HAWAII (Ter.) BOARD OF AGRICULTURE AND FORESTRY REPORT

1906

ISSUED FEBRUARY 28, 1907.

THIRD REPORT

OF THE

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY

OF THE

TERRITORY OF HAWAII.

FOR THE YEAR ENDING DECEMBER 31, 1906.

HONOLULU:
HAWAIIAN GAZETTE CO., LTD
1907.

BOARD OF AGRICULTURE AND FORESTRY

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from $1.00 to $2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform Hawaiian readers of this report that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

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OFFICERS AND STAFF

OF

THE BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY

1907

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NAME	TERM EXPIRES
L. A. THURSTON, *President*, - -	January 1, 1910
C. S. HOLLOWAY, *Secretary and Executive Officer*, Superintendent of Public Works, *ex officio*.	
A. W. CARTER, - - - - -	January 1, 1908
W. M. GIFFARD, - - - - -	" " 1909
G. P. WILDER, - - - - -	" " 1911
L. G. KELLOGG, - - - - -	" 4, 1912

DIVISION OF ENTOMOLOGY

ALEXANDER CRAW, *Superintendent of Entomology and Inspector*.
A. KOEBELE, *Consulting Entomologist*.
JACOB KOTINSKY, *Assistant Entomologist*.
G. A. JORDAN, *Inspector's Assistant*.
B. M. NEWELL, *Entomological Inspector at Hilo*.

DIVISION OF FORESTRY

RALPH S. HOSMER, *Superintendent of Forestry and Chief Fire Warden*.
DAVID HAUGHS, *Forest Nurseryman*.
DAVID KAPIHE, *Forest Ranger for Tantalus*.

DIVISION OF ANIMAL INDUSTRY

VICTOR A. NÖRGAARD, *Superintendent and Territorial Veterinarian*.
J. CHARLTON FITZGERALD, *Assistant Territorial Veterinarian*.

DIVISION OF AGRICULTURE

In coöperation with the Hawaii Experiment Station,
JARED G. SMITH, *Special Agent in Charge*.

CLERKS AND STENOGRAPHERS

MISS MELIKA PETERSON
MISS ELLA K. DAYTON

EDITOR, FORESTER AND AGRICULTURIST

LEOPOLD G. BLACKMAN

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BOARD OF AGRICULTURE AND FORESTRY.

Report of the Commissioners.

To the Governor of Hawaii:

The Board of Commissioners of Agriculture and Forestry presents herewith the report of this Bureau for the year ending December 31st, 1906.

LEGISLATION.

FOREST RESERVES.

Attention is again called to the advisability of amending the present law which permits the setting apart only of unleased Government land or of that on which the lease has not more than two years to run so that the Governor would have authority, with the approval of a majority of this Board to set aside all Government lands within the forest reserve boundaries, those being held under lease to actually become a part of the reserve as soon as they revert to the Government. Under these conditions private owners of lands adjoining, as well as of those to be taken into the reserve would be fully informed as to the policy to be adopted by the Government relative to public land set aside for forestry purposes.

FOREST FIRES.

At the last session of the Legislature a bill was introduced providing a special fund for extinguishing fires on Government lands or property immediately adjacent thereto where the spreading of the fires might do much damage to the forest reserves. Any money so appropriated was to be expended by this Board only with the consent and approval of the Governor.

While it is fortunate that no fires of large extent have occurred during the past year, it is important that the Board of Agriculture and Forestry should be provided with sufficient funds to properly protect the forest reserves and other large tracts of Government land in the future.

MEETINGS OF THE BOARD.

The Board has, during the year 1906, held ten regular and two special meetings, while the members of the various Committees have consulted frequently and submitted numerous recommendations.

Seven joint meetings have been held with the Governor as provided by the Territorial Laws affecting this Bureau for the purpose of ascertaining public opinion in regard to the setting aside of certain forest reserves.

RULES AND REGULATIONS.

The following rule and regulation appertaining to the importation of rice has been adopted by the Board:

Rule and Regulation by the Board of Commissioners of Agriculture and Forestry Concerning the Importation of Rice.

The Board of Commissioners of Agriculture and Forestry hereby makes the following rule and regulation:

Sec. I. For the purpose of preventing the introduction into the Territory of Hawaii of insects, their larvae or pupae, injurious or liable to become injurious to rice either growing or stored, all persons, companies and corporations are hereby prohibited from introducing or importing into the Territory of Hawaii or into any of its ports, any rice infested with such insects.

Sec. II. If any rice infested with insects, their larvae or pupae, injurious to rice either growing or stored, shall be imported or introduced into the Territory of Hawaii or into any of its ports, the same shall, in the discretion of the Board of Commissioners of Agriculture and Forestry, or its duly authorized agent, officer or inspector, be immediately destroyed or deported at the expense of the importer or introducer, and the person or persons or corporation introducing or importing the same shall be guilty of a misdemeanor and shall be liable to the penalty or penalties provided by law.

Sec. III. This regulation shall take effect from and after the approval thereof by the Governor.

PUBLICATIONS.

Press Bulletins have been prepared by the Division of Forestry and given wide circulation, as follows:

Press Bulletin No. 3. Revised list of forest and ornamental tree seed for sale at the Government Nursery—4 pp.

Press Bulletin No. 4. Instructions for propagating and planting forest trees—4 pp.

DIVISION OF FORESTRY.

Mr. Ralph S. Hosmer has continued as Superintendent of the Division of Forestry, the rest of the regular staff including Mr. David Haughs as Forest Nurseryman, being the same as last year.

During the summer months, the services of Mr. Charles S. Judd of Yale University, School of Forestry, were secured and he carried on certain investigations as Special Forest Agent in the planted forest at Lihue, Kauai. It is expected that a bulletin will soon be issued giving the results of his work.

There have been several changes made among the District Foresters, it having been found advisable to divide some of the larger districts into smaller areas. A number of new Fire Wardens have also been appointed. Revised lists showing these officers and the districts in which they serve are included in the report of the Superintendent of Forestry.

FOREST RESERVES.

There have been seven new forest reserves established during the past year containing a total area of 126,825 acres of which 62,425 acres of unleased Government land have been set apart by proclamation of the Governor.

The Territory now has twelve forest reserves with a total area of 337,147 acres, 117,532 have actually been set aside.

The firm of Alexander & Baldwin has recently turned over to the Government a large private forest in the Koolau, Maui, Forest Reserve owned by one of the plantations controlled by this corporation. This property will be managed in accordance with the terms of the law creating this Board. This action is of considerable importance and indicates the beginning of coöperation on the part of private interests with the Government in the handling of forest land within established forest reserves. It is proposed to establish several other forest reserves as soon as the necessary surveys have been completed.

FOREST RANGERS.

It is hardly necessary to point out the necessity of a forest ranger service to police and protect the Government forest reserves. The beneficial results to be obtained from the setting aside of these forest lands will be very materially affected if no provisions are made to properly care for the reserves. It is absolutely essential that a ranger service should be established and that the persons appointed to these positions see that boundary fences are maintained, cattle and other animals kept off the lands and that proper precautions are taken to prevent the destruction by fire of the forests.

Very often private interests are allowed to construct flumes and ditches through these reserves and it is important to have some one representing the Government's interests in order to prevent persons employed in constructing and maintaining these waterways from damaging the forests.

Upon the recommendation of the Superintendent of Forestry the Commissioners have included in their recommendations for appropriations to cover the coming biennial period a sum sufficient to establish a ranger service as follows:

Two rangers on Kauai, three on Oahu, one on Molokai, two on Maui and four on Hawaii, making a total of twelve.

While this is a small force to cover the large area already set aside much good work can be accomplished and it is to be hoped that in two years the Territorial revenues will be sufficiently increased to permit of the employment of a larger staff.

FOREST EXTENSION.

Under the direction of the Superintendent of Forestry advice and assistance have been given to persons and corporations desirous of establishing forest plantations or otherwise interested in forestry.

The Forest Nurseryman has been engaged most of the time on this work. Fourteen planting schemes have been prepared and a large amount of correspondence handled in furnishing information desired.

The distribution of tree seeds has continued, this service offering an opportunity to persons interested in forest work to obtain fresh and pure seeds at nominal prices.

RUBBER EXPERIMENTS.

It has been impossible to complete the experiments with rubber producing plants undertaken this year but data are being obtained which will be of much value to persons interested in this industry. Tests are being made in order to ascertain the conditions of situation, elevation and exposure which are most favorable to Ceara rubber. Hevea and Castilloa seeds are also being propagated, and will eventually be distributed.

A grove of mature Ceara trees discovered by Mr. Judd during his investigations on Kauai will be systematically tapped and no doubt the reports of the yield of these trees will be of interest to growers of rubber.

FOREST FIRES.

No destructive forest fires have occurred during the past year and such as were started on forest lands were extinguished before any serious damage was done. Undoubtedly the appointment of forest fire wardens in the various districts and the enactment of a law providing penalties have resulted in more care being taken by persons usually responsible for starting fires and allowing them to get beyond control.

Last spring a special forest ranger for Tantalus Heights was appointed by the Board and he has rendered good service in enforcing the laws and preventing undesirable trespass on the forest lands in this locality.

REPORTS OF FOREST WORK.

Following the report of the Superintendent of Forestry are those of the Forest Nurseryman and a number of District Foresters containing a large amount of interesting information.

DIVISION OF ENTOMOLOGY.

This division continues under the charge of Mr. Alexander Craw, with Mr. A. Koebele and Mr. J. Kotinsky as Consulting and Assistant Entomologists respectively. Mr. C. J. Austin, who acted as assistant to the Superintendent in the inspection of importations, resigned in November and has been succeeded by Mr. A. Jordan. Brother Matthias Newell was appointed in August as Inspector for the port of Hilo.

LOCAL LEGISLATION.

Owing to the fact that there are no Federal laws regulating the importation of pests injurious to vegetable products in Territories, it is quite essential that legislative measures should be enacted in Hawaii giving full powers to the Board to prevent the entering of insects or plant diseases which might prove destructive to agricultural interests here.

Circumstances have arisen during the past year which have made it necessary to place restrictions on the importation of rice from Oriental ports and it is certainly fortunate that the Board has been given powers by the Territorial Statutes to enact such measures.

INSPECTION OF IMPORTATIONS.

As will be seen by the report of the Superintendent of this Division, it has been necessary to carefully examine a large number of packages arriving by freight as well as through the postal service, and numerous shipments have been destroyed after it had been clearly established that they contained insects or pests injurious to products raised in Hawaii.

The most important matter of this nature requiring the attention of the Superintendent consisted of several importations from Japan of rice from the old crop, infested with bettles and weevils. Prompt measures were taken to prevent the spread of these insects and after cable communication with the Honorable James Wilson, Secretary of Agriculture, the Collector of Customs was authorized to refuse entry of the rice until the same had been thoroughly fumigated. Successful results were obtained from the use of carbon bisulphide, all of this chemical on hand in the local stores being exhausted before all the shipments were treated. Pending the arrival of an additional supply, hydrocyannic acid gas was tried but proved to be unsatisfactory. The expense of this fumigation was borne entirely by the importers.

Through the courtesy of the Federal officials, it has been possible to install a fumigating apparatus at the Honolulu Post Office where all mail matter containing plants or insects are chemically treated, thus preventing the introduction of any injurious pests through this source.

Fumigatories were installed at the dock and Post Office in Hilo in order that the inspector at this port might have proper facilities for fumigating importations.

Suitable fumigatories have also been placed on three of the wharves in Honolulu which can be charged with light or heavy gases so that the Division is now well equipped for handling of shipments arriving here which require treatment.

BENEFICIAL INSECTS.

As the Superintendent has been almost constantly engaged in examining importations, the work of breeding and distributing beneficial insects has devolved upon the Assistant Entomologist. Several colonies of useful insects have been received from Mr. A. Koebele, the Consulting Entomologist of the Board, as well as from others mentioned in the Superintendent's report, and colonies have been distributed on the various Islands.

Special attention has been paid to the establishing of enemies to the horn fly, the avocado pear scale and cut worms. It is to be hoped that experiments carried on with the horn fly parasites will result in diminishing this pest which is so troublesome to cattle raisers.

EQUIPMENT.

Numerous changes in the buildings at the Nursery have facilitated the scientific work of this Division. An addition has been made to the laboratory so as to provide for the installation of modern equipment for microscopic study. The building formerly used for fumigation has been converted into a dark room for photographic purposes and the Board has recently purchased a camera especially adapted to the requirements of this Division.

GENERAL.

As opportunity has offered, local conditions on the various Islands have been carefully noted with a view to exterminating pests reported as injurious to agricultural products. These investigations are dwelt upon in detail in the report of the Superintendent of this Division.

DIVISION OF ANIMAL INDUSTRY.

By continuing an arrangement made last year with the Federal Government and the Hawaiian Live Stock Breeders' Association, the Board has been able to retain the services of Dr. V. A. Nörgaard as Superintendent of this Division. He has secured as his assistant, Dr. J. C. Fitzgerald, a veterinary surgeon, who having practiced in the Islands for several years, has had an opportunity of studying diseases of animals most commonly found here.

Dr. H. B. Elliot acts as heretofore as Animal Inspector for Hilo, and as importations are restricted to this port and Honolulu, all animals brought into the Territory can be carefully examined before being admitted.

INSPECTION.

As will be seen by the report of the Territorial Veterinarian, a large portion of his time has been occupied in inspecting and testing animals arriving at Honolulu.

The appointment of Dr. W. F. Egan, as official examiner for San Francisco and the fact that his certificate as to mallein and tuberculin tests is accepted, has been taken advantage of by local breeders and has resulted in a considerable saving to them as they are not necessarily subject to freight charges on animals brought here and found to be diseased.

The Board has also been fortunate in securing the coöperation of the local representative of the United States Bureau of Animal Industry in San Francisco as he has signified his willingness to inspect all animals shipped from that port and consigned to local importers.

In cases where animals arrive here with suspicious symptoms they are immediately taken to the Quarantine Station at Kalihi where the Territorial Veterinarian has proper facilities for studying their condition. If found to be infected with the suspected disease, they are destroyed, but if healthy, they are turned over to their owners after the expiration of the quarantine period.

The caretaker at the Station sees that the premises are kept in proper sanitary condition and also looks after the feeding and treatment of the animals confined in quarantine.

Territorial property is also reserved at Hilo for similar purposes and is sufficiently isolated to prevent any possibility of contagion.

GLANDERS.

In order to definitely determine the prevalence of glanders, which is undoubtedly the most serious disease affecting horses and mules found on the Islands, Dr. Nörgaard has made a number of trips to various districts on Hawaii, Maui and Oahu and the reports of his inspections indicate that there are a large number of animals infected with this disease, and it deserves serious consideration as to the best method of stamping it out. Without question the only way to rid the

Territory of glanders, which is found to be so contagious, is by the destruction of infected animals. This is the method adopted in most countries but in Hawaii certain difficulties are met with owing to the large number of Orientals residing here, many of whom are owners of live stock. These persons being of small means are inclined to hide animals showing any indication of glanders and it would therefore seem advisable that some legislative action should be taken whereby owners of diseased stock reporting the same to the Territorial Veterinarian should be reasonably compensated for the destruction of their animals.

Quotations in Dr. Nörgaard's report from an article by Dr. Rutherford of Canada, where this policy has been adopted, show that there is a noticeable tendency on the part of live stock owners to report outbreaks of this disease and to allow their animals to be killed.

SHEEP.

In the various ranches devoted to sheep raising, it has been found that "Scabies" exists in practically all of the flocks and Dr. Nörgaard has devoted a considerable portion of his time to the treatment of animals infected with this disease. By systematic dipping at frequent intervals in a mixture prepared by the Veterinarian, satisfactory results have been obtained and reports received from some of the ranches indicate that this disease is almost eradicated and now has little effect on the quality or quantity of wool produced.

The screw worm is proving quite injurious to the Island sheep and this pest is now receiving the attention of Dr. Nörgaard.

HEART WORM.

It is interesting to note that the Territorial Veterinarian has been endeavoring to find some remedy for this disease which is so destructive to hunting dogs, especially to those imported from the United States and foreign countries.

CONSULTATION.

In establishing the Bureau of Animal Industry, it was the desire of the Commissioners that the services of the Territorial Veterinarian should at all times be available to owners desiring advice in regard to diseases affecting their stock and Dr. Nörgaard and his assistant have given careful consideration to all inquiries referred to them.

LABORATORY.

This Division has been without sufficient funds to properly equip a laboratory for the scientific investigation of animal diseases found in the Islands.

In the recommendations to cover the biennial period commencing July 1st, 1907, the Board has included a special amount to cover the cost of extensions to the building at the Government Nursery and necessary instruments to efficiently carry on this important branch of the work.

GENERAL.

The live stock industry has been greatly benefitted by the creation of this Division and it is to be hoped that ample appropriations will be made for the coming two years so that its scope may be enlarged.

DIVISION OF AGRICULTURE.

The Legislature at the last session appropriated the sum of $5,472.00 for "Assistance to the Federal Experiment Station," and as will be seen by the report of Mr. Jared G. Smith, Director in charge of the Station here, most of this money has been expended on experiments in growing various varieties of tobacco.

It seems to be well established that tobacco of good quality can be raised on the Island of Hawaii, especially in the Hamakua district, and the results should be encouraging to those desiring to engage in this industry for commercial purposes.

Probably a larger crop of high grade leaf could be obtained by engaging the services of a tobacco curing expert.

Respectfully submitted,

L. A. THURSTON,

C. S. HOLLOWAY,

W. M. GIFFARD,

A. W. CARTER,

J. F. BROWN,

G. P. WILDER,

Commissioners of Agriculture and Forestry.

APPROPRIATIONS FOR BOARD OF AGRICULTURE AND FORESTRY, PASSED BY THE LEGISLATURE AT THE EXTRA SESSION OF 1905, FOR THE BIENNIAL PERIOD, JULY 1, 1905, TO JUNE 30, 1907.

Statement to December 31, 1906.

SALARIES AND PAY ROLLS.

	Appropriation.	Balance Dec. 31, 1905.	Drawn.	Balance Dec. 31, 1906.
Salary of Superintendent of Forestry	$ 6,000.00	$ 4,500.00	$ 2,703.23	$ 1,796.77
Pay of Assistants, Laborers and Rangers, Division of Forestry	4,000.00	3,010.00	1,930.00	1,080.00
Salary of Superintendent of Entomology	6,000.00	4,500.00	3,000.00	1,500.00
Pay of Assistants, Inspectors and Employees, Division of Entomology	5,000.00	3,760.00	2,405.48	1,354.52
Salary of Clerk and Stenographer	1,800.00	1,350.00	900.00	450.00
Salary of Territorial Veterinarian	1,400.00	1,050.00	700.00	350.00
Pay of Assistants, Inspectors, Employees and Laborers of Division of Animal Industry	1,000.00	935.00	525.00	410.00
	$25,200.00	$19,105.00	$12,163.71	$ 6,941.29

CURRENT EXPENSES.

	Appropriation.	Balance Dec. 31, 1905.	Drawn.	Balance Dec. 31, 1906.
Incidentals and General Expenses and Experimenting in Growing Rubber Trees on Government Forest Lands	$29,848.00	$24,606.98	$16,896.82	$ 7,710.16
Assistance to Federal Experiment Station	5,472.00	3,740.95	3,203.77	537.18
Incidentals and General Expenses, Bureau of Animal Industry	250.00	102.25	101.50	.75
	$35,570.00	$28,450.18	$20,202.09	$ 8,248.09

DIVISION OF FORESTRY.

Report of the Superintendent of Forestry.

Honolulu, Dec. 31, 1906.

Board of Commissioners of
Agriculture and Forestry,
Honolulu, Hawaii.

Gentlemen:—I have the honor to submit the following report covering the work of the Division of Forestry during the calendar year 1906; and to transmit in addition certain reports from my assistant, the Forest Nurseryman, and from a majority of the District Foresters, dealing in detail with various aspects of forestry in the Territory.

The past year has been one of construction in the forest work of Hawaii. While marked by no spectacular accomplishments—forest work seldom is—it has seen much done toward strengthening the foundations upon which forestry in the islands rests; work which cannot but result in benefit to the Territory in the years that are to come.

The general program of forest work adopted when the Division of Forestry was organized three years ago has been followed during 1906. The creation of forest reserves has continued to hold first place in the activities of the Division and has claimed the major part of my own time and attention, as it must in future until the projected system of forest reserves is actually established.

Next in importance has come the work of the Section of Forest Extension. The notable feature here is the increasing number of requests that have been received for advice and assistance from persons or corporations desiring to establish forest plantations. It has been clearly demonstrated that the offer of cooperative assistance published in December, 1905, meets a real demand; one that will become more and more pressing as the natural supply of wood diminishes. This branch of the Division's work has been under the direct charge of Mr. David Haughs, Forest Nurseryman, who from his intimate acquaintance with island conditions is well fitted to handle it. The policy of helping the individual to help himself will, it is believed, result in much permanent good to the Territory. Certainly the expenditure so made goes much further than would a very much larger sum devoted to actual tree planting by the Territory itself. This work will therefore be continued during the coming year.

Other branches of forest work have received as much attention as the very limited staff could give them. The results achieved are set forth in the following pages under the several main headings under which the work of the Division of Forestry may naturally be divided.

APPROPRIATION.

The appropriation for salaries on the statutory roll of the Division of Forestry for the present fiscal period (July 1, 1905 to June 30, 1907) was $10,000.00, or $5,000.00 per annum. Of the total lump sum appropriated for the Current Expenses of the Board ($29,848.00), the amount allotted to the Division of Forestry was $5,450.00 per annum. During the past year, owing to a re-allotment made necessary by the needs of the Division of Animal Industry, the Forestry fund was somewhat curtailed, thereby reducing the amount available for forestry items. The necessity for this cut is to be regretted but that it was unavoidable and essential to the work of the Board as a whole is not questioned.

STAFF.

The regular staff of the Division of Forestry during 1906 has consisted of the Superintendent of Forestry and the Forest Nurseryman.

For a period of two months during the summer Mr. Charles S. Judd was appointed temporarily, as Special Forest Agent, to carry on certain investigations on Kauai. These are discussed on another page of this report.

One forest ranger, Mr. David Kapihe was appointed in March for patrol duty in the Tantalus Heights District, to see that the regulations of the Board in regard to forest fire and trespass were carried out. He continues to serve.

Several additional District Foresters and District Fire Wardens have been appointed during the year and some other changes have been made in the personnel of these corps. Revised lists are given elsewhere in this report.

As in former years, the stenographic and clerical work of the Division of Forestry has been performed by the general clerk and stenographer of the Board, Miss Melika Peterson.

Mention may be made here of my absence from the Territory from April 7 to July 13. Two months of this period was a leave of absence; the remainder was a furlough without pay. In the course of my vacation I visited the eastern states, spending some time in Washington, D. C., and in Boston. During my absence Mr. Haughs was Acting Superintendent of Forestry and Acting Chief Fire Warden.

FOREST RESERVES.

The objects for which the Hawaiian forest reserves are made have been so often set forth that it seems almost unnecessary to repeat the statement here. But lest this report fall into the hands of persons not familiar with the local conditions it may be said that the native Hawaiian forests are chiefly of value as conservators of water, and that the forest reserves are created on the important watersheds of the Terriory that the forest within their boundaries may be permanently maintained as a protective cover. On the drainage from the area that the forest reserves do or will include depends the supply of the various irrigation and power-development systems that have been or may be built on each of the large islands. In Hawaii, as on the mainland, forestry and irrigation are closely related; only by the perpetuation of the forest cover can the streams be maintained and their flow kept relatively constant.

The Hawaiian forest reserves are created by the Governor of the Territory, who acting on the recommendations of the Board of Agriculture and Forestry, declares by proclamation that within certain specified boundaries the land should be permanently maintained under a forest cover. This declaration constitutes the area a forest reserve. The Governor then sets apart such unleased government lands as may be within the reserve boundaries, and from time to time, as the leases on other government lands in the reserve expire, adds them as well to the area actually set apart. In most of the reserves there is also privately owned land, but that this may be treated as an organic part of the reserve, the law provides that the management and control may be turned over to the Board of Agriculture and Forestry. Such action has already been taken in one reserve. The law creating the present Board of Commissioners of Agriculture and Forestry, and providing for the establishment of forest reserves, is Chapter 28 of the Revised Laws of Hawaii.

RESERVES ESTABLISHED.

During the year seven new forest reserves have been created. They have an aggregate area of 126,825 acres and are distributed throughout the Territory as follows: Kauai, one; Oahu, three; Maui, one; Hawaii, two. Of the total area, 62,425 acres have been actually set apart.

The total number of forest reserves is now twelve. These have a combined total area of 337,147 acres within the reserve boundaries. Of this 117,532 acres of unleased government land have been actually set apart.

The following table gives the essential facts about the twelve established forest reserves, arranged in the order of the creation of the reserves. The several slight differences in area between this and similar tables heretofore published are due to corrected computations of area, recently made by the Survey Office.

TABLE I.

FORESTRY RESERVES—TERRITORY OF HAWAII.

ARRANGED IN CHRONOLOGICAL ORDER.

No.	Name	District	Island	Total Area Recommended to be Reserved	Area Government Land Actually Reserved	Date of Proclamation	Proclamations Signed by
				Acres	Acres		
1	Kaipapau ..	Koolauloa	Oahu...	913	913	Nov. 10, 1904	G. R. Carter
2	Hamakua Pali	Hamakua.	Hawaii..	18,940	16,133	Dec. 23, 1904	" "
	Total for 1904..............			19,853	17,046		
3	Hilo........	Hilo..........	Hawaii..	110,000	12,771	July 24, 1905	A. L. C. Atkinson
4	Koolau, Maui	Koolau, Hamakua-loa.	Maui....	42,969	14,300	Aug. 24, 1905	" " "
5	Halelea.....	Halelea	Kauai. .	37,500	10,990	Aug. 24, 1905	" " "
	Total for 1905..............			190,469	38,061		
6	Kealia......	Puna..........	Kauai. .	9,935	7,385	Mar. 9, 1906	" " "
7	Ewa..	Ewa, Waianae and Waialua	Oahu...	28,550	4,768	Mar. 9, 1906	" " "

TABLE I—Continued.

No.	Name	District	Island	Total Area Recommended to be Reserved	Area Government Land Actually Reserved	Date of Proclamation	Proclamations Signed by
				Acres	Acres		
8	Honuaula ..	Kona	Hawaii .	665	665	Apr. 4, 1906	A. L. C. Atkinson
9	Kau	Kau	" .	65,850	35,960	Aug. 2, 1906	G. R. Carter
10	Waianae-kai.	Waianae	Oahu ..	3,257	3,150	Sept. 7, 1906	" "
11	Lualualei ...	"	" ..	3,743	3,743	Nov. 30, 1906	" "
12	Hana	Hana	Maui ..	14,825	6,754	Nov. 30, 1906	" "
	Total for 1906			126,825	62,425		
	Grand total			337,147	117,532		

Table II shows the same data for the existing reserves, arranged by islands and counties.

TABLE II.

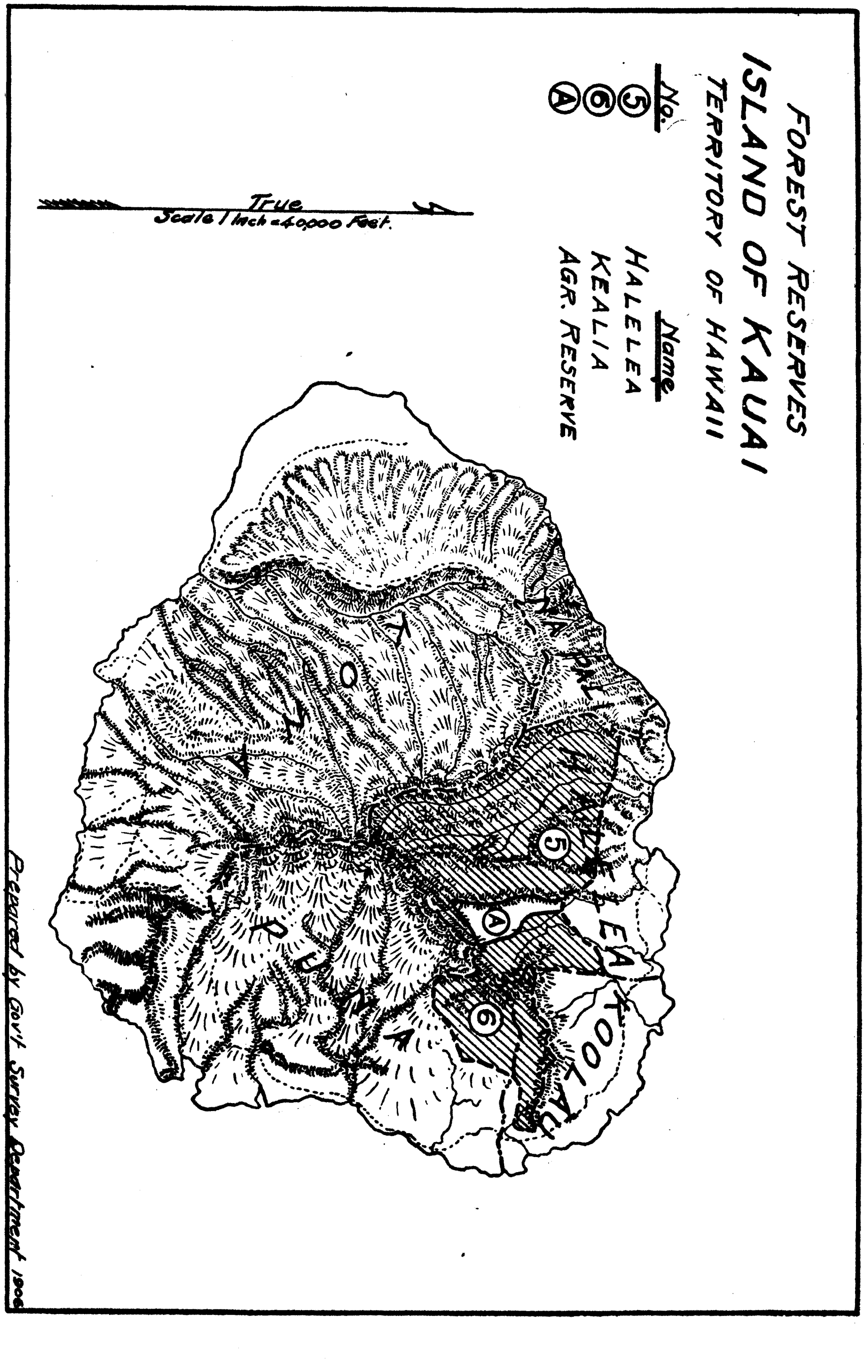
FOREST RESERVES—TERRITORY OF HAWAII.

ARRANGED BY COUNTIES.

No.	Name	District	Island	Total Area Recommended to be Reserved	Area Government Land Actually Reserved	Date of Proclamation	Proclamations Signed by
			COUNTY OF KAUAI.				
				Acres	Acres		
5	Halelea	Halelea	Kauai ..	37,500	10,990	Aug. 24, 1905	A. L. C. Atkinson
6	Kealia	Puna	" ...	9,935	7,385	Mar. 9, 1906	" " "
			Total,	47,435	18,375		
			COUNTY OF OAHU.				
1	Kaipapau	Koolauloa	Oahu ...	913	913	Nov. 10, 1904	G. R. Carter
7	Ewa	Ewa, Waianae and Waialua .	" ...	28,550	4,768	Mar. 9, 1906	A. L. C. Atkinson
10	Waianae-kai ..	Waianae	" ...	3,257	3,150	Sept. 7, 1906	G. R. Carter
11	Lualualei . ..	"	" ...	3,743	3,743	Nov. 30, 1906	" "
			Total,	36,463	12,574		

TABLE II—Continued.

No.	Name	District	Island	Total Area Recommended to be Reserved	Area Government Land Actually Reserved	Date of Proclamation	Proclamations Signed by
			COUNTY OF MAUI.				
				Acres	Acres		
4	Koolau, Maui	Koolau, Hamakua-loa	Maui ...	42,969	14,300	Aug. 24, 1905	A. L. C. Atkinson
12	Hana	Hana	" ...	14,825	6,754	Nov. 30, 1906	G. R. Carter
			Total,	57,794	21,054		
			COUNTY OF HAWAII.				
2	Hamakua Pali	Hamakua	Hawaii..	18,940	16,133	Dec. 23, 1904	G. R. Carter
3	Hilo	Hilo	" ..	110,000	12,771	July 24, 1905	A. L. C. Atkinson
8	Honuaula	Kona	" ..	665	665	Apr. 4, 1906	" " "
9	Kau	Kau	" ..	65,850	35,960	Aug. 2, 1906	G. R. Carter
			Total,	195,455	65,529		
	Grand Total, ...			337,147	117,532		


FOREST RESERVES
ISLAND OF KAUAI
TERRITORY OF HAWAII
No. Name
5 HALELEA
6 KEALIA
A AGR. RESERVE
True
Scale 1 Inch = 40,000 Feet.
Prepared by Gov't Survey Department 1906

ERRATUM.

For "Kealea" read "Kealia," lines 2 and 5, page 23.

The seven reserves made in 1906 may be thus briefly described:

Kealea Forest Reserve, Kauai.

This reserve includes the mauka portion of the three large government lands of Anahola, Kamalomalo and Kapaa, and the private land of Kealea, at the north end of the PunaDistrict, Island of Kauai. The total area is 9,935 acres. That of the government land actually set apart is 7,385 acres, or 74 per cent. Its value as a watershed justifies the creation of this reserve.

Ewa Forest Reserve, Oahu.

The section covered by this reserve is one of the most important watersheds in the Territory, in that it supplies the major part of the water for the three great sugar plantations, Ewa, Oahu and Honolulu, whose combined output made in 1906 over one-sixth of the total sugar crop of the Territory. The total area of this reserve is 28,550 acres. Much of it is private land, but of the 5,151 acres belonging to the Territory 4,768 have been set apart. This is 1.7 per cent of the whole reserve and 93 per cent of the government land.

Honuaula Forest Reserve, Hawaii.

The Honuaula Forest Reserve is a tract of 665 acres on the western slope of Mt. Hualalai in the District of Kona on Hawaii. It is part of a government land now under lease for grazing but by an arrangement effected through the Land Office this area was surrendered and set apart as a reserve. It contains some of the best Koa (*Acacia Koa*) forest on any government land on Hawaii.

Kau Forest Reserve, Hawaii.

The Kau Forest Reserve is another very important reserve because from it comes the water that serves the two large sugar plantations in Kau to flume their cane and irrigate their lower lands. The reserve lies on the lower slopes of Mauna Loa. It is the second in size of the reserves so far declared. The total area is 65,850 acres. Of this 55 per cent., or 35,960 acres of government land have been actually set apart.

Waianae-kai and Lualualei, Oahu.

These two reserves are situated on the western slope of the Waianae mountains on Oahu and in reality form one tract. They include both the scanty forest on the upper slopes and the barren ridges lower down that should be brought back under a forest cover. With lands on the leeward side of the islands it is essential that all the water possible be made available for use. A forest on the slopes will help to secure this result; hence the reserve. The area of Lualualei is 3,743 acres, all reserved; that of Waianae-kai 3,257 acres, of which all but 107 acres (3 per cent.) is government land, actually set apart.

Hana Forest Reserve, Maui.

The Hana Reserve includes the entire mauka portion of the Hana District. It covers an area of 14,825 acres, the greater part of which is government land. There are actually set apart 6,754 acres, or 46 per cent. This reserve is also important as a protective forest, especially in connection with the Koolau Forest Reserve, which it adjoins.

DETAILED REPORTS.

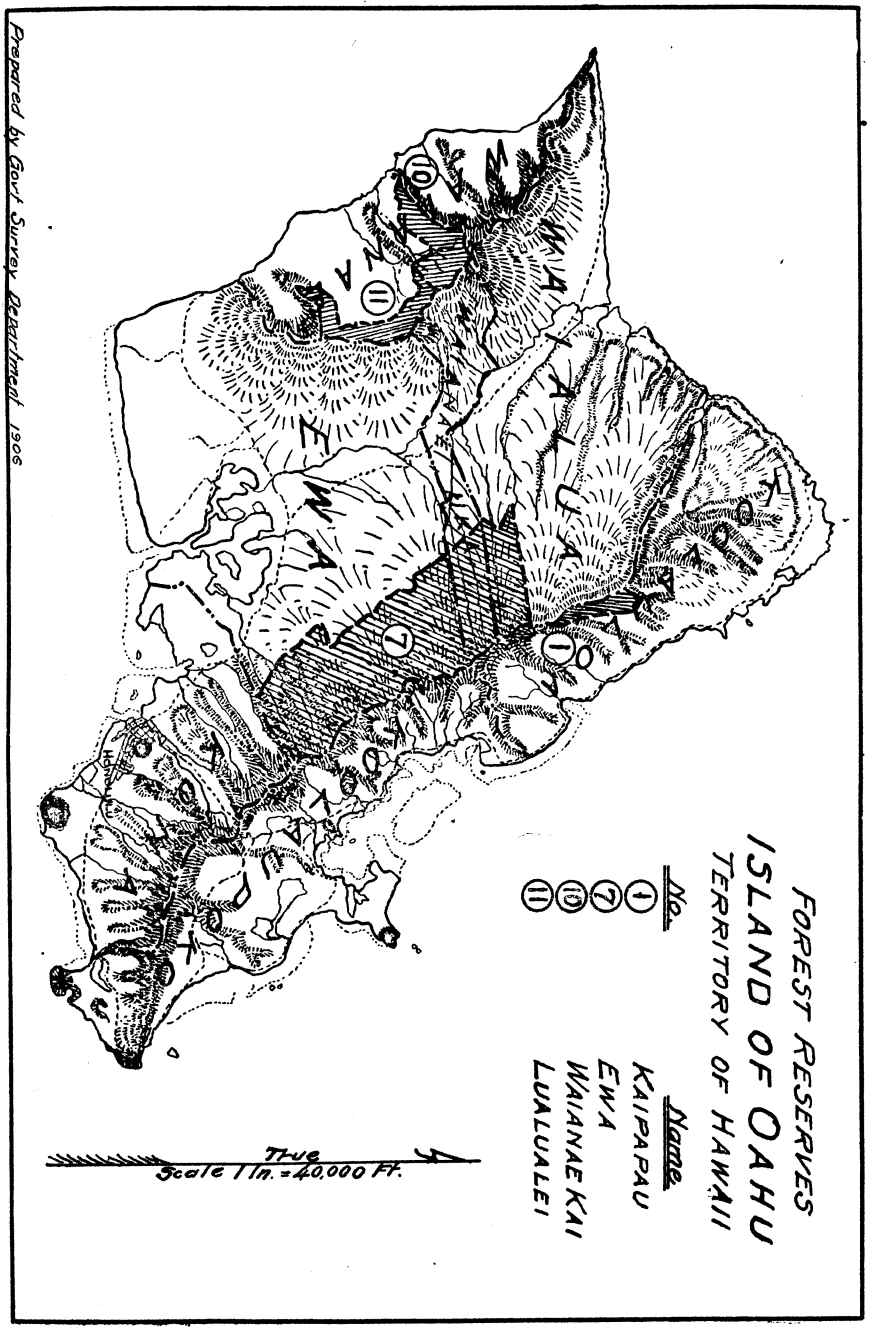
Following the established usage of the Board the reports, resolutions, descriptions of boundaries and proclamations dealing with the several reserves have been published in the Hawaiian Forester and Agriculturist as each reserve has been made. The original reports are filed in the office of the Board of Agriculture and Forestry, with official copies of the proclamations and descriptions.

FOREST MAPS.

The twelve established forest reserves are shown on the accompanying maps of the four main islands of the Hawaiian group. The maps were prepared under my direction by the Government Survey Office and are based on the large scale official maps of the several islands.

PRIVATE CO-OPERATION—WAIANAE-KAI RESERVE.

A feature of no small interest in the creation of the Waianae-kai Forest Reserve was the action taken by the Waianae


FOREST RESERVES
ISLAND OF OAHU
TERRITORY OF HAWAII
No. Name
1 KAIPAPAU
7 EWA
10 WAIANAE KAI
11 LUALUALEI
True
Scale 1 In. = 40,000 Ft.
Prepared by Gov't Survey Department 1906

(Plantation) Company to facilitate the actual setting apart of the area. Under an agreement with the Land Commissioner the Waianae Company signed a partial surrender of their lease on the land covered by the reserve, whereby the term of the lease was shortened by one year and so brought within the two-year-limit-of-expiration clause of the forest law.

The Waianae Company has further shown its interest in this reserve by undertaking to reforest, at its own expense, considerable areas on the lower slopes of the mountain within the reserve boundaries. A planting plan for this work has been drawn up by Mr. Haughs and preparations for planting have already begun. For its active support of the forest reserve policy of the Territory the Waianae Company deserves special commendation. It is by such intelligent coöperation that the cause of forestry in Hawaii is strengthened and advanced.

MAUI FOREST LAND SURRENDER.

One of the most notable events of the present year, in view of its far reaching effect, was the turning over to the Government by the plantations in Ceneral Maui controlled by Messrs. Alexander and Baldwin, of the management of certain privately owned lands within the Koolau Forest Reserve. Owing to the fact that several corporations were involved, considerable legal formality attended this transfer, which it took the greater part of the year to bring to completion. The final papers were signed on Nov. 12th, 1906.

