufacturer an assured supply of timber
continuously from lands naturally tributary to the plant. It pro-
vides certainty of returns at reasonable intervals to the land
owners. It would result in stability of industry and of land use
and hence is of vital public importance to communities.

While there are those who believe that private ownership of forests
has a definite and prominent place in our future forest management,
there are others who believe that the only solution of the problems
involved lies in a continuing increase of public ownership. The
latter contend that a single ownership will wipe out the complex-
ities of present day forestry and assure a sustained yield manage-
ment. There is no question but that the gradual acquisition of the
private forests by the public will lessen the devastation now going
on and assure the people of the preservation of their heritage.
One thing is certain -- if the private owners and the industries
do not demonstrate, in the very near future, their capacity to
handle the lands productively before they are much further depleted,
public acquisition will become necessary in order to restore and
safeguard the general public interests. The private interests must
learn to "farm" the forests instead of "mine" them. "Forty years
of effort on the part of the government to persuade private operators
to cooperate in conservation measures seemed to demonstrate pretty
clearly that the problem can not be solved under private ownership."

"Under their present management the American forests are drifting
into constantly expanding ruin. Year by year the area of devastated
land keeps mounting, until today it has reached the appalling total
of 83 million acres, to which nearly a million acres are being added
annually. Even more serious than the devastation is the grave
deterioration which has occurred on at least 200 million additional
acres. Between devastation and deterioration the American forests
and all the social values which they represent are indeed in a tragic
condition.

The major cause of this sorry plight is the mismanagement of privately
owned forests. Fire damage, erosion, devastation, and destruction
of scenic values are many times more severe on private than on public
forests. This hopeless insufficiency of private ownership has obtained
even though the government has carried five sixths of the burden
of fire protection. When this miserable failure is contrasted with
the splendid record of public forest management the moral seems
inescapable. Public ownership is the only basis on which we can hope
to protect the incalculable values of the forests for wood resources,
for soil and water conservation, and for recreation. It is urged,
therefore, that the public should acquire at least 562 million acres
out of the 670 million acres of potential forest land."
VIII. PLANNING

The solution of the problems discussed in the preceding pages lies in a systematic and intelligent course of procedure, called "Planning." This involves, first, the organization of knowledge now at hand, and, secondly, action based upon that knowledge. In addition, intelligent planning involves continued research in a multiplicity of problems which go to make up orderly development of our resources. Basically, then, planning is three things: (1) fact finding; (2) analyzing the facts and making recommendations based on them; and (3) action, based upon those recommendations by legislative authority. The first two become worthless and a waste of time and energy unless supported by action. A fourth stipulation may also be added to successful planning -- the mobilization of public opinion.

While our effort toward a planned economy is a step forward, it is up to the public to see that planning does not become plotting. When we consider State Planning we must think first of the State Planning agency. "Here at once we face a paradox," states Harlom James. "If the State Planning Board is 'in politics' as the words are ordinarily accepted, its usefulness is crippled and its service may be entirely diverted from the obvious purpose for which State Planning boards are set up. On the other hand, if the State Planning boards have not the confidence of the governors and active cooperation and understanding of the heads of the state departments of the administrations in power, their plans, however good, are bound to be futile. A true course must avoid both horns of this dilemma."

If citizen-support groups can keep public sentiment crystallized in favor of maintaining Planning Commissions, in membership and staff, as technical advisory agencies, there is a very good chance that planning will play its proper part. From the present trend of public opinion there seems to be a well-defined sentiment which will assert itself where the decision between politics and non-politics is presented with concrete, understandable programs of action which may be followed. If we select a field like planning which is essentially technical and based on comprehensive, accurate information which can be gathered only by experts, there seems to be an excellent chance that public opinion will function. And wise political leaders are singularly influenced by public opinion. The answer, therefore, rests with organized citizen groups who lead public opinion.

In the words of Miss James, "the whole planning structure is built upon the common-sense premise that decisions based on pertinent information, analysis and technical advice are sounder than snap judgment based on prejudice, privilege and ignorance of the facts. There is certainly nothing futilely optimistic about such a procedure. The principal danger is that after the present high-mindedness, born of desperation, shows a tendency to wane, the organized
citizens will fail to give that support to State Planning boards which is essential to protect them from adverse political influences. It is ourselves we must hold responsible if State Planning boards are not permitted to make the fullest use of technical information and to function in a common-sense manner."

The Pacific Northwest is still rich in fine scenery and in native economic resources. Land planning studies should give to the region a comprehensive plan for land uses which would serve this generation without robbing future generations of the heritage which is their due. In the East the United States Forest Service is now purchasing cut-over and left-over forest lands which a mistaken land policy allowed to pass into private ownership and so to be stripped of their wealth. In many parts of the country, today, vast sums of money are being expended to correct erosion which has followed the complete denuding of lands once covered with fine virgin forests.

In the East the people are obliged to purchase their national parks so far with state and private funds — and, unfortunately to accept some scarred and injured areas which may not return to wilderness conditions for fifty or a hundred years. It may well be that in another 100 years the only highly scenic areas which have escaped commercial utilisation will be the national parks, and national primitive areas.

In the Pacific Northwest these land and water resources are still abundant and largely in public ownership. And so this section of the country, which still has so much of its inheritance intact, should profit by the mistakes of the eastern states, and with the aid of local, state, and regional planning maintain an environment for its citizens which will give to this country a new standard of culture and comfort.
PART II

THE FORESTS OF WASHINGTON

Note: As was the case in our survey of "Power," we cannot take up a study of forestry in Washington without including the forest problems of the entire Pacific Northwest or the entire Columbia Basin region. They are so closely interrelated and the problems are so similar that what affects one section of this region is generally applicable to another. This is especially true of the Douglas Fir and Ponderosa Pine regions of Oregon and Washington. Also the problems of the white pine region of Northern Idaho and Northeastern Washington are common to both. It may also be stated that most of the forestry studies made by the Government and other agencies have dealt mostly with the region as a unit, and the greater portion of statistical material is so based. Therefore, if the writer on numerous occasions steps over the State line in his discussion, the reader will know that it is unavoidable. However, the major portion of the survey will deal specifically with Washington.

I. PRELIMINARY DISCUSSION

The forest resources of Washington have, since the earliest days, formed this territory's principal source of revenue. From the first hand-sawn schooner load of lumber shipped to San Francisco by the earliest settlers in exchange for general merchandise, to the present production, which in the whole State reaches approximately $200,000,000 in value annually and furnishes around 65 per cent of the total industrial payroll, the forests have, in a more marked degree than in any other State, influenced the character of development and the prosperity of this region.

The stands of timber in Washington and the Columbia Basin not only provide a great source of support for local social structures but the great potential forest productive capacity of the region also affords possibilities of a valuable contribution to the welfare of the nation; provided that aggressive steps are taken to bring all lands primarily valuable for growing timber under adequate forest management. This involves public action and greater public responsibility. While this region is handicapped by distance from its principal markets, the wood-using industries have already reached a high rank for the United States. In lumber production, Washington has led all States for over twenty years. The Columbia Basin States for 1929 produced 36% of all lumber cut in the United States.

While the whole resource is confronted with many serious problems, including control of fires and ravages from insects and disease, the most critical of all is that of private ownership. Stabilization of this ownership and the introduction of adequate forest management of private lands is one of the most vital questions confronting the Nation today.
Certain large areas of heavy virgin timber stands within the Columbia Basin, particularly in Oregon and Washington, afford about the last opportunity in the Nation, with the possible exception of the Southern Pine Belt, to apply sustained yield forest management to old growth timber stands. Hasty exploitation and devastation by fire have progressively depleted all forest regions of the Nation except the Rocky Mountain and the Pacific States where large bodies of virgin timber are still intact. Effective action in a large way is still possible in this area if the public is soon awakened to the seriousness of the problems involved and are willing to shoulder the responsibility of preserving this State's heritage next to water power.

Most of us have not given enough thought to the social and economic importance of the forests of this region. When we think of the vast timber stands of this corner of the United States, aggregating 796 billion board feet and constituting 55 per cent of the remaining virgin timber supply of the country, we erroneously harbor the idea that they will last forever. In the first place, it should be recognized that some portions of the forest, largely on public lands, are on high and rugged mountain areas, of difficult access, and certain relatively low quality timber. This cuts down considerably the availability of this timber for commercial use. Such areas have a very great importance, however, for the conservation of water, recreation, wild life, and forage, and must be protected. On the other hand, the commercial timber is now being cut much faster than it is growing and at the present rate may be completely depleted within the next generation unless the proper steps are taken for its preservation and regrowth.

Under intensive forestry management, in contrast with the migratory wood-using industries of the past, the forests can afford an excellent opportunity for the establishment of permanent towns and settlements and the building of a more stable social structure. In addition, the forests in their various uses provide an extensive field for the employment of labor, a very significant factor bearing on the future settlement and development of the heavily-timbered States.

Let us explore for a moment the economic dependency of this State upon its forest products.

A. Economic Dependency of Washington on its Forests.

The first sawmill west of the Mississippi River was built in 1827, by the Hudson's Bay Company, at Fort Vancouver. Much of the output was shipped to Hawaii. Thus began a business which, more than any other, has contributed to the development of this State.

High point of lumber production was reached in 1926, with an output of more than 7,546,000,000 board feet (see plates II & IV). In 1932 lumber and timber production declined to 2,260,689,000 board feet, but has since increased somewhat, and is expected to amount to over four
billion board feet in 1937. There are at present (1938) 423 active sawmills in Washington, 107 of them producing more than 10,000 board feet per hour, most of the others producing less than 3,000 board feet per hour.

The importance of the forest industries' contribution to economic stability may be seen in the following table for the year 1929.
## Washington Industries for 1929

<table>
<thead>
<tr>
<th>Industry</th>
<th>Number of Establishments</th>
<th>Wage Earners **</th>
<th>Wages Paid</th>
<th>Value of Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lumber and Timber</td>
<td>772</td>
<td>58,570</td>
<td>$83,753,402</td>
<td>$262,621,000</td>
</tr>
<tr>
<td>Paper</td>
<td>15</td>
<td>2,774</td>
<td>3,667,225</td>
<td>28,429,000</td>
</tr>
<tr>
<td>Furniture</td>
<td>65</td>
<td>1,632</td>
<td>1,915,000</td>
<td>6,637,000</td>
</tr>
<tr>
<td>Planing Mills</td>
<td>129</td>
<td>3,600</td>
<td>4,472,000</td>
<td>23,463,000</td>
</tr>
<tr>
<td>Pulp</td>
<td>15</td>
<td>2,394</td>
<td>3,648,000</td>
<td>18,665,000</td>
</tr>
<tr>
<td>Wood Preserving</td>
<td>12</td>
<td>519</td>
<td>734,911</td>
<td>8,074,000</td>
</tr>
<tr>
<td>Wooden Boxes</td>
<td>22</td>
<td>451</td>
<td>449,053</td>
<td>2,197,000</td>
</tr>
<tr>
<td>Cooperage</td>
<td>5</td>
<td>519</td>
<td>645,337</td>
<td>2,089,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,055</strong></td>
<td><strong>70,459</strong></td>
<td><strong>$99,286,836</strong></td>
<td><strong>$352,175,000</strong></td>
</tr>
<tr>
<td>All Washington Industries</td>
<td><strong>3,672</strong></td>
<td><strong>114,330</strong></td>
<td><strong>$160,670,891</strong></td>
<td><strong>$795,561,861</strong></td>
</tr>
<tr>
<td>% Forest Industries to all Industries</td>
<td><strong>28.73</strong></td>
<td><strong>61.36</strong></td>
<td><strong>61.80</strong></td>
<td><strong>44.27</strong></td>
</tr>
</tbody>
</table>

**Not including salaried personnel.**
In 1939 total production of lumber was 7,302,063,000 board feet. In 1953 it was 3,106,095,000 feet. The serious effects of depression in these industries upon employment and wages, the mortality in manufacturing establishments, and reduction of value of the product, are indicated in the following comparative table for 1933:
## Washington Industries for 1933

