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THE PRESENT SITUATION IN FORESTRY, WITH SPECIAL REFERENCE TO STATE FORESTRY¹

No nation can prosper or even exist in comfort without wood, without a considerable supply of relatively inexpensive timber. Three years ago our per capita annual consumption of wood was about 300 board feet, exclusive of large quantities used for fuel, paper and a multitude of other purposes. It is extremely difficult for our minds to picture what this means in total volume or amount when multiplied by 110 million, our present population. Each year we remove from our forests or destroy through forest fires about 56 billion board feet of timber large enough to saw into lumber. This almost incomprehensible amount of wood disappears from our forests every year. Much of it we need and use, and can not very well get along without. On the other hand much of it is destroyed by fire. The latter is not only a great immediate economic loss and waste, but also an encroachment on supplies that will be very much needed in the immediate future.

As a nation we have grown to our present stature on a lavish diet of wood. We use more wood than any other nation on earth. Our industries would stop, our very civilization stagnate were we suddenly deprived of our wood supply. Wood the world over is a basic resource. It is almost the first resource to be exploited and utilized in the development of a new country. Moreover, it is the resource that makes possible the utilization of other resources. There is scarcely an industry that can prosper without wood. Agriculture, transportation and commerce as we know them to-day are inconceivable without wood. All of us are daily in contact with wood wrought into some form for our comfort or necessity. From

¹ An address delivered in the School of Citizenship, Yale University, Wednesday, October 26.

morning until night wood in one or another of the diverse forms into which man has shaped it is influencing your life and mine.

If we trace the progress of industrial development in the civilized nations of the earth we are impressed by the apparent fact that:

1. Industrial development proceeds faster in countries when domestic or imported wood is available in considerable quantities.

2. Industrial development becomes arrested when available wood supplies are reduced below the essential needs of industry.

China at one time was well wooded. Prior to the exhaustion of her timber supplies she reached a stage in civilization and economic development beyond that of most other nations. She exhausted her forests centuries ago and has been without wood adequate for her essential needs for many generations. Historians have assigned many reasons for the early arrest in economic progress by the Chinese. It appears, however, that the progressive destruction of her forests far below the point of essential wood needs made the development of other industries impossible or extremely difficult.

Japan, on the other hand, although surpassed in civilization and industry by China during the long period while Chinese wood was available in quantity, has never exhausted her forests and now has wood in abundance. There is every reason to believe if Japan had followed China's example and had devastated and exhausted her forests and made no provision for regrowth, we would hear little of Japan to-day as a world power. Greece, once powerful and prosperous, fell from her high estate centuries ago. She swept the forests from her hills and mountains in attaining her power and in building her civilization and did not make provision for regrowth. She destroyed her forests, she neglected regrowth and lost her place in the sun. She is still without adequate wood for her essential needs. Switzerland, a small nation of mountains and hills, though poor in soil and most other resources upon which the strength of a nation depends, has retained her forests. She still has wood, a basic resource. She is prosperous and forward moving.

The republic of Switzerland, only a little

larger than the state of Connecticut, has three million people tilling less than 20 per cent. of the land. Some of her forests were organized as early as 853 A.D. They have been continuously under timber production for more than 1000 years and are more intensively managed and more productive to-day than ever before. The government assumes control over all absolute forest land and the following three requisites are a part of the forest laws:

(a) The forests must not be divided in area or broken up by sales.

(b) The volume of the cut must be prescribed and the fellings must follow a plan which maintains a growing stock of trees.

(c) All areas cut must be promptly restocked.

The forest laws of Switzerland declare that her forest area must not be diminished but the private owner can demand that his forest be bought by the public if he feels unable to manage it under laws which insure its perpetuation. These laws have for their object the maintaining of the forest in area and with stocked stands of growing trees.

England, though a leader among nations in economic and industrial development, has reached her place of eminence in world affairs without maintaining an adequate domestic supply of wood. Great Britain, an island empire, the first sea power of the world, has been able to meet the need of her industries for wood by bringing it from the four ends of the earth. The recent war, however, has shown her the necessity for domestic wood resources and she is now expending millions of pounds in reforestation.

America was blessed with abundance of wood when settlement began early in the seventeenth century. More than half of what is now the United States was covered with virgin forests, composed of a great variety of species, many of which are unexcelled for lumber and other essential products. We have been called a nation of home builders; we have built our homes out of the forest and we have kept them warm with wood cut in the forest. We have been more lavish in the use of wood than any other nation. We have used and destroyed the

wood at hand and thought little of the future. To-day 110 million people in the United States are using wood just as lavishly, just as wastefully as when our country was young. As a nation we have been unable to think in terms of possible timber exhaustion. Three or more centuries of forest devastation, of forest destruction, have given us the habit of thinking of the forest as inexhaustible.