In brief the arrangement is that the Paia Plantation, the Haiku Sugar Company, and the Hawaiian Commercial and Sugar Company turn over to the Government for a term of 17 years from Feb. 26th, 1906, the care, custody and control of the privately owned lands of Halehaku, Haiku, Opana and Kaupakulua within the boundaries of the Koolau Forest Reserve, excepting and reserving however (1) all water rights, (2) rights of way for roads, ditches, tunnels, flumes and pipe lines, (3) the right to plant trees, (4) the right to cut fence posts for local use, and (5) the right to make economic use of the forest, subject to reasonable rules and regulations of the Board of Agriculture and Forestry and in a way not inconsistent with the purposes of the reserve. Under each of these clauses are included the rights of ingress and egress. The plantations agree, in addition, to keep the makai boundary of the reserve fenced during the term of the agreement.

The surrender is made contingent on the following points: (1) that the lands surrendered be used by the Government solely for forest purposes, (2) that all government lands within the reserve be set apart now or as soon as may be as parts of the reserve, (the only additional tract that, under the law, can be reserved is about to be set apart), (3) that if all or any portion of the two tracts of government land covered by leases Nos. 538 and 539 revert to the Government during the seventeen years, such lands shall be added to the reserve, and (4) that all government lands within the reserve shall be used only for forest purposes during the period of the surrender, except that the Government may exercise rights similar to those reserved to the plantations. Failure on the part of the Government to comply with these conditions nullifies and terminates the whole agreement. The term of seventeen years expires on the same day as do the leases (Nos. 538 and 539) of the government lands adjoining the private lands surrendered.

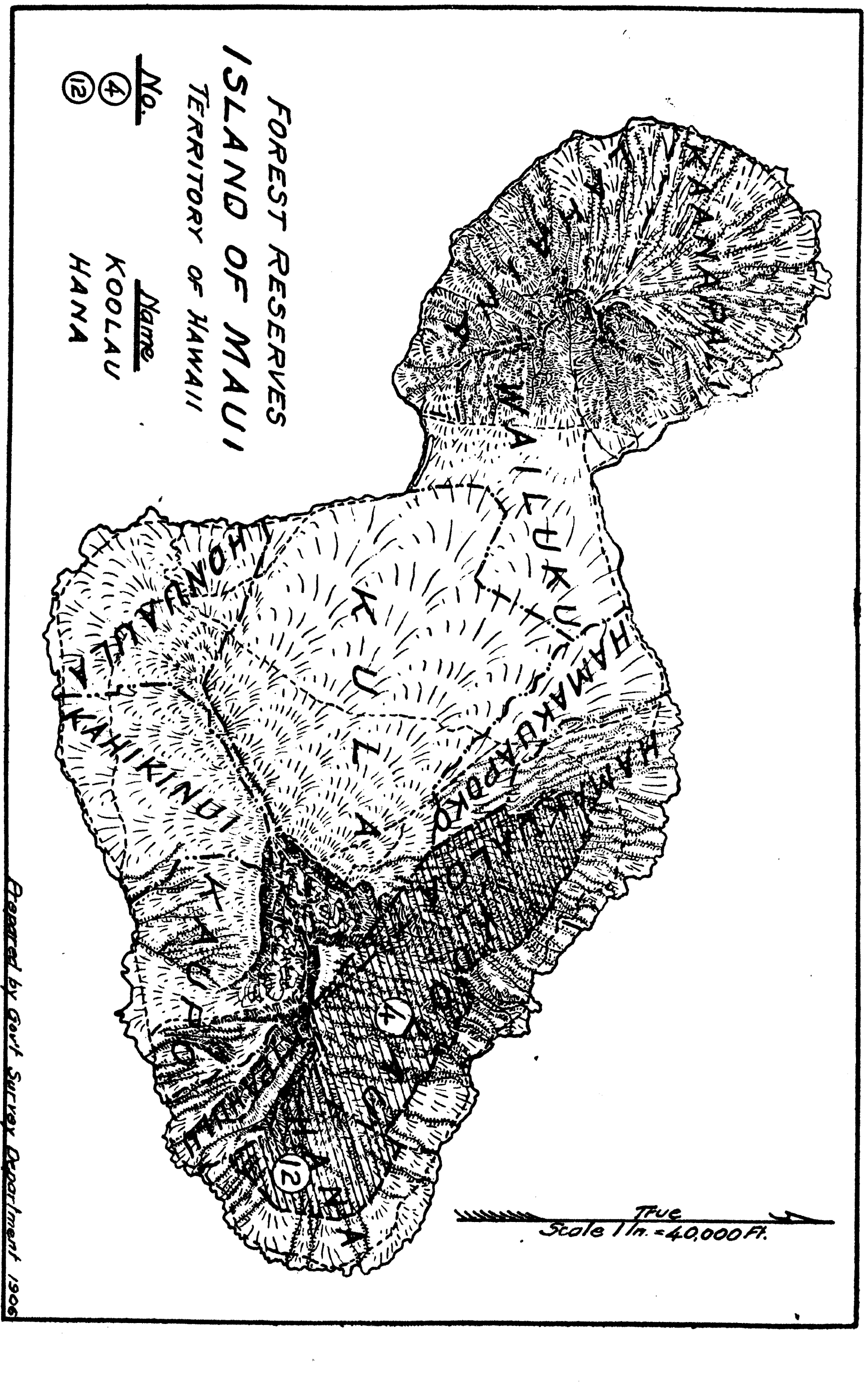
The full text of the surrender, which is a lengthy legal document, was published in the Hawaiian Forester and Agriculturist for December, 1906.

The action taken in this instance will serve as a precedent in future cases, of which it is hoped there will be many, for only by the putting into operation of a systematic and organic plan for the management of any given reserve as a whole, can the best results be attained.

The foregoing statement brings the question to the point on which the whole matter turns, for unless the Government will make it evident that it can exercise an efficient and satisfactory control over the forest reserves, private interests owning land within the reserve boundaries will be slow to agree to turn the management of their lands over to the Board.

FOREST RANGERS.

The establishment of a forest ranger service for the proper administration of the reserves that already exist, or that will


FOREST RESERVES
ISLAND OF MAUI
TERRITORY OF HAWAII
No. Name
4 KOOLAU
12 HANA
WAILUKU
KULA
HAMAKUAPOKO
HONUAULA
KAHIKINUI
True
Scale 1 In. = 40,000 Ft.
Prepared by Gov't Survey Department 1906

soon be created is therefore the most pressing need in the forest work of Hawaii today. The necessity for such action is obvious and I cannot too strongly urge that the attention of the Legislature be called to this matter in the most forcible way. Important steps have been taken in getting the reserves established by proclamation, and the boundaries defined more or less thoroughly on the ground, but until an administrative force is actually in commission the reserve system will not have been truly started.

To show how this general question is regarded by the men who as a body have given most careful attention to the forest question in Hawaii, I insert the following resolution unanimously adopted by the Hawaiian Sugar Planters' Association, at the annual meeting held in Honolulu during November, 1906.

Resolution.

(Adopted by the Hawaiian Sugar Planters' Association, at a meeting held in Honolulu, on Nov. 21, 1906).

"Resolved, That the Hawaiian Sugar Planters' Association hereby expresses its hearty approval of the policy of setting apart forest reserves, inaugurated and now being prosecuted by the Territorial authorities;

"That it is the opinion of this Association that said policy should be supplemented:

"(1) By providing rangers to guard and protect such reserves from fire, trespassers and depredation;

"(2) By the initiation of systematic reforesting of such portions of said reserves as are not now covered with trees;

"That we hereby petition the Legislature of the Territory to make adequate appropriations for the purposes aforesaid."

FOREST RESERVE PROJECTS.

As I pointed out in my last annual report, the table of forest reserves actually established at any one time is not a true index by which to measure the work accomplished to that date. As this report goes to press there are several projects that need only a little more work to bring them to a head, and so into the list of reserves established.

Na Pali-Kona, Kauai.

The proposed Na Pali-Kona reserve on Kauai is one of these. This proposed reserve embraces the greater part of the mauka portion of the Na Pali and the western end of the Kona Districts on Kauai. It covers an area of 60,040 acres. A large proportion of the reserve is government land under lease for some years to come but 3,980 acres in Na Pali can be now actually set part.

All the section covered by the proposed reserve is under forest cover;most of it is heavily wooded. Both the leased government and the fee simple lands have for some time been maintained as private forest reserves by the lessees or owners, who have driven out the wild cattle or exterminated them.

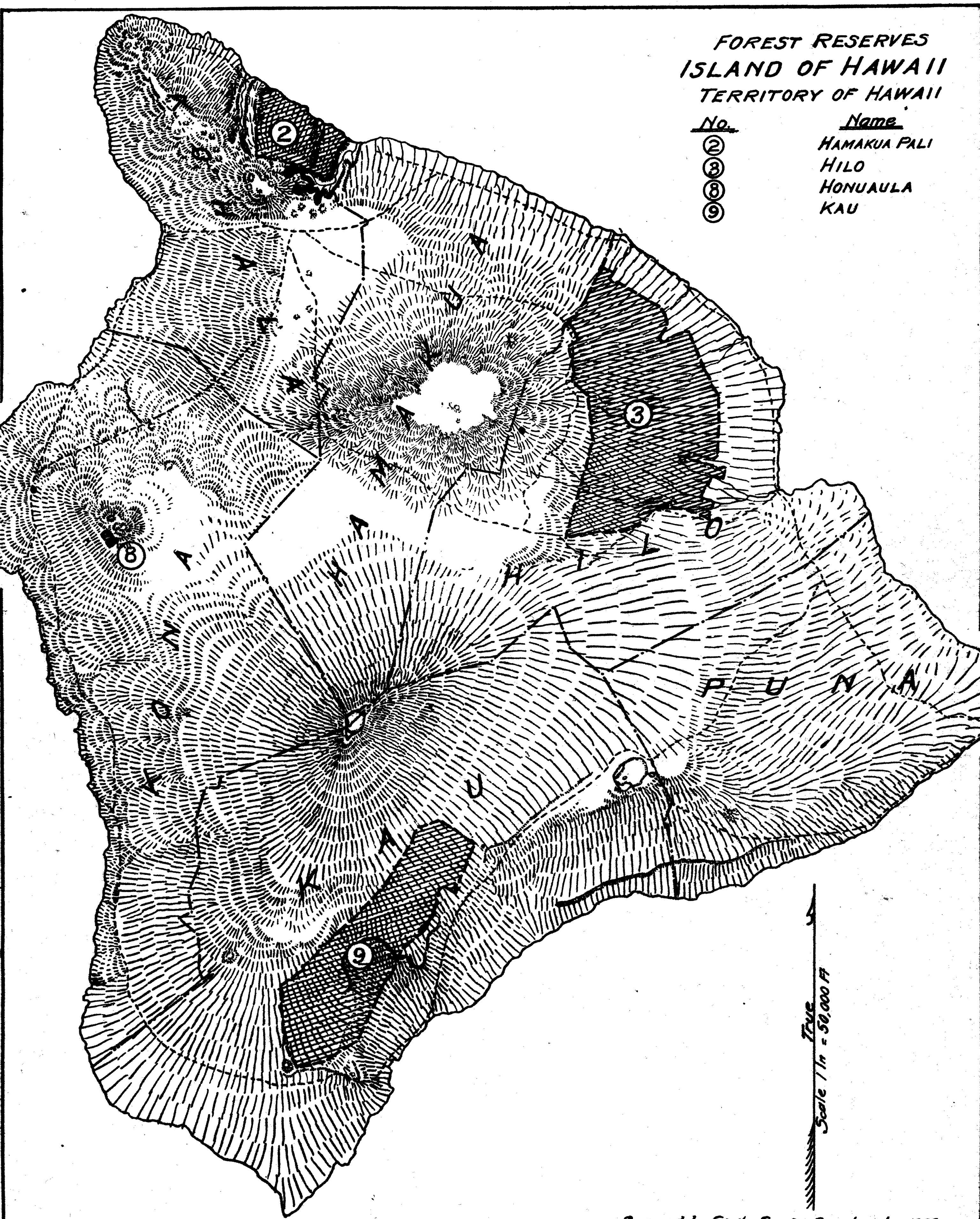
The object of the proposed Na Pali-Kona Reserve is to protect the watersheds of the important streams on the leeward side of Kauai, which from their volume and fall are of very great value in the development of that island. Somewhat used at present for irrigation these streams are capable of being harnessed and made to produce immense quantities of power, as well as being made use of more extensively for irrigation. The project only awaits the completion of my report to be brought before the Board for action.

Other Forest Reserve Projects on Kauai.

From field work done during the past year I am now prepared to report upon a forest line through the Districts of Kona, Puna and Koolau, connecting the existing reserves, above which in my judgment the forest cover ought to be permanently maintained. Surveys are now in progress to define several sections of this boundary. As soon as the descriptions are in hand, reports with recommendations will be submitted to the Board.

Proposed Forest Reserves on Oahu.

Several small reserves are projected on the Waianae Mountains, which when completed will result in the reservation of nearly the whole of the upper part of this range. The proposed Makua-Keaau Reserve only awaits a survey to define its exact


FOREST RESERVES
ISLAND OF HAWAII
TERRITORY OF HAWAII
No.
Name
2
HAMAKUA PALI
3
HILO
8
HONUAULA
9
KAU
HILO
PUNA
True
Scale 1 In = 50,000 Ft
Prepared by Gov't Survey Department 1906

boundaries. The mauka part of Mokuleia is in much the same case, while a survey is now in progress to define the forest boundary on the large private land of Honouliuli.

On the Koolau Mountains arrangements are well under way to extend the existing Ewa Reserve into the Waialua District, and preliminary steps have been taken in regard to reserving the section at the northwest end of the Koolau range.

Maui and Molokai.

Through no lack of interest but because of the press of other work, seemingly of more immediate importance, the status of the forest lands on the West Maui Mountain and on the Island of Molokai has not changed since my last annual report. During 1907 the forest problems in these localities will be studied and the reserve projects brought to the point of action. There is also forest work to be done on the slopes of Mt. Haleakala. This, too, will be taken up during the coming year.

Hawaii.

The Kohala Mountain Reserve project is now the most important reserve work to be done on Hawaii. Progress has been made on this proposed reserve during the year but it still remains for a survey to be made before definite action can be taken on it. The District of Kona has forest problems that claim attention. These it is expected can be taken up early in 1907.

LAND CLASSIFICATION IN RESERVES.

As has already been pointed out the Hawaiian forest reserves contain three classes of land, (1) government land, not leased, (2) government land, leased, and (3) land in private, fee simple ownership. To further elucidate this matter and to make available for ready reference the valuable data contained therein, I append tables showing the several classes of land in each of the established forest reserves. These tables were prepared under the direction of Mr. W. E. Wall, Government Surveyor, by Mr. R. D. King. They are reproduced with Mr. Wall's permission.

TABLE III.

AREAS OF LANDS IN FOREST RESERVES.

(Corrected to December 31, 1906—Prepared by the Survey Department.)

ISLAND OF KAUAI.

Reserve Name	Lease Number	Government Lands Leased Acres	Government Lands Leased Acres	Government Lands Not Leased Acres	Government Lands Not Leased Acres	Private Lands Acres	Private Lands Acres	Total Acres
Halelea Forest Reserve—								
Wainiha (private)						11,050.00		
Lumahai "						8,975.00		
Waipa "						800.00		
Waioli				*2,650.00				
Hanalei				*8,340.00				
Kalihiwai (private)						5,685.00		
					*10,990.00		26,510.00	37,500.00
Kealia Forest Reserve—								
Anahola	44	*4,018.00						
Kamalomalo	514	*1,033.00						

* Government lands set apart by proclamation as forest reserves.

Leased lands marked * are set apart under the two-year limit of expiration of lease clause.

W. R.—Water rights only are leased.

For additional information regarding leased lands see "List of Public Lands," issued by the Land Department.

TABLE III—Continued—ISLAND OF KAUAI.

RESERVE	LEASE	GOVERNMENT LANDS				PRIVATE LANDS		TOTAL
Name	Number	Leased		Not Leased				
		Acres	Acres	Acres	Acres	Acres	Acres	Acres
Kealia Forest Res.—Con.								
Kealia (private)	....	....	....	....	....	2,550.00	....	....
Kapaa	44	*2,334.00	....	....	....	....	....	....
			*7,385.00				2,550.00	9,935.00
Total, Kauai	....	....	*7,385.00	....	*10,990.00	....	29,060.00	47,435.00

TABLE III—Continued—ISLAND OF OAHU.

RESERVE Name	LEASE Number	GOVERNMENT LANDS Leased		Not Leased		PRIVATE LANDS		TOTAL
		Acres	Acres	Acres	Acres	Acres	Acres	Acres
Kaipapau Forest Reserve—								
Kaipapau				*913.00				
					*913.00			913.00
Ewa Forest Reserve—								
Wahiawa	530 (W. R.)			*3,978.00				
Waianae uka (U. S. Army Reservation)	68					4,247.00		
Waipio (private)						5,080.00		
Waiawa "						4,040.00		
Manana "						1,090.00		
Waimano				*790.00				
Waiau (private)						1,320.00		
Waimalu "						2,238.00		
Kalauao "						1,538.00		
Aiea	66A	383.00						
Halawa (private)						3,846.00		
			383.00		*4,768.00		23,399.00	28,550.00

TABLE III—Continued—ISLAND OF OAHU.

Reserve — Name	Lease — Number	Government Lands — Leased		Government Lands — Not Leased		Private Lands		Total
		Acres	Acres	Acres	Acres	Acres	Acres	Acres
Waianae-kai Forest Res.—								
Waianae kai	60	*3,150.00	....	....	....	....	......	....
Waianae kai (grants)	....	....	......	....	....	106.80	....	....
			*3,150.00				106.80	3,256.80
Lualualei Forest Reserve—								
Lualualei	....	......	.....	*3,743.00	....	....	....	....
					*3,743.00			3,743.00
Total, Oahu	....	......	3,533.00	....	*9,424.00	.....	23,505.80	36,462.80

TABLE III—Continued—ISLAND OF MAUI.

Reserve Name	Lease Number	Government Lands Leased Acres	Government Lands Leased Acres	Government Lands Not Leased Acres	Government Lands Not Leased Acres	Private Lands Acres	Private Lands Acres	Total Acres
Koolau-Maui Forest Res.—								
Opana (private), Peahi ", Haiku "						10,899.00		
Halehaku "						1,840.00		
Honopou-W. Makaiwa	475 (W. R.)			*4,800.00				
E. Makaiwa-Keopuka	267B (W. R.)			*1,400.00				
Honomanu	52	2,000.00						
Keanae, Mauka	539	8,750.00						
Wailua, 1 and 2 Mauka	539	1,280.00						
Wailua-Ulaino Forest	538	3,000.00						
" " "	492	900.00		*8,100.00	Lease 520B W. R			
			15,930.00		*14,300.00		12,739.00	42,969.00
Hana Forest Reserve—								
Hana Forest	492	6,330.00		*5,242.00				
W. Honomaele (private)						187.00		
E. Honomaele	474	15.00		*115.00				
Kawela-Kaeleku	474	65.00						
Wakiu	518	3.00		*15.00				
Aleamai (private)						357.00		

TABLE III—Continued—ISLAND OF MAUI.

Reserve	Lease	Government Lands				Private Lands		Total
Name	Number	Leased		Not Leased				
		Acres	Acres	Acres	Acres	Acres	Acres	Acres
Hana Forest Reserve—Con.								
Haneoo (private)						84.00		
Kakio				*700.00				
Waiohonu				*33.00				
Puukai-Papahawahawa				*68.00				
Muolea (private)						430.00		
Koali-Puuhaoa	479B	600.00						
Wailua	583 (W. R.)			*270.00				
Puaaluu				*311.00				
			7,013.00		*6,754.00		1,058.00	14,825.00
Total, Maui			22,943.00		*21,054.00		13,797.00	57,794.00

TABLE III—Continued—ISLAND OF HAWAII.

RESERVE Name of Land	LEASE Number	GOVERNMENT LANDS Leased		Not Leased		PRIVATE LANDS		TOTAL
		Acres	Acres	Acres	Acres	Acres	Acres	Acres
Hamakua Pali Forest Res'r'e								
Laupahoehoe, Nakooka, Apua, Waikapu, Honopue	560 (W.R.)	....	....	*10,533.20	....	....	....	....
Laupahoehoe (private)	....	....	....	....	....	2,350.00	....	....
Waimanu	524	200.00	....	....	....	....	....	....
Waimanu:—kuleanas and homesteads	....	....	....	....	....	256.80	....	....
Waimanu and Muliwai, including the private ili of Kekealani, (unsurv'yed)	....	....	....	*5,600.00	....	....	....	....
			200.00		*16,133.20		2,606.80	18,940.00
Hilo Forest Reserve—								
Humuula	75	3,901.00	....	....	....	....	....	....
Kahoahuna	....	....	....	46.00	....	....	....	....
Waipunalei, (private)	....	....	....	....	....	1,470.00	....	....
Laupahoehoe - Weloka Forest	....	....	....	*11,845.00	....	....	....	....
Maulua, (private)	....	....	....	....	....	7,989.00	....	....

TABLE III--Continued--ISLAND OF HAWAII.

RESERVE	LEASE	GOVERNMENT LANDS				PRIVATE LANDS		TOTAL
		Leased		Not Leased				
Name	Number	Acres	Acres	Acres	Acres	Acres	Acres	Acres
Hilo Forest Reserve—Con.								
Waikaumalo—Maulua				790.00				
Piha	442	3,780.00						
Nanue (private)						145.00		
Honohina (private)						5,555.00		
Opea-Peleau				230.00				
Umauma (private)						1,561.00		
Kamaee-Wailua				930.00				
Hakalau (private)						9,826.00		
Wailea-Kaiwiki				3,834.00				
Honomu-Kuhua Forest				*926.00				
Makahanaloa (private)						3,949.00		
Onomea "						773.00		
Kahalii "						183.00		
Papaikou "						10,269.00		
Pahoehoe "						176.00		
Paukaa "						6,221.00		
Kikala "						90.00		
Kalalau "						918.00		
Puueo (private)						436.00		

TABLE III—Continued—ISLAND OF HAWAII.

Reserve Name	Lease Number	Government Lands Leased Acres	Government Lands Leased Acres	Government Lands Not Leased Acres	Government Lands Not Leased Acres	Private Lands Acres	Private Lands Acres	Total Acres
Hilo Forest Reserve—Con.								
Piihonua	103	33,941.00						
Punahoa (private)						216.00		
		———	41,622.00	———	18,601.00	———	49,777.00	110,000.00
Honuaula Forest Reserve—								
Honuaula				*665.00				
				———	*665.00			665.00
Kau Forest Reserve—								
Puumakaa–Kiolakaa Forest	550	5,750.00						
Waiohinu	151	10,740.00						
Kahilipalinui (private)						165.00		
Kawala–Kaunamano				*380.00				
Kioloku				*216.00				
Hionaa–Hokukano Mauka				*345.00				
Kaalaiki Forest				*10,705.00				
Hilea-nui (private)						2,620.00		
Hilea-iki "						37.00		
Ninole–Wailau Forest				*5,680.00				
Punaluu (private)						1,275.00		

TABLE III—Concluded—ISLAND OF HAWAII.

Reserve	Lease	Government Lands				Private Lands		Total
		Leased		Not Leased				
Name	Number	Acres	Acres	Acres	Acres	Acres	Acres	Acres
Kau Forest Reserve—Con.								
Mohokea, 1 and 2	454	*1,875.86						
Moaula-Kopu-Makaka, Mauka	578	46.40		*7,379.74				
Paauau 2 (private)						1,675.00		
Kaauhuhuula Forest				*2,332.00				
Keaiwa (private)						460.00		
Kaalaala-Makakupu Forest	555	7,122.00						
Kapapala	106	*7,046.00						
			32,580.26		*27,037.74		6,232.00	65,850.00
Total, Hawaii			74,402.26		62,436.94		58,615.80	195,455.00

* Government lands set apart by proclamation as forest reserves.
Leased lands marked * are set apart under the two-year limit of expiration of lease clause..
W. R.—Water rights only are leased.
For additional information regarding leased lands see "List of Public Lands," issued by the Land Department.

TABLE IV.

AREAS OF LANDS IN FOREST RESERVES.

(Corrected to December 31, 1906.)

Prepared by the Survey Department.

SUMMARY.

RECAPITULATION
BY ISLANDS

ISLAND OF KAUAI.

	Acres	Acres
Halelea Forest Reserve:		
Government Lands, not Leased	10,990.00	
Private Lands	26,510.00	
		37,500.00
Kealia Forest Reserve:		
Government Lands, Leased	7,385.00	
Private Lands	2,550.00	
		9,935.00
Total		47,435.00

ISLAND OF OAHU.

Kaipapau Forest Reserve:		
Government Lands, not Leased ...	913.00	
		913.00
Ewa Forest Reserve:		
Government Lands, Leased	383.00	
Government Lands, not Leased	4,768.00	
Private Lands	23,399.00	
		28,550.00
Waianae-kai Forest Reserve:		
Government Lands, Leased	3,150.00	
Private Lands	106.80	
		3,256.80
Lualualei Forest Reserve:		
Government Lands, not Leased	3,743.00	
		3,743.00
Total		36,462.80

ISLAND OF MAUI.

Koolau Forest Reserve:		
Government Lands, Leased	15,930.00	
Government Lands, not Leased	14,300.00	
Private Lands	12,739.00	
		42,969.00
Hana Forest Reserve:		
Government Lands, Leased	7,013.00	
Government Lands, not Leased	6,754.00	
Private Lands	1,058.00	
		14,825.00
Total		57,794.00

ISLAND OF HAWAII.

Hamakua Pali Forest Reserve:		
Government Lands, Leased	200.00	
Government Lands, not Leased	16,133.20	
Private Lands	2,606.80	
		18,940.00
Hilo Forest Reserve:		
Government Lands, Leased	41,622.00	
Government Lands, not Leased	18,601.00	
Private Lands	49,777.00	
		110,000.00
Honuaula Forest Reserve:		
Government Lands, not Leased	665.00	
		665.00
Kau Forest Reserve:		
Government Lands, Leased	32,580.26	
Government Lands, not Leased	27,037.74	
Private Lands	6,232.00	
		65,850.00
Total		195,455.00

GRAND SUMMARY

BY ISLANDS

	Acres	Acres
Island of Kauai—		
Leased	7,385.00	
Not Leased	10,990.00	
Private	29,060.00	
		47,435.00
Island of Oahu—		
Leased	3,533.00	
Not Leased	9,424.00	
Private	23,505.80	
		36,462.80
Island of Maui—		
Leased	22,943.00	
Not Leased	21,054.00	
Private	13,797.00	
		57,794.00
Island of Hawaii—		
Leased	74,402.26	
Not Leased	62,436.94	
Private	58,615.80	
		195,455.00
		337,146.80

BY CLASSES OF LAND

Islands	Government Lands		Private Lands
	Leased	Not Leas'd	
	Acres	Acres	Acres
Kauai	7,385.00	10,990;00	29,060.00
Oahu	3,533.00	9,424.00	23,505.80
Maui	22,943.00	21,054.00	13,797.00
Hawaii	74,402.26	62,436.94	58,615.80
	108,263.26	103,904.94	124,978.60
		337,146.80	

Acknowledgment.

Apropos of these tables I would this year again express my appreciation of the assistance given this Department by the Survey Office. Mr. Wall has taken an active interest in the forest reserves and in detailing members of his staff, particularly Messrs. F. E. Harvey, G. F. Wright and R. D. King, to do forest work, has enabled me to bring to completion several projects that would otherwise have been delayed into 1907.

Proposed Amendment of Forest Law.

As was pointed out at some length in the 1905 report the forest laws should be so amended as to permit the Governor to set apart all government lands within the boundaries of established forest reserves, whether or not they are under lease; it being provided in the case of leased lands that the reservation be subject to the terms of the lease and not effective until the expiration thereof. Such an amendment would materially strengthen the forest reserve policy.

FOREST RESERVE MONUMENTS.

To properly and permanently mark the main points along the forest reserve boundaries, metallic forest reserve monuments have been manufactured, consisting of two galvanized iron pipes, each 4½ feet long, and respectively 2½ and 3 inches in diameter. The smaller pipe is set in the ground, the larger fitting over it and held in place by a bolt secured by a brass railway switch padlock. The upper pipe carries a metal target with the letters F. R. T. H. (Forest Reserve, Territory of Hawaii). When set in place the monument is given a coat of white enamel paint. The upper pipe being detachable permits the use of the point as a station in survey work.

During 1906 sixty-nine forest reserve monuments were erected on the boundaries of eight forest reserves. Distributed by islands, the list of monuments is as follows: Kauai 29, Oahu 17, Hawaii 23.

FOREST EXTENSION.

The second main branch of the work of the Division of Forestry is Forest Extension. This includes the cooperative assistance that the Division is prepared to render persons desiring to establish forest plantations or to conduct their forest work in accordance with the methods of forestry, and also the introduction and distribution of exotic and other seeds and plants of value to the Territory.

This Section is under the direct charge of Mr. David Haughs, Forest Nurseryman, whose own report should be consulted for the details of the work. Briefly summarized the accomplishments of the past year are as follows:

COOPERATIVE ASSISTANCE.

Under the terms of Circular No. 1 of the Division of Forestry, issued in December, 1905, thirty-nine applications in all have been received for advice and assistance in forest planting. In answer to the more important of these requests Mr. Haughs has made five trips during the year to the other islands and three to points on Oahu, during which he has visited and examined nineteen tracts. In most cases the suggestions made verbally while going over the ground have been followed by a written report or by a detailed planting plan. Fourteen such reports have been prepared during 1906. Besides the applications for advice regarding large tracts, twenty persons in and around Honolulu have been given assistance of one sort or another in forest or nursery work, and a considerable number more have received information by letter, or in person during visits to the Nursery.

One of the most encouraging features of this work is the attitude taken by some of the large corporations. In undertaking forest planting these companies show a commendable foresight which will surely bring returns in later years, when the wood supply becomes an even more important factor than it is today.

In making the examinations the attempt is made so far as possible, to arrange that applicants in one part of the Territory shall be visited during one trip; in this way both time and expense are saved. On his trips to the other islands, Mr. Haughs has been able to gather much valuable information in regard to the success or failure of forest plantations started in former years. The systematic collection of data of this character is of great importance, for when properly put together and published they give a definite basis on which to rest present forest work.

Properly included under this general head is a trip to Hawaii made by me in October to discuss on the ground with the manager of the company plans for logging the Koa timber on the Bishop Estate Tract of Keauhou, in Kau. This trip occupied ten days. On my return I appeared before the directors of the Hawaiian Mahogany Lumber Company and made a verbal report, approving the plan of operations outlined by Mr. E. H. Cant, the manager. The statement there made was also furnished Mr. Cant, in the form of a letter.

In reply to an application from the same company for a report upon the Koa in the Kona District on Hawaii, a report outlining the general policy of the Division of Forestry in regard to lumbering in Hawaii was prepared early in September. This report, approved by the Board, appeared in the Hawaiian Forester and Agriculturist for November, 1906.

Press Bulletins.

As an aid to tree planters, there was published in November, 1906, a four-page press bulletin by Mr. Haughs (Press Bulletin No. 4 of the Division of Forestry) entitled "Instructions for Propagating and Planting Forest Trees." This leaflet describes in a concise way the methods which should be followed in the nursery and in the field to secure success in tree planting.

Earlier in the year, in February, a "Revised List of the Forest and Ornamental Tree Seed for Sale at the Government Nursery" was issued as Press Bulletin No. 3 of the Division of Forestry. Both these are intended to be used with, and to supplement Circular No. 1, the "Offer of Practical Assistance to Tree Planters."

COLLECTION, SALE AND DISTRIBUTION OF SEED AND PLANTS.

The past year has also seen an advance in the matter of seed collection and distribution. The local work has been further systematized so that now seed of all the more important native and introduced trees is collected as it becomes ripe and kept on sale at very moderate prices. Whenever possible it is the intention to collect seed from Hawaiian grown trees rather than to import it, thus at once securing fresh seed and profiting by any advantage that may come from acclimatization. But unfortunately not all of the introduced trees are yet in bearing, nor do all those that are, produce seed regularly. In such cases it is the aim of the Division to import and keep on hand enough seed to satisfy the probable demand.

In the introduction of seed of new or little known exotic plants the present year has seen a marked development, not so much in actual receipts as in the perfection of arrangements to exchange with botanic gardens and other similar institutions in various parts of the world, especially in the tropics. Collections of native Hawaiian seeds made for the Division of Forestry have been sent to a number of these institutions, in return for which it is expected that valuable additions to the stock will be received.

As has been pointed out in earlier reports the introduction of new trees is one of the most important lines of work to be taken up in the Territory. It is capable of almost unlimited expansion and later should be given a prominent place in the activities of the Division. For the present it is believed that the greatest amount of good to the Territory will result from following up the offer of cooperative assistance. Later, the Division of Forestry can well leave the planting of private lands wholly to the private owner and devote its attention to more technical forest work.

Free Distribution of Seed and Plants.

The sale of seed and plants from the Government Nursery resulted during 1907 in the realization of $291.28. This sum was turned into the General Treasury of the Territory.

Free distribution of seed and especially of plants to schools and to improvement clubs has been continued. For Arbor Day, November 2nd, 1906, 2,580 plants were distributed. During the remainder of the year 7,177 more plants were given to homesteaders, improvement clubs, schools and others; in all a total of 9,757 plants given gratis.

RUBBER EXPERIMENTS.

The wording of the item appropriating money for the current expenses of the Board of Agriculture and Forestry for the present fiscal period makes mandatory "experimenting in growing rubber trees on government forest lands."

In compliance with this law and in response to a general demand for such information, the Division of Forestry has undertaken three kinds of rubber experiments: (1) A systematic trial of Ceara Rubber (*Manihot glaziovii*) in various localities throughout the Territory to ascertain definitely where this species will and will not grow; (2) The importation of seed or seedlings of other rubber producing trees, followed by propagation and distribution; and (3) Systematic experiments in tapping rubber trees that have reached sufficient size to be so treated.

In the Ceara experiment sample lots, usually of 25 seed each, were sent to ninety-four persons, who agreed to report from time to time upon the growth of the trees and other facts of interest. In a few cases where exceptionally favorable conditions for the experiment obtained larger quantities were given. In reply to a card of inquiry, figures are now being received showing the height and diameter which the trees have attained in six months. These figures will be tabulated and soon published in the form of a circular.

After several unsuccessful attempts to secure seed or plants of the Para and Central American species (*Hevea brasiliensis*) and (*Castilla lactiflua*) respectively, plants of both kinds are now being propagated at the Government Nursery. These will eventually be placed in various situations where they can be watched and noted. The Castilla seed was purchased in Ceylon through Mr. Jared G. Smith. The Para plants are from a consignment of stumps that arrived at this port in such poor condition that the consignees refused to accept it. The plants were accordingly put up at auction by the Customs officials. They were bid in by Mr. Alexander Craw, Superintendent of Entomology, who turned them over to this Division. Although in very unpromising condition when received, by careful attention many have been saved and are now doing well.

The most important question in connection with the rubber industry in Hawaii is whether or not the trees will yield rubber in commercial quantities. This is, of course, the vital point in the whole matter and until it is demonstrated one way or the other, the industry must remain in the experimental stage. In connection with the investigation of the planted forest at Lihue, made during the past summer by the Division of Forestry, the attention of the public was brought to two groves of Ceara Rubber trees of sufficient size to tap. Arrangements were at once made for careful experiments to determine the yield of these trees. These experiments will soon be begun and will be carried on under the joint direction of this Division and the Federal Agricultural Experiment Station, as that office has a man available to conduct the experiment and this Board has not. The results of this work will be made public as soon as enough definite information is obtained to warrant publication.

The Ceara groves at Lihue are the only ones in the Territory where enough trees of the necessary age and size are to be found to make the results of value. Each grove contains about fifty trees large enough to tap.

NUUANU VALLEY.

The work of the Division of Forestry in Nuuanu Valley during 1906 as for two preceding years, has consisted in caring for the forest plantations already established rather than in planting more trees. It is gratifying to note that the care that has been given the young trees is now bearing fruit in their sturdy appearance and thrifty habit. Especially is this seen in the lower part of the plantation, but even where more exposed to the wind the trees are now making a satisfactory growth. Two laborers are kept at the Forester's cottage to look after the Nuuanu work. This arrangement will be continued during the coming year.

TANTALUS FOREST.

The most notable feature of the past year in connection with Tantalus is the greater protection that has been afforded both the planted forest and the native growth higher up by the forest ranger who, since March, has made a daily round of the section. Owing to the occurrence of several small forest fires on Tantalus early in the year, a period of special fire danger for the Tantalus District was declared under date of February 8, and since then permits have been required for the burning of brush. In each case where a permit is given the ranger personally supervises the burning and sees that it is done properly. In a report upon his district the local fire warden, Mr. W. M. Giffard, says:

"I consider that the absence of forest fires in the Tantalus section and its immediate neighborhood during the excessively dry period we have had, is due to the regulations established by the Commissioners of Forestry, whereby a forest police ranger was appointed and the numerous lot owners in the residential section of Tantalus were requested to secure permits from the District Fire Warden before they were allowed to burn off brush on their premises. The Forest Police Ranger has faithfully attended to the carrying out of the regulations, and as no two permits were ever granted for the same day, he has been able to personally supervise the burning of rubbish and brush for which permits were applied. The carelessness of the overseers in charge of these premises in the past in allowing a burning pile of brush, etc., to take care of itself, while they either left the premises or attended to other work, was the cause of practically all of the fires which have occurred on Tantalus in recent years. The presence of the Forest Police Ranger has a salutary effect on these overseers, all of whom are Japanese, for they are now compelled to stay by the burning piles of brush so long as any fire remains.

"During the period named, the District Fire Warden has issued thirty-one permits to the property owners in the district for the burning of brush fires. The Ranger reports that there has been only one infingement of the regulations since these were established, which would tend to show that the property owners in this district are, as a whole, inclined to coöperate with the Department.

"In addition to his daily duties of policing the forest section of Tantalus and Makiki, the Forest Ranger has cut several miles of trails through the thickest of forest undergrowth, in order to allow access to the upper ranges in case of fires starting there during dry weather. He has furthermore protected from destruction much undergrowth and many young trees which in the past have been, to a very great extent, ruthlessly destroyed by pleasure seekers."

The acquisition by the Territory of the Coney Estate property on Tantalus, on which is the larger part of the Eucalyptus forest, has not yet taken place, but during the year some progress has been made looking thereto. It is earnestly to be hoped that by an equitable exchange this tract can be secured by the Government.

MISCELLANEOUS FOREST WORK.

With an increased appropriation and a large staff the Division of Forestry could undertake much work of benefit to the Territory which can now be given only aggravatingly scant attention.

But even under the present conditions there are gradually being accumulated materials for the collections needed for reference or that illustrate the forest work. Additions to the herbarium, to the reference collection of native and exotic seed, and to the forest photographs have been made during the year, and more notes have been taken on the times and duration of the period during which the important trees and shrubs are in flower and fruit.

INVESTIGATION OF THE PLANTED FOREST AT LIHUE.

Perhaps the most important thing to be recorded under the head of miscellaneous forest work is the investigation of the planted forest at Lihue, Kauai, undertaken during the summer of 1906, under the immediate charge of Mr. Charles S. Judd, of Honolulu, a senior in the Yale Forest School, who was appointed Special Forest Agent in the Division of Forestry for a temporary period of two months and a half (July 23 to September 30). The investigation consisted in the careful measurement of the trees on sample plots in the various types of planted forest on the lands of the Lihue Plantation

Company and of Grove Farm. From the data collected can be compiled tables of volume and yield—which based on what this forest has produced, may be used in computing what may be expected from other plantations of the same species grown under similar conditions.

The results of the investigation will appear as a bulletin of the Division of Forestry. This is now being prepared.

PUBLICATIONS.

One of the ways in which the Division of Forestry makes its work of value to the Territory is by issuing publications dealing with various phases of forestry in the islands.

The list of publications of the Division of Forestry issued during 1906 is a short one, the preparation of several circulars which it was expected could be published during the year having been unavoidably delayed. It is as follows:

Press Bulletin No. 3. A "Revised List of the Forest and Ornamental Tree Seed for Sale at the Government Nursery," 4 pp. Issued February, 1906. (1,500 copies.)

Press Bulletin No. 4. "Instructions for Propagating and Planting Forest Trees," by David Haughs. 4 pp. Issued November, 1906. (1,000 copies.)

Report of the Division of Forestry for the year ending December 31, 1905. (Reprinted from the Second Report of the Board of Commissioners of Agriculture and Forestry.) Issued Novmber, 1906. (500 copies.)

REPORTS AND OCCASIONAL PAPERS.

During 1906 routine reports outlining the work of the Division of Forestry have been submitted at each regular meeting of the Board. These are subsequently published in the Hawaiian Forester and Agriculturist. The Forest Nurseryman has also submitted weekly reports covering in more detail what has taken place in his section.

Special reports and papers on forestry in Hawaii have, by request, been prepared by the Superintendent of Forestry for publication in the annual report of the Governor to the Secretary of the Interior, and for delivery before the Honolulu High School on Arbor Day, and before the Hawaiian Sugar Planters' Association at its annual meeting.

An address on "Some Forest Problems in Hawaii" was delivered by the Superintendent of Forestry, in Washington, D. C., in April, before the national organization of professional foresters, The Society of American Foresters.

EXHIBIT AT THE POULTRY SHOW.

On December 20 to 22 the Hawaiian Poultry Association held its annual exhibition in Honolulu, this year with the coöperation of the Farmers' Institute and the Board of Agriculture and Forestry.