<table>
<thead>
<tr>
<th>Industry</th>
<th>Number of Establishments</th>
<th>Wage Earners</th>
<th>Wages Paid</th>
<th>Value of Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lumber and Timber</td>
<td>389</td>
<td>30,494</td>
<td>$26,043,493</td>
<td>$84,156,412</td>
</tr>
<tr>
<td>Paper</td>
<td>13</td>
<td>1,945</td>
<td>2,144,022</td>
<td>21,781,850</td>
</tr>
<tr>
<td>Furniture</td>
<td>33</td>
<td>999</td>
<td>683,116</td>
<td>2,553,212</td>
</tr>
<tr>
<td>Planing Mills</td>
<td>79</td>
<td>1,954</td>
<td>1,451,791</td>
<td>8,131,101</td>
</tr>
<tr>
<td>Pulp</td>
<td>15</td>
<td>1,993</td>
<td>2,134,311</td>
<td>18,875,465</td>
</tr>
<tr>
<td>Wood Preserving</td>
<td>10</td>
<td>291</td>
<td>223,116</td>
<td>2,351,660</td>
</tr>
<tr>
<td>Wooden Boxes</td>
<td>16</td>
<td>384</td>
<td>269,357</td>
<td>1,056,940</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>555</strong></td>
<td><strong>38,060</strong></td>
<td><strong>$32,949,206</strong></td>
<td><strong>$138,886,650</strong></td>
</tr>
<tr>
<td><strong>All Washington Industries</strong></td>
<td><strong>2,307</strong></td>
<td><strong>67,752</strong></td>
<td><strong>$62,116,862</strong></td>
<td><strong>$331,225,041</strong></td>
</tr>
</tbody>
</table>

% Forest Industries to all Industries

<table>
<thead>
<tr>
<th>Industry</th>
<th>% Forest</th>
<th>% All</th>
<th>% Wages</th>
<th>% Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lumber and Timber</td>
<td>24.06</td>
<td>56.18</td>
<td>53.04</td>
<td>41.93</td>
</tr>
</tbody>
</table>
According to the census of 1929, out of 1,563,396 population, 664,813 were earning a living. Of these 15.69% were occupied in agriculture and 12.8% in forest industries. Population directly and entirely dependent upon forest industries was 199,500, farm population was 307,737, and rural non-farm population 378,714. A large portion of the last class, and certainly some of the farm population, also relied upon part-time employment in forest and mill. In the rendering of services to forest industries and their employees more men are employed and more persons supported than by direct employment. The United States Forest Service has estimated that for every million board foot of wood consumed yearly 18.6 persons are supported by direct employment (workers and their families), while 28.7 persons are supported indirectly in services activities. In the pulping industry the estimated figures are substantially higher.

It is further estimated that under reasonably intensive forest management the combined lumber and timber products, pulp, paper, and other forest industries of Washington can maintain permanently 875,000 employes and dependents.

These industries now create one dollar of every three paid for all products of the State. Two thirds of all rail and water-borne tonnage originating in the State is forest tonnage, and a considerable portion of freight inbound is for the use of these industries. And 80% of the value of products of these industries normally is distributed within the State for wages, supplies, taxes, construction and the like.

According to the 1929 census, United States Department of Commerce, the rated capacity of all installed power equipment in forest industries, including pulp and paper manufacturing in Oregon, Washington, Idaho, and Montana, was 1,185,846 horsepower. Of this amount, 404,464 h.p. was the installed capacity of electric motors driven by purchased energy. The remaining power was in prime movers at the mills. The amount of power actually used was, of course, considerably less than the rated horsepower capacity. Some conception of the importance of the forest industries as power users is gained from the same census report which shows that 49% of the capacity rating of electric motors purchasing energy in all kinds of manufacturing in Oregon and Washington was installed in the sawmill, pulp and paper plants, box factories and other wood-using factories. The capacity of all motors and prime movers in the forest industries was 71% of the total for all manufacturing plants in the two States.

There are also other indirect economic benefits from the forest. The beneficial effect of forest cover upon stream flow is well known; forests have an important bearing upon erosion, floods, and water supply for irrigation. Washington's forests present scenic attractions and opportunities for recreation not surpassed by those of any other State. (See Plate VI.) Tourist business can be developed into a much larger enterprise than at present. Yet the value of outdoor
recreation is not merely commercial. Of even greater value is its effect upon the physical, mental and moral well-being of our people. Closely associated with and indispensable to complete development of recreation possibilities is conservation of wild life. Fish and game require the influence of the forest. Their value must be measured in terms of recreation and food.

While the figures and facts given in the above paragraphs are comparatively meager and fall far short of presenting the entire economic importance of our timber resources, they will, nevertheless, give the reader a fair picture of the economic dependency of the people of Washington upon their forests. Add to the above the taxable property involved, and then wonder why the citizens of the State have for so long failed to meet their responsibility in the matter.

All these values can be impaired by wasteful and heedless exploitation of the woodlands. They can be sustained and greatly increased by wise management based upon far-sighted planning and public support.

B. The Present Control of Our Forests

Oregon and Washington are divided by the Cascade Range into two geographic regions, which vary greatly in forest cover. The combined area of eastern Oregon and eastern Washington is 67 million acres, amounting to roughly two-thirds the total area of the two States. In western Oregon and western Washington more than 80 per cent of the area is forest land and the larger part of the land now classified as agricultural was originally forested; only above timber line in the Cascade Range and Olympic Mountains is tree growth limited by climatic conditions. In eastern Oregon and eastern Washington meager precipitation limits tree growth over extensive areas and only about 35 per cent of the total area is forest land. The treelose area consists of river valleys, plateaus, deserts, rolling hills, and in southeastern Oregon, the Steens Mountains, are practically nonforestod.

The Douglas fir region of Oregon and Washington, consisting of that part of the two States west of the summit of the Cascade Range, has a total land area of 35,127,449 acres, of which 29,001,910 acres, or 82 per cent, is classed as forest land. This 29 million acres supports a timber stand of over 546 billion board feet, placing this region foremost as a source of timber.

The present administration and control of our forest lands falls into six general categories -- National Forests, Public Domain, Indian Lands, State Lands, County Lands, and Private Lands.

(a) National Forests

The National Forests in the four States, Washington, Oregon, Idaho and Montana, aggregate 56,789,792 acres. Administered by the Forest Service, United States Department of Agriculture, they are managed under Established policies providing for the highest use of the land and its
and its resources, which include sustained yield management of the timber resources, preservation of watershed values, conservative management of grazing, development of recreational use, reforestation of denuded areas, and protection against the inroads of fire, insects and tree diseases.

Although dependent on annual appropriations by Congress, which have not always been adequate, the National Forests aided by more adequate appropriations than other forest agencies, may be considered to be on the most stable basis of any forest lands in this region. Unfortunately, as stated before, the National Forests do not in general include the best grade of forest lands, a very large percentage being rugged mountain country or inaccessible regions valuable chiefly for watershed purposes; consequently, the large area classified as forest land is misleading in relation to its influence on commercial timber production.

(b) Public Domain

The forested public domain, which in the four States aggregate about 2,000,000 acres, is without definite provisions for protection, development, administration, or permanent use of its resources.

(c) Indian Lands

Approximately 9 million acres of Indian forest land are under the jurisdiction of the Forestry Branch of the Indian Service. Indian lands are either allotted lands or undivided tribal lands. In either case the pressure to liquidate timber values is heavy. The principle of sustained yield, however, is recognized, and has in some cases been observed. Capable foresters are employed and, in general, the cutting practices are good. Systematic forest protection is provided. Although practice and policy are necessarily modified by the nature of ownership and other considerations not connected with the ordinary use of forest lands, management of Indian timber tends to be in accordance with desirable forest practice.

(d) State Lands

The situation as to State forest lands varies in the different States. All four States, however, in the Columbia Basin region received lands in grants from the Federal Government. Washington, including all classes of land, received grants of 3,044,000 acres. The forest lands in these grants exceed 1,500,000 acres. Large areas of State land were consolidated through exchange with the Forest Service. One of these blocks, together with other State land on the west side of the Olympic Peninsula, has been designated by the Legislature as a sustained yield forest, although as yet, no definite plan has been established for its management. The present administration indicates its intention to manage the area on a sustained yield basis in conjunction with adjoining National Forest lands. Legislative acts in this State provide for the purchase with utility bonds of forest land...
for State forests. About 50,000 acres of good cutover lands have been acquired in this manner. Authority exists for further purchases up to $300,000. Protection improvements on the area acquired have been made by the C.C.C., a nursery has been started, and planting has been done where required.

Considerable timber has been sold from the scattered State lands, as well as from certain blocks acquired from the Federal Government through exchange at its full value. The tendency has been to liquidate timber values promptly. Aside from the State sustained yield forest mentioned above, and an acquired cutover area which is to be managed on a sustained yield basis, there is no provision for intensive forest management.

Aside from slash disposal, few restrictions are imposed in logging State forest lands, except in the pine region of eastern Washington where there has been a recent trend toward selective cutting designed to provide for future crops. While the Legislature consistently appropriates money for the use of the State Forest Department, these funds being used for protection from fire, it is generally conceded that the present protective provisions are far from adequate to meet full requirements.

(e) County Lands

Throughout the Northwest States there is a very rapid movement of cutover lands to county ownership through tax delinquency and foreclosure. This process of transfer promises to be accelerated in the future since there is little inclination on the part of many private owners to hold land after the timber is removed.

According to the Washington State Commissioner of Public Lands, the various counties of the State in 1934 had 1,250,000 acres of land obtained through delinquent tax foreclosures. A large additional acreage, possibly several million acres, is delinquent but not yet acquired by the counties, due to legislation prolonging the foreclosure period. Economists of the Pacific Northwest Forest Experiment Station recently found that of the forest land areas of 18 western Oregon and Washington counties, more than 3,200,000 acres were tax delinquent and almost 479,000 acres had been acquired by the counties for unpaid taxes. More than 37% of the area of private and county-owned lands studied was involved in long-term tax delinquency. The owners of lands valued for tax purposes at more than $40,000,000 had either permanently or temporarily stopped paying taxes.

The situation implies and reveals the financial distress of these land owners. It has other serious aspects. The burden of supporting local government has been shifted to the owners who are continuing to pay taxes. As this burden becomes concentrated on a smaller and smaller number of property owners, the processes of timber depletion are speeded up and lands giving little promise of yielding early income
are dumped into the delinquency hopper. The cumulative effects of these processes fall heavily upon all taxpayers, jeopardizing tax-supported institutions and services, threatening the existence of once thrifty communities, and limiting the opportunities for obtaining gainful occupation. Furthermore, the permanent welfare of the region's forest industries is being threatened by the progressive deterioration and devastation aggravated by the uncertain status of tax reverted and reverting forest lands. When the welfare of any one of the major natural-resource industries is threatened, the entire industrial structure is weakened.

The future of tax delinquent lands is one of the most important problems of land management in the State. It is important that this type of ownership, which is ever increasing in acreage, be given such status that it will be protected and properly administered. Permanent ownership by the counties does not seem to be practicable, and it is probable that the best ultimate solution will be through transfer either to the State or the Federal Government. Pointing toward this solution, the 1935 Legislature has required that all lands reverting to counties through tax delinquency which are suitable for State forests and which are selected by the State forest authorities shall be turned over to the State.

Municipal ownership of forest lands in this State is unimportant from an acreage standpoint, except that the City of Seattle owns and protects several thousand acres of land on its city watershed.

(f) Private Lands

Since privately-owned forest lands are in general the best quality timber lands of both the State and the region, the importance of their proper management in comparison with the publicly-owned forests which contain much inferior land, is out of proportion to their area.

