CONNECTICUT

Agricultural Experiment Station

NEW HAVEN, CONN.

BULLETIN 231 SEPTEMBER, 1921

Report of the

Tree Protection Examining Board

By W. E. BRITTON, *Chairman*

Miscellaneous Notes

By E. H. JENKINS

CONTENTS

CONNECTICUT AGRICULTURAL EXPERIMENT STATION

OFFICERS AND STAFF

OCTOBER, 1921

BOARD OF CONTROL.

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MISS L. M. BRAUTLECHT, *Bookkeeper and Stenographer.*
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V. L. CHURCHILL, *Sampling Agent.*
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E. M. STODDARD, B.S., *Assistant Botanist.*
MISS FLORENCE A. MCCORMICK, PH.D., *Scientific Assistant.*
G. E. GRAHAM, *General Assistant.*
MRS. W. W. KELSEY, *Stenographer.*

Entomology.
W. E. BRITTON, PH.D., *Entomologist; State Entomologist.*
B. H. WALDEN, B.AGR., M. P. ZAPPE, B.S.,
PHILIP GARMAN, PH.D.,
} *Assistant Entomologists.*
JOHN T. ASHWORTH, *Deputy in Charge of Gipsy Moth Work.*
SAMUEL T. SEALY, *Deputy in Charge of Mosquito Control.*
MISS GLADYS M. FINLEY, *Stenographer.*

Forestry.
WALTER O. FILLEY, *Forester.*
A. E. MOSS, M.F., *Assistant.*
H. W. HICOCK, M.F., *Assistant.*
MISS PAULINE A. MERCHANT, *Stenographer.*

Plant Breeding.
DONALD F. JONES, S.D., *Plant Breeder.*
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Press of The Wilson H. Lee Company.

FIRST REPORT

OF THE

Tree Protection Examining Board

FOR THE BIENNIAL PERIOD ENDING JUNE 30, 1921.*

By W. E. BRITTON, Chairman.

For many years men have traveled about the State and in various places obtained work for the alleged improvement of orchard and shade trees, such as pruning, spraying, bracing, filling cavities, or applying fertilizers. In some cases good service was rendered and the owners were satisfied; in others no benefit resulted. Occasionally trees were positively injured by the treatment, because the so-called "tree doctors" did not understand their business. Finally this condition existed: tree work was being done by well-trained, intelligent and conscientious men; by poorly trained but reliable men; and worst of all, by unscrupulous men who were usually, though not always, poorly trained. The unsatisfactory work of the unreliable men had a tendency to bring the whole business into disrepute. Some of them were at work here one day, but the next they would be gone, perhaps forever, only to be followed by a new crop. Even though such men guaranteed their work, the owner could obtain no redress because the men could not be found.

More than thirty years ago, in the southwestern corner of the State, traveling "tree doctors" did a flourishing business by boring holes in the trunks of elm trees and inserting some chemical substance which they claimed would dissolve in the sap and be carried to the leaves and keep the trees free from the attacks of the elm leaf beetle. The price was seventy-five cents per tree. It was easy money and many property owners "fell for it." Needless to state, no benefit followed the treatment, and members of the Station staff removed some of the material seven years after it was placed in the tree, and apparently none of it had dissolved. A chemical examination showed it to be powdered sulphur and some kind of grease, two substances as nearly insoluble in the sap as could easily be found.

Now such transient work damaged the business of those men and firms who had established a reputation for intelligence and

* This report properly belongs in the Station report for 1921 rather than in this Station report of 1920. But as there is great delay in issuing the latter it seems advisable to include in it this paper rather than to hold it for the Station report of 1921.

square dealing, and after due consideration, they thought best to apply for legislation to regulate this condition by the issuing of licenses or certificates to qualified workers.

As a result, the following act was passed by the General Assembly of 1919, and was approved May 2nd:—

AN ACT CONCERNING THE IMPROVEMENT, PROTECTION OR PRESERVATION OF FRUIT, SHADE OR ORNAMENTAL TREES.

Chapter 181. Public Acts of 1919. (In effect July 1, 1919.)

SECTION 1. No person, firm or corporation shall advertise, solicit or contract to improve the condition of fruit, shade, forest or ornamental trees, by pruning, trimming or filling cavities, or to protect such trees from damage by insects or disease, either by spraying or any other method, without having secured a certificate as specified in section two of this act; and any person, firm or corporation failing to comply with the terms of this act shall be fined not more than one hundred dollars; provided any person may improve or protect any tree on his own premises or on the property of his employer or on any property within the limits of the town of which he is a legal resident, without securing such a certificate.

SEC. 2. The botanist, entomologist and forester of the Connecticut Agricultural Experiment Station shall constitute a board which shall, upon application from any person, firm or corporation, examine the qualifications of the applicant to improve, protect or preserve fruit, shade, ornamental or forest trees, and if satisfied that the applicant is qualified, may issue a certificate so stating; which certificate shall be valid for one year from the date of its issue, unless sooner revoked as provided in section three of this act, and may be renewed by the board for succeeding years without further examination, upon payment of the fee hereinafter required, provided any person, firm or corporation receiving such certificate shall be responsible for the acts of all employees in the performance of such work.

SEC. 3. Said board shall prepare all necessary forms and prescribe all rules and regulations governing examinations, and any certificate issued under the provisions of this act may be revoked by it upon proof that improper methods have been used or for other sufficient cause.

