Dr. Fisher

August 2, 1932

Mr. C. W. Collins,
1156 Main Street,
Melrose Highlands, Mass.

Dear Collins:

Following our conversation about the need for further study on the resistance of pitch pine to gipsy moth defoliation, I had a long talk with Hall. Several years ago, while working at the Harvard Forest School Hall made some preliminary studies on the growth of pitch pine on Cape Cod and was likewise quite impressed with its superiority over white pine in the gipsy moth infested areas. He tells me that there is still a little more work to be done on this study before it could be summarized for use.

It occurs to me that it would be opportune while Hall is on the locust borer work in New York state to have him run over to Melrose Highlands to consult with you and, if you feel that the information you desire could be obtained from a continuation of the work originally undertaken by him, I will be glad to give Hall the necessary authority.

Doctor Hall will go up into New York State about the middle of August and finish his locust study towards the end of the month. He could then run over to Petersham, consult with Dr. Fisher and then on to Melrose Highlands and talk the whole proposition over with you. He feels that the study could be completed in two or three weeks. We would continue his salary and expenses on our project rather than take the trouble to switch him over for this short period.

Sincerely yours,

F. C. Craighead,
In Charge, Forest Insect Investigations.

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Statement Presented at Conference on Gypsy Moth

By F. C. Craighead and C. W. Collins

December 4, 1934

History of Gypsy Moth Spread and Defoliation

The gypsy moth was introduced into eastern Massachusetts in 1869. Twenty years later it attracted attention by defoliating forest and shade trees in the same section, and suppression measures against it were started by the Commonwealth of Massachusetts and continued until 1899, at which time no defoliation could be found in any part of the infested area. From 1900 on there was a gradual increase, from year to year, in the extent of feeding by gypsy moth caterpillars, and a gradual expansion of the territory covered by this insect, until 1921, when there were a few years of sharp decline. Another peak was reached in 1929, when all the towns in eastern and central Massachusetts to beyond the Connecticut River showed defoliation in some degree. During that year a total of 551,133 acres was defoliated in New England, 380,000 of which ranged from 51 to 100 percent defoliated. That year showed the largest acreage affected for the period 1924 to 1934, inclusive. Again in 1934 defoliation reached considerable proportions in localities in the northern third of Massachusetts, namely, in the vicinity of the Princeton, Rutland, Hubbardston, Athol, New Salem, Montague, Greenfield, and Bernardston sections. It is believed that this represents another peak which will subside in a year or two, as has happened previously in other sections.

The accompanying figure (fig. -) shows the spread of the gypsy moth in 5-year periods from 1900 to 1925, with two large infestations found in New

Jersey in 1920 and in Pennsylvania in 1932, together with isolated colonies found outside the main infested area of New England and New York. The maximum area of expansion was reached in the New England region about 1925. This seemingly rapid spread about 1925 may be explained by the more extensive area scouted coincident with the establishment of the Barrier Zone. One thing of particular significance in connection with this expansion is that many isolated infestations immediately east of the Barrier Zone have been of short duration and have disappeared from natural causes without artificial control. This is true in Massachusetts for Worcester, Middlesex, and Norfolk Counties, and for the western part of Plymouth County as well.

Some of the isolated infestations beyond the Barrier Zone are undoubtedly from 10 to 15 years old. The question naturally arises, Are there other areas of infestation in New York, Pennsylvania, or New Jersey?

Losses from the Gypsy Moth

To give a concise and specific picture of past losses from the gypsy moth in forested areas has been difficult, judging from the incompleteness of the records on this subject. Giving figures to show the acreage of defoliation from year to year has seemed to be the best means of presenting damage tangibly and this method has been followed in most of the reports and bulletins dealing with the insect. However, defoliation does not measure losses. From observations of numbered trees exposed to the gypsy moth on sample plots, and of artificially defoliated trees, it is well known that hardwoods can stand repeated defoliations. In fact, it is questionable whether, in the past ten years, any hardwoods with the possible exception of Barnstable County and southeastern Plymouth County, Mass., have been killed by gypsy moth feeding alone. On the other hand, most conifers succumb with one

complete stripping; and local losses have occurred to conifers, particularly white pine and hemlock, when mixed with hardwoods. From the forestry standpoint, this is the most serious effect of gypsy moth defoliation.

