

SCIENCE

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FOREST POLICY FOR THE FORESTED LANDS OF THE UNITED STATES.*

THE RESERVED FOREST LANDS OF THE PUBLIC DOMAIN.†

THE peculiar topographical and climatic conditions of western North America would appear to make the preservation of its forests essential to the profitable and permanent occupation of the country. The precipitation of moisture west of the one hundredth meridian is unequally distributed throughout the year; the summers are hot and dry, and the whole territory, with the exception of the coast region of the northwest, is watered so imperfectly that forests are restricted to the slopes of high mountain ranges or to elevated plains and mesas, the valleys of the interior and of all the south being practically treeless. In all the interior and southern regions precipitation is insufficient for certain and profitable cultivation, and permanent agricultural prosperity can only be assured through irrigation. Much of the region is traversed

* Extracts from the report of the committee appointed by the National Academy of Sciences, transmitted by the President to Congress on May 25th. The report is signed by the members of the committee—Charles S. Sargent, Henry L. Abbot, A. Agassiz, Wm. H. Brewer, Arnold Hague, Gifford Pinchot, Wolcott Gibbs. It is dated from Arnold Arboretum, Harvard University, May 1, 1897.

† In the first part of the report the importance of the conservation of forests is considered in the light of European studies and the forest administration of foreign countries is reviewed.

by lofty mountain ranges well wooded at the north and sparsely wooded at the south. Their forests serve to collect, and in a measure regulate the flow of streams, the waters of which, carefully conserved and distributed artificially, would render possible the reclamation of vast areas of so-called desert lands. Irrigation systems have been undertaken in many localities under State or corporate control and have been prosecuted until their value has been amply demonstrated, although the one essential condition of their permanent success, the preservation of the forests on high mountain slopes, has been entirely neglected.

Under the authority of Section 24 of the Act of Congress, approved March 3, 1891, by which the President of the United States can withdraw from sale and entry and set apart as forest reservations parts of the public domain, whether wholly or in part covered with timber, seventeen forest reserves, with a total estimated area of 17,500,000 acres, were established prior to 1894. During the journey made by your committee last summer through the Western States and Territories it became impressed with the importance of extending this reserved area before further encroachments were made on the public domain; and on its return it prepared a short preliminary report, recommending the establishment of thirteen additional forest reserves with an estimated total area of 21,378,840 acres and roughly designating their boundaries. On the 6th of February this report was submitted by the Secretary of the Interior to the President, who, on the 22d of February, issued proclamations making the recommendations of your committee effective.

Fire and pasturage chiefly threaten the reserved forest lands of the public domain. In comparison with these the damage which is inflicted on them by illegal timber cutting is insignificant. Timber can only be cut

profitably when the operation is conducted on a comparatively large scale; and large operations require roads and sawmills, and consequently the use of capital, and are usually easy to detect and arrest. The cutting of timber on the unreserved public lands under cover of bad laws or without a pretense of legal sanction causes, as we shall show later, serious losses to the government, but so far as we have been able to observe it does not now seriously menace many of the reserves.

Fires are particularly destructive to the forests of western North America. These are composed almost exclusively of highly resinous trees, which, when they grow beyond the influence of the moisture-laden air currents from the Pacific Ocean, ignite easily, and, burning fiercely on the surface, are quickly killed, while the flames sweep forward, leaving standing behind them the dead, although unconsumed, trunks to furnish material for later conflagrations and to intensify their heat. The climate, with its unequally distributed rainfall and intensely hot and dry summers and the peculiarly inflammable character of the forests, make forest fires in the West numerous and particularly destructive, and no other part of the country has suffered so seriously from this cause.

Nomadic sheep husbandry has already seriously damaged the mountain forests in those States and Territories where it has been largely practiced. In California and western Oregon great bands of sheep, often owned by foreigners, who are temporary residents of this country, are driven in spring into the high Sierras and Cascade ranges. Feeding as they travel from the valleys at the foot of the mountains to the the upper alpine meadows, they carry desolation with them. Every blade of grass, the tender, growing shoots of shrubs, and seedling trees, are eaten to the ground. The feet of these 'hoofed locusts,' crossing and

recrossing the faces of steep slope, tread out the plants sheep do not relish and, loosening the forest floor, produce conditions favorable to floods. Their destruction of the undergrowth of the forest and of the sod of alpine meadows hastens the melting of snow in spring and quickens evaporation.

