

Appendix G

General Description of Hawaiian Forests

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A Report of U.S. Forester E. M. Griffith on Hawaiian Forests
Presented at Yokohama, Japan, on March 5, 1902

Note: This following was copied in its entirety in July 1991 from a manuscript hanging (framed) in the main office of DOFAW. Typographical adjustments were made mainly to the title and opening portion of the manuscript for cosmetic purposes. It is assumed that the manuscript was a talk given by Griffith in Japan in 1902. It seems that it was made up of excerpts from a letter to Dole written by Griffith. Note also that a discussion of Kauai's conditions is missing.

His Excellency, Governor Dole
Honolulu, Hawaii

Dear Sir

I have the honor to forward herewith my report upon the condition of the Hawaiian Islands for your consideration. During the course of my preliminary examination, I visited the Islands of Oahu, Maui, Hawaii and Molokai, and paid particular attention to investigating the rapid destruction of the forests. I feel perfectly satisfied that the indiscriminate ranging of cattle in the forests have been very largely responsible for the present conditions, and that the sure remedy will be to fence off the forests and confine the cattle to the lower slopes.

Very respectfully, /s/

E. M. Griffith Assistant Forester
Bureau of Forestry, U.S. Department of Agriculture

Formerly, the Hawaiian Islands were covered with dense and almost impenetrable forests which covered the steep ridges and deep canyons extending down to the narrow strip of arable land along the coasts and up to an elevation of 8,000 to 9,000 feet on the highest mountains. Ever-

running streams and springs occurred on all the islands and the rainfall was fairly even and much heavier than it is today.

The old chiefs began the destruction of the forests by cutting enormous quantities of sandalwood but the blanks were soon filled up by other forest trees. The rapidity with which the native Hawaiian forest can be absolutely destroyed is truly remarkable and peculiar to the islands.

Dense forests which were absolutely impassable have, within the short space of five to ten years, been completely wiped out, so that at the present time, the soil is covered with a thick matting of grass. This comes from the fact that all the natives trees have a very shallow root system so that the least drying up of the soil immediately affects their vitality.

In nearly all sections of the islands, the undergrowth is composed largely of a dense mass of ferns which absorbs a very large amount of moisture thus affording a most favorable protection to the soil.

Stock, particularly cattle, are responsible for the destruction of the forests in as much as they eat and trample down the ferns and other undergrowth, thus allowing the soil to become dry and often hardened under the full force of the hot tropical sun so that the roots begin to dry up and the trees naturally die. The worst feature, however, is that as soon as the undergrowth is killed out, the heavy Hilo grass immediately covers the soil and forms such a thick mat that it is impossible for seed to reach the soil and germinate. Then the life of the forest simply depends on how long the old trees can survive, for as soon as they fall the space which they occupied in the forest is taken possession of by the grasses.

Stock also destroy many trees by stripping off the bark and by injuring the roots which they have already exposed by trampling. Another very bad feature of pasturing stock in the forests is that they eat and trample down the young trees.

In a virgin forest where no stock have been allowed to graze, with very few exceptions, the only trees which are dying are those which would naturally do so from old age. The virgin Hawaiian forest is healthy, but where stock have destroyed the undergrowth the trees are dying in great numbers and are found to be attacked by insects particularly borers and the large girdling worms.

Insects can readily be collected by breaking off the limb of a tree or injuring it in some other way. The forests which are being attacked by insects are those whose vitality has been affected in some other way, usually by stock grazing. After investigating the matter very carefully I should say that stock are alone responsible for the rapid destruction of the forests. This is readily admitted by those who have studied the matter carefully and from an unprejudiced point of view; so that it seems essentially wrong that the welfare of the whole islands should be sacrificed to benefit the cattle business which forms such a small part of the commercial prosperity of the islands.

With a few exceptions the forests are only valuable in conserving the water supply and increasing the rainfall. Koa and algaroba are the only two species which occur in sufficient quantities to be of any considerable commercial importance.

Koa is a high grade cabinet wood with a very handsome grain and capable of a high polish while the algaroba furnishes the bulk of the firewood for the islands.

The algaroba grows very well at low elevations, particularly on the leeward side of Oahu and it would pay the government to plant it on rocky or denuded areas which are unsuited to any form of agriculture.

The chief characteristic of the native species is their small size averaging only fifteen to twenty inches in diameter and thirty to 40 feet in height,

together with the short length of clear bole. As a rule the side branches extend low down on the trunk which is accounted for from the fact that the trees have grown up in open stands.