Defoliation retards growth and in consequence there is a loss of wood. Our efforts to measure this loss on some 55 sample plots in eastern Massachusetts on which we have records for 20 years have been most difficult and unconvincing. This loss in wood is indisputable, but that due to the gypsy moth cannot be definitely separated from that caused by other factors, such as drought, fire, or competition, any of which likewise reduces increment. There was a period from 1910 to 1915, during the maximum defoliation of the gypsy moth, when tremendous numbers of oaks died in eastern Massachusetts. These trees showed gradual weakening and decline in annual growth; the roots were attacked by Armellaria, and the stems by Agrilus. This period of mortality likewise coincided with a period of drought. Such a picture of oaks dying after defoliation and drought has occurred again and again in the Middle Atlantic States and in the Southern Appalachian region, and especially was this the case following the drought of 1930. Since this period of 1910-1915, no such widespread killing of trees has occurred in the gypsy moth area. In the Cape Cod region, where the most intensive and repeated defoliation of the gypsy moth has occurred, a marked retardation in growth in the hardwoods is observable. The pitch pine in this region has been notably resistant.

On the other hand, the depreciation in esthetic values occasioned by gypsy moth feeding on park and roadside trees is a real and very tangible loss. The annoyance and disfiguration resulting from defoliation of a row

of street or roadside trees is very definite and the protection of such trees by spraying or otherwise is easily justifiable. The gypsy moth, except possibly in the Cape Cod region, is more important as a pest of shade or roadside trees than as a forest pest.

Costs

It is not necessary to discuss in detail the costs of various phases of gypsy moth control and prevention of spread. It is sufficient to mention for this purpose that an expenditure in excess of $39,000,000 from all sources is chargeable against the gypsy moth, of which over $14,000,000 has been Federal funds, and that in recent years the annual expenditure has exceeded $1,500,000 from all sources.

Gypsy Moth and Other Defoliators Compared

Aside from the fluctuations in total acreage defoliated by the gypsy moth and the total area covered by outbreaks, local variation has occurred. This can be seen from the accompanying table, which shows for several counties in the New England States, the major and minor peaks in defoliation which tie into the general picture previously drawn but the times of occurrence of which also differ locally by as much as 2 to 4 years. The major and minor peaks appear in 1915-17, 1921-22, 1926-28, and 1934.

Counties	Major Outbreak	Major Outbreak	Minor Outbreak	Major Outbreak	Major Outbreak
Barnstable, Mass.	-	1917	1922	1926	1934
Middlesex, "	1912	1917	-	1928	1934
Worcester, "	-	1916	-	1928	1934
Providence, R. I.	-	1917	-	-	1934
Rockingham, N. H.	-	1915	1920	1930	1934
Belknap, N. H.	-	-	1921	1928	1934
York, Maine	-	1915	1922	1930	1934
Cumberland, Maine	-	1916	-	1927	1934

Interesting comparisons may be made between these major and minor outbreaks of the gypsy moth and those of some other insect defoliators of forest and shade trees. For example, the spring and fall cankerworms have recurred in peak abundance in New England and New York as follows: In Maine, Massachusetts, Vermont, and New York, in from 6 to 8 years; in Connecticut, in from 9 to 13 years.

Outbreaks of the elm leaf beetle in the same region have recurred in 10, 13, and 15 years, and outbreaks of the forest tent caterpillar in 10, 13, 15, and 20 years in Maine and Vermont and in 9 and 15 years in New York. The saddled prominent (Heterocampa guttivitta) in New England has been destructive at intervals of 11 and 12 years. The lengths of the cycles of abundance as measured by the peaks of outbreaks of this insect are more even, as compared with those of the gypsy moth, than are some of the others. Also, somewhere throughout this region local outbreaks of variable intensity have

occurred every 2 or 3 years for some of these insects.