Sec. 4. Each applicant for an examination shall pay a fee of five dollars in advance, and a fee of two dollars, for each certificate or renewal issued; which fees may be expended by the board for any expense incurred by it in making examinations or issuing certificates, and an account of all receipts and expenditures under this act shall be rendered annually to the state comptroller.

As the botanist, entomologist, and forester of this Station were named to constitute a Board, a meeting of this Board was held on June 14th, and organized by electing as Chairman, W. E. Britton, Entomologist, and as Secretary and Treasurer, W. O. Filley, Forester. The Board also drew up the following rules and regulations according to the provisions of the law:—

EXAMINATION RULES AND REGULATIONS.

I. Each person, firm or corporation required to secure a certificate under Chapter 181, Public Acts of 1919, shall be examined as follows: When a firm is under control of one person who is solely responsible for the contracts, methods and oversight of each piece of work, this person

alone may be required to pass the examination, but when more than one person is responsible for the methods of work and oversight of same, each shall be required to take the examination. When foremen or others are given complete charge of recommending and applying treatments, they shall also be required to take the examination, in so far as it relates to their work. The Examining Board shall decide who shall be required to take the examination.

II. Unless otherwise arranged, candidates for certificates shall appear for examination at the Connecticut Agricultural Experiment Station, at New Haven, at such times as shall be designated by the Board.

III. Examinations may be oral, written, or both, as shall be determined by the Examining Board, and, in general, shall cover tree species, tree life and growth; diseases and insect pests of trees, with treatment for same; pruning and tree surgery.

IV. Candidates prior to the time of examination shall furnish a typewritten statement of their qualifications as follows:—

1. General education.
2. Special training for tree protection work.
3. Experience in tree protection work. The latter shall include
   (a) Place of business, name of firm and position now held.
   (b) Previous positions held.
   (c) Total length of experience.
   (d) Contracts now under way or completed during the past 12 months.

In addition three or more recommendations as to reliability and efficiency shall be furnished; and where typed or printed forms of contracts, regulations, etc., are used, these shall also be supplied, or if not available, statements shall be made concerning the same.

V. If satisfied with the qualifications of the applicant, the Board will issue a certificate good for the succeeding twelve months (unless revoked for cause), then to be renewed upon application under such conditions as the Examining Board may require in each case.

VI. Upon evidence of unfitness in training or improper business methods, the Examining Board may refuse to issue a certificate or cancel one that has been issued. Complaints may be made to the Board on these points, and if deemed desirable by the Board, private hearings of the interested parties shall be held.

The new measure became a law on May 2nd, but it did not take effect until July 1, 1919. In order to give the tree men a chance to meet the provisions of the law, two examinations were held before the law became operative: one on June 27th and one on June 30th. Four examinations were held in July, on the 9th, 12th, 16th and 23rd, respectively.

The form of application used is as follows:—

.....19

I,.....,hereby make application

to the Tree Protection Examining Board, for an examination / a renewal certificate, as provided in Chapter 181, Public Acts of 1919.

I enclose fee of $.....as required by law.

.....
Applicant

.....
Address

Fee for Examination Certificate; $5.00
" " Renewal Certificate $2.00

The law provides that the fee shall be paid in advance. In most cases a check for five dollars was received by mail, but in some cases the applicants were allowed to make payment at the time of the examination.

EXAMINATIONS

The Board expected and preferred to hold examinations rather infrequently and to have each one well attended. But though the new law and notices of the examinations were at first mentioned in the newspapers, only a few candidates were present at most of the examinations. Some of the applicants were unable to be present on any of the dates set and asked for another date in the near future. It often happened that an application would be received a few days following an examination, with a request for an examination at an early date. This explains the reason for holding so many examinations in attempting to accomodate the applicants.

During the two years covered by this report, twenty examinations were held on the dates given below:—

In 1919: June 27 and 30; July 9, 12, 16 and 23; August 1; September 17; October 29; November 19.
In 1920: January 28; March 17 and 31; May 5; June 7 and 17; September 15; December 6.
In 1921: February 28 and May 11.

The examination has consisted of written answers to certain fundamental questions, selected to show the applicants' knowledge of the subject. In addition to these answers, each applicant was asked oral questions by each member of the Board, and he was told whether his answers were right or wrong, and if wrong, wherein they were wrong. Several different sets of written questions have been used in the course of these examinations, and one of these is given below as a sample:—

TREE PROTECTION EXAMINING BOARD.

EXAMINATION QUESTIONS.

(Please indicate by number each question answered.)

A. **Injurious Insects** (Answer *both.*)

(1) Explain the purpose of an insecticide, name examples of the common types, and specify how they are used.

(2) Describe briefly the difference between sucking and chewing insects, explain how each may injure trees and give remedies for each.

(Answer *any two.*)

(3) What are the three principal types of insect injury to trees? Give an example of each with remedy.

(4) How and when would you treat elm trees as a protection against the ravages of the elm leaf beetle?

(5) What are the chief insect pests of the apple orchard, and what treatment is commonly recommended for each?

(6) Give a brief account of the maple borer and how to combat it.

B. **Tree Diseases.** (Answer *three out of the five.*)

(7) What are fungi? Give several examples. How do they reproduce? How does a parasite differ from a saprophyte?