The exhibit made by the Division of Forestry attracted a due share of attention and elicited considerable favorable comment. It consisted of a series of maps and charts showing the location and area of the established forest reserves; a collection of seed and seedlings of forest trees and other plants, illustrating the methods in use at the Government Nursery; examples of the forest fire and other warning notices, printed on cloth for posting along the forest reserve boundaries and elsewhere in the Territory; and a forest reserve boundary monument, used to mark the important points on the reserve lines. A case containing the publications of the Board also formed a part of the exhibit and packages of various circulars and press bulletins of the several divisions were left in trays for free distribution.

The space allotted to the Division consisted of a four-foot wide table about thirty-five feet in length, with a wall space behind, corresponding in length to the table.

The maps used in the exhibit were especially prepared for the purpose by the Government Survey Office. They were based on the maps made to accompany the report of the Governor to the Secretary of the Interior, for the year ending June 30, 1906. The maps and charts are now hung in the office of the Board.

DISTRICT FORESTERS.

During 1906 the following changes have taken place in the personnel of the corps of District Foresters:

Resignations.

Resignations have been received from Messrs. F. W. Carter of South Kohala, Hawaii, and G. C. Munro of Molokai, because of change of residence; and from Mr. C. Bolte of Koolaupoko, Oahu, because through change of ownership he was no longer directly interested in that section.

Appointments.

To succeed those resigning the following gentlemen were appointed: Mr. E. E. Conant to succeed Mr. Carter; Mr. James Munro to succeed his brother, and Mr. W. C. Weedon to succeed Mr. Bolte. Mr. T. S. Kay was also appointed, in February, to the position left vacant by the resignation of Mr. E. E. Olding of Kohala, in the latter part of 1905.

The new appointments are as follows: *Kauai*, Messrs. A. F. Knudsen, Walter D. McBryde and Edward Broadbent; *Molokai*, east end, Mr. C. C. Conradt; *Maui*, Mr. C. J. Austin.

In each case but one the new appointees have districts resulting from the breaking up of larger ones. This has, of course, necessitated a change of boundaries with other district foresters than those named. On another page of this report will be found a corrected list of all the district foresters, with their respective jurisdictions. The list numbers forty names.

Interesting reports have been received from a majority of the district foresters. These are printed elsewhere in this volume.

FOREST FIRE SERVICE.

Fortunately the past year has been relatively free from forest fires and those that have occurred have been checked in season to prevent any great damage. The freedom from fire is without question due in part, if not in large part, to the forest fire law enacted by the Legislature of 1905. The knowledge that there existed a law providing penalties for damage resulting from the careless use of fire, behind which stood a branch of the Government, represented locally by the district fire wardens, ready to see that the law was enforced has had unquestionably a salutary influence on the class of persons to whose doors forest fires can usually be traced.

In connection with this statement the following resolution, adopted by the Board of Agriculture and Forestry on March 22, 1906, may be cited:

"Resolved, that the Superintendent of Forestry be, and he is hereby instructed, without further action by the Board, upon each occasion when brush or forest fires take place, to make investigations, either in person or through the local fire wardens, as to the origin of each such fire; and if in any case the facts appear to warrant further investigation or prosecution, to request the assistance of the appropriate police authorities and prosecuting attorneys to secure evidence and prosecute the persons found responsible for such fires."

PERIOD OF SPECIAL FIRE DANGER.

As a result of the prolonged dry weather early in the year advantage was taken in three cases of the section of the Forest Fire Law (Section 6, Act 71 of the Sessions Laws of 1905), which provides that in times or localities of particular fire danger a special warning may be issued, that during a specified time fires to burn brush, etc., shall not be started unless the written permission of the District Fire Warden shall have been first obtained. Acting under this authority the Chief Fire Warden issued special warnings as follows:

For a portion of the Waialua District, Island of Oahu, for a period of six months from March 7, 1906;

For a portion of the Ewa District, Island of Oahu, for a period of six months from March 17, 1906; and

For a portion of the Waianae District, Island of Oahu, for a period of six months from March 23, 1906.

There was also issued on February 8, 1906, for the period of 12 months, a special warning covering the section between Manoa and Pauoa Valleys in the District of Kona, on Oahu. This includes Tantalus Heights and the planted forest below.

Permits to burn brush under these special warnings were isued as follows: Waialua none; Ewa, one; Waianae, none; and Tantalus, to November 30, 1906, thirty-one.

Special warning notices in English, Hawaiian, Portuguese and Japanese were printed on cloth and posted in each of these four districts, calling attention to the period of special danger. The regular fire warning notices have been kept in evidence throughout the Territory.

RECORD OF THE YEAR'S FIRES.

In answer to a letter from the Chief Fire Warden requesting data in relation to forest fires from January 1 to November 30, 1906, letters have been received from 37 out of the 50 district fire wardens.

From the information so received and from data already in the office the following list has been prepared ,which is believed to be a practically complete record of the forest fires of 1906, certainly of all the important ones. Twenty-five fires are recorded in the list.

February 5, Tantalus Heights, Kona, Oahu.

Grass fire, 3 to 5 acres. Started from a fire for burning brush on the lot owned by Hon. C. H. Dickey. Stopped just before it got to the edge of the forest. Fifteen men called out. The men from the Government Nursery were paid $6.00 by the Board. The rest were paid by Senator Dickey.

February 13, Tantalus Heights, Kona, Oahu.

Heavy smoke from several piles of burning brush on the property of Mr. T. Clive Davies made it appear from town that a big fire had started on Tantalus. A force of 22 men was accordingly sent up to fight it. No damage, except loss of time and expense of the men called out. This fire cost the Board $9.50.

March 3, Grant 973, Waialua, Oahu.

Grass fire, 25 acres. Probably set to burn off dead grass and improve pasture. Put out by a Waialua Agricultural Company luna and three laborers. No damage was done, but says the District Fire Warden, "Had the fire got half an hour's' better start I believe it would have been as disastrous as the Wahiawa fire of March, 1905."

March 7, Paauhau, Hamakua, Hawaii.

Brush and grass fire in open and largely burned over forest. on land owned by the Parker Ranch. About 1,000 acres. This fire was started by sparks carried by a sudden and severe Kona wind storm from brush fires for burning German ivy. The clearing of ivy had been going on for four months under proper precautions and except for the sudden wind there would have been no danger. A large gang of men was at once set to work and aided by rains checked the fire and the next day had it under control. Paauhau Sugar Plantation had 300 men at work for one day protecting the upper cane fields from the fire beside others who assisted the Parker Ranch gang in keeping the fire within certain bounds.

As most of the area burned over had been severely injured by previous fires the direct loss from this fire was mainly the expense for labor. This fell on the Parker Ranch and on the Paauhau Sugar Plantation Company. The expense to the latter is estimated at $250.00.

March 7, Pakua Hill, Hilea, Kau, Hawaii.

On the night of March 7, a fire burned off the forest on the top of the Pakua Mauka Hill and also 23 acres of cane on Makanau Hill, directly makai. The fire is supposed to have started from the house of a Chinese taro planter. The plantation called out a force of 473 men to extinguish this fire, at a cost of $376.05. Hard work got it out about noon on March 8. The District Fire Warden says, "It was only by great and repeated efforts that the flames were prevented from escaping into the Ninole and Kaalaiki hills, from whence they would have spread over the whole mountain side, as the woods had been dry as tinder for weeks."

March 7, Puu Oo, Piihonua, Hilo, Hawaii.

On the morning of March 7, two fires were discovered on Mr. W. H. Shipman's ranch; one about half a mile below the Puu Oo house, the other about two miles away toward Halealoha. The ranch men at once started out to fight the fire, but the strong Kona wind hindered the work and the two fires met near Mr. Shipman's line fence and burned over a considerable area; just how much is not stated. As the country burned over was mainly outside the heavy forest the damage was comparatively slight, but the cost of replacing the fences burnt amounted to about $1,000. Certain signs pointed to this fire being of incendiary origin, but no definite evidence could be secured.

March 7, Punahawai, Hilo, Hawaii.

Brush and grass fire, escaped during the Kona storm from a homesteader clearing land. One hundred and twenty five acres of pasture land owned by the Hilo Sugar Company were burned over. There was no particular damage, as the 40 men called out soon had the fire under control.

March 7, Kukuau 2nd, Hilo, Hawaii.

Brush fire on homestead lot. Burned for two nights and one day, but was controlled without damage to other property.

March 8, Kamae Homesteads, Hilo, Hawaii.

What might easily have been a disastrous forest fire was prevented by the prompt action of the Hakalau Plantation in stopping a fire that started from fires to clear land on the Kamae Homesteads at the time of the Kona storm. Three hundred men were called out and worked for one day, while for two days longer 30 men remained on duty until the fire was entirely extinguished. The expenses incurred in fighting this fire were paid by the Hakalau Plantation Company.

March 9, Hilo District, Hawaii.

Messrs. W. G. Irwin & Company, under the date of March 19, reported that in addition to the fires recorded on March 7, 8 and 9, "several of our managers have reported fires on Waiakea, Onomea and Honomu. On the dates named at the latter place, as in most of the others, the cause was the homesteaders clearing and burning brush without apparently using any discretion as to conditions of weather or prevailing winds." These fires could not have been important as the District Fire Warden for the Onomea section, Mr. J. T. Moir, says that he has no fires to report during the year.

March 11, Palolo Valley, Kona, Oahu.

A grass fire of about 5 acres, on homestead lot No. 16, owned by Mr. Edward Stone, started by children playing with matches in the dry grass. Mr. Stone, assisted by Mr. Charles Hau, owner of a neighboring lot, began to fight the fire as soon as discovered. Soon after, Mr. Haughs arrived on the scene with one man from the Nursery and eleven from the Road Board. After a hard fight of four hours the fire was stopped before it reached the forest. The wages of the laborers at this fire amounted to $25.00; this was paid by the Board.

March 12, Waiakea, Puna, Hawaii.

Grass fire on Waiakea near the beach; about 75 acres burned. Went out as the wind died down; no damage.

March 18, Honokua, Kona, Hawaii.

Forest fire of about 75 acres on the privately owned land of Honokua, at an elevation of about 5,800 feet. The forest was scrubby Koa and Ohia and the damage was regarded as nominal. The fire burned for about ten days and was finally put out by rains. Cause, unknown.

March 30, Nuuanu Valley, Kona, Oahu.

Mr. Haughs, with four laborers from the Nursery, answered a fire call that proved to be a fire in the dwelling house occupied by Mr. W. C. Kapulani. From the appearance of the smoke it looked as if the fire were further up the valley, in the forest.

May 20, Hanalei, Halelea, Kauai.

A small grass fire started by some Chinamen burning rice straw was spreading rapidly toward the forest when put out by a heavy shower. No damage.

July 24, Nuuanu Valley, Kona, Oahu.

A brush fire on the slopes below Pacific Heights was successfully fought and extinguished on the evening of July 24 by Mr. Haughs and three laborers. The area burned over was covered by guava, lantana and grass. No clue could be found regarding the origin of this fire. The cost to the Board of fighting it was $4.00.

August 2, Wahiawa, Waialua, Oahu.

Grass fire of about 2 acres; cause unknown, but thought to be due either to cattlemen or to Japanese charcoal burners. Put out by Mr. A. Anderson and five men employed by the Wahiawa Water Company—the same luna who put out the fire in March on neighboring lands. No damage.

August 12, Halemanu, Waimea, Kona, Kauai.

Grass and brush fire, 4 acres. Started from sparks from a smouldering stump, in a fire to clear land. Stopped by residents and laborers from near-by mountain camps before any serious damage had resulted.

August 16, Country Club, Nuuanu Valley, Kona, Oahu.

A brush and grass fire that might have assumed serious proportions occurred on the hill side above the Country Club on the afternoon of August 16, starting from piles of burning brush left unwatched. The fire was put out by a gang of seven men from the Government Nursery, assisted, when the fire was almost out, by a gang of 20 men from the Road Department. The expense thus incurred, $57.50, was borne by the Country Club.

August, Waimea, Kona, Kauai.

Two grass fires occurred in August on the western side of the Waimea Valley, started by sparks from blasting on the new Waimea ditch. They were put out without any particular damage being done.

September 9, Olomano, Koolaupoko, Oahu.

Brush fire, of about 500 acres, supposed to have been started from a cigar stub or cigarette dropped by some unknown person into dry grass. The fire was stopped by a gang of 14 men from the Maunawili Ranch, under the direction of the local fire warden, Mr. John Herd. The men worked for 6 hours. The cost, $21.00, was borne by the ranch. Fortunately the fire was stopped before it got to the forest, so that the loss of a number of fence posts was the most serious damage. Mr. Herd says, "Had not the laboring force of the Maunawili Ranch been available this fire might have extended itself into the Kailua watershed and the upper Waimanalo cane fields."

September, Waiohinu, Kau, Hawaii.

A brush fire of about 40 acres occurred in the fern growth near the edge of the forest on Waiohinu. Supposed to have been caused by some careless smoker. About 20 men turned out from Waiohinu and Naalehu and worked for a couple of hours to put it out. They received no pay, so far as the local fire warden knows.

October, Wahiawa, Waialua, Oahu.

A brush and grass fire of a few acres, supposed to have been started by a careless smoker, occurred in the gulch at Wahiawa, back of the settlement, early in October. It was put out by Mr. B. O. Clark, with six other men from the Colony and two Japanese. Stopped before any particular damage was done.

December, Kawaihae, N. Kohala, Hawaii.

A brush and grass fire was reported on the grazing land of Kawaihae 1, cause unknown. Put out by Parker Ranch employees.

December, Puna, Hawaii.

Several grass fires are reported as having occurred during the year on grazing lands in Puna. The damage appears to have been slight.

From the above statements it will be seen that in a number of cases only prompt and determined action prevented an incipient fire from spreading over considerable areas of forest and doing much damage. If of value in no other way the forest fire law has brought home to many persons the fact that a forest fire is a danger not to be lightly disregarded, in itself an important step toward the awakening of an intelligent public sentiment. The reports of the fire wardens show, too, that the men who hold the position are not merely nominal appointees, but active agents in seeing that the law is enforced.

What the Fire Wardens Say.

The following extracts from the letters of certain of the fire wardens are quoted because the points brought out are of general interest in connection with this subject.

Mr. Walter F. Dillingham, Ewa, Oahu.

"In view of the fact that during the prescribed fire danger period there were no forest fires in this district, I am led to believe that the regulations in regard to the matter have worked satisfactorily."

Mr. A. Horner, Hamakua, Hawaii.

"I am pleased to be able to report no forest fires in this district the past year. * * * Since the experience with the fires of 1901 the homesteaders have been very careful when burning off. You will likely remember that all fires in 1901 originated in the homesteads."

Mr. James Gibb, Hamakua, Hawaii.

"Considering that five months of the present year have been very dry, we think this district has been very fortunate in having but one fire. We are inclined to think that the vigilance now maintained over the forests of the Territory by the Board of Agriculture and Forestry has made the people in general more careful with fire."

Mr. G. W. McDougall, South Kona, Hawaii.

"If it is the intention of the Government to keep the forest from being destroyed by fire, there will have to be an appropriation for this work, and each fire warden ought to be authorized and allowed to spend fifty or a hundred dollars, to fight fire, at very start of same, i. e. if on government land. By this mode large areas and large expenses can be cut out from being injured, and spent."

POLICY IN REGARD TO FIRE CLAIMS.

Significant action was taken in three cases where bills for expense incurred in fighting forest fires were referred to the Board of Agriculture and Forestry for payment, in that a precedent was thereby established, which will guide future cases. It is the judgment of the Board, expressed at a meeting held on March 22, 1906, "that owners or lessees of fee simple land, and lessees of government land should protect the same from fire at their own expense."

Lack of Appropriation.

It will be remembered that a bill to appropriate $5,000.00 per annum to be used only in cases of emergency, and expended only with the approval of the Governor, was introduced at the last session of the Legislature and failed to pass. Some arrangement should be made at the coming session to provide an appropriation that can be drawn on to combat fires on government land or on private land where if the fire spreads it will endangegr overnment property. As it is now there is no provision for the payment of fire fighting of any kind; a condition which to say the least is highly unsatisfactory.

FIRE WARDENS.

A number of new district fire wardens have been appointed during the year so that now the chain of fire districts is practically complete on each of the islands. There are now fifty district fire wardens. A corrected list appears on another page of this report, giving the name and district of each warden.

PROGRESS OF FORESTRY IN THE TERRITORY.

It has been the custom in past reports to make note of forest work other than that being carried on by the Division of Forestry. Perhaps the celebration of Arbor Day may be noted first under this head.

ARBOR DAY.

By proclamation of the Governor, Nov, 2, 1906 was set apart as the second Arbor Day to be officially observed in Hawaii. While the interest was perhaps not so marked as in 1905, the observance of the day was general and spontaneous, showing conclusively that Arbor Day has come to stay.

The feature of special interest this year was the announcement of the prize winners in the tree planting contest begun on the first Arbor Day in 1905. Made possible by the money contributed by Governor Carter and others, a prize was offered to the grade in each public school planting a tree on Arbor Day, which, as the result of care, should be in the best condition at the end of the year. One hundred and twelve schools, out of a total of 154, qualified as prize winners. The prizes are now being procured under the direction of Mr. W. H. Babbitt, Superintendent of Public Instruction, and will be awarded early in 1907.

Credit should be given Mr. Babbitt for the real interest he has taken in this matter, for to secure a fair judgment and to arrange the necessary details of awarding the prizes, he has cheerfully given his personal attention to an unexpected amount of routine detail.

The Board of Education took an active part in this year's celebration of Arbor Day by paying the freight on the boxes of plants sent out by the Government Nursery to the public schools. This year 2,546 plants were furnished to 68 schools, as against 2,846 to 95 schools in 1905.

KOA LUMBERING.

Two companies are now organized to lumber Koa in Hawaii: the Hawaiian Mahogany Lumber Company, Limited, operating on the Bishop Estate land of Keauhou in Kau and the American Hawaiian Mahogany Lumber Company, operating in South Kona, both on the island of Hawaii. Neither company had begun actual work in the woods on Dec. 31, 1906, but both have taken many preliminary steps so that before long the logging can successfully begin. The similarity in name of the two companies is accidental. The former is an Hawaiian, the latter a California corporation.

FOREST PLANTING.

An awakened interest in forest planting bids fair to become general on the larger sugar plantations. Much work has been done this year, both directly by the plantations and in coöperation with the Division of Forestry. The latter work has already been discussed; for details in regard to the former the reports of the District Foresters should be consulted, especially those of Mr. Walter D. McBryde, Mr. Louis von Tempsky and Dr. J. H. Raymond.

Mention has already been made of the reforestation of a portion of the Waianae-kai Forest Reserve, by The Waianae Company. It is again noted here because it is the first case where forest planting has been undertaken in a forest reserve.

RUBBER.

The interest in rubber continues to increase in the Territory and has led to a number of rubber planting projects, several of which will doubtless result in additional rubber plantations. There is as yet little that can be said definitely about the ultimate success of the industry, but so far as can be judged the outlook is certainly promising.

During the year a number of rubber experts have visited the Territory, among them Dr. Pehr Olsson-Seffer, Director, La Zacualpa (Mexico) Botanical Station and Rubber Laboratory. In an interesting article, published in the Hawaiian Forester and Agriculturist for November, 1906, Dr. Olsson-Seffer discusses the rubber situation in Hawaii and gives his views on the types of rubber plants adapted to the local conditions.

FUTURE PLANS AND RECOMMENDATIONS.

It is the intention to conduct the Division of Forestry during the year 1907 in conformity with the general program that has been followed for the past three years. The creation of forest reserves will go on until the chain of projected reserves is established, continuing until that time to hold the first place in the work of the Division.

Coöperation with private owners in the giving of advice and assistance to those desiring to undertake forest work will also be continued, and additional steps will be taken to arouse interest in tree planting or to stimulate the movement where it already exists.

The experiments with rubber producing trees will be continued and as far as may be the various minor activities of the Division will be carried on.

The use of the Government Nursery as a distributing center for forest trees will be continued, but the effort will constantly be made to encourage the establishment of local nurseries in connection with tree planting work. Ornamental plants will only be grown and distributed for the use of schools or improvement associations, except in the few cases where such plants cannot be obtained from the commercial nurserymen.

RECOMMENDATIONS.

Forest Rangers.

The particular and pressing need of forest work in Hawaii today is the establishment of a corps of paid forest rangers, for the administration and proper protection of the forest reserves already created or that will be established during the coming year. While a larger force would be desirable and will ultimately be necessary, I think that with the appointment of twelve rangers much can be accomplished toward securing the adequate protection and care which is essential if the reserves are to fully realize the objects for which they are set apart.

Furthermore until the Government can assure him that it is prepared adequately to administer its forest property, the private owner will be slow to turn over his forest land to the Government for management. And until the greater part of the land within the boundaries of any given forest reserve is brought under one organic and systematic control, that reserve cannot be made of the greatest possible value to the Territory.

I accordingly most urgently recommend that every effort be made to secure an appropriation from the Legislature sufficient to enable the appointment of a force of forest rangers. It is a matter of extreme importance in the forest work of the Territory. It must be given attention.

Amendments to the Forest Law.

I again recommend that the section of the forest law, covering the creation of forest reserves be so amended as to permit the Governor to set apart government land within the boundaries of established forest reserves whether or not the lands are under lease, provided of course that on lands under lease the reservation be subject to the vested rights under the lease and actually take effect at its expiration. Such a modification of the existing law would, I believe, go far toward strengthening the reserve policy of the Territory.

I recommend that a law be enacted making better provision than at present exists for dealing with forest trespass. The statute of malicious injury at present invoked is not sufficient for many cases that have come up or that are likely to arise in connection with the forest reserves or other government forest land.

Provision should be made for a fund from which could be paid expenses incurred in fighting forest fires on government land or in cases where the fire, if not stopped, would spread over and cause damage to government property. Such a fund should only be used in emergencies and may be safeguarded by restrictions as to how it shall be expended, but it should unquestionably be provided.

With these changes in the law and with an appropriation sufficient to enable the work to be carried on in a systematic way, the Division of Forestry may hope to continue to achieve results of lasting benefit to the Territory and to the people of Hawaii.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry and
Chief Fire Warden.

Report of Forest Nurseryman.

Honolulu, Dec. 31, 1906.

Ralph S. Hosmer, Esq.,

Superintendent of Forestry,

Honolulu.

Dear Sir:—I herewith submit a report of the work done at the Government Nursery, the Nuuanu Station and the Tantalus Forest, including the giving of advice and assistance and other matters, for the year ending December 31, 1906.

THE NURSERY.

COLLECTION OF SEED.

The collecting of tree and shrub seed has been continued during the seeding season, the principal supply having been collected in the neighborhood of Honolulu. Thirteen kinds of native tree seeds have been received from Mr. Robert Hind, Puuwaawaa, Hawaii, and several small donations of seed have been received from a number of people on different parts of the Islands.

Seed Received From Abroad.

At different times during the year sample packages of seed have been received from Dr. F. Franceschi, Santa Barbara, California; W. S. Lyon, Horticulturist, Bureau of Agriculture, Manila, P. I.; E. A. Sterling, Assistant Forester, U. S. Forest Service; Wm. H. Mast, Assistant, Dismal River Forest Reserve; George W. Peavy, Assistant Forest Inspector, U. S. Forest Service; G. French, Nurseryman and Seedsman, Melbourne.

Packages of seed containing all the kinds on hand have been sent to a number of botanic gardens, experiment stations and others in different parts of the world.

Congressional Vegetable Seed.

During the month of January 15,550 packages of vegetable seed were received from the Hon. J. K. Kalanianaole for distribution. Each package contained from five to six kinds of seed in small packets.

There is no doubt that this lot of seed reached more families requiring them and did more good than any previous consignment, principally owing to the assistance given in the distribution by the Superintendent of Public Instruction. A circular letter was sent by Mr. W. H. Babbitt to the principal of each of the public schools of the Territory, asking them to give the number of families represented in each school. Each family desiring vegetable seed was then supplied with an assortment. A notice was also put in the daily papers, stating that vegetable seeds would be sent to any person in the Territory applying for them.

Following is the number of schools supplied, also the number of packages sent to each island:

Islands.	Schools.	Packages.
Hawaii	52	4,354
Maui	25	1,890
Molokai	4	406
Lanai	2	46
Honolulu	10	1,588
Kauai	12	1,190
Oahu	11	1,338
Total	116	10,812

The balance of the seed was distributed to persons calling at this office and others who applied for same by letter.

GROWING AND DISTRIBUTION OF PLANTS.

In addition to the growing and distribution of forest and street trees, which is the principal work under this head, considerable experimenting has been done in the propagation of rubber and various other seeds new to the Islands. One laborer has been regularly employed during the year in the routine work of plant growing and propagation.

Following are tables showing the number of plants given away and sold, and also those sent out for the Arbor Day planting:

Given Gratis.

	Forest.	Fruit.	Ornamental.
Homesteaders	501	62	66
Improvement Clubs	2,300	195	475
Schools	808	...	196
Parks	...	...	240
Others	1,397	441	496
	5,006	698	1,473

Number of plants given gratis....................7,177

ARBOR DAY.

Following is the number of plants sent out for Arbor Day planting, with the number of schools, by islands:

Islands.	Schools.	Plants.
Oahu	30	719
Hawaii	17	581
Kauai	4	53
Maui	13	472
Molokai	4	721
	68	2,546
Others		34
		2,580

Sold.

Forest	Fruit	Ornamental	Total
3,100	47	538	3,685

Summary of Plants Distributed From the Nursery During the Year 1906.

Gratis	7,177
Arbor Day	2,580
Total Gratis	9,757
Sold	3,685
Total	13,442

In addition to the above, about 30,000 seedling Ironwoods, *Casuarina equisetifolia*, in 50 boxes, grown at the Government Nursery, were sold to the Paauhau Plantation for planting on the strip of land along the sea beach, as recommended by the writer.

Under the same arrangement 5,000 seedlings have been started for the Oahu Railway and Land Company, as follows:

Swamp Mahogany *(Eucalyptus robusta)*	1,000
Lemon Scented Gum *(Eucalyptus citriodora)*	250
Red Gum *(Eucalyptus rostrata)*	250
Koa *(Acacia Koa)*	1,000
High level Ironwood *(Casuarina quadrivalvis)*	500
Black Wattle *(Acacia decurrens)*	500
Monterey Cypress *(Cupressus macrocarpa)*	500
Silk Oak *(Grevillea robusta)*	1,000
	5,000

Realization.

During the year there has been collected and deposited with the Treasurer of the Territory as a government realization the sum of $298.63. The amount is itemized as follows:

Sale of plants	$ 183.08
Sale of seed	108.20
Sale of dead wood on government land, Tantalus Forest	4.00
Receipts for fumigating plants (Division of Entomology)	3.35
	$ 298.63

EXPERIMENTAL WORK AT THE NURSERY.

The experimental work done at the Nursery has been along the lines of seed testing and the propagation of new and rare plants. In this connection the new testing house has been of much benefit to us. During heavy rains, outside propagation of some of the smaller seed, such as most of the Eucalypts, suffers greatly, as the seed are often washed out of the boxes and lost.

BLUEFIELDS BANANA PLANTS.

The Bluefields banana plants, which the Board turned over to the U. S. Experiment Station in 1905 for propagation, had, by the spring of 1906, produced enough young plants to supply those who had agreed to plant and report on the same. During the month of May, Mr. Jared G. Smith turned over to this Division for shipment, plants sufficient for fifty applicants. The plants were forwarded to people in different parts of Oahu, Hawaii, Kauai and Maui.

EXPERIMENTS WITH RUBBER.

During the month of May circular letters were sent to a number of selected persons on the different islands of the group asking them to coöperate with the Division of Forestry in making experiments in the growing of rubber trees. The circular letter stated that seed or plants would be supplied free providing they would agree to report occasionally on the growth and condition of the trees. It was proposed to make the experiments in the different districts from near sea level up to twenty-five hundred feet elevation and people were selected who had land at different elevations.

Ninety-four persons consented to coöperate with this Division and agreement postal cards stating the conditions were mailed to each to fill up. These were in due time returned to this office, filled out as required. To each applicant were sent twenty-five seeds of Ceara rubber *(Manihot glaziovii)*, filed and ready to plant, with instructions on the propagating and planting of same. The following is the number, by Islands, of persons who agreed to coöperate: Oahu, 20; Hawaii, 39; Maui, 17; Kauai, 10, and Molokai, 8. Favorable reports have already been received from a number of those who received seed. By these experiments it is believed that in time valuable data will be obtained showing the locations where this class of rubber may be successfully grown.

Four thousand seeds of the Central American Rubber *(Castilla lactiflua)* were received from Ceylon, being ordered through Mr. Jared G. Smith of the U. S. Experiment Station. A large percentage of the seed was useless when it arrived. From this consignment two hundred and forty-six plants were successfully propagated and are doing well. The 4,000 seed cost $68.32, and customs duties of $20.50, making a total of $88.82.

On August 6, the Nahiku Rubber Company received a consignment of Para Rubber *(Hevea brasiliensis)* stumps from Ceylon, but owing to the very bad condition of the plants on their arrival at Honolulu, the company concluded not to accept them. Consequently the plants were offered for sale on August 15 by the Custom House officials. Mr. Alexander Craw bought the plants for the Board and turned them over to the Nursery. The plants were planted in boxes and in a short time a number of them started to sprout. Eighty have already been potted off and are doing well. From twenty to thirty more show signs of life and we are in hopes of being able to save them.

Three consignments of seed of the Central American Rubber *(Castilla lactiflua)*, ordered from Mexico by Mr. G. R. Ewart were handed to us to be propagated for him.

Out of the first and last consignments only about one dozen of the seeds sprouted. Out of the second consignment 238 sprouted and those are doing well.

The total number of Castilla plants at the Nursery belonging to Mr. Ewart is 250; these we have been asked to distribute for him to the different sugar plantations on the Islands.

The rubber trees planted during 1905 in the Huluamanu gulch, at Moanalua, of which mention was made in the last annual report, are doing well. These trees may in time be looked to for both seed and cuttings.

NURSERY GROUNDS.

The nursery grounds have been kept in order by one regular laborer, with the assistance of two prisoners kindly granted by Sheriff Henry.

Among the improvements made during the year may be mentioned the making of a new driveway from King street to the stables, running along the east side of the office building. The drive has been graded and macadamized with coral rock. Considerable leveling and filling up with the same material has also been done around the stables. A new seed room has been created by enclosing one end of the wagon shed. All the out houses have been treated to a coat of green stain. An Hibiscus hedge has been planted on the division line between the Hotel Melrose and the Nursery grounds; the same is growing nicely and is from four to six feet high. Other general improvements have been the fixing up of side-walks and the leveling and grassing over of parts of the grounds that required attention.

ADVICE AND ASSISTANCE.

This work has taken up much of the writer's time during the past year.

In accordance with the offer made in Circular No. 1 of the Division of Forestry, applications for advice and assistance have been received from a number of people on the islands of Oahu, Hawaii and Maui. In answer thereto three trips have been made to Hawaii, two to Maui and three to places on Oahu, outside of the District of Honolulu. Twenty places have been visited in and around the city in answer to applications for advice and assistance in a number of matters connected with the growing and care of plants.

The following is a list of the places visited and the nature of the advice and assistance given to those outside of the District of Honolulu.

HAWAII.

Paauhau Plantation.

The making of a working plan for 65 acres of forest consisting principally of Blue Gum *(Eucalyptus globulus)* planted sixteen years ago. The plan was made on the basis of a twenty years' rotation crop, with a diagram showing the method of thinning recommended. Advice on a tract of land along the beach containing about 50 acres was also given. The object of planting trees on this tract was principally to protect the sugar cane from the heavy winds and salt spray; also for the wood. Ironwood *(Casuarina equisetifolia)* was recommended for this tract, the same to be planted six by six feet each way.

Parker Ranch.

An examination of the tree planting done by the Parker Ranch Company, with suggestions on the ground.

Honomu Plantation.

Examination and advice on patches of land along the gulches and a strip of land along the sea beach. For the patches along the gulches, Black Wattle *(Acacia decurrens)* was recommended, the same to be planted eight by eight feet each way. For the strip along the beach Ironwood *(Casuarina equisetifolia)*, the same to be planted six by six feet each way.

Pepeekeo Plantation.

Examination with advice on certain lands belonging to the Pepeekeo Plantation Company. The following lands were examined: A strip of land along the sea beach, patches along the gulches, also a strip of land along the top of the cane fields.

For the land along the sea beach, Ironwood *(Casuarina equisetifolia)* was recommended, the same to be planted six by six feet each way. The patches along the gulches, Black Wattle *(Acacia decurrens)* to be planted eight by eight feet each way. For the strip of land along the top of the cane lands, Eucalyptus, preferably *E. citriodora*, *E. globulus* and *E. robusta,* to be planted six by six feet each way.

Wainaku Plantation.

Examination and report on a tract of land belonging to the Hilo Sugar Company and known as Punahoa first and second.

For this tract the planting of the Black Wattle *(Acacia decurrens)* was recommended, the same to be planted eight by eight feet each way. The land is admirably adapted for such purpose.

Pahala Plantation.

Examination with report and recommendations on the reforesting of certain lands belonging to the Hawaiian Agricultural Company at Pahala.

Examination of lands along the following gulches: Charley Wall gulch, Hionamoana, Clover and Whitney gulches, also a strip of land between the top of the cane land and the forest reserve boundary. For the gulches, the Black Wattle *(Acacia decurrens)* to be planted eight by eight feet each way. For the strip of land between the top of the cane land and the forets reserve boundary, principally Swamp Mahogany (*Eucalyptus robusta*), Lemon gum (*Eucalyptus citriodora*) and Red Gum tree of Southwestern Australia (*Eucalyptus calophylla*).

Kukaiau Plantation.

Examination of certain government lands in the District of Hamakua, formerly leased to the Kukaiau Plantation Company, with recommendations in regard to tree planting thereon. The object of the visit to Kukaiau was for the purpose of examining and reporting on the present condition of the different tracts which the company has held under lease from the Government, also to submit some system of tree planting for the future, whereby the lands might be improved in addition to the annual revenue received by the Government should the land be again leased for grazing purposes. The following lands were examined: The part of Kaohe 2, known as "The Burned District," the tract known as the "Old Kukaiau Plantation Lease," also the Kaohe Forest Tract.

Recommendations.

Burned District, Kaohe 2, area 1,200 acres. If again leased for grazing purposes it is recommended that a tree planting clause be added, whereby the lessee will agree to plant and care for trees to the number of not less than 40 per acre, the same to be left in a growing and healthy condition at expiration of lease.

Old Kukaiau Plantation Lease. The part of the above tract examined and reported on is from an elevation of 2,900 feet on lower boundary up to 4,500 feet elevation. This covers an area of not less than 11,000 acres and is what might be termed "second class forest and grazing land." The same agreement is recommended for this tract as for Kaohe 2. With the trees now on the tract and the addition of 40 more per acre, quite a decent forest will be in progress at the end of the lease.

Kaohe Forest Tract. The above tract has been used for grazing purposes for the past twenty-five years and the writer is of the opinion that no better use can be made of it. There are plenty of trees on the tract and they are in a healthy condition.

Mooheau Park, Hilo.

Examination of trees supplied by this Division and planted on the first Arbor Day, November 3, 1905, at Mooheau Park, Hilo. The writer found most of the trees in a growing and healthy condition. This park is a great addition to the city and the people of Hilo have every reason to be proud of it.

Naalehu Plantation and Kapapala Ranch.

While in the Kau District, although no applications had been received, Kapapala Ranch and Naalehu Plantation were visited. The visit to Naalehu was principally for the purpose of examining the trees planted by the writer some sixteen years ago. At that time a great variety of trees was experimented with. A number of them are still to be found around the manager's house and several acres above the mill, but the large majority have perished. The principal trees left are the Blue gum *(Eucalyptus globulus),* Monterey Cypress and the Chinese plum (*Eugenia* sps.). The long droughts and cattle are responsible for the destruction of the large majority of the trees planted at that time.

Kapapala Ranch. One day was profitably spent at Kapapala Ranch, Mr. and Mrs. Monsarrat are both lovers of plants and their beautiful garden contains many rare and useful species seldom found anywhere else on the Islands. A grove of Eucalyptus, principally *E. calophylla,* was examined, also the nursery where a number of varieties of young plants were found in different stages of development. These plants were from seed sent from this Division.

Kukuihaele Plantation.

The visit to Kukuihaele was made for the purpose of collecting information regarding trees planted by Mr. D. Forbes a number of years ago, also to obtain information regarding the uses and value of Hawaiian grown timbers, which Mr. Forbes had been experimenting with and was using for a number of purposes on the plantation.

MAUI.

Wailuku Plantation.

Report with recommendations on the reforesting of certain lands on the Waikapu, Wailuku and Waihee sections of the Wailuku Plantation.

An examination of the different lands was made and the following recommendations submitted for the different tracts.

Waikapu Section: For the portion under 500 feet elevation, the planting of Algaroba *(Prosopis juliflora)*, and for the portion above the 500 feet level, Swamp Mahogany *(Eucalyptus robusta)*.

Wailuku Section: The preservation of the water is the principal object for this section. The following trees are recommended: For the tops of the barren ridges, Swamp Mahogany *(Eucalyptus robusta)*, Lemon gum *(Eucalyptus citriodora)*, Blue gum *(Eucalyptus globulus)* and species of Casuarina, including *Casuarina quadrivalvis*. For the sides and sheltered places, Silk Oak (*Grevillea robusta*), Japan Cedar (*Cryptomeria japonica*), Australian Black Wood (*Acacia melanoxylon*), Koa (*Acacia koa*) and a few others.

Waihee Beach Tract: The Ironwood *(Casuarina equisetifolia)* is recommended for this tract, but the Hala *(Pandanus odoratissima)*, Milo *(Thespesia populnea)*, Kamani *(Calophyllum inophyllum)* and *Barringtonia speciosa* might also be grown successfully. A line of each along the sea shore is recommended.

Polipoli Water Reservation, Kula.

This tract of land is 673 acres in extent and lies between the elevations of 5,000 feet and 6,250 feet above sea level. The object of reforesting this tract is to protect and, if possible, to increase the water supply of Polipoli and other smaller springs. It is essential that fast growing trees be planted for the first crop so that a water shed may be established as soon as possible. Swamp Mahogany *(Eucalyptus robusta)* is recommended as the predominating tree, but a few Lemon gum *(E. citriodora)*, Red Gum *(Eucalyptus rostrata)*. The Red gum of Southwestern Australia *(Eucalyptus calophylla)* might also be planted, the spacing to be six by six feet each way.

Wailuku Improvement Association.

At Wailuku the trees planted by the Wailuku Improvement Association, at the instance of the Hon. W. J. Coelho, were examined. The writer was very much pleased to see that the trees which had been sent from the Government Nursery from time to time had been made such good use of. Much praise is due Mr. Coelho and other members of the Association for the great interest they are taking in beautifying their streets and highways.

Lahainaluna School.

Examination of the grounds and certain lands belonging to the Lahainaluna school, with report and recommendations in regard to tree planting, etc. The following tracts were examined and reported on: The grounds, area about eight or nine acres, upon which the school buildings, dormitories, principal's house and work shop, etc., are erected; a piece of land within the grounds and to the north of the main school buildings; also the mountain tract, an area of about 1,000 acres. The lower end of this tract commences at an elevation of about 700 feet tbove sea level and runs up to the top of the mountain.

Recommendations.

School Grounds: Several suggestions were made verbally to Mr. C. A. MacDonald and Mr. C. Flack in regard to the planting and laying out of the grounds. These will be acted on as soon as time and plants are available.

Land to the North of the School Buildings. The piece of land is about one and a half acres in extent and is suitable for the growing of citrus and other fruits. A windbreak consisting of three rows of Black Wattle (*Acacia decurrens*) to be planted six by six feet each way to run along the north and east side should be the first work; then the planting of lime trees, the same to be planted twenty-five by twenty-five feet each way.

Mountain Tract: For the mountain tract the following trees are recommended: For the land under 1,500 feet elevation Black Wattle (*Acacia decurrens*), to be planted eight by eight feet each way; above 1,500 foot level and up to the top of the mountain, *Eucalyptus robusta, Eucalyptus citriodora, Eucalyptus calophylla, Acacia melanoxylon* and *Cupressus macrocarpa* for the most exposed places. For the more sheltered places *Cryptomeria japonica, Grevillea robusta* and *Acacia koa.*

Haiku Ranch.

At Haiku Ranch the trees planted by the company a number of years ago were examined. A great deal of tree planting has been done on this ranch with excellent success. Mr. David Fleming, the present manager, is very much interested in the forestry movement and contemplates planting large numbers of the best timber trees in the near future.

OAHU.

Honouliuli Ranch.

Examination of the trees planted by the ranch company with advice on the selection and planting of trees for the future. The Honouliuli Ranch Company, by its manager, Mr. H. M. von Holt, has done a great deal during the past few years towards the preservation and extension of the forest area. Large tracts of land along the tops of the gulches have been fenced off and the cattle driven out, with the result that the growth of a large number of young koas and other indigenous trees has been encouraged. A large number of different kinds of exotic trees has also been planted on this ranch during the last few years with good success. This work deserves the highest praise, for very seldom indeed do we find trees planted and cared for in the manner that they are to be found on this ranch.

Waianae-kai Forest Reserve.

Report with recommendations on the reforesting of the tract of land known as the "Waianae-kai Forest Reserve." This tract takes in all of the upper part of the Waianae Valley and has an area of 3,257 acres, more or less. The tract is mostly government land, the greater part of which is covered with indigenous trees and other vegetation. This is the water shed for the Waianae Company, who control all the land in this valley makai of the reserve. Most of the land owned by the company is planted in sugar cane. With the permission of the Board of Agriculture and Forestry, it is the desire of the Waianae Plantation Company to commence immediately to drive out all the cattle and fence the tract. The starting of a nursery and the planting out of forest trees on this reserve will also be undertaken by the company.

