VOL. XI. MAY, 1914 No. 5

Price, 10c. Per Copy; Per Annum, $1.00; Foreign, $1.25.

THE Hawaiian Forester AND Agriculturist

A MONTHLY MAGAZINE

OF

Forestry, Entomology and Agriculture

ISSUED UNDER THE DIRECTION

OF THE

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

PUBLISHED MONTHLY.

Entered as second-class matter at the Post office, at Honolulu, Hawaii.

ADDRESS ALL COMMUNICATIONS TO

DANIEL LOGAN,

EDITOR "THE FORESTER,"

P. O. BOX 366,

HONOLULU, H. T.

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For business relating to advertising or subscriptions, address

HAWAIIAN GAZETTE CO., LTD., Publishers,

217 S. KING ST., HONOLULU, HAWAII.

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RALPH S. HOSMER,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent.

THE HAWAIIAN

FORESTER & AGRICULTURIST

VOL. XI. MAY, 1914. No. 5

DIVISION OF ANIMAL INDUSTRY.

ANNUAL REPORT FOR YEAR 1913.

Honolulu, December 31, 1913.

The Honorable the Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.

Gentlemen:—I have the honor to submit herewith my report as Superintendent of Animal Industry and Territorial Veterinarian for the year ending December 31, 1913.

As all routine and detail work has been recorded in the twelve monthly reports of my Division it has been my aim in this report to show the present status of live stock conditions in the Territory in order to emphasize what has been accomplished during the nine years I have had the honor to be the head of the Division of Animal Industry.

Very respectfully,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF THE TERRITORIAL VETERINARIAN—1913

THE LIVE STOCK INDUSTRY OF THE TERRITORY.

The year ending December 31, 1913, must be said to have been in most respects favorable to the live stock interests throughout the Territory. The prolonged drought of the previous year extended well into the spring or summer of 1913 and the feed on the ranges became very short, but with the improved water supply of nearly all the stock breeding districts the losses from this cause were comparatively small.

The vast increase in the consumption of beef and other meats, as a result of the great number of soldiers now stationed here, necessitated the importation of large amounts of beef and mutton from California, as well as from the Colonies, but the expected reduction in price from the removal of the duty on live stock products did not materialize, the foreign exporters advancing the

price in direct proportion to the reduction and pocketing the profit that was to have benefited the local consumers.

The past year has seen the sheep industry reduced to a considerable extent in favor of cattle raising, it being generally believed that many of the sheep ranges have been overstocked and consequently worn out, at least in so far as sheep are concerned.

No epidemic of any kind has occurred among either cattle or sheep, but for the first time in four years a considerable number of hogs have been lost from cholera, especially on the Island of Oahu, thereby necessitating the importation of butcher hogs from California. Previous to 1908 this Territory imported annually from 4000 to 6000 butcher hogs, and pork was always a very expensive meat on the local markets. Hog raising was consequently encouraged and urged at every opportunity by the federal, territorial and local live stock authorities until the production of hogs increased to the point when importations were no longer necessary. This condition lasted, as stated, for four years, or until the latter part of 1913, when a shipment of 200 hogs arrived here from Oregon. There is, however, little cause to believe that this condition will last for any length of time. The outbreak of hog cholera was under control shortly after its presence was definitely established, and were it not for the persistence of the infection for about six months after the last case had occurred in any locality it would soon have been safe for the hog raisers to begin to stock up again, at least with serum-immunized hogs. But, in any case, it has been demonstrated that hog raising is a very profitable business in this Territory, at least to the extent where cheap feed (hotel, mess or kitchen swill) can be obtained, and, further, that there is now a sufficient amount of that feed here to supply the local demand for pork.

Horse and Mule Breeding has taken an immense upward swing during the past few years and it is highly satisfactory to report that the past year has demonstrated the absolute fitness, or rather superiority, of locally raised horses for all the branches of the military service stationed here. About three years ago the cavalry began experimenting with Parker Ranch horses, first as polo ponies and then as regular mounts and officers' chargers, since which time about 200 head of horses have been purchased on various ranches on Hawaii and are giving great satisfaction. It may therefore be safely predicted that no more horses will be sent here for military purposes, but that the future needs of the regiments stationed here will be supplied by the local horse breeders. The only possible objection to such an arrangement might be the price asked for Island-bred horses, as there remain but few of the cheap cow-ponies of common-breed stock. All the larger breeders now use only pedigreed stallions of high class, and the colts and young animals are no longer left to care for themselves on the ranges at all times of the year, but are fed, broken and handled and, in fact, looked after and cared for, selected and classified

until they can hardly be called range horses any longer; and, as a steadily increasing percentage shows all the qualities and marks of high breeding seen in the blue grass regions of the States, it is obvious that they cannot be sold at the figures which prevailed five to ten years ago. As regards the health of the horse stock it must be said to have never been better. A few scattered cases of spinal meningitis—so-called—have occurred, on Maui and Molokai principally, but beyond these there has not been one outbreak of infectious or contagious disease worth mentioning. Two cases of suspected glanders in the same stable were reported from Hawaii, but as this was in a neighborhood where glanders had not occurred for many years, and quite isolated, it is more likely to have been epizootic lymphangitis.

IMPORTATIONS OF LIVE STOCK.

The following numbers of different classes of live stock have been received through the ports of Honolulu and Hilo during the past year:

	Honolulu	Hilo
Horses	550	6
Mules	710	6
Cattle	93	42
Sheep	2	42
Swine	227	11
Dogs and cats	75	11
Poultry (crates)	1330	127

From the above table it will be seen that by far the greater number of live stock enters the Territory through the port of Honolulu. Direct importations to the Island of Maui are included in the Honolulu record, since they all arrive here first and are inspected before being passed on to Maui, for quarantine or otherwise.

Of the 1200 to 1300 head of horse stock which arrived here during the year by far the greater part, that is, more than one thousand, were for military purposes. Of the remaining number most were draft horses of medium quality, and finally a number of stallions and mares for breeding purposes. Among these must be mentioned an importation of six black Percheron stallions and mares for the Parker Ranch, which undoubtedly will put their mark on many of the coming generations of heavy draft horses for which this ranch is so justly noted.

Among the cattle imported must be mentioned a bunch of five "Dutch Belted" cattle, the first seen here of that breed, and which were purchased by Mrs. B. M. Allen at the California State Fair, where they were prize winners. There also arrived a number of good bulls of the beef breeds but not by far as many as the Territory needs. Quite a number of the larger ranch owners are

exceedingly slow when it comes to improving their herds through the purchase of high class pedigreed sires, and seem to think that the end may be gained as well through the use of one-half, three-quarter or seven-eighth cross-bred bulls, many of which can now be purchased here, and some of which are splendid individuals besides costing much less than pure-bred animals. These breeders, however, do not realize that such animals lack that unfailing breeding potency inherent in the pure-bred sire of an old established breed, and which makes even the first cross with a common-bred cow worth twice as much and mature a year earlier than the offspring of a cross-bred or common sire with the same class of mother. It may be argued that the local market does not call for such heavy beeves or for such large cuts as those resulting from 1500 lb. steers, but that is simply because the consumers have become used to the smaller cuts and never have had an opportunity to learn that the larger the cut the smaller the waste. Another discouraging feature in this connection is the present system of the wholesale trade in butcher animals, all of which are practically bought on the block, that is, after they are butchered, and very rarely on the hoof, as is done everywhere else. This throws the entire loss from shrinkage—from the time a steer leaves the pasture until it has been butchered, bled and well drained, in many cases more than a week—on the stock grower, and the quality of the carcass, so apparent in the live animal in the feed yard or on the range, becomes almost insignificant. Whereas, for instance, a bunch of high grade Hereford or Shorthorn steers in the stables averaging 1400 or 1500 lbs. would bring the top market price, say seven or eight cents per pound on the hoof, a bunch of fat common-bred steers of all colors but fairly even size and weighing about 1100 pounds would bring at best five to six cents per pound. In the local market, however, the ranchman ships his cattle to Honolulu, taking them off the pasture and after a strenuous trip landing them in the slaughterhouse pens, where they remain until butchered, getting nothing but dry hay and water, a procedure which is obviously much more trying on well-bred cattle than on scrub stock and, as stated, when the final deal is made the carcass of the latter will in most cases bring as much as the former and possibly be preferred on account of their smaller size, the larger carcasses being classified as stags even if they average a year younger than the others. So long as this condition continues there is little incentive for the progressive cattle raiser to improve his herd with expensive sires and only concerted action on their part for the sale of the live animals to be consummated either on the ranch before shipment or else immediately after arrival in Honolulu, will give the producer of high class beef his just dues, and help to elevate the live stock industry to the standpoint which the ideal climatic conditions and the almost total absence of diseases of live stock warant.

QUARANTINE STATIONS.

In connection with the importation of live stock and the above mentioned absence of disease, it is worthy of note that the Board has done everything in its power not alone to guard against the introduction of infected animals, but also to facilitate the importation of valuable breeding animals and assist the progressive stock breeder in bringing such into the Territory with as little cost and inconvenience as possible. To this end two ports of entry besides Honolulu, that is, Hilo and Kahului, were during the past year provided with quarantine stations. The Hilo station cost nearly $3000 and the Kahului Station about half of that amount, besides which the Board provided a permanent caretaker for each. Both stations are of solid construction and absolutely modern in so far as sanitation and hygiene, as well as comfort and convenience, are concerned. The old quarantine station at Hilo was at best a makeshift affair, while importations of live stock for the Island of Maui had to be quarantined, when required, at Honolulu, and were it not for the uncertainty engendered through the change in the national administration, these improvements would undoubtedly have seen a great increase in the numbers of draft and breeding animals imported. The observations made by this Division during the past eight years have however demonstrated beyond a doubt that so long as new centers of infection are prevented from gaining entrance it is possible to eradicate the infection already established here. The following section of this report, dealing with glanders, shows this most clearly and accentuates the necessity for continuing the policy of vigilance embodied in the Board's regulations requiring inspection, testing and quarantine of all live stock coming from or through a state, territory or country known to be infected with one or more of the numerous animal scourges from which the Territory now is free.