(8) What kinds of injury to trees are caused by the following: Sun scorch? Drought? Ice storms? Late frosts? Lightning? Animals (including man)?

(9) What different fungous diseases have you tried to control and by what methods?

(10) What causes decay of wood in trees and how would you control it?

(11) What is a fungicide? Name four kinds. Give theory of spraying against fungi. How is Bordeaux mixture made? Distinguish between a fungicide and an insecticide.

C. **Tree Surgery.** (Answer *any three.*)

(12) Describe in detail the way you would remove a large limb and the treatment you would give the resulting cut surface if undecayed.

(13) Discuss the relative merits of filled cavities and open cavities, stating under what conditions you would recommend one or the other.

(14) Describe your method of filling cavities, giving the reason for each operation.

(15) What may be done to hasten the healing of wounds and the growing over of filled cavities?

(16) Discuss advantages and disadvantages of the different methods of strengthening weak trees.

D. **Tree Life and Growth.** (Answer *one.*)

(17) Discuss the growth of a tree, indicating where and when growth takes place, also the manner in which the roots and leaves perform their work.

(18) Describe the way in which water and food materials are secured by a tree, and how they are utilized by it.

E. **Tree Species.**

(19) Identify the specimens on the table, giving the common name of each as numbered.

Altogether 65 candidates took the examinations. Of this number 61 were finally granted certificates, four of them being required to take a second examination. Four applicants were refused certificates because the Board did not consider them qualified.

CERTIFICATES

The form of the regular certificate adopted by the Board is as follows:—

CERTIFICATE

FROM

Tree Protection Examining Board

STATE OF CONNECTICUT

This is to Certify that _____

of _____ has been duly examined in compliance with the provisions of Chapter 181, Public Acts of 1919, and is considered qualified to conduct the business of protecting trees.

No. _____ _____ Entomologist, *Chairman*

Date _____ _____ Forester, *Sec'y-Treas.* } Examining Board

Expires _____ _____ Botanist

CONNECTICUT AGRICULTURAL EXPERIMENT STATION

NEW HAVEN, CONNECTICUT

A small card shown below was furnished for each foreman employed by a firm receiving a regular certificate:—

State of Connecticut

TREE PROTECTION EXAMINING BOARD

THE BEARER

is working under supervision of and is responsible to

.....

of.....Conn.,

to whom this board has issued Certificate No.....as provided by Chapter 181, Public Acts of 1919. Said Certificate expires.....

CONNECTICUT AGRICULTURAL EXPERIMENT STATION
NEW HAVEN, CONN. .....
Secretary

Up to this time no certificate has been revoked although several holders have failed to renew. The list of individuals and firms receiving certificates between July 1, 1919, and June 30, 1921, together with number and date of each certificate and date of renewal, is given below—

LIST OF FIRMS AND INDIVIDUALS RECEIVING CERTIFICATES FOR TREE WORK.

Biennial Period Ending June 30, 1921.

Name	Address	Certificate Number	Date Issued	Date of Renewal
Armstrong, Edward H.	Branford, Ct.	34	Sept. 18, 1919	Not renewed
Baldwin, Thomas J., Jr.	Guilford, Ct.	21	July 16, 1919	July 15, 1920
Bartlett Co., F. A., (F. A. Bartlett)	Stamford, Ct.	10	July 16, 1919	July 15, 1920
Beaupain & Saunders, (Harry F. Beaupain)	So. Norwalk, Ct.	27	Aug. 13, 1919	Aug. 12, 1920
Bertolf Bros., (August C. Bertolf)	Sound Beach, Ct.	24	July 30, 1919	July 29, 1920
Brown, Edgar M.	Hartford, Ct.	52	June 7, 1920	June 6, 1921
Cardarelli, B. J.	Cromwell, Ct.	57	Mar. 1, 1921	
Clark, Wyllis S.	New Canaan, Ct.	20	July 16, 1919	July 15, 1920
Clyne, G. A.	West Cheshire, Ct.	5	July 2, 1919	July 1, 1920
Condon, Maurice L.	Lake Mahopac, N. Y.	46	Feb. 3, 1920	Feb. 2, 1921
Conn. Forestry Co., (Walter S. Crosby)	West Haven, Ct.	29	Sept. 18, 1919	Sept. 17, 1920
Dept. Pomology, Conn. Agr. College, (S.P. Hollister)	Storrs, Ct.	47	Mar. 22, 1920	Mar. 21, 1921
Davey Tree Expert Co., (Charles T. Burks)	Kent, Ohio Stamford, Ct.	59	May 27, 1921	
(Geo. J. Champlain)	Kent, Ohio	13	July 16, 1919	July 15, 1920
(Felix H. Caldwell)	Kent, Ohio	15	July 16, 1919	July 15, 1920
(John C. G. DeWolf)	Kent, Ohio	14	July 16, 1919	July 15, 1920
(Peter Gammie)	Kent, Ohio	60	May 27, 1921	
(Walter O. Noyes)	Danbury, Ct.	28	Sept. 18, 1919	Not renewed
(Harold A. Horn)	Kent, Ohio	49	April 5, 1920	Not renewed