Available records are not so complete for the hemlock looper, forest tent caterpillar, variable oak caterpillar, and yellow-striped oak worm, which occur in other sections of the country, but all evidence points to similar periodicity in time and place.

Another interesting comparison between the gypsy moth and native defoliators is that of the area defoliated during outbreaks. The extent of outbreaks of several of the more important of these defoliators are shown on the accompanying maps. It is at once evident that widespread defoliation of areas as large as, or larger than, that covered by the gypsy moth in any year have occurred from time to time.

These comparisons would indicate that in this country the gypsy moth has become adjusted to environmental conditions; furthermore, our European studies indicate that in the New England States the gypsy moth has assumed much the same status it has in central Europe and the Mediterranean countries. In other words, we are not dealing with the virulent, aggressive pest of 1900-1920, but with an acclimated insect having its predators and parasites and responding to environmental influences in a similar manner as do our endemic insects.

Distribution of, and Defoliation by, the Gypsy Moth and Its Correlation With Forest Regions

In early work with the gypsy moth its preference for the foliage of certain species of plants was soon indicated. These food preferences have been carefully studied and the plants of the region grouped into four classes on the basis of suitability for feeding. For present purposes it

is sufficient to mention that class 1 contains favored species on which all instars of gypsy moth larvae can develop. These are all hardwoods. On those species in classes 2, 3, and 4, the gypsy moth larvae either cannot feed in their early instars, or, if forced to feed upon them, very few larvae survive. It is obvious, therefore, that the forest composition is a most important factor influencing the activity of the gypsy moth. As a matter of fact, it is believed to be the most important single factor affecting the intensity of infestation. In pure stands of favorable food the danger can be extreme, but in pure stands of unfavorable food such danger is nonexistent. It is equally true that the danger from the insect increases with an increase in the proportion of favorable to unfavorable food plants.

Among forest trees of commercial importance favored as food there are only a few with which the forester need be concerned. In class 1 the favored species of commercial importance are several oaks - white, red, black, chestnut, and scarlet - two aspens, and the paper birch. The gray birch, which is abundant but of little value, is also a class 1 tree. Among the trees of commercial importance on which the gypsy moth cannot feed in the early stages are the maples, white pine, spruce, hemlock, white ash, and beech.* There are of course others, but these form the bulk of the commercial output and are the chief concern of the forester when he is considering damage by the gypsy moth in connection with the management of forested areas.

The importance of this food factor is well illustrated by comparison of the maps showing forest regions of the New England States (fig. 1), dispersion of the gypsy moth since 1900 (fig. 2), degree of gypsy moth

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* This species was formerly classified as a favored food, but recent experiments do not corroborate this.

defoliation (figs. 3+4), and the chart (fig.) showing intensity of defoliation. The manner in which distribution and degree of damage coincide with forest regions is striking and significant. There are 4 major forest regions which come into consideration. These are the oak-pine region of Cape Cod and southeastern Massachusetts; the white pine region occupying eastern Massachusetts, southeastern New Hampshire, and southeastern Maine; the northern hardwood region of western Massachusetts, the greater part of Vermont, and northern New Hampshire and New York; and the chestnut, oak, and yellow poplar region of Connecticut and Rhode Island, southeastern New York, parts of New Jersey, and eastern Pennsylvania.

There has been practically no serious defoliation in the northern hardwood region. Here the forest is composed largely of maple, yellow birch, beech, white pine, spruce, and fir - all unsuitable foods. Contrasted to this is a heavy and almost continuous defoliation in the oak-pine type of southeastern Massachusetts and Cape Cod. Here the composition of the forest is predominantly oak, and oaks that are low and scrubby as the result of cutting and repeated fires. This presents ideal conditions for gypsy moth feeding. The southern half of Long Island likewise belongs to this general type. The pine is predominantly pitch pine and scattered and has not much influence on the gypsy moth. This type is economically unimportant for timber production.