Recommendations.

For the part of the reserve under 600 feet elevation above sea level, the planting of Algaroba *(Prosopis juliflora)* is recommended. For the part of the reserve above the 600 foot level, a variety of trees is recommended as follows:

For the tops of the ridges and other exposed places: *Eucalyptus citriodora, E. globulus, E. robusta, Acacia melanoxylon, Casuarina quadrivalvis, Cupressus macrocarpa* and probably a few others which may be selected later.

For the flat land, also the sides and bottoms of gulches, *Cryptomeria japonica, Grevillea robusta, E. robusta, E. rostrata, E. calophylla* and *Acacia koa.*

Ii Estate Land.

Examination with advice on the planting of trees on the land of Waipio, in the Ewa District, belonging to the John Ii Estate.

The tract of land upon which advice was asked is the top of sub-gulch to the east and close by the mountain house.

The planting of *Eucalyptus robusta* was recommended for the most exposed places. For the more sheltered places *Cupressus macrocarpa, Cryptomeria japonica, Grevillea robusta, Acacia koa, Acacia melanoxylon* and probably a few others which may be selected later.

SUMMARY.

The foregoing statement includes all the large places visited and shows the nature of the advice given to those outside of the district of Honolulu. Of the nineteen places visited planting plans or detailed letters of advice were prepared and sent in eleven cases. For the other eight suggestions were made verbally at the time of the visit.

The assistance given to those in and around the city, as previously mentioned, in most cases had to do with matters connected with the growing and care of plants. The applications for this local work were often made over the telephone or in person. In addition much information on various subjects has been given to persons who have called at the Nursery.

For further information regarding descriptions or recommendations, etc., of any or all of the places mentioned where advice and assistance was given, the writer would refer to reports, plans, etc., drawn up at the time of the visits. These are on file in the office of the Division of Forestry.

Seed has been supplied from the Government Nursery to all those for whom working plans were made. The writer takes pleasure in stating that the majority have commenced to establish nurseries and are making preparations to plant in accordance with the plans and recommendations made.

Press Bulletin.

Press Bulletin No. 4 of the Division of Forestry, entitled "Instructions for Propagating and Planting Forest Trees," which was issued during the year, has been given to all requesting advice and assistance on the above subject.

Acknowledgment.

Before leaving the subject of advice and assistance the writer would like to state that he was everywhere very cordially received and that every assistance was given him in the way of transportation, the pointing out of lands and all other desired information. For these and other courtesies received, the writer avails himself of this opportunity of expressing his thanks.

REPORT OF THE DEPUTY FIRE WARDEN.

On March 22, 1906, the writer was appointed Deputy Fire Warden at Large for the Territory. During the period covered by this report several small fires have occurred in the neighborhood of Honolulu at each of which (excepting the Country Club fire) the writer was present.

On February 13, a fire was reported on Tantalus. The writer with three men from the Nursery went to where the smoke was seen and found a Japanese employed by Mr. T. Clive Davies burning several large piles of grass on the latter"s lot. The fire was watched till all danger of its spreading was over. On our way back, when near the Forester's cottage, we met a gang of men from the road department, who returned to the city on being told that the fire was out.

On the evening of March 11, a fire was observed at Palolo Valley. The writer with eleven men from the road department and one from the nursery started for it. It was found that the fire had started on lot No. 16, and it was supposed that children playing with matches was the cause. After four hours of hard work this fire was put out about 11 o'clock. The area burned over was covered with grass and brush, the fire being put out before it reached the native forest. The area burned over was, approximately, eight or nine acres.

On March 30, a fire was reported in Nuuanu Valley. The writer with four men from the Nursery on being informed by telephone started at once to investigate. On arriving at the scene, it was found that the fire was in a dwelling house belonging to Mr. W. C. Kapulani.

On the evening of July 24, at about 6 o'clock, a fire was reported in Nuuanu Valley. The writer on receiving word started at once with one of the men from the Nursery. When we arrived at the fire, which was on the east side of the valley opposite the old Queen Emma place, we found that about one acre had already been burned. With the assistance of two men, who reside near by, the fire was put out about 9 o'clock. About four acres were burned over, consisting principally of guava, lantana and long grass, with a few Hau trees. No clue could be found regarding the person who started this fire.

The writer was on Maui when the fire occurred on the Country Club lands in Nuuanu Valley.

NUUANU FOREST STATION.

At the Nuuanu Station two men have been employed during the year, their principal work being in keeping the vine (Maile pilau) in check, clearing grass away from the small trees and doing other routine work.

The workmen's house has been painted inside and the outside given a coat of green stain.

CONDITION OF FOREST.

The forest is in a very healthy condition and the trees have made considerable growth during the past year. As years go by it becomes evident that the planting of trees in Nuuanu Valley is not such a great mistake as some predicted, while the operation of planting was going on. Instead of the land lying idle as it was before tree planting was started, there are now prospects of the Government realizing a revenue from it, when these trees arrive at maturity. The clothing of the slopes with trees also increases the value of the land as a watershed.

From a large number of the native trees that were threatened with being strangled by the "Maile pilau" the vines have been cleared away. There will be time for more of this kind of work during the coming year as the young trees are getting up and do not require so much attention.

TANTALUS FOREST.

The Tantalus forest is also in a healthy and growing condition and the percentage of dead trees has been less than for the past several years. Four cords of dead wood were taken from the forest during the year, the price received for the same being one dollar per cord on the stump. The fruit and other valuable exotic trees planted a number of years ago and mentioned in my last report have been kept clear of brush and vines.

On March 6 the Board authorized the employment of a Forest Ranger for the Tantalus Heights section, District of Kona, Island of Oahu, at a salary of $60.00 a month. David Kapihe was appointed to the position and has done excellent work. His principal work is to see that the forest fire laws are observed and to be on hand when people have brush or other material to burn. He has also done considerable work in clearing out trails when he was not engaged looking after brush fires.

Respectfully submitted,

DAVID HAUGHS,

Forest Nurseryman.

Reports of District Foresters.

Following the usage of former years the Superintendent of Forestry requested the several District Foresters to submit reports to be included in this publication. The replies received are given below:

LETTER FROM THE SUPERINTENDENT OF FORESTRY.

Honolulu, Oahu, November 22, 1906.

Dear Sir:—The law creating the Board of Agriculture and Forestry makes mandatory the preparation and publication of an annual report. Following the established custom I wish to include in the Report of the Division of Forestry for the calendar year 1906 a statement from each of the District Foresters dealing with one or all of the following subjects:

Present Extent of the Native Forest: A concise description of the present limits of the native forest in your district, for the purpose of comparison in future years.

Present Condition of the Forest: Notes on the present condition of the forest and injuries from any cause during the past year.

Private Forest Reserves: Have areas of privately owned forest land been set apart in your district as private forest reserves? Notes on the ownership, area, length of time reserved, whether or not the area is fenced, and remarks on the object and benefits of the reserve, are in order.

Tax Exemption of Forest Land: Under the law forest land that is fenced off and treated as a reserve may be exempted from taxation. Has this provision been taken advantage of in your district? If so, for what area and since when? Does the law work well in practice? If not, why?

Forest Planting: During the year considerable interest has been manifested in forest planting. Notes as to the area, kind and number of trees planted, type of plantation established, etc., in your district are in order.

Forestry in General: Notes of interest on any forest matters.

As it is desired to have the report ready for distribution early in February, contributions should be in my hands not later than Christmas week.

Very sincerely yours,

RALPH S. HOSMER,

Superintendent of Forestry.

REPORT OF MR. A. S. WILCOX.

Halelea, Kauai.

Lihue, Kauai, Nov. 30, 1906.

Dear Sir:—Your favor of 22nd instant is at hand, and has had my careful consideration. I regret exceedingly that I am not in possession of sufficient information to make an exhaustive report.

Present Extent of the Native Forest: So far as I am aware, no accurate survey has been made of the District, and guesses would not be of any particular value.

Present Condition of the Forest: The present condition of the forest is excellent. There have been no forest fires, nor any damage by cattle worth mentioning.

Private Forest Reserves: Practically half of the land of Kalihiwai has been a Private Forest Reserve for a great many years. The growth is very dense, and this fact in connection with other conditions has rendered fencing unnecessary. The area I should estimate roughly at four thousand acres. The land is owned by myself, and it is my present intention to protect the forest as much as possible, to conserve the water supply.

Tax Exemption of Forest Land: No advantage has been taken of this provision, consequently I am unable to say whether the law would work well in practice or not.

Forest Planting: Nothing has been done in this line, as it has not been considered necessary. The district is very sparsely settled, and there is very little demand for firewood, which can easily be obtained without going to the mountains; the absence of fires, the small number of cattle, confined mainly to the makai lands on account of the impenetrable mass of undergrowth in the woods, the abundant rainfall, all tend to make planting scarcely worthy of consideration.

Yours very truly,

A. S. WILCOX.

REPORT OF MR. F. SCOTT.

Koolau, Kauai.

Kilauea, Kauai, H. T., Dec. 28, 1906.

Dear Sir:—Your letter of the 22nd ultimo, re Report of the Division of Forestry, to hand and in reply to your various subjects would state as follows:

Present Extent of the Native Forest: I am not able to give the limits of the native forest as there are no defined lines at present.

Present Condition of the Forest: The forest is in good condition and there have been no injuries from any cause during the past year, as I have driven out all cattle from the forest.

Forest Planting: There has been no planting done for the past year.

Respectfully yours,

F. SCOTT.

REPORT OF REV. J. M. LYDGATE.

East Kona, Kauai.

Lihue, Kauai, Dec. 28, 1906.

Dear Sir:—In response to your request I beg to hand you the following notes in regard to forest in my District of Koloa.

Present Extent of Native Forest: This is practically all contained within the bounds, surveys of which are now being prepared for you. This is a part of the Waialeale Range of Mountains. The Haupu Range retains little or no forest, what there is being of a scrubby and unimportant character. This region, however, in my opinion, ought to be set apart as a reserve and might support an interesting and valuable forest growth, the more so as it is easily accessible.

Condition of Forest: Except on the outskirts where the forest is exposed to destructive influences, it is, so far as my observations go, in a healthy and normal condition. There have been no fires or other devastating injuries during the year in this district.

Private Forest Reserves: Practically all the forest land in my district, as you know, is privately owned, controlled by the two sugar estates—the Koloa Plantation and the McBryde Sugar Co. The McBryde area, about two-thirds of the whole, has already been substantially fenced and arrangements are being made to fence the Koloa Plantation area.

Tax Exemption: Advantage has not been taken of this provision. I fancy for the reason that the amount of the tax remitted would be trifling and would cut no figure in the taxes of a large estate which, in any case, is taxed on a valuation as a whole.

In General: Whatever may be thought of lantana as a competitor and possibly a destructive agent for the forest, my observation has led me to believe that it is a valuable agent on the outskirts of the forest where its dense growth protects and perhaps rallies the retreating line of the forest, and in such regions it, to a considerable extent, serves the beneficial purposes of the original forest.

I had occasion recently to inspect a burned over sub-forest area at Wainiha and was pleased to note a generous and healthy young growth of Koa and Sandalwood coming up, so that under favorable conditions there will probably be a better forest showing there than before the fire. The dense coating of undergrowth had not given the forest a chance.

In conclusion I can only add my emphatic conviction that the forest areas should all be fenced as soon as possible.

Respectfully yours,

J. M. LYDGATE.

REPORT OF MR. WALTER D. McBRYDE.

East Kona, Kauai.

Brydeswood, Kauai, Dec. 5, 1906.

Sir:—I beg to acknowledge yours of Nov. 22, relative to a report on the forest conditions and forest work accomplished in this district.

Forest Reserve: The private forest reserves fenced off with a strong five-wire fence, all cattle excluded, set aside by the McBryde Sugar Company, as also the government forest reserve of Kalaheo, are showing marked effects from the exclusion of the cattle; the uluhi fern, as also other ferns, are growing rapidly over trails and covering bare spots, and young maile is growing abundantly where two years ago hardly any was to be found. I do not notice as yet, the growth of any young trees, but this is hardly expected in the short time the fence has been completed. It would, I think, be advisable to plant out within the forest reserve such foreign trees as the *Grevillea robusta* and the Eucalyptus, for these are known to reseed themselves on the slopes of Haleakala as also in other forests on this island.

Fires: Fortunately, I am able to report no forest fires within the last exceptionally dry year.

Tree Planting: The McBryde Sugar Company have done a great deal of tree planting during the year, putting out thousands of trees along their cane fields in the line of windbreaks and also planting in the gullies for the purpose of future firewood and posts.

The Koloa Sugar Company are also actively engaged in the reforesting of their lands denuded of forests through fire and the depredations of cattle. The work now being undertaken will speak for itself in a few years.

Within the past three years I have, with the aid of the McBryde family, entered enthusiastically into the reforesting of the lands adjoining the homestead and have, within that period, put out thirty thousand trees. Of this number I should say, fully 10 per cent. are fruit trees, viz.: mangoes, pears, oranges, peaches, etc.

I am more than pleased with the growth of the different Eucalypts which I have set out. I am now experimenting with some thirty varieties.

I am glad to report that I have been able to furnish free, from my nursery, to settlers and others some thousands of young trees of different varieties.

Very respectfully,

W. D. McBryde.

REPORT OF MR. FRANCIS GAY.

West Kona, Kauai.

Makaweli, Kauai, Dec. 3rd, 1906.

Sir:—In reply to yours of the 22nd ult. I beg to report as follows:

Present Extent of the Native Forest: Has not been surveyed, but is all covered with native woods.

Present Condition of the Forest: In good condition.

Private Forest Reserves: Gay & Robinson have for many years past set apart all their mountain lands and wherever necessary fenced.

Tax Exemption of Forest Land: Gay & Robinson have never claimed exemption.

Forest Planting: It has not been necessary to plant the mountain lands, but on the low lands. forests were started by the land owners in the district, mostly by V. Knudsen and Gay & Robinson.

Forestry in General: No forest fires occurred this year, but small grass fires. that didn't do much harm.

Yours very truly,

Francis Gay.

REPORT OF MR. AUGUSTUS F. KNUDSEN.

Napali, Kauai.

Kekaha, Kauai, Dec. 7, 1906.

This section consists of that part of the Waimea District lying west and north of the Waimea and Poomau canons and the district of Napali.

All the upland is well forested, while the cliffs and sides of the canons have been stripped of all verdure by the goats.

The whole of the Mana and Kekaha water shed is a semi-arid region. More or less compact clumps of trees or groves exist at the heads of the Mana gulches. These are Koa on the ridges and mostly Kukui in the gulches. There are also several groves of Lehua, some of them very fine though of small area. None of these exceed one acre in extent, but follow in frequent succession a belt of country from one to two miles wide between the 2000 and the 3000 foot contour line. This extends from the escarpment of the Waimea pali on the south to the Kauhau gulch on the north. This is the boundary of the private forest reserve. Within the forest reserve is an almost continuous forest; the only denudation is along the pali where the wild goats are doing and have done a great deal of damage. From the Kauhau gulch to Kalalau there is hardly a tree left on the bluffs. From the south buttress of Kalalau, called Nianiau, northwards the goats are making slower progress on account of the greater monthly precipitation. But gradually the forest is receding, the turf and soil is being trampled and washed off, and the bare rock remains grim and forbidding.

Present Condition: South of the forest boundary fence running from Kauhau pali to Puu Hinahina is grazing land and naturally there is no new or young growth, but this is outside of any forest in its true sense, and is a dry section in which no rivers originate. Within the reserve the forest has grown more dense and has not suffered any injury except as far as the goats are concerned.

Private Forest Reserves: The Knudsen Estate protected the high upland forest by continual and relentless hunting of the wild cattle and goats as early as 1882. By 1890 the wild cattle were practically extinct, not only on the lands controlled by the Estate, but on the adjacent parts of Napali. In 1898 the firm of Knudsen Bros. built a fence at a convenient location to prevent their cattle from encroaching on the great forest. This is the fence mentioned above and protects an immense area variously estimated at from eighteen to thirty thousand acres. This forest covers the headwaters of the Milolii, Nuulolo, Awaapuhi rivers and parts of the drainage areas of Kalalau and Waimea rivers.

Tax Exemption: No advantage has been taken so far of this provision in the law relating to forest reserves.

Forest Planting: Nothing of any great extent has been attempted in this section. Mr. A. F. Knudsen has made sundry attempts with many varieties to find a forest tree easy of propagation that would not need care or irrigation. So far *Acacia melanoxylon,* the Australian Koa, has been the most satisfactory. The seed was planted in open spaces in the forest, amid grass and bracken, by merely scratching the ground every few feet and putting in the seed. There is now quite a stand of trees two to six feet tall, at practically no expense. Some will grow even if the seed is merely broadcast on the ground. A New Zealand tree known as the Karaka has begun to spread voluntarily from two original trees planted at Halemanu by Mr. V. Knudsen about 1880. This spreading has been assisted by carrying the seed and scattering them far and wide. It makes an excellent secondary growth and makes a dense shade. Cattle eat the leaves with avidity. Of late years the most marked forest growth has been seen in the great number of Kauila (Ironwood) trees springing up in all directions within the fenced area, and the seedling Koa trees starting up as soon as the dying parent tree drops its leaves, thus letting in the sunshine to start the waiting germ into life. These two trees promise to regenerate the forests in the vicinity of Halemanu.

Forest Fires: One forest fire occurred within the forest area during the year. It occurred about August 12th, and burned over an area of about four acres. It was open grass and fern country with a few scattered trees. The fire originated in a burning stump that was thought to have been carefully extinguished.

No loss was sustained. Back firing from roads and trails to leeward and beating on the windward side quickly extinguished it. Six men from neighboring camps, with several women and children, put the fire out with no expense financially.

AUGUSTUS F. KNUDSEN.

REPORT OF MR. JOHN HERD.

Koolaupoko, Oahu.

Maunawili Ranch, Waimanalo, Oahu, Dec. 24, 1906.

Dear Sir:—In compliance with your request, I herewith submit my annual report on forest conditions:

Present Extent of Native Forest: The forest in this section is confined to a very narrow strip, running along the base of a portion of the Koolau Mountain Range. As the mountain wall rises very abruptly, the strip referred to varies considerably in width and is much interrupted by the numerous gulches and ravines running through the same.

Present Condition: The limited and interrupted area of forest above noted is mostly made up of Kukui and Ohia with occasional Koa trees, and its condition has not changed very materially since my last report was submitted. It has been noticeable, however, that many of the Ohia ai (Mountain Apple) trees in the gulches continue producing much dead growth from the top of tree and that the Koa twig and seed worms are still in evidence.

Re-Forestation: W. G. Irwin, the owner of all the area within the confines of the Maunawili Ranch, is the only person who has so far gone to any trouble or expense in either protecting or reforesting the section under my control as District Forester. On the Maunawili Ranch, Mr. Irwin has established and planted eight (8) separate and permanent reserves consisting of about 300 acres. These reserves are all fenced in, the object being to protect the adjoining native forest above referred to.

Number and Variety of Trees Planted: During the past year, there have been planted out on the ranch above named 3,133 trees of the following varieties: Alligator pear, mango, kamani, milo, koa, *Albizzia moluccana, Grevillea robusta,* mahogany, jacaranda, mammea apple, traveller's tree, bouganvillea, banyan, longan, *Castilloa elastica, Manihot glaziovii,* cocoanut, magnolia, cryptomeria, araucaria and Bluefield bananas.

Forestry in General: The past season was an exceptionally dry one, which fact prevented the planting out of any large number of trees. Advantage of the dry weather was taken, however, by clearing around trees of former plantings.

Respectfully submitted,

JOHN HERD,
District Forester.

REPORT OF MR. A. M. NOWELL.

Waialua, Oahu.

Wahiawa, Oahu, Dec. 27, 1906.

Dear Sir:—I am in receipt of your letter of November 22nd, asking for my contribution to the annual report of the Board of Agriculture and Forestry, for the year 1906, the same to be dealt with on the following lines:

Present Extent of the Native Forest: A concise description of the present limits of the native forest in this district would necessitate more of a study than I have up to this time been able to give the matter, but it is with certainty that I can say that since the cattle have been excluded from the lower forest, the latter has been increasing steadily and surely.

Present Condition of the Forest: This forest is at present suffering but little from injuries of any kind, and is in a rather better condition now than at the same time last year, and this in spite of the fact that the twelve months just past, with the exception of the present month of December, have been very dry.

Private Forest Reserves: There has been, as yet, no area actually set apart in this district, as a Forest Reserve.

A reserve, of approximately 23,040 acres, has, however, been proposed, and considerable preliminary work done on the proposition, but the project is still pending.

Tax Exemption of Forest Land: There is an area of about 12,700 acres of Upper Kawailoa and Paalaa, that has been fenced off for a number of years, and practically treated as a Reserve, but I believe there has been no tax exemption on this land.

Forest Planting: There has been nothing done in this line here this year, but negotiations are under way with the manager of the Waialua Agricultural Co., Ltd., for the reforestation of certain lands of Kawailoa and Paalaa, between the elevations of 800 and 1,200 feet.

I believe this matter should be pushed, as the successful fulfillment of such an undertaking, would, in my opinion, be most beneficial in its results. There would be an increase in precipitation, which would be of distinct benefit to the whole district, and there would be a source of profit to the parties concerned.

Forest Fires: There have been but two fires in this district this year, and neither of these could be termed a *forest fire.*

On the third of March there occurred a grass fire, which, though put out before any damage was done, came very near to being a very disastrous one.

This was at Wahiawa, on the north side of the north fork of the Kaukonahua, and directly opposite to the scene of the disastrous fire of March, 1905, which, by the way, might lead one to suppose that both *March* and *Wahiawa* were synonymous with *fire.*

This fire burned about twenty-five acres of grass land, but in several places reached as far as the top of the Kaukonahua gulch, and succeeded in spreading down into the gulch, where it was with difficulty gotten under control before reaching the timber.

The mauka line of the burned area was less than two miles from the makai line of the heavy forest, and, with the tall rank grass as dry as it was at that time, had the fire obtained a trifle more start, the consequences might have been very severe.

This fire was put out by Waialua Agricultural Co. men, a luna and three Japanese laborers, who live near by. They responded promptly, and did their work thoroughly as well as rapidly, and had the fire out when I arrived.

This fire satisfied me conclusively that I should avail myself of the suggestion in your letter of February 23rd, to cause the issuance, under the Forest Fire Law (Act 71, Session Laws of 1905,) of a *Special Fire Warning*. I recommended that the area, bounded as follows, be thus guarded:

South—Waianae District line.

South and West—The Kaukonahua stream.

West and North—The Waialua Agricultural Co.'s ditch, from the Wahiawa Dam, and an extension of same, following approximately the 700-foot contour, to the Waimea boundary.

North and East—The Waialua-Koolauloa District line.

This recommendation was approved, and the area described became the object of a Special Fire Warning, for a period of six months from March 7th, 1906.

I would say that during this period I was not called upon to issue a single permit for starting fires, but I have not the least doubt that, had there been no warning during that dry time, I should have had numerous fires to deal with. This, to my mind, goes to show that the customary fires, occurring during dry weather, are not necessary ones or ones that could have taken place legitimately by the application for a permit, but were fires that start through the carelessness and neglect of cattle men, hunters, and very possibly charcoal-burners.

The second and last fire this year, occurred on August 2nd, also at Wahiawa, and on the same ridge as the above mentioned one, only a little further makai.

About two acres of grass land was burned, the fire being put out by the same men that put out fire No. 1, and no damage was done.

Rainfall: It may be interesting to follow the record of rainfall, that I started in my last year's report, so I shall repeat, adding the new record for this year. The following figures are for an elevation of thirty feet:

1901..........35	inches.	1904..........66	inches.
1902..........27	"	1905..........18	"
1903..........16	"	1906..........27	"

This makes an average annual fall of 32 inches. As stated last year, the rainfall five miles inland, at an elevation of 1,000 feet, is double that at thirty feet, while the fall ten miles inland is approximately four times that at 30 feet.

In conclusion, I would sav that I hope the year 1907 will see the establishment of the Waialua Forest Reserve, the accomplishment of the reforestation work as outlined, and the fulfillment of any other plans for forest work that may be for the benefit of the district.

Respectfully submitted,

A. M. NOWELL,

District Forester, Waialua District.

REPORT OF MR. JAMES MUNRO.

Molokai.

Kaunakakai, Molokai, Dec. 7th, 1906.

Dear Sir:—Yours of 22nd ult. to hand and contents noted. For most of the data required I will have to refer you to Mr. Chas. A. Hartwell.

In re amount of tree planting done up to date this is all I can fine record of: 12,450 Black Wattle (there must be very much more); 5,695 *Eucalyptus robusta* (more to plant); 3,655 White Locust (approximately; more to plant); 2,000 Japanese Sugi (approximately).

I will try and get some more data together on the amount of tree planting done and furnish you with it later.

No forest fires during the year.

Very truly,

JAMES MUNRO.

REPORT OF MR. C. C. CONRADT.

East Molokai.

Pukoo, Molokai, Dec. 8th, 1906.

Dear Sir:—In reply to yours of November 22nd, asking for a report on forestry for the east end of the island of Molokai, I have to state that owing to the fact of my being a resident here of only a few months, I have not had the chance, nor time, to cover the ground from which to gather my information, as to the present extent of the native forest and present condition of the forest.

As to private forest reserves I know of none, although parties are contemplating the setting aside and also fencing for private forest reserves. As to forest planting I do not know of any one that has undertaken that in this district.

Respectfully yours,

C. C. CONRADT.

REPORT OF MR. L. BARKHAUSEN.

Lahaina, Maui.

Lahaina, Dec. 26th, 1906.

Dear Sir:—Your favor of the 22nd ult. to hand and contents noted. I am unable to give you the area of native forest land in this district. The forest land under control of the Pioneer Mill Co., Ltd., in an altitude from 2000 feet and higher has been fenced in for a number of years, and as far as I have been able to observe the forest is in a healthy condition.

The company has never yet taken advantage of the tax exemption clause for the simple reason that it did not know of the existence of such clause. There have been no forest fires in the district during the year.

Yours very respectfully,

L. BARKHAUSEN.

REPORT OF MR. C. B. WELLS.

Wailuku, Maui.

Wailuku, Maui, H. T., Dec. 19, 1906.

Dear Sir:—Your esteemed favor of Nov. 22nd to hand and I must apologize for not answering sooner.

Present Extent of Native Forest: I am unable to give. I have been waiting for some two years to go over the whole ground with you.

Present Condition of Forest: As far as I have been able to observe, it is in the same condition as last year.

Private Forest Reserves: There are none.

Forest Planting: None has been done. The Wailuku Sugar Company are planning to commence tree planting on quite a large scale and are only delayed by not having a competent man to attend to planting of seeds and looking after the trees when set out.

I regret I cannot give you a more satisfactory report and will again write you asking you to visit me at Wailuku and go over the ground with me. I am

Very truly yours,

C. B. WELLS,

Forester for District of Wailuku, Island of Maui.

REPORT OF DR. J. H. RAYMOND.

Kula, Honuaula and Kahikinui, Maui.

Wailuku, Maui, Dec. 8, 1906.

Dear Sir:—I herewith submit a brief report on the conditions appertaining to the forest in my district:

The forest belt in the District of Kula extends from an elevation of from approximately 3,000 feet to the top of the mountain, the thickest portion being at an elevation of about from 3,500 to 5,000 feet.

The lands from north to south along the slopes of Haleakala are as follows: Waiakoa, Kaonoulu, Waiohuli, Keokea, Kamaole and Ulupalakua. The mountain slopes from approximately 7,000 feet to about 4,000 feet, which would be the highest point above Ulupalakua. The forest, or what is left of a once densely covered land, is composed of straggling, dead and rapidly dying mamanis, ohias, koas and a variety of other native trees usually found on the mountain slopes. There still remain quite a number of healthy trees throughout the district above referred to, but unless something is done at once to protect them, within a comparatively short time, what are left will be destroyed.

The lands of Waiohuli and Keokea are under lease to the Cornwell Estate; said lease expires in 1911. The lands of Kamaole and Waiakea are government lands, the latter, the upper part of which constitutes in part the Polipoli Reservation, is at this time a forest reservation, containing 673 acres, and is maintained under an agreement with the Hawaiian Government by the Raymond Ranch as a forest reserve. This land is to be planted with a variety of trees, the seed of which have been furnished by the Department of Agriculture and Forestry of the Territory, and within a few weeks will be planted. It is proposed to plant principally the different variety of eucalyptus, on recommendation of Mr. David Haughs of the department. The desolated appearance of the lands above referred to, Waiakoa, Waiohuli and Keokea in particular, presents in itself the strongest argument in favor of action on the part of those interested toward saving to the island what was once and may be again a rich agricultural district. Immediately below these lands there are several hundred acres of agricultural land rented out to Chinese corn-planters. These lands for forty years have been very productive, it being said that that district, during the time of the visitation of the whaling vessels to these islands, furnished them with produce, most particularly Irish potatoes, and derived therefrom a good revenue.

It is now no longer necessary to dilate upon the advantages of the conservation of forests in that region, nor is it at all necessary to point out to you the advantages to the interests of the Territory at large of these agricultural lands; suffice to say that there are hundred of acres of choice Government land, both above and below the government road, that will support a large number of bona fide American settlers, and the writer believes everything should be done toward protecting the forest for the above reason. The lands above and below the corn-fields are used by the Cornwell Estate for pasturing cattle, and it is due to this that the forests have been destroyed.

The lands adjoining Kamaole, extending to the east, around to and including the southern part of the island are as follows: Ulupalakua, Kanaio, Auwahi and Kahikinui. All through Ulupalakua there are to be found a variety of beautiful, large eucalyptus trees, pines, wattles and many other varieties that were planted by the late Captain Makee. A more fitting and lasting monument could not possibly have been erected by him to commemorate his industry and unselfishness and desire to benefit those who were to follow him than the planting of this magnificent collection of trees. That they have had the desired effect upon the precipitation of moisture there can be no doubt, as ample proof is at hand of the great benefit in this respect, derived therefrom. While no definite plans have been made toward reserving any particular land at Ulupalakua for the purpose of planting trees, it is our intention to do much in this respect, more especially toward planting of fruit trees.

The land of Kanaio is in part owned by the Government and the Raymond Ranch, besides a large number of kuleanas. The upper part of the middle third is quite densely covered with mostly native shrubs and a number of native trees. It is at present not under lease.

The land of Auwahi extends on the southern slopes of Haleakala from the top of the mountain to the sea and is owned in fee simple by the Raymond Ranch. Upon the upper third of this land can be found a very well preserved forest of native trees; the greater portion of this area of forest land has been fenced off and is now maintained as a private forest reserve by the owners, approximately 1,200 acres. This land has been fenced and there are practically no cattle within the reserve.

The land of Kahikinui, also on the southern slopes of Haleakala running from the top of the mountain to the sea, contains about 25,000 acres and between the elevation of 3,000 feet and the top of the mountain can be seen the remnants of a once densely wooded land, more particularly the lower part of the upper third. The forest stretching across the entire slope of the mountain has been destroyed by the cattle and it is commonly known and referred to by the natives now living in that district. The forest consisted at one time, mostly of Mamane and Ohia trees and in various places there are to be found at this time a number of

Ohia trees scattered throughout the district, which, in some instances, have been fenced off by the Raymond Ranch.

In 1901, when I purchased the interest of Kahikinui, there were about 3,000 head of cattle running on that land and Auwahi, mostly on Kahikinui, the greater number of which were to be found on the upper third of these lands and were mostly wild. It was plainly seen that the best part of the entire ranch was in this particular region. Necessity compelled the fencing off of nearly one-half of the land in order that the wild cattle might be controlled, and accordingly I constructed, at my own expense, a five-wire fence extending across the entire slope of the mountain, running through the lower part of what was once the thickest part of the forest, and upon completion of said fence and since that time we have continually reduced the number of cattle on top of the mountain and I now observe the following effect. There has been a rapid growth of all of the native shrubs above the fence line and I note most particularly that from the fence line to the very top of the mountain there has been a rapid growth of young Mamani trees and from the manner in which these shrubs and trees have grown it would seem that it will be but a comparatively short time when the forest in that region will again be in evidence. The ill effect upon the Kahikinui lands, from loss of forests, as well as upon the adjoining land of Waiopai, controlled by the Haleakala Ranch Co., to the east of the Kahikinui lands, has been felt most particularly during our incumbency and is well known by every one who is familiar and has been familiar with those lands for many years past.

The most striking evidence of the effect of the conservation of forests can be noted in the difference of pasture lands between the Waiopai and Kahikinui lands and that of Auwahi, the land referred to as having its middle third reserved for forest purposes. During the past three years when the lands of Waiopai and Kahikinui were suffering from the most severe drought known in their history, Auwahi supported a large number of cattle and was visited by frequent showers, which the writer attributes solely to the influence of the forest growth.

From my experience with lands of Kahikinui during the past four years and considering the effect upon the productive capacity of the land for pastural purposes (admittedly the only use that this land can be put to by reason of its arid character) and from my observation as above referred to of the effect of removal of cattle from the upper forest region, it is imperative that some measure or measures must be adopted to save the lands, and it is the intention of the Raymond Ranch to formulate a plan whereby the upper part of these various lands, viz: Kanaio, Auwahi and Kahikinui, may be established as a permanent forest reserve and it is hoped and believed that when the said plan shall have been completed that the Government will lend its efforts to the project. It is the writer's belief that if such support is forth coming from the Government, that not only those particular lands may be saved but that the entire island of Maui will be benefited by the reforesting of the entire upper slopes of both sides of the mountain.

I remain, Yours very truly,

J. H. RAYMOND,

District Forester, Districts of Kula, Ulupalakua and Kahikinui.

REPORT OF MR. L. VON TEMPSKY.

Kula and Kaupo, Maui.

Makawao, Maui, T. H., Dec. 14, 1906.

Dear Sir:—In accordance with the wishes expressed in your letter of the 22nd ult. I append herewith a report of work done in this and the Kaupo District for the last year or so.

Present Extent of Native Forest: The Makawao Forest, a portion of which is in my district, extends from the Maliko Gulch, which runs down the mountain on the eastern side of Olinda, clear round the mountain in an easterly direction to Nahiku; running mauka to an elevation of *about* 6,500 feet—Puu o Luuau being on the upper edge of the forest—and makai to about 2,400 feet.

The present condition of this forest is good. On the Haleakala Ranch Co.'s side it is securely fenced and the fence kept in good order. The growth of young trees since the exclusion of cattle being very marked, these consist mainly of Ohia, Koa, Olapa, Naio, Pua and Mamani.

On the northern slope of Haleakala above the ordinary forest belt, and also in the Crater of Haleakala, the growth of young Mamani is something extraordinary. In some places, which formerly were open and clear, it is now next to impossible to get through on horseback; this in spite of the fact that there are just as many, if not more, cattle now than there used to be. This growth commenced about sixteen or eighteen years ago.

A great number of the old Koa trees are dead, or dying, from the effects of an insect which bores into the ends of the branches and later on kills the tree.

Private Forest Reserve: The Haleakala Ranch Co. has voluntarily fenced, and reserved, an area of over seven thousand acres of forest land; this land lies mauka of the Government Forest Reserve (Koolau), and the closing up of this land by the company, with a fence, has secured the government land from the depredations of cattle. The object of this reservation is to conserve the rainfall of the district.

The Haleakala Ranch Co. has not taken advantage of the law which allows of exemption of taxes on land reserved for forestry.

Forest Planting: The residents of the Makawao District have always been growers of trees, and the last year or two this industry has received a fresh impetus, due principally, I think, to the people seeing for themselves the amount of firewood that a grove of *Eucalyptus globulus* will produce in a few years' time. This is about the only tree the general public plant, I suppose from the fact that they are certain of its growing anywhere, and also that the seed can be had for the picking.

The Haleakala Ranch Co. has gone in systematically for the last seven years for planting and experimenting with trees and tree seeds, their object being, first, shade and shelter for cattle; later on, for the production of fence posts, railroad ties, firewood, etc., etc.; and incidentally, the general improvement in appearance of the company's property.

The general type of plantation established is an area varying from seven (7) to twenty-five (25) acres selected with a view to sheltering the young trees, and later on the cattle, from the prevailing N. E. trade winds and rain. The trees are planted from 8 feet by 8 feet to 15 feet by 15 feet apart, as conditions require; and are securely fenced off from stock.

Furrows are plowed out and then the tree holes are prepared by "kipikua" work. The trees selected for planting are generally *Eucalyptus globulus* to windward, they being quickest to grow, and rapidly forming a breakwind for the more delicate and slower growing kind.

From the appended list of seventy-six (76) varieties of trees experimented with, I have come down to planting principally the following:

For Shade.—*Acacia melanoxylon, Grevillea robusta, Eucalyptus globulus, Eucalyptus robusta, Cupressus macrocarpa.*

For Fence Posts.—*Eucalyptus leucoxylon, Eucalyptus corymbosa.*

For Railroad Ties.—*Eucalyptus rostrata, Eucalyptus corynocalyx.*

There have been planted on the ranch since 1899 over 120,000 trees, eighty per cent. of which are growing and doing well; these are planted out in twenty-three (23) lots, besides avenues, along fences, etc., etc., in all over 250 acres, ranging in elevation from 300 feet at Waiopai and 2000 feet at Makawao to 6500 feet.

At 300 feet Kiawe is the only tree I plant, but there are trees of this sort now growing in Kuia, at the 2500 feet altitude. I am selecting the seed from these trees and planting them still higher up. At what elevation they will cease to thrive remains for time to prove.

At the 6500 feet elevation I have planted the aforementioned nine varieties, also a number of pines; and strange to say, the pines are doing the least well of them all. Between 2000 feet and 6500 feet they all do well except that the *Acacia melanoxylon* is subject to the ravages of the so-called "Olinda beetle." If it were not for this set back, it would grow almost as rapidly as the rest of them.

The common Wattle that grows so successfully in the Kula District, I have found by experience to be the equal of, if not superior to, the Hawaiian Koa for ox yokes, brake-blocks for wagons, etc., etc. If dried carefully it does not warp or crack, and is very durable. There ought to be quite a future for this tree in Kula as it grows, seeds itself, and thrives in the face of all that cattle can do to destroy it. I have noticed it growing down on the plains, at as low an elevation as 500 feet, and from there to 4000 feet it grows equally well.

I should like to have identified a tree I noticed growing near Hilo, at the residence of Mr. W. H. C. Campbell, manager of the Hawaii Mill Co. I have heard it called German Spruce. Whatever it is, it certainly grows as well as any tree I have seen in the Islands, and it might have quite a large commercial value. I know that these trees (there are eight or nine of them) are not more than six years old, as I was there at that time, and they were not even planted then. I have tried some seed I secured at the time I was there (last April), but am afraid the trees are too young for the seed to germinate, as so far I have had no success.

I should think it would be well worth the trouble when any officer of the Forestry Department is in Hilo, to look them up and identify them. I would give a good deal to get them growing on the slopes of Haleakala.

Respectfully submitted,

L. VON TEMPSKY,

Manager Haleakala Ranch Co.

LIST OF TREES EXPERIMENTED WITH BY HALEAKALA RANCH COMPANY TO NOVEMBER 30, 1906.

Name.	Date Planted.	Remarks.
Ash	Jan., 1902	Grows well at 5500 ft. elevation.
Acacia Baileyana	May, 1902	Grows well; wonderful reseeder.
" Latifolia	Jan., 1905	Grows well.
" Melanoxylon	Jan., 1904	One of the best trees to plant.
" Pycnantha	Sept., 1906	Grows well.
" Lopantha	Sept., 1906	Grows well.
" Floribunda	Sept., 1906	Grows well.
Beech, purple	Jan., 1902	Grows well at 5500 ft. elevation.
Brachychiton Acerifolia	Sept., 1906	Grows well.
Catalpa Speciosa	Jan., 1902	Very slow of growth.

Name.	Date Planted.	Remarks.
Catalpa Bignonioides	Jan., 1902	Did not grow.
Cryptomeria Japonica	Jan., 1902	Did not grow.
Camphor	Jan., 1902	Very well at 2000 ft. great reseeder.
Cupressus Macrocarpa	Jan., 1899	Very good from 2000 to 5500 ft. el.
Casuarina	Jan., 1902	Very good at 2000 ft. elevation.
Eucalyptus Robusta	Sept., 1901	A 1 from 2000 to 5500 ft. elevation.
" Citriodora	Sept., 1900	do.
" Globulus	Jan., 1899	do
" Rostrata	Jan., 1899	do
" Ficifolia	Jan., 1899	Grows well 2000 to 4000 ft. el.
" Salignae	Jan., 1903	Seed sterile.
" Marginata	Jan., 1903	Seed sterile.
" Cordosa	Jan., 1903	Seed sterile.
" Cerbera	Jan., 1903	Does well.
" Coriacea	Jan., 1903	do
" Pillularis	Jan., 1903	do
" McArthurii	Jan., 1903	do
" Longifolia	Jan., 1903	do
" Sideropholia	Jan., 1903	do
" Dephanophylla	Oct., 1903	Seed no good.
" Obliqua	Apr., 1904	do
" Leucoxylon	Apr., 1905	Seed good, does well.
" Corymbosa	Apr., 1905	do do
" Corynocalyx	Apr., 1905	do do
" Paniculata	Sept., 1906	Does well so far.
" Amygdalina	Sept., 1906	do
" Botryoides	Sept., 1906	do
" Siberiana	Sept., 1906	do
" Rudis	Sept., 1906	do
" Marginata	Sept., 1906	do
Elm	Jan., 1902	Grows well but for "Olinda beetle"
European Larch	Jan., 1902	do do
German Spruce	May, 1906	Seed did not sprout.
Grevillea Robusta	Jan., 1901	Very good from 2000 to 4000 ft. el.
Ginko Biloba	Oct., 1902	Sprouted and died.
Kamane	Jan., 1905	Grew well.
Karaka	Aug., 1906	Grows well so far.
Locust, black	Jan., 1902	Grew well, Olinda beetles killed them.
" white	Jan., 1902	do do
Linden	Jan., 1902	Grows well but for Olinda beetle.
Maple, Norwegian	Jan., 1902	do do
" Cutleaf	Jan., 1902	do do

Name.	Date Planted.	Remarks.
Milo	Apr., 1903	Does well makai.
Manele	July, 1906	Grows well.
Maiden Hair tree	May, 1902	2 seeds sprouted, did not thrive.
Pua	May, 1902	Did not grow.
Pinus Maritima	Jan., 1903	Good seed, trees did not thrive.
" Torreyana	Jan., 1903	do do
" Tuberculata	Jan., 1903	do do
" Ponderosa	Jan., 1903	do do
" Pinea	Jan., 1903	do do
" Attenuata	Dec., 1904	Seed sprouted, slow growth.
" Coulteri	Dec., 1904	do do
" Insignis	Dec., 1904	do grows well.
" Lambertiana	Dec., 1904	do do
Picea Macrocarpa	Dec., 1904	do slow growth.
Poplar, silver	Jan., 1902	Grows well.
Rubber Ceara	May, 1906	Slow growth.
Cork Oak	Mar. 29, 1902	Sprouted, but did not succeed.
Sequoia Gigantea	Jan., 1902	Growing well (one) but slowly.
" Sempervirens	Jan., 1903	Seed no good.
Tipuana Speciosa	May, 1902	Seed sterile.
Tulip Tree	Jan., 1902	Grows very well at 2000 ft. el.
Uhiuhi	July, 1906	do
Kiawe	Jan., 1899	do
Syncarpia Laurifolia	May, 1902	Did not grow.