Name	Address	Certificate Number	Date Issued	Date of Renewal
Desmond, Thomas H.	Simsbury, Ct.	50	April 5, 1920	April 4, 1921
Dunlop, Daniel S.	Cromwell, Ct.	58	March 1, 1921	
Easton, Clifford H.	New York, N. Y.	53	June 17, 1920	June 16, 1921
Elm City Nursery Co., (W. E. Campbell)	New Haven, Ct.	7	July 2, 1919	July 1, 1920
Gavitt, Lester E.	Westerly, R. I.	51	May 10, 1920	May 9, 1921
Gilbert, J. E.	New Haven, Ct.	61	May 27, 1921	
Goodwin Associates, The James L. (Edward E. Pettee)	Hartford, Ct.	38	Nov. 7, 1919	Nov. 6, 1920
(James L. Goodwin)	Hartford, Ct.	39	Nov. 7, 1919	Nov. 6, 1920
Hartford Forestry Co., (Philip Hansling, Jr.)	Hartford, Ct.	16	July 16, 1919	July 15, 1920
(Philip Hansling)	Hartford, Ct.	17	July 16, 1919	July 15, 1920
Herthal, Gus, Jr.	Bridgeport, Ct.	36	Sept. 18, 1919	Sept. 17, 1920
Herthal, G. F.	Bridgeport, Ct.	25	July 30, 1919	July 29, 1920
Homewood Forestry Co., (Peter J. Belletti)	Waterbury, Ct.	41	Nov. 7, 1919	Nov. 6, 1920
Hunt Co., W. W., (W. A. Wright)	Hartford, Ct.	33	Sept. 18, 1919	Sept. 17, 1920
Jaynes, H. A., Conn. Tree Surgery Co.	Storrs, Ct.	56	Aug. 6, 1920	
Kelley, James J.	New Canaan, Ct.	19	July 16, 1919	July 15, 1920
Kellner & Son, Herman H., (Arthur H. Kellner)	Danbury, Ct.	26	Aug. 13, 1919	Aug. 12, 1920
Landscape Foresters Ltd., (C. E. Mager)	New York, N. Y.	32	Sept. 18, 1919	Sept. 17, 1920
Mallett Co., George A., (George A. Mallett)	Bridgeport, Ct.	11	July 16, 1919	July 15, 1920
Markham, W. R.	Middletown, Ct.	23	July 30, 1919	July 29, 1920
McLain & Co., J. A., (J. A. McLain)	Stamford, Ct.	37	Sept. 18, 1919	Sept. 17, 1920
McLeod, Donald	Cromwell, Ct.	54	June 17, 1920	Not renewed
Meader Co., L. H., (Lewis H. Meader, Jr.)	Providence, R. I.	31	Sept. 18, 1919	Sept. 17, 1920
Millane Tree Expert Co., (Neil A. Millane)	Middletown, Ct.	1	July 2, 1919	July 1, 1920
Morris, Harry H.	Danbury, Ct.	40	Nov. 7, 1919	Nov. 6, 1920
Munson Whitaker Co., (Robert O'Shea)	Boston, Mass.	42	Nov. 26, 1919	Nov. 25, 1920
Nichol, James (Fred B. Bartlett)	Greenwich, Ct.	12	July 16, 1919	July 15, 1920
Old Colony Forestry Co., (Thos. J. McGinnis)	West Haven, Ct.	4	July 2, 1919	July 1, 1920
O'Meara, Harry J.	Stamford, Ct.	35	Sept. 18, 1919	Sept. 17, 1920
Palmer, Arthur J.	West Haven, Ct.	2	July 2, 1919	July 1, 1920
Pauley Tree Expert Co., (George A. Pauley, Jr.)	New Canaan, Ct.	22	July 30, 1919	July 29, 1920
Quality Seed Store, (William J. Rice)	Stamford, Ct.	9	July 2, 1919	July 1, 1920
Rich, Nehemiah L.	Stamford, Ct.	3	July 2, 1919	July 1, 1920
Schoonman, W. J.	New London, Ct.	6	July 2, 1919	July 1, 1920
Shaw, Walter	Westville, Ct.	55	June 17, 1920	Not renewed
Sierman, C. H.	Hartford, Ct.	8	July 2, 1919	July 1, 1920
Smith, Joseph P.	Stamford, Ct.	44	Nov. 26, 1919	Not renewed
Van Heiningen, Jacob C.	So. Wilton, Ct.	48	April 5, 1920	Not renewed
Verkade, H.	New London, Ct.	18	July 16, 1919	July 15, 1920
Wilcox, Reginald C.	Essex, Ct.	30	Sept. 18, 1919	Sept. 17, 1920
Wright, John L.	Putnam, Ct.	43	Nov. 26, 1919	Nov. 25, 1920
Zack, Harry J.	Chester, Ct.	45	Feb. 3, 1920	Feb. 2, 1921

TREE WORKERS' INSTITUTE

The early examinations indicated that many of the applicants were not well versed in the growth and care of trees, yet some of these men had conducted a fairly successful business for a number of years. Evidently they knew what to do better than they could tell how or why it should be done. To the members of the Board it seemed unfair to refuse certificates to such men, so an effort was made to help them by giving them the proper instruction in their work; consequently an institute was held at the Station on July 22 and 23, with the following program:-

TUESDAY MORNING, JULY 22

10:00 A. M.	How a Tree Lives and Grows (Illustrated). Prof. A. H. Graves.
11:00	Best Species of Shade Trees for Street and Home Planting. Best Methods of Planting and Guarding Street Trees. G. A. Cromie, Supt. of Trees, City of New Haven.
11:45	Discussion. Led by E. F. Coe, Elm City Nursery Co., New Haven.
12:00	Methods of Fertilizing Trees. Dr. E. H. Jenkins, Director, Conn. Agricultural Experiment Station.