The pasturage of sheep in mountain forests thus increases the floods of early summer, which carry away rapidly the water that under natural conditions would not reach the rivers until late in the season, when it is most needed for irrigation, and by destroying the seedling trees, on which the permanency of forests depends, prevents natural forest reproduction, and therefore ultimately destroys the forests themselves. In California and Oregon the injury to the public domain by illegal pasturage is usually increased by the methods of the shepherds, who now penetrate to the highest and most inaccessible slopes and alpine meadows wherever a blade of grass can grow, and before returning to the valleys in the autumn start fires to uncover the surface of the ground and simulate the growth of herbage. Unrestricted pasturing of sheep in the Sierras and southern Cascade forests, by preventing their reproduction and increasing the number of fires, must inevitably so change the flow of streams heading in these mountains that they will become worthless for irrigation.

A study of the forest reserves, in their relations to the general development and welfare of the country, shows that the segregations of these great bodies of reserved lands can not be withdrawn from all occupation and use, and that they must be made to perform their part in the economy of the nation. According to a strict interpretation of the rulings of the Department of the Interior, no one has a right to enter a forest reserve, to cut a single tree from its forests, or to examine its rocks in search of

valuable minerals. Forty million acres of land are thus theoretically shut out from all human occupation or enjoyment. Such a condition of things should not continue, for unless the reserved lands of the public domain are made to contribute to the welfare and prosperity of the country they should be thrown open to settlement and the whole system of reserved forests abandoned. Land more valuable for its mineral deposits, or for the production of agricultural crops, than for its timber should be taken from the reservations and sold to miners and farmers; the mature timber should be cut and sold; settlers within or adjacent to the boundaries, unable to procure it in other ways, should be authorized to take such material from reserved forests as is necessary for their needs, and prospectors should be allowed to search them for minerals.

But it must not be forgotten that the public domain of which these reserves form a part belongs to the people of the whole country, and not to those of any one section. It is right, therefore, that the forest reserves should be managed for the benefit of the people of the whole country, and not for any particular class or section. Steep and elevated mountain slopes should not be cleared of their forests for the sole benefit of the prospector or the miner, because this by its influence on water flow might mean permanent injury to persons living hundreds of miles away. A few foreign sheep owners should not be allowed to exterminate great forests at the expense of the whole country, and prospectors and miners should not be permitted to burn willfully or carelessly forests in which all classes of the community are equally interested.

Our examination of the Western forests shows that the existing methods and forces at the disposal of the Interior Department are entirely inadequate to protect the for-

ests of the public domain. Civil employees, often selected for political reasons and retained in office by political favor, insufficiently paid and without security in their tenure of office, have proved unable to cope with the difficulties of forest protection, and the reserves are practically unguarded. Excluded from the provisions of the general land laws and without protection, they invite trespass of every kind and demoralize without benefiting the community. It is evident that if the government proposes to protect public property in the reserves and to enforce any laws or regulations which may be enacted for their administration, the assistance of the military must be called in until an organization can be developed in the Interior Department for the protection, management and improvement of all reserved government forest lands; for without such assistance the experience of the past clearly shows that it is idle to hope that fires can be restricted, pasturage abolished and timber cutting and mining regulated in the reserves; and if this can not be done their forests will sooner or later be ruined and the objects defeated for which they have been established.

PROPOSED SYSTEM OF FOREST ADMINISTRATION.