DISEASES OF LIVE STOCK.

Glanders. It is with considerable satisfaction that this Division believes itself justified in claiming that glanders, the most destructive of all equine diseases, has apparently been eradicated from the Territory, especially in view of the fact that the disease was very prevalent here when the Division was established about nine years ago, and that no indemnity has ever been paid for destroyed animals. This is a feat which the best live stock sanitarians have claimed to be impossible and one that has not been accomplished anywhere else in the civilized world. It must, however, be said that it would have been nearly as difficult here had it not been for certain natural, especially climatic, conditions and resulting circumstances, all of which tended to favor the efforts at eradication. The prime factor, however, was the exclusion of

fresh infection with horses and mules imported from or through California and other countries. Owing to the great distance of these Islands from the mainland, and to the absolute necessity of importing large numbers of draft animals from the nearest available market, that is, California, it seemed to have become a habit with horse dealers there to unload on Hawaiian buyers latent or obscure cases of glanders, taking it for granted that the diseased animals could not be returned and that, if returned, they would not be admitted to the State but would have to be destroyed upon return arrival. It seemed therefore to be perfectly safe to ship such animals to Hawaii, and, until the mallein test came into general use, there can be little doubt that many reactors found their way to this Territory. No wonder therefore that glanders spread through the local stables and pastures until over one hundred outbreaks per annum became the rule rather than the exception and that the losses from this disease alone at times aggregated $30,000 per year.

With the establishment of the Division of Animal Industry in 1905 a check was immediately put upon the importation of infected animals, although it was not until the coöperation of the federal Bureau of Animal Industry was enlisted in 1907 that a complete stop may be said to have been effected. This policy of the Territorial Board of Agriculture and Forestry, to demand and obtain federal protection in the interstate shipment of live stock, was soon followed by other states and territories until at the present time it is universally employed throughout the Union, and the regulations of this Board pertaining to the importation of live stock have been adopted, and in some cases copied word for word, by a number of the States.

At the same time a vigorous fight against the disease within the Territory was inaugurated and this again led to the appointment of deputy territorial veterinarians on the principal islands, without which the creditable result, that is, the apparently complete eradication of the disease, could not have been accomplished in such a short time, and especially without the payment of compensation for destroyed animals. It is, of course, not impossible that the disease may linger in some out-of-the-way mountain valley or gulch or remain latent in some old "carrier," as was the case in Waipio Valley, but even so if another outbreak should occur it will soon be apprehended and suppressed, while the intradermal test with mallein is so easy and simple that all exposed animals can be located and rendered harmless with comparative ease.

Bovine Tuberculosis.

What has been said above in regard to glanders in horse stock may to a certain extent be repeated in so far as bovine tuberculosis is concerned. What has been accomplished here along the line of control, suppression and eradication of this fatal insidious disease of dairy cattle and the resulting improvement of the local

milk supply is unparalleled in any other country, state or territory where no indemnification is provided for the destruction of diseased cattle, and where the enforcement of sanitary regulations is in the hands of political employees.

Beginning four years ago with the tuberculin testing of the dairy cows of the City of Honolulu conditions were met of sufficient severity to discourage the stoutest heart, and, had it not been for the unfailing support of the leading dairymen and their willingness to sacrifice large numbers of their best animals, it is doubtful whether the present satisfactory state could ever have been reached or, at least, not until the milk consumers had been educated up to demand pure and wholesome milk for their children.

The first tuberculin test revealed no less than 32% of diseased cows among the Honolulu dairy herds, which figure was reduced to 24% when all the dairy cattle of the City and County of Honolulu, that is the Island of Oahu, were tested, and it cannot be disputed that had the test been postponed even one single year the question of eradication would have had to be abandoned and either pasteurization or the "Bang method" of gradual elimination resorted to. But as it was, by far the greater part of the 469 head of reactors to this first test belonged to three or four of the largest dairymen, who were financially able to bear the loss and who declared themselves willing or even anxious to have their herds cleaned up. There was consequently nothing else for the recalcitrants to do than to follow this step or else go out of the dairy business, as the milk consumers were quick to respond to the movement for sanitary dairies and clean milk and refused to buy from any dairy that was not declared clean officially, even though there was a slight advance in the price of milk from the clean herds.

In the latter part of 1910 (November), the intradermal method of testing was adopted, whereby the greater part of the objection to the work of eradication was overcome. This method, fully described in the previous reports from this Division, has proved absolutely satisfactory and is fully believed to be the only means whereby the universal eradication of bovine tuberculosis can ever be accomplished.

The second and third annual tests gave respectively 5.8% and 3.8% of reactors whereas the 1913 test, comprising 4444 head of cattle, gave only 119 reactors of which a great part were range cattle that had escaped the previous tests and about 1½% were actual dairy cows. All of these reactors were slaughtered without unnecessary delay and, whenever possible, examined post mortem. In every case did the pathological changes verify the diagnosis and prove the value of the intradermal method of testing. All stables where reactors were found were thoroughly disinfected and whitewashed, and these herds are now being submitted to the test every three months in order to apprehend any

case, that may still develop, in its incipiency. In the meantime it may be said that the milk supply of the City and County of Honolulu, to all intents and purposes, is free from tuberculous infection and it is to be hoped that this good work which has only recently been inaugurated on the other islands, where deputy territorial veterinarians are located, will progress and meet with the same support from the public as has been the case here. Up to the present time the efforts of this Board to do its share in fighting the Great White Plague by suppressing the one source of infantile tuberculous infection that we know *can* be suppressed,—viz., the milk-borne infection—has met with but lukewarm support from the municipal authorities in this county and none at all in the other counties, while the Territorial Board of Health is doing splendid work all over the Territory fighting the spread of the disease among all classes and nationalities of the population. Whether the efforts of the Board of Agriculture and Forestry along these lines are of any actual value in saving human lives has frequently been disputed, but knowing as we do that children under five years of age are especially susceptible to the bovine tuberculous infection, so often contained in milk from tuberculous cows, the Board of Health was asked for statistics in regard to the mortality among children from tuberculosis in Honolulu as compared to the rest of the Territory, during the period of the last three years. The report received covers the number of cases, with the number of deaths, of all forms of tuberculosis among children under five years of age, in the entire Territory and in the district of Honolulu alone, and proves clearly that there has been a decrease in the number of cases in Honolulu since 1910, of more than 66%, or to one-third of the annual number of cases, while the number of deaths has decreased more than 75%, or to one-fourth of the annual number of deaths. On the other hand the number of cases for the entire Territory shows an increase of 40% and the mortality an increase of 80% per annum. These figures cover the period from April, 1910, to June, 1913, with a total of 102 cases of infantile tuberculosis with 90 deaths, of which number 50 cases with 35 deaths occurred in Honolulu. But whereas the last year, ending June 30, 1913, gave the entire Territory 36 cases with 32 deaths, the District of Honolulu had only 9 cases with 5 deaths, which warrants the conclusion that some extraordinary factor must have contributed to this immense reduction in the local prevalence of the disease which it would not seem far-fetched to attribute, at least in part, to the absence of the specific infection, the tubercle bacillus from the local milk supply, especially as milk forms such an important part of the food of children under five years of age.

By this inference it is not meant to take an iota of credit away from the splendid work done by the Anti-Tuberculosis League of Hawaii and the Territorial Board of Health, but an analysis of the statistics contained in the pamphlet published by the

League (Advertiser, December 20, 1913), shows a *reduction* in the death rate from tuberculosis of all classes and ages (1911-1913) of from 3.5 per 1000 to 2.7 per 1000 inhabitants, which makes the *increase* in mortality among children under five years of age except in the one district where non-tuberculous milk is available, so much more conspicuous, and forcibly accentuates the fact that the said pamphlet, entitled "Fighting the Great White Plague in Hawaii," in no place on its fourteen pages mentions either cows or milk or the danger of transmission of bovine tuberculosis to children with infected milk, but simply ignores the efforts of this Board to assist in the fight along the lines which are now recognized the world over, that is, the eradication of the tuberculous cow. This statement is made with regret as there can be little doubt that, had the League embodied in its educational campaign a single paragraph urging the necessity of providing the children with milk from healthy tuberculin-tested cows, the milk producers all over the Territory would long ago have been forced to clean up their herds and stables in spite of the lethargy of the various municipal sanitary authorities, and more than a few lives might have been saved.

To attempt to eradicate human tuberculosis while the children are being fed milk from tuberculous cows is futile. Consequently the first step must be the eradication of bovine tuberculosis, and that can only be accomplished by teaching the parents the danger of tuberculous milk. Pasteurization cannot be relied on, especially not home pasteurization. To protect the children the parents must therefore refuse to buy milk from any but tuberculin tested cows, guaranteed professionally or preferably officially, to be free from the disease and kept in sanitary surroundings. The first dairyman in Honolulu to receive a clean bill of health from this Board found the demand for his milk doubled within one month even though he advanced the price from 10 cents to 12½ cents per quart. There are at the present time few families left where tuberculosis has not claimed one or more victims, and no mother will, after once being taught the danger, willingly buy milk from untested or diseased cows if wholesome milk can at all be obtained for her children.

There is consequently no reason why any individual or any community should wait for official action in order to get clean milk. In every district or community there is at least one dairyman who has a clean herd or who is progressive enough to clean up his herd the moment there is any agitation for clean milk, and it may safely be said that an application from a dairyman to have his herd tested and cleaned up, addressed to the proper local authorities, would hardly be denied at the present time. If it should be denied there is still the practicing veterinarian, who, if he is at all progressive, is the one who should take the initiative in every district or community where the authorities are slow about attacking the problem.