TUESDAY AFTERNOON

2:00 P. M.	Fungous Diseases of Trees. (Illustrated by Stereopticon.) Dr. G. P. Clinton, Botanist.
3:00	Cavity Work and Care of Mutilations. G. A. Cromie, Supt. of Trees, City of New Haven.
3:30	The Pruning and Spraying of Shade Trees. G. H. Hollister, Supt. of Keney Park, Hartford.
4:00	Discussion. Led by F. A. Bartlett, Stamford.
4:15	Question Box.

TUESDAY EVENING

7:30 P. M.	The Tree Doctor and the Golden Rule. Dr. E. H. Jenkins.
8:15	Methods of Forest Planting and Management. (Illustrated by Stereopticon.) W. O. Filley, Forester.
9:00	Discussion. Led by L. F. Harvey, County Agricultural Agent, New Haven.
9:15	Question Box.

WEDNESDAY MORNING, JULY 23

10:00 A. M.	Some Common Insects Attacking Shade and Fruit Trees. (Illustrated by Stereopticon.) Dr. W. E. Britton, Entomologist.
11:00	The Pruning and Spraying of Fruit Trees. (Illustrated by Stereopticon.) E. M. Stoddard, Assistant Botanist.
11:30	Solid Stream Spraying as Practiced in Gipsy Moth Work. (Illustrated by Stereopticon.) I. W. Davis, Assistant Entomologist.
12:00	Discussion. Led by N. A. Millane, Middletown.
12:15	Question Box.

Notices of this institute were sent to newspapers and to all tree workers, including the tree wardens in each town and the men in charge of shade trees in each city in the State. Considering the

number of such men interested, the attendance was rather small, about forty being present. The rainy weather no doubt kept many away. The papers were full of interesting information and there was great interest shown by the questions and discussions.

At that time it was planned to hold further institutes but this has not been done, as the need for it has in part at least subsided. It was also thought best to form a State organization of tree workers and a committee was elected to prepare a plan, but so far nothing further has developed.

Financial Statement

Receipts

From 65 examination fees @ $5.00 each		$325.00
53 renewal fees @ $2.00 each		106.00
		$431.00

Expenditures

Printing	$59.70	
Postage	21.26	
Stationery	11.10	
Filing Cabinets, etc.	62.50	
Office Supplies	24.18	
Traveling Expenses of Board	38.28	217.02
Balance on Hand June 30, 1921		$213.98

Dangers Which May Arise

Of course tree workers are supposed to know all about trees and to be able to diagnose troubles on sight. Most of them are unable to do so, and many of our best specialists can do so only after a careful examination. Many times, evidence is lacking. If evidence can be obtained and the tree worker is in doubt, he should submit it to his Agricultural Experiment Station, or to some other institution where competent specialists are employed. There are many cases on record where tree workers have not done this, but induced the owners to allow them to give treatment at considerable expense, which afterward proved useless. Even positive injury has resulted in some instances. It is human nature for the tree worker to dislike to say that he does not know, yet an honest man frequently must do so. It is much better to say so and try to find out, than to make a serious mistake by giving the wrong treatment. There are many injuries to trees which are non-parasitic in their nature, for which the usual remedies for parasitic troubles are worthless.

Then, too, some owners give authority for certain work to be done, but do not keep in close touch with the progress of it and are astounded at the size of the bill when finally presented. A good way of keeping check on the cost is to have the owner or his agent approve and sign the time slips each day or week, as the case may be.

The Board may revoke a certificate for improper work done, or if dishonest business methods are followed when dealing with clients. The Board has no jurisdiction, however, over legal questions, such as fixing damages in a case of violation of contract. Such matters must go to the courts if they cannot be settled to the satisfaction of both parties.

Employ Workers Who Hold Certificates

Unless the owner is acquainted with some tree worker in whom he has confidence, it is safer to employ only those men or firms who hold certificates from this Board. It is true that the law permits a tree worker to practice without a certificate in the town of which he is a legal resident, but this provision was included for the purpose of allowing farmers and orchardists to employ men to do the necessary spraying and pruning of their orchards. It is a question if city tree workers should have been allowed to do this. However, the exception is clear in the law and must stand until changed.

If a tree worker solicits work from you, ask him if he or his firm has passed the examination and holds the certificate of this Board. If not, tell him that you prefer some one who holds a state certificate. This will help to induce all workers to apply for the examination and certificate, according to the provisions of the law. The names of those who have received certificates from the Board are given on pages 345 and 346.

Complaints Will be Investigated

The Board cannot guarantee the work of any one, even though a certificate has been issued to him, but requests that written complaints of unsatisfactory work, discourteous treatment, or improper business methods be filed with the Secretary. So far as may be possible, such complaints will be investigated and the findings will be recorded and furnished to both parties concerned. If the tree worker is at fault and the circumstances warrant, his certificate may be revoked.