REPORT OF MR. W. F. POGUE.

Koolau, Maui.

Kailua, Maui, January 24th, 1907.

Dear Sir:—Complying with your request for a report on the state of the Koolau and East Hamakualoa Forest Reserve, I would state: That the fence from Halehaku to Makapipi, erected two years ago, has been kept in repair, all stock have been excluded and with few exceptions, and then for only a day or two, no stock have been at large above the said fence.

The renewal of the forest in places where formerly there was only Hilo grass, is very marked in some localities; young Paihi, Ohia Lehua, Kopiko, Haa, Koa and other native forest trees are coming up very thick in places.

In spots at Honomanu, Keanae, Nahiku the Ieie is dying out, and many of the forest trees with it, the reason for which is not apparent.

There have been no forest fires since the erection of the so-called forest fence.

The residents living contiguous to this Forest Reserve are now reconciled to the exclusion of stock from above the forest fence, and, in not a few cases, are giving assistance in the preservation of the forest.

Respectfully submitted,

W. F. POGUE.

REPORT OF MR. T. S. KAY.

North Kohala, Hawaii.

Kohala, Hawaii, Dec. 31, 1906.

Dear Mr. Hosmer:—

I have your regarded favors of Nov. 22 before me. Regarding the information you call for about the forests in this district, I regret to say I cannot supply you with any information which you do not know, as I have made no investigations as to forest acreage.

There have been no forest fires during the past year in our district; there have been no additions to existing reserves.

Present reserves are in fine condition, becoming so dense that it is now impossible to get through the old trails; fences are in a fairly good condition, sufficient to prevent animals from doing any injury.

Private planting of trees in ravines and waste places has been carried on as usual.

A very fine, healthy belt of forest is now growing well along the sea coast in Halawa after many years of persistent effort, in all about 15 acres. Having had good success here, I would like to see the whole coast line planted up.

And as our effort is an object lesson, I hope in the near future to see others do this.

Believe me to remain, Yours respectfully,

THOS. S. KAY.

REPORT OF MR. JOHN M. ROSS.

North Hilo, Hawaii.

Hakalau, Hawaii, T. H., 21st Dec., 1906.

Dear Sir:—In reply to yours of Nov. 22nd, requesting a statement from each of the District Foresters for your annual report, I will report as follows:

1. Present Extent of Native Forest: I would estimate the present limits of the native forest in my district to average six miles in depth by sixteen in length, or about 62,000 acres.

2. Present Condition of Forest: The forest condition is excellent, with a dense undergrowth of ferns, vines and shrubs. From the edge of the cane belt back for about a quarter of a mile or so, there are several dead or dying Ohias occasioned by former clearings in the near vicinity, but which are now being rapidly covered with Koa and dense undergrowth of ferns, shrubs and vines.

There has been no injury to the forest from any cause whatever during the past year.

3. Private Forest Reserves: There have been no areas of forest set apart as forest reserves excepting Government forest land. All private forests, which are owned by Bishop Estate, Pepeekeo Sugar Co. and Hakalau Plantation Co., and other private owners, are controlled by the respective owners, but are preserved for the preservation of forest as well as conserving our water supply.

From Makahanaloa right across to the lands of Honohina the upper forest boundary is fenced. From Honohina across Piha and Maulua the forest is protected by a strip of raspberry bushes so dense that sheep cannot get through, and as this unfenced strip lies makai of the sheep ranch the forest is practically protected from the inroads of cattle or sheep.

The preserving of our forests on these Islands is one of the many judicious acts of our present Executive and the future will more fully illustrate to us the far-sightedness of this policy of preserving our forests, upon which all of our running streams are dependent, and all credit is due to private owners for their coöperation in this laudable policy for the good of the country at large.

4. *Tax Exemption of Forest Land:* Forest that is fenced off and treated as a reserve may be exempted from taxation. No advantage is derived from this provision as all are assessed the same. In levying assessments there is no regard, in my opinion, as to what an equitable valuation would be, but rather to increase year by year if there is no appeal, or in other words, let the willing horse take all the load he can possibly haul for the present, with utter disregard for his future.

5. *Forest Planting:* Under this head Mr. Pullar of the Honomu Sugar Co. and Mr. Webster of the Pepeekeo Sugar Co. have informed me that they are doing some planting under the supervision and recommendation of your office so that you are familiar with what is being done. On Hakalau there has been nothing done in the way of tree planting.

Respectfully submitted,

JOHN M. ROSS,

District Forester, North Hilo.

REPORT OF MR. JOHN A. SCOTT.

South Hilo, Hawaii.

Wainaku, Hilo, Hawaii, Dec. 20th, 1906.

Dear Sir:—Yours of the 22nd Nov. was duly received and contents noted.

Present Condition of the Forest: I have nothing new to report on the condition of the forest, as I am not aware that it has been injured in any way during the past year, except that on the upper side near W. H. Shipman's ranch, there were a number of the old and mature trees blown down by a strong wind that prevailed during the early days of March.

Private Forest Reserves: The lands of Kikala, Alae and Kalalau, belonging to the Bishop Estate, under lease to the Hilo Sugar Company, and the fee simple land of Puueo, are the only private lands that are included in the forest reserve in this section, and they are being maintained as forest reserves by the owners. For the maintenance of the water supply to the streams, as with the continued clearing off of the forest, the flow of the streams has been in late years seriously affected.

The area of the above lands under forest must be in the neighborhood of 1300 acres.

Forest Planting: The Hilo Sugar Company is endeavoring to reforest a tract of land on Punahoa 1st with Black Wattle trees, but as the young plants have only been set out a short time, it is too early to report success.

Yours very truly,

JOHN A. SCOTT,

District Forester.

REPORT OF MR. JOHN WATT.

Puna, Hawaii.

Olaa, Hawaii, Dec. 20th, 1906.

Dear Sir:—Beg to acknowledge receipt of yours of the 22nd inst., regarding forest in this district.

Present Extent of Native Forest: The Puna forests may be said to consist of two large belts of woods separated by the pahoehoe lava flow lying to the eastward of the Volcano road.

The heaviest belt, that to the westward, contains about 62,000 acres and is mainly of Ohia wood, while Koa is present at the higher altitudes.

To the westward the forest has been destroyed by lava flows and exists largely as pockets, with the exception of the woods between Pohoiki and Panau.

This section contains about 111,000 acres, or about 173,000 acres for the district.

Present Condition of Forest: The forest here is in its usual healthy condition as far as I have seen it.

Private Forest Reserves: There are no private forest reserves in the District of Puna.

Tax Exemption of Forest Land: None of the land owned privately in this district has been properly fenced so as to comply with the law, therefore no tax exemption of forest lands exists in this district.

Forest Planting: No forest planting has been done here, properly speaking. A few rubber trees have been set out at different points, but more as an experiment than any attempt at reforesting.

Forest Fires: There have been no fires in the forest within the past twelve months with the exception of numerous fires in that portion of the district lying between the Puna Plantation and Olaa Plantation.

The forest in this part of the district is very, very scattering, small, scrubby trees, growing in the cracks in the pahoehoe. The country is covered with a thin growth of Hilo grass and the ranchmen have frequently set fire to the grass during dry weather. This has undoubtedly done some damage to the scattering trees, but no attempt was ever made to extinguish the fires.

I have, on several occasions, called the ranch-owner's attention to these fires, but so far he evidently has not been able to prevent the parties living in that district from setting fire to the grass.

Several grass fires were also caused by people passing along the road and dropping burning cigarettes and matches.

I have nothing further of interest to communicate in this report.

I respectfully remain, Yours very truly,

J. WATT,
District Forester.

REPORT OF MR. JULIAN MONSARRAT.

Kau, Hawaii.

Kapapala Ranch, Pahala, Kau, Hawaii, Dec. 2nd, 1906.

Dear Sir:—In reply to your letter requesting a report from me on forestry conditions in my division, beg leave to reply as follows to your questions:

Present Extent of the Native Forest: I hardly know how to answer this, as a "concise description of the native forest" in my division is a difficult question to answer, unless you are ready, and willing to expend money for surveys, "for the purpose of comparison in future years." Am not good at guessing. All forest reservations that *should* be, *have been* made, under the "Forest Reserve in the District of Kau," dated and signed by Governor Carter, August 2nd, 1906, and containing an area of 65,850 acres. In passing would mention the fact, that the Hawaiian Agricultural Company in February, 1896, completed the construction of a fence 31 miles in length, around the greater portion of this reserve, at their own expense, and have kept this fence in good repair ever since, at an annual expense of $1000.00, not including an extra outlay of some $4000.00. The fence enclosed a large area of good pasture land, and it was also necessary to kill off a large number of cattle, for which they have never asked the government a "rebate" on their leases. It may also be well to mention the fact that there was nothing in their leases compelling them to erect this amount of fencing.

Present Condition of the Forest: Is very good, and the young trees show a remarkable growth within the reserve, more especially the Koa and Ohia Lehua. The larger trees were injured somewhat by the storm of a year or so ago, a number having been blown down. Where Koa is protected by undergrowth, nothing seems to injure it, except strong winds.

Private Forest Reserves: None. [But note the second paragraph above.—R. S. H.]

Tax Exemption of Forest Land: Know of none, or that any advantage has been taken of the law. Guess the government get all that is coming to them in the way of taxes, and more too, all right, all right.

Forest Planting: The Hawaiian Agricultural Company have, within a year, set out some eight thousand trees, consisting principally of Monkey-pods, which Mr. W. G. Ogg, the manager, informs me withstand the severe droughts of this district much better than any other variety. This company have started two large nurseries with the intention of planting a large area of waste and other lands this coming year, and are experimenting with a variety of trees, with the object in view of finding varieties that will prove good drought resisters. They expect to set out some hundred thousand trees next year, weather permitting. In this connection, beg to state that this is an expensive, and unsatisfactory district in which to plant trees, owing to the uncertainty of the weather. I have found this so from experience. To make tree planting a success in this district, requires a great deal of care, labor and expense.

Forestry in General: The Koa, outside of the reserve, is fast dying out, being attacked by a borer and other pests. In my opinion it would be far better to find some parasites, which would destroy these pests than it is to form mahogany companies, for as it looks to me this borer is a more rapid worker than the saw and axe. The combination of borer, saw and axe will soon clean out all the Koa, unless something is found to destroy the former, and that very soon. There is no Koa outside of the reserve that might be classed as commercial.

Steps should be taken to pass a law during the coming Legislature to prevent the cutting of young trees within the forest reserves, also for pay of forest rangers.

In my opinion it is very necessary that an appropriation for a traveling entomologist should be asked for from the Legislature.

Respectfully yours,

J. MONSARRAT.

REPORT OF MR. ERIC H. EDWARDS.

South Kona, Hawaii.

Papa Ranch, Hoopuloa, Hawaii, January 5, 1907.

Dear Sir:—I herewith beg to send in a small report which I trust will be of some interest.

In re the present limits of the forest in this district, it is practically the same as of yore, and as for the condition, I have not noticed any injuries to it during the past year. Where there are cattle running they are apt to bark trees of various sorts but not to any very great extent.

No forest reserves have been set apart in this district during the past year.

During the past year, Mr. R. v. L. Domkowicz has planted out various trees: "Logwood," "Jacaranda," "Lebanon Cypress," "Medeira Mahogany," "Rubber," Gum trees of various kinds, "Kou," "Milo," "Ironwood," "Camphor," etc., all of which are making good growth.

This is, I think, all I can say on the subject this year, as practically no changes have taken place in the conditions during the past year.

Yours very truly,

ERIC H. EDWARDS.

REPORT OF MR. G. W. McDOUGALL.

South Kona, Hawaii.

Hookena, South Kona, Hawaii, Dec. 8th, 1906.

Dear Sir:—Yours of Nov. 22 wishing a report on subject of forest in my district which I believe extends from Ahupuaa of Hookena to Ahupuaa of Kaohe in the District of South Kona.

Taking the average elevations of present native forest in my district, it will be about from 1,800 feet elevation up to 5,500 feet elevation. There are portions of the forest in my district as low down as 12 to 1,500 ft. elevation, and on Hookena, the Mamani forest runs up to 6,500 to 7,000 ft. elevation.

The general condition of the forest is dense and uninjured, except in one portion between Honokua and Hukuiopae. In this portion cattle are being run in the forest, and they are barking and killing young Koa and other trees which have a soft juicy bark.

These cattle men are located on private land, but the cattle go over Government land and all, and as the boundaries between the different lands are not known up in the forest, I cannot see how a stop can be put to same until boundaries have been located.

Very respectfully,

G. W. McDOUGALL.

REPORT OF HON. JOHN D. PARIS.

Central Kona, Hawaii.

Kealakekua, Dec. 27, 1906.

Dear Sir: In accordance with your request, I hereby submit my report as forester for Central Kona:

There has been very little change in the condition of the forest in my district since my last report.

The heavy forest belt is about three and a half to four miles deep and is composed mostly of Koa and Ohia, intermixed with Kolea, Pua, Opiko, Olomea and Pilo, with an undergrowth of ferns and vines.

I have noticed very few insects or blights, except the worm which eats the leaves of the Koa tree. These have been very numerous this year and in many places the Koa trees have been denuded of foliage, but their life is short and the leaves soon grow out again.

Forest Reserves: The only forest reserve in South Kona is the heavy forest on the lands of Kahauloa, Keei and Honaunau, belonging to the Bishop Estate. This is about three miles deep and four or five miles wide, and is mostly heavy forest. It has been fenced for about four years. It has grown up a jungle and in many places fine young Koa and Ohia trees are pushing up through the undergrowth.

A like reserve will probably be made on the lands of Keauhou and Kahaluu, belonging to this Estate.

Forest Planting: Very little has been done here in this line, as we have fine forests already planted. What is needed is to preserve them and not wait until it is too late. The Territory should set an example and see that all forest tracts and public lands are protected.

The Algaroba trees are increasing along the sea cosat and large portion of the Kona coast could be covered with them if an equal interest was taken in planting them.

Forest Fires : No fires of any consequence have occurred. A small fire started at the upper edge of the woods at Honokua, but was put out before any serious damage was done.

The general forest belt of Central Kona is in good condition, excepting those portions owned by private parties and heavily stocked with cattle, there the forest is disappearing.

I remain, Yours truly,

J. D. PARIS,
Forester for Central Kona.

REPORT OF MR. J. A. MAGUIRE.

North Kona, Hawaii.

Huehue, Kailua, Hawaii, Dec. 14, 1906.

Dear Sir:—I herein submit my report on Forestry, in reply to yours of Nov. 22nd. There are no new conditions in regard to the forest of North Kona.

This report is almost a repetition of my former ones.

The Government has set aside a Forest Reserve of fine Koa on a part of the land of Honuaula, and has thus made a step forward in the preservation of the forest covered slopes of Hualalai. The Bishop Estate, I believe, has given its consent to the reservation of part of their forest land adjoining.

Kona is all a Native Forest, except where clearance has been made by the small farmers or native homesteaders. Along the sea coast where the lava flows have emptied into the sea are the barren spots. If the owners of the lands along the sea coast would only make it compulsory for their tenants to plant cocoanut trees, there are many little fertile sand beaches that might be made attractive and useful by planting the cocoanut palm. As an inducement and help to the poor Hawaiian tenants, the owners of the lands might furnish them with the young plants and make a stipulation in their leases to have them fence and care for the plants.

Between here and Puuwaawaa is a virgin forest of native trees found nowhere else on the whole group, seeds of which are being collected for the Experiment Station. These trees flourish on the bare lava with apparently very little soil. The Koa forest, which has been enclosed in the reservation of Honuaula, already begins to show the good effects of protection. The Mamani above the Koa belt on the southerly slope of Hualalai is increasing very rapidly, spreading towards the summit.

There are no private forest reservations in this section. There is very little tree planting, except a few fruit trees. The climate of Kona is so mild that it is the ideal place for the cultivation of tropical fruits, but the market and the means of transportation are so limited that there is very little fruit cultivation. The trees grow wild, no care being taken of them, and naturally the fruit is inferior and does not bear transportation. The drought of the past two years made great inroads in the growth of the forest, but recent rains have started the seeds and where they are protected from cattle grow very rapidly. My district has so far been very fortunate in escaping from forest fires.

The lantana blight has done very fine work, aided by the dry weather. What growth there is now is not strong, and in a few years I think the land will be quite clear.

Yours respectfully,

J. A. MAGUIRE,
Forester for the District of North Kona.

LIST OF THE DISTRICT FORESTERS.

(Corrected to December 31, 1906.)

Following is a list of the (forty) District Foresters with their respective jurisdictions:

KAUAI.

ALBERT S. WILCOX.

In and for the District of Halelea.

FRANK SCOTT.

In and for the District of Koolau, excepting the land of Anahola.

GEORGE H. FAIRCHILD.

In and for the land of Anahola and the northern portion of the District of Puna, extending as far as the land of Wailua.

F. WEBER.

In and for the portion of the District of Puna, south of and including the land of Wailua, except the lands controlled by Grove Farm Plantation.

EDWARD BROADBENT.

In and for those lands in the District of Puna, controlled by the Grove Farm Plantation.

REV. J. M. LYDGATE AND WALTER D. McBRYDE.

In and for that portion of the District of Kona, lying to the east of the Hanapepe Valley.

FRANCIS GAY.

In and for that portion of the District of Kona, lying between and including the Waimea, Poomau and Kauaikanana Valleys on the west and the Hanapepe Valley on the east.

AUGUSTUS F. KNUDSEN.

In and for the District of Na Pali and that portion of the District of Kona, formerly known as the District of Waimea, lying to the west of the Waimea, Poomau and Kauaikanana Valleys.

OAHU.

ANDREW ADAMS.

In and for the District of Koolauloa.

L. L. McCANDLESS.

In and for that portion of the District of Koolaupoko extending from Koolauloa to the land of Heeia.

W. C. WEEDON.

In and for that portion of the District of Koolaupoko extending from and including the land of Heeia to the land of Kailua.

JOHN HERD.

In and for that portion of the District of Koolaupoko extending from and including the land of Kailua to Makapuu Point.

PAUL R. ISENBERG.

In and for that portion of the District of Kona extending from Makapuu Point to and including Manoa Valley.

WALTER F. DILLINGHAM.

In and for the Districts of Ewa and Waianae.

A. M. NOWELL.

In and for the District of Waialua.

MOLOKAI.

JAMES MUNRO.

In and for the Island of Molokai, excepting that portion between the lands of Pukoo and Halawa, inclusive.

C. C. CONRADT.

In and for the portion of the east end of the Island of Molokai, lying between the lands of Pukoo and Halawa.

LANAI.

CHARLES GAY.

In and for the Island of Lanai.

MAUI.

H. P. BALDWIN.

District Forester at Large for the Island of Maui.

L. BARKHAUSEN.

In and for the District of Lahaina.

C. B. WELLS.

In and for the District of Wailuku.

H. A. BALDWIN.

In and for the District of Hamakuapoko and the western half of the District of Hamakualoa.

W. F. POGUE.

In and for the District of Koolau and the eastern half of the District of Hamakualoa.

C. J. AUSTIN.

In and for the District of Hana.

L. VON TEMPSKY.

In and for the District of Makawao.

L. VON TEMPSKY and DR. J. H. RAYMOND.

In and for the Districts of Kula, Honuaula, and the lands beyond, to and including Kaupo.

HAWAII.

T. S. KAY.

In and for the District of North Kohala, and that portion of the District of Hamakua lying between the District of North Kohala and the Waimanu Valley.

E. E. CONANT.

In and for the District of South Kohala.

DAVID FORBES.

In and for that portion of the District of Hamakua from and including the Waimanu Valley to the District of Hilo.

JOHN M. ROSS.

In and for that portion of the District of Hilo extending from the District of Hamakua to the land of Makahanaloa.

JOHN A. SCOTT.

In and for that portion of the District of Hilo extending from the District of Puna to and including the land of Kikala.

JOHN WATT.

In and for the District of Puna.

JULIAN MONSARRAT.

In and for that portion of the District of Kau extending from the District of Puna to and including the land of Punaluu.

GEORGE C. HEWITT.

In and for that portion of the District of Kau extending from the land of Punaluu to the District of Kona.

ERIC H. EDWARDS.

In and for that portion of the District of South Kona extending from the District of Kau to the land of Kaohe.

WM. R. CASTLE and GEO. W. McDOUGALL.

In and for that portion of the District of South Kona extending from and including the land of Kaohe to the District of North Kona.

JOHN D. PARIS.

In and for that portion of the District of North Kona extending from the District of South Kona to and including the land of Kahaluu.

JOHN A. MAGUIRE.

In and for that portion of the District of North Kona extending from Kahaluu to the District of South Kohala.

LIST OF DISTRICT FIRE WARDENS.

(Corrected to December 31, 1906.)

Following is a list of the (fifty) District Fire Wardens, with their respective Districts:

CHIEF FIRE WARDEN

RALPH S. HOSMER,

Superintendent of Forestry, *ex officio*

DEPUTY FIRE WARDEN AT LARGE

DAVID HAUGHS.

In and for the Territory of Hawaii.

DISTRICT FIRE WARDENS.

KAUAI.

C. W. HUDSON.

In and for the Wainiha Valley, District of Halelea.

W. F. SANBORN.

In and for the District of Halelea, excepting the Wainiha Valley.

FRANK SCOTT.

In and for the District of Koolau, excepting the land of Anahola.

GEORGE H. FAIRCHILD.

In and for the portion of the Districts of Koolau and Puna, extending from the land of Anahola to the land of Olohena, inclusive.

F. WEBER.

In and for the portion of the District of Puna, south of and including the land of Wailua.

REV. J. M. LYDGATE.

In and for that portion of the District of Kona, formerly known as the District of Koloa.

FRANCIS GAY.

In and for that portion of the District of Kona, lying between and including the Waimea, Poomau and Kauaikanana Valleys on the west and the Hanapepe Valley on the east.

AUGUSTUS F. KNUDSEN.

In and for the District of Na Pali and that portion of the District of Kona, formerly known as the District of Waimea, lying to the west of the Waimea, Poomau and Kauaikanana Valleys.

OAHU.

ANDREW ADAMS.

In and for the District of Koolauloa.

FRANK PAHIA.

In and for that portion of the District of Koolaupoko, extending from the Koolauloa District line to the land of Heeia.

GEORGE CAMPBELL.

In and for that portion of the District of Koolaupoko, extending from and including the land of Heeia to the land of Kailua.

JOHN HERD.

In and for that portion of the District of Koolaupoko, extending from and including the land of Kailua to Makapuu Point.

CHARLES H. BAILEY.

In and for that portion of the District of Kona, extending from Makapuu Point to Palolo Valley.

H. J. RHODES.

In and for Palolo Valley, District of Kona.

W. M. GIFFARD.

In and for that portion of the District of Kona, lying between Pauoa and Manoa Valleys.

G. H. MOORE.

In and for Pauoa and Nuuanu Valleys, District of Kona.

WALTER F. DILLINGHAM.

In and for the District of Ewa and that portion of the District of Waianae lying to the East of the Waianae Mountains.

F. MEYER.

In and for that portion of the District of Waianae lying to the West of the Waianae Mountains.

BYRON O. CLARK.

In and for that portion of the lands of Wahiawa and Waianae-uka, lying to the east of the main Government road from Ewa to Waialua.

A. M. NOWELL.

In and for the District of Waialua.

MOLOKAI.

JAMES MUNRO.

In and for the Island of Molokai, excepting that portion between the lands of Pukoo and Halawa, inclusive.

C. C. CONRADT.

In and for that portion of the east end of the Island of Molokai, between the lands of Pukoo and Halawa, inclusive.

LANAI.

CHARLES GAY.

In and for the Island of Lanai.

MAUI.

H. P. BALDWIN.

Fire Warden at Large, for the Island of Maui.

LOUIS BARKHAUSEN.

In and for the District of Lahaina.

R. C. SEARLE.

In and for the District of Kaanapali.

C. B. WELLS.

In and for the District of Wailuku.

H. A. BALDWIN.

In and for the District of Hamakuapoko and the west half of the District of Hamakualoa.

W. F. POGUE.

In and for the District of Koolau and the east half of the District of Hamakualoa.

JOHN CHALMERS.

In and for the District of Hana.

HUGO HANEBERG.

In and for the District of Kipahulu.

J. H. RAYMOND, M. D.

In and for the Districts of Honuaula and Kahikinui.

L. VON TEMPSKY.

In and for the Districts of Kula and Kaupo.

HAWAII.

T. S. KAY.

In and for that portion of the north half of the District of Kohala, extending from the land of Kaauhuhu to the Hamakua District line.

SAM. F. WOODS.

In and for that portion of North Kohala, extending from the northern boundary of the land of Kawaihae I to and including the land of Kaauhuhu.

E. E. CONANT.

In and for the District of South Kohala.

DAVID FORBES.

In and for the western part of the District of Hamakua, extending to the boundary of the land of Paauhau.

JAMES GIBB.

In and for that portion of the District of Hamakua, extending from the western boundary of the land of Paauhau to the boundary of the land of Kukaiau.

ALBERT HORNER.

In and for that portion of the District of Hamakua, extending from and including the land of Kukaiau to the Hilo District line.

JOHN M. ROSS.

In and for that portion of the District of Hilo, extending from the Hamakua District line to the land of Makahanaloa.

JOHN T. MOIR.

In and for that portion of the District of Hilo, extending from and including the land of Makahanaloa to the land of Kikala.

JOHN A. SCOTT.

In and for that portion of the District of Hilo, extending from the Puna District line to and including the land of Kikala.

JOHN WATT.

In and for the District of Puna.

WILLIAM G. OGG.

In and for that portion of the District of Kau, extending from the Puna District line to and including the land of Punaluu.

CARL WOLTERS.

In and for that portion of the District of Kau, extending from the land of Punaluu to the Kona District line.

ERIC H. EDWARDS.

In and for that portion of the District of Kona, extending from the Kau District line to and including the land of Kaapuna.

GEORGE W. McDOUGALL.

In and for the portion of the District of Kona, extending from the land of Kaapuna to and including the land of Hookena.

JOHN D. PARIS.

In and for that portion of the District of Kona, extending from the land of Hookena to and including the land of Kaawaloa.

T. C. WHITE.

In and for that portion of the District of Kona, extending from the land of Kaawaloa to the land of Kahaluu.

JOHN A. MAGUIRE.

In and for that portion of the District of Kona, extending from the land of Kahaluu to the Kohala District line.

FOREST RANGER.

DAVID KAPIHE.

In and for that section of the District of Kona, Island of Oahu, bounded on the east by Manoa Valley, on the north by the Konahuanui Mountain Range, on the west by Pauoa Valley and on the south by the makai edge of the eucalyptus forest, the Makiki reservoir and the mauka boundary of the Judd land in Makiki and Manoa.

Report of the Librarian.

Honolulu, Hawaii, Dec. 31, 1906.

Board of Commissioners of
Agriculture and Forestry,
Honolulu, Hawaii.

Gentlemen:

Under the authority conferred on me by the Board at a meeting held on March 9, 1904, when it was resolved that the library and the routine work of the office be placed in my charge, I have the honor to submit the following report for the past year.

LIBRARY.

The statute creating the Board provides that "it shall be the duty of the Board to secure copies of the laws of other States, Territories, and countries, and other publications germane to the subject matter of this Act, and make the same available for public information and consultation."

The aim of the library is to cover the field of general agriculture in its relation to tropical and sub-tropical conditions, especial attention being paid to the collection of publications having to do with Botany, Entomology, Forestry and Animal Industry. The library now numbers between four and five thousand books and pamphlets, besides serial publications in completed volumes and currently received.

Accessions to the library are received through purchase, gift and exchange, the attempt being made, as opportunity and means permit, to secure the standard authorities and the other more important books in the several branches of Natural Science named above.

The policy of the Board is to maintain its library as a free reference library, open to the public, daily, during office hours. As yet the library has not been used as generally as could be wished. This is probably due in part to the fact that some of those who could most profitably use it are not able to do so because of not residing in the vicinity of Honolulu, while others who might consult the library are not aware of what it has to offer. To meet the latter objection the Board staff has lost no opportunity of calling the attention of the public to the existence of the library and of cordially extending an invitation to all to make use of it. During the latter part of 1906 more persons visited the library than at any previous time and those who came were almost without exception persons who could and did profit by so doing.

An important feature of the library is the current periodicals regularly received. A full list was given in the Report of the Board for 1905, and need not be repeated here.

In the purchase of new books during the year the aim has been to add to the standard works on Entomology and Forestry now on the shelves and to continue systematically the collection of Floras of tropical and sub-tropical countries in all parts of the world.

Among the important accessions received by purchase during 1906 may be mentioned the following:

Title.	*Botany.* Author.
Flora Capensis (7 volumes)	Harvey & Sonder
Flora, British India (7 volumes)	Hooker
Flora, Tropical Africa (8 volumes)	Oliver & Thiselton-Dyer
Flora, Mauritius and the Seychelles	Baker
Flora, British West Indian Islands	Grisebach
Flora, Madeira	Lowe
Flora, Southern United States	Chapman
Flowering Plants of Western India	Nairne
Vascular Plants from Surinam	Pulle
Southern Wild Flowers and Trees	Lounsberry
The Tree Book	Rogers
History of Botany	Sachs
Plant Geography	Schimper
Enumeration of Hawaiian Plants	Mann
Indigenous Flowers of the Hawaiian Islands	Sinclair
Pflanzenfamilien (Phanerogams) (11 vols.)	Engler & Prantl

Forestry.

The Forester ....Nisbet
Handbuch der Forstwissenschaft ....Lorey
Wald, Klima und Wasser ....v. Liburnau
Die Klimate der Erde ....Woeikof
Einwirkungen des Waldes ....Ebermayer
Forst Asthetik ....v. Salisch
Fortwissenschaft ....Fischbach
History of the Lumber Industry of America ......Defebaugh
Timbers of Commerce ....Stone
Principal Species of Wood ....Snow
Trees ....Ward
Studies in Forestry ....Nisbet
Forest Utilization, Mensuration and Sylviculture ..Schenck
Manual of Forest Engineering for India ....Rogers

Entomology.

Butterflies of the West Coast ....W. G. Wright
The Coccidae of Kansas ....S. J. Hunter
Microscoper's Vade Mecum ....A. B. Lee
American Almanac of Photography.
Entomology ....J. W. Folsom
Explanations of Terms Used in Entomology .....J. B. Smith
American Insects ....V. L. Kellog
Trans. Ent. Soc. London (1877-1890)
The Entomologist (1840-1905)
Entomologists' Monthly Magazine (1864-1905)
Anatomy of the Blow-fly (2 vols.)..................Lowne
List of Hemiptera in the British Museum ....Dallas

A large number of important Coccid papers and a number of separates bearing on our native insect fauna.

General Science.

A Naturalist on the River Amazon ....Bates-Clodd
A Naturalist's Wanderings in the Eastern Archipelago. Forbes
The Malay Archipelago ....Wallace
Land Revenue of British India ....Baden-Powell

On Seedlings .... Lubbock
Research Methods in Ecology .... Clements
Odorographia .... Sawyer
New Creations in Plant Life .... Harwood
Irrigation Farming .... Wilcox
Tropical Agriculture .... Nicholls
Volcanoes of the Hawaiian Islands .... Brigham
The Teaching Botanist .... Ganong
Classification of Flowering Plants .... Rendle
Treatise on the Physiology of Plants .... Sorauer
Disease in Plants .... Ward
Timber and Some of Its Diseases .... Ward

Rubber.

Para Rubber (Second edition) .... Herbert Wright
The Chemistry of India Rubber .... Carl Otto Weber
Coffee and India Rubber in Mexico................ Romero
India Rubber, Gutta-Percha, and Balata .... Brannt

Matters in connection with the books and publications on Entomology have been handled by Mr. Jacob Kotinsky, of the Division of Entomology, who has also directed the preparation of a card catalog (by author, subject and series) of the Entomological publications. Later this catalog will be extended to cover the other books in the library.

The recording of the accessions of current periodicals and the arrangement of the magazines on the library shelves was performed by Mr. David Haughs up to May, 1906. Since then it has been done by Miss Ella K. Dayton, the clerk of the Division of Entomology, who has also carried out certain other routine work in connection with the library.

USE OF THE BOARD ROOM.

Besides serving as the library, the large room in the office building is used for the regular meetings of the Board and also, through the courtesy of the Commissioners, for the meetings of other organizations having to do more or less directly with the advancement of agricultural science.

During the year forty-eight evening meetings have been held. The following list gives the names of the organizations and the number of meetings held by each:

Hawaiian Entomological Society	12
Honolulu Improvement Advisory Board ..	13
Pawaa Improvement Club	3
McCully Improvement Club	4
Waialae, Palolo & Kaimuki Imp. Club......	3
Farmers' Institute	2
Hawaiian Poultry Association	11
Total	48

Because of its accessibility and because it is well lighted, screened, and of sufficient size to accomodate the organizations that use it, the Board room is well adapted for such meetings. That the privilege of using the room is appreciated by the several societies is attested by several votes of thanks that have been passed during the year. From this use of its building the Board gains the advantage of bringing the public in touch with the work done by its several divisions and with the resources of its library.

During the year the Board itself has held nine regular meeting in its office; three special meetings were also held down town. Seven forest reserve hearings have also been held during the year in the office of the Board, to secure expressions of public opinion on various forest reserve projects.

EXHIBITS OF FRUITS AND WOODS.

The collections of fruits, indigenous woods, and seed from island grown trees continue to arouse interest not only in visitors to Honolulu but also among local residents. The collection of fruits contains many specimens never seen in the markets. During the year a number of particularly rare fruits have been added, which will repay a visit of inspection.

As in the past Mr. Alexander Craw has had charge of preparing the fruits for exhibition, a task requiring skill and careful attention to detail.

Visitors.

During the year 262 persons have registered in the record book, kept in a conspicuous place near the entrance to the building. The record by months is as follows:

January	32
February	16
March	44
April	17
May	16
June	18
July	13
August	10
September	23
October	25
November	21
December	27
Total	262

As many persons forget or neglect to sign the register this does not represent all those who have visited the office during the year, nor does it include more than a small part of the persons who have called to consult members of the staff on one subject or other in connection with the work of the Board.

ROUTINE WORK.

In common with many similar organizations much of the time of the staff of the Board of Agriculture and Forestry is consumed with routine work. Owing to the necessity for frequent reports there is more stenographic work and typewriting to be done than would perhaps appear from the size of the staff, while the regular correspondence of the Board is steadily increasing.

A record kept by the stenographer for the "Board" and "Forestry" letters, shows that during the year letters were prepared and sent out as follows: Board business, 58; Library, 55; Division of Forestry, 584; Forest Nurseryman, 405; Forest Fire business, 100; total, 1,202.

Bearing in mind the absence of the Superintendent of Forestry during the early summer months, this is a decided increase over the correspondence of former years.

Miss Melika Peterson has continued during the year as general clerk of the Board and stenographer of the Division of Forestry. Her faithful and conscientious service deserves more than passing recognition.

Distribution of Seed and Publications.

In the early part of the year the distribution was completed of the 1905 quota of congressional vegetable seed, furnished by the Delegate to Congress and, with the coöperation of the Superintendent of Public Instruction, sent out through this office to the various public schools throughout the Territory. As long as the seed lasted every family represented in each school had a share. In all something over 15,000 packages of seed were sent out.

In August the Delegate sent his quota of the U. S. Department of Agriculture Yearbook for 1905 to be distributed through this office. Copies were sent to each public school principal and to all who applied under an offer published in the newspapers. Some copies of the 1905 and also of the 1903 yearbooks still remain on hand. They may be had on application.

The second Report of the Board of Agriculture and Forestry, for the year 1905, delayed in preparation, was finally issued on Oct. 13, 1906. An edition of 2,500 copies was struck off and in addition 500 separates of the report of each of the four divisions were printed for distribution to divisional correspondents outside of the Territory. The full report was widely distributed throughout the Territory.

To facilitate the sending out of this report and to do certain other extra clerical work, Miss Marie Legros was appointed in October for a temporary period as special clerk. She continued to serve at the end of the year.

Forester and Agriculturist.

The publication of the Hawaiian Forester and Agriculturist, a monthly magazine issued under the direction of the Board, has been continued during the year. This journal is devoted to Forestry, Entomology and Agriculture and to the development of what are locally termed the "allied industries." Under the efficient editorship of Mr. Leopold G. Blackman, it has come to have an established place among local periodicals.

The Forester and Agriculturist deserves a much wider circulation than it now has, for each volume contains many valuable contributions of general interest to those concerned with Agriculture under sub-tropical conditions. The 1906 volume (No. III) contains 422 pages, illustrated by 11 plates and 1 wood cut. The financial condition of the Board does not permit the free distribution of the Forester and Agriculturist. Accordingly, while issued under the auspices of the Board, the magazine is published by the Hawaiian Gazette Company of Honolulu, from whom it may be obtained. To subscribers anywhere in the United States the yearly rate is one dollar; to those in foreign countries, one dollar and a quarter.

BUILDINGS AND GROUNDS.

A few minor changes have been made in the office building during the year, the most important being the completion in January of the rebuilding of the book cases in the library room and the construction of a map case in the office of the Superintendent of Forestry. At the same time improvements were made in the Entomological laboratory and in the insect-proof room, particularly by the construction in the laboratory of a cabinet, specially designed for controlling the light, for careful work with the compound microscope.

Of the changes in the other buildings on the Nursery grounds the most important is the transformation of the old fumigating house into a modern dark room, equipped with water, gas, and special appliances for the convenience of the photographer. The dark room is for the use of all of the Board staff, though so far only entomological work has been done in it. The dark room was constructed in August.

Earlier in the year an addition was made to the stable, which permitted the rearrangement of the stalls and gave more room for the carriage shed and the feed and harness room. There are now one regular and three box stalls. These changes were made necessaray by the needs of the Division of Animal Industry. By the erection of a partition at one end of the wagon shed a seed room was obtained in which are stored the seed collected in and around Honolulu.

By the resignation of Mr. C. J. Austin, the cottage in the Nursery grounds until recently occupied by him is made vacant. No disposition had been made of it on December 31. As Mr. Austin has several times pointed out, the house is out of repair. It must be put in order before it can again be occupied.

Grounds.

No noticeable changes have been made in the nursery grounds during the year except the completion of an entrance driveway, begun in 1905, on the east side of the Board building. In connection with the making of the roadway, the stable yard was filled in with coral rock and black sand. The sidewalks about the nursery grounds were given a top dressing of black sand at the same time. The grounds are kept in condition with the aid of two prisoners detailed by High Sheriff Henry. Without these men it would be impossible to maintain the grounds in satisfactory shape. A good deal could still be done toward making the nursery more attractive. It is expected that a number of improvements can be made during the coming year.

Very respectfully,

RALPH S. HOSMER,

Librarian.

DIVISION OF ENTOMOLOGY.

Report of Superintendent of Entomology and Inspector.

Honolulu, T. H., December 31st, 1906.

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

GENTLEMEN:—I take pleasure in submitting to you a brief synopsis of the work done by your Division of Entomology during the year 1906.

INSPECTION OF IMPORTATIONS.

During that period we have boarded 355 steam and sailing vessels from which were discharged and inspected 202,374 packages of fruits and vegetables from outside the Territory, out of which we returned or destroyed 697 packages infested with injurious insects or plant diseases. Beside the above we received 77 bales and cases of plants and trees that we fumigated with hydrocyanic acid gas. By mail there arrived 603 packages of small plants and seed. Even in such small packages we found and preserved samples of injurious insects and diseases that would have been established on these Islands if not intercepted.

INFESTED JAPANESE RICE.

During the months of September and October we found importations of the old crop of Japanese rice to be infested with larvae of a small brown beetle (*Tenebroides mauritanicus*) and numbers of "Rice weevils" (*Calandra oryza*). The former is only found in the fall in old rice, and shipment of this rice was forbidden, by cable, to be sent here. Upon the arrival of the new crop rice in November it was found to be entirely free from the above pests.