Bovine tuberculosis must go first, but to await its eradication through the promulgation of laws, ordinances and regulations which necessarily must carry large appropriations to become effective is futile. Action must come from below and not from above. It therefore rests with either the consumer, the milk producer or the local veterinarian to start the ball rolling and, as it is the milk consumer who is to reap the greatest benefit from the improvement, it is only reasonable that the consumer should pay for it. And what would the cost amount to? An advance of one cent per quart of milk would in one year pay the full value of every tuberculous cow in the United States and besides leave a handsome profit for the producer as well as pay for the work of the veterinarian. In accordance with statistics furnished by the Hygienic Laboratory (Bulletin No. 56) of the U. S. Public Health and Marine Hospital Service there were consumed in the United States in the year 1900 (12th census) no less than 740,000,000 gallons of milk and cream by the urban and suburban population alone—that is, this enormous quantity was sold by the milk producers and did not include what was consumed on the farm and what was used in the manufacture of butter, cheese, condensed milk, etc. This amounts to about 23 gallons a year for each person. The consumption of milk in Philadelphia during the year 1905 was estimated at 23 gallons for each inhabitant or an average of half a pint per day for each person. The daily consumption of milk in Honolulu aggregates 6000 quarts, so an advance of one cent per quart would mean $60 per day or $21,900 per annum. This sum would, and probably has, fully reimbursed the milk producers in the City and County of Honolulu if taken as a whole, since the bovine tuberculosis work began in 1910, for losses sustained through the destruction of diseased animals, and it has been paid without objection by the milk consumers. It will therefore be seen that if the annual consumption of milk in Honolulu averages 23 gallons or about 100 quarts per head as in Philadelphia, the insurance against tuberculous infection through cows' milk would, at an advance of one cent per quart, have cost the consumers on an average one dollar per annum each.

In conclusion it may be stated that the intradermal test is slowly but surely gaining ground, at least four States using it officially and many others experimenting with it. In California it is now used almost exclusively by the live stock sanitary authorities, even though it is admitted that considerable practice is required before the veterinarian in general can be trusted with it.

Preventive Measures Against Rabies.

It is now nearly two years since the regulation requiring the quarantining of all dogs coming from or through territory infected with rabies went into effect.

While the measure has met with a considerable amount of more or less pertinent criticism it cannot be said to have been actually opposed and it is doubtful whether a single dog, if at all worth while, has been left behind on that account.

The actual number of dogs imported or arriving here with tourists or returning residents fell during 1913 to 75 head as compared with 106 during 1912 and 132 in 1911, but this reduction is due principally to an official order restricting the number of pets and mascots which usually arrived here with every regiment, company or troop that was to be stationed here. During the past year only officers' dogs have been allowed to accompany the various contingents of soldiers arriving here, thereby eliminating a great number of more or less worthless dogs which otherwise would have crowded the quarantine station for four months each. Another cause for the reduction is due in part to the strict six months' quarantine maintained in Australia and New Zealand which in conjunction with the local quarantine prevents theatrical companies, such as dog and monkey shows, from bringing performing animals to any of these countries or which at least makes it so expensive and annoying to the managers that they have practically abandoned the Hawaii, New Zealand, Australian circuit which formerly concluded such companies' tour of the world. In 1911 for instance more than 33 per cent. of the dogs arriving here consisted of soldiers' pets and performing dogs. That the dog quarantine regulation has proved effective in keeping the disease out until this time is very gratifying, especially when considering that the epidemic prevailing in the Pacific Coast States, so far from being suppressed, is constantly on the increase, and, while a number of attempts have been made to willfully circumvent the regulation and land dogs here regardless of the quarantine requirements, it is believed that no such attempt has so far been successful, and it is sincerely to be hoped that common sense will prevail among both tourists and resident dog owners and make them realize the awful responsibility they assume in attempting or conniving at the introduction of a dog without quarantine. The last case reported to the Board, from Hayward, California, where one rabid dog bit six persons, a couple of horses and more than twenty other dogs in less than an hour, before it was cornered and shot, furnishes a good illustration of what might happen in this dog-infested district, should the disease gain an entrance here. In the first place it would be necessary to establish a Pasteur institute here for the preparation of the vaccine and the treatment of bitten persons, a matter of several thousand dollars, and the employment of at least one expert scientist and assistant. California now has seven such official institutions and a number of private ones, in which hundreds of people are being treated annually. But before such laboratory and clinic could be established here it would be necessary to send all bitten persons to San Francisco, in many cases at public ex-

pense, and, owing to the distance and length of time required to get there—in some cases ten to twelve days—at great risk to the life of the patient. There is consequently every reason why this preventive measure of the Board, the dog quarantine, should receive the full support of the public as well as of the press. To recommend that a Pasteur laboratory be established here before the actual appearance of the disease would probably be futile, besides which it is a matter for the consideration of the Territorial Board of Health exclusively. But there can be no doubt that the disease *may* gain entrance here in spite of every precaution taken, and, if this calamity should occur, the question will immediately be raised, Why was nothing done in time, when we had the disease next door to us?

SUMMARY.

Summing up the results of the year's work it may be stated:

(1) That inspection and testing of all classes of domestic animals before or upon arrival here, and the enforcement of the various quarantine regulations, have again proved effective in preventing the introduction of any of the many diseases of live stock and other domestic animals so prevalent on the mainland of the United States or in its colonies and other countries.

(2) That glanders among horses and mules, which formerly caused a greater loss than all other diseases of live stock combined, has been practically wiped out, only one doubtful outbreak, affecting two animals, having occurred during the year, as compared to a hundred outbreaks annually a few years ago.

(3) That bovine tuberculosis has been reduced to a minimum among the dairy cattle in the City and County of Honolulu and bovine tuberculous infection removed from the milk supply in that district, which work coincides with a reduction of 50% in the mortality among children under five years of age from all forms of tuberculosis, as compared with an increase of 80% in the rest of the Territory where tuberculous cows are still being milked and the milk fed to the children (facts based on Board of Health records).

(4) That the eradication of bovine tuberculosis on the other islands is being pushed as fast as the deputy territorial veterinarians can do it and the local health authorities and the milk producers and consumers will furnish and support it, and finally—

(5) That the live stock industry of the Territory is prospering under the natural and unparalleled favorable conditions and unprecedented freedom from infectious and contagious diseases of animals, results and conditions which have placed the Territory among the leaders in live stock sanitary work and caused a number of States in the Union to emulate or copy the policies, methods and regulations of this Board.

Respectfully submitted,

VICTOR A. NORGAARD,

Superintendent of Animal Industry and Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

ANNUAL REPORT.

Honolulu, December 31, 1913.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—I have the honor to submit herewith a brief report covering the various lines of work carried on by the Division of Entomology during the calendar year, 1913.

The principal and most important work of my Division during the year consisted of the usual quarantine inspection of all agricultural and horticultural products which were shipped into the Territory from the mainland and foreign countries. In addition to this work, a thorough inspection of all fruits, vegetables and plants going from the Island of Oahu to the other islands has been carried on during this period. There was also attached to this general work the introduction, care and distribution of several parasites of the Mediterranean fruitfly and the hornfly. This work, although connected with my Division, was under the direct supervision of W. M. Giffard, Esq., president of the Board of Agriculture and Forestry, and only on special occasions were my services required. The personnel of this branch, as well as a review of the work done, has been published in Bulletin No. 3 of the Division of Entomology, which Bulletin is in itself a complete report and was recommended by me for publication and appeared at the end of the year.

During the year the fruitfly control work by clean culture methods, as instituted by the Board of Agriculture and Forestry in November, 1911, has been continued by the Bureau of Entomology of the U. S. Department of Agriculture, of Washington, D. C., under the superintendence of Dr. E. A. Back, in charge of Mediterranean fruitfly investigations. He has also had direct charge of the inspection of all banana shipments to the Pacific coast. Results of this work will no doubt be reported by Dr. Back to the Bureau of Entomology and in due time will appear.

Staff.

During the first half of the year the staff of the Division of Entomology consisted of the writer as superintendent and chief inspector; Mr. D. B. Kuhns, assistant inspector; Messrs. Edward Drew, Robert W. Kanakanui and Isaac Kahele, as assistants on the wharves. On June 3rd, 1913, Mr. J. C. Bridwell was appointed assistant superintendent of entomology. On account of the unexpected developments in breeding and distributing the introduced parasites of the fruitfly and owing to the difficulty of finding proper men for such work here, he was immediately de-

tailed to assist Mr. D. T. Fullaway, whose services were very kindly loaned to the Board by the Hawaii Experiment Station, in the multiplication and distribution of fruitfly and hornfly parasites. Mr. Fullaway was called away from the work during the month of October to take up some special investigation in the Philippine Islands and Mr. Bridwell then assumed charge of the breeding work of all the parasites to the end of the year. Brother Matthias Newell has continued as our regular inspector at the Port of Hilo, Hawaii, and the following gentlemen have served as honorary inspectors at the various ports on the islands. Mr. E. Madden, Mahukona, Hawaii; Mr. E. R. Bevins, Kahului, Maui; Mr. W. D. McBryde, Koloa, Kauai; Dr. W. D. Deas, Hana, Maui; Capt. C. F. Turne, Kaanapali, Maui, and Mr. G. C. Munro, Keomoku, Lanai.

Work Performed.

During 1913 we again note a slight increase in the arrival of horticultural products as well as in the number of vessels entering the Territory.

Including the port of Hilo, we inspected 565 vessels, of which we found 342 carrying vegetable matter, amounting to 13,586 lot shipments, consisting of 295,928 packages. Of this amount 288,-679 were packages of fruit and vegetables, direct imports for home consumption, 1866 packages were seeds and 5385 packages were plants.

From these shipments, on account of infestations, 922 packages were destroyed by burning, 3850 packages were fumigated before delivery and 371 packages were returned to the shippers.

Rice and Bean Shipments.

All shipments of rice and beans from the Orient have been carefully inspected, not only for the rice weevil (*Calandra oryzae*), which species already exists on the Islands, but more especially for the rice moth (*Paralipsa modesta*), a very serious pest of stored rice and beans. Under a ruling of the Board of Agriculture and Forestry all rice shipments are fumigated at the port of Kobe, Japan, this being the port of debarkation for this product. I am pleased to report that of the enormous quantity of rice, 266,677 bags, which arrived in the Territory during the year, only 3100 bags of rice had to be fumigated at Honolulu.