The Board also invites complaints regarding tree workers who are operating in violation of the law, and will follow up all such complaints wherever feasible.

A Partial List of Publications Relating to the Care of Trees

Bailey, L. H., "The Pruning Manual," The Macmillan Co., New York, 1919.

Blakeslee, A. F., and Jarvis, C. D., "Trees in Winter," The Macmillan Co., York, 1913.

Collins, J. F., "Tree Surgery," Farmers' Bulletin No. 1178, U. S. Department of Agriculture, Washington, D. C., 1920.

Fernow, B. E., "The Care of Trees," Henry Holt & Co., New York, 1910.

Houser, J. S., "Destructive Insects Affecting Shade and Forest Trees," Bulletin 332, Agricultural Experiment Station, Wooster, Ohio, 1918.

Kotinsky, Jacob, "Insects Injurious to Deciduous Shade Trees and Their Control," Farmers' Bulletin No. 1169, U. S. Department of Agriculture, Washington, D. C., 1921.
Levison, J. J., "Studies of Trees," John Wiley & Sons, New York, 1914.
Peets, Elbert, "Practical Tree Repair," McBride, Nast & Co., New York, 1913.
Rankin, W. F., "Manual of Tree Diseases," The Macmillan Co., New York, 1918.
Solotaroff, William, "Shade Trees in Towns and Cities," John Wiley & Sons, New York, 1911.
Stone, G. E., "Shade Trees, Characteristics, Adaptation, Diseases and Care," Bulletin No. 170, Massachusetts Agricultural Experiment Station, Amherst, Mass., 1916.

Also, the bulletins and reports of this Station, and of other Agricultural Experiment Stations, and of the United States Department of Agriculture, treat of special subjects relating to trees. If available, these may be obtained free on request. It is recommended tha tree workers obtain these publications and use them for reference in connection with their work.

The foregoing report has been approved and adopted as the First Report of the Tree Protection Examining Board. It is intended to issue future reports biennially covering the activities of the Board under the provisions of the law.

Respectfully submitted,

W. E. BRITTON, Entomologist,
Chairman.

W. O. FILLEY, Forester,
Secretary and Treasurer.

G. P. CLINTON, Botanist.

AN EXPERIMENT IN TOP-DRESSING A RUN-OUT MEADOW

By E. H. JENKINS

The meadow was acquired in 1915. Its previous cropping was unknown but its average annual yield for the following six years was 1.01 tons per acre of poor hay much mixed with weeds. Seventeen plots were established, 14 feet wide and 155½ feet long, each one-twentieth of an acre. Four-foot strips separated the plots. The top-dressings were applied early each year. The hay from all the plots was weighed on the same day. The yields of the checks show an increased natural yield from No. 1 to No. 17, and the "gains" have been corrected as required by this difference in the check plots. For two years no potash could be applied to plot 8, and in 1920 an equivalent amount of muriate was used in place of kainit.

The arrangement of the plots, their treatment and the corrected average results of the six years cropping appear in the following table

Plot No.	Fertilizer	Tons of Hay Per Acre	Corrected Gain in Tons	Cost of Fertilizer 1915	Cost of Fertilizer 1919
1	None	0.80	.....	.....	.....
2	2.3 tons manure	1.57	0.56	$ 8.05	$12.65
3	250 lbs. nitrate	1.98	0.97	6.88	12.50
4	175 lbs. nitrate + 150 lbs. bone	1.74	0.73	7.45	12.65
5	None	0.71	.....	.....	.....
6	250 lbs. nitrate + 200 lbs. acid phosphate	1.96	0.96	8.18	15.85
7	250 lbs. nitrate + 190 lbs. basic slag	2.05	1.04	8.49	*
8	250 lbs. nitrate + 200 lbs. acid phos. + 130 lbs. kainit	2.10	1.10	9.09	*
9	None	0.97	....	.....	.....
10	Double quantity of 2	1.69	0.68	16.10	25.30
11	" " " 3	2.09	1.08	13.76	25.00
12	" " " 4	1.47	0.46	14.90	25.30
13	None	1.01	....	.....	.....
14	Double quantity of No. 6	2.44	1.43	16.36	31.70
15	" " " " 7	2.43	1.42	16.98	*
16	" " " " 8	3.19	2.13	18.18	*
17	None	1.10	....	.....	.....

*Basic slag and kainit were not available in 1919.

CERTIFICATION OF BABCOCK TEST APPARATUS

As provided by statute the Station tests the accuracy of Babcock apparatus which is used for determining the value of milk or cream. Each piece thus tested is permanently marked with the Station initials, CT. AG. ST. if it is accurately graduated: BAD if it is inaccurate.

Since our last report 2,102 pieces have been tested of which 43, or about two percent, were bad.

SORGHUM JUICE

A single test of juice from Early Amber Sorghum grown at Mt. Carmel gave the following result:

Sucrose (Cane sugar)	7.35%
Invert sugar	3.29
Total sugars	10.64
Undetermined solids	1.87
Total solids	12.51

TEST OF PERILLA

Perilla frutescens is grown extensively in Japan for the oil in its seeds. In 1917 the Institute of Industrial Research asked the co-operation of this Station in testing its growth in this part of the country.

The seed was planted in drills 18 inches apart about 3 inches apart in the row.

The planting was made May 31st, as weather and labor conditions made earlier planting impossible.