Upon the arrival of the first shipment of "old crop" rice which was found infested, we were granted permission by Acting Collector of Customs, R. C. Stackable, to make a thorough test of fumigating the rice in the sacks, with carbon bi-sulphide in one of our large fumigating chambers, with a strength of half a pound of the bi-sulphide to every 100 cubic feet of enclosed space. After an exposure of twenty-four hours we found the fumes had penetrated the sacks and rice, killing both larvae and weevils. At your request and by courtesy of the Hon. James Wilson, Secretary of Agriculture, and the U. S. Department of the Treasury, Mr. Stackable was directed by the latter department to withhold delivery of the rice until after fumigation and report by your entomologist that the work was satisfactory. We soon used up all the carbon bi-sulphide to be had in town and sent a cable message to San Francisco for two hundred pounds more, which arrived at the end of October. During the intermission we tested the efficacy of hydrocyanic acid gas in a large chamber, using an ingeniously contrived outfit so as to avoid the possible danger of inhaling any of that deadly gas. Large tubs were used, in each of which was placed a ten gallon wooden tub, and into the latter was poured the necessary amount of water, and commercial sulphuric acid. Over each of these tubs was suspended by a strong cord a paper sack containing ten pounds of 98°-99° per cent. cyanide of potassium. In all, one hundred pounds were used at one charge. The method referred to above, so as to avoid any danger to the operators, was to extend the cord from each tub distributed in the chamber, to the door where they were screwed. The farthest package of cyanide was lowered first, and when all were lowered, the door was closed and sealed with paper and paste and remained closed for thirty-six hours, after which it was ventilated by the aid of a powerful electric fan. Upon examination it was observed, however, that this gas did not penetrate the grain as thoroughly as the carbon bi-sulphide did, and several of the larvae and weevils were still alive; so the chamber was again sealed up and remained until the arrival of the bi-sulphide; with the latter the work was throughly done. In all, we fumigated 22,924 sacks of Japanese rice. The importers paid for the chemicals and the work in handling the sacks. No damage to the grain is caused by the fumigation, either in its value as a food or its germinative power.

SOIL BALLAST CONDEMNED.

On Sunday, July 15th, the large four-masted American iron ship "Atlas," arrived from Yokohama, with a cargo of soil ballast containing vegetable matter and roots. As the laws of this Territory, and your regulations positively prohibit the landing of such material, we notified the Master and the Agents of the vessel that they would have to discharge her cargo of ballast into the ocean outside the harbor. After some objections on the part of the representatives of the vessel the regulations were finally complied with.

NEW FUMIGATORY.

When it was found necessary to fumigate packages arriving by mail we have heretofore had to remove them to one of our fumigatories on the docks. To expedite this work we, with the Executive Officer's consent and Postmaster Pratt's permission, have now an outfit in the postoffice. As we use chemical gases, no building is in danger of fire from their use.

IMPROVEMENT IN OUR FUMIGATORIES.

Our fumigatories are now all fitted up so that we can use heavy as well as light gases, enabling us to treat grape roots whene there is danger of introducing *Phylloxera* thereon. These insects are very small and have a preference to locate under the rough bark on the roots, but when treated with carbon bi-sulphide before they are planted, nothing of that kind can escape.

PRACTICALLY NO DAMAGE FROM FUMIGATION.

We are frequently informed by parties that have received plants—more especially small plants by mail—that their plants were killed by fumigation; whereas, the fact is, that very seldom plants or fruit when treated in our fumigatories are even injured, as we fully understand the amount of gas each species will stand, and the exact number of cubic feet in the fumigatory is known, whereas in the treatment of trees or shrubs growing out doors, the space under the tents has to be estimated. Parties receiving plants seldom or never take into consideration that their plants have been in transit, under conditions other than natural, from eight to twenty days. In most instances with such plants as heliotrope, etc., the roots are sometimes dried and shriveled up, and other plants are packed tight in boxes with all their foliage, to heat and rot, arriving in anything but growing condition and instead of their being injured by the inspectors, or by fumigation, we frequently are the means of rescuing plants from death, by removing the rotted leaves or stems, or by applying a little moisture to those that are suffering from lack of it. The Postmaster or one of his assistants' attention is always called to packages when they arrive in bad condition.

INSECTS AND OTHER PESTS FOUND UPON IMPORTATIONS.

I will here briefly enumerate some of the pests that have been stopped the past year. Among scale insects we found some lemon trees arriving in January, by mail from Florida, that were infested by a white wax scale (*Ceroplastes floridensis*). The owner's attention was called to the condition of the trees, after which they were burned. On the S. S. "Hong Kong Maru" that arrived on the 23rd of October, fourteen small tea plants were found infested with this same scale from Japan, and destroyed. Another importation of five tea plants from Japan in May, were infested with the partial "mining scale" (*Pseudaonidia duplex*). This pest also attacks orange trees, camellias and a great variety of shrubs. In the same package was a plant of *Lespedeza bicolor,* a low growing shrub with small violet-purple flowers, that was completely covered with a species of *Aspidiotus* scale unknown to me. This and the tea plants were destroyed by fire; the balance of the plants in the case were fumigated with hydrocyanic acid gas. Two tea plants and a *Sanchezia* plant came by mail from Florida infested with scale insects about the same time and were also burned.

Retinosporas are generally free from scale insects, but a plant that came from Japan was found with a colony of healthy *Dactylopius* sp. that appeared to thrive on that plant as a food. The tree was destroyed; a sample of the infested plant was put up in a tube as an office specimen.

INFESTED ORANGE TREES. On a shipment of citrus trees from California, we found some larvae of "black" and "cottony cushion" scales, and after a thorough fumigation the trees were passed; we already have both species on the Islands, together with their natural enemies and parasites that keep them in check.

ORTHEZIA INSIGNIS. A package of plants was received by mail, in which we found a *Salvia* plant infested with the so-called "Maui Blight" (*Orthezia insignis*), figured on page 127 of your report for 1905. This plant was destroyed. Unfortunately this insect has been widely distribubted by stockmen in the hope that it would kill out the Lantana plant that was rapidly destroying their pasture lands. While it checked the vigor of the Lantana it in no case destroyed it like the insects that were introduced specially for that purpose. The *Orthezia* unfortunately seriously attacks a variety of economic trees and plants. The *Salvia*, above referred to, was destroyed and the owner and shipper were both notified.

OTHER PESTS. Besides the foregoing scale insects, we have found on imported trees and fruit samples of several species of scale insects that are already well established on the Islands, including the disastrous "purple" (*Lepidosaphes beckii*), the "Florida red" (*Chrysomphalus ficus*), the "orange red" (*Aspidiotus aurantii*), and that white pest (*Pseudococcus nipae*) of the "Alligator pear." A consignment of plants arrived from Cuba that was slightly infested with the latter pest. This was my first knowledge of the existence of that pest there. Its apparently limited numbers there may be accounted for either by parasitic checks or by recent introduction. An effective parasite for this pest would be of incalculable value to this Territory, and Mr. Koebele's attention will be called to its existence there.

Besides scale insects, we occasionaly find vegetables or plants infested with larvae or egg clusters of insects, which are either destroyed or fumigated. In the case of trees or plants, these borers are always dug out or the infested plants are burned. In this class we have destroyed trees from the Southern States which were infested with larvae of the "peach root borer" (*Sanninoidea exitiosa*). We have even found small trees by mail infested by the same pest.

FUNGUS DISEASES.

Various fungi have been detected upon plants, trees and fruits coming from outside the Territory, and all such have been destroyed. These included plum, orange and other plants, also sugar cane.

SUGAR CANE PESTS.

A consignment of sugar cane arrived May 8th ex S. S. "Manchuria" from Formosa, via Hong Kong. As a precaution we fumigated the case before unpacking it to guard against the possible escape of any insects that had hatched on the voyage. Upon subsequent inspection frequent evidence of small borers was found. The cane was also black in places from the "honey dew" exuded by mealy bugs secreted under the base of leaves. Under the circumstances it was deemed necessary to burn the cane, including the packages.

During my vacation in August my assistants, Messrs. Kotinsky and Austin, intercepted another importation of sugar cane cuttings, which on this occasion came from Fiji ex S. S. "Miowera." These, after fumigation, showed signs of having been punctured by leaf and cane hoppers. The cane was burned not only on this account, but because of unmistakable signs of fungi on the stalks. I have since learned from a resident in Fiji of the existence of a very serious fungus disease in sugar cane on that island.

On December 20th, two packages of sugar cane cuttings arrived by mail from Florida. The cane was very slender and in sampling, it evidently contained a very low percentage of saccharine matter. The cane was discolored in places evidently by some insect. The cane and packages were burned.

INFESTED MANGO SEED.

On Sunday, June 10th, the transport Sheridan arrived from Manila. In her mail was a tin box of mango seed packed in charcoal. Upon inspection the seeds were found to be badly infested with small eight-legged silvery mites. The owner was notified and the condition of the seed was shown him, after which the entire lot, also the packages and wrappers, were burned.

LOCAL INSPECTION WORK.

MANGO WEEVIL.

In my weekly report to you of October 2, 1905, I called your attention to the existence of a mango fruit pest in two sections of Oahu. Mr. Austin and I immediately visited these districts, but found the crop of mangoes over for that season. Upon examination of a few fallen dry seeds under the trees we discovered several larvae and beetles, afterwards identified as *Cryptorhynchus mangiferae,* Fabr. We called the attention of the Superintendent of the estates to the existence of the pest, and requested him to have all the seed collected and burned, which was done.

During the past season Mr. Austin and I made a careful examination of the cultivated mango trees on Oahu, and found the above pest distributed from Palama valley to within a mile of Pearl City. During the fall of 1905, Mr. Van Dine first called attention to its existence on Oahu, and his estimate then was that sixty per cent. of the fruit in the original district was infected. An elderly Hawaiian living at the head of a small valley which we visited on our investigating trip, stated that he had known of its existence in his mangoes three seasons before our visit. From the enormous size of the trees and the character of the undergrowth and soil I fear that it is too late to attempt the extermination of this pest. As the weevil is found inside the seed, there appears to be very little damage done other than destroying its germinating power.

AN EFFORT TO EXTERMINATE THE INDIAN MANGO SCALES.

Previous to the enactment of the Plant Inspection law a shipment of Indian mango trees was imported and planted without fumigation, and during this summer they were found to be infested with the "mango scale" (*Coccus mangiferae,* Green), and a small white undescribed species resembling a *Pollinia.* Last August, obeying your orders, the trees were all fumigated with hydrocyanic acid gas. The trees were then making some new wood and the work was performed after sun down to prevent any serious injury from the actinic rays. Even with this precaution a slight scorching of the very tender twigs was noticeable, but two weeks later a thrifty new growth was sprouting all over the fumigated trees; and, what was more satisfactory, was the fact that upon further examination we failed to find a single living scale of either species. All immediately adjacent mango trees were also fumigated.

NEW SCALE INSECT.

In October a small package was received at this office from Kauai containing a twig of "Norfolk Island Pine" (*Araucaria excelsa*) infested with a cottony scale which Mr. Kotinsky determined to be *Pseudococcus aurilanatus*. This scale is a native of Australia, and was occasionally found upon small Araucarias entering San Francisco, but they succumbed readily to fumigation. The owner reported that he had found the scale on two small Araucarias that he had received by mail. He was advised to dip the trees in whale oil soap solution, which was done, and he afterwards sent sample twigs showing that the scales were all dead.

INTRODUCTION, BREEDING AND DISTRIBUTION OF BENEFICIAL INSECTS.

This section of work which has continued in charge of Assistant Entomologist Jacob Kotinsky, has progressed satisfactorily during the past year. The work has largely been the care, breeding and distribution of beneficial insects, including new importations, recently established species, as well as some of the older established forms. Other features of the work have been the study of injurious insects, especialy scale insects, and their enemies; the usual routine of biological and systematic work; correspondence and imparting information to visitors.

NEW IMPORTATIONS OF BENEFICIAL INSECTS.

In all, 14 consignments of useful insects were received during the year. Besides the collections sent in by Mr. A. Koebele from California and Arizona, we were also favored with one colony of ladybirds from California by Mr. E. M. Ehrhorn; one of ladybirds from Fiji by Mr. F. Muir, of the Hawaiian Sugar Planters' Association Experiment Station; and five colonies of scale enemies from China and Japan by Mr. Geo. Compere. Grouped according to host, these new six-footed immigrants may be classified as enemies of (*a*) horn fly, (*b*) scale bugs, (*c*) aphis or plant lice, and (*d*) army and cut worms.

(*a*) **ENEMIES OF HORN FLY.**

By far the largest and most numerous consignments of beneficial insects received during the year were enemies of the horn fly. These comprised an extensive variety of predators and two species of parasites. Neither of the latter, so far as could be ascertained, is a specific enemy of the horn fly, though one of them, referred to later as the "Arizona dung-fly parasite," was bred from horn fly pupae. The predators were beetles that habitually either live in cattle dung and feed upon the living maggots therein, or "tumble bugs" which disintegrate the dropping shortly after deposition, thus preventing the breeding of flies therein.

THE ARIZONA DUNG-FLY PARASITE (*Eucoila impatiens,* Say.) In his search for useful insects for the Territory, Mr. Koebele has concentrated his attention on the horn fly, taking enemies of our other pests, as Avocado pear scale and cutworms, incidentally. On the 5th of May, of this year, the "Alameda" brought, among other things, a box with dipterous pupae collected in dung in the vicinity of Nogales, Arizona. They were packed in sphagnum moss and kept at about 40° F. aboard the steamer. In the laboratory they were gradually brought to our normal temperature, and then segregated and put away for breeding. A little less than a month later males and females (Fig. 1) of the above named parasite began to issue. They were immediately supplied with two large jars full of cattle droppings well stocked with dipterous larvae and pupae that usually inhabit it. As fast as other specimens of the parasite issued they were placed in these jars. Twenty-five days later a large brood of the parasite made its appearance in the jars, and systematic distribution among ranchmen on the Islands and at

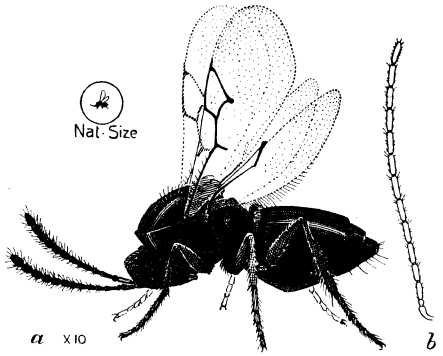


Fig. 1. Arizona horn fly parasite (*Eucoila impatiens*, Say): *a*, female; *b*, antenna of male. Both magnified 10 times. The natural size is given in the circle. (Original; by W. E. Chambers.)

the heads of the valleys in the vicinity of Honolulu immediately commenced. A portion of the brood was retained and two fresh jars stocked with it for further breeding and distribution. So far as we are aware, nearly all stock breeders on the Islands have been supplied with colonies of the useful insect.

It is now beyond doubt that the parasite does and will attack the horn fly larva and pupa, though it will probably show preference to the larger hosts breeding in the same medium. But even in the latter event it cannot but prove useful, both directly and indirectly. Directly, by reducing the numbers of the larger flies that inhabit cattle droppings. Indirectly by reducing the numbers of the larger maggots and pupae as a source of food to the mynah bird and other predators and thus compelling them to feed on the smaller fry, including horn fly larvae and pupae. No opportunity was yet open to ascertain whether the parasite has been established on the Islands, but the facility with which large numbers were bred in confinement encourages the hope that this useful ally will make itself at home on our Islands. Once established much of the success of its introduction will depend upon the intelligent manipulation by ranch managers and owners in distributing parasitized pupae over their respective lands.

For the identification of this fly we are indebted to Dr. W. H. Ashmead, through the courtesy of the U. S. Bureau of Entomology, Washington, D. C.

THE LESSER DUNG-FLY PARASITE (*Eutrias* sp.). This is a small four-winged fly, in general appearance very much like the preceding parasite, though only about half the size. It was bred from dung-fly pupae sent by Mr. Koebele per "Sonoma," which arrived in Honolulu Aug. 11th. After securing Mr. Perkins' assurance that it is a dipterous parasite, a number were released, and others were retained in the laboratory for breeding purposes. Although exactly the same method of breeding was pursued as with the other parasite, no results were forthcoming.

CARRION AND DUNG BEETLES (*Histeridae*). Each of the five consignments of desirable insects collected and sent by Mr. Koebele from Nogales, Arizona, contained a lot of these bettles in the pupa and adult stages. The immature forms were kept in the laboratory until maturity and then released. As indicated in the distribution table below, they were distributed over the Islands as widely as possible.

"TUMBLE-BUG" (*Copris carolina,* Linn.). Large numbers of this beetle were received alive and immediately released in suitable localities. This was the largest among the manure beetles received. It is dark brown, ungainly in appearance, almost an inch long, little less wide, and over half an inch thick (Fig. 2). "These insects act the part of scavengers by breaking up and burying the droppings of cattle and other animals. The female *Scarabaeus* detaches a portion of the dung and forms it into a ball, sometimes as large as the fist; this it rolls along by means of its hind legs, by pushing when necessary with its broad head, or by walking backwards and dragging the ball with its front legs. The strength and patience displayed by the creature in the execution of this task are admirable."*

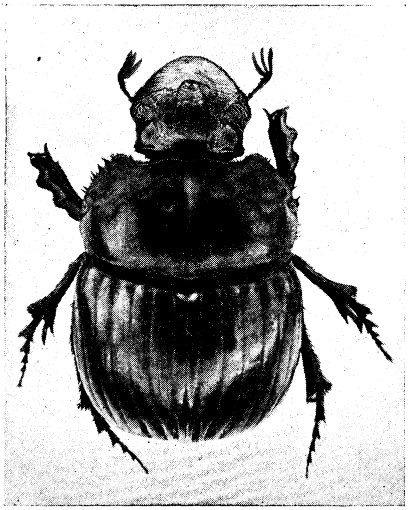


Fig. 2. One of the Tumble bugs (*Copris carolina,* Linn.) from Arizona released on these Islands. (Original; photograph by Dr. Cobb.)

OTHER MANURE INHABITING BEETLES. At least six other species of dung beetles were received and distributed. In distributing them, variety of climate was provided these immigrants in order to give them every possible opportunity for propagation and carrying on the good work for which they were intended.

(*b*) SCALE BUG ENEMIES.

Among our scale bug pests perhaps none attract more attention than the "Avocado mealy bug" (*Pseudococcus nipae,* Mask.), also known as "Alligator pear scale." As a matter of common observation this scale insect, which attacks also fig, banyan, bread-fruit, mulberry, guava and numerous other plants, is regularly each year,

* Sharp, Cambridge Nat. His., Insects II, p. 196

usually during the winter months, reduced to comparative non-importance by the black ladybird (*Rhizobius ventralis*, Ericks.). But when it gains the ascendency over its enemy during the summer it is very conspicuous by virtue of its white color, especially of the males, and becomes a subject of general complaint. For enemies of this, among scale insects, therefore, Mr. Koebele has given especial attention in his expeditions of the past year. Messrs. Muir, Ehrhorn and Compere also kindly assisted in this work by sending ladybirds that fed in their respective homes upon allied pests.

Following is a list of this group of insects received during the year:

LADYBIRDS.	DIPTERA.	HYMENOPTERA.	NEUROPTERA.
Exochomus pilatei, Muls. *Exochomus marginipennis*, Lec. Scymnids. *Hyperaspis lateralis*, Muls. *Chilocorus cacti*, Linn.	Syrphus. Geomyzid?	A variety of chalcids and encyrtids.	Hemerobiid.

AVOCADO MEALY BUG ENEMIES. The first named ladybird (*Exochomus pilatei*, Muls.) seemed a promising foe of the Avocado mealy bug, upon which it fed while under observation in the laboratory before being released. The Scymnids and *H. lateralis* were released in prodigious unmbers upon trees infested with this pernicious pest.

Numerous internal parasites (*Hymenopterous*) were bred from mealy bugs (*Ceroputo bahiae* and *Phenacoccus* sp.) sent by Mr. Koebele from California, and released, after eliminating hyper-parasites and questionable species. A Dipteron (Geomyzid) and lace-wing fly (Hemerobiid) were also bred from this material and released. None of these having as yet been definitely named, specific mention is omitted.

PURPLE SCALE PARASITES. Two large consignments of carefully packed almond twigs thickly infested with what is doubtless the "apple tree bark-louse" (*Lepidosaphes ulmi,* Linn.), or a closely allied species, were received from Hong Kong, China, sent by Mr. George Compere. From these a very pretty Chalcid (*Perissopterus* sp.) was bred and a number released upon trees infested with purple scale. These consignments were received August 14th and September 4th, respectively.

Mr. Muir has sent to Dr. Perkins, of the Hawaiian Sugar Planters' Entomological Division, citrus leaves infested with parasitized purple scale from China. We are informed that many parasites were bred and released by Dr. Perkins and staff.

FLORIDA RED SCALE PARASITE. On September 4th, the "Nippon Maru" brought also a small Cycas plant thickly infested with the above scale (*Chrysomphalus aonidum,* Linn.=*Aspidiotus*

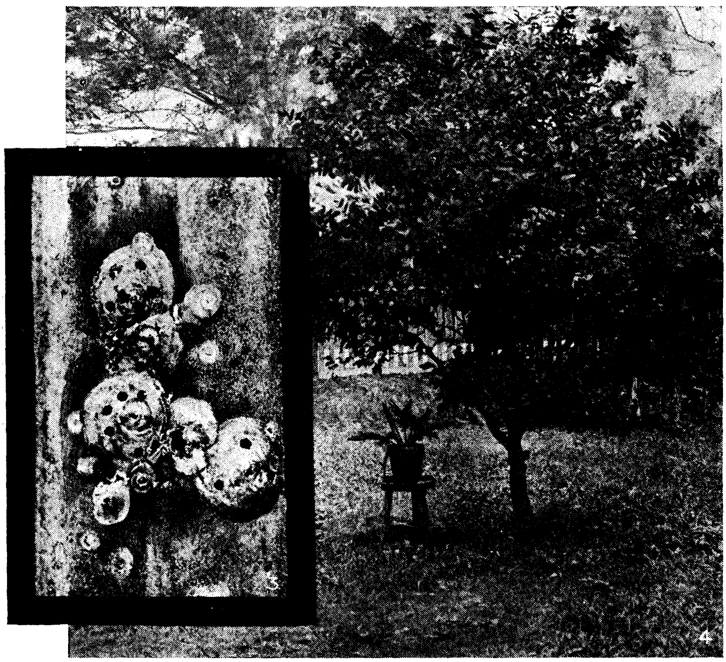


Fig. 3. *Chrysomphalus aonidum,* Linn., on bit of Cycas leaf from China, showing exit holes of parasite. The uncommon number of these holes (1 or 2 is the usual number in armored scale insects) indicates the probable effectiveness of the parasite. Magnified about 10 times.
Fig. 4. The Cycas with the above parasitized scale, potted, in the Government Nursery under an orange tree infested with the same scale. (Original; photographs by Jacob Kotinsky, arranged by E. M. Grosse.)

ficus, Ashm.) many of which showed 5-7 exit holes (Fig. 3) of a parasite. This plant came in good condition and after careful inspection was potted and placed beneath an orange tree (Fig. 4) well stocked with the scale.

PARASITES OF THE ORANGE RED SCALE (*Chrysomphalus aurantii*, Mask.) Two species of parasites were bred from this scale upon cuttings kindly left by Mr. Compere on his way to California aboard the "Nippon Maru," December 11, 1906. Several pairs of these parasites were released in the Government Nursery grounds on a tree infested with this scale. Of the two parasites one was a Chalcidoid, and the other a very pretty Encyrtid.

(*c*) ENEMY OF APHIS OR PLANT LICE.

FIJIAN LADYBIRD (*Arcaioneda tricolor*, var. *fijiensis*, Crotch). If established this will be the largest ladybird on the Islands, being about 8 mm. (1/3 in.) long, 7 mm. wide and 3 mm. high, or about twice as large as the red spotted ladybird (*Coccinella repanda*). It is light brown ochre in color with a narrow black stripe on the medio-dorsal line. The eggs, laid in batches of a dozen or less, and the larvae, are proportionately large, the latter being in addition armed closely with heavy spines and gaudily colored with transverse bands of orange and purple.

On February 12 we were presented by the H. S. P. A. Experiment Station entomologists with 10 adults, a number of larvae in various stages and egg batches of this ladybird. These were successfully bred in the laboratory until the middle of May, and the adults distributed from time to time. Here they were fed entirely upon aphis principally from sorghum. At no time were they observed to eat mealy bug, although they were confined with it for days, and Mr. Muir, who collected them in Fiji, has found them upon mealy bugs. About 30 days was consumed in the development from egg to imago, and on an average about 25 per cent. of the eggs under observation reached maturity.

(*d*) ARMY AND CUT WORM ENEMIES.

Several consignments of very large, black, flattish ground beetles (*Carabidae*, *Calosoma* spp.) (Fig. 5) were sent by Mr. Koebele from Arizona. These are predaceous insects that in the young and full grown stages habitually feed on other insects, particularly caterpillars in or close to the ground. Many of these were released in suitable localities.

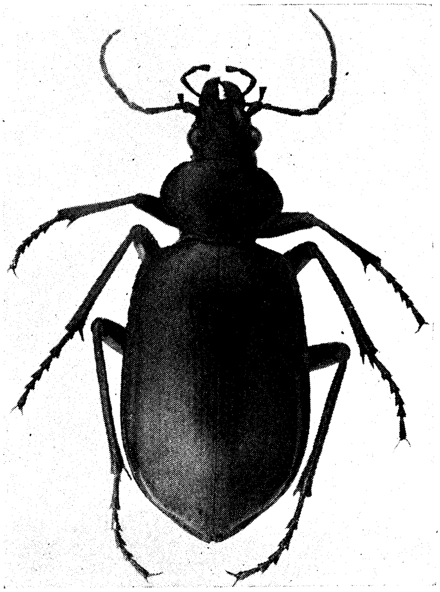


Fig. 5. One of the ground beetles (*Calosoma* sp.) from Arizona released on these Islands. (Original; photograph by Jacob Kotinsky.)

RESULTS TO BE EXPECTED.

Time alone will tell the result of the release of these various insects. This result, however, can only be either positive or neutral, depending upon whether or not the insects are established and how rapidly they increase. No evil effects need be apprehended for the reason that all the insects released were of either predaceous or parasitic habit, and no insect is known to abandon carnivorous diet for vegetarian.

PREVIOUSLY ESTABLISHED BENEFICIAL INSECTS.

Siphanta or Torpedo Bug Parasite (*Aphanomerus pusillus*, Perk.) This useful little ally reported last year as established and doing effective work in its new home, has since been found thoroughly established on a coffee plantation on this Island and numerous colonies were sent from there to Hamakua, Hilo and Kona, Hawaii, and Haiku, Maui. At the Forester's Cottage up Nuuanu Valley, where formerly Siphanta was exceedingly abundant upon the Eugenia trees, it is now a decidedly uncommon insect, so thorough has been the work of the parasite.

EXPERIMENT WITH THE JAPANESE BEETLE.

(*Adoretus umbrosus,* var. *tenuimaculatus,* Waterh.) Upon returning from Fiji, Mr. Muir reported the cacao plants of that country saved from the ravages of a beetle closely allied to the above, by means of a fence of bamboo sticks about 1 inch in diameter, placed 1½ inches apart, 3 or 4 inches from the plants and rising about 10 inches above the plant.

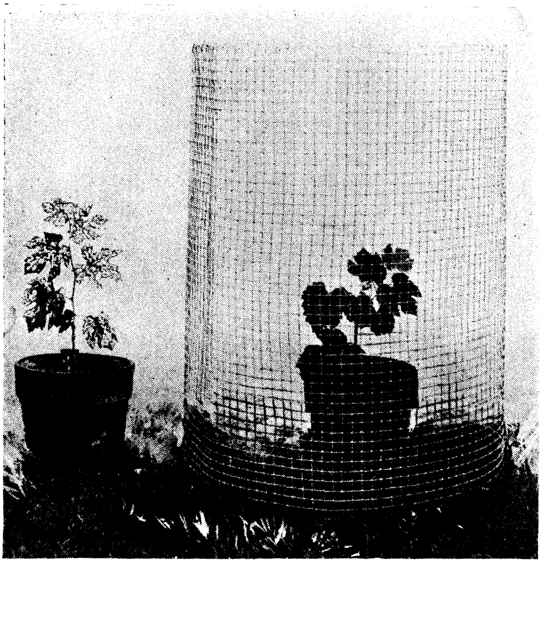


Fig. 6. These vines were grown indoors and placed in June in the Government Nursery grounds near a grape arbor badly infested with Japanese beetles, and a ¾ inch. mesh screen placed over one of them, as shown in the illustration. The photograph was taken ten days later. But the beetles were too much even for the screen for it was subsequently penetrated by them and the vine ruined. (Original; photograph by Jacob Kotinsky.)

To ascertain the effect of a similar fence upon our very much abused rose bushes by the Japanese beetle, lath and ¾-inch mesh wire screens were used in the construction of similar fences. At first the results were quite encouraging, as illustrated by the photograph (Fig. 6) which was taken 10 days after putting up

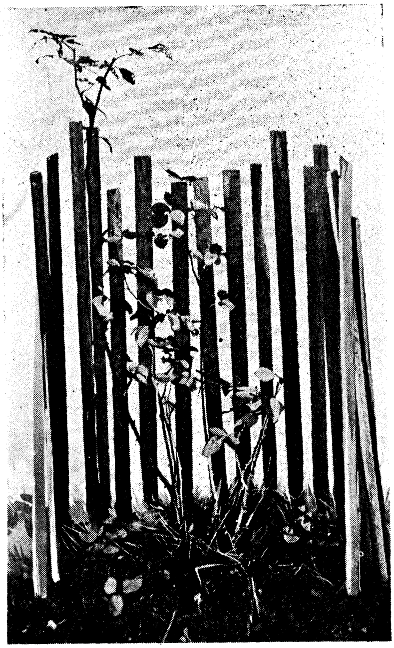


Fig. 7. This lath paling (the laths are 1½ in. wide and 1½ in. apart) was built about the rose bush last June. The photograph was taken in December. Part of the fence was removed to expose to advantage the rose bush within. It will be observed that the leaves within the fence were scarcely touched by the beetles, though they were somewhat injured by tailor bees (the round cuts). The only explanation to this fact that can be offered is that the beetles are apparently reluctant to pass the barrier. The branch above the fence was stripped by the beetles, yet this branch was able to make the growth because of the protection afforded in early development, since an identical rose (not shown in the illustration) made no headway at all for the beetles. The advantage of the fence over a lath house for roses is that it is much cheaper and allows the tops of the bushes to remain open and exposed to the sun,—an important factor in rose culture. (Original: photograph by Jacob Kotinsky.)

the experiment. The day following, however, the beetles penetrated the screen and commenced the destruction of the plant. The photograph of the rose (Fig. 7) shows, however, that in the long run a certain degree of protection is afforded the plant that is fenced in.

COLONIES OF BENEFICIAL INSECTS DISTRIBUTED DURING 1906.

Name.	Hawaii..	Maui....	Molokai.	Oahu....	Kauai...
HORN FLY ENEMIES.					
Arizona dung fly parasite (*Eucoila impatiens* Say)	19	11	5	26	12
Histers...........	1	2	1	5	....
Manure beetles...............................	26	12	12	19	25

Name.	Hawaii. .	Maui	Molokai	Oahu . . .	Kauai . .
SCALE BUG AND APHIS ENEMIES.					
Fijian ladybird (*A. fijiensis*)	....	2	....	8	1
Chalcaspis sp	....	....	....	6	....
Chalcidoidea (Misc.)	....	....	...	4	....
Cryptolaemus montrouzieri	....	....	....	1	....
Exochomus pilatei	...	....	....	1	....
E. marginipennis	....	....	....	2	....
Hemerobiid	....	....	....	6	....
H. lateralis	....	....	....	9	1
Perissopterus sp	....	....	....	2	....
Scale eating fly (Geomyzid)	...	....	....	6	....
Scymnids	....	....	....	2	....
Syrphus fly	....	...	....	2	....
Vedalia cardinalis	....	...	....	1	....
Parasite from Florida red scale (*Chrysomphalus aonidum* Linn.)	....	....	..	1	....
Parasites from Orange red scale (*Chrysomphalus aurantii* Mask.)	....	....	....	2	....
CUT WORM ENEMY.					
Calosoma spp.	2	2	1	3	1
MISCELLANEOUS.					
Siphanta egg parasite (*A. pusillus*)	18	....	....	1	....
Japanese beetle fungus	....	1	....	1	1
Lantana Insects	4	....	....	1	1

NOTE. It will be observed that the largest number of colonies of beneficial insects was released in Oahu, i. e., principally in and near Honolulu. The cause for this apparent partiality is obvious. If a useful insect is established it is desirable to have is as near the office as possible to facilitate further distribution. In the case of many insects immediate release is imperative and the best locality in the environs of the office was therefore chosen.

GENERAL REMARKS.

NEW FRUIT TREES. We have on various steamers to Brisbane, Queensland, forwarded packages of *Ceroplastes rubens* to Mr. Leslie G. Corrie, President of the Queensland Acclimatization Society, in hopes of introducing into that country the hymenopterous parasites that now keep that formerly damaging introduced scale insect in check on these Islands. In return for our efforts Mr. Corrie has very kindly sent us—freight prepaid—three new mandarin orange trees of a variety that originated there and is considered to be the finest mandarin orange in the world. One of the trees was planted on the uplands of Tantalus; one in Nuuanu Valley and the other on the outskirts of Honolulu. This will thoroughly test their adaptability to various elevations. Buds will be taken later from them for general distribution. A variety of persimmon, a mango tree called "Rose," and three small coccus palm trees were also sent. We appreciate and thank Mr. Corrie for his kindness.

ECONOMIC PLANTS FROM WASHINGTON, D. C.

Four large cases of "cacao" (370 plants) and six small mango trees arrived ex S. S. "Alameda" from the Department of Agriculture, Washington, D. C., via San Francisco. The former from their appearance had been thoroughly treated with Bordeaux mixture to destroy any fungi spores; on the mango tree we found a few very small "Florida red scale" (*Chrysomphalus ficus*), which upon microscopic examination we found were dead, evidently having been fumigated before shipment.

A CEYLON SUGAR CANE PEST.

Mr. George Compere, the beneficial insect collector for California, passed through Honolulu, December 11th, on his way to California from India and the Orient. While in Ceylon he observed a very destructive leaf hopper on cane and brought samples of the larvae and imago in a vial of formalin; he presented me with a few which I gave to the Entomological Division of the Hawaiian Sugar Planters' Association. To be forewarned is to be forearmed, and sugar cane or similar plants coming from Ceylon will receive careful examination and treatment.

AN IMPORTATION OF FIBER PLANTS.

In February a resident of Oahu imported three cases—1000 plants—of New Zealand flax (*Phormium tenax*); a careful examination did not reveal any insects or fungi. However, we examined each plant and then fumigated them, also the cases and packing. It is a fiber plant and great quantities of the fiber in bales enters San Francisco on nearly every steamship from New Zealand. Mr. Byron O. Clark of Wahiawa, intends testing it to see if it cannot be profitably grown on these

Islands. As it requires better land and more moisture than sisal I doubt if it will be as profitable as that plant.

CHOICE LIMES. During November we received a package of limes from Mr. W. W. Taylor of Kipahulu, Maui, samples of which we have on exhibition; they compare favorably with Mexican or California grown limes and should be extensively grown, and would command good prices when California lemons are scarce.

DARK ROOM. The original fumigating house, figured on Plate VII of your report for 1905, located on your experimental grounds, has not been used for that purpose since the construction of other rooms on the docks, and has been converted into an up to date photographic "dark room" where the various divisions of your Board can develop their photographic plates of subjects pertaining to their work.

THE PORT OF HILO. With your consent, two fumigatories have been built at Hilo, on the Island of Hawaii, and a quarantine officer, Mr. B. M. Newell, was appointed by your Board in August to take charge. One fumigatory was constructed on the principal dock, and the other at the postoffice.

Respectfully submitted,

Alexander Craw,
Superintendent of Entomology and Inspector.

Report of Prof. A. Koebele.

Alameda, California, Dec. 31, 1906.

To the

Honorable Board of Agriculture and Forestry,

Honolulu, T. H.

GENTLEMEN:—I herewith submit some field notes on enemies of the Alligator pear scale, Hornfly and other insects, sent to Honolulu during the year.

The study of enemies of Leaf-hoppers has been continued in California, Arizona and Sonora, the result of which will appear elsewhere.

PARASITES AND PREDATORY INSECTS FORWARDED FOR *PSEUDOCOCCUS NIPAE*.

Several lots of a Coccid, related to the Alligator pear scale, found abundantly on *Salicornia* were sent, with the following insects breeding on the same:

(1) A Chalcid parasite, frequently met with, was contained in every parcel sent.

(2) Two species of *Hyperaspis,* of these *H. postica,* Lec., was by far the most numerous. The round species appears to be *H. limbatus,* Casey. The first named was found during the later part of 1893, on roots of a bunch grass infested with a Dactylopiid, in company with *H. depressa,* Casey, *Hyperaspidius comparatus,* Casey, and *Scymnus debilis,* Lec., all of which were sent to the Islands at that time. The last named has become very abundant around Honolulu. A small *Scymnus* was found quite numerous upon the Coccid on *Salicornia* and was sent to the Islands; it resembles *S. guttulatus,* Lec., which is found abundantly on *Adenostoma fasciculatum* and *Baccharis pillularis,* infested with Lecanium; it was sent to the Islands in large numbers some thirteen years since.

In Arizona and Sonora a number of useful ladybirds were found and forwarded. A common weed, *Ambrosia artemisiaefolia* was found here and there to be badly infested with a Coccid, *Dactylopius* sp., often in such masses as to almost obscure the upper part of the plant. On this large numbers of *Hyperaspis lateralis,* Muls., were present in all stages, and several consignments were made of this Coccid with large numbers of the *Hyperaspis* which—as Mr. Craw has been informed by letter—is badly attacked by a Chalcid parasite. This scale is also attacked by an internal parasite, which was sent, and may prove of value in the Islands. The same *Hyperaspis,* described under a number of specific names, was also kindly forwarded by Mr. Ehrhorn from San Francisco; and from Alameda, California, specimens were collected on *Adenostoma fasciculatum* infested with *Lecanium* and *Pulvinaria,* during the autumn in 1893. The trees in the parks at the City of Mexico are badly attacked by a Coccid (*Dactylopiid*) upon which a variety of this ladybird is found. At times it is seen in large numbers and at other times but rarely, when the largest part of the pupae are destroyed by a Chalcid parasite. Sendings from this locality were made at various times, to the Commissioner of Agriculture and during 1902 to Dr. Perkins.

Another species of *Hyperaspis* was found during spring in Arizona, breeding upon a Coccid infesting *Opuntia;* the same was forwarded in all stages on its original food.

Whenever *Quercus undulata,* which grows sparingly over the hills around Nogales, Arizona, was found to be infested by *Aspidiotus personatus,* Comst., *Chilochorus cacti,* Linn., was always present and breeding on the same. Specimens of this, as on previous occasions, were also sent. Another species was found upon the same oak tree, or rather more so on the variety *crisea,* Emgelm., breeding upon a species of *Kermes.* Some of this ladybird, *Exochomus pilatei,* Muls., were also sent. Another interesting Coccinellid that was sent is *Thalassa montezuma,* Muls.; on one occasion this was found in large numbers in larva and pupa state upon a mesquite tree, *Prosopis julifera,* feeding upon a large Lecaniid, *Toumeyella mirabilis,* Cock. This fact had previously been reported by the late Mr. H. S. Hubbard in the Proceedings of the Entomological Society of Washington, Vol. IV, No. 3, p. 297. I have met with this insect in abundance on a similar, if not the same Coccid, upon *Acacia greggii* and *A. farnesiana*, at Cuautla, Morelos, Mexico, July, 1897. My notes do not show whether I sent the insect at that time.

During 1897 I collected a Coccinellid, of the Exoplectrae group, feeding upon an *Icerya*, in the State of Morelos, Mexico, and had then been informed by Mr. Schwarz that it was a species of *Chnoodes*. These are South American insects, a few species only have been taken in Mexico. In southern Arizona, *Icerya rileyi* was found upon several species of Mimosa, including mesquite, *Prosopis juliflora*. It is often riddled with holes from which a *Chalcid* parasite has issued, and the latter was bred in large numbers. This is apparently a useful enemy and may with advantage be used against *I. purchasei*. A species of ladybird, similar to that found in Morelos, was also present in considerable numbers and breeding upon *I. rileyi* around Nogales and Benson, Arizona. I also had the larva of the same, from which four *Chalcid* parasites were bred. I consider this of sufficient importance to record, since this parasite may readily be imported, or appear on its own account, in any district where the *Vedalia cardinalis* has been introduced, upon the larva of which it would unquestionably breed and prevent its beneficial work. Should this ever be the case—and it may be expected at any time in southern California—we should have recourse to the deadly *Chalcid* parasite of *Icerya rileyi*, which even without the help of man, may find its way into the orchards of southern California, if it is not already present.

OTHER BENEFICIAL INSECTS.