With some few exceptions, the present management of private forest lands within this region has no assured status. Most owners have no definite plan or policy beyond the liquidation of the existing timber resources. There are certain possibilities of future sustained yield management of some private lands, particularly for pulpwood production, through government aid in extension of credits, revised taxation, and assistance in protection, but in general it may be said that permanent planned forest management of private lands in this region is very uncertain.

For the present, private timberland carrying commercial timber values is receiving reasonably adequate fire protection. As timber values are reduced by cutting, the continuation of such protection, if maintained at all, will become more uncertain and fall more heavily upon the States. Cutover lands in the Douglas fir region of western Oregon and Washington are now subject to an annual loss of about 3%, which is excessive.
Under the lumber code of the N.R.A., the logging operators were forced to recognize the importance and necessity of leaving cutover lands in such a productive condition as would permit continued growth on these lands without the necessity for artificial planting or the lapse of long periods of time to secure restocking. As part of the code, the operators adopted forest practice rules for the different forest types. These were designed to leave the cutover areas in condition to insure that they would be kept productive. These rules were actually in force for a little less than a year. Variable results were secured in some districts, but in others marked progress was made in leaving an adequate source of seed supply and in facilitating future protection by adequate slash and snag disposal. Since the discontinuance of the lumber code the various associations of operators in the Columbia Basin territory have announced their intention of continuing in cooperation the forest practice rules on this cooperation basis. But in actual practice they have fallen far short of their seeming intentions.

Under the lumber code and present cooperative endeavor the industry has expressed some interest in the possibilities of adopting sustained yield operation, as witness the annual Forest Conservation Conference under the auspices of the National Lumber Manufacturers Association, but a sustained yield management plan in this region has been worked out for only one large operation. With this exception no operation dependent upon privately owned lands in the whole Columbia Basin territory is being handled on a sustained yield basis.

So far as private lands are concerned, the policy of cutting on a liquidation basis is by reason of economic pressure, universal with but few exceptions throughout the region. While problems of continuity of operating on a permanent basis are in some cases being given serious consideration, progress in the actual development of sustained yield operation has been very limited. There is recognition of the fact that land should be left in a productive condition after the merchantable timber has been removed, but the condition in which the lands are being left after cutting and the degree of protection given as indicated by the percentage of the area burned annually are still far from satisfactory from the public viewpoint. For inventory of forest resources in regard to ownership see appendix.

The writer believes that the foregoing pages of "preliminary discussion" now afford the reader a sufficient background of the forestry situation to be able to approach intelligently the detailed discussion of the various problems involved. We have attempted in the preliminary discussion to establish one point: that the management of State and private forest lands in Washington is characterized by a lack of definite dedication of the land to permanent forest production and by a lack of adequate plans for sustained yield or full development of the multiple use principle. And as far as State control is concerned, the directing personnel, appropriations and policies are all more or less still subject to the vicissitudes of politics. One of the bright spots in the picture is the management of our National forests, and even that could be improved.
But before we go into a detailed discussion of the major forestry problems of Washington, let us absorb a few pages of elementary forestry as it applies to the State of Washington:

II. THE FOREST — Timber Regions and Forest Types

A. Douglas Fir Region

While the State of Washington has during a number of years led all other States in lumber production, 85% of the standing timber and a corresponding portion of the activities are located west of the Cascades, a region climatically favored in a high degree and particularly as regards the growth of heavy stands of timber. This great lumber industry is based on a purely climatic natural resource, and the effects of even slight changes of the climate can be easily traced from the humid coast region to the higher slopes of the Cascades, until on crossing this range, which precipitates the moisture carried inland on the prevailing western and southerly winds, the drier eastern slope immediately shows a greatly differing growth of timber both as to species and yield of stands.

The Douglas fir region lies between the Pacific Ocean and the crest of the Cascade Range in western Washington and Oregon from British Columbia approximately to the California line. Except for a few meadows, prairies, and mountain barrens, the entire region was once forest clad. In the density of its forests, in the huge size of its trees, in the luxuriance of growth, this region is in the front rank.

Speaking broadly, this was a primitiv forest region of over 30,000,000 acres of original forest and less than 5,000,000 acres have been logged, including land used for agricultural purposes. A little in addition has been slashed and burned off for agricultural use. The rest is in a state of nature. By no means, however, is every acre of natural woods bearing the quota of timber it might. It is estimated that on the advent of the white man the whole region was not bearing more than a third of the timber the land is capable of producing. The average stand for the region was probably under 30,000 feet per acre, whereas mature virgin timber ought to run 100,000 feet per acre. Many acres were denuded of bearing small young timber, and others were thinned out and patchy because of the inroads of fire.

Serious fires from time immemorial have wrought great havoc in the virgin forest, which when destroyed has usually been replaced by a "second-growth" forest of young timber. Thus, there is in this region timber of various ages. There are whole townships of immature timber. The existence of so great an acreage of young forests has a very important bearing on the future stability of the lumber industry of the region. Extensive lumber operations, however, are as yet mostly in mature timber.
Of the entire lumber cut out of western Oregon and Washington (excluding cedar shingles), 82% is Douglas fir. Of the 371,000,000,000 feet of privately owned timber, at least 70% is Douglas fir. But the timber of the entire region, though so predominantly and characteristically Douglas fir, is by no means homogeneous. Although Douglas fir occurs more or less on nearly every site, the physical differences between high and low altitudes, between coastal, valley, and mountain sites, are reflected in pronounced differences in the forest cover.

For clarity in this discussion it is convenient to recognize the several forest types which occur in the Douglas fir region. They are the Douglas fir type proper, the fog-belt type, and the upper-slope types. Most of the timber cutting is in the Douglas fir type and the fog-belt type, which together include practically all the privately owned timberlands.

* The Douglas Fir Type Proper

A forest in which Douglas fir comprises 60 per cent or more of the timber volume is classed as the Douglas fir type proper. This type covers at least three-quarters of the forested area of western Washington and Oregon and an even larger proportion of the area of commercial forest. In this Zone also occur western hemlock, western red cedar, Sitka spruce, silver firs, western white pine, and other species of minor commercial importance.

Roughly speaking, the wetter the site the larger the proportion of other species in the virgin timber. The proportion of hemlock increases with the altitude and with approach to the coastal fog belt. Also northward the proportion of other species than Douglas fir increases with the increasing humidity and coolness. Then again when approaching the warmer and drier climate in southern Oregon, the Douglas fir gradually merges into Ponderosa pine.

Again, the proportions of Douglas fir diminishes as the age of the stand increases. In very old stands there is apt to be more hemlock and cedar than in young timber. The so-called second-growth stands on old burns and logged-off lands are composed to a striking degree of Douglas fir, and are therefore justly spoken of as pure Douglas fir forests. The younger Douglas fir forests are often referred to by lumbermen as "red fir stands," while the overmature forests are called "yellow fir stands."

The Fog-Belt Type

The humid western slope of the Olympic Mountains and such portions of the Coast Range as have similar climatic exposures receive the brunt of the moisture carried inland from the Pacific. Here the growth is very rapid and shows a distinct tendency to favor species which thrive

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under abundant moisture. In this group are western hemlock, western red cedar, and Sitka spruce, forming over 60 per cent of the stands, with Douglas fir stands averaging less than 40 per cent. Most of the timber of this type is in private ownership.

The Upper-Slope Types

This region includes the higher slopes of the Olympic and Cascade Ranges, largely within the boundaries of the national forests. As the altitude increases Douglas fir gradually gives way to western hemlock and mountain hemlock, several species of balsam fir, Alaska or yellow cedar, Englemann spruce and varieties of minor importance. Because of their inaccessibility and the remaining large stands in the Douglas fir zone, the species on the upper slopes have as yet not been commercially exploited. However, they have a considerable potential value as a future reserve of timber. They are largely administered by the National Forest Service and are managed so as to produce continuous crops in the future on the "sustained yield" basis or logged in such a manner as to balance the annual growth over the reserves as a whole.

Use of Species

Douglas fir -- Named after the Scotch botanist, David Douglas, this species is not a true fir. As the scientific name, Pseudotsuga Taxifolio (with foliage like the taxus), implies, it is more comparable to a "false hemlock." The true firs in western Washington are the species in the balsam fir group. Other common and trade names of Douglas fir are red fir, yellow fir, Oregon pine, Douglas spruce, Puget Sound pine, etc.

Quoting United States Forest Service Bulletin No. 88:

"Douglas fir may, perhaps, be considered as the most important of American woods. Though in point of production it ranks second to the southern yellow pine, its rapid growth in the Pacific Coast forests, its comparatively wide distribution, and the great variety of uses to which the wood can be put, place it first. It is very extensively used in building trades; by the railroads in the form of ties, piling, car and bridge material; and by many of the manufacturing industries of the country. As a structural timber it is not surpassed, and probably it is most widely used and known in this capacity."

It may be noted that about two thirds of all the railroad ties in the western part of the United States are of Douglas fir, and that this timber has no competition as material for piling. Among additional uses may be mentioned wooden ships, boats, masts and spars, cooperage products, boxes, tanks, wooden stave pipe, paving blocks, sulphate pulp, furniture, plywood, flooring, sash and doors, finish, etc.

Hemlock -- The western hemlock has only lately gained the recognition it has long deserved. For an extended period, handicapped by a name which in the eastern districts has been synonymous with lumber of far poorer quality, it has been low-priced, and often considered as waste. The lumber is free from pitch, relatively hard, takes paints and stains even better than Douglas fir, and makes excellent flooring and finish,
It is an excellent wood for barrels, kegs, boxes, baskets and fruit containers, since it is comparatively odorless and tasteless when dry. In late years an extensive business in hemlock box shooks has been developed, and it has gained increasing use as flooring. Lower in structural strength than Douglas fir, hemlock has not been used in this field to any great extent, although it is suitable for all except the heaviest construction work.

The potential value of hemlock is greatly increased by its pulping properties, as it can be converted into a high grade of sulphite pulp, and with the increasing percentages of this timber found on the higher levels now being approached, even small hemlock growths, tops, culls, etc., could, with increased demand, be salvaged as valuable material.

Western Red Cedar -- Cedar resists decay in a higher degree than any other Washington wood, and it is because of this fact used for a number of purposes where this quality is important. Its principal use is for shingles, which have for a long period of years been distributed from western Washington over a wide market throughout the United States. In general building work it is extensively used for siding and other exposed finishes. It is relatively soft, but straight-grained, has a low shrinkage factor, takes a beautiful finish, and is successfully used for all purposes where not subject to hard wear or abrasion. Cedar is extensively used for boat lumber and cedar piling and poles. Being naturally durable, it finds a wide use in this field.

The largest dimension and the best quality have been found on the lowlands, and as these have been largely logged off in the Douglas fir region, the future supplies of this quality are diminishing as the upper levels are approached. Western red cedar has been so common, and it has been included with other lumber logged off in the past to such an extent that the prices realized for this semiprecious lumber have not been in keeping with its actual value. Foreign countries appreciate the excellent qualities of cedar, and it is, in the form of logs, exported to Japan, South America, China, Australia, and New Zealand in increasing quantities. The exports of cedar logs in 1930 greatly exceeded the exports of fir logs, the amounts being, respectively, 63,856,000 and 16,670,000 feet board measure. However, Douglas fir sawed lumber exceeds all other lumber exports in a decisive manner.

Cedar has, unfortunately, neither been conserved nor manufactured in a manner which would result in profiting by the latent value of this remarkable wood, partly because of general economic conditions and partly because of its former abundance; but many possible uses can yet be developed, leading to as close and profitable utilization as in the redwood region of California.

Sitka Spruce -- This lumber possesses characteristics which in a measure render it unique among American woods. In proportion to its weight, it is probably the stiffest softwood in the United States. It is also rough and straight-grained, which qualities, in combination with its lightness, have made it the favored lumber for airplanes.
It is odorless and tasteless, and therefore unsurpassed for shipments of butter, meats and other food products. It is excellent for outside trim in building construction and advantageous in large doors for hangars, garages, etc., requiring strength and lightness. It possesses remarkable properties when used as a sounding board and is in demand for pianos, violins, etc. It can be converted into sulphite pulp of the highest grade, superior to the spruce pulp of the Northeastern States.