On September 18th, the plants had a maximum height of 50 inches, average 44-46 inches, and were beginning to blossom.

They were sparsely branched mostly near the root, and had already been slightly touched by frost. A short time later they were killed by cold.

We judge that, in this region, seed could only be produced by starting the plants in the greenhouse and later setting them in the field.

EFFECTS OF BORAX ON THE GROWTH OF POTATOES, CORN AND BEANS

By E. H. Jenkins

In consequence of the lack of German potash salts during the war, various domestic sources of potash were exploited and their output eagerly sought and used.

Occasional injury or total loss of crops led to careful search for the cause, which in widely separated districts was not at first evident. It was found that the domestic potash obtained from certain sources contained notable quantities of borax, which in relatively small amounts is a plant poison, and it was proved that in some cases the injuries noted were certainly caused by borax in the fertilizer. Further study of the poisonous effect of borax and the limits of its toxicity seemed to the directors of the New England, New York and New Jersey Stations to be immediately necessary, and it was evident that such a study could be carried

out best as a single joint project, each Station bearing its proportionate part of the expense involved. This Station joined with the others in this study.

Director Hills of the Vermont Station placed a suitable greenhouse at the disposal of the co-operating Stations, Director Woods and Dr. Morse, pathologist of the Maine Station, assembled the materials and prepared detailed plans, Director Lipman of the New Jersey Station selected a trained experimenter to take charge of the greenhouse work, and the experiments were carried out during 1920. The method and results were published in Soil Science Vol. XII, No. 2, pp 79-106, 13 plates August 1921, with the title, "Effect Upon the Growth of Potatoes, Corn and Beans Resulting from the Addition of Borax to the Fertilizers Used. J. P. Neller and W. J. Morse."

The general summary is as follows:

"Plants were uninjured where fertilizer mixtures made from borax-free chemicals were applied to soil in pots in which potatoes, corn and beans were grown. These crops were injured where the pots contained the same soil and the same fertilizer mixtures in like quantity, provided sufficient amounts of borax were added with the fertilizer. The same types of injury were produced, in somewhat greater degree, when a commercial fertilizer carrying equivalent amounts of borax was applied.

"Corn and beans were more susceptible to the injurious effects of borax than were potatoes. Under the conditions of the experiment, anhydrous borax at the rate of 3 pounds per acre was the largest amount that could be applied in drills with safety to beans. The limit for corn is somewhat under 5 pounds, and for potatoes slightly above 5 pounds per acre. Borax applied with the fertilizer below the seed or seedpiece proved more toxic in all cases than where applied above in like manner. Mixing the borax and fertilizer with the soil decreased the injury and slightly raised the amount that could be applied per acre with safety.

"Evidence was obtained that applications of lime prevented some of the injury to potatoes. The tests with gypsum and manure were not conclusive with this crop. All three of these materials seemed to reduce the toxic effects on corn. Lime was beneficial with beans, but gypsum and manure did not show any appreciable influence.

"The above results were all obtained with soil at an optimum water content of 19.2 per cent. A subsequent test with beans showed that more injury occurred where the soil moisture was maintained at 15.2 per cent. than where it was 30.4 per cent.

"The only indication of possible stimulation due to the presence of small amounts of boron occurred with corn, but the evidence was inconclusive."

The Station has a few reprints of this paper which can be given to persons specially interested in the technique followed.

TIMOTHY AS A COVER CROP FOR TOBACCO LAND

By E. H. JENKINS

Various experimenters have made observations on the amount of vegetable matter and plant food left in the soil by the stubble and roots of crops. Among these may be cited:

Heiden, Düngelehre, I, p. 72, 1866, and III, p. 243, 1872, notes the work of Boussingault, John, Schubart, Hellriegel, Dietrich and others.

Hopkins, Soil Fertility and Permanent Agriculture p. 218, 1910, gives statistics on the amount of dry matter and plant food in various legumes and cites the observations of others.

Penny, Delaware Station, Bulletin 67, 1905, reports observations on the root system of crimson clover at various periods of growth.

In the report of the Connecticut Board of Agriculture, 1871, p. 95, notice is given of Weiske's observations at Proskau, on the composition of roots and stubble of a number of crops. (Versuchs-St. 14, p. 107, 1871.)

Woods, Storrs Station Report, 1888, p. 28, reports Observations on the Quantity and Composition of Roots of Clover, Timothy, Wheat and Other Plants, taken at time of harvest in Maine.

The observations here to be noted do not admit of close comparison with those referred to above, for these reasons: They were made on young, green crops to be plowed under for manure. The sowing was somewhat heavier than would be practiced if the crop were to be harvested and it was grown on tobacco land, and therefore on very heavily fertilized soil.

The observations specially concern or only concern tobacco growers.

It is matter of common knowledge and common complaint among tobacco growers in the Connecticut valley that on many fields the yield of tobacco has gradually decreased.

No appreciable loss of quality in the leaf is noted but only an unsatisfactory yield per acre.

This cannot be attributed to lack of fertilizer for increased applications and changes in the fertilizer formulas have not improved this condition.

The cause of the trouble is not known and can only be surmised, but it has been noticed in some cases that resting the land by growing other crops for a few years restored the soil, so that the yield of tobacco became satisfactory again.

But this change of crops is both inconvenient and expensive. The tobacco grower usually specializes in the one crop.