Of other useful insects found and forwarded in large numbers is *Calosoma simplex*, Lec. If the establishment of the same on the Islands should be successful, this would be a valuable agent in reducing the countless numbers of the so-called cut worms. I have had ample opportunities to observe the habits of these beetles. Being more or less nocturnal insects, they are attracted to the light during the evening in large numbers, where, amongst the hosts of various other creatures similarly attracted, they can gratify their insatiable appetite. Hardly any insect, that may sit around on the ground, is safe from their attacks. Small moths are usually an easy prey, even the numerous lively crickets are often attacked and after a few rough tumbles are overcome, any injured and helpless moth, however large, is devoured by them. Often some of these beetles would run over the walls full of resting *Sphingidae,* and it was repeatedly observed that this *Calosoma* would deliberately fasten its mandibles into, even such a large moth as *Protoparce 5-maculata,* Haworth, when both would fall to the ground and become separated again; yet undaunted, the beetle will renew its attack.

Calosoma scrutator, Fabr., was observed both in larva and mature stages. During spring, when the willow and cottonwood trees are covered with the larva of *Malacosoma,* the beetle and its larva are active by day and night under dead leaves at the base of the tree, always in wait for any larva that may come down to pupate. The beetle at this time can be seen at almost any time during the day, often ascending the trees in quest of larvae or cocoons of the above moth. I have fed them on the pupae and the usual meal consisted of some six or more. One of this *Calosoma* was kept in confinement for over three months (at which time it had to be killed on account of my departure) usually burying itself in the ground and becoming partly dormant, if food was not forthcoming, yet always becoming active again after devouring a few larvae of *Agrotis,* upon which it had been fed.

On a hot sunny day, June 17, 1906, while walking over a grass field in Sonoma County, California, a large coleopterous larva was noticed on top of the grass, exposed to the rays of the sun and with its head buried in a cocoon of one of the numerous *Malacosoma* present; it fed a few days longer on the same, entered the ground in a glass jar wherein it had been placed, and pupated. It produced the beetle twelve days later, yet remained in the ground a week longer; when it was taken out, it proved to be *Calosoma discors,* Lec.

A nocturnal tiger beetle, *Tetracha carolina,* Linn., or variety thereof, previously sent from Mexico, was also amongst the consignments.

THE HORN FLY.

Further enemies of the Horn fly (*Haematobia serrata*) were collected during the year and forwarded to Mr. Craw, mostly by means of puparia and maggots of flies that breed within manure, and produce internal parasites. More of the manure beetles were sent from Arizona and Sonora; of these I should expect the best results from a species of *Pinotus* (sent previously from the States of Morelos Mexico, with a host of other species found in that locality) which with *Canthon* and *Copris* comprised the sendings.

In Europe the value of Histerids as enemies of the Horn fly has long been recognized and a considerable number of the same were sent, some two or more species. What appears to be the larva of the large forms in Arizona was often present in considerable numbers in dung droppings of a few days old or in the ground below the same, at a time when the maggots are most abundant. These larvae were sent to be bred.

The mature beetle appears shortly after the manure is dropped, and may be found anywhere within or beneath the same, where it deposits its eggs. Within a week's time full grown larvae are already present, often in such numbers as to destroy every single maggot, not within the manure alone, but also in the soil, since repeated and careful examination of the ground to a depth of some five inches failed to reveal either maggots or puparia, though there were always plenty of these *Hister* larvae in search of those maggots, that had entered ground for pupation. Some two dozen of these larvae will take care of the entire lot of the various species of fly maggots that may breed in one dung dropping. I refer only to those larvae sent to breed. When full grown they construct a rather hard roundish cocoon out of earth, from two to five inches below the surface, and pupate herein.

I did not find time to breed the mature insect from this larva, yet so much material has been sent, that it should be an easy matter to do so in your laboratory, and we should not fail to establish this beetle on the Islands, providing the conditions are suitable.

Besides this *Hister,* two or more species of Carabidae, *Anisodactylus* sp., were most always present under manure that had become partly dry, so that the maggots therein had begun to leave the same and enter the ground. Most of these beetles were found burrowing in the soil at that depth where the fly maggots usually pupate, and it was but rarely that any puparia of the flies could be found, where this beetle was present.

In addition to the above predaceous insects there is another important agent in helping to keep the Horn fly in check. This is a small red ant, met with over large areas of ground; whenever present, and probably some sixty per cent. of the dung droppings will disclose the same, this ant will destroy every solitary insect that may breed in the manure; the ground below to any depth that the maggots may descend, is found swarming with it, and few, if any, of the puparia are exempt from destruction. This ant was not introduced, since the same conditions prevail on the Islands where *Pheidole megacephala* is so abundantly represented. With all the numerous enemies preying upon the Horn fly (there are many not enumerated here, for example the numerous Staphylinidae, and the internal parasites, which escape observation in the fields), the Horn fly is more or less a pest during a few months of the hot summer weather in California, Arizona and Sonora.

Respectfully,

A. KOEBELE.

DIVISION OF ANIMAL INDUSTRY.

Report for the Year Ending Dec. 31, 1906.

BY VICTOR A. NORGAARD, V. S. (Copenhagen).

Superintendent of Animal Industry, Board of Agriculture and Forestry, Territory of Hawaii.

Veterinary Inspector U. S. Bureau of Animal Industry.

The Board of Commissioners of Agriculture and Forestry,
Honolulu, Territory of Hawaii.

Gentlemen:—

I beg to submit herewith my second annual report as Superintendent of Animal Industry and Territorial Veterinarian.

Under the various headings below will be found such information as may be of interest to the breeders of different classes of live stock, in some cases supplemented by private or official correspondence pertaining thereto.

Very respectfully,

VICTOR A. NORGAARD,
Territorial Veterinarian.

INSPECTION OF IMPORTED LIVE STOCK.

During the past year the following live stock arrived on board sixty-three steam or sailing vessels:

	Honolulu.	Hilo.
Mules	178	117
Horses	97	9
Bulls	71	
Milch cows	52	
Calves	25	2
Hogs (for slaughter)	3344	
Hogs (for breeding)	15	
Sheep (for breeding)	33	
Goats (Angora)	18	12
Dogs	22	3
Crates of poultry	125	4

The regulations governing the importation of live stock, which were approved by the Governor on September 11th, 1905, have proved effective, and I am pleased to announce that the local representative of the United States Bureau of Animal Industry in San Francisco has signified his willingness to inspect all stock intended for shipment to these Islands. This, however, does not include the testing of horses and cattle for glanders and tuberculosis, and importers of these two classes of animals are still referred to this Board's inspector in San Francisco, in case they prefer to have them tested before shipment. The principal value of having Government inspection in San Francisco will, however, consist in the prevention of shipment of obviously affected animals, for instance cholera hogs or hogs originating from infected districts..

The appended correspondence relative to this subject will undoubtedly prove of interest to all importers of hogs.

Honolulu, April 5, 1906.

Dr. A. D. Melvin,

Chief, Bureau of Animal Industry, Washington, D. C.

Sir:—

On March 25th the bark "R. P. Rithet" arrived in this port with ninety-two hogs on board, many of which showed decided symptoms of hog cholera. The bark had left San Francisco on February 19th, and had, therefore, been thirty-four days on its way, during which time 158 hogs out of a total consignment of 250 head had died. These hogs had not been inspected in San Francisco before leaving, even though the owner had received repeated instructions from me not to ship hogs to this port without first having them inspected by Dr. Baker. It appears from statements made by the man who accompanied the hogs, and from other persons on board, that the animals were sick when placed on board on February 17th, two days before the bark sailed. During the first five days out the 250 animals ate less than 100 lbs. of feed, and on the sixth day several of them were reported to have broken out with large sores on various parts of the body. On the eighth day they began dying and continued so all during the voyage, eleven head being thrown overboard the morning of the day when they arrived in Honolulu. The hogs were sold by R., B. & Co. of San Francisco, and were consigned to Messrs. W. & C. of this city.

I immediately took steps to have several of the pens in the Animal Quarantine Station, near Honolulu, made hog proof, and, the morning after arrival, the animals were unloaded directly into stock cars and taken by rail to the quarantine station. Six head had died during the night on board and four more died on the way to the station. A post-mortem examination of these ten hogs showed the typical pathological alterations of hog cholera and swine plague. I had the apparently well ones separated from those which showed symptoms of the disease, and commenced treating them with the hog cholera remedy recommended by the Bureau. Since then about twenty head have died, on all of which I have made post-mortems with the same result as above described. The remaining animals will be confined at the quarantine station until they have either died or recovered, and will in no case be allowed to be taken to the fattening pens connected with the slaughter house, where hundreds of hogs are constantly being kept, but will in due time be taken in wagons to the slaughter house and killed, subject to post-mortem inspection.

As there can be no doubt that the animals in question were affected with hog cholera and swine plague when they were placed on board in San Francisco, I would like to ask what, in your opinion, should be done to prevent a recurrence of this incident. A regulation promulgated by the Board of Agriculture of this Territory prohibiting the importation of hogs without a certificate of health from the Bureau of Animal Industry Inspector at San Francisco, or other ports, would hardly be sufficient. Stock is constantly arriving here which has been submitted neither to the test of mallein or tuberculin, nor to any other inspection, and, considering the long voyage, the expense of shipment and the cost of the animals imported, it has not been found advisable so far to prohibit the landing of animals, even though they arrive here without certificates. In my opinion an order from the Bureau of

Animal Industry forbidding the shipment of live stock to this Territory without inspection would be far more effective, and the Territorial Board of Agriculture and Forestry would very much appreciate such action on the part of the Bureau. There is to my knowledge but little hog cholera or swine plague in the Territory, and great loss would be caused if a virulent form of the disease gets in here. The principal importers of live hogs in this Territory always buy their hogs in California, from districts which are known to be free from the disease in question, and avoid, as far as possible, to have them unloaded in San Francisco, except directly on board the ship which is to carry them to this port. This precaution was omitted in this case with the result that the importers suffered heavy loss. Please inform me whether the firm in question can have any recourse against the San Francisco firm for selling them diseased hogs, and whether any regulations of the Bureau of Animal Industry regarding shipment of stock in interstate trade have been violated. I have taken every precaution possible to prevent the spread of the disease here, but I realize that it might have been wiser to have immediately killed the remnant of the shipment which arrived here alive.

Very respectfully,

(S) V. A. NORGAARD,
Inspector.

Rooms 407-8, Post Office Bldg., San Francisco, Cal.,
Oct. 24, 1906.

Dr. Victor A. Norgaard, Territorial Veterinarian,
Honolulu, Hawaiian Islands.

Dear Doctor:—

Will you kindly notify me of any shipments of live stock received from this port unaccompanied by certificates from this office.

The conditions here have been such during the last few months that it has been impossible to keep close watch on such shipments, or to receive ready communication from the transportation companies. Conditions here are righting themselves now, and it is thoroughly possible to handle these shipments as they should be, and I wish to get the transportation companies into line prior to the issuance of Regulations under the new Law, No. 340.

If you will kindly do as requested it will assist me very materially in accomplishing this object.

Trusting you are enjoying good health, and assuring you of my very high regard, and thanking you for any action taken, I am,

Yours very truly,

(S) GEO. S. BAKER,
Inspector in Charge.

Honolulu, Nov. 5th, 1906.

Dr. Geo. S. Baker, Inspector in Charge, Bureau of Animal Industry, San Francisco, Cal.

Dear Doctor:—

I beg to acknowledge receipt of your letter of the 24th ult. requesting that I notify you of any shipments of live stock received at this port from San Francisco unaccompanied by certificates of health issued by your office.

In reply I would say that I shall be pleased to cooperate with you in the establishment and enforcement of any rules or regulations which may tend to prevent the shipment of infected or diseased live stock to this Territory.

I do not know what you meau by the new law, No. 340, to which you refer in your letter, but would be glad to have you send me a copy of the same at your earliest convenience.

While I have been in charge at this port diseased live stock has arrived here three times. In two shipments of horses and mules glanders was present or developed shortly after arrival here, and in one shipment of 250 hogs only 90 arrived here alive, and 40 of these died subsequently from hog cholera.

From the enclosed local regulations you will notice that I have made the mallein and tuberculin tests compulsory for horse stock and cattle before admission to this Territory, and I have been contemplating issuing a regulation for the inspection of hogs at San Francisco before shipment to this port. Such inspection should embrace a careful enquiry into the origin of the hogs, and would require a thorough knowledge on the part of the Inspector as to the various districts in California where hog cholera now prevails or has recently prevailed. Any hogs originating from one of the infected districts or which have been exposed to the infection in transit, should be refused a certificate of health until they have been kept in quarantine for three weeks.

The S. S. "Enterprise," of the Matson line, which left San Francisco about two weeks ago, arrived here this morning with the following live stock on board: 9 cows with 6 small calves; 1 bull; 2 hogs; 2 horses, and 5 crates of chickens. None of these were accompanied by any certificate from your office, and as the cows and horses had not been tested in San Francisco, they will be kept in provisional quarantine here until the tests have been applied to them.

Kindly advise me whether you think it necessary for me to issue the contemplated regulation regarding the inspection of hogs before shipment to this Territory, or if I may count on these animals being inspected by you prior to shipment.

With kind regards, I remain,

Very sincerely yours,

(S) V. A. NORGAARD,

Territorial Veterinarian.

Rooms 407-8 Post Office Bldg., San Francisco, Cal.,

November 24, 1906.

Dear Doctor:—

Replying to yours of the 5th inst., I beg to say we are making on the S. S. "Nevadan" hence today, the following shipment of live stock for your port:

Two horses presenting strong suspicion of glanders; 10 mules which have been associating with the horses for the past week, and are consequently exposed. These are consigned by W. H. M. of San Francisco to the C. S., Honolulu, and shipment is being permitted simply for the reason that we haven't' authority to refuse shipment. They are being shipped, however, without a certificate, a permit being issued to the captain to enable him to clear his vessel without the certificate. The consignor was advised to submit these animals to a mallein test and was told that if same stood the test a certificate would be issued. He said, however, he would prefer taking his chances and have the test made at your end.

There are, in addition, 8 mules consigned to the H. M. L. Co., Hilo. These are apparently free from disease and are being so certified. The Inspector has instructions to see that these 8 mules are placed entirely apart from the other 10, so as to avoid exposure on the way down, if possible.

There are 1 boar and 3 sow pigs being shipped in a crate, for breeding purposes.

There are 17 cows, 2 of which were rejected on account of enlarged sub-maxillary glands and the consequent suspicion of tuberculosis; 1 Holstein cow with a sucking calf; 1 bull originating at Mountain View, Californa, and for which the shipper has a letter from the breeder, G. B. R., claiming the bull has been submitted to the tuberculin test, but no chart appears; 247 hogs, fat, from the northern portion of the State —Ukiah and Willits—and apparently in first class condition. There has been no cholera in that vicinity to my knowledge for two years.

So far as your issuing a regulation for inspection of hogs at this point, before shipment to Honolulu, is concerned, it would strengthen our hands here if such a regulation were issued and called for inspection by an officer of this Bureau.

I have taken this matter up with the State Veterinarian of California, and have asked him to cooperate to the extent of keeping me posted continually as to appearance of hog cholera in any portion of the State. If such a regulation is issued. as you propose, and the State authorities are willing to cooperate, I will agree to have pens, corrals, and cars thoroughly cleaned and disinfected, in which shipments of hogs are handled.

In regard to the stock which left here on the steamer "E." of the "M." line, they called me up and told me that they had five crates of chickens and several dogs which they desired to ship, and asked if such were subject to inspection by this Bureau. I told them "no," and evidently they have stretched my "no" to cover the stock you mention.

You state that you are enclosing some local regulations calling for a mallein and tuberculin test, but you failed to enclose the same. I would be glad if you would send me any such.

I will be very pleased indeed to do anything in my power to assist in the work, and can guarantee a careful inspection at this point prior to shipment.

With very kind regard, I am,

Yours very sincerely,

(S) GEO. S. BAKER,
Inspector in Charge.

Honolulu, T. H., December 29th, 1906.

Dr. George S. Baker, Inspector in Charge of the Bureau of Animal Industry, Post Office Bldg., San Francisco, Cal.

Dear Doctor:—

Your letter of the 24th ult. relating to a shipment of live stock on the steamship "Nevadan" received, and I would say that I am very much obliged to you for the timely information contained in your letter.

The two horses which you stated were suspicious of glanders had apparently recovered when they arrived here, but were nevertheless placed in quarantine and subjected to the mallein test. Neither of them re-acted.

The two cows, however, were undoubtedly tuberculous, but

I have been unable so far to test them as they are expected to calve very shortly. They are, however, kept in quarantine, and if they re-act will be destroyed.

Acting on your suggestion I have prepared a regulation for the inspection of hogs at San Francisco before shipment to this point, and the same will be promulgated as soon as submitted to the Board and approved by the Governor.

I am very much afraid of getting virulent hog cholera in here, as it would undoubtedly cause a very great loss. It has been here three or four times before and each time came close to cleaning up all of the hogs in the Islands.

I enclose copies of the local regulations, which I forgot to send in my last letter, and would add that the Board of Agriculture was very much pleased with the interest you have taken in the matter of inspecting stock for this Territory.

Again thanking you, I remain,

Very sincerely yours,

(S) V. A. NORGAARD,
Territorial Veterinarian.

As already stated in my report for last year, glanders appeared among a shipment of mules from San Francisco, one case developing shortly after arrival here (January 8th, 1906). Every precaution was immediately taken to prevent further spread, and so far as I have been able to ascertain, none of the remaining animals became affected.

A limited number only of the horses and mules which have arrived here during the past year have been accompanied by certificates of Mallein test, and have, therefore, been kept in provisional quarantine until tested. This method is far from satisfactory, as it is not always easy to identify a mule from even a careful description of the same, and arrangements have, therefore, been made for the tagging in the ear of all animals until tested. The same will apply to horses and cattle.

During the past year there has been imported 71 head of bulls, principally Herefords and Shorthorns, and nearly all registered animals. This is very encouraging, as this number greatly exceeds that of the preceding year, and continued importations of such high class breeding stock can only prove a blessing to every meat-eating person in the Territory who will sooner or later partake.

The milch cows, on the other hand, have with few exceptions been only medium to fair grades, and it seems strange how it pays to import that class of stock.

A new industry in the live stock line has been inaugurated by one of the larger ranches, by the importation of a number of pure bred Angora goats. As there are undoubtedly vast stretches of land in the Islands eminently adapted for these frugal and hardy animals it is to be hoped that the experiment will prove a success.

The importation of live hogs for slaughter has increased over last year by nearly 1,000 head, or a total of 3,358. Out of this number sixteen (16) were imported for breeding purposes, and of these only five (5) were pure bred animals. This does not compare favorably with the increased importations of other classes of breeding stock, and I can only repeat my statement in last year's report that I feel more convinced than ever that the Territory is well adapted for the raising of hogs, and that I trust before long to see this branch of the live stock industry take a great swing up.

A total of thirty-three sheep were imported for breeding purposes (as compared with 63 the past year). Thirty of the former were, however, ewes, pure bred Shropshires, and as these will be placed with the best imported rams in the Islands, they will form the nucleus for a herd of pure bred Shropshires, island bred, which, in my opinion, is very much to be desired.

The Metropolitan Meat Company, Limited, of Honolulu, imported during the past year the following frozen mutton:

		Weight.	Value.
4970	Australian Sheep	196,904 lbs.	$19,015.84
1687	California Sheep	81,474 lbs.	8,404.84
6657		278,378 lbs.	$27,420.68

One hundred and twenty-five crates of poultry arrived here during the past year. The aggregate number of individual birds would probably exceed 3,000. A great variety of fancy birds were received, and I have no doubt that the recent poultry show has given a great stimulus to this long neglected industry. The majority of the birds seem to stand the long trip very well and arrive here in good condition, even though frequently shipped in very cramped quarters. One game cock which arrived here recently from Manila was destroyed in accordance with a Federal order which forbids the introduction of any live animals into the United States from the Philippine Islands.

IMPORTATION OF STOCK FROM NEW ZEALAND.

The following correspondence will indicate what action has been taken by this office in order to obtain permission for the importation of stock from New Zealand. It is to be hoped that the Federal Government will be able to see its way clear to comply with the desire of the stock breeders in this matter:

Jan. 31, 1906.

Dr. A. D. Melvin, Chief, Bureau of Animal Industry,
Washington, D. C.

Sir:—

I have been asked by the Directors of two of the largest ranches here regarding the possibility of having live stock, especially cattle and sheep, allowed to enter this Territory from New Zealand and Australia.

Several of the ranch owners are of the opinion that stock imported from either one of these places would do better here than stock from the United States. Only the best breeding stock would be selected, and an expert from this place would be sent to New Zealand or Australia to select animals and bring them here. There are still strains of early importations of stock from New Zealand left here, and they seem, according to the observations of their owners, to have carried down the characteristics of their breeds to a greater extent than importations from the States.

I may add that either of the ranches are in a position to isolate this stock after its arrival here, and that the prolonged stay on board ship might be considered at least a preliminary quarantine.

If, on account of ticks, importations from Australia should be absolutely prohibited, would you allow cattle or sheep, in small numbers and for breeding purposes only, to be imported from New Zealand?

I would also like to ask whether dogs can be brought to the United States from either Australia or New Zealand without restrictions.

Yours respectfully,

(S) V. A. NORGAARD,
Inspector.

United States Department of Agriculture, Bureau of Animal Industry, Washington, D. C.

Dr. V. A. Norgaard, Honolulu, Hawaii.

Sir:—

Referring to your letter of the 31st ultimo, concerning the importation of breeding stock from Australia and New Zealand, I have to advise you that the official reports from these countries show that contagious pleuro-pneumonia (lung plague of cattle) exists in Australia, and that there is a contagious pleuro-pneumonia of lambs in New Zealand. This Bureau, therefore, is not favorable to the importation of live stock from either Australia or New Zealand to Hawaii.

Regarding the importation of dogs, please find enclosed Biological Survey Circular No. 30. Dogs should receive careful inspection by yourself or other qualified veterinary inspectors upon arrival.

Very respectfully,

(S) A. D. MELVIN,
Chief of Bureau.

Honolulu, T. H., December 29th, 1906.

Dr. A. D. Melvin, Chief of the Bureau of Animal Industry,
Washington, D. C.

Sir:—

I would again call your attention to the desire of the local live stock breeders to obtain stock from New Zealand for breeding purposes. In your letter of February 26th, 1906, you state that the official reports from New Zealand show that there exists a contagious pleuro-pneumonia of lambs in that country, and that consequently the Bureau was not favorable to the importation of live stock from that source. I subsequently wrote to Dr. J. A. Gilruth, Chief Veterinarian of the Department of Agriculture, of New Zealand, asking for further information regarding the sheep disease in question and received in reply a letter containing the following information:

"As regards importing cattle and sheep from New Zealand, I am sure you need not be in the slightest degree afraid of the introduction of any disease. With regard to contagious pneumonia with pleurisy, due to a diplococcus, we have had no further cases of this, and considering that all sheep slaughtered for export are examined by departmental officials, I am certain that if such disease had been present in any district we would have gotten track of it. Pleuro-pneumonia in sheep was only recorded by me as an interesting condition; it has never spread from one farm to another, and the two outbreaks reported only affected a very small percentage of the sheep on the farms. I would further add that a considerable number of stud sheep are sent annually from this colony to the Argentine and to Australia, and I have never heard of any complaint regarding the health of our stock in either of those countries. All live stock exported from here are carefully examined before being shipped, which, of course, is an additional precaution."

From the above and from more recent official reports it would appear that there is little to fear from any introduction of disease with stud sheep or cattle from New Zealand, and as the breeders here fully believe that live stock from that colony thrive better here than those from the States, it would be much appreciated if the Bureau could see its way clear to allow the importation of a limited number of sheep or cattle.

Very respectfully,

(S) V. A. NORGAARD.
Inspector.

DISEASES AMONG LIVE STOCK IN THE TERRITORY.
GLANDERS.

Most prominent among the infectious diseases, which have come under observation during the past fiscal year, is undoubtedly Glanders. Forty-four cases have been brought to my notice and have been destroyed, and I have little doubt that as many again have died without being reported. At a low estimate this disease alone has cost the Territory $10,000 during the past year.

Of the cases reported seventeen occurred in Honolulu, twelve on Oahu, outside of Honolulu, and fifteen on Maui.

Considerable difficulty has again been experienced in dealing with live stock owners of Oriental origin. The following letter addressed by me to the Honolulu agents for a certain rice company will illustrate a single case:

Honolulu, October 25th, 1906.

Gentlemen:—

In regard to the recent outbreak of glanders among the horses belonging to the .... Rice Company at M., Dr. Fitzgerald, Assistant Territorial Veterinarian, went out and found one horse suffering from glanders. This animal was removed to the animal quarantine station in Kalihi, where, upon the return of the writer from Hawaii, it was destroyed. The post-mortem examination fully demonstrated the correctness of the diagnosis and samples of the affected organs are now on exhibition in this office. It was also learned from this examination that the animal in question must have been affected for a long time before the same was reported to this

ADDENDUM.

After this report had gone to print the following communication was received from the Chief of the Bureau of Animal Industry, under date of February 13th, 1907:

"In view of your statements concerning the importation of sheep and cattle from New Zealand to Hawaii, on account of the bette adaptability of these animals for that locality than those from the States, a limited number of such breeding animals may be imported from New Zealand to the Islands, subject to the provisions of B. A. I. Order 109, copy herewith enclosed."

Applications for permit to import cattle or sheep from New Zealand to this Territorry should be addressed to the Territorial Veterinarian.

office, and the fact that the animal was found in an isolated place, where its presence was only discovered with difficulty, would indicate that the owner was aware of the dangerous nature of the disease; the case would, therefore, when proven in court, have constituted a misdemeanor punishable by both fine and imprisonment.

This chronic condition of the case suggested the possibility that some of the other animals on the place might be affected, and arrangements were made to have the remaining twenty-three horses tested with Mallein.

For the convenience of the owners the following Saturday and Sunday were selected for the first test of twelve horses, and accompanied by my assistant I went to M. Saturday afternoon, October 13th, for the purpose of taking temperatures and injecting the Mallein. The owners now assumed very threatening attitudes and absolutely refused to assist or even allow us to examine the animals.

I called again the next morning and found an English-speaking Chinese in charge, with whose assistance I selected the animals to be tested, and that same evening twelve horses were injected with Mallein. The following morning when Dr. Fitzgerald reported to take the temperatures the same hostile feeling prevailed; nobody would lend a hand and only impertinence could be elicited in reply to inquiries for the bookkeeper. It, therefore, became necessary to return to Honolulu and secure assistance for the handling of the animals. The early morning temperatures and the nine o'clock temperatures could not be taken and the test of these twelve animals cannot be considered satisfactory as far as it pertains to the animals which gave no reaction. The 11:30 a. m. temperature, however, revealed the following condition: Of the twelve animals injected six showed no diagnostic rise in temperature, while the six others showed temperatures ranging between 104 deg. and 106 deg. F. As neither of the latter had any elevation of temperature before injection it must be considered that they have reacted typically to the test, or, in other words, there is a very strong probability that they are infected with the glanders bacillus.

On the following Saturday the remaining eleven horses were injected, the test being finished at 1 p. m., October 21st. The result showed five animals to have given typical reaction to the test, while six showed no appreciable rise in temperature.

Between the first and second test one horse was destroyed by the owners. As this animal had given strong reaction and showed no external symptoms of glanders, it is much to be regretted that such action was taken without notifying this office, as a post-mortem examination might have thrown considerable light on the conditions on the premises in question.

From the above investigation I feel justified in drawing the following conclusions, upon which further action will be based:

Glanders has prevailed on the plantation of the Rice Company at M. for some considerable time—at least for several months. As no precautions have been taken to prevent the spread of the disease, it stands to reason that some of the other animals which have come in constant contact with the affected ones have become infected. That such is the case has been fully demonstrated by the Mallein test.

The owners have shown a spirit antagonistic to the laws of the country and defiant towards its officers. Under these circumstances I would feel justified in destroying all of the animals which have reacted to the Mallein test and to place the entire plantation under strict quarantine for an indefinite period, and unless I can obtain a satisfactory guaranty that efforts on my part to relieve the situation, as far as it can be done under the present regulations, will not be abused by the owners, I have no other alternative.

The lines along which I would proceed in dealing with the present situation would be as follows:

(1) A strict separation of all of the suspected animals from those which have not reacted, the former under no circumstances to come in contact with any other horses, mules or asses, whether belonging to the same company or not. This would mean that in no case shall any of the suspects leave the premises of the Company in question.

(2) Separate watering troughs, stable utensils, harness,

halters, etc., must be provided for each set of animals and in no case interchanged.

(3) Outside horse stock shall not be allowed to enter the premises, fields or other property belonging to the said Company and located in M.

(4) The suspected animals must be branded or marked in such a way as to be easily recognized and identified.

(5) All of the animals belonging to the Company in question shall be subject to regular inspection by the Territorial Veterinarian, or his representatives, and every assistance rendered by the said Company in making such inspections.

(6) Rule 3 of the Division of Animal Industry, T. H., shall be translated and explained to the owners.

Very respectfully,

(S) V. A. NORGAARD,
Territorial Veterinarian.

The following letter addressed to the Territorial Board of Health will explain the further action taken in the matter:

The Honorable, the President of the Board of Health,
Honolulu, T. H.

Sir:—

Pursuant to our conversation of yesterday I beg herewith to request the cooperation of the Board of Health in the eradication of glanders among horse stock in Honolulu.

That this dangerous disease, which is transmissible to man, and always with fatal result, prevails here to an alarming extent has been fully demonstrated, more than sixty cases having been destroyed by me during the past year.

In attempting to eradicate this disease it is of the utmost importance that the premises where affected animals are found be thoroughly disinfected after the latter have been removed to quarantine or destroyed, and it is in regard to this part of the work that I would especially solicit your cooperation.

The glanders bacillus will persist in water troughs and mangers, or on stable utensils, halters or harness for a considerable time after being discharged by an affected animal, and unless a thorough and scientific disinfection can be effected the danger of repeated outbreaks from the same source will remain.

As this office is utterly unprovided with means for carrying out such work I have been compelled hitherto to rely on private enterprise, more or less experienced and more or less reliable, and I have found in a number of cases that the work performed has been ineffective.

At the present time I am dealing with an outbreak of glanders among the horses belonging to the ...... Rice Company at M. There are two stables, with several yards, accomodating about twenty-four horses. Two horses have been destroyed and of the remaining twenty-two, ten have given typical reaction to the Mallein test for glanders.

These, however, will not be destroyed until they show physical symptoms of the disease. They will, however, be branded and placed in strict quarantine, separated from the uninfected horses on the premises until the rice harvest and planting has been finished.

If, therefore, your Honorable Board decides to cooperate with this office, as suggested above, I would ask that the disinfection of the premises in question be undertaken on Sunday, October 28th, at 8 a. m., when I shall be present myself with my assistant.

In anticipation of a favorable answer, I beg to remain,

Yours respectfully,

(S) V. A. NORGAARD,
Territorial Veterinarian.

Honolulu, November 5th, 1906.

C. S. Holloway, Esq., Superintendent of Public Works,
Honolulu, T. H.

Dear Sir:—

I beg to make application for the registration of a brand for official use only, consisting of the two letters T and V, connected at the top, as follows: TV.

This brand will be used only on animals suspected of suffering from either glanders or tuberculosis; that is, animals which have reacted either to the Mallein or the Tuberculin tests, and which are being kept in provisional quarantine pending the definite establishment of the diagnosis.

The brand will be applied to both sides of rump and the police authorities will be requested to arrest any person leading, driving or being in charge of any animal so branded, when found outside of the premises on which such animal has been quarantined, unless said person has previously obtained and can produce a written permit from the Territorial Veterinarian authorizing the transfer of such animal from one place to another.

Very respectfully,

(S) V. A. NORGAARD,
Territorial Veterinarian.

Another case was reported from Manoa Valley A Japanese owned a horse which apparently was badly affected with glanders and farcy. The Assistant Territorial Veterinarian was despatched to the place, but no trace could be found of either the Japanese or the horse. The owner had noticed that the horse was attracting attention and no doubt thought it was time for him to make himself scarce.

This same condition is, however, not peculiar to this country, although the remedy therefor is the same everywhere; that is, the Government to pay a reasonable compensation for the destruction of diseased animals, when the case is reported by the owner.

I have before me a "Special Report on Glanders," by Hon. J. G. Rutherford, Veterinary Director-General of the Department of Agriculture of Canada, and dated Ottawa, September 1st, 1906. The same has just come to hand, and in support of the above theory, I beg to quote therefrom as follows:

"Although the time which has elapsed since the inauguration of the policy of compensation and slaughter is altogether too short to enable us to form a definite and decided opinion as to its wisdom and probable effectiveness in securing the eradication of glanders, the following figures furnish convincing proof that it has a strong tendency to remove the disinclination generally evinced by owners to report outbreaks of the disease and to permit the slaughter of their horses.

		Tested.	Re-acted.	Killed.	Clinical.
	1902-3	1,062	466	219	219
	1903-4	1,387	420	499	499
Inclusive of Manitoba	1904-5	4,899	1,854	2,113	932
Inclusive of Manitoba	1905-6 (To March 31)	3,957	1,285	1,387	561
Inclusive of Manitoba	1906-7 (To Aug. 31st)	4,200	850	946	502
	Total	15,505	4,875	5,164	2,713

"In considering these figures I desire particularly to draw your attention to the large increase, not only in the numbers of those tested and killed as reactors, but of those showing clinical symptoms. These figures furnish incontestible evidence that the present system brings to light a very large number of cases of glanders, which, without provision for payment of compensation, would never have been reported.

"Under the conditions formerly existing, there was a tendency on the part of owners and doubtless of some veterinarians, to avoid trouble and loss by concealing the existence of glanders. Where no compensation is paid many owners, otherwise quite respectable, are undoubtedly in the habit of allowing clinically affected cases to run their course, working them as long as possible, and finally either permitting them to die or having them quietly destroyed; while those less honest or more unprincipled have no hesitation in subjecting them to palliative treatment, with a view to removing or concealing suspicious symptoms, and subsequently disposing of them to the best advantage.

"I am satisfied that the system now followed in Canada will, by removing temptation, prove effective in overcoming, at least to a very large extent, these tendencies shown by depraved human nature under less favorable circumstances."

Mr. Rutherford strongly advises the testing with Mallein of all animals which have come in contact with an affected animal, whether showing clinical symptoms or not, and the destruction of the same if they react typically to the test. This, however, can only be done where compensation is paid. In support of this he says:

"The figures already quoted from the returns of the Board of Agriculture of Great Britain indicate that, under modern conditions, the disease, unless properly controlled, is certain to spread rapidly and to cause a constantly increasing loss in horse flesh.

"As an illustration of this, I would quote from our own experience the case of one Canadian lumber company in a remote part of the country which reported last year, for the first time, the existence of glanders among its horses. Inquiry elicited the fact that in less than four years upwards of fifty head of valuable horses owned by this company had died of glanders. Of thirty-six survivors, thirty-four reacted to Mallein and were destroyed. Of the two remaining, neither had been in contact with the diseased horses.

"We have a number of similar cases on record, but it would scarcely be possible to furnish a better illustration of the evil results certain to follow carelessness or neglect in dealing with glanders.

"In this connection I cannot refrain from quoting an extract from the London 'Lancet,' of July 5th, 1905, which in a review of the report of the Board of Agriculture speaks as follows:

" 'Glanders is admittedly on the increase, and it is time that some radical measures were taken to control the disease. In 1894 there were only 502 outbreaks reported but in 1904 these had increased to 1,539, and 2,658 horses were killed as glandered. More power ought certainly to be given to the veterinary inspectors to test the in-contact horses with Mallein, as by this agent an almost infallible diagnosis can be made within twenty-four, or at most, forty-eight hours. The expense, although great the first year, would not be excessive if allowed to spread over a period of years; and where a preventible disease, which also causes the death of numbers of human beings each year, is concerned, the cost ought certainly not to be considered too seriously as the reason why it should not be taken thoroughly in hand!'

"He further says:

"'When engaged in private practice, however, I had an opportunity of forming an opinion on the subject, for although, after the use of Mallein was adopted, which, with me, was in the year 1893, I invariably advised my clients to destroy all typical reactors; the law did not make their slaughter compulsory and many were permitted to live. Not a few subsequent outbreaks of which I was cognizant were undoubtedly due to the retention and distribution of infection by these apparently healthtly animals."

In regard to the value of the Mallein test in the eradication of glanders he says:

"Again, I would remind you of the days before Mallein was heard of, when in spite of all our efforts and precautions, case after case and outbreak after outbreak, of glanders would occur in the same stable. After each fresh outbreak the most thorough disinfection was practiced, and all the surviving horses subjected to careful scrutiny and continued close observation. Six months, or perhaps a year, would elapse and then another case or series of cases would occur. We blamed the stables, we thought the contagion, or, as we then called it, the virus, was immortal and indestructible. Now we know that, outside of the animal body, the life of the bacillus Mallei is, under the most favorable conditions, limited to three or four months. In the animal body it is a different matter, and the cause of the mysterious recurrent outbreaks was the chronic latent case of glanders, then unrecognized, but now, through the agency of Mallein, marked down and known as a reactor."

I have taken the liberty of quoting Mr. Rutherford at length as he is a well known authority on glanders, and I have little doubt that now that the Department of Agriculture of Canada has obtained sufficient money to pay compensation for all animals destroyed, he will succeed in eradicating glanders from the Dominion.

I am further of the opinion that glanders prevails here to a proportionately greater extent than it does in Canada, but that, owing to the limited area of this Territory, it should be a comparatively easy matter to check and gradually eradicate the disease, if sufficient funds for this purpose should be appropriated.

The following letter refers to the above mentioned importation of mules, among which glanders developed after arrival here:

February 13th, 1906.

Dr. W. F. Egan,
1115-1117 Golden Gate Avenue,
San Francisco, Cal.

Dear Doctor:

I regret to inform you that one of the mules tested by you under date of December 23rd, 1905, developed symptoms of what at first appeared to be strangles, which later developed into typical glanders, necessitating the destruction of the animal a few days ago.

The animal was noticed to be sick shortly after its arrival here, with swelling of the left sub-maxillary glands, but the attending veterinaraian did not consider it of much importance. However, the animal continued to carry its head stiffly and kept separate from the other mules. A week later it developed a typical discharge from the left nostril, and when I first saw it, on February 4th, it had typical ulcerations on the left side of the septum. The mule was destroyed on February 10th, having been previously tested with Mallein and giving a reaction at the thirteenth hour of 104.8. On post-mortem the ulcerations on the left side of the septum were found to be nearly penetrating and extending over an area of 1 x 3 inches on the lower third of the septum with another large ulceration, about an inch in diameter, on the turbinated bone, with a smaller ulceration on the septum opposite it; the left sub-maxillary gland had attained a size of about 1 x 3 inches and was adherent to the skin. In the lungs were hundreds of small but typical glander nodules.

As a result of this I felt constrained to quarantine the ten mules of the same shipment, which were still in the possession of the importer, Mr. L. M., and to notify the various plantations which purchased mules from this shipment warning them to watch the same and to keep them separate from other animals on the plantations.

The mules in question, including the one which developed glanders, have not been in contact with any other animals since their arrival here, nor has the disease been known to exist in or in the neighborhood of the enclosure where they have been kept.

You will remember that one mule of this shipment, No. 36, developed a rise in temperature of 3.5 degrees when tested by you in San Francisco, and was not shipped. I am, therefore, inclined to believe that the animal which I destroyed here had the infection in its system before shipment, but not sufficiently developed to cause a reaction when tested by you. This will explain the telegram which Mr. M. sent to you a few days ago and the reply to which he has shown me today.

In reference to the two mares which you tested for Mr. I. and refused to issue permit for, I have learned that he has had them shipped on a sailing vessel and that they will arrive here in the course of next week. Mr. I. has shown me a number of certificates issued by local veterinarians in California who have examined the mares physically and stated that to the best of their knowledge neither of the animals were affected with glanders. Mr. I. has also shown me the records of the two tests made by you, and from which I judge that there was no other course left open for you than to refuse to issue the permit. I shall place the mares in question in quarantine immediately upon their arrival, and submit them to a Mallein test as soon as they have recovered from the trip. I shall notify you of the results of said test.

It is, of course, unfortunate that this case of glanders should develop among practically the first shipment of mules which were tested in San Francisco, but I have explained to the Board of Agriculture the conditions under which the said test was made, stating that I have had similar experiences myself in testing wild mules, and the Board is satisfied that every reasonable precaution has been taken in order to prevent the introduction of the disease to this Territory.

Very respectfully,

(S) V. A. NORGAARD,
Territorial Veterinarian.

OSTEOMALACEA.

As stated in my report of last year, this disease prevails to a considerable extent in several of the islands, and causes considerable loss among nearly all classes of livestock, in preventing the growth and rapid maturity of the food producing animals.

The treatment inaugurated by me in feeding bonemeal on certain ranches where the deficiency in lime salts is apparent, has been continued throughout the year, and with very satisfactory results. Where the treatment has been carried out systematically the mortality resulting from this disease has practically come to a stop, and a very noticeable improvement has resulted in the growth and development of the young animals which have been born in pastures supplied with bonemeal. On one of the large ranches on Hawaii from five to seven tons of bonemeal has been distributed every month, and it stands to reason that this rather expensive treatment or process would not have been continued except actual benefit therefrom was apparent. It is now contemplated to extend this treatment to every part of the ranch, where it is deemed necessary, which will probably necessitate the use of some fifteen tons of bonemeal per month and the constant employment of three four-mule wagons.

The use of molasses in connection with this treatment has been practically abandoned, and the bonemeal has been simply mixed with equal proportions of coarse salt. It was found that the cattle ate this mixture very freely as soon as they realized the presence of the bonemeal in the salt, and as there is no danger of the mixture fermenting, as was the case with the molasses, and as the cost of transportation has been considerably reduced, the salt and bonemeal mixture must be considered a decided improvement.

On the Molokai Ranch bonemeal and molasses has been fed to a considerable extent during the past year, and has, in the opinion of the manager, served to make the stock winter, or pass through the dry season, in better condition than has heretofore been the case.