During the year we were surprised to find a consignment of soya beans badly infested with the rice moth and I immediately notified all shippers to have all bean shipments destined for these Islands fumigated at the port of debarkation in Japan. In this matter I had the heartiest coöperation of the shippers and of the Japanese Merchants' Association. During the year 15,075 bags

of beans arrived in the Territory and of this number only 162 bags were found infested with the moth.

About the middle of November the Toyo Kisen Kaisha Steamship Company made Hilo a port of call for their South American run instead of Honolulu. This meant the arrival of all kinds of freight, including rice and beans, direct from Japanese ports to Hilo. The first steamer brought 6457 bags of rice and 110 bags of beans. As this was a new experience for the Hilo inspector I thought it best to oversee his work and accordingly dispatched Mr. D. B. Kuhns, my local inspector, to attend to this matter. The shipments proved to be free from both rice pests.

Equipment.

The equipment of the Division of Entomology has been added to since my last report. In 1912 I drew attention to the inadequate quarters that were at our disposal for fumigating large shipments of infested rice [see page 120 of the 1912 report], and recommended the erection of a large fumigating house for this purpose at that time. During the latter part of the year a very good fumigating house 20 x 30 feet, with 12 foot ceiling, has been built near Pier No. 7, that being the dock where all Oriental cargoes are unloaded. In building this structure the very best plans for economy as well as efficiency were used. Also, two vent doors, one at the ceiling line for light gases and one at the floor line for heavy gases, make our fumigation absolutely without danger to human life. We have had occasion to test this house and have had excellent results.

Through the kindness of the Board of Harbor Commissioners, I have had the privilege of changing my main dock office on Pier No. 7 from a small office under the staircase to the one which was formerly occupied by the harbormaster, near the main entrance to the dock. This is more commodious and has greatly assisted us in this important branch of our work.

As the port of Hilo is now in direct communication with the Orient and as there are no facilities for handling infested rice shipments should any arrive there, it becomes apparent that we shall have to provide a similar fumigating house at that port. I would, therefore, recommend that the Commissioners consider this important matter favorably and enable the building of the necessary structure.

The question is often asked why rice shipments are found infested, when all rice is fumigated at Kobe, Japan. In answer to this I will state that our observations in the past have demonstrated that these shipments can easily become infested in the hold of the vessel during the voyage from Japan here, because all rice shipments going to the mainland are not fumigated before leaving Kobe. Our shipments of rice are very often placed alongside or even on top of these shipments. For this reason the

weevils and larvae of the rice moth can readily crawl from one lot to another. So long as these conditions continue, the consignee at Honolulu or Hilo can hardly be held responsible for the infestation if there be any on arrival, especially when he has complied with the fumigation regulations in Japan. All bills of lading for shipments of rice coming to this Territory have government certificates of fumigation attached. I have recently taken up this matter with the Commissioner of Horticulture of the State of California looking to the possibility of that State requiring the fumigation of all rice shipments in Japan and he has promised to look into the matter.

Inter-Island Inspection.

The rule which was drawn up by the Board of Agriculture and Forestry for establishing Inter-Island inspection was passed at the time when the Mediterranean fruitfly made its appearance on the Island of Oahu and its intention was to keep the pest from spreading from that island to the other islands. Now that the pest has gained a foothold on all the islands we are more convinced than ever that other pests which might be accidentally introduced at Honolulu, the port of entry, should be closely watched. All plants, fruit, vegetables and soil, capable of carrying pests of any kind, have been closely examined during the year and whenever found infested have been refused shipment to the other islands. Especial stress has been put on soil attached to the roots of plants which were removed from the ground or recently potted. The constant finding of grubs and beetles and especially finding the larvae of nymphs of cicadas in soil from Oriental countries shows clearly the necessity of a very close inspection here. Should accidental introduction of such pests as just mentioned, or should any plant disease carried in soil, ever occur, we are in a position through the Inter-Island inspection to prevent their dissemination to the other Islands for some time at least.

During the year 716 steamers going from Honolulu to the various ports on the other islands were attended to and 13,658 packages were examined. These consisted of 4075 packages of plants, 9252 packages of vegetables and 330 packages of fruit. The bulk of the plants were nursery stock shipped by the Division of Forestry in the usual plant boxes, being young seedlings grown in sterilized soil. The bulk of the vegetables was taro for poi-making and it was thoroughly washed before shipment. The fruit was mostly imported fruit from the mainland. In all 326 packages were refused shipment on account of infestation or, in the case of plants, because questionable soil was attached. Owing to the rush of passengers at the gangway at time of sailing it has been our practice to inspect the staterooms and especially look through the steerage quarters before the gangway is lowered.

Everything has been done to make the Inter-Island inspection thorough and up to date as far as finances would permit.

Federal Horticultural Board.

On December 1, 1912, I received my appointment as collaborator of the Federal Horticultural Board, authorizing me to carry out the Federal horticultural quarantine and inspection laws, which became operative on October 1, 1912. After receiving my appointment I realized the necessity of having assistance in case of illness or absence from the port or the Territory and I requested the appointment of Mr. J. C. Bridwell and Mr. D. B. Kuhns as collaborators. They have both been appointed as such, which will materially strengthen our work.

Although since 1904 under the Territorial law all fruits, vegetables and plants have been regularly inspected upon arrival in the Territory, the additional powers we receive under Federal regulations have materially assisted us in regulating the unlisted small package, usually brought in by tourists or travelling friends of our citizens. Under the regulations of the Federal Horticultural Board it is compulsory for an importer or his agent to make formal application for a permit to import into the United States or territories any plants or parts of plants. All such shipments, therefore, which arrived here without a permit, and this included those brought by passengers, were refused entry by either being kept on board the vessel or destroyed after landing. These regulations assist materially in discouraging the promiscuous fetching in of plants by the travelling public. These plants, gathered at random and packed in all kinds of soil, moss or other material, are a great menace. It is usually this small package wherein lies the greatest danger and one of the main objects of the Federal Horticultural Board is to discourage this traffic.

It is very apparent from the appended list of pests which were taken from the various shipments coming into this Territory, that our occupation has kept us quite busy. There could be no better proof of what horticultural inspection means to our several industries. The keeping out of some of the most serious pests known in various parts of the world means that we may continue having profitable industries in our country and that whatever crops we may raise will not be injured and cause us great losses.

Respectfully submitted,

E. M. EHRHORN,
Superintendent of Entomology.

RECAPITULATION OF INSPECTION WORK.

Vessels inspected, Honolulu	466	...
Vessels found carrying vegetable matter, Honolulu	...	282

Vessels inspected, Hilo	99	...
Vessels found carrying vegetable matter, Hilo	...	60
	565	342

Disposal of Shipments, Honolulu.

	Lots	Packages
Passed as free from pests	10,925	256,169
Burned	613	911
Returned	14	183
Fumigated	110	3,850
Total, Honolulu	11,662	261,113

Disposal of Shipments, Hilo.

Passed as free from pests	1,921	34,616
Burned	2	11
Returned	1	188
Fumigated	0	0
Total, Hilo	1,924	34,815
Grand total, Hilo and Honolulu	13,586	295,928

Fruits and vegetables inspected	288,679
Plants inspected	5,383
Seeds inspected	1,866
Total	295,928

Rice Shipments.

Passed as free from pests	263,277	
Fumigated on account of infestation	3,400	266,677
Beans passed as free from pests	14,913	
Fumigated on account of bean moth	162	15,075

Inter-Island Inspection.

Steamers attended	716
Packages of fruits, vegetables and plants passed	13,332
Packages of fruits, vegetables and plants refused shipment	326
Total packages inspected	13,658

Injurious Insects and Plant Diseases Intercepted Which Were Found on Shipments of Fruits, Vegetables and Plants Imported Into the Territory During the Year 1913.

Coleoptera or Beetles—Cincindelid larvae in stems of Orchids, Manila; *Carabid* beetle in moss packing, California; also 1 species found on wharf from California; these are beneficial. *Hydrophilus* species in soil on Iris roots, Japan; *Elater* species in Banana roots, Manila; *Elateria* larvae in soil on plants, Japan; these are very injurious to many plants. *Cerambycid* larvae in stems of ornamental trees, Japan. *Sylphid beetle* found on wharf; probably from California in commercial fertilizer. *Anomala* larvae in soil around plants, also larvae of *Melolontha* species and *Scarabeid* species, probably several species were taken 5 or 6 times. *Chrysomelid* species, a leaf-eating beetle, in packing around plants from Sydney, N. S. W. Fleabeetle on Orchids from Manila. *Aracocerus* species in seeds of *Ziziphus trinerois,* Manila. The following weevils: *Bruchus prosopis* in Algaroba seeds from Arizona; *Bruchuschinensis* in beans and peas from Manila and Japan; *Bruchus pisorum* in Beans and Peas taken from Spanish immigrants from Gibraltar; *Balaninus* species in Chestnuts from Japan and U. S. A.; *Calandra granaria* in corn from the mainland; *Calandra oryzae* in Rice from China and Japan; a *Calandra* species in seeds from Sydney, N. S. W.; *Cryptorhynchus* species in seeds of *Heritiera littoralis* from Manila; *Sphenophoras* species in Banana roots from Manila; *Cylas formicarius* in Sweet potatoes and Yams from the Orient; *Acytheopeus aterrimus* in stems of Orchids, Manila; *Alphitobius piceus* in Banana roots, Manila.

Lepidoptera—Butterflies and Moths—Angumois grain moth, *Sitotroga cerealella* in Corn from the United States; *Isia isabella* larvae found crawling on potato bags from Seattle; *Sesiid larvae* feeding on the bark and roots of Gardenia from Japan; *Paralipsa modesta* in Rice and Beans from Japan; Larvae of moths on roots of plants from Japan; Codling moth in apples and pears from California; *Anarsia lineatella,* the Peachmoth, in peaches from California; Leafminers in Citrus leaves from Sydney, N. S. W.; *Lycaenid* larvae and pupae on Orchids from Manila.

Hemiptera—True Bugs—Cicada pupae and larvae in soil on plants from Japan, also in soil and packing around Orchids from Manila; *Aradid* species injuring orchids from Manila; *Reduviid* species found crawling on the wharf, probably from California. The following *Aphis* species, *Macrosiphum sanboriuns* on Chrysanthemums from California; *Macrosiphum rosae* on rose plants, California, and two species of *Myzus persicae* on carnations and *Cincrarias* from California.