However, Sitka spruce, except on the unlogged western slope of the Olympic Peninsula, is quite scarce and has during the past 10 years been contained in the cut merely to the extent of 2.6 per cent. Its use is limited to specialties and there is sufficient for the demands.

Balsam Firs -- Some confusion reigns in this classification, even among local lumbermen. The United States Forest Service includes in this group, the noble fir, lowland white fir, alpine fir, silver fir, and white fir; local lumbermen use various names, as larch, gray fir, white fir, balsam, etc. There is no larch west of the Cascades, so that the classification of the United States Forest Service is being gradually accepted.

Except the lowland white fir, or balsam, which grows down to tide water all these species of the true fir occur on the higher levels and have as yet not reached commercial importance. Occurring in fairly large percentages among the high-level stumpage, and furnishing a generally good grade of lumber for a variety of purposes, they have a considerable potential value as a future timber reserve. All these species can be used for the production of pulp. However, the percentage of "clears" included in the balsam firs is not as large as in the Douglas fir, rendering the former group less useful for veneers, uppers, and other purposes requiring clear lumber. Balsam firs generally contain small spike knots for the full length of the trunk, even if hidden by the bark or the sapwood.

Hardwoods -- Hardwoods do not occur in this region to the extent and in the varieties which mark the eastern hardwood regions, and with the exceptions of red alder, they do not occur in commercial stands. As a product of the lowland and the river valley, the Washington hardwoods have been the first to give away for land clearing and settlement; also for domestic use.

Red alder occurs in moist and protected locations throughout western Washington as pure stands of commercial-size timber, sometimes over fairly large areas, and scattered elsewhere as smaller trees in limited stands. Single stands containing as much as 500,000 board feet are not numerous; tracts containing 100,000 board feet are of frequent occurrence. The total alder stands of western Washington are estimated, by the United States Forest Service, at 555,000,000 feet, distributed in small groups over 30,000 acres, or at the average rate of 12,000 feet per acre.
Alder sometimes takes complete possession of burned-over lands not reforesting in conifers, but this growth is not always enduring. Alder grows very rapidly and annually contributes a large amount of decaying foliage and undergrowth as new topsoil. When overripe the alder gradually dies out, and the new enriched soil gives abundant nourishment and protection to a new conifer growth, which gradually takes full possession, thereby completing the rotation and a natural cycle of considerable interest and importance.

As second in abundance ranks black cotton-wood in scattered stands along the lowland streams. This species is declining in importance because of its increasing scarcity. Other hardwoods are big leaf maple, Oregon ash, western birch, and Oregon white oak. None of these have any commercial importance.

It will therefore be noted that red alder forms the only commercial hardwood stand of any importance in western Washington; and while in the past it was considered to be of slight value even for fuel, the rapidly increasing uses, especially for furniture, have during the last decade caused corresponding increases in stumpage values.

B. PONDEROSA PINE REGION

In central Washington, southern Idaho, central and eastern Oregon, ponderosa pine either in pure stands or in mixture with Douglas fir, white fir and western larch covers enormous areas. In extreme northeastern Washington, northern Idaho and western Montana, western white pine associated more or less closely with Douglas fir, hemlock, cedar, western larch and white fir predominates. The ponderosa pine belt in Washington alone covers some 8,000,000 acres which have a saw-timber volume of over 44 billion board feet, according to the late forest survey authorized by the McSweeney-McNary Forest Research Act of 1928.

However, about 90 per cent of the lumber industry in this State will be found west of the Cascades. In the ponderosa pine region the operations are scattered and of small size, as is witnessed by the amount of their production. Nevertheless, the forests of the ponderosa pine region have multiple uses which have inherent values. Outside of lumbering, these forests are valuable for grazing, recreation and watershed protection.

The forested counties of the pine region in eastern Washington include, Okanogan, Chelan, Kittitas, Yakima, Klickitat, Ferry, Stevens, Pend Oreille, Spokane, Lincoln, Garfield, Columbia, Walla Walla, and Asotin. The eastern counties of Douglas, Grant, Adams, Whitman, Franklin, and Benton have so little forest that it is not even recorded.

C. THE WHITE PINE REGION

The white pine region of this State is negligible, being located in the extreme northeastern corner. The region, however, extends over northern Idaho and western Montana, and includes altogether some 2,700,000 acres. But unless the blister rust, which is destroying
thousands of acres annually, is brought under control within the next few years, the region will soon be badly depleted. More will be said of this later.

III. MAJOR FOREST PROBLEMS OF WASHINGTON

It is to be hoped that the reader has not been led into the belief that the following pages are to constitute an exhaustive study of the forest problems of Washington. That would necessitate the publishing of several large volumes and a person much more grounded in the subject than the writer. Space, under the present conditions, is necessarily limited, so that the presentation of the following problems will also be limited in scope. Some of the problems and objectives will be treated in a rather sketchy manner while others will be handled in much greater detail, according to the writer's opinion of their importance.

Despite some reason for gratification in past accomplishments, the people of this State have no reason to be proud of what still remains to be done to put forestry on a satisfactory footing. What is still needed falls logically into a group of major forest problems. Some of these problems have to do with the productive use of land as influenced by ownership and management. Others center in timber, watershed influences, and other chief products and services of the land. Another deals with the knowledge which must be available for the solution of the problems. Our objective is to present enough of this basic knowledge to give those who come in contact with this material a sufficient insight into forestry conditions to approach more intelligently the problems which will increasingly confront them as the years go on.

A. Preservation of Watershed Values (Water and Soil Conservation)

1. West of the Cascades.

The region west of the Cascade Range of Oregon and Washington is one of heavy precipitation, deep snows at the higher elevations and steep and rugged topography, all conducive to heavy and rapid run-off. Over most of the drainages the forest growth is dense, as a result of heavy precipitation, fertile soils, and a long growing season. A heavy undergrowth, principally of brush and ferns, combines with the tree growth and thick litter to form a protective cover for the slopes, which is unusually effective in conserving moisture and preventing erosion.

The forest reaches elevations of 4,500 to 6,000 feet in the northern Cascades and 7,000 feet or more in the southern. At the upper elevations, the forest is often difficult of access. Above the forest are rugged mountain ridges and numerous peaks, several with glacial fields. Of the total area of 49,450 square miles in the Pacific Cascade drainages, 41,386 square miles (about 26,487,000 acres) is forested land or potential forest land now bearing a brush cover. Of this area approximately 15,564,000 acres, principally the steep slopes of the Cascade
Mountains, has been classified as having a major watershed-protection influence, 9,509,000 acres largely bordering on the Pacific coast, as having a moderate influence, and 1,414,000 acres, chiefly on islands in Puget Sound, as having only slight to no influence.

Because of the extremely heavy precipitation, averaging from 50 to 75 inches and in some places totaling as much as 200 to 300 inches a year, the heavy snowfall which at the higher elevations totals 30 to 50 feet, and the occurrence in winter of Chinook winds accompanied by warm rains, floods are inevitable. Stream channels have, in the main, adapted themselves to take care of large amounts of water. Occasionally, however, floods do considerable damage to high-value land and improvements.

A comparatively large population draws upon the water supplies of these drainages for municipal use. Seattle, Tacoma, Portland, and practically all of the smaller towns and cities obtain their water from forested watersheds. Most of these municipal watersheds are within national forests and have been set aside as special reserves on which other uses are restricted or entirely eliminated. The larger cities have developed water storage for dry periods. The pure, clear water from the heavily forested slopes is ideal for both industrial use, and for long life of storage reservoirs.

Without forest cover or other protective vegetative growth the soil over the greater portion of these drainages would erode easily; where there is a heavy forest cover however, indications of erosion are practically lacking. Logging operations cover some 200,000 acres in these drainages each year, but because of the heaviness of the timber growth the individual logging areas are for the present relatively small. The destructive logging methods used in the Douglas Fir type, including the burning of slash following cutting, expose the soil to sheet and gully erosion. But rank herbaceous vegetation and a brush cover of sprouts quickly reclothe the soil surface and check whatever erosion has started. It is but a few years until the rapidly growing timber reproduction which comes in thickly in the exposed mineral soil following the slash burn overtops the low-growing vegetation and true forest conditions are restored. If repeated fires take place, however, the timber cover is destroyed and forested areas are transformed into brush fields, which according to Forest Service observers are less capable of retarding snow melt and of regulating stream flow from the heavy precipitation.

On the upper slopes of the Cascade Range, particularly in the northern part, avalanches occur commonly. Occasionally they have been exceedingly destructive of life and property. Many of them start above timber line, on steep slopes at the heads of canyons, and follow a definite course down the canyons. Such avalanches, known as "canyon slides," occurring almost yearly, keep a "slideway" thoroughly stripped of sizeable tree growth. This type of slide must be considered the inevitable consequence of very heavy snowfall on steep, nonforested slopes.
Another type of avalanche known as "slope slide" is characteristic of hillsides that were once forested but have been devastated by fires or logging. On such hillsides great areas of wet snow sometimes start to slide, as snow does on a stoop roof, carrying with them all in the path. Slides of this type do not occur until the forest has been burned or cut, because the trees pin the snow blanket to the ground, so to speak, as nails hold the shingles to a roof. Keeping the steep slopes well forested will forestall the damage which such avalanches do to all in their path and to the valleys below.

In a region of such steep slopes, high precipitation, and deep snow as that west of the Cascades, a high dense forest cover, such as that formed by the existing coniferous stands, is essential to retard run-off, hold the soil in place, and prevent avalanches. The high timber values per acre of the virgin forest have resulted in large private holdings. Private lands are rapidly being cut over, and after cutting are largely devastated by fire. There is considerable doubt, therefore, whether the watershed requirements of these drainages as a whole will be adequately safeguarded if conditions continue as they are or become worse, as they can easily do.

Public agencies should acquire about 5,000,000 acres of the private land on steep slopes, according to the Copeland Report. Approximately 100,000 acres of devastated forest lands should be replanted. And above all, more research is needed to determine how the forest cover of the Pacific Cascade slope can be made most effective in watershed protection.

2. Columbia River Basin

The Columbia River Basin (which as here considered includes only lands east of the Cascade Divide) is a region of valuable forest growth, heavy snows, rapid spring run-off, large and valuable irrigation developments, extensive power possibilities, large demands for domestic water supplies, and large areas of easily erasible soils.

On areas of low precipitation throughout the basin, at the lower fringe of the timber, the main tree cover is scattered ponderosa pine or juniper. The trees ordinarily do not form a closed canopy. Litter is scant. Here precipitation usually averages about 15 to 25 inches a year, with a dry summer period. Run-off from these forests is not particularly large or rapid except on occasional instances when snows melt rapidly or torrential rains fall. In these open forest stands the principal erosion-control influence is the undergrowth of herbs and shrubs. On large areas the perennial herbaceous vegetation has been seriously depleted. Studies by the Forest Service have shown that in the main these open timber stands, under satisfactory management and with a good understory of herbaceous plants, are highly effective in controlling abnormal erosion that would otherwise become serious. But in the volcanic pumice soils, especially in parts of eastern Washington, absorption of rain and melting snow is normally so rapid, and the danger of abnormal erosion so slight, that where these forests occur on such soils their watershed influence is slight.
At intermediate elevations the forest is more dense, made up chiefly of ponderosa pine, often with an intermixture of larch and fir. The western white-pine type occurs as an unusually dense forest with a heavy litter on the better soils, especially in northeastern Washington. In these types precipitation is somewhat higher than in the lower fringe types. It ranges from as low as 20 inches in the ponderosa pine type at the lower elevations to 50 inches or more at higher elevations.