Ohia occurs far more frequently than any other species and together with kukui, koa, mamane and hala forms the bulk of the forest, while the undergrowth is composed very largely of ferns.

As the forest of the Hawaiian Islands contain such a very limited amount of merchantable timber, the question of the best methods of lumbering does not enter into consideration; the whole problem is conserving the water supply which depends upon the preservation of the existing forests and restocking some of the denuded slopes either by natural reproduction or planting.

During the course of my preliminary examination the forest areas on the islands of Oahu, Maui, Hawaii and Molokai were examined, particular attention being paid to the condition of the forests along the headwaters of all streams.

Forest protection means not only increasing the rainfall but--more important still--conserving the water supply. Upon the right solution of this problem depends to a very large extent the future welfare and agricultural prosperity of the Hawaiian Islands. Sugar, the backbone of the islands, comprising over 80% of the exports, is absolutely dependent upon a plentiful and constant supply of water. The planter who does not depend upon the natural rainfall but irrigates his cane is apt to think that forest protection does not directly affect his business; but in reality he should be far more solicitous about the preservation of the forest than the planter who depends on the rainfall, for whether he is taking his water from a stream or an artesian well his supply will be very quickly affected by any disturbance of the forest cover along the important watersheds.

Particularly is this the case where water is being taken from a stream

whose headwaters lie within the forest belt, which is the case with most of the streams on the islands.

Fluming cane is by far the cheapest means of transportation, for this reason to many plantations it is of vital necessity that their supply of water be at least held constant and increased if possible. The stockman or farmer and those engaged in growing rice or taro are also dependent, though not to the same extent as the sugarcane planter, upon a water supply which shall be fairly constant through all seasons of the year.

As previously stated, the denudation of the Hawaiian forests has been brought about to a very large extent by the practice of pasturing stock in the forests. Certainly this has been admitted by those who have studied the question and it is believed that fencing and the absolute exclusion of all stock is the only sure remedy. There is no necessity for abandoning the cattle business in order to protect the forests, but the cattle must be confined to the lower slopes.

It is especially important that fences should be built along the upper limits of the forest in order to prevent the wild cattle, sheep and goats which at present are ranging on the higher grass slopes from working down into the forests.

Wherever fences have already been built, the reclamation of the forests is as surprisingly rapid as their destruction when stock are allowed to range freely. As previously stated, the first effort should be to fence and protect those forests along the headwaters of all the important streams.

In order to place the work upon a thoroughly efficient basis, it will be necessary for the government, planter, ranchers and all others owning or leasing land upon which water is the chief consideration to cooperate and see to it that the forests are thoroughly protected.

A. Hawaii (the island). During the three weeks which were spent in the examination of Hawaii, I was enabled through the courtesy of the plantation and ranch managers throughout the island to visit all the districts and obtain a general idea of the conditions of the forests and what was being done to preserve them. In treating the forest problems of this island, the various districts will be considered in their order commencing with Hamakua.

A1. Hamakua. This district extends from the northern slope of Mauna Loa, north to the sea and includes the greater portion of Mauna Kea which rises to an elevation 13,805 feet.

During the summer of 1901, a considerable portion of the forest lying between Mauna Kea and the coast on the north was burned over very severely. There is very little question but that most of the trees in this section are so badly burned that they will die and blow down, thus furnishing fuel for succeeding forest fires. The undergrowth had been destroyed by cattle so that the fire had swept; in fact, if this had been a virgin forest with a rank undergrowth it would probably have been impossible to set it on fire. The forest had been so opened up by cattle that it died out thoroughly as is proved by the almost complete destruction of the humus so that the bare soil is now exposed. This latter result would be extremely favorable to the natural restocking of this burned area by self-sown seed but, very unfortunately, cattle are grazing in the forest and will destroy any young growth which may come up.

Within the present generation, forest fires have been almost unknown in the Hawaiian Islands but the indiscriminate pasturing of cattle in the forests makes their destruction by fire not only possible but extremely probable either through malice or carelessness in burning brush, cane trash or by camping parties.

A large part of the burned forest is on government land which has been leased until 1906, but it is extremely important that the government should induce the lessee, by an extension of time on his cane land lease or in some other way, to absolutely exclude cattle from this forest and protect it by fencing.

The forests in the remainder of the northern portion of the district of Hamakua are being rapidly destroyed by cattle, both wild and tame, so that the whole section within a few years will be a continuation of the Waimea plains unless adequate means are taken to protect the forests from cattle.