Coccidae or Scale Insects—Aspidiotus rapax on laurel and apples from California; *Aspidiotus cyanophylli* on Orchids, Eastern states; *Chionaspis* species on Hibiscus, Tutuila, Samoa; *Chrysomphalus biformis* on Orchids, Manila; *Coccus hemisphae-*

ricum on *Ardisia cremilata,* Japan; *Coccus hesperidum* on Citrus, New York greenhouse; *Diaspis boisduvali* on Orchids, New Jersey nursery; *Fiorinia fiorinae* on Orchids, Java, and on *Strelitzia regina* from California; *Fiorinia* species on Orchids, Manila; *Lepidosaphes cocculi* on *Deudrobium,* Manila; *Lepidosaphes beckii* on Oranges, Florida; *Hemichionaspis minor* on Coconuts, Washington island; *Hemichonaspis aspidistrae* on Orchids, Sydney, N. S. W.; *Parlatoria pergandei* on Orchids, Manila, and on Rose plants, Japan; *Pulvinaria cammelicola* on Camellia, Japan; *Pseudococcus citri,* Orchids, Manila; *Pseudococcus pandani* on Palms, Samoa; *Pseudococcus azaleae* on Azalea, Japan; *Pseudococcus longispinus* on Palms, Sydney, N. S. W.; *Saissetia nigra* on Hibiscus, Samoa; *Saissetia oleae* on Palms, Sydney, N. S. W.

Formicidae or Ants—Lasius niger, Prenolepis obscura in soil from Japan; *Monomorium pharaonis, Tetramorium guineense, Dolichoderus bituberculatus; Prenolepis* species, *Ponerid* species in soil and packing from Manila; *Tetramorium guineense* in the roots of Palms, Sydney, N. S. W.; *Prenolepis imparis* and a Myrmicid species in soil, U. S. A. A *Ponerid* and *Myrmicid* species in baggage of immigrants from Gibraltar and a *Myrmicid* species in moss from England.

Diptera or Flies—Ptectus species, *Tipula* species and *Phorid* species in soil from Japan, *Phorbia brassica* in turnips from California and *Drosophilid* species in fruit from California.

There were also found Spiders, Millipeds and Centipeds in soil from Manila and other Oriental ports. Four species of *Mollusks* from Australia, Java and the Philippines and the following fungi: *Cladosporium citri* on Citrus, Japan, *Fusicladium dendriticum* and *pirinum* on Apples and Pears from California; *Claeosporium fructigenum* on Apples from Japan; *Oospora scabies* on Potatoes from Pacific Coast; *Phragonidium subcorticatum* on Roses from United States.

DIVISION OF FORESTRY.

ANNUAL REPORT SUPERINTENDENT OF FORESTRY.

Honolulu, December 31, 1913.

Board of Commissioners of Agriculture and Forestry, Honolulu.

Gentlemen:—I have the honor to submit as follows a brief report covering the work of the Division of Forestry for the year 1913.

GENERAL SUMMARY.

Continuing the established policy now pursued for over a decade, the work of the Division of Forestry in 1913 was primarily directed to preserving and protecting the native Hawaiian

forest on the important watersheds throughout the Territory and to establishing on waste and other non-agricultural areas stands of valuable trees.

Several forest reserve projects that had for some time been pending were brought to final action in 1913 by the setting apart of additional sections of forest land on Oahu and Hawaii. As regards technical reservation of the land, the forest reserve system in Hawaii is now pretty well completed. Some scattered areas now wait to be brought within the boundaries to round out certain reserves, but taken by and large the belt of forest that is needed on each island to protect its water supply has nearly all been proclaimed as forest reserves.

The formal declaration that a given tract is a forest reserve does not of course exempt it from trespass. Such action is but a necessary step toward its adequate protection and proper administration. But it is in just this way that the year 1913 marks real advance. The action of the Legislature of 1913, in creating a special fund for forest and hydrographic work from the revenues derived from water licenses and leases, has made available for the first time since the organization of the forest reserve system in Hawaii funds for forest fencing and the active prosecution of other forms of protective work. Since July 1 several fencing projects have been got under way and preparation made under others for the inauguration of active work on the ground in the near future.

Along with the forest reserve work the Division of Forestry has continued its accustomed distribution of seedling trees, free and at cost, to individuals and corporations engaged in tree planting and as far as was practicable has carried forward the testing in the nursery and the propagation for subsequent distribution of plant introductions new to the Territory. Requests for advice on forest questions have increased in number and variety. In a quiet way a great deal of information is thus given out, which, in connection with the distribution of plant material, is of material assistance to local tree planters. It is a phase of the work that meets a growing demand.

Other activities of the Division of Forestry have followed the lines of former years. The forest fire organization has been kept up to date by the appointment of new fire wardens. During the year members of the staff responded to a number of calls to fight fires. Fortunately all the fires occurring in 1913 were stopped before serious damage had been done.

The following paragraphs outline briefly the points touched on in this summary.

Forest Reserves.

The list of the new forest reserves created in 1913 is as follows:

Name and Island	Total area acres	Area Gov't. land, acres	Date of proclamation
Nanakuli, Oahu	1,010	1,010	June 4, 1913
Makua-Keaau, Oahu	4,716	4,376	" "
Kuaokala, Oahu	434	434	" "
Kohala Mountain, Hawaii	29,627	14,204	Oct. 13, 1913
Upper Waiakea, Hawaii	51,800	51,800	" "
Upper Olaa, Hawaii	9,280	9,280	" "
Honolulu Watershed, Oahu	6,950	5,000	" "

On October 13, 1913, the boundary of the Moloaa forest reserve on Kauai was modified by the elimination of 83 acres and the addition of 34 acres, a net decrease of 49 acres. This action was taken on the basis of a recent survey, to straighten the boundary and exclude from the reserve a section of open land suitable for grazing and found not to be essential for water protection.

At the end of the year 1913 there were 34 forest reserves in Hawaii with a total area of 786,869 acres, of which 69 per cent. (540,877 acres) was land belonging to the Territory.

Forest Fencing.

The action of the Legislature, in setting apart the water revenues from Government forest lands as a special fund to be used for forest and hydrographic work, was one result of the long campaign that has been carried on by the Board for securing better provision for the protection of the native forests. In securing the final passage of the act, the efforts of a joint committee of the Hawaiian Sugar Planters' Association and the Board of Commissioners of Agriculture and Forestry played no small part. A comprehensive statement of the reasons why such a use of public moneys was justifiable, prepared by the chairman of that committee, Mr. W. M. Giffard, was printed early in the year. This statement also appeared as an appendix to the biennial report of the Board of Agriculture and Forestry, issued in March, 1913.

Under the terms of the new law (Act 57 of 1913) one-half of the revenues derived from the lease of water rights is devoted to forest work. The annual income for water rights is a little over $66,000. The share for forestry is therefore $33,000 per annum, an increase of about $22,000 per annum over the amount which the Division of Forestry has had in recent years. Continuing the staff of the Division of Forestry unchanged and making the same provision as in the past for its routine work, the bulk of this money will be expended for the construction of forest fences on the boundaries of certain forest reserves where there remain gaps in the line, in the eradication of wild stock—cattle, goats and pigs—in other of the forests, and in planting areas of Government land with forest trees. During the six months period from June to December, 1913, fencing projects were got under way at Moloaa, Kauai, and at Makawao and Nahiku, Maui. At the end

of the year calls for tenders were out for other fences at Ninole, Kau, Hawaii, and at Lualualei, Oahu, both of which projects were actually started in January, 1914. Much preliminary work was also done toward getting ready to let contracts on several other fencing projects.

In the way of forest planting actual work has been going on since July, 1913, on the replanting of the slopes of Mount Sugar Loaf on Tantalus Heights, back of Honolulu, with a stand of two native Hawaiian trees, koa and kukui. The area chosen for the first work was on the bare hillsides at the head of a valley tributary to the reservoir in Makiki that is now in use by the City of Honolulu for domestic supply.

Another planting project, continued during the last six months of 1913 under this fund, was in the Koolau district, Maui, where the work of caring for young trees set out by the Alexander & Baldwin interests on Government land was kept on, as otherwise it could not have been. This particular project consists of tree planting in areas along the lines of the ditches of the East Maui irrigation system, where the native Hawaiian forest suddenly died off a few years ago. The present planting is being done under a planting plan worked out by the Division of Forestry.

Administration of Forest Land Under Government Leases.

During 1913 a number of visits of inspection were made to Government lands in various parts of the Territory to see that conditions in regard to forest protection, fencing and tree planting were being carried out. Following conferences with the Land Commissioner an improved system of coöperation between the two departments was worked out, that should in future result in a better enforcement of the Government's requirements. The immediate result of the inspection visits was, in several instances, an increase of activity on the part of the lessee in pushing forward work on fences and in tree planting. So far as possible it is the policy of the Territorial Government to secure the construction and maintenance of fences on forest reserve boundaries as conditions under the lease of adjoining agricultural or grazing lands. Provision was made in this way in 1913 for the upkeep of the fences a good part of the way around the Kohala mountain on Hawaii and in other districts for the carrying out of needed forest work.

In several places, too, tree planting has been required on tracts leased for grazing in specified areas. Notwithstanding unfavorable climatic conditions in 1912 and 1913, the results of the planting under these leases is generally encouraging. Especial mention may be made here of progress under such auspices in tree planting on the Parker and Kukaiau ranches, Hawaii, and on the Cornwell ranch on Maui.

Forest Extension.

Mention has already been made of the giving of advice on forest matters to anyone in the Territory who desires such help. This function of the Division of Forestry has grown in importance with the passing years. As much of it is verbal in response to inquiries made in person at the Nursery, it is not easy to keep an exact record of how much is accomplished, but from the number of persons calling on the Division it is evident that such assistance meets a real demand.

It may be noted in passing that during 1913 many requests came from Army officers recently arrived in Hawaii who desired to do their part in making the new posts more comfortable and attractive than they found them.