Let us go into the woods and see what we can find. It must be clear to all of us that no matter how large an area of forest land this country holds within her borders, if there are no trees growing thereon we can not look forward to getting wood to build our homes and supply our industries. We must have foresight to see that regrowth or young stands of timber of acceptable species must reclothe forest land after the removal of old timber through lumbering, fire or other causes. Future timber supply to meet the essential needs of this country depends upon one thing and one thing only, namely, adequate regrowth. Somehow, or in some way, this regrowth must be attained.

Since settlement began we have been getting our wood for the most part from virgin forests, namely, from woods that were thousands of years in developing and were never disturbed by man. As a nation we have cut and otherwise destroyed the virgin forests so rapidly, out of our original 822 million acres we now have left only 137 million acres and these for the most part are in the more inaccessible parts of the country, chiefly in the far West. For all this the remnant of our virgin stands are now yielding three fourths of all the saw timber that we consume. At our present rate of cutting and present rate of destruction by fire, it is certain the remainder of our virgin timber will be practically all gone within the life time of people now living. At present we obtain but one fourth of our timber needs from forest land previously cut over or from stands that have grown since the removal of the virgin crop. It must be clear to all of us that with the passage of time more and more of our timber needs must be met from trees grown on forest land that has been previously cut over. It must also be appreciated that in the not distant

future all our wood must come from such land because there will be no virgin forest left.

Prohibiting cutting in the remnant of our virgin forests will not give us an adequate future timber supply. We should not be critical of the cutting of virgin timber or for that matter of the cutting of merchantable second growth timber. The wood is needed and is a basic resource in our national progress and industrial development. We should be critical that regrowth, in the form of fully stocked stands of desirable species, does not follow the removal of the old stand by logging, by fire or by any other cause whatsoever, when the removal is from forest land, that is, land better suited for the growth of timber than for other economic uses.

As a nation we have been so remiss in providing for regrowth, for new crops of timber of acceptable species, to take the place of the old, we are certain to suffer a severe timber shortage as the remnant of our virgin timber disappears and we are forced to turn to second growth for a constantly and rapidly increasing percentage of the wood supplies essential for our prosperity and well being.

About 463 million acres of the land area of the United States is classed as forest at the present time, but of this vast area 326 million acres have been culled of their best timber, cut over or burned. For the most part these 326 million acres have been left to chance restocking and only a comparatively small percentage is fully stocked with desirable species. Nearly all of this vast area now bears a more or less fragmentary growth, often of inferior species. On a fourth of the entire area there is no forest growth whatsoever and the land is idle.

What can we expect in the way of future timber supplies from our culled, cut-over and burned forest areas? This is a very important economic question at the present time. Please remember 326 million acres of our present area of forest land culled, cut over or burned, and only 137 million acres of virgin forest remaining, all of which will soon be gone.

Assuming that our area of forest land re-

mains as it is to-day, namely, at 463 million acres, and that we exercise no more foresight in harvesting the remainder of our virgin forest than we have in the past, what can we expect in annual growth when our virgin timber is gone, to supply this great nation with wood? The United States Forest Service estimates the present annual growth on our 326 million acres of burned and exploited forest at approximately 6 billion cubic feet. Assuming that the annual growth on exploited forest land will remain as it is at the present, after we have exploited the remainder of our virgin forests, the total 463 million acres of forest property in the United States will produce an annual growth of approximately 7 1/2 billion cubic feet. This is all that will be produced by growth each year unless we radically change our present forest policy and conscientiously plan for regrowth on a vast scale.

It is a very serious economic situation that we are now using up our forest capital more than four times as fast as we are producing it. In other words the annual growth in our forests is now approximately 6 billion cubic feet while the annual removal of wood from our forests by lumbering, fire and other causes, is over 26 billion cubic feet. We are cutting into our forest capital—the reserve supply, largely in our virgin forests—more than four times as fast as we are growing wood.

It must be evident to all that we can not go on using each year four times as much wood as we grow in a year and do this indefinitely. It must also be evident that our future supply of timber will not be assured until the annual growth of wood on our 463 million acres of forest land is at least as much as what we annually consume.

Without forest management and without serious attention given to regrowth, we grow each year less than one fourth as much wood as we use, but were all our 463 million acres of forest land fully stocked and in different age classes, there is ample evidence to show that the annual growth would be raised to approximately 28 billion cubic feet. In other

words, it is possible to produce, through increased growth on our present area of forest property, more than four times as much wood as is now grown. An annual growth of 28 billion cubic feet of wood in the forests of the United States is a goal toward which we should push. It will take a century to place all our forest property under management and to fully stock all our 463 million acres of forest land with acceptable species. An annual growth of 28 billion cubic feet, however, can not be attained until this is done.