The wild cattle, sheep and pigs should be driven down from the mountains and the forests preserved by fencing.

On the north slopes of Mauna Kea, the mamane forest is spreading itself rapidly and appears to be holding out against the cattle, which is truly remarkable inasmuch as it is the only case of the kind which was seen anywhere on the islands. The mamane is a tough mountain tree and it is believed that it could be used to good advantage in restocking denuded slopes.

Between Mauna Kea and Mauna Loa the extensive plain or table land is covered with a rather broken growth of ohia, with scattering koa and mamane, while both mountain slopes are fairly heavily timbered.

On the whole the forests of Hamakua are in very poor condition and in some section fast disappearing solely on account of cattle grazing and the consequent forest fire.

A2. North Kohala. The Kohala mountains which extend northwest and southeast through the district were formerly covered with very dense forests which were practically impassable except by cutting trail with cane knives. Cattle, however, have absolutely destroyed all the forests on the lower slopes and are rapidly denuding the forests on the higher slopes. In

order to save any of the remaining forests, they should be fenced off and protected as soon as possible. On the lower slopes which have been absolutely denuded, artificial restoration will be necessary.

Some of the planters in this district have fenced their forests, but concerted action on the part of the government, planters and ranchers will be necessary in order to save the water supply.

A3. South Kohala. The Kohala mountains extend along the northern portion of this district, but here too the forests have been very badly damaged by the cattle. The central and southern portion include the Waimea plains and the open grazing country west of Mauna Kea. On all sides of Waimea the country is a rolling plain which is unquestionably suited to agriculture and should not be covered with forests. But this fine agricultural land will be almost useless unless a constant water supply is assured and this can only be accomplished by carefully protecting the forests on the Kohala mountains, particularly north of the village of Waimea.

At present, cattle are being run on this range and it is possible to ride through a large portion of the forest which a few years ago was impassable. Here, as elsewhere, there is no necessity for abandoning the cattle business but it should be carried on with much more system, with paddocks or an open range on the plains and the mountain forests protected from all grazing.

A4. Kona. This district is covered to a very large extent with lava flows a very restricted area of land suitable for any form of agriculture and no running streams of any importance. Here the need of protecting the forests is not so pressing as in many parts of the island, as there are no headwaters of streams to be protected and the chief value of a large area of forest land will be to increase the rainfall and maintain an equable climate.

Here lava flows are gradually being covered with a forest growth composed chiefly of ferns and ohia which assist greatly in the rapid disintegration of the lava and the formation of a fairly rich soil. Such tracts are naturally suited to forest growth and as they are not, at present, capable of producing any more valuable crop, they should be used as forest reserves. Cattle grazing on such lands does not yield sufficient returns to justify the destruction of the young forests.

On all parts of the island, the heaviest rains occur within the forests on the higher slopes of the mountains. Hence it is extremely important that the forest growth should be encouraged on Hualalai and the existing forest protected.

The combined area of the rocky slopes and the lava flows is considerable and the territorial government should see to it that these sections are kept under forests as they are almost worthless for any other purpose. Provided such a definite policy is adopted, it would be entirely safe to permit the clearing of all forest land for agriculture within the district.

A5. Kau. Formerly this was considered the driest district on the island of Hawaii, but since the plantations and ranches have commenced to preserve the forests by means of fencing out the cattle, the rainfall has increased materially.

Great credit is due the gentlemen who have been so far-sighted and liberal thus preserving a magnificent stretch of forest. Over 31 miles of protection fence have been built on the slopes of Mauna Loa back of the Pahala plantation and ranch, and within five years, since the fence has been constructed, the young growth, composed for the most part of ferns and ohia, has come up in such dense masses that it is almost impassable and the land is rapidly regaining its marshy character. This very satisfactory reclamation of a large forest belt which had been severely thinned out by both wild and tame cattle within a few years speaks for itself and points

out the way both for the government, corporations and private owners who are all vitally interested in preserving the water supply.

Within this district, also notably, in the vicinity of the crater of Kilauea, are large tracts of land covered with lava and upon which the young forest growth which is struggling to gain a foothold and make soil should be absolutely protected. The growth of all species which are easily self-sown, particularly the pines, should be encouraged. This is especially true on the mountain slopes and higher elevations where it is important to conserve the heavy rainfall which, at present, is very largely lost through the rapid evaporation on soil which is exposed to the full force of the sun's rays.