As in former years, the distribution of seedling trees, free and at cost price to individuals and to corporations, has gone steadily forward. Especial efforts have been made to render it easy for homesteaders to get trees, particularly in such localities as the recently opened tracts at Haiku, Maui, and Kapaa, Kauai. At other times as well as on Arbor Day, there have been periods of free distribution, and even when a charge is made the price is so low that no one who really wants trees need have reason to go without.

The two sub-nurseries so far established by the Board on Hawaii and on Kauai continue to serve their respective localities. That at Hilo, under the direction of Brother Matthias Newell, takes care of the Hilo district and, now that the Hilo railroad extension is in operation, a portion of Hamakua as well. From the Homestead nursery on Kauai, under the direction of Mr. Walter D. McBryde, trees are distributed to anyone who applies on the lee side of that island. And from Honolulu shipments are made to other parts of the Territory as there is demand. Accompanying this report is a tabular statement prepared by Mr. David Haughs, Forest Nurseryman, giving the statistics of the plant distribution for 1913.

Experimental Planting.

Only the briefest mention can be made here of a subordinate but highly important line of work carried on by the Division of Forestry, the trial and experimental planting of trees of economic importance new to Hawaii. From various sources seed is received from time to time and started in the propagating houses of the Government Nursery. The plants are then cared for in the experiment garden in Makiki valley and finally distributed or planted out where they can be kept track of. During the latter part of 1913 there were received from Mr. Joseph F. Rock, consulting botanist of the Board, a number of consignments of seeds that had been personally collected by him in India, during a trip around the world.

In connection with the sub-nursery at Homestead some experimental planting of exotics has been done at the Papapaholahola Spring reserve. On Maui experimental forest planting in coöperation with the Division of Forestry is in progress at Kailiili, under the charge of Mr. W. Hannestad; at Wailuku, under an agreement with the Wailuku Sugar Co., and in Koolau, under the arrangement with the East Maui Irrigation Company already referred to.

The experimental plantation of eucalypts in Nuuanu Valley, Oahu, started with funds provided by the U. S. Forest Service, has now got to the stage when the little trees can take care of themselves. It may be regarded as established.

Forest Fires.

During the year forest or brush fires were reported from the following localities: Kapaa, Kauai; Waipio, Wahiawa, Pacific Heights and Kalihi Valley, Oahu; Pukoo, Molokai, and Ninole, Kau, Hawaii. In each case the fire was got under control and put out before it had resulted in serious damage.

New fire wardens were appointed during 1913, as follows: Island of Kauai: F. A. Alexander (Koloa), G. P. Wilcox (Kawaihau). Island of Oahu: H. Blomfield Brown, Geo. M. Robertson and Geo. Wilson (Waialua), C. J. Wheeler (Koolauloa) and Otto Ludloff (Koolaupoko). Island of Maui: Andrew Gross (Wailuku), A. K. Jones (Kahikinui). Island of Hawaii: Geo. Gibb (Kau), C. F. Eckart (Puna), D. S. Macalister and Alex. Morrison (Hamakua), and O. L. Sorenson (So. Kohala).

Publications.

The biennial Report of the Board and its several divisions for 1911 and 1912 was issued in March. As usual the divisional reports appeared also as separates, for distribution to persons and institutions interested only in particular phases of the work.

In June there appeared, as Botanical Bulletin No. 2 of the Board, a "List of Hawaiian Names of Plants," by Joseph F. Rock, consulting botanist of the Board. This list is compiled from Mr. Rock's volume, "The Indigenous Trees of the Hawaiian Islands," that appeared in June, 1913. Privately printed, under patronage, the field work on which this work was based was largely done while Mr. Rock was still actively on the staff of the Division of Forestry. The book is a highly valuable contribution to our knowledge of the Hawaiian flora and from now on will be looked to as the recognized authority in local dendrological questions.

Looking back at the year, nineteen thirteen may be regarded as the beginning of a new regimé in the forest work of Hawaii—the time when education and propaganda gave place to getting actually under way in the forest on a scale large enough to be

worth while, the things that are necessary to a proper administration of its forests.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

DIVISION OF HYDROGRAPHY.

ANNUAL REPORT FOR THE YEAR 1913.

April 7, 1914.

Board of Commissioners of Agriculture and Forestry, Honolulu.

Gentlemen:—The following brief report of operations of the Division of Hydrography for the period July 1 to December 31, 1913, is submitted:

The Division of Hydrography was created by Act 56 of the 1913 Legislature on July 1, 1913, which provided that the present District of Hawaii of the U. S. Geological Survey, Water Resources Branch, should become a division of the Bureau of Agriculture and Forestry.

During the six months period a large amount of reconnaissance surveys have been made on all islands, preliminary to the outlining of a definite policy as to the carrying on of the work. All of these investigations were completed on December 31, and stream measurement stations have been selected on all streams and ditches to be investigated. The policy adopted in this connection is covered in detail in a special report under date of October 3, 1913. A further special report has been submitted on "Kauai Irrigation Projects" under date of November 6, 1913.

The field work of the Special Kona, Hawaii, Investigation authorized by Act 102 of the 1913 Legislature was practically completed. Stream and rainfall measurements will be continued during the calendar year 1914, after which the final report and estimate will be filed.

The following tabulation shows the status of all stream and rain gaging work during the period ending December 31, 1913. Attention is invited to the decrease in the number of stations. This is the result of the policy adopted to abandon all stations of which the records can not be of value in connection with present or future utilization and development. Since December 31 many of the discontinued stations have been replaced by permanent stations at locations where these records will be of value.

It is estimated that about three hundred stream and ditch measurement stations will be necessary to entirely cover the islands of Kauai, Oahu, Maui, Molokai and Hawaii.

Stream Measurement Stations.

Island	June 30, 1913	Established	Discontinued	Dec. 31, 1913	Measurements made at regular stations	Miscellaneous measurements made
Kauai	43	1	10	34	24	....
Oahu	27	....	6	21	70	42
Maui	48	6	15	39	77	17
Hawaii	87	....	87	....	1	6
Kona Investigation	...	1	....	1	....	6
Total	205	8	118	95	172	71

In addition to the above records were furnished from private sources as follows: Kauai, 10; Oahu, 0; Maui, 17; Hawaii, 2; total, 29 stations.

Rainfall Measurement Stations.

Island	June 30, 1913	Established	Discontinued	Dec. 31, 1913
Kauai	28	....	....	28
Oahu	6	1	....	7
Maui	18	....	....	18
Hawaii	20	1	20	1
Kona Investigation	...	15	....	15
Total	72	17	20	69

In addition to the above records were furnished from private sources as follows: Kauai, 6; Oahu, 1; Maui, 16; Hawaii, 1; total, 34.

Evaporation Measurement Stations.

All of these were established between July 1 and December 31, 1913: Kauai, 4; Oahu, 3; Maui, 4; Hawaii, 0; Kona Investigation, 3; total, 14.

Very respectfully,

G. K. Larrison,
Superintendent of Hydrography.

DIVISION OF ANIMAL INDUSTRY.

Honolulu, April 30, 1914.

Albert Waterhouse, Esq., President and Executive Officer, Board of Agriculture and Forestry.

Sir:—I beg to report on the work of the Division of Animal Industry for the month of April, 1914, as follows:

Bovine Tuberculosis Control.

As will be seen from the appended report of Dr. Case another test of the dairy herds of Honolulu has nearly been finished; that is, practically all, with the exception of the railroad ranches, have now been through the fifth test. The final result of 2.89% of reactors looks at first sight as an increase in the number of animals affected, but when the several thousand head of railroad ranch cattle is added—among which it is not expected that any, or at least very few, reactors will be found—the final percentage will be materially reduced.

As an example of the efficiency of the test it may be mentioned that one of the largest dairy herds in the county, but at the same time the one in which the eradication of tuberculosis was first begun, this time came through the test with a single reactor. While this animal was sent to the slaughterhouse immediately it must not be taken for granted that the herd, consisting of several hundred head, is now permanently free from the disease. In this mild climate the infection seems able to persist for a considerable length of time unless destroyed by repeated and effective disinfection, and even when this precaution has been taken the disease has been known to crop up again after two or even three successful tests have been passed.

This statement should not be considered as discouraging but on the contrary should stimulate every milk producer who has once got his herd cleaned up not to drop the work there but to continue the same vigilance against its recurrence as was taken towards its eradication, and in a community where the inspection and testing is done without any cost to the owners this cannot be considered a hardship, when a herd has once been cleaned up it cannot suddenly drop back to be a heavily infected herd, unless gross carelessness or criminal negligence is practiced by the owner or his employees. The immense importance of the subject, that is, the recurrence of tuberculosis in a herd once declared clean, may be understood when it is learned that one of the principal papers to be discussed at the annual meeting of the American Association of Medical Milk Commissioners, to be held at Rochester, N. Y., June 10-20, 1914, is entitled, "The Amount of Return Tuberculosis in Certified Herds," by no less an authority

than Dr. W. H. Park, chief of the hygienic laboratories of the Board of Health of New York City, the same scientist who was quoted in one of my recent reports as author of the statement that not less than 300 children die annually in that city from tuberculosis of proved bovine origin, the infection in every case being traced to milk from tuberculosis cows.

While by far the greater majority of milk producers in Honolulu have got their herds cleaned up so far as tuberculosis is concerned, there has at the same time occurred a distinct relapse in the amount of care and cleanliness employed in a number of the local dairies. This applies to animals as well as to premises, and, so far as the milk is concerned, to utensils as well as to methods; in short the present form of milk inspection in the city and county of Honolulu cannot be considered anything but a farce. When to this is added an unfortunate tendency on the part of a few dairymen and cattle dealers to traffic in condemned tuberculous cows it will be seen that the ultimate complete eradication of bovine tuberculosis cannot be expected in the immediate future, unless more drastic measures be adopted.