In the white pine type occupying all of Massachusetts east of the Connecticut River, southern New Hampshire, and Maine, the forest composition is chiefly mixed hardwoods, often favored species, interspersed with pine, or pure stands of pine. There has been frequent heavy local feeding in

this region. After abandonment, many cultivated fields have reverted to pine or aspen and gray or white birch, forming blocks of trees of unsuitable or favored foliage. Also, the oaks very decidedly in distribution, being generally more abundant in the eastern section. This group-wise mixture of favored and unfavored host plants and the varying percentage of oak explains the irregularity of feeding of the gypsy moth in eastern Massachusetts and southern New Hampshire and southwestern Maine. Estimates based on surveys by the Massachusetts Department of Conservation[1] indicate that there is a large percentage (about 64) of oak in the make-up of the forests of Barnstable County, tapering to about 20 percent in Hampshire County. In general the degree of defoliation very well matches the percentage of oaks, indicating a strong correlation. (See table.)

In the chestnut, oak, and yellow poplar region of Connecticut there likewise has been little defoliation. This can be explained by the lower percentage of favorable food plants, the conditions being analogous to those of central Massachusetts, as climatically this region would be ideal for gypsy moth survival. Oak in general now composes from 20 to 40[2] percent of the stand since the chestnut has disappeared. Locally in the oak-ridge type the proportion of chestnut oak runs higher. Maples, hickories, black and yellow birch, and ash are the other predominant trees in these forests -- all unfavored foods. This difference in the degree of infestation cannot be explained by control work, as a comparison of the relative amount of work done and the money expenditure indicates.

At the present time we are also concerned with another outbreak of

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1. The forests of Worcester County (and other counties). Dept. of Conservation and Forestry 1917-1922.

2. Conn. Agr. Exp. Sta. Bull. 330.

the gypsy moth in Pennsylvania. The writers have no first-hand information on the forest composition in this outbreak. It would appear to lie partially in two regions, that of the chestnut-yellow poplar and that of the northern hardwoods - both of which, as indicated previously, have a generally unfavorable composition from the gypsy moth standpoint. This seems to be borne out by the fact that this outbreak had been established in this vicinity from 10 to 15 years before it attracted any attention, and that only a small amount of damage has occurred.

The foregoing discussion, based on the accompanying data and graphs, no doubt goes far towards explaining why local infestations in western New England fail to assume the proportions found on Cape Cod and farther north along the Atlantic Seaboard. Furthermore, where local outbreaks occur in restricted areas in which favored food predominates, the species, as explained later, is at a disadvantage because of the problem of wind-drift.

The accompanying graph shows the correlation between intensity of gypsy moth infestation and the proportion of favored or unfavored food plants in the stands. As the proportion of favored food plants increases up to 100 percent, so rises the infestation to above 16,000 egg clusters per acre. The opposite is true with a gradual increase of unfavored food, the intensity of infestation likewise decreasing. These data were obtained from 33 observation points from the years 1913 to 1922 inclusive.

In concluding this discussion of food plants it can be said that, other factors being equal, the ability of the gypsy moth to establish itself in any environment is directly correlated with the proportion of favorable food plants present. In pure stands of favorable food the situa-

tion is most favorable for establishment and, conversely, in pure stands of unfavorable food the chances for establishment are nonexistent. From available data it has been determined that in general when the proportion of favorable food is less than 40 percent the danger from gypsy moth damage is of little concern.