His barns, tools and help cannot conveniently be shifted to the raising of other crops at any profit.

This condition has raised the question whether the restoration of the land cannot be effected gradually, if not immediately, by growing some kind of cover crop between successive tobacco crops, sowing the seed as soon as possible after harvesting tobacco and keeping the cover crop on the land until it has to be broken up in the spring and fitted for the next crop.

Several well-known growers have followed this plan consistently for a number of years and have obtained very favorable results,

some of which are reported in the Hartford County Farm News for August, 1919.

Various cover crops have been suggested and tried. The nitrogen-gathering crops, vetches, clovers, soy beans and the like have no special value over the cereals on tobacco lands, because they do not exercise their nitrogen-gathering function where nitrogen is fairly abundant in the soil already, as is the case on highly fertilized tobacco fields.

There is the further objection to their use that certain legumes are natural hosts of the dreaded *Thielavia* or root rot disease; moreover they make no such growth through the colder season as do the cereals and other grasses.

Of these rye has been and is, quite commonly used. The tradition that it sours the land has no basis in fact, but one sound objection to it is its very rapid growth in spring. If it is not turned under at just the right time it becomes too "woody" and when turned under decays but slowly and leaves the soil too loose and open. If rye is used it should be sown at the rate of a bushel and a half to the acre.

Timothy is now being tried and so far has given good satisfaction. It makes slow growth above ground and never gets too rank or woody before the time for plowing, but it forms a thick mat of very fine roots which fill the soil to the depth of six or eight inches and takes up from it surprisingly large amounts of plant food. It can be sown thicker than is usual in seeding down for a hay crop. Half a bushel of timothy seed per acre should be enough. It should be sown as early as is possible. Where tobacco is primed the seed may be sown after the second priming. Some wait until the tobacco is harvested and the stalk disk-harrowed.

We urge tobacco growers who are concerned with diminishing yields on their fields to test timothy as a cover crop for at least three years in succession, sowing early, with a fairly heavy seeding. It is the only alternative in sight to avoid the necessity of dropping tobacco and growing other crops for a time; and the experience of some growers has shown its value in restoring production.

Apart from the use of cover crops as a corrective for failing tobacco soils, they are always needed as a protection from the drifting of the soils in high winds, from their washing in heavy rains and from the leaching of the plant food in them. Whenever the land is unfrozen, timothy and rye are always growing and gathering and holding the soluble plant food in the soil for the following crop and adding to it a store of organic material got largely from the air.

Within the last two years some observations have been made by Mr. B. G. Southwick, the Hartford County Agent, Mr. Henry Dorsey, Extension Agronomist, and the writer, to determine how much organic matter and plant food a timothy cover crop might gather from a tobacco soil and hold for the tobacco crop.

The samples, usually five in each field, were taken with a six inch iron tube, driven down six or seven inches. The cores thus obtained with the roots and top growth, were very carefully washed out by the writer, on fine sieves, and when partially dried were cleaned as far as possible of all adhering soil and foreign matters and then analyzed.

While some roots go much deeper than seven inches their total weight is relatively very small.

The averages of the five samples taken from each field are given below.

A., B. and C. were taken May 8, 1919, just before the crop was turned under. The top growth was six to eight inches high. A from land of D. E. Newberry, South Windsor, B from Windsor Tobacco Corporation, Windsor, C from S. F. Brown, Poquonock.

D. E. F. were taken in the late fall of 1919 and show what had been taken by the crop before winter. D from J. W. Alsop, Avon, E from J. E. Phelps, Suffield F from D. E. Newberry, South Windsor.

G. and H. were taken in May, 1920, just before plowing. H is a mixture of timothy and alsike clover. In 1920 timothy did not make nearly as good a growth as in the previous year on account of unfavorable weather conditions and farmers generally did not have as good cover crops as usual.

The samples were taken from different fields, probably unlike in soil, moisture conditions and fertility, so that no very close agreement in results was to be expected.

But in general they indicate that *an even, thick stand of timothy may contain, when plowed under, not far from three tons of vegetable matter, 100 pounds of nitrogen, 50 of phosphoric acid and more than 100 pounds of potash for the use of the following crop.*

To fix a valuation on this material is hardly possible.

If we calculate that forty per cent. of the nitrogen is available to the coming crop and half of the phosphoric acid and potash, we find a valuation of about $31.00.

But the value of three tons of vegetable matter, quite widely and evenly distributed in the soil it is impossible to estimate.

POUNDS PER ACRE OF ORGANIC MATTER AND PLANT FOOD CONTAINED IN A COVER CROP OF TIMOTHY GROWN ON TOBACCO SOIL

Spring, 1919	Organic Matter.	Nitrogen.	Phosphoric Acid.	Potash.
A. So. Windsor,	7860	176	70	173
B. Windsor,	6099	185	75	183
C. Poquonock,	7112	160	72	150
Average	7020	173	72	168
Fall, 1919				
D. Avon	2813	68.2	31.5	61.2
E. Suffield,	2015	60.2	28.2	49.2
F. So. Windsor,	1398	39.4	17.8	28.3
Average	2075	55.9	25.8	46.2
Spring, 1920				
G. Suffield,	5060	94.8	37.8	117.0
H. So. Windsor,	6693	90.4	57.6	131.5