There still remains, even in the heart of the city, private herds or individual family cows, that have never been tested and which the owners object to having tested. Such animals remain a menace to all the milk producers, not alone in the immediate vicinity, but, through trade and transfer, to every part of the city and county, who have earnestly endeavored to eradicate the disease from their herds, and they certainly are entitled to protection as much as the general public are entitled to clean milk. Filthy stables and unsanitary methods and milk rooms can only serve to keep the infection alive while diseased animals may spread it promiscuously in being transferred from place to place.

An animal which has reacted to the tuberculin test can under the statutes of Hawaii and the rules and regulations of the Board of Agriculture and Forestry, as well as those of the Board of Supervisors, neither be used for dairy purposes nor any other purposes, nor be sold or exposed, but can only be taken to the slaughterhouse or otherwise destroyed under competent supervision, and, if the carcass is passed as fit for human consumption, it can be sold as beef. Consequently anybody who purchases or sells a reacting animal and disposes of it in any other way is violating the law and must take the consequences.

The statistics of the Board of Health as well as of the Anti-Tuberculosis League have fully demonstrated that infantile tuberculosis has diminished to a considerable degree in the city of Honolulu since the eradication of bovine tuberculosis was practically accomplished—that is, in other words, a number of human lives is annually being saved as the direct result of the work of this board, which should be sufficient to put a stop to any interference with or obstruction of such work. And now that we are approaching the warmest season of the year, when milk deterio-

rates twice as fast as at any other time, there is every reason why the local milk regulations should be complied with and their enforcement placed in efficient hands.

The improved method of testing mentioned in last month's report whereby the injection is being made under the eye instead of under the tail continues to give highly satisfactory results, and will undoubtedly be adopted wherever it becomes known. Photographs showing the pronounced reaction resulting from this new method of injection are appended hereto and, while not every reaction is as pronounced as two of those shown, it may be said that the smaller one (the black animal) shows an average reaction, which in all cases is very plain.

Respectfully submitted,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, April 31, 1914.

Dr. V. A. Norgaard, Chief of Division of Animal Industry.

Sir:—I have the honor to report as follows on the work of the month of April, 1914:

Tuberculosis Control.

	T.	P.	C.
J. M. Whitney	13	13	0
J. H. Cummings	7	7	0
H. Focke	7	3	4
F. K. Makino	2	2	0
M. Quintal	6	6	0
S. Tsumoto	8	8	0
Lunalilo Home	19	19	0
B. M. Allen	17	15	2
Dr. Straub	17	15	2
F. Valph	7	7	0
F. Correa	12	12	0
W. P. Louis	3	3	0
K. Oshiro	11	11	0
M. Kawamura	7	7	0
Geo. Wond	28	28	0
Kamehameha Schools	48	47	1
C. J. Day	4	4	0
D. Tello	2	2	0
J. P. Mendonca	9	9	0
Geo. Holt	27	18	9
S. M. Damon	320	317	3
Y. Nakamura	4	4	0
S. Boyama	5	5	0
I. Morioko	20	20	0

The above table gives a total of 603 head of cattle tested out of which number 582 were passed and tagged and 21 head condemned and branded. Up to the present time 2490 head of cattle have been tested with the result that 72 head or 2.89% have been found diseased and consequently condemned and branded. This is a decrease of 1% from the amount of disease present in the same district last year.

Importation of Live Stock.

S. S. Lurline, San Francisco: 15 horses, Hawaiian Pineapple Co.; 8 horses, A. W. Eames; 1 dog, Mrs. Belle Bucklin; 5 Berkshire hogs, Cornwell Ranch; 20 crates poultry.

S. S. Wilhelmina, San Francisco: 32 crates poultry; 1 dog, Mrs. L. Mathew.

S. S. Sonoma, Sydney: 1 dog, Mrs. E. Adams.

S. S. Missourian, Seattle: 169 butcher hogs, A. L. Macpherson.

S. S. Niagara, Sydney: 1 dog, Mr. Harvey.

S. S. Manoa, San Francisco: 22 mules, Schuman Carriage Co.; 21 cows (grades), 2 calves (grades), 1 bull (Holstein), 1 bull (shorthorn), 3 horses, 26 crates poultry, Charles Bellina; 8 crates poultry.

S. S. Matsonia, San Francisco: 2 crates poultry, 2 pigs, A. Zumstein; 10 crates poultry, G. S. Mackenzie; 5 crates poultry, Sing Sing.

Respectfully submitted,

LEONARD N. CASE,
Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, April 30, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of April, 1914, as follows:

During the month 36 vessels arrived at the port of Honolulu, of which 26 carried vegetable matter and 2 carried moulding sand.

Disposal	*Lots*	*Parcels*
Passed as free from pests	648	17,712
Fumigated	33	7,771
Burned	62	91
Returned	8	21
Total inspected	751	25,595

Of these shipments 25,301 packages arrived as freight, 177 packages by mail and 117 packages as baggage of passengers and immigrants.

Rice and Bean Shipments.

During the month the usual quota of rice and bean shipments from the Orient was thoroughly inspected. Thirty-two thousand five hundred seventy-six bags of rice and 2357 bags of beans arrived which were found free from pests and allowed to land.

Pests Intercepted.

Forty-eight packages of fruit and 23 packages of vegetables were found in the baggage of passengers and immigrants from foreign countries, all of which, being prohibited from entry, was seized and destroyed by burning.

Three packages of plants and 3 packages of seeds arrived by parcels post from a foreign country and, under the ruling of the Federal horticultural board, were returned to the shipper by the postmaster.

The Luka brought a cargo of coconuts (about 4000) and by previous arrangement they were turned over to us for treatment. They were fumigated in the large fumigating house on Kilauea street in the usual manner and more particularly as a precautionary measure. A few of the nuts had indications of the work of *Lepidopterous* larvae, feeding in the old, soft fibre. Probably it is the same species we have here.

A large package of Japanese sugarcane came by mail from Florida. I found it infested with the fungus *Colletotrichum falcatum,* kindly determined for me by Dr. Lyon, and ordered it burnt in Lucas' mill. The party receiving it lives on Maui and saw an advertisement in a paper that this kind of sugarcane is good for forage. Through the kindness of the H. S. P. A. she will receive a good supply of Japanese sugarcane in a few weeks.

Three hundred twenty-five cases of apples had to be overhauled on account of containing larvae of the codlingmoth between the ends and sides of the boxes, the fruit being in excellent condition and free from worms. I have notified the shippers of this condition and I have warned them that in the future such shipments will be either returned to them or destroyed. Fifteen boxes of apples were infested with codlingmoth and were returned to the Coast.

A case of hibiscus cuttings and one of growing ginger arrived by the S. S. Sonoma from Samoa and not having the necessary permit from the Federal horticultural board were ordered destroyed. The hibiscus cuttings were infested with two scale insects, *Saissetia nigra* and *Chionaspis mussaendae;* the ginger with a mealy bug.

Another case arriving from Singapore containing orchids was also ordered destroyed, not having the required permit from the Federal horticultural board.

A box containing some roseplants and geraniums arrived from the Coast; the geraniums were infested with the Greenhouse white fly, *Aleyrodes vaporariorum,* and were fumigated before delivery. The following insects were taken from a shipment of orchids from Manila: Two species of ants in the packing and around the roots of one plant. One plant infested with a scale insect, *Lepidosaphes cocculi,* the orchid borer (*Acytheopeus atterrimua*), 2 species of weevils in the larvae, some *capsids* and three species of beetles—a *Dytiscid,* a *Carabid* and a fleabeetle, crawling about in the packing. Shortly before the sailing of the S. S. Nippon Maru on April 9 one of the U. S. immigration officers found two caterpillars crawling on the coatsleeve of the interpreter. One of the ship's plants probably was infested with the pest and passing by he must have brushed against it and dislodged the caterpillars. It was too late to examine the ship's plants but the two caterpillars are in the cabinet of the division. This goes to show how easy it is for pests to be carried ashore without being contained in a shipment consigned to this port. Plants used as table decorations on board ship are often found infested with various pests.

The ship John Ena with coal and moulding sand was sent to Pearl Harbor direct. After notifying the authorities of the soil regulations they notified us when the sand could be examined. It proved to be the ordinary moulding sand and was allowed to land.

Beneficial Insects.

Several lots of Japanese beetle fungus were distributed during the month. Also a colony of ladybirds which Mr. Fullaway brought from Manila. He has liberated several colonies in various places. These are supposed to feed on mealybugs.

Four packages of dungfly parasites arrived from Dr. Silvestri. These were staphylinid beetles which feed on the larvae of all dungflies, the housefly, stablefly and possibly the hornfly. Upon arrival all live beetles are taken from the material and placed in manure containing housefiy larvae. All material is thoroughly fumigated and then destroyed by burning, lest there be some eggs or a germ which might accidentally bring a new pest into the country. A thorough record is kept of every shipment, its condition on arrival and where distributed.

Hilo Inspection.

Brother Newell at Hilo reports the arrival of eleven steamers, six of which brought vegetable matter consisting of 132 lots and 2408 packages. All of these were found free from pests and were passed.

Inter-Island Inspection.

During the month of April 54 steamers plying between the islands were attended to and the following shipments were inspected:

Plants	59 packages
Taro	418 bags
Vegetables	19 packages
Fruit	18 packages
Total passed	514 packages

The following packages were refused shipment on account of being either infested with pests or having objectionable soil attached to plants:

Plants	14 packages
Fruit	3 packages
Vegetables	1 package
Total refused	18 packages

Respectfully submitted,

E. M. EHRHORN,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, April 30, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I have the honor to submit as follows the routine report of the Division of Forestry for April, 1914:

FENCING OF FOREST RESERVE BOUNDARIES.

During the first week of April I made a quick trip to Hawaii to inspect the forest fence at Ninole, Kau, going over from Hilo with the contractor, Mr. C. H. Will. This fence follows the mauka line of the Ninole homesteads and is designed to close an unprotected gap in the forest boundary between the protected forests above the Hawaiian Agricultural Company lands and the Hutchinson plantation.