Were all our forest land under management and fully stocked, would we be able to use advantageously the amount of timber each year represented in the possible annual growth of 28 billion cubic feet? We are now using and destroying annually approximately 26 billion cubic feet of wood; only a little less than can be grown on our entire area of 463 million acres were it all under a system of management as excellent as that of Central Europe.

Although there appears to be no inherent reason why this nation can not grow yearly as much wood as we now consume, it will not be done and moreover it can not be done without public approval and public support. The raising of the present annual growth in our forests from 6 billion cubic feet to a possible annual growth of 28 billion cubic feet is necessary if we are to be adequately supplied with wood fifty years hence.

As conditions are at present we Americans are faced with the essential fact that we are not only destroying our forest supplies more than four times as fast as we are growing them, but what is of more far-reaching importance we are, through lack of forest organization and management, rapidly using up the productive capacity of our forest lands. Not only is there less and less wood grown each year but more and more forest soil is destroyed each year beyond the power of immediate recovery for the production of wood crops. The investigations of the United States Forest Service show that already 81 million acres, out of our 463 million acres of forest property have been so completely

denuded, they are now idle, and with no immediate prospects of regrowth. This vast area scattered through many states is of no more immediate value to the nation or to the owners than it would be were it in the heart of the Sahara Desert.

The destruction of our timber through lumbering and fires without providing for regrowth and the destruction of the timber-producing power of vast areas of land valuable for no other purpose would not be so important from the standpoint of our future industrial development were it possible to obtain needed wood from beyond our own borders. Can we look to other countries for the enormous amount of wood needed if we permit our forests to fail us through our neglect to obtain regrowth? We can not. Mexico has no more lumber than she needs for her own use. Canada has already made it plain that we can not look to her for lumber supplies in large quantity. The old world requires all the available wood in her forests and tropical America, although with vast resources of hardwoods, has comparatively little that is suited to the needs of the American people. In short, as time goes on we must grow our own wood or go without. Furthermore, we must increase the growing of timber on a vast scale during the next fifty years while we still have virgin forests that remain uncut.

A program for the growing of timber on an adequate scale for our future needs must include:

First, organized fire protection and prevention that will eliminate present losses to young and old stands from forest fires.

Second, the prevention of owners of commercial forests now uncut from destroying, through destructive lumbering, the power of their lands to keep on growing trees.

Third, the reforestation of those parts of our forest area of 463 million acres that have become more or less completely denuded and are now without regrowth or are inadequately stocked.

Fourth, the improvement of existing re-

growth and that to be attained in the future by systematic silvicultural operations.

Please remember all of these must be put into operation and continued until all our forest property is subject to them. Even if we begin now, a hundred years, at least, will be required, and the expenditure of vast sums of money, if we finally reach our goal and increase our annual growth from 6 billion cubic feet of wood to 28 billion cubic feet, which measured by present consumption appears essential for our future needs.

Bringing this important question of inadequate forest growth and denuded and imperfectly stocked forest land nearer home, let us look at the state of Connecticut. Any one of a dozen eastern and southern states might be taken as well. Connecticut was originally completely covered with hardwood and softwood forests. From the time of settlement until toward the middle of the last century the state produced more lumber than she used and some was shipped abroad or exported to other states. Since then she has been unable to supply wood for her own essential needs. Constantly increasing quantities are yearly imported from other states and from other countries.

Connecticut was early settled and the land was gradually cleared for agricultural use. Farmers settled on areas of primeval woods and started to carve farms out of the wilderness. The land embraced in the entire state of Connecticut early passed to the ownership of private citizens. The farms were the year-long homes of the people who owned them. Roughly they were composed of agricultural land and forest land. Early in the last century the forest had been cleared from approximately three fourths of the state and the land taken for agriculture and grazing, also a considerable part of the remaining one fourth still bearing forest had been culled of its best timber, or more or less completely cut over. The last remnant of the virgin forest disappeared early in the present century.

Throughout Connecticut, as in most other eastern states, acceptable farm land is interspersed with forest land, that is, with land

that it is unprofitable to attempt to cultivate. The average farm therefore contains both agricultural land and forest land. In the poorer regions of the state, as in parts of Litchfield and Middlesex counties, the larger percentage of the farms is forest land while in Hartford County the larger percentage is agricultural land. Although three quarters of a century or more ago, three fourths of the land of Connecticut had been cleared for agriculture and grazing, much of this cleared land has since been abandoned as fields and pastures and left to return to forest. To-day almost one half of the entire area of the state is classed as forest and the area in productive agriculture has been gradually decreasing for a half century. Why has the area of Connecticut soil used for the production of agricultural crops so persistently and so rapidly fallen off and why has so much land formerly cultivated been permitted to revert to forest?