Although it would be presumptuous to forecast what will take place when the gypsy moth spreads to other forested areas of the Eastern States, it is reasonable to believe that these principles will still be operative and that, in general, the insect's behavior can be predicted. There will of course be variable local conditions influencing such general trends. Severe damage may occur locally in some of the oak types of New Jersey, Pennsylvania, Delaware, Maryland, and Virginia. Now that the gypsy moth is well established in Pennsylvania, further study of new food plants and local behavior is necessary.

Other Natural Factors Influencing the Distribution of the Gypsy Moth

There are other factors which have a very definite influence on the distribution of the gypsy moth and materially affect control considerations. Winter mortality from low temperature is a limiting factor. Figure 5 presents an isotherm across the northern part of the United States as far west as Minnesota. This isotherm indicates the southern limits of regions subjected to temperatures averaging -25° F. every fourth year. This line is also practically identical with an isotherm representing a mean minimum of -20° F. Such average temperatures coupled with the prevailing forest types found generally north of this isotherm make for conditions that are extremely unfavorable for survival of the gypsy moth as a pest. Such an area is

the upper third of the Barrier Zone and the Adirondack region of New York. We can expect little injury from the gypsy moth northward and at higher elevations southward.

The effectiveness of the several introduced and native parasites varies from time to time and from place to place. For example, the abundance and efficiency of Compsilura concinnata in any locality infested by the gypsy moth depend to a great extent on the prevalence of native alternate hosts. The percentage of parasitization, as a rule, is highest when gypsy moth infestation is low. In isolated infestations and in large areas which are sparsely infested this is particularly noticeable.

The female gypsy moth is ~~wingless~~ flightless and therefore spread through flight is impossible. This factor is important in the slow spread of local outbreaks in the absence of strong winds. Dispersion of the gypsy moth by air currents takes place during May, soon after hatching occurs and the young larvae can be blown about. These small larvae have been known to be carried more than 20 miles and have been collected 2,000 feet in the air. Unquestionably prevailing winds have been a factor in the northeasterly distribution but this does not mean that there has not been considerable wind spread also to the southwest.