A letter from the manager of the ranch in question is herewith appended:

Molokai Ranch, October 30th, 1906.

Dr. V. A. Norgaard,
Territorial Veterinarian, Honolulu, T. H.

Dear Sir:

My first experiment, following your recommendations, with feeding bonemeal to stock was made in the wet season, when feed was fresh and green, and the bonemeal was then mixed with salt, and the stock failed to take it. I had then two hundred four-months-old lambs weaned on to a field of rape, off which they were being shipped to market in small lots, and weighing out, when dressed, on an average of from 25 lbs. upwards, and I have no doubt if they had taken to the bonemeal and salt mixture placed before them, they would have done even better. The very dry weather in February temporarily wilted the rape and the lambs had to be turned out on a large pasture, and further experiment with them postponed.

After that I tried mixing the bonemeal with molasses, and the stock did not take to it for some time; in fact not till the feed got dry, when some began to eat it and the rest quickly followed, and then the difficulty arose of keeping only such stock as needed it on the pastures where it was fed, as the large stock would eat such quantities of it. With sheep and lambs this was not difficult, as small enclosures could be made on their pastures accessible to them alone, and the troughs filled with the mixture kept in these.

I found this system of feeding bonemeal of great value in the case of choice pure or half-bred young stock; these were kept on small pastures where the feed was very dry and they were fed all the bonemeal and molasses, mixed thick, that they cared to eat, and this with a ration of kiawe beans kept them in fine condition through the driest months. It was also fed to two-year-old bulls and mules, and mares and suckling mules with good effect.

When the dry ranches have so far advanced as to cure a quantity of hay every year, so that in exceptionally dry seasons they will have a reserve of feed to carry, at any rate their best stock through, and in any dry season I think the bonemeal will be of great value to feed with the hay, chaff or ensilage, especially if these animals can be paddocked in the algeroba belt where they can also pick up some beans. Lambs and young wethers, I believe, could thus be profitably fattened for the market in the dry season, as they can be fattened with rape or other fodder crops in the wet months.

I have demonstrated on the Molokai Ranch the possibility of growing fine crops of rape, and of growing and curing heavy crops of Rhodes grass hay, and have laid plans for raising and storing hay in quantity as a reserve for dry years.

I think that your discovery of the lack of lime salts in the Hawaiian grasses, and this being greatly the cause of the slow growth of stock on the Islands, is a very important and valuable one, as it would not matter how much we developed fodders and grasses, this lack would always be in them, and we have now been shown how to counteract this; and I am sure that on the Molokai Ranch feeding bonemeal has very greatly assisted in carrying some of the best stock in such good condition up to this time.

Yours very truly,

(S) G. C. MUNRO,

Manager Molokai Ranch.

OSTEOPOROSIS, OR BIG HEAD, IN HORSES.

This disease has during the past year been noticed in a number of localities, and one distinct epidemic, which has resulted in the loss of a number of valuable animals, has occurred on one of the plantations on the Island of Oahu.

The outbreak on Maui described in my last report, has apparently subsided under the lime-water and bonemeal treatment, but up to the present writing I regret to state that no noticeable benefit has been observed therefrom in the Oahu outbreak.

On the plantation in question cases of Osteoporosis have occurred in only one stable out of three, the feed being identically the same in all the stables. The iodide of potassium treatment has been tried in individual cases but apparently without success.

I would, therefore, urgently recommend that the Division of Animal Industry be placed in a position to investigate this disease thoroughly, and that means be provided for experimenting on affected animals. On one plantation alone more than one thousand dollars' worth of stock has been lost during the past year, and as the disease is more or less prevalent throughout the Territory, it would seem that the establishment of an experimental laboratory would be a good investment.

The following letter concerning some cases of this disease on the Island of Maui is of interest:

United States Department of Agriculture, Bureau of Animal Industry, Washington, D. C., July 28, 1905.

Dr. Victor A. Norgaard, Honolulu, T. H.

Dear Sir:

I am in receipt of your letter of the 21st ult. relative to your trip to Maui, and asking for suggestions as to the treatment of an outbreak of osteoporosis among the horses belonging to the .... Company, of Paia, Maui.

In reply I would say that there is no specific treatment for osteoporosis, and the disease is in many cases extremely refractory to all medication. A complete change of surroundings to a higher or lower altitude, and especially to a limestone district, if practicable, has often resulted in producing a complete cure. In case it is necessary for the animals to remain in their present location an entire change of diet is to be recommended. At the same time calcium phosphate in 1½ to 3 dram doses, or ground bonemeal in 1 to 2 tabelspoonful doses in the feed two or three times daily is beneficial. Pure phosphorus may also be given in ¼ grain doses, three times daily, in the form of pills with cacao butter. The affected animals should be given plenty of lime water to drink, their bowels kept loose and overloading of the gastro-intestinal tract carefully guarded against at all times.

There has been no literature published by the Bureau on this disease. Circular No. 66 treats of osteomalacia of cattle, a somewhat similar disease, and as the treatment of both conditions is practically the same, a copy of this article has been enclosed.

Very respectfully,

(S) D. E. SALMON,
Chief of Bureau.

EMBOLIC COLIC IN HORSES AND MULES.

This disease, which is due to the local obstruction of certain blood vessels of the intestines, and is caused by the presence of a small worm which penetrates from the intestines into the blood vessels, has caused considerable loss among work animals during the past year. Two distinct outbreaks have come under observation; one on the Island of Kauai, and one on Oahu.

The worm in question (Sclerostoma armatum) inhabits the cecum and the beginning of the large colon, but is often met with in the arteries of horses and mules, and generally causes a formation of aneurisms. These verminous aneurisms are, as stated, located on the visceral branches of the posterior aorta, and average in size about that of a walnut, though sometimes they may attain the size of a man's head. They consist of dilatation of the affected artery due to the presence of the worm in question. In the interior of the aneurism there is usually a fibrinous deposit, a thrombus adhering to a greater or less extent to the internal membrane of the blood vessel, which it partially blocks, but always leaving a canal in the center for the passage of blood. The worms found in these aneurisms are rose tinted, and average about half an inch in length. As a rule only a few of them are present, on an average from 9 to 11, but more than 100 have been found in a single aneurism.

The gravity of this condition is due to the risk of rupture of the vessels, and more especially to the influence on the frequency and seriousness of the colic. The clots which form in the interior of the blood vessels may throw off one or more fragments which are carried by the blood and cause obstructions in the arteries passing to the intestines, with the result that there is a sudden anaemia of that portion of the intestines to which the artery furnishes blood, and, consequently, paralysis of one or more of the sections of the digestive tube.

In consequence of this disturbance there are colics, which rapidly disappear if the obstructed artery is of small caliber. Otherwise there is stagnation and consequent fermentation of the affected part of the intestines, with an abundant production of gases. This frequently causes rupture of the intestines, the result of which is always fatal. If a verminous aneurism is ruptured the animal dies from internal hemorrhage. On the occurrence of this accident the animal crouches or sits on its hind quarters, knuckles over at the fetlock joints and seems as if struck with paralysis; the limbs become cold, and the visible mucous membranes of eye, nose and mouth become blanched. The last moments of life are marked by signs of extreme suffering.

Besides these cases of acute colic which recover in the course of twelve to twenty-four hours, and the cases of rapid death, there has been noted a more chronic course of this disease. This is characterized by a decrease in vigor of the animal, stiffness in the movements of the hind quarters, difficulty and pain in urinating, arching of the loin, swelling and lameness of one or both hind legs, gradual but complete emaciation and death after one to six months.

The worm which causes this disease enters the intestinal canal of the affected animals by means of the drinking water, or is taken in with grass from wet pastures, where the worm is known to exist. It is, therefore, advisable when an outbreak, or even a single case of the disease is observed, to at once remove all horses and mules from such pastures. A saline purgative or calomel should be given to all of the animals, as soon as they have been stabled, and in cases of violent colics, the ordinary remedies for this disease should be prescribed. Where the animals have not been in pasture, the water supply should be carefully examined, and the only possible remedy to prevent further cases from developing would be to filter the drinking water. This can be done by means of a simple sand filter made out of a strong wooden box, with graduated layers of fine to coarse sand.

In the one outbreak on Kauai five mules have died within a short time, out of a stable of twenty head, and a number of the remaining ones are undoubtedly more or less affected. In the outbreak on Oahu the cases occurred with more or less frequency, and were undoubtedly due to the use of a certain pasture, which has now been abandoned. At the plantation in question the animals got only artesian water to drink, so this source of infection was eliminated.

I am informed of one more outbreak which occurred a few years ago on a plantation on Hawaii, where over thirty work animals were lost in the course of six weeks.

RED WATER IN CATTLE.

This disease has not come under my personal observation, but as a number of outbreaks have occurred on both Hawaii and Maui, I append herewith some correspondence which will show the action I have taken in the matter:

Kealakekua, September, 1906.

Victor A. Norgaard, V. S.,
Honolulu.

Dear Sir:

I spoke to you a little over a year ago in regard to a disease of bloody urine among cattle in Kona, from which different ranchers are losing quite heavily every year.

The disease seems to be mostly in the forest belt, at elevations from 3,000 to 4,500 feet, and affects cattle of all kinds, except calves. In some cases animals may have it for one or two years, but usually only a few months, before they die from it. Fat animals often die sooner than those in only fair condition.

I send you per "Mauna Loa" the bladder taken from a heifer passing blood in clots. You will see there seems to be a lump in the bladder. The other intestines seemed all in good condition, and the meat was fat and seemed all right.

I trust you may be able to give us some light on the cause of this disease.

It was first noticed on the Greenwell"s and our ranches, about twelve years ago, and is now on J. A. Maguire's, R. Hind's and, I hear, at Horner's ranches.

I have been reading with interest your report in the "Hawaiian Livestock & Breeders' Association." We are losing quite largely, especially colts, from what you describe as "Osteoporosis or Big Head." The disease seems worse in the forest belt, and it is strange so, for our neighbor's stock, the Greenwell's, are not affected.

Trusting this may be of some assistance in your work, I remain,

Yours respectfully,

(S) J. D. PARIS.

Honolulu, T. H., November 9th, 1906.

Hon. J. D. Paris,
Kealakekua, Kona, Hawaii.

Dear Sir:

I regret exceedingly not having replied any sooner to your letter which I received more than a month ago, together with a specimen of the bladder of a heifer suffering from hematuria (bloody urine). I have, however, been away from Honolulu on official business most of the time, and only returned on Tuesday last from Hawaii. This coming week I have to go to Molokai and again the following week back to Hawaii.

In regard to the disease which you describe, I am very much interested in the same and beg to say that the specimen reached me in good condition and well preserved. Upon incision the bladder was found to contain a blood clot the size of a walnut, firmly attached to the mucous membrane, which at that place was greatly thickened and showing necrotic areas.

I have hitherto been inclined to be sceptic when told that animals affected as described by you passed actual blood, and not blood colored urine, but the specimen forwarded illustrates plainly that the principal symptom of the disease in question is hemorrhage from the bladder, due to necrotic ulcers on the mucous membrane and in the muscular layers of the wall.

I remember ten years ago, while Chief of the Pathological Division in the Bureau of Animal Industry in Washington, D. C., receiving a jar full of bladders of cattle from the Island of Jamaica in the West Indies, all of which showed pathological alterations similar to those observed in the specimen forwarded by you. At the time no specific investigation was made of the disease, and as I have never since come across anything similar I am at the present time unable to furnish you any information as to the nature, cause and treatment thereof. I shall however, forward a copy of your letter to Washington and ask to be furnished with what information the Bureau may have on the subject, and will request that inquiries be made of the proper authorities in Jamaica to ascertain whether the disease has been investigated there, and if so, with what results.

In the meantime I trust that the case in question will serve to illustrate the necessity of the establishment of a pathological laboratory in connection with the office of Territorial Veterinarian, in order that I may be enabled to investigate this disease, as well as the several others of which mention was made in my report to the Hawaiian Stock Breeders' Association.

Any effort on your part in furthering this object can only serve to promote the interests of the livestock industry in this Territory.

Very respectfully,
(S) V. A. NORGAARD,
Territorial Veterinarian.

United States Department of Agriculture, Bureau of Animal Industry, Local Office.

Honolulu, T. H., November 16th, 1906.

Dr. A. D. Melvin,
Chief, Bureau of Animal Industry, Washington, D. C.

Dear Sir:

I enclose herewith copies of two letters regarding a certain form of hematuria which seems to prevail to some extent on the Islands of Hawaii and Maui.

I remember plainly the specimens which we received from Jamaica in the latter part of 1896 or the beginning of 1897 and which may possibly be found in the collection of the Pathological Division. Could you furnish me or obtain for me any information regarding this disease? It seems to me that as the disease was described to be quite prevalent in the West Indies some work may have been done on the subject during the past ten years, and anything that would throw light on the nature of the disease, and especially on its cause, would be much appreciated by the ranchmen here.

Very respectfully,
(S) V. A. NORGAARD,
Inspector.

January 14, 1907.

Dr. V. A. Nörgaard,
Inspector, B. A. I.,
Honolulu, T. H.

Sir:

Replying to your letter of November 16th, you are advised that we are not familiar with any work that has been done in the West Indies on a disease similating the one you describe in Hawaii. It seems apparent from your description that the disease in question is a hematuria, but the cause of this condition is not so apparent. As you know hematuria may accompany many varying conditions and is in itself only a symptom, but nevertheless in bovine pathology the term has acquired a special significance. It is indicated clinically by the presence of unaltered blood in the urine, and histologically by lesions in the bladder, ureters and at times the kidneys. In Germany the disease is known as "stallroth," and in France, Galtier has given it the name of hemorrhagic cystitis. Many opinions have been advanced regarding its cause. Land reclamations and the use of lime dressings on the soil have been suggested. Destroye considers it of microbic origin and easily transmitted, but Galtier states it is produced by the consumption of irritant plants by animals affected with distomatosis. Arnold, on the other hand, attributes it to coccidiae encysted in the mucous membrane of the bladder. Boudeaud claims that hematuria affects one-tenth of all the cattle south of the Indre and north of the Creuze, where the soil is thin and poor in phosphoric acid. Knowing that the blood fluke (Bilharzia) is found in Hawaii and that hematuria is a frequent symptom of bilharziosis, it is possible that this parasite is the causative agent of this affection in Hawaii. Of course this could easily be determined by a microscopic examination of the urine for the eggs of the parasite. Hematuria may cause death by exhaustion in from six weeks to two months, but it may last for a much longer period. The animal at first passes unaltered blood, but after a time the extravasated blood coagulates in the bladder and the urine passed contains filamentous clots from the size of one's finger to that of a guinea fowl egg. When ulceration occurs, the subepithelial vessels of the mucous membrane which previously had contributed in the formation of diffused hemorrhagic patches become ruptured, allowing the flow of blood therefrom with the subsequent formation of clots. The prognosis is grave as no curative treatment is known. Prophylaxis consists in the drainage of pastures, where necessary, and their improvement by the use of fertilizers, especially superphosphates.

These alterations in the character of the soil improve the pasture and may diminish or prevent the growth of the causative agents, whether animal or vegetable parasites or irritant plants. Boudeaud has seen hematuria disappear from farms under such treatment. It has also been recommended to transfer the cattle to pastures on which the animals do not appear to be affected. The literature on this disease is slight, but general articles may be found in most of the textbooks on the practice of veterinary medicine.

Very respectfully,.

A. D. MELVIN,
Chief of Bureau.

SHEEP SCAB.

In continuation of the work inaugurated last year for the purpose of eradicating sheep scab, between fifty thousand and sixty thousand dippings have been made. A new dipping plant has been installed on the Parker Ranch, which hitherto had been considered free from this disease, but where it was noticed that a small percentage of the sheep showed small bare spots and tagging of the wool. On the Molokai Ranch all the sheep have again been dipped, and I am inclined to believe that scab has been practically eradicated, even though the horn flies continue to irritate the bare spots to a considerable extent.

The animals so affected are, however, gradually being eliminated from the flocks, and I feel confident that in the course of a few years this ranch will be able to show as clean a herd as any on the islands.

The screw-worm fly has increased considerably, several hundred cases of screw-worm maggots having been observed, but every effort has been made to eradicate this pest along the lines indicated in my report for last year. I am, as stated, of the opinion that there must be one or more powerful enemies of this parasite present in these Islands, as otherwise it is difficult to understand why the screw worm fly does not multiply to the extent which the apparently most favorable conditions here would seem to suggest.

INFECTIOUS OPTHALMIA IN CATTLE.

There arrived in Honolulu during the past year a shipment of forty-eight bulls among which was one animal suffering from inflammation of one eye, thought to be due to an injury received during shipment. This, however, proved to be a mistake, and in the course of a few days it was found that a number of the bulls had developed infectious opthalmia. The disease gradually spread to the whole herd, affecting first one eye and then the other, and necessitated the quarantining of the entire herd for more than six months.

This disease occurs sporadically in these Islands, but does not seem to affect the native stock as seriously as it does imported stock. It yields readily to treatment and all of the cases in question recovered completely. The fact remains, however, that only one or two cases developed at the same time and that in only a few instances were both eyes affected at the same time, necessitating the above mentioned prolonged quarantine and considerable expense for treatment and care.

With the inspection now inaugurated in San Francisco it is to be hoped that no more cases will be introduced with imported stock.

HEART WORM IN DOGS.

This disease seems to be quite prevalent here, and causes considerable loss among well bred dogs, especially of the short-haired breeds. It is transmitted from animal to animal by means of mosquitoes, as will be seen from the following letter, and no remedy has so far been discovered which will in any way alleviate the suffering of the affected animals.

United States Department of Agriculture, Bureau of Animal Industry, Washington, D. C., April 23, 1906.

Dr. V. A. Norgaard,
Inspector, Bureau of Animal Industry, Honolulu, Hawaii.

Sir:

With reference to your enquiry of March 23, as to the life history of ***Filaria immitis***, I would say that this parasite is transmitted by mosquitoes of the genus *Anopheles*.

The larvae in the circulation of the dog are sucked up by the mosquito while biting; they migrate to the malpighian tubules, then into the body cavity, and finally into the labium, these migrations and accompanying development requiring in summer about 12 days. The embryos are introduced into a new host by the mosquito during the act of blood sucking. The cuticle of the labium is ruptured and the embryo escaping immediately penetrate the skin and subcutaneous tissues until they come to a blood vessel, probably following the puncture made by the piercing stylets of the mosquito. The embryos thus introduced into a dog find their way to the heart and develop to maturity.

Very respectfully,

(S) A. D. MELVIN,
Chief of Bureau.

As it is practically impossible to keep a well bred dog here for any length of time, a thorough investigation should be undertaken in order to ascertain if some remedy could not be found for it. I have especially in mind the transfusion of blood from native, and, apparently, immune dogs, into the system of imported animals before they become infected, or at least, before the disease reaches a stage where it is beyond recovery. I would, therefore, recommend that facilities be provided for a series of experiments along these lines.

OTHER DOG DISEASES.

The following letter, written in reply to an enquiry from the President of the Board of Health, will give some idea of the prevalence of disease among dogs in this Territory:

Honolulu, April 27, 1906.

Mr. L. E. Pinkham,
President, Board of Health, Honolulu, T. H.

Sir:

Replying to your letter of the 26th inst. I beg to say that

I am decidedly in sympathy with you in regard to a campaign against the numerous mangy and worthtless dogs which at the present time infest the streets of Honolulu and vicinity.

Of all the domesticated animals no species is the host of so many parasites, or susceptible to so many parasitic diseases, transmissible to man as well as to other species of domesticated animals, as the dog, and no other animal has the opportunities to transmit its diseases to the same extent as the dog, owing to the close companionship in which it lives with man.

I find it impossible at this time to write you fully on the subject, as I have to leave Honolulu today, but would call your attention to the sarcoptic mange of the dog, which seems to be extremely prevalent here. This disease is easily transmitted to man and epidemics of it, especially among the lower classes, have been reported from various countries. An epizooty occurred in Germany in 1890 (Berlin) where hundreds of people who had come in contact with mangy dogs were contaminated.

Another disease, common among the dogs here, is ringworm, Tinea tonsurans, which likewise is easily transmitted to man, especially to children. Favus is common among the poultry here and may be transmitted to children by means of dogs and cats.

Of more importance, however, are the intestinal parasites of the dog, particularaly the cestodes, of which the taenia echinococcus, in its cystic form, has frequently been known to cause death in man and domesticated animals. The Taenia coenurus causes a disease in sheep known as "Gid," which is common in these Islands, and one of the worst enemies of the sheep breeders.

When it is further considered that the skin of the dog is frequently infested with fleas, lice and ticks, and that the dog may infect man with one of the most dreaded and absolutely fatal diseases—rabies—then it would seem that there is every reason for limiting the number of absolutely worthless animals which now infest these Islands, and which make it nearly impossible for dog fanciers, sportsmen and others to keep dogs for specific purposes without getting them contaminated or infected with one or more of the above mentioned diseases.

Very respectfully,

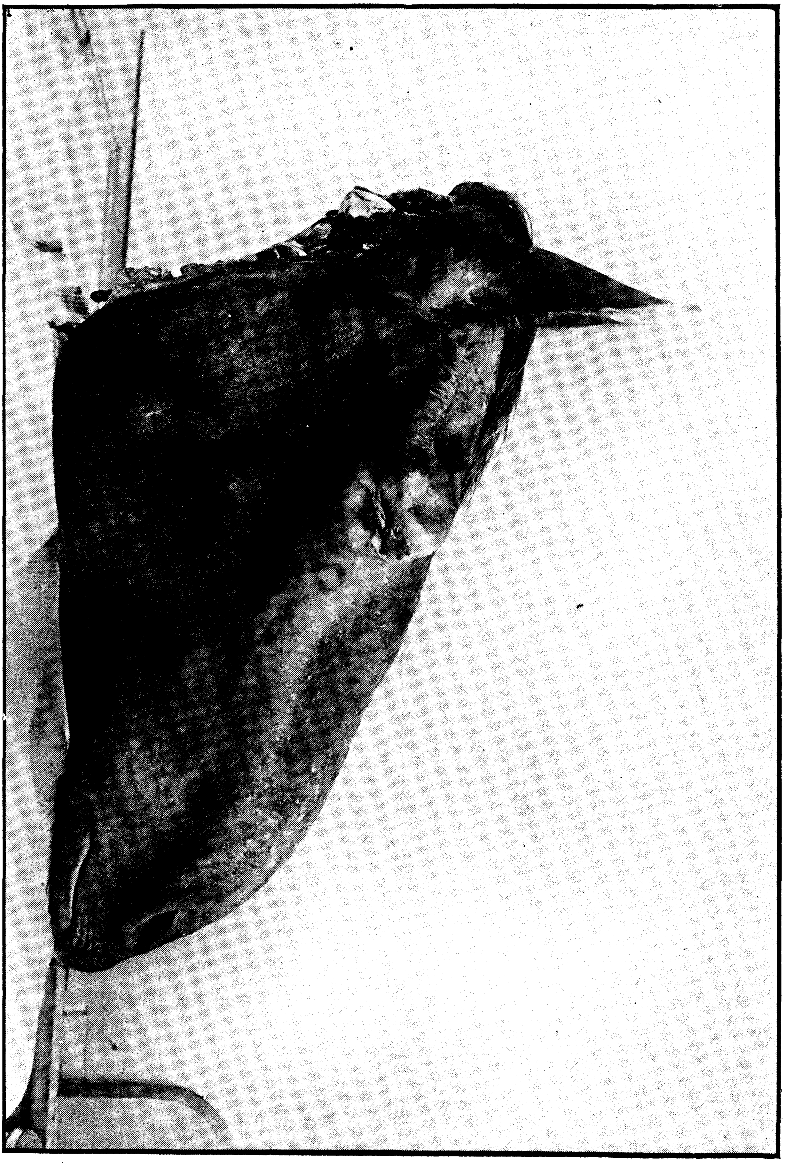
(S) VICTOR A. NORGAARD,
Territorial Veterinarian.

EPIZOOTIC LYMPHANGITIS (Japanese Farcy).

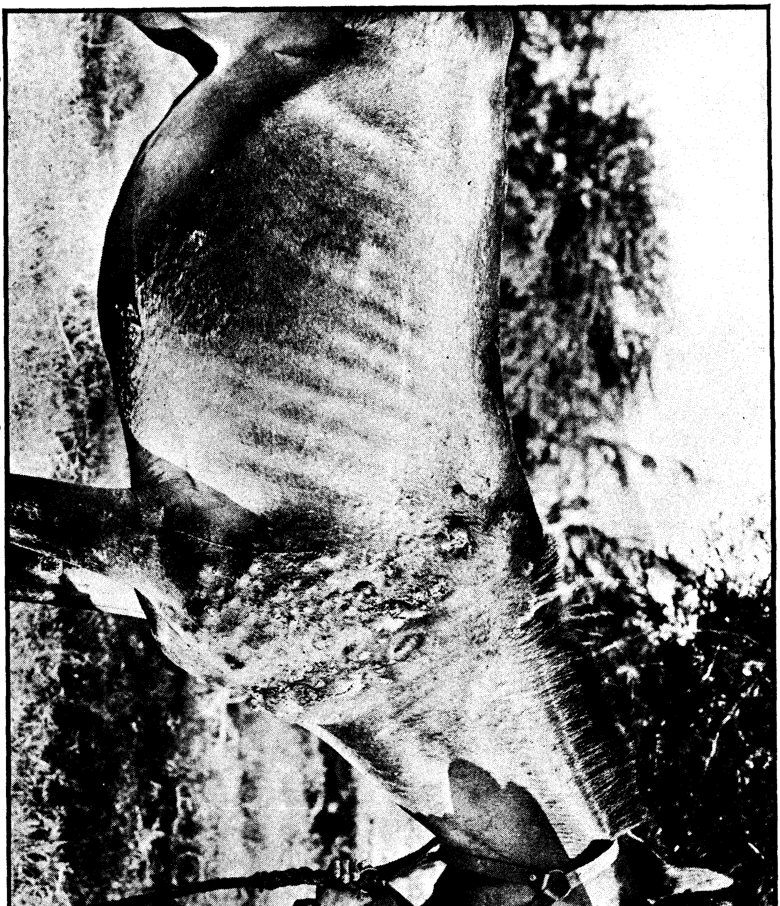
A special report on this disease is now under preparation and the same will be issued as soon as the investigation has been finished. The absolute lack of funds and facilities for laboratory investigation has delayed this important work, and unless means be forthcoming, it will be necessary to continue to deal with this diseases as has been done hitherto, that is, by immediate destruction of all affected animals, and by subsequent measures identical with those taken in cases of glanders and farcy.

Epizootic lymphangitis or Japanese farcy resembles ordinary glanders and farcy to such an extent that a differential diagnosis can only be made by means of the microscope. The disease is very common in Japan and China, but has only recently been introduced into Europe with army horses returning from South Africa. No cases have to my knowledge been reported from the mainland of the United States. In Europe the disease is dealt with as glanders, even though it is admitted that some of the cases may be cured. The disease is, however, extremely contagious, and from my experience with it here I am inclined to believe that it is more difficult of extermination than is glanders and farcy. On one plantation alone eleven valuable mules have died from this disease during the past year, and as the affected animals do not react to the mallein test incipient cases cannot be detected and disposed of until the symptoms have become manifest and the infection transmitted to other animals through the discharge from nose or running sores.

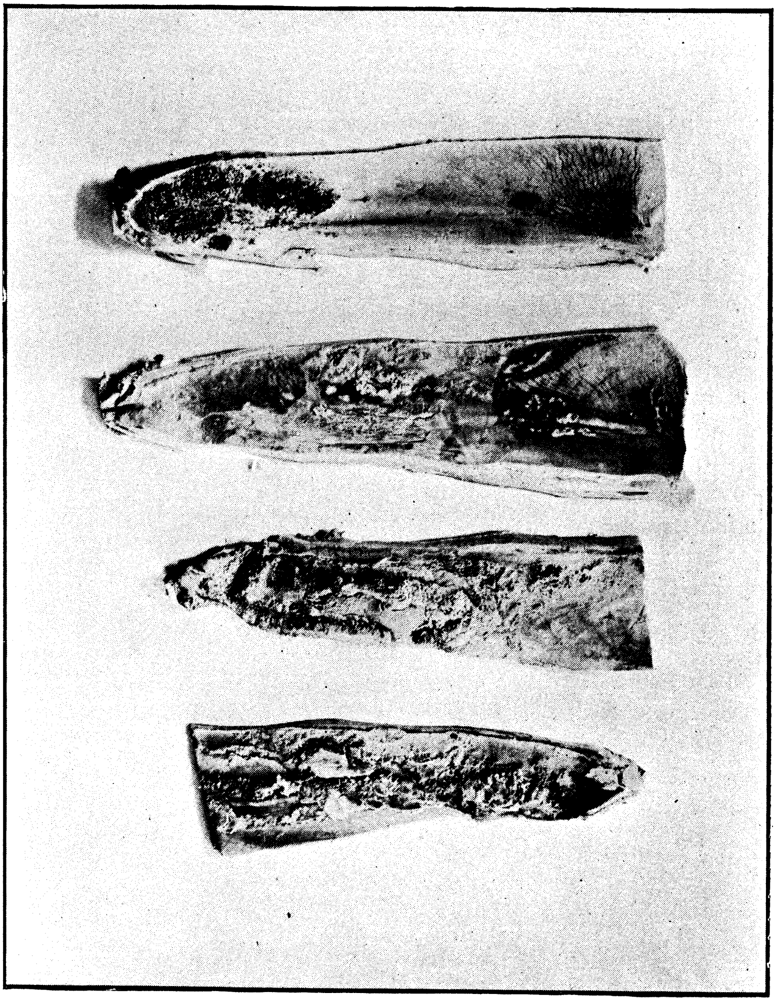
The three accompanying illustrations are from photographs of animals suffering from epizootic lymphangitis. In Plate 1 the disease had gained entrance through the right eye. The nose was not affected. In Plate 2 the infection had taken place



The infection has taken place in the right eye, the swelling of the eyelids and surrounding tissues completely closing the eye. From there the distended lymphatics extend toward and below the ear, and in the opposite direction halfway toward the right corner of the mouth; from there backward and down, in a *zigzag* line, to the lower edge of the jawbone, where they connect with the greatly enlarged submaxillary glands.



The infection has taken place through a harness gall on the shoulder, causing the appearance of a network of enlarged lymphatics extending from the top of the withers over the entire shoulder, the front and the lower part of the chest, the upper part of the front legs and under the chest toward the abdomen. On these lymphatics appear numerous nodules up to the size of a hens egg, many of which have ruptured and are discharging pus



The nasal septum (partition) from four cases of epizootic lymphangitis where the infection has taken place through the mucous membrance of the nose.

through a harness gall on the shoulder, while the remaining figures on Plate 3 show the lesions on the septum of the nose (the partition between the nostrils) where the infection has gained entrance through the air passages.

These pictures clearly illustrate the loathsome nature of this disease, and when it is stated that up to the present time the literature covering this subject is very scant, it would seem that there is every reason for making a thorough investigation here where subjects can be had at nearly any time. In order to accomplish this, however, a thoroughly equipped pathological and bacteriological laboratory must be provided and it is to be hoped that the next legislature will be able to see its way clear to appropriate the necessary funds therefor.

DIVISION OF AGRICULTURE.

Report of Mr. Jared G. Smith.

Honolulu, Oahu, December 31, 1906.

Board of Commissioners of
Agriculture and Forestry,
Honolulu, Oahu.

Gentlemen:—Up to December 31, 1906, the sum of $4,934.77 has been expended by me from the Territorial appropriation. This has been largely used in carrying on three lines of work: the propagation and distribution of Bluefields bananas, the cultivation of tobacco and experiments in shipping and marketing of tropical fruits.

TOBACCO.

A report in regard to the tobacco investigations has been published for the period up to January 1, 1905, both in the Annual Report of the Board of Agriculture and in one of the press bulletins of this station.

SEASON OF 1905.

Early in 1905 two new cloth covered seed-houses were constructed for raising tobacco plants increasing the area of seed beds from 72 square yards to 217½ square yards. Sowings for the 1905 crop were made on November 6, 1904, November 13, December 9, January 20, January 24, February 2, February 6, 7, 10, 11, 23, 25, March 1, 10, 25, 27, April 3, 19, 24, May 8, 17, 22, June 7, 9, 17 and July 1. Seed of the following varieties were planted: Sumatra, Landreth, Glessner, Partidos, Vuelta Abajo, Comstock Spanish, Connecticut Broad-leaf, Pennsylvania Seed-leaf, Cuban from four sources, Manila, Zimmer

Spanish, Hester, Gooch, Hawaiian, Virginia Dark-leaf and White Burley.

Complete notes were kept in regard to the growth and development of all of these varieties, the object being to determine their suitability to Hawaiian conditions and establish, if possible, the best time of seedng for the Hawaiian crop. In Cuba, tobacco is a winter crop, the winter being the dry season of the year. With the exception of the Manila, none of the varieties did at all well when planted early in the winter except the Hawaiian, which grew well at all seasons of the year. Considerable information has been accumulated which will be available for publication as soon as the 1906 crop has been finished and sold. Fertilizer tests were carried on, not only in the seed beds, but after the plants were set in the field, and valuable suggestions have been obtained in regard to the requirements of the tobacco crop in Hawaii. The tobacco was set out at the rate of about ten thousand plants per acre. Two and a half acres of tobacco were cultivated during 1905 on the same leased land utilized for this crop in 1904. Tobacco-leaf was harvested from about 20% of all plants set in the field, but as the 1905 experiment was intended largely as a demonstration of the question of a suitable season of planting, the results are not surprising, and the loss no greater than was to have been expected.

Early in 1905, the old curing barn, which had a floor area of only 322 square feet with a 9-foot wall was renovated and extended into a barn of 1,280 square feet floor area with 14-foot sides and with a hanging capacity of about 1,500 poles. Better ventilation was provided than we had in the building used in 1904. A small tool room, 8 by 11 feet, a storage room 8 by 29 feet and a stringing room 8 by 12 feet were also added to the buildings. The artificial ventilators used in 1904 having been found unsatisfactory, horizontal ventilators were placed about 5 feet apart all around the curing barn. The windward side of the roof was built about 2 feet higher than the leeward side at the ridge, projecting from it far enough to protect the opening from drifting rain. The opening at the ridge was provided with a door which could be opened or closed. We secured about one thousand new poles for handling the crop in addition to those on hand in 1904, but even the new supply was not sufficient to care for the crop.

The year 1905 was a very wet one, the rainfall being 109 inches and the harvesting months, July to October, were unusually wet with many dull cold foggy days, even when it was not raining. This made the curing of the 1905 crop a slow and difficult one and considerable trouble was experienced with stem-rot, mold and mildew. The curing process we find takes about fourteen days if the weather is good, the ventilation of the house perfect and especially if some provision is made for artificial heat in the curing barn. Without this, the curing takes ten to twelve days longer. Any one attempting the tobacco industry on a commercial scale would, of course, be provided with better facilities than we were able to acquire for our demonstration experiments.

The yield of tobacco during the 1905 season was as follows:

Cuban (all kinds)	1242	poles	from	5051	plants
Sumatra	504	"	"	5051	"
Hawaiian	1008	"	"	1269	"
Havana	173	"	"	275	"
Penn. Seed-leaf	182	"	"	352	"
Conn. Broad-leaf	273	"	"	1593	"
Vuelta Abajo	442	"	"	1565	"
Manila	38	"	"	250	"
Comstock Spanish	739	"	"	800	"
Zimmer Spanish	58	"	"	171	"
Glessner	10	"	"	40	"
Virginia Dark-leaf	10	"	"	60	"

The tobacco was finished as well as could be, sorted and 150 pounds of finished leaf was sold to a Seattle cigar maker with the understanding that it should be made up into cigars which would be returned to Honolulu and placed on sale. The Station received the value of the tobacco in cigars, which were distributed in Honolulu and elsewhere, in order to give people an opportunity of judging of the quality of the Hawaiian product.

SEASON OF 1906.

In February, 1906, the lease of the Louisson lot was given up and the Land Commissioner, Hon. James W. Pratt, set aside for the use of this Station for three years, Lot No. 17, Paauilo Homesteads. It having been recognized that it would require a larger sum to carry on the tobacco experiments another season than was available from either the Territorial or Experiment Station appropriations, private subscriptions were solicited and the sum of $4,000 was advanced by five parties on the understanding that they should be reimbursed pro rata from the sales of tobacco grown in 1906 and from the sale of improvements made on Lot 17 at any time when such would be offered for sale at the close of the experimental period. The tobacco work in 1906 has cost about $6,000.00, $4,000.00 of this amount having been supplied as previously stated by private subscription, the remaining $2,000.00 from the Territorial and Experiment Station appropriations.

Four acres of land were cleared, the seed beds and curing barn were removed from the land formerly under lease and transferred to Lot 17 and lumber was purchased and a large modern curing-barn erected, capable of holding a crop from five acres of land. Operations were commenced so late in the season that it was impossibe for us to utilize the full area originally intended and while four acres were cleared and plowed, only about three and a half acres were planted, the majority of the crop being Sumatra, Havana and Comstock Spanish, the seed being mainly selections from our own plants during 1905.

The 1906 crop of tobacco is not yet completely finished. Although barn-cured, the fermenting process is not yet complete, but it has been pronounced by many experts to whom the tobacco has been submitted for examination, of as good quality as any tobacco produced anywhere in the world.

The results of the 1906 crop are such that I do not believe it will be necessary for this Station or the Board of Agriculture to attempt any further demonstration on a field scale, but there are many points connected with the curing, fermenting and sorting, and with the treatment of the plants in the field, on which this Station could do good work, provided arrangements can be made to carry on such work in coöperation with growers. It has been demonstrated absolutely, that tobacco of good burn, texture, flavor and color, can be produced on a commercial scale and I believe at a very large profit in certain districts in Hawaii.

BLUEFIELDS BANANAS.

The work with Bluefieds bananas, previously reported upon, has been continued during the summer of 1906. One thousand suckers were distributed to parties who applied for the same. This portion of the work is about completed as the bananas are now so widely distributed that it would not be necessary for the Station to continue their propagation on a large scale.

FRESH FRUIT TRADE.

In August, 1906, the horticulturist of this Station took with him to California, Oregon and Washington a large shipment of pineapples, papaias, bananas and alligator pears, his object being to investigate the difficulties which have attended the Hawaiian fresh fruit trade and determine whether the obstacles were such as could be overcome.

During the three and a half months that Mr. Higgins was absent from Hawaii, he made an extensive study of market and shipping conditions on the Pacific Coast, and as a result of his experiments, the results of which will shortly be published, has, I believe, made discoveries which will prove of immediate financial value to all who have investments in this line of agricultural trade. The fresh fruit industry of Hawaii now amounts to about $100,000 per annum and even if no new markets are opened up or new outlets for Hawaiian fruits discovered, I believe that I am safe in saying that the financial results of Mr. Higgins' observations and experiments will be worth to Hawaii at least 15% of the annual value of the trade.

A demonstration has been made of the fact that papaias and alligator pears can be shipped to the mainland without losses in transit and it is not claiming too much to state that a market for $500,000 worth of these fruits is waiting to be filled. This field is only awaiting Hawaiian enterprise to supply these fruits to an almost unlimited demand. As one result of this work, negotiations are now in progress with one of the steamship companies whose vessels trade between Hawaii and the Pacific Coast to make changes and alterations in their vessels in order better to accommodate their ships to the interests of the fresh fruit trade.

OTHER LINES OF WORK.

In addition to the definite lines of works herein mentioned, lines which could not have been undertaken had there been no Territorial appropriation, the appropriation has proved vastly helpful to the Station through assistance rendered in the maintenance of an increased clerical and labor staff. During 1905, the Station foreman was paid entirely from the Territorial appropriation and other citizen employees have been paid from the same fund as occasion required, or as it was desirable to relieve the overburdened Station payrolls.

Respectfully,

JARED G. SMITH,
Special Agent in Charge, Hawaii Experiment Station.

PUBLICATIONS FOR DISTRIBUTION

BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.
Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.
* First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.
Second Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1905; 240 pp.; 8 plates; 10 text figures.
Third Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1906; 212 pp.; 3 plates; 4 maps; 7 text figures.
"Notice to Importers," by H. E. Cooper; 4 p.; 1903.
"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables, etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.
"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.
* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.
"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.
"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.
Report of the Division of Entomology, for the year ending December 31, 1905. Reprint from Second Report of the Board; 68 pp.; 3 plates; 10 text figures.
Report of the Division of Entomology, for the year ending December 31, 1906. Reprint from Third Report of the Board; 25 pp.; 7 text figures.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.
"Suggestions in Regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.
"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.
"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.
"Instructions for Propagating and Planting Forest Trees." Press Bulletin No. 4; 4 pp.; 1906.
Report of the Division of Forestry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 77 pp.; 5 plates.
Report of the Division of Forestry, for the year ending December 31, 1906. Reprint from Third Report of the Board; 123 pp.; 4 maps.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.
"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.
"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.
Report of the Division of Animal Industry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 62 pp.
Report of the Division of Animal Industry, for the year ending December 31, 1906. Reprint from Third Report of the Board; 41 pp.; 3 plates.

DIVISION OF AGRICULTURE.

Report of the Division of Agriculture, for the year ending December 31, 1905. Reprint from Second Report of the Board; 12 pp.
Report of the Division of Agriculture, for the year ending December 31, 1906. Reprint from Third Report of the Board; 6 pp.

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* Out of Print.

Any one or all of the publications listed above (except those marked *) will be sent to residents of this Territory, free, upon application to Mailng Clerk, P. O. Box 331, Honolulu.