During the long period of extension of Connecticut agriculture and reduction of the forested areas, the farmers not only tilled their fields in summer, but they worked in the woods in winter. Only a part of their sustenance and profit was derived from their cultivated fields; a considerable part came from the woodland part of their farms. So long as it was possible to find profitable employment during the long winter in their own woodlots, a comfortable living for themselves and families could be derived from their farms, but as soon as the woodlots had been culled of all the best timber and nothing left but cheap fuel wood, it was no longer possible to obtain year-long employment and a comfortable living from the fields alone. For fifty years abandoned Connecticut farms have been in evidence in every county in the state. This abandonment is due to economic pressure forced through the exhaustion and often almost the complete destruction of the productive capacity of the forest land, thus impelling the cleared land alone to support a permanent population which in many cases has been economically impossible.

When the forests of Connecticut were still

producing timber in abundance, and agricultural extension had claimed the maximum of Connecticut land, land utilization was at its height. It is a long way from our climax of land utilization in this state of fifty or more years ago to what we find today. Not only have we greatly reduced the area in productive agriculture, but our woods, although increasing in area, have almost completely lost their capacity for yielding timber of large sizes and of high value. They are for the most part stands of sprouts that have been repeatedly culled and cut over until little but inferior fuel wood remains. Although the state now boasts of nearly one half of her total area as forest, its growing capacity is so low and the quality and kinds of timber so inferior, we are forced to send out of the state for 83 per cent. of all saw timber we consume and upon which we yearly pay four to five million dollars in freight alone. Although the forests of the state produce little timber of high grade and of desirable species which command high prices, our woods are filled with inferior species, and low-grade wood chiefly useful for fuel which commands a stumpage price but little higher than that of a half century ago.

While the forests of the state were productive, industries using wood as a raw product were widely distributed through our villages and towns. Every village had its cooper and its wheelwright. Barrels, wagons, tubs, ox-yokes, and all the various articles made from wood and used in a given community, were locally made from home-grown wood in that community.

Wood from local forests helped to support community life and nearby forests provided employment to supplement farm work. Large areas in this state as well as in most other states can not sustain profitable agriculture unless the intermingled areas of forest land are made productive. The development of agriculture and the development of forestry must go forward together wherever part of the land is unsuited for farm crops.

In my opinion an increased population on the land in this state can not be attained and

a more complete land utilization undertaken without employing modern forestry methods in improving forest land which, as you remember, occupies nearly one half of the entire state. If the present forest area of this state were fully stocked and in various age classes, we could, in a very short time, vastly increase our agricultural production, as it would make possible permanent homes on areas that, without nearby woods to afford employment to supplement farm work, is economically impossible.

I sincerely hope that I have been able to impress you with the serious situation which now confronts the American people as to adequate future supplies and for the need of a radical change in forest policy which will make regrowth possible on an extensive scale while we still have virgin supplies for our immediate needs. I sincerely hope that I have been able to impress you with the seriousness of present land problems in states like Connecticut whose agriculture has declined with the removal of the forest.

If you accept my thesis that forestry practise must be established on all of our 463 million acres of forest land, if we are to grow as much wood each year as we will need for the best development of our industrial life, you may well ask how can it be attained. It can never be attained if left to individual effort. Its attainment is primarily a function of government. The forest history of the old world clearly proves that forests are over cut and otherwise destroyed when their control and management are left entirely to private land owners. No nation can perpetuate her forests through wise use unless they are publicly owned or publicly controlled. This nation with four fifths of her forests privately owned, can not possibly attain the regrowth essential in forest renewal unless the public exercise mandatory control and demand of the private land owner that regrowth must follow as a natural consequence of forest exploitation. As a people we must appreciate that our continued prosperity is dependent upon the conservation and wise use of our 463 million acres of forest land. We must also appreciate that the forests

thereon are threatened with extinction by the methods under which much of the forest is now handled. We must work for a forest policy which embodies reasonable public regulation of operations in all forests, both public and private. We must work for adequate fire protection, for reforestation, for silvicultural practise and for further acquisition of national, state and communal forests, and all these on a scale which will with certainty insure a future supply of wood to meet the needs of the nation.