Summers are normally dry; much of the precipitation comes in the form of snow, which accumulates to depths of 5 or 10 feet or more. The melting of this snow causes a high spring run-off and sustains reasonably well a low summer stream flow from underground seepage. An adequate forest litter prevails which together with the timber and understory vegetation ordinarily controls erosion and regulates stream flow rather effectively at the present time.

**Irrigation**

How to obtain adequate water for irrigation on the Columbia River drainage without excessive cost for storage is a great problem, which becomes more intense when rainfall is subnormal for several years, as has recently been the case on much of the area. The large quantity and high values of the irrigated land, as well as the high average annual returns from the land, make irrigation agriculture a dominant industry. According to the 1930 figures of the Regional Planning Commission irrigated land in the basin totals 3,560,000 acres and represents an investment in lands, buildings, irrigation enterprises, and implements of several hundred million dollars. Today, about 4,700,000 acres are under irrigation, according to recent figures.

Many large irrigation projects are found in the basin, including the Twin Falls and Boise projects of Idaho and such apple-producing areas as the Yakima and Wenatchee of Washington and the Hood River of Oregon. Of outstanding importance is the projected Columbia Basin project of Washington, which involves irrigation of some 1,200,000 acres. Many other areas are capable of irrigation development; in southern Idaho, for example, there is more than 2,200,000 acres of irrigable land.

Water power, also, is of great importance in the Columbia River Basin, of which every citizen of Washington is well aware. Our watersheds play an important part in preserving that power, which will ultimately develop several million horsepower. The domestic water supplies of numerous cities and towns, also, originate chiefly on forested watersheds of the basin. Therefore, the influence of forest cover in regulating stream flow in the Columbia River Basin cannot be too greatly emphasized.

Of equal importance with effective regulations of stream flow is control of erosion. A large part of the forested area of the Columbia River Basin is made up of coarse, readily erodible granite soil. This soil is so loose that where plant cover is scarce or absent it is readily swept off in sheet erosion. Rapid run-off then forms
gullies from a few inches to several feet deep. Loose soil on the edges of the gullies soon crumbles, and within a year or two after being formed many of the smaller gullies have so smoothed over as to be almost unnoticeable. Such abnormal erosion is taking place over extensive areas.

Some rather large areas of private forest within the Columbia River Basin have been heavily cut and burned, and this has caused material thinning of the timber stand and some erosion; the principal cause of erosion, however, has been the decline of the herbaceous undergrowth of the forest, largely from overgrazing but in part from fires. Bunch grasses, which in good stands effectively control erosion and build soil, have over large areas, been almost replaced by downy brome and other inferior annuals or perennials. This replacement is especially marked on the several million acres of forest land in the public domain. Forage production on the forested public-domain areas and on intermingled private land has been found by Forest Service observers to have been reduced in many instances by from 50 to 80 per cent. Such conditions are adversely affecting the livestock industry as well as the watershed-protection values of the forest.

Floods

Where only scant cover is present on the watersheds to interrupt run-off, the combination of torrential rains, rapid snow melt, and ready formation of gullies causes local floods on many of the smaller tributaries. These local floods sometimes do considerable damage, destroying improvements and depositing mudrock flows at the mouths of the drainages, sometimes destroying good agricultural land.

High water can be expected practically every spring in nearly all important tributaries of the Columbia River as a result of the melting of the large accumulations of snow in the mountains. This high water in the main streams seldom assumes the proportions of destructive floods, although usually it causes minor damage along the stream courses. It does, however, move a considerable quantity of silt which has collected in small tributaries down to the main river channels. By 1930, 15 years after the construction of the Arrowrock Dam of the Boise, Idaho, project, silting was estimated to have reduced the storage capacity of the reservoir by 7,000 to 8,000 acre feet. This amount of storage space represents more than $100,000 of the original cost of the dam. Officials of the water-users' organization estimated that by 1930 the sand deposit at the power dam had reduced its capacity by 25 per cent, and considerable silting of canals and other irrigation works had caused additional expense.

Another reason for preventing silting of the Columbia River is the use of the river for navigation. The value of shipping and of rafts of logs and piling moved on the Columbia River annually from 1926 to 1930 amounted to about $383,000,000. Only the proper protection of the watersheds can prevent the ultimate excessive silting of our streams.
On the whole, however, the Columbia and its main tributaries are not
too bad silt streams. Their silt problem comes from the minor tributaries.

3. Requirements for Watershed Protection

While this section of the country has as yet not suffered the major
catastrophies of floods and soil erosion that have visited the eastern
and mid-western States, the continued depletion of the forest cover of
our watersheds will eventually bring about the same serious results
that are now being experienced in the Ohio and Tennessee River Valleys
unless the proper precautions are taken in the near future.

Some of these precautions and requirements follow:

Prevention of forest fires, since forest fires greatly change the
capacity of the soil surface to retain moisture.

Prompt reforestation of lands that are logged over and burned over.

Change in logging methods. This is now much more widely feasible as
a result of new developments in trucks and tractors which makes possi-
ble selective logging where it was not possible before; and that is
beneficial both in the prevention of soil erosion and in the regulating
of streams.

The preservation of woody growth along stream banks so that in the course
of logging the banks will not be exposed to stream cutting.

Regulating grazing -- recognizing that overgrazing gives a soil surface
that is not conducive to absorption of rain and melting snows.

Proper cultivation of land in agricultural use -- the avoidance of
cultivation of slopes that are too steep, the use of soil cover crops
on steep slopes, contour plowing, and strip cropping.

Practically all the forest area on the public domain could justifiably
be added immediately to the national forests for the purpose of waters-
shed protection. Grazing regulation on this area would permanently
benefit the livestock industry, as well as assuring more adequate pro-
tection to watershed values. A more efficient fire control would
result. In addition, timber cutting would be regulated more strictly.

Since few counties can afford adequate forest fire protection, it seems
logical that the States or the Federal Government should acquire a con-
siderable part of the private lands that are reverting to public owner-
ship for non-payment of taxes, in order that the watershed and other
values of those lands may be adequately safeguarded. Available data
point to the need for public acquisition of about 12,400,000 acres of
forest watershed lands in the Columbia Basin.
According to the United States Forest Service, on badly depleted areas efforts should be made to restore a cover that would be more profitable and that would protect the soil and water flow more effectively. The area on which forest planting will be necessary for watershed protection is roughly 150,000 acres. Many of the burns in the western white pine region of northeastern Washington, for example, should be planted in trees. About 200,000 acres of openings in the forest where the vegetation is depleted, but where moisture conditions are favorable, should be reseeded to herbaceous erosion control plants. If practical methods for artificial reseeding of the drier low-elevation forest ranges to forage plants can be developed, many of the areas now supporting a thin cover of annual plants should be restored to a perennial type of vegetation more typical of what they formerly produced.

Finally, then, conservation methods as applied to our watersheds; help save the soil for productive use, help eliminate what would otherwise be recurring minor floods, help to reduce the volume and velocity of surface run-off that contributes to major ones, help reduce sedimentation of reservoirs, and help preserve water for irrigation and power.

B. Management of Grazing

The forage produced by herbaceous and shrubby plants under the trees and in openings in the forest is one of the major resources of forest land. More than half the forest land of the country is grazed by domestic livestock. Feed furnished, for periods of three months in the higher mountains or the full year on some low-elevation forest ranges, amounts to about 12 percent of all pasturage of the United States. Grazing furnishes a current return to many timberland owners, it aids in fire protection, and helps to make forests accessible with roads and trails.

The extensive forest lands of the West, largely occupying the mountain areas, furnish a considerable percentage of the summer feed for the beef cattle and sheep of the Rocky Mountain and Pacific Coast States. The nutritious forage, cool climate, and shade of forest lands, all combine to facilitate growth of calves, lambs, and wool.

Within or near almost every western forest-range area there are agricultural communities whose prosperity is mainly dependent upon the production of livestock. Many of the farms within these communities are small and far from markets. Without the aid of complementary forest land range, however, most of such farms could not long exist. These forest ranges, with their ability to produce high-quality beef and mutton at a nominal cost for forage, are indispensable in offsetting the more expensive production and feeding of cultivated crops. More than 4½ million acres of improved farm land and 22 million acres of private or leased grazing land, for example, are used in connection with the 83 million acres of national-forest land now grazed. Without forest ranges a large proportion of associated farm lands and the community life dependent upon them would never have been developed so satisfactorily.
Washington, however, is not at present affected by grazing conditions to the same extent that some of the other western States are; notably—Montana, Idaho, Wyoming and Oregon, where the forest range has played a more important part in their economic development. While in the Douglas fir region of western Washington a heavy undergrowth, chiefly of ferns and of salal and other brush species, occurs in spite of the dense stand of timber, its low forage value renders these areas practically worthless for grazing. However, after destructive fires a luxuriant growth of moderately palatable herbaceous and browse plants ordinarily prevails for some years until forest reproduction again shades it out. Good food is also produced for a number of years on cut-over areas of these forest types that have been resereed to forage plants.

The condition, however, in the ponderosa pine belt east of the Cascades is considerably different. This forest type furnishes good feed practically wherever it occurs. Ponderosa pine and its associated tree species usually grow in stands sufficiently open to allow the development of a great variety of herbs and shrubs. So in the eastern part of the State we find certain localities where grazing of forested areas has become of major economic importance, including grazing for wild life. In this region we have the same need for development and application of forage management as we have in the other western States.

This can be accomplished through rehabilitation of the valuable subcon-dinate forest vegetation and stabilization of range use, and the effective coordination of grazing with the watershed protection, timber production, recreation, and wild-life service of forest lands. Restoration of depleted forest ranges would ultimately not only benefit the livestock owners, but contribute to more satisfactory watershed protection, aid in protection of timber reproduction from grazing damage, and make available more abundant feed for wild life.

C. WILD LIFE CONSERVATION

The social and economic values contained in wild life are of far reaching importance in the multiple-use management of forested areas. Forest lands in one form or another furnish the environmental conditions in whole or in part for all classes of game, fur bearers, and other wild life except that which prefers open country and unwooded marsh land. Direct economic values attributable to game include those of food and fur, and income from sale of hunting and fishing licenses. Indirect values include the market afforded by hunting and fishing to manufacturers of arms, ammunition, fishing tackle, clothing and other outdoor equipment; expenditures of sportsmen for board, transportation, guide service, and sundry supplies; annual expenditures of sportsmen and clubs for hunting and fishing privileges in private lands; and benefit of wild life, chiefly birds, as destroyers of insects preying on agricultural crops. These various values total well over one billion dollars per annum, according to W. L. McAttee, of the United States Biological Survey, who has made an extensive study of the subject.
Social values of forest game life are far-reaching. Game and fish are closely associated with recreation. Additional leisure for the average man through shorter hours and less days of work will add tremendously to those who seek the "out-of-doors" form of recreation. Hunting and fishing will attract large numbers of these folk. Wild life in general affords enjoyment, the opportunity for building health and character, and for increasing scientific knowledge.

Wild-life management, as a phase of general multiple-use forest-land management, and especially with respect to game birds and animals, contemplates proper stocking of forest areas with game; removal of the surplus of either sex under proper procedure; the furnishing of suitable food and cover requirements for wild life; the regulation of protection from natural enemies and other injurious factors; fundamental research and fact finding; public education; and other measures that may be necessary to the welfare of wild life in a proper coordination with other products, uses, and services of forest lands. It contemplates the removal of the crop of game and fur bearers in accordance with the principle of sustained yield, which involves continuous production for human benefit, and yields the greatest economic and social return. Management requires cropping and utilization under plans providing for perpetuation and development of breeding stock.

Washington's Conservation Policies.

Probably no State in the Union is a greater potential haven for varied wild life than Washington. Rightly named the Evergreen State, Washington is known nationally as a game paradise and a land of scenic wonders. The preservation of this heritage is of grave importance to the people of the State, both economically and socially. Fortunately, the majority of the people have become "game conscious," as is witnessed by the interest taken in proper wild life conservation and the general support and cooperation given an efficient State Game Commission.