It has been shown that the preservation and judicious management of the forests on those portions of the public domain which are unsuited for agriculture are of great importance for the flow of rivers needed for the irrigation of arid districts, and to furnish forest products for settlers on adjacent arable lands, and for mining operations. The cheapness of forest products in the United States, and the length of time required to produce crops of timber in the West, will make the investment of the capital of individuals in silvicultural operations, for the present at least, a doubtful enterprise in those States and Territories

where the public domain is now principally situated; and silviculture in western North America will only be really successful under sustained government control and administration; for, dealing with crops which often do not reach maturity until the end of one or two centuries, it can only be made profitable by carrying out without interruption and under thoroughly trained officers, plans which must often be followed during the lives of several generations of men. This stability and continuity of management can only be secured by a permanent government administration composed of officers of the highest character, entirely devoted to duty.

Annual taxes on the land of individuals demand annual income; and to avoid or meet this burden of taxation land which should always remain covered with forests is often denuded before the requirements of commerce justify it, or is devoted to uses for which it is ill adapted. Private ownership, for example, of the redwood-bearing land of the California coast region, the most productive forest land in the world, has resulted in this land, which should remain covered with forest for all time, being rapidly converted into indifferent pasturage. The fee of lands which are most valuable for the production of timber should remain vested in the general government, and these lands, if they are managed wisely, can be made to supply forest material indefinitely to the agricultural and mining populations of adjacent districts and to improve in productiveness and value.

Ultimate self-support of a government forest administration is possible in the United States, and it may be expected to yield a permanent income if the national forests are managed with the intelligence, thrift and honesty which characterize the forest administration in Germany, France and other European countries. At first, however, the cost of administration will

exceed the receipts, as is almost invariably the case in important economic reforms, but outlays may be expected to diminish in proportion as the administration is faithful, intelligent and honest.

To inaugurate at once a complete system of forest administration would be to attempt more than is wise or feasible at this time; but the necessity of prompt action for the protection of the forest reserves from fire, illegal pasturage and other depredations is urgent, and efficient temporary police measures are needed immediately. A plan for the temporary care of the forest reserves may be wisely based on the experience gained in the management of the national parks. This clearly shows that it is possible to protect forests in the most exposed and difficult parts of the public domain with small bodies of troops; whereas, before soldiers were detailed to police the Yellowstone National Park, all efforts to manage it by civil officers of the government had shown the futility of any attempts at control which did not rest on the moral and physical support of the army.

The primary object of such temporary management would not be to produce a revenue, but to protect the reserves against fire and depredation. It should be the duty of the superintendents to issue passes to persons desirous of entering or crossing them, and to keep a careful record of the names and residences of all such persons. Sheep should be wholly excluded from the reserves, and cattle should be admitted only in moderate numbers and when the property of actual settlers on adjacent lands.

The fundamental principle of any government system of forest management should be the retention of the fee of forest lands, and the sale of forest products from them at reasonable prices, under regulations looking to the perpetual reproduction of the forest. While it is not desirable,

perhaps, that the government in the immediate future should enter into competition with the private owners of forest lands, it is evident that ultimately the sale of forest supplies from the government timber lands should not only cover all expenses of government forest management, but produce a steadily increasing income.

Upon officers charged with the administration of the government forests will devolve the care of immensely valuable public property, its improvement under the best established scientific methods, police responsibility of exceptional delicacy, surveys, the construction of roads and engineering works for the protection of mountain slopes, and the control of numerous agents widely separated and not easily trained to habits of discipline. Many of these duties are essentially military in character, and should be regulated for the present on military principles. Wise forest management calls for technical knowledge which must be based on a liberal scientific education. The forest officers must be men of the highest personal character, who can be trusted to avoid participation in any private business connected, however remotely, with forest products. To secure the service of men qualified to meet these several requirements will call for liberal remuneration and permanent tenure of office.*

Topographical and economic surveys upon which it would have been possible to establish scientifically the proper boundaries of the reserved lands do not exist and their limits have been laid down roughly with the idea that they would be modified as soon as it was possible to determine accurately what portions were more valuable for the production of minerals and for agriculture and grazing than for their timber

* A plan for a permanent organization is then recommended, a bill to protect and administer public forest reserves being given in an appendix.

growth, and that such lands would then be opened to entry and settlement. In all the forest reserves visited by your committee it saw opportunities to improve their boundaries and found lands which can not be permanently reserved without inflicting serious hardships and losses on the community. Only a small portion of the White River Plateau Timber Land Reserve in Colorado, for example, is forest land, the remainder being covered with grasses and scattered clumps of oak bushes. Such land is, of course, most valuable for pasturage, and its withdrawal from use cripples the important cattle industry of the region. In the Washington Forest Reserve and in the Cascade Forest Reserve are mineral deposits which can not wisely be held from entry, and near the borders of others there are lands more valuable for agriculture or fruit growing than for other purposes.