The nation, the state, lesser governmental units and the private owners of forest land must cooperate and work together if adequate regrowth to meet the needs of the country is attained. There is need for national legislation and large national appropriations to stimulate cooperation with the states, and provide for fire protection, reforestation, investigation and silvicultural practise. There is need for state legislation which requires of the private owner of forest land that it be kept fully stocked with growing timber and of the state that through tax adjustment, fire protection, and in other ways it make regrowth possible of execution without becoming a financial loss to the private owner. There is need for state legislation providing for local forestry boards comprised of foresters, timber-land owners and timber users to interpret the degree of stocking in their particular locality which will meet the requirements of the law.

As it is in all states to-day, forest property may be taxed for its full sale value. The owner of a growing crop of timber may be taxed fifty times on the crop before ready for harvest and without deriving a single dollar from it until cut. If taxed each year at its full sale value he may pay out more in taxes during the growth of the crop than its entire sale value when cut. This outgrown method of forest taxation must be changed.

Forest crops are inflammable and subject to serious loss by fire. So long as the fire hazard is as great as it is at the present time there is little incentive for private owners of forest land to establish stocked stands of young timber and carry them forward to

maturity. In my judgment it is clearly the duty of the state to adjust taxation on growing stands of timber, provide adequate protection against fire and other destructive agents, instruct the public in silvicultural methods and encourage reforestation by providing planting stock. In return for this assistance by the public, forest land must by law be subject to public regulation which will insure regrowth of acceptable species. Furthermore this public regulation must be in the hands of local boards whose function it is to interpret the requirements of the law in their particular locality.

Constructive state forest legislation is only in its beginning. It is your duty and mine to assist in every way we can in making regrowth possible. First, as American citizens and voters we should work for increased publicly owned forests by the nation, by states, and by local communities. Second, as American citizens and voters we should work for the reasonable public regulation of all forest lands, based upon a system of cooperation between the public and the private owner that will make regrowth possible without, in the long run, entailing financial loss upon the owner. Third, as American citizens and voters we should work for more liberal financial support of the entire forestry movement by both the nation and the state.

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OCCURRENCE OF PLEISTOCENE VERTEBRATES IN AN ASPHALT DEPOSIT NEAR MCKITTRICK, CALIFORNIA

PLEISTOCENE mammalian remains from asphalt deposits located along the southwestern border of the Great Valley of California have been known since 1865, when Joseph Leidy reported the occurrence of two horse teeth from near Buena Vista Lake and referred the specimens to *Equus occidentalis*. Further remains of this species from the region of Buena Vista Lake were described and figured by Leidy¹ in 1873. Thirty years

¹ Leidy, J., *Proc. Acad. Nat. Sci. Phila.*, 1865,

later J. C. Merriam² described a fragmentary lower jaw of the dire wolf, *Aenocyon dirus*, that apparently came from an asphalt bed in Tulare County, California.

The construction of the Taft-McKittrick highway in the petroleum producing belt southwest of Bakersfield has brought to light a fossiliferous bed of asphalt on the southern outskirts of the town of McKittrick. The deposit is apparently located in a narrow zone of asphaltic material shown on the geologic maps³ of the McKittrick oil region as traversing the foothill region immediately southwest of McKittrick. As mapped by Arnold and Johnson this brea belt is associated areally with Pliocene and Miocene marine beds and is found also in contact with the alluvium of McKittrick Valley.

The occurrence of bones in asphalt near McKittrick was known for many years to the Department of Palæontology of the University of California. Recently John B. Stevens explored the deposit and secured a number of specimens that were kindly presented to the University. During the past summer a field party from the Museum of Palæontology with cooperation and support of the Carnegie Institution of Washington, commenced excavations and made additional collections. Grateful acknowledgment should be made to the Midway Royal Oil Company for permission to excavate and for valuable assistance rendered during the progress of the work.

In the brea deposit near McKittrick a surface stratum of hardened asphaltic material reaches in places a thickness of several feet. This layer contains numerous remains of birds and mammals, apparently represented. 94; Rept. U. S. Geol. Surv. Terr., pp. 242-244, pl. 33, fig. 1, 1873.

² Merriam, J. C., Univ. Calif. Publ. Bull. Dept. Geol., Vol. 3, pp. 288-289, pl. 30, fig. 2, 1903.

³ Arnold, R., and Johnson, H. R., "Preliminary report on the McKittrick-Sunset Oil Region, Kern and San Luis Obispo Counties, California," pl. 1, U. S. Geol. Surv. Bull. 406, 1910; Pack, R. W., "The Sunset-Midway Oil Field, California, Part I., Geology and Oil Resources," pl. 2, U. S. Geol. Surv. Prof. Paper 116, 1920.