Towards the end of the month, under an agreement between Mr. J. Frank Woods and the Government to unite in the building of a fence along one course of the Kohala Mountain

forest reserve boundary, between the lands of Kawaihae 1 and Waika, in North Kohala, Hawaii, Mr. F. W. P. Bluett was instructed to run out and clear the line on the ground. This fence will protect the Kohala mountain on the west by filling in the gap between the Honokane gulch and the corner of the forest reserve fence that now runs across the face of this mountain. Work on the fence itself will be begun in the near future.

Progress is reported on the other fencing projects now under way under the auspices of the board above Lihue, Kauai; at Nahiku, Maui, and at Lualualei, Oahu. Dr. J. H. Raymond reports that the fence around the Polipoli spring in the Kula forest reserve, Maui, is being repaired and that it should be completed within a month.

Finding that dairy cattle from Palolo were working up the ridge between Palolo and Manoa, a short stretch of temporary fence was put up across the top of the ridge by employees of this board on April 21. This will serve to prevent stock from getting mauka into the thick forest until such time as a proper fence can be built on the line between the lands of Wailupe and Pukele (government). Negotiations for this fence are now in hand. With this exception the Honolulu Watershed forest reserve is not anywhere in danger from cattle.

TREE PLANTING.

Homestead, Kauai.

A report recently received from Mr. Walter D. McBryde in regard to the plant distribution during 1913 from the Division of Forestry nursery at Homestead, Kauai, shows a total of 6500 trees given out for that calendar year. In addition 12,044 trees were planted in the Papapaholahola Spring reserve. This number includes several species of eucalypts, koa, silk oak and Japanese cedar, all of which "have made a most satisfactory growth, due in part to the fact that all land to be planted to trees is first given a good plowing and just prior to planting is well harrowed.

"A good road has been built to the Spring reserve by the county, making the same accessible to those desirous of getting trees from the nursery. The road within the reserve itself was built from moneys received from the department." The value of this sub-nursery is yearly becoming more apparent. It is a decidedly useful institution.

Kukaiau Ranch, Hawaii.

Under the terms of four Government leases, tree planting is required on certain of the Government lands that form a part of the Kukaiau ranch, Hamakua, Hawaii. During the last week of April I made a thorough inspection and count of the tree plots, finding the work well in hand as to the number planted, and the

young trees satisfactorily established. Three of the leases require that the tree planting shall be done during the first five years of the term; on the fourth, during the first eight years. With the exception of two plots which are to be completed during the next month, the required number of trees has been set out.

Notwithstanding delays, setbacks and losses caused by the dry weather during 1912 and 1913 the work is now up to date, the blanks in some of the earlier planted plots caused by the trees dying having recently been filled in. This tree planting was started by Mr. Robert Horner when he was manager of the ranch. For the past two years it has been carried on by his successor, Mr. Donald B. Macalister.

Kona, Hawaii.

On April 30, a lot of 2000 sugi seedlings (Japanese cedar) was shipped to Mr. L. Macfarlane, manager of the Captain Cook Coffee Co. of Kealakekua, Kona, Hawaii, to use in extending a stand of this tree begun two years ago. Sugi (*Cryptomeria Japonica*) has proved itself to be well adapted for use at the higher levels in this Territory. This particular plantation should serve not only as a valuable asset to its owners, but also as a good object lesson to other land owners in Kona. Sugi is a valuable timber tree that deserves to be more generally planted in Hawaii.

ADVICE AND COOPERATION.

Pursuant to the established policy of the Division to give advice on forest matters, I visited the Bishop Estate land of Heeia, Oahu, on April 13, at the request of Mr. G. H. Gere, agent of that estate, further to consider on the ground questions of tree planting and forest fencing. Other cases in which the Division of Forestry has rendered aid to the public in this manner are listed in the report of the forest nurseryman, which as usual is submitted herewith.

FOREST FIRE.

On the afternoon of April 10, the staff and four laborers of the Division of Forestry reported to a call to fight fire above Lot No. 9 of the Palolo homestead tract. This fire originated in the escape of a small bonfire from the dooryard of the occupant of the lot, Manuel Souza. Getting into the dry grass it ran up to the ridge on the east side of Palolo valley, burning over some 10 to 15 acres of grass and brush, and killing some thickets of ti and a few koa trees. Through the efforts of Mr. Souza it had been got practically under control by the time we arrived, so that our work consisted in putting out the smouldering embers that might have again been fanned into flame by a rising wind.

For speedy transportation to this fire the Division of Forestry is again indebted to the Division of Hydrography, Mr. Larrison

having put his automobile at our disposal and taken our party to the nearest practicable point for attacking the fire.

Under the date of April 15, I renewed, as chief fire warden, the special warning that has now been in force for some years, forbidding the burning of brush on Tantalus heights and on the Kalawahine ridge unless a permit is first obtained. The new period runs until June 30, 1915.

ROUTINE WORK.

As usual considerable time was spent during the month in routine administrative work, including the preparation of several short special reports on various matters that have been submitted to the Board. The report of the forest nurseryman contains additional details regarding the plant distribution work.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, April 30, 1914.

R. S. Hosmer, Esq.,
Superintendent of Forestry.

Dear Sir:—I herewith submit a report of the principal work done during the month of April, 1914:

Nursery.

Distribution of Plants.

	In seed boxes	In boxes transplanted	Pot grown	Total
Sold	....	351	31	382
Gratis	1000	1050	898	2948
	1000	1401	929	3330

Collections.

Collections on account of plants sold amounted to $8.20.

Plantation Companies and Other Corporations.

The distribution of trees under this heading amounted to 400 pot grown.

Experimental Garden, Makiki.

The work at this station consisted principally of the usual routine work, mixing and sterilizing soil, transplanting trees, etc.

Honolulu Watershed Planting.

The work on the face of Sugar Loaf is progressing. Four hundred seventy-four kukui trees and 175 koa trees were planted during the month. Other work done consisted of clearing off and making holes, also hoeing the trees first planted.

Advice and Assistance.

The writer, at the request of a number of people, paid visits and answered inquiries as follows:

Calls made in and around city, 4; advice by telephone, 5; advice given at nursery, 4; letters of advice to other islands, 6.

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

May 11, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the division of hydrography during the month of April, 1914, is submitted:

Oahu.

Stevens automatic continuous registers were installed on the new stations on the Haiku, Kahana, and Punaluu streams. Alterations were made to the concrete measuring weir on the Nuuanu stream, and a shelter was constructed to house the new Bristol water register which has been loaned by the College of Hawaii. Two new converted Watson continuous water register stations were established on the east and west branches of the Manoa stream.

Two coöperative staff gage stations were established on the Waiahole stream to show the developed water in the Waiahole tunnel. All costs incident to the establishment of these stations was borne by the Waiahole Water Co. The regular station on the Waiahole stream was also improved, and three stations in the Kailua valley were repaired. The regular station on the Poha-

kea stream was discontinued as sufficient data have been secured to rate this stream.

In addition to the above 19 measurements were made and six rain gages were read.

From April 29 to May 1 a reconnaissance was made of the streams in the vicinity of Hauula, and tentative arrangements were made to establish from four to six coöperative stations for the Laie and Kahuku plantations. It has been proposed that, if the plantations will purchase and install the necessary equipment and materials, this division will furnish the supervising engineer and will rate the stations. Should this arrangement be consummated all windward Oahu streams will be under investigation, except the Waianu, Waikane, Kahaluu, Waihee, Kaalaea, Kaluanui, and Kaipapau streams.

An abundance of rain fell on Oahu during the month, and all surface and underground storage was well replenished.

Kauai.

Little was done on Kauai during the first part of the month as Mr. Hardy left Waimea April 1 and Mr. Dort, his successor, did not arrive until April 16. During this period Mr. Horner spent all of his time constructing the new trail to the new Lumahai station. This trail was completed on April 30. The latter part of the month was spent on general maintenance and construction work on windward Kauai.

Six rainfall stations were visited and the stations on the Anahola, Kapahi, and Kaneha ditches, the old station on the Lumahai stream, and the station on the Halekua stream were discontinued as having served the purpose for which these were established.

Maui.

Only routine work was done on Maui with the exception of the construction of foot bridges for flood measurements on the Hoolawanui and Hoolawaliilii streams. Twenty-one stream and five rainfall stations were visited, and twenty-two stream measurements were made.

An unusual amount of rain fell during the month, although there were no extreme floods. The lowlands were unusually well supplied. The Wailuku Sugar Co. did not find it necessary to irrigate from March 25 to April 27, a period of 33 days.

MAY PLANS.

Oahu.

A reconnaissance of the Laie and Kahuku streams will be completed and station sites selected.

Kauai.

The Lumahai clock register station will be completed and work started on either the Wainiha, or Waioli, station, the latter including the construction of about three miles of trail.

Maui.

Routine field measurement and rating work will be done.

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

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DIVISION OF HYDROGRAPHY.

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H. A. R. Austin, *Junior Engineer, Oahu.*
E. E. Goo, *Clerk.*

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Mrs. C. L. Seybolt, *Clerk.*
Daniel Logan, *Editor of the "Forester."*

Board of Agriculture and Forestry

PUBLICATIONS FOR DISTRIBUTION.

The Board of Commissioners issues for general distribution to persons in the Territory, annual reports, bulletins, circulars, copies of its rules and regulations, and other occasional papers, which may be had, free, upon application.

A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

Applications for publications should be addressed to the Mailing Clerk, P. O. Box 207, Honolulu, Hawaii.

DIVISION OF HYDROGRAPHY.

Rooms 20-22 Kapiolani Bldg. Tel. No. 3662.

The Division of Hydrography has on hand free publications relative to the water resources of the Hawaiian Islands. These publications furnish detailed data as to daily, monthly, mean, maximum, and minimum run-off of streams and ditches, and also cuts and maps pertaining to the different islands. Much descriptive data relative to the mountain ranges and physical configuration of each island is also contained. These publications will be mailed free of charge on request.

The United States Geological Survey topographic map of Kauai is also on sale, and copies will be mailed on receipt of 50 cents.

The records and maps of this division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this division will be mailed free of charge on request.

This division will also make ditch seepage losses and utilization investigations when the actual cost of the labor, meals, subsistence, transportation, etc., of each investigation is borne by those desiring the same.

G. K. LARRISON,
Superintendent of Hydrography.