A6. Puna. Puna is called the tropical district of the island and contains the truly magnificent forests of Oloa which are composed very largely of tree ferns which are composed very largely of tree ferns which grow to a height of from 30 to 40 feet with a mass of smaller ferns as an undergrowth. In this connection the fact should be emphasized that a dense of ferns conserves the water more completely and gives it off more gradually than a more open forest of native trees. The ferns act as a sponge, absorbing an enormous amount of moisture and giving it off very gradually, especially if the ferns are in dense shade from an overhead or second-storied forest of trees.

Puna has a vast forest area and while large tracts are being cleared for sugar and homesteads, yet it is probable that there will be no diminution of the rainfall or water supply for fluming or irrigating provided the upper slopes of the forest are protected.

A7. Hilo. This district contains nearly all the running streams on the island of Hawaii and it is therefore more important to protect the forests on the headwaters of these streams than in nearly all other section combined. Most of these streams come from underground water which rises to the surface at a comparatively low elevation and are used extensively for

fluming cane along the line of plantations which extend from Hilo to Hamakua. The loss or decrease in flow of these streams would be a severe blow to the plantations as they depend on fluming almost exclusively for the transportation of their cane to the mill. Above the plantations, the extensive forest covered slopes of Mauna Kea produce a very heavy rainfall which seeps through the aa flows and is carried to the lower levels by the more or less solid pahoehoe.

The lower edge of the forest is protected by the cane lands but wild and tame cattle, sheep and goats are killing the forest along the upper slopes and so gradually narrowing the forest belt. The rains which fall on the higher grass covered slopes and which is not lost by evaporation runs off very rapidly thus causing the small streams to overflow their banks after a very heavy rain without conserving any of it for the drier season when it is most needed.

Nearly all of this government land has been leased for a long term of years and the plantations in order to protect the headwaters of the streams must fence along the upper forest slopes and drive out or kill the stock which remains below the fence.

The government should assist the plantations in every possible way to protect the forests and incorporate in all future leases a provision that all important forest areas shall either be fenced by the lessee or all cattle absolutely excluded.

B. Maui. The forests on the island of Maui, upon the whole, are in a fairly satisfactory condition although in certain sections they are disappearing very rapidly. Nearly all the sugar plantations and the bulk of the arable land lies between Wailuku and Honomanu and here the forests have been seriously injured by stock grazing.

The sugar planters and farmers in this locality all depend upon irrigation, the water being taken from small streams which for the most part rise on the slopes of Haleakala. For many years, cattle were allowed an unrestricted range in the forests along the headwaters of these streams so that in many sections the forest is either dead or dying.

The almost total destruction of the undergrowth has allowed the soil to bake and harden thus causing the rainfall to run off rapidly with the resultant effect of very low water during the dry season. The Haiku and Spreckelsville ditches have prevented stock from ranging in the upper forests and so have formed a protection belt from Haiku to Honomanu. Along the line of the Haiku ditch the almost total destruction of the forests by stock is clearly shown; for whereas the forests on the upper side of the ditch, which have been protected, are very dense and healthy, those on the lower side, which have been open to grazing, are either almost destroyed or in a very unhealthy condition.

The district of Kula is also a striking example and, in order to save the little remaining forest, the cattle must be absolutely excluded. It is far easier and a much better policy to save the existing forests than to certainly destroy them by grazing and attempt to realize by planting a forest in some other locality.

Planting is extremely expensive, especially if the trees are set out very close together as must be done if a dense forest is to be secured which will act as a sponge and hold the water supply. Then too, a small amount of planting here and there does very little good and such expensive work will seldom be necessary in the islands if a common sense forest policy is pursued.

The government owns some very important forest areas on Maui along the headwaters of the streams and the upper slopes of the mountains which should be segregated and set aside as forest reserves. It will probably be

advisable to build fences and necessary to determine which lands are suitable for agriculture and those which should always be kept under timber.

The forests in the Iao valley are very well protected and consequently show no signs of deterioration while the streams are maintained with a fairly even flow. The forests in the remainder of the district of Lahaina show very plainly the effect of grazing and must be much more carefully looked after in order to conserve the all important water supply.

The whole question on the island of Maui is protecting the existing forests; it is of the most vital importance to the plantations that these should be done at once and thus save the very large expense of artificial planting.

C. Molokai. Cattle, goats and deer have totally destroyed the forests upon the larger portion of the island of Molokai so that the western half is practically destitute of any tree growth. It is possible that the algaroba forests which have secured such a strong hold along the coast near Kaunakakai may gradually spread over this end of the island. At present the soil is covered with a thin growth of grass which is apt to die down during the dry season thus allowing the top soil to cake and powder. Molokai is exposed to the full force of very heavy winds which are rapidly blowing most of this fine soil top soil off into the ocean. The algaroba will hold this soil, furnish splendid firewood and the bean pods make a very good feed for cattle during the dry season.