It is evident that such lands should be taken from the forest reserves as soon as it is practicable to do so, but before this can be done safely those parts of the public domain which have been reserved, or which may be reserved, should be accurately surveyed and carefully mapped. As the United States Geological Survey is the only Bureau in the Department of the Interior equipped for this work, it can probably most conveniently make these surveys. Their proper interpretation is a matter of the greatest importance, for on the men who undertake it will devolve the duty of establishing the final boundaries of the reserved forest lands of the public domain. Enormous interests are involved in these final decisions, and this work can be entrusted only to men of the highest integrity, intelligence and public spirit. Efforts will certainly be made to improperly influence their judgment, and they will be subjected to severe temptations. The power to open any part of the reserved lands to settlement is in the hands of the President of the United States, but he will

necessarily base his decisions in such matters on the reports and recommendations of the experts who are to study the results of the surveys made under the direction of the Geological Survey.

To provide for this important duty, we recommend that the President be authorized to appoint a commission to be known as the board of forest lands, to consist of an officer of the Engineer Corps of the Army, a member of the Geological Survey, a member of the Coast Survey and two persons not connected with the public service, and that it shall be the duty of this board to determine, with the aid of actual surveys and such other examinations as may be found necessary, the boundaries of those parts of the public domain which should be retained permanently by the government as forests, and that upon its recommendations the President should be authorized to open all other lands to entry and sale. It is believed that the character of this commission can be best maintained at the highest level by limiting the remuneration of the two members unconnected with government service to their actual expenses.

In all the forest reserves individuals have acquired more or less perfect title to land, and as they may claim that their rights are interfered with, or the value of their holdings diminished by the reservation from entry of adjacent lands, opportunity should be given them to exchange on an equitable basis their lands or rights for those of similar character outside the reservations. Several of the forest reserves are within the limits of land grants made to railroad corporations, and it should be possible for the Secretary of the Interior to arrange with these corporations to exchange their holdings within the reservations for similar unreserved lands.*

* A section on the unreserved forest lands of the public domain shows the harm that has resulted from the working of the land laws.

ADDITIONAL NATIONAL PARKS.

Parts of two forest reserves contain features of supreme natural beauty, and can best be preserved for the enjoyment and instruction of the world by creating them national parks and governing them under the rules and regulations which have proved successful in protecting the Yellowstone National Park. The first of these is the upper slopes of Mount Ranier, in Washington, with its glaciers, its alpine meadows clothed with flowers, and the fringe of forest which maintains a precarious foothold on the steep ridges below the line of its perpetual snows. This mountain is one of the highest and most beautiful in North America, and outside Alaska its glaciers are unrivaled in magnitude and interest in the United States. Memorials have been presented to Congress by the American Association for the Advancement of Science, the Geological Society of America, the Sierra Club and the Apalachian Mountain Club favoring the establishment of this national park, and an act setting aside certain lands for it was passed by the Fifty-fourth Congress at its second session; but the bill, by extending to it the mineral-land laws, might have destroyed its scenic value, and it did not receive Executive sanction.

The second spot which we believe should be made into a national park is that portion of the Grand Canyon Reserve in Arizona which is immediately adjacent to and includes the walls of the canyon itself. These two localities, Mount Ranier in Washington and the Grand Canyon of the Colorado in Arizona, are each in its particular way unsurpassed in interest. Their natural wonders should be preserved without further defacement than is necessary to make them easily accessible to the people; and unless mining is prohibited in their immediate neighborhood, and unless they can be strictly guarded against fires, their scenic value will be seriously impaired. As

this protection can only be secured by the adoption of the rules and regulations similar to those which govern the national parks, we recommend the establishment of a Ranier national park and a Grand Canyon national park.