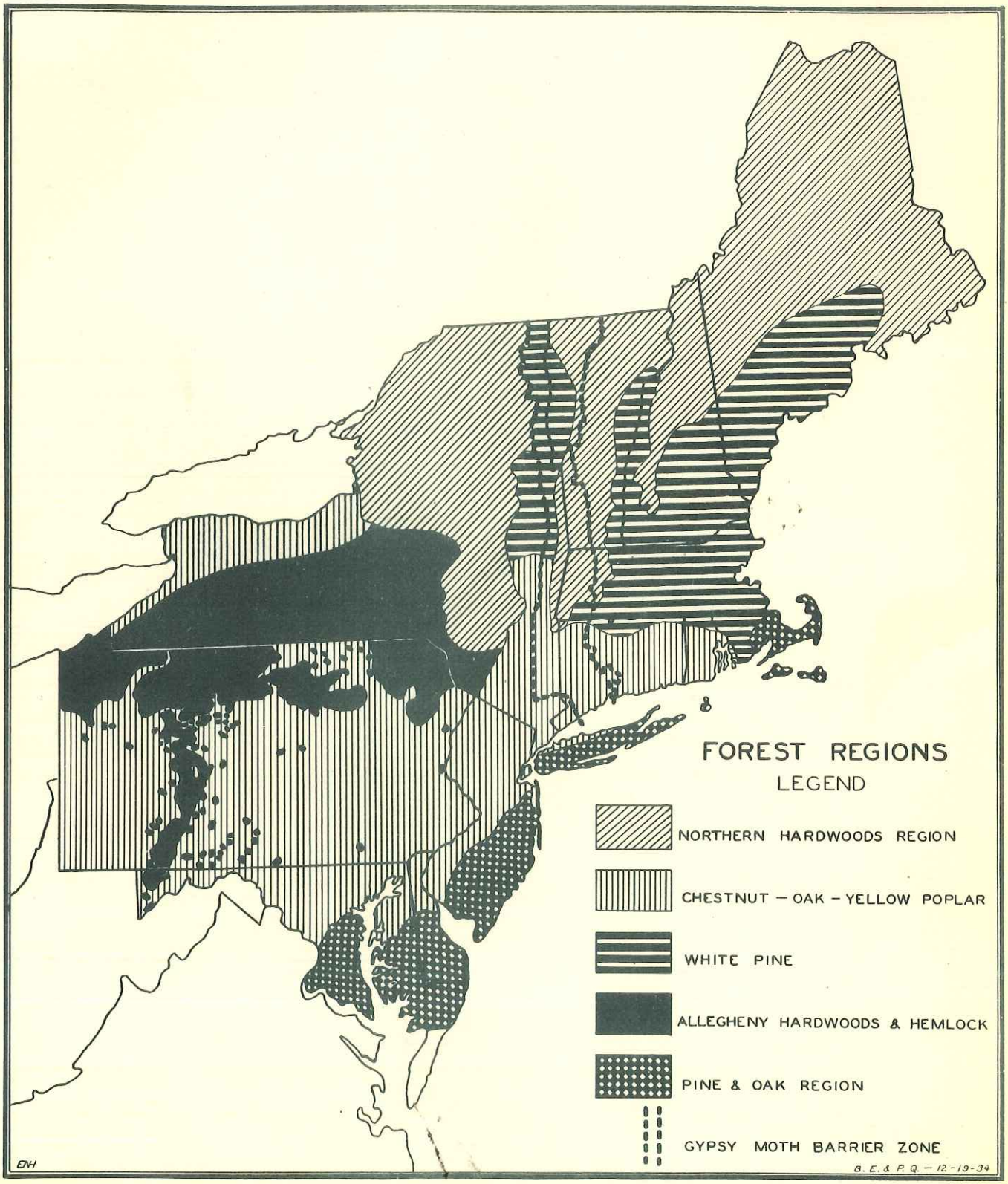
In wide, continuous areas of favorable food, such as are found in the Cape Cod region, there is merely a shifting in position of wind-blown larvae - that is, for those blown out, roughly an equal number are blown in. The opposite holds true for local or restricted outbreaks. There we find outward wing drift, but practically no inward drift. In western New England, in general, the proportion of unfavorable to favorable food is extremely

high. As a result larvae blown out of areas of favorable food, in the vast majority of instances, are deposited in environments of unfavorable food and thus either perish or are unable to increase to dangerous proportions.

We know very little of the effect of warmer climates on the activities of the gypsy moth. It has been suggested that the intensity of infestation along the coast of Massachusetts is due to milder climate but this should then apply equally to coastal regions in Rhode Island and Connecticut. It is unsafe to forecast what the behavior of the moth will be when introduced into more southern climates, although some predictions of serious depredations have been made based on the presence of this insect on the shores of the Mediterranean. This is not sufficient evidence for such claims, as it is quite possible that these strains inhabiting milder regions are different races.