Planting in belts or strips is recommended on the western half of the island in order to form windbreaks and thus hold the shifting soils. The eastern half of the island including the entire Olokui section is by far the most important for here all the streams rise.

Cattle and deer, particularly the latter, have destroyed a large area of the forests but within late years their numbers have been greatly reduced by hunters who have been paid to shoot them.

The condition at present time is that the forest has been pushed back into the deeper and more inaccessible canyons and onto the highest slopes of the mountain. The effective watershed in respect to the conservation of the water supply has thus been greatly reduced and the careful protection of the remaining forests is an absolute necessity.

A small amount of fencing has already been done and the results are surprisingly satisfactory although the forests had been very badly denuded. The remaining fences should be constructed at once while there is still a small amount of undergrowth which will assist very materially in the rapid reclamation of the forests.

D. Oahu. Forest protection on Oahu is far more important than on any other island of the Hawaiian group on account of the large interests at stake and the great value of the water supply. Probably there is a greater daily consumption of water for irrigation purposes between Honolulu and Kahuku than on any equal area in the United States. The sugar plantations alone pump over 314 million gallons of water daily.

Both the Waianae and Koolau Mountain Ranges were formerly covered with a heavy forest growth extending down nearly to the shore line and in the center to the Waialua plains. But the indiscriminate ranging of cattle has resulted in the total destruction of all the undergrowth and trees on the lower slopes so that today the remaining forests are confined to the upper slopes and the more inaccessible canyons. Still the cattle continue to rapidly destroy the forest although in many cases the land and cattle owners are far more financially concerned in the welfare of the sugar plantations.

The water which is being pumped by the plantations to irrigate their cane is very largely that which falls within the forest belt on the higher slopes and gradually sinks to the artesian level. Consequently if the cattle and goats are allowed to destroy these forests, a considerable amount of water will be lost through largely increased evaporation on the exposed soil and the rapid run off.

There is a large amount of natural grazing land such as the Waialua plains and the lower slopes of the two ranges above the cane lands so that the necessary protection of the forest areas does not mean doing away with cattle business. There is also a large amount of fine agricultural land on the Waialua plains but these will be absolutely worthless unless the water supply is protected.

The reforestation of Tantalus by the Department of Agriculture and Forestry is an unusually fine piece of work very successfully carried out but it clearly demonstrates how difficult and expensive the reclamation of such land becomes when all the forest growth has been destroyed. It emphasizes the fact of how much easier it is to fence and protect the forests in time while a few trees remain to seed up the surrounding soil than it is to delay until artificial reforestation is necessary.

If the lower slopes of the forests on the Waianae and Koolau ranges are fenced off as soon as possible, the scattering trees will gradually reforest the slopes, the young koa, which at present is being eaten off and tramped by cattle, will come up and a small amount of planting of those areas which are absolutely denuded will be necessary. The fencing should have been done long ago and at present the reclamation of the forests will be very slow on account of the few seeds which remain and the mass of Hilo grass which has covered the soil and makes reproduction very difficult if not impossible.

So much of the government land on this island has been leased for a long term of years that the effective protection of the remaining forests depend upon the planters and other lessees will be benefitted. However, it is hoped that the government can assist in building the fences and they will appoint a ranger to patrol the forest lands not under lease and see to it that all cattle are excluded.

In future the forest areas on this island should never be leased for grazing purposes and the lessees of cane and agricultural lands should be obliged by the terms of their lease, to build stock fences and keep them in repair.

I recommend that a Forest Force be organized. In order to thoroughly protect the forest areas and carry out the forest policy of the government, the organization of a field force is extremely important.

The following forest force which is similar to those in charge of the forest reserves in the United States is recommended, viz: A forest inspector who shall be a practical forester and have charge of all government forest land and direct the work of the forest rangers. Four forest rangers who shall have had some practical training in forestry, understand lumbering and tree planting, with rangers as follows: One on the island of Oahu; one on the island of Hawaii; one on the island of Kauai; one for the islands of Maui and Molokai.

Their duties should consist in patrolling all government forest land within their ranges and enforcing the terms of the lease, supervising the construction of all government fences, acting as fire wardens and taking charge of all the planting.

If thoroughly competent men are appointed, such a force should prove wonderfully efficient in protecting and building up the forest reserves.

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