The people of Washington first gave evidence of their determination to conserve the wild life of this region by initiating a law in 1932 placing the control and management of game under a State Commission. Under the old system three commissioners for each county administered the wild-life affairs of their county, making a total of 117 commissioners operating in the 39 counties, which necessarily resulted in conflicting policies and utter lack of cooperation with the Forest Service and Biological Survey. With the County boundaries eliminated, real progress has been made within the past few years.

One of the most commendable activities of the present game commission is the effort made along the lines of research. State research activity in all fields of game, propagation, disease, feed and habits, is steadily going on. Scientific game surveys are now being successfully carried on dealing with pertinent problems in the care and propagation of fish and game. A preliminary survey of Washington big game, which is prepar-
atory to a state-wide study of elk and deer, is being conducted under the supervision of Dr. R. L. Webster, Professor of Zoology, Washington State College. The State College is also making a study of wild bird diseases. The State University's School of Fisheries is also cooperating with the Commission in studies dealing with fish culture, fish food and fish diseases.

A sample survey questionnaire used in survey work would seek solution of these timely points: (1) location and condition of all big game winter, spring, and fall feeding ranges -- and their food habits, (2) aggregate number of deer and elk and the sex ratio, (3) where to logically situate the big game preserves, (4) facts pertaining to reproduction of fawns and calves, (5) migratory habits, (6) prevalence of predatory animals, (7) mortality, i.e. disease, poaching, predatory and winter feed losses, (8) utilization of range in relation to domestic livestock, (9) breeding habits, (10) relation to other animals, (11) where big game is shot.

**Game Preservation and Grazing**

In June, 1934, Congress passed what is known as the Taylor Act, providing for the leasing of the public domain for grazing purposes and for the creation of grazing districts. This Act opened the final 165,000,000 acres of public domain to grazing interests and thereby created considerable friction between the game-minded public and the stockmen.

Game authorities in the State according to the Game Commission's report, have for some time studied the grazing conditions in Washington's National Forest lands and have pointed out to Forest Service officials the vanishing numbers of big game due to inroads of armies of cattle and sheep to primitive regions. Sportsmen organizations throughout the State have also considered the problem of depleted big game feeding areas and are generally in favor of measures which will provide for a correlation of grazing interests pledged to wildlife conservation. They point to the watershed destruction of other States with its complementary destruction of wild-life habitats, and do not wish the same catastrophe to visit this region.

"Looking at the grazing problem in a broad light," states the Game Commission, "the current obstacles facing conservationists is wrought with difficulties. Millions of acres of public land is rented to stockmen by the Government at a price so low that it shapes up as a government subsidy. Now some of these herds are ruining the watersheds in the eleven western States -- the last frontier of American game -- is known too well. Passage of the Taylor Grazing Act virtually signed the death warrant for our elk and deer in grazing regions of the State. Viewing the grazing situation, the Commission gives full consideration to the investments and interests dependent upon the forest area resources and is not basing its opinion solely upon the increased influx of cattle and sheep. All forest natural products were given equal study in the relationship to game.
"The Commission takes the stand that a clearer and coordinated understanding between Government, State Department of Game, livestock and sportsmen interests is essential to a satisfactory disposition of the grazing problem. Summarized, there is room in the West and the State of Washington for both livestock and game, but there must be a correlation of usage before any constructive program of conservation can be developed." However, the regional office of the U. S. Forest Service offers strong objections to the stand taken by the Washington Game Commission. They point out that the unreserved Public Domain of 160 million acres has been grazed by domestic stock for many decades, and that the Taylor Grazing Act was the first attempt to regulate and control such grazing.

They also point out by Forest Service statistics that big game animals have been increasing in the national forests for twenty years or more, and domestic stock grazed on the national forests has been decreased. It is the winter range, they state, outside the national forests which constitutes the critical problem for deer and elk.

The facts seem to be on the side of the forestry service.

D. DEVELOPMENT OF RECREATIONAL USE

Recreation and Conservation of Wild Life are so closely interrelated that the one acts as a foundation for the other. While hunting and fishing are undoubtedly our most popular forms of recreation, the forests also furnish other forms which are of considerable importance.

* The aesthetic and recreational resources of the Pacific Northwest are generally conceded to be outstanding in character, variety and extent. Here, especially, the conservation of such resources is bound up inextricably with the more material developments of navigation, irrigation, power, industry, transportation, cities and towns. On the one hand, the recreational resources are adjuncts of value, working with land and industrial projects to enhance the productiveness and fullness of life in the region. They also contribute directly and substantially to income. On the other hand, without unremitting effort in conservation, other projects and developments will bring about serious losses in scenic and recreational values. In the present stage of American social philosophy and economy, there is no valid reason why recreational conservation and development should not proceed concurrently and in harmony with the more material development.

Recreational resources and facilities are so broad in scope and so varied in nature that some definitions will be helpful in understanding the problem and its relationships to general regional development. The following definitions and classifications are condensed from a study of the Division of Land Planning and Housing of the Tennessee Valley Authority:

* Columbia Basin Report, Pacific Northwest Regional Planning Commission -- Appendix T.
Recreation is constructive relaxation. It is the reanimation of the body, mind and spirit after toil; the turning from something one must do to something one wants to do... It has two phases: the form or act, and the means. The first involves group organization on social planning; the second, land planning... which is concerned with providing areas for outdoor recreation. The following table will give the reader an idea of what is involved in a recreation program:

I. REGIONAL AREAS. Tracts of essentially rural or primitive character:

A. Outing areas. Public recreation areas, usually for group activities.
   1. Intensive used areas
   2. Developed scenic areas

B. Conservation areas. (primary purpose is conservation)
   1. Wilderness areas (or primitive areas)
      Containing no permanent inhabitants, and possessing no means of mechanical conveyance or other perceptible evidence of civilization.
   2. Monuments. (a) Historical
      (b) Natural Science
      (c) Archaeological

II. TRAVELWAYS

A. Motorways.
   1. Parkway. Elongated park with road; traffic restricted pleasure vehicles; control of access.
   2. Freeway. Unrestricted traffic; physical control of access.
   3. Highway. Road of more than local significance; unrestricted traffic and access.
   4. Byway. Road of local significance; unrestricted traffic and access.

B. Trailways. A system of independent recreational trails.

C. Waterways. For recreational water travel.

D. Airways.

E. Waysides. Stopping places.
Observation points,
1. Observation points.
2. Picnic grounds.
3. Overnight camps.
4. Scenic spots.

Natural Resources

The States of the Pacific Northwest possess magnificent natural playgrounds. The national forests alone cover an area of about 48 million acres, or approximately 19 per cent of the four States. The total of all forested lands, public and private, is about 93 million acres, or 28 per cent of the entire area. The various national parks and monuments include some 4 million acres more.

Within these forests and parks lie many great snow-capped mountains with all their inspiring beauty of glaciers, lakes and rushing mountain streams, alpine meadows with brilliant summer flowers, and forests which wage their eternal struggle all along the timberline. At many points in the Cascade range may be counted a score or more of lakes, each set in some volcanic pocket. The most notable of these is Crater Lake, the center of Crater Lake National Park, in southern Oregon, with its many hues or color and its "Phantom Ship" rocks which, protruding from the depths of the water, tell the story of its geologic birth. There are other lakes of considerable size having more peaceful beauty. Lake Chelan in Washington gives all the appearance of a quiet corner of Switzerland. Glacier National Park in Montana exhibits all the grandeur of the Rockies with some tones of Indian lore still preserved. It would be difficult to find Nature in more varied moods than are present in the contrasting beauties which are here to delight the souls of nature lovers. A fertile landscape backed by some snow-capped volcanic cone is a picture which belongs to the region just as truly as the picture of Mt. Fujiyama belongs to Japan. On the other hand one may see volcanic action literally cast in a mould of lava in the "Craters of the Moon" of Idaho.

Of the four States, Washington seems to have been the most active of late in acquiring lands for parks, forests and monuments. One of those which is of special interest is the Gingko State Park, containing some remarkable fossil remains which are of palaeontological interest. Beacon Rock in the Columbia Gorge, a very striking monolith rising several hundred feet above the river, has been set apart as one of the State monuments. Near the site of Grand Coulee dam is Dry Falls Park which marks an ancient channel of the Columbia River. The Washington park board and State Forest Department have provided many other parks, forests, public beaches, and camping grounds along the highways.

There is only one criticism. The State has been more or less niggardly in providing the money for administration and for the acquisition of additional park areas, and while we have rather numerous State Parks, they are not coordinated into a well-managed system. So it can hardly be said that we have a real State Park System.
While the region is well provided with highways, comparatively little attention, except in one or two cases, so far has been given officially to roadside beautification. Some splendid arteries have been built leading to the larger cities of Seattle, Tacoma, and Portland, yet only sufficient right-of-way has been purchased for the roadway itself. No "freeways" have yet been planned.

In Washington a law passed at the 1935 session of the legislature, permitting the creation of county and city planning commissions, gives the power to municipalities to "regulate and restrict... the density of population; the setback of buildings along highways, parks or public water frontage; and the subdivision and development of land." While cities previously had the power to zone, this is the first time that counties in the Pacific Northwest have the right. This authority, wisely and discriminatingly used, may be far-reaching in advancing roadside beautification, and in setting aside desirable areas for recreational purposes for the people of the county.

Already stream pollution, both from city sewage and industrial wastes, is present. It has had the effect of decimating runs of commercial and game fish, and very definitely destroying the value of some bodies of water for recreational purposes. The diversion of water for irrigation and power purposes presents possibilities of further damage. The whole program is so involved with other public activities that, to be coordinated properly, all must be studied.

* Problems of Forest Recreation

Anybody who visits the popular outing centers near the large American cities on public holidays cannot fail to be impressed by the immense number of people in search of forest recreation. Almost every possible open spot along the highways will be filled with picnickers and campers cooking their meals, pitching tents, playing games, swinging from trees, and noisily giving vent to pent-up child-like impulses which are rigidly curbed under city regimentation. Such heavy use does more than kill the possibility of enjoying one of the chief recreational values of the forest, its privacy and quiet. It threatens to destroy the forest itself.

This damage to the forest comes from several sources. Small trees are cut down for fuel and tent poles. Reproduction and underbrush which gets in the way is removed. Trees and the lesser vegetation are killed by abrasion, camp fires and burning cigarettes start forest fires. Gas and oil leaking from cars onto the forest floor seriously injure all forms of plant life. Finally, the mere constant tramping on the forest floor kills the moisture-absorbing nitrogen-providing ground cover, and packs down the soil so firmly that proper aeration for the roots of the trees becomes impossible.

From Senate Document No. 12, A National Plan for American Forestry.
The problem of use without destruction is in many respects even more critical in the case of primeval areas such as we have in Washington. The only reason it is not in all respects more critical is that fewer people visit primeval areas (unless the areas are along main routes of travel, as in the case of the California redwood grove). Primeval areas are the result of a very delicate balance of natural conditions. As soon as they become overrun by hordes of people, the original conditions are upset and the natural balance of the forest destroyed. To prevent this it will generally be necessary to prohibit camping, most destructive of the recreational uses of the forest, in all primeval areas except a few of the more extensive. Where camping is permitted it will have to be confined to specially prepared campgrounds. Trails will have to be constructed through the areas so that the great bulk of people, instead of tramping promiscuously over everything, will limit their wanderings to the pathways.

The growing population and ever-increasing influx of tourists into this State is annually making greater inroads into the primeval areas for recreation purposes. This resulting increased use enlarges the task of protection and administration. This calls for additional supervisory personnel and development and maintenance of adequate numbers of public campgrounds so equipped that they will draw and hold the visitors. Such campgrounds do away with hazards created by large numbers of persons scattered promiscuously over extensive areas of high fire risk and promote sanitation upon watersheds.