CONCLUSIONS AND RECOMMENDATIONS.

The Secretary of the Interior, in his letter of February 15, 1896, asked the Academy whether "it is desirable and practicable to preserve from fire and to maintain permanently as forest lands those portions of the public domain now bearing wood growth for the supply of timber."

Your committee is of the opinion that it is not only desirable but essential to national welfare to protect the forested lands of the public domain, for their influence on the flow of streams and to supply timber and other forest products; and that it is practicable to reduce the number and restrict the ravages of forest fires in the Western States and Territories, provided details from the Army of the United States are used for this purpose permanently, or until a body of trained forest guards or rangers can be organized. It does not believe that it is practicable or possible to protect the forests on the public domain from fire and pillage with the present methods and machinery of the government.

In answer to the second question submitted by the Secretary of the Interior, "How far does the influence of forests upon climate, soil, and water conditions make desirable a policy of forest conservation in regions where the public domain is principally situated?" It is the opinion of your committee that, while forests probably do not increase the precipitation of moisture in any broad and general way, they are necessary to prevent destructive spring floods, and corresponding periods of low water in summer and autumn when the agriculture of a large part of western

North America is dependent upon irrigation.

The answer to the third question, "What specific legislation should be enacted to remedy the evils now confessedly existing?" will be found in the series of proposed bills appended to this report. They present the following recommendations:

1. That the Secretary of War, upon the request of the Secretary of the Interior, shall be authorized and directed to make the necessary details of troops to protect the forests, timber and undergrowth on the public reservations, and in the national parks not otherwise protected under existing laws, until a permanent forest bureau in the Department of the Interior has been authorized and thoroughly organized.

2. That the Secretary of the Interior shall be authorized and directed to issue the necessary rules and regulations for the protection, growth and improvement of the forests on the forest reserves of the United States; for the sale from them of timber, firewood and fencing to actual settlers on and adjacent to such reserves, and to the owners of mines legally located in them for use in such mines; for allowing actual settlers who have no timber on their own claims to take from the reserves firewood, posts, poles and fencing material necessary for their immediate personal use; for allowing the public to enter and cross the reserves; for granting to county commissioners rights of way for wagon roads in and across the reserves; for granting rights of way for irrigating ditches, flumes and pipes, and for reservoir sites; for permitting prospectors to enter the reserves in search of valuable minerals; for opening the reserves to the location of mining claims under the general mineral laws; and for allowing the owners of unperfected claims or patents, and the land-grant railroads with lands located in the reserves, to exchange them

under equitable conditions for unreserved lands.

3. That a bureau of public forests shall be established in the Department of the Interior, composed of officers specially selected with reference to their character and attainments, holding office during efficiency and good behavior and liberally paid and pensioned.

4. That a board of forest lands shall be appointed by the President to determine from actual topographical surveys to be made by the director of the Geological Survey what portions of the public domain should be reserved permanently as forest lands and what portions, being more valuable for agriculture or mining, should be open to sale and settlement.

5. That all public lands of the United States more valuable for the production of timber than for agriculture or mining shall be withdrawn from sale, settlement and other disposition and held for the growth and sale of timber.

6. That certain portions of the Rainier Forest Reserve in Washington and of the Grand Canyon Forest Reserve in Arizona shall be set aside and governed as national parks.

THE AMERICAN PHYSIOLOGICAL SOCIETY.

THE fourth special meeting of the American Physiological Society was held in Washington, D. C., on May 4, 5 and 6, 1897, in conjunction with the fourth Congress of American Physicians and Surgeons. The sessions were held at the Columbian University. The following communications were presented and discussed:

A new form of Gastric Cannula. W. T. PORTER.

Phlorhizin Diabetes in Dogs. G. LUSK.

The continued frequent administration of phlorhizin to dogs produces in them a form of diabetes in which, during starvation or meat nutrition, sugar is eliminated in the