Because of increased uses, National Forest campgrounds now require development of higher quality than in earlier years. Most of the relatively crude improvements installed years ago must be replaced to maintain the effectiveness of the campgrounds. The growing use of automobile trailers has necessitated modification. The Forest Service is now engaged in building new, and improving old, camp-sites in many of our recreational areas. This is especially true of the mountain passes through the Cascades.

The demand is increasing for privileges of occupancy of National Forest lands by outdoor resorts, summer camps, and summer homes. The greater permanency of and larger investments in improvements call for careful planning to prevent conflicts with public use of important recreation areas or with the proper utilization of other resources. The same need exists for careful planning of roads and industrial operations. To assure that current action does not destroy or impair national values of growing importance, the Forest Service has employed technicians in landscape planning and recreational development and management.

In conclusion, let me summarize the problems and needs:

1. Recreational resources are recognized as one of our greatest heritages and must be preserved.
2. The enormous increase in recreational visitors during the last ten years is evidence of the fact that people realize the value and inspiration of the unregimented type of recreation.

3. By proper planning, all recreational needs and desires can be fully realized. People can come year after year without destroying the value of the recreational resources.

4. By common-sense methods, recreational development can be planned and handled with little interference to other uses.

5. Local, State, and regional planning agencies have contributed much in planning recreational developments and should continue to render assistance in planning and coordinating recreational and other uses of our natural resources, thereby making this section, in truth, the "Evergreen Playground."

II. PROTECTION AGAINST FIRE, INSECTS AND DISEASE

1. The Fire Problem

The timbered lands in the Columbia Basin area constitute an extremely high fire hazard. Being located in a climatic zone subject to long periods of dry weather, forest fires once started may destroy extensive stands. Included in the timbered areas requiring protection are large acreages of cutover land upon which reproduction must be preserved, if the timber yield is to be sustained. These lands constitute an abnormally high hazard. The past fire history in the Columbia Basin reveals several instances where burns covering 300,000 acres or more completely killed the entire timber stand. Fires in all types of forest seriously impair soil fertility and unfavorably alter stream flow. Heavy burns are followed by destructive erosion which causes serious damage to irrigation and power development by heavy silting of streams, reservoirs and rivers.

In the final analysis, fire control not only affects the residents of the immediate vicinity of the forests who may be employed or occupied directly in woods work, but it also has a far-reaching effect on the welfare of those living along the lower drainages of rivers having their sources in forested areas. Forest fire protection must therefore be regarded as a necessity.

The steady downward trend of the curve showing acreage burned is the most graphic proof of continuous progress in protection of the national forests from fire. This has occurred in the face of a marked and long-continued deficiency in precipitation in the regions of greatest fire risk; a tremendous increase in human use of the forests; recurring outbreaks of incendiariism, aggravated by unemployment; and the growing hazard due to the steady increase in the acreage.

of the hard-to-protect cut-over lands immediately adjacent to the national forests and on some of the private lands within their boundaries. In the Douglas fir region of Washington and Oregon the area of cut-over lands burned is roughly 30 times that of the area of green timber burned.

Approximately one-third of the fires occurring on timbered lands at high elevations are started by lightning. The balance, all man-caused, are caused by smokers, campers, logging and lumbering operations, debris burning, and other miscellaneous sources, the far greater percentage of the fires occurring on privately owned lands.

The records of fire losses show approximately the following per cent of protected areas burned over annually in Oregon and Washington:

<table>
<thead>
<tr>
<th>Washington</th>
<th>Percent Federal Land</th>
<th>Percent Private &amp; State</th>
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<tbody>
<tr>
<td>1926-30 (no division by federal &amp; private)</td>
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<tr>
<td>1931-35</td>
<td>.17</td>
<td>.33</td>
</tr>
<tr>
<td>1932-36</td>
<td>.15</td>
<td>.63</td>
</tr>
</tbody>
</table>

| Oregon | |
| 1926-30 (no division by federal & private) | |
| 1931-35 | .12 | 0.65 |
| 1932-36 | .09 | 1.67 |

It is estimated that losses from forest fires should not exceed from one-tenth to three-tenths of one-percent of the area protected if sustained yield timber management is to be maintained. The former figure is the objective of the Forest Service. Actual losses at the present time are excessive and must, if possible, be reduced, especially on private lands.

The forested lands in the Columbia Basin areas include National Forests, National Parks, Indian reservations and public domain. Large areas are privately owned, with relatively small tracts in State or county ownership. The National Forest and National Park holdings are given well organized and fairly satisfactory forest fire protection. The Indian lands are nearly as well organized but public domain lands receive inadequate protection. State and private lands are given organized fire protection, but in almost every instance the protection afforded is inadequate. Laws in all States require forest fire protection, but these are partly nullified by the natural desire on the part of private owners to keep down expenditures. Private agencies often have insufficient funds for fire prevention and suppression in the country as a whole, with consequent relatively heavy losses. This is not true in Washington, however, especially on the West Coast. In general, private owners are inclined to be concerned chiefly with protection from fire preceding the cutting and removing of the timber.
Washington again offers the exception by spending 75% on cutover land. In any program of development it is essential that adequate forest fire protection include cut-over land to protect reproduction and to insure against loss of soil fertility, excessive erosion and decrease in sustained yield capacity.

The estimated annual cost to secure adequate fire protection in Washington forests will average about 12 cents per acre. In addition to the above cost certain capital investments are necessary for construction of permanent roads, trails, adequate detection system with developed lookout points, and adequate telephone or radio communication facilities for reporting fires. These provide quick transportation of suppression forces from established bases to the fires. Headquarters buildings at base stations and adequate equipment are also essential. The estimated cost of these improvements in the Columbia Basin would run slightly over a dollar per acre. According to Major Cowans, the cost per acre in Washington is less than the Forest Service cost.

Effective forest fire control has many aspects which are highly dependent upon proper technique. Continuous research has been an important function of the Forest Service and should be carried on in connection with any protective work undertaken. This research should include investigation of those factors which determine fire danger, such as weather, inflammability of different fuels and tree species in various localities and on various exposures and slopes, fire behavior, and the effects of various fire deterrents.*

2. Protection Against Insects

The devastating inroads of certain forest insects present a protection problem second only to that of fire. Periodically outbreaks of defoliating insects or of bark beetles sweep through these forests and cause heavy losses of timber, which in some cases amounts to almost complete destruction of mature timber stands. These insects not only destroy valuable forest products, but increase fire hazards by changing the character of the forest cover. This may ruin the chances of maintaining sustained yield forest production in the severely affected localities.

In this region the principal insect pests are the following:

(1) The western pine beetle -- active in the ponderosa pine stands of eastern Oregon, Washington, and Idaho. During a recent three year interval, 1931-33, it killed over three billion board feet of timber in Oregon and Washington alone, or more than the pine timber cut in those States during the same period.

(2) The mountain pine beetle -- particularly destructive to lodgepole and white pine. Thousands of acres of lodgepole pine in the high mountains of the Cascade and Northern Rocky Mountain ranges already have been wiped out by this beetle.

(3) The Douglas fir beetle -- a bark beetle which from time to time causes appreciable damage to stands in the upper Columbia Basin and occasionally in the Douglas fir region.

(4) The Douglas fir tussock moth -- a defoliating insect which at intervals kills the timber on large areas of the upper Columbia Basin. From 1929 to 1931, approximately 300 million board feet of Douglas fir were killed by this insect in northwestern Washington.

(5) The pine butterfly -- a defoliating insect feeding on ponderosa pine, and a potential threat to pine forests. Forty years ago it practically wiped out the mature ponderosa pine stand over six townships of the Yakima Indian Reservation. More recent outbreaks have occurred in Idaho and parts of eastern Washington.

(6) The Hemlock looper -- a very destructive insect, feeding on hemlock and other coniferous foliage in the coast region of Oregon and Washington. Approximately 165 million board feet were killed in Pacific County, Washington, between 1929 and 1931.

Other forest insect pests, such as the spruce aphid, engraver beetles, fir bark beetles, wood borers, add to the total forest damage caused by insects.

Until recent years little or no attempt was made to check forest insect outbreaks, which developed and ran their course without hindrance, until finally brought under control through natural enemies or by the exhaustion of suitable host material.

With the intensification of forest protection, has come a corresponding effort to curb forest insect outbreaks. Bark beetle epidemics have been fought by felling the infested trees, peeling or burning the bark or exposing it to the sun. "The results have been very successful in breaking up aggressive outbreaks, but until the advent of the C.C.C. program it has not been possible to apply these methods with sufficient frequency over the large areas requiring treatment. The destruction of ponderosa pine, western white pine, and lodgepole by various species of bark beetles is at present the most serious forest insect problem in the forests of the Columbia Basin. These bark beetle epidemics frequently develop on large contiguous areas.

Since the success of control work is dependent upon a prompt and complete clean-up of the entire infested area rather than the treatment of portions of it, cooperation between those responsible for the protection of the private and federal timber is often necessary. Such cooperative effort requires more public and private assistance than has been available thus far. The continuance of a C.C.C.
program will be of help in this problem, but with the present prevalence of bark beetle outbreaks additional provisions for handling the beetle problem on private and public timber are necessary if the outbreaks are to be effectively handled in their incipiency and the destruction of large volumes of timber prevented.

Forest defoliators, such as the hemlock looper, have been fought by dusting infested areas with arsenicals liberated from an airplane. Such work has met with considerable success but the expense is unusually high.

Generally speaking, a forest protection program from insects should at least provide for:

(1) Adequate research to develop and improve methods of forest insect control.

(2) A system of insect detection to discover outbreaks of native forest pests while still in the early epidemic stages.

(3) Prompt control of outbreaks when they do occur.*

3. Protection from Disease

Forest stands are susceptible to diseases which affect their productive capacity by reducing either the rate of growth or density of stocking. Forest pathology is an indispensable adjunct of silviculture. Each of the many valuable tree species in the Columbia Basin States is subject to attack by one or more species of fungi. Some are capable of killing trees; others merely injure or destroy the wood, while others retard growth.

Outstanding among the killing diseases in the Columbia Basin States is white pine blister rust, which is doing serious damage to western white pine stands of Idaho and northeastern Washington. The existence of the lumber industry in that section, which is based primarily on white pine, is dependent on successful control of blister rust through eradication of the wild currant ribes and gooseberry plants which form the alternate hosts for the disease.

BLISTER RUST

With some 12,000 members of the Civilian Conservation Corps in twenty-two States at work on blister rust control; with more than $2,000,000 allotted for the work from the Public Works Fund; and with an annual Federal appropriation of $375,000 available for cooperative control, the drive to save the white and sugar pine of the United States is really going forward. It is, therefore, appropriate in this discussion to assemble certain fundamental facts relative to this vital forest problem, especially as it applies to the State of Washington.

Precisely when the blister rust was introduced into North America from Europe appears to be a matter of some doubt. But according to Mr. H. E. Swanson, government pathologist at Spokane, it was introduced into the Northwest in 1910 through a shipment of 1,000 white pine trees from France to British Columbia. From this one infection the white and sugar pines suffered to as far as 125 miles south of the Oregon-California line. The disease first made serious inroads in this country in northern Idaho and Montana in 1920 and soon spread within 19 miles of Yellowstone National Park.

The peculiar part of this rather peculiar infection is that it only affects the species of five-needle pines. Other trees are absolutely immune from the infection. For instance, the ponderosa pines which cover the eastern slopes of the Cascades are never infested by this highly contagious disease.

Blister rust is a fungous disease of white pines and currant and gooseberry plants. It enters white pines through the needles and grows into the bark. The diseased areas in the bark are called cankers. The cankers are usually spindle shaped, with swollen bark and a yellowish discoloration around their edges. About three years after a tree is infected, orange-yellow blisters break through the diseased bark of mature cankers. From these blisters millions of spores are scattered over long distances by the wind and infect the leaves of currant and gooseberry plants. These spores may remain alive several weeks and are called spring spores to distinguish them from the summer and fall spores that are produced on the leaves of currants and gooseberries. Following the production of blisters, the broken bark dies. The fungus continues its growth in the live bark and produces new blisters each spring. The disease cannot go directly from one pine to another. From infected white pines it spreads only to currant and gooseberry leaves.

The fungus is not noticeable on currant and gooseberry plants until it has grown in the leaves for a period or two or three weeks. Then small orange-yellow spots appear on the under surface of the infected leaves. These spots contain the summer spores, which spread the disease locally on currants and gooseberries. The summer spores may survive several weeks and greatly increase the amount of disease on these plants. From late June until the leaves drop, brownish hair-like growths of the fungus replace the spots in increasing abundance.

These outgrowths produce the fall spores, which infect white pines within a short radius of diseased currants and gooseberries. The fall spores are spread by the wind, but they are so delicate and consequently short lived that their infecting range is limited to short distances. This makes it possible to control the disease locally by destroying the currants and gooseberries in the vicinity of white pines.
The value of white and sugar pine timber in the forests of the United States is about $550,000,000. In addition there are several million acres of young growth which will become valuable timber in the future. Foresters advise that the maintenance of these pines in our forests is of great importance because of their rapid growth, excellent wood, high yield, and adaptability to forest management. Fortunately, in the region two-thirds of the infected area is now under control.

Wherever white pines grow, from Maine to California, they constitute the cream of the forest and are far more valuable than the associated species. With such an essential and valuable resource at stake, affecting national, regional, and local economic welfare, it is important that Federal, State, and private agencies cooperate in a united effort to accomplish control of the white-pine blister rust.

The first, and for a long time one of the principal, activities in any program that can be laid down now with reference to forest diseases is research. There are 180 native timber species in the country of importance for production of wood, and still others that are of more or less importance from the standpoint of aesthetics of watershed protection, in addition to a few introduced species which demand attention. To distinguish the different diseases, determine their causes, etc., which attack even the 25 most important tree species would take not less than half a century with the force of investigators as small as that now active in the field of forest pathology. Superficial studies reveal ways in which a few diseases can be controlled or avoided, but to get economically practical methods of cutting down the losses from most diseases it is necessary to know the fundamental facts about them.

"But in spite of the best protective efforts, there is one natural enemy against which the primeval forest cannot in the long run be protected. This enemy is senility. Sentimental conservationists talk glibly about setting aside virgin timber tracts to be preserved in all their natural glory forever. Nevertheless, relatively few forest trees live beyond 400 years. What is a beautiful virgin forest field today may in 40 years be a very ragged stand in which most of the old trees are dying and in which the understory will require a century or more to attain the size and beauty of the former forest. There is good evidence that in the past great areas of overmature timber were wiped out by widespread insect epidemics, often followed by fire.

"Just recently the disastrous mountain pine beetle epidemic among the lodgepole and ponderosa pine stands of the northern Rocky Mountains has destroyed the overmature timber on millions of acres, in spite of strenuous efforts to control it. Such natural devastation is bound to occur among trees that have passed their normal life span. Expensive protective measures may delay it, but they can never make trees immortal. The primeval forest, though it is a self-perpetuating unit, is bound to go through cycles of deterioration and upbuilding."
"Since deterioration is inevitable, and many years or even several centuries may elapse before the beauty of the primeval is restored, sustained-yield principles must be applied to primeval areas as well as to lands which are being logged. It is necessary, in other words, to maintain in a primitive state a complete rotation of age classes, so that when the over-mature forest decays a mature stand will be growing up to take its place and a stand of reproduction will be advancing toward maturity.

"To illustrate this principle specifically, let us suppose that it is desired to set up a primeval rotation in the western white pine type. This type does not reach its finest development before 200 years. By 300 years the white pine elements of the stand begin to disintegrate rapidly. Thus the 200-year-old primeval stands which we set aside today at their most beautiful stage of development will be considerably less splendid in 2037. Consequently it is desirable to reserve mature stands of about 100 years which today lack much of the beauty of the older forests but in a century will have surpassed them in aesthetic value. Similarly it is desirable to set aside stands of present reproduction which will grow into the primeval forests of the twenty-second century.

"In actual practice the first necessity is to preserve the virgin areas of the present. This action cannot be postponed. If many of the present overmature forests are not set aside as primeval areas within the next few years, they probably never will be set aside. The acquiring of the mature and immature age classes can safely wait in most cases, but sooner or later it will be desirable, in all except a few uniformly uneven-aged types, to make provision for preserving the important stages in the life cycle of the forest." (Robert Marshall in "A National Plan for American Forestry.")

F. WASTE IN THE LOGGING AND SAWMILL INDUSTRY*

The logging of forests almost universally means that varying amounts of material which, because of size or character, cannot profitably be used are left in the woods as so-called waste.

The Douglas fir region of Oregon and Washington contains about one-fourth of the country's remaining saw timber and it is here that nearly one-third of the nation's lumber supply is produced. There is probably more unutilized wood left per acre in this region, excepting possibly the redwood region, than in any other lumbering section. The reasons for this condition are many. Some of these are the character of the forest and topography, the infestations of wood destroying fungi and insects in standing and down timber, the results of forest fires that have occurred in the past, and the action of wind and sleet storms, most of which were due to natural cause and were largely uncontrollable.

Others are the result of broad and complicated economic forces. Many may be attributed to common methods and practices of the industry. Nearly all of them, unfortunately, are inter-related, precluding a satisfactory analysis of their relative importance. However, some of the more important factors causing or contributing to logging waste should be pointed out in order to understand the conditions surrounding the industry as a whole.

The factors of supply and demand have an important relation to logging waste. If the number of high grade logs that are produced were not sufficient to meet the demand there would be a tendency for the market to absorb smaller logs and logs of poorer grade.

Of the several primary forest products of the region, lumber is the most important and amounts in volume to nearly nine-tenths of the annual output. The markets and the price received for this commodity, therefore, are very important from the standpoint of good utilization. The distances to the larger domestic markets, however, are so great as to give other competing regions the benefit of shorter hauls and therefore lower transportation costs. This tends to depress the price of lumber in the Douglas fir region to a point where production cost closely approximates the selling price. Due to this condition, as well as to other economic factors, the market for logs has been weak and critical, thus limiting the sale of small, rough logs, particularly those from the less-favored species such as western hemlock and balsam firs (Abies) which are found in the forest in mixture with the more valuable species.

The ability of the market to absorb even relatively small amounts of such items as pulpwood, shingles, cooperage, poles and piling, and a number of secondary products has a beneficial effect on utilization in the woods, since it provides an outlet for certain types of material which cannot profitably be used for lumber. The demand for these products, however, is still not great enough to make any noticeable impression upon the large amounts of low grade material which remain in the woods after logging.

Not only have large bodies of timber in the Douglas fir region been bought and held more or less for speculation, but the producing branch of the lumber industry of the region has necessarily carried over so much larger supplies of raw material in the form of stumpage than is the case of other industries, excepting those engaged in the production of oil, coal, and the like. Because of excessive carrying charges on this standing timber, such as interest on borrowed capital, advancing tax rates, costs of fire prevention and suppression, as well as the desire on the part of some owners to realize on their stumpage investments, there is apparently a strong pressure to liquidate stumpage through cutting. This, in addition to the more or less wholesome pressure to operate that is common in most industries, has resulted in over-production, even during periods of a sluggish or a falling market, with attendant wood losses in both mills and woods.
1. **Logging Methods**

The loggers of the Douglas fir region fell all of the trees that are considered merchantable. These are cut into logs, and by means of high-speed power equipment are skidded to the railroad irrespective of the presence of smaller or otherwise less desirable trees, which occur in large numbers in many stands of timber. The huge trees, when they are thrown, tend to mash down many of the trees that are left. Others are pulled over or are knocked down by the logs as they are dragged over the ground to the log landing where they are loaded on cars. After logging is completed, the remaining trees together with great masses of broken and culled logs, tree tops, wind-falls, snags, limbs, and underbrush, are burned broadcast at a suitable season of the year. The mixture of small trees, having a diameter of from six to eighteen inches and with little or no present value with large timber, either as individuals or as patches of a few or more acres, presents a problem which automatically results in waste.

Not infrequently areas occur within the logging operation which contain no merchantable trees but have grown up with dense stands of small timber. The logger takes out the surrounding commercially-valuable trees and, so far as the logging operation is concerned, does not damage the second growth unless, which often happens, the logs are dragged through it. With the use of tractors and caterpillars, today, much of this is now eliminated. When the slash is burned, however, usually no precaution is taken to protect the young stand that remains and since the area is surrounded by the hot slash fire the trees are usually killed. In other cases such small timber is frequently sacrificed for a very few large trees that are standing with it.

There are many other practices in the woods which cause heavy waste in logging operations, but space does not allow us to take them up. We may mention a few of them: breakage resulting from felling; excessive stump heights; faulty bucking of trees; and the skidding of logs to the railroad. However, it is refreshing to note the change in logging operations which some operators have made in the past few years. The writer visited a large logging operation southeast of Seattle a short time ago and was agreeably surprised to find that practically all of the wasteful practices mentioned above had been eliminated. From the standpoint of the elimination of "waste," it was the cleanest logging operation he had ever seen. In fact it was too clean. That was the one criticism. Not a single seedling was left on the entire mountain side. This is known as clear cutting.

The huge Douglas fir forests of the Pacific Northwest have almost always been nearly 'clear-cut' by private operators, and those trees which did escape the axe have generally been knocked down by the high-power logging machinery. Furthermore, the highly inflammable debris left on the ground after such operations has generally burned up after a short time, thus killing the reproduction which may have started from the seeds shed by the old stand before it was logged. The result in about 60 per cent of the cut-over forests has been devastation."

* Irving M. Clarke
An estimate, reached in 1929, shows that the annual accumulations of material of cordwood size or larger, now being left unused after logging in the Douglas fir region amounts to considerably more than three billion board feet, or more than six million cords of sound wood. This figure becomes significant when one realizes that in footage it is equal to almost one-tenth of all the lumber annually produced from domestic timber in the United States. As a further comparison, it may be noted that in 1926 the total pulpwood cut in the United States was 5,489,517 cords, or over 500,000 cords less than the logging waste in 1929.

More than one-third of this amount of unutilized wood — 1,146,276,000 feet or 2,292,252 cords — was western hemlock, Sitka spruce, and true or "white" firs, woods in demand for sulphite and mechanical paper pulp. The balance — 1,942,472,000 feet or 3,884,944 cords — was Douglas fir, western red cedar, and other species such as Port Orford and incense cedar, sugar, western pine and yellow pine, woods with high values for lumber but low pulping properties, at least when reduced by present commercial practices. More than one-half of all the logging waste — 1,626,547,000 feet — was Douglas fir.

More than one-third — 1,354,828,000 feet — of all the unused wood found in the region was within the Puget Sound district. This is largely due to the great size of the district, to the activity of the lumber industry within it, and to the fact that a considerable percentage of its timber is western hemlock, a species having at present a relatively low commercial value for sawlogs. For much the same reasons, one-fourth 781,615,000 feet — of all the logging waste is found in the Columbia River district.

An analysis of the total annual wood loss of 3,088,748,000 feet b.m. shows that more than one-third, or 1,062,529,000 feet b.m. is in the form of Class I sawlogs, the bulk of which under slightly improved economic conditions the industry could reasonably be expected to use for lumber; at least 90 per cent of these logs were well within or above the specifications of commercial log grade No. 3 provided for Douglas fir by the Puget Sound Log Scaling and Grading Bureau. A little less than one-half, 480,623,000 feet, of the Class I logs are western hemlock, "white" fir and Sitka spruce, woods of interest to the west coast paper pulp industry since it depends largely upon these species for its raw material.

In this day of applied science, it is reasonable to believe that sooner or later not only profitable uses but economical methods of logging and manufacture will be found for at least a considerable proportion of the logging waste of the region.