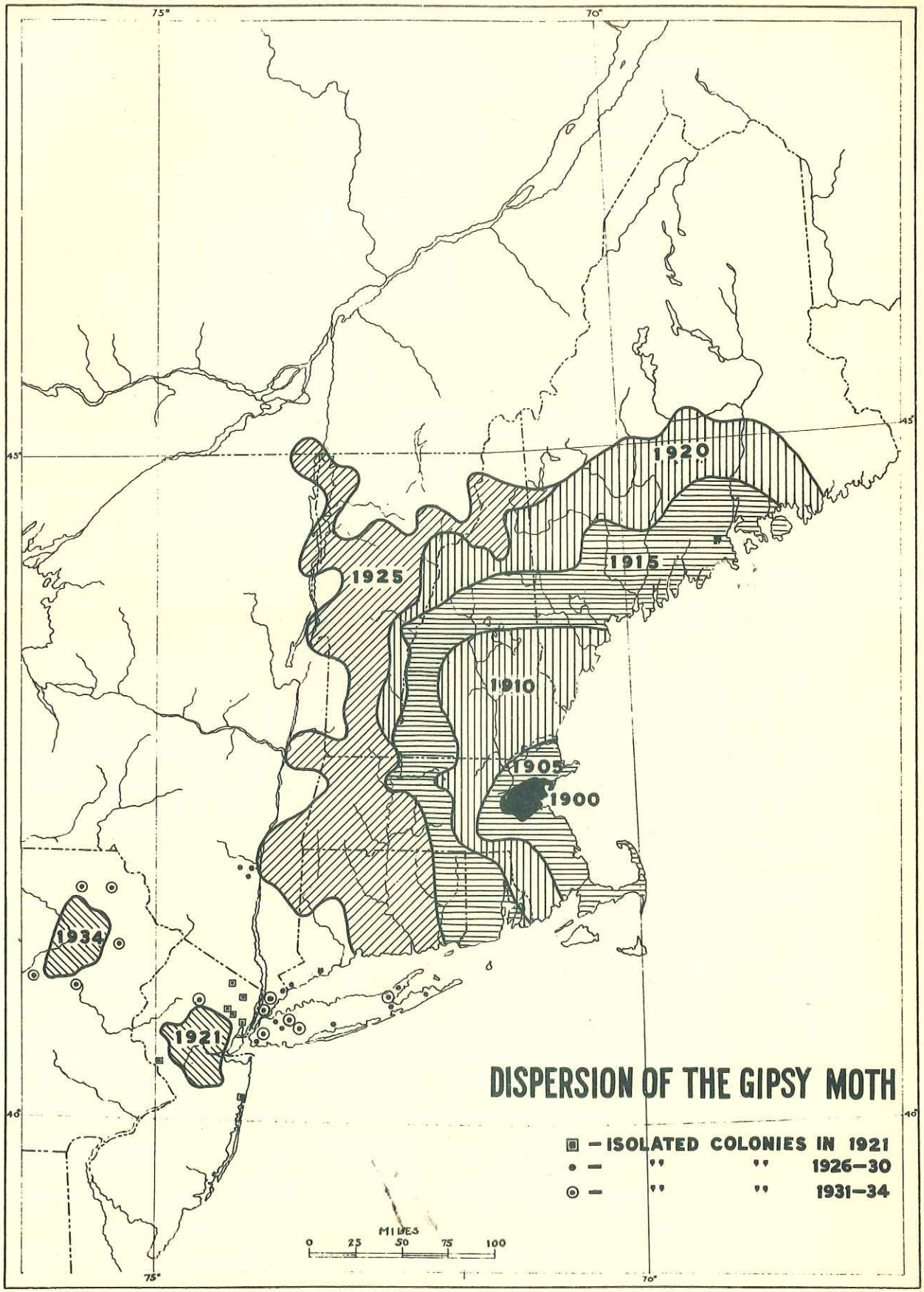
It is almost axiomatic that complete defoliation means absence of feeding next year, as most of the larvae starve. This of course has an important bearing on spraying programs.

Another consideration in regard to the distribution of this insect over the eastern part of the United States is that we must recognize that any animal or plant is restricted within certain definite limits - so-called life zones - and that it is usually abundant only within certain narrow ecological units within these broad zones. Innumerable examples of the application of this principle to our economic insects are brought to mind. Therefore, it is unsafe to predict that damage comparable to that which is current in the most heavily infested areas of eastern Massachusetts will occur in other parts of the Eastern States.



FROM INFORMATION FURNISHED BY THE NORTHEASTERN AND ALLEGHENY FOREST EXPERIMENT STATIONs.

Fig 1


75°
70°
45°
1920
1915
1925
1910
1905
1900
1934
1921
DISPERSION OF THE GIPSY MOTH
■ — ISOLATED COLONIES IN 1921
• — " " 1926–30
⊙ — " " 1931–34
MILES
0 25 50 75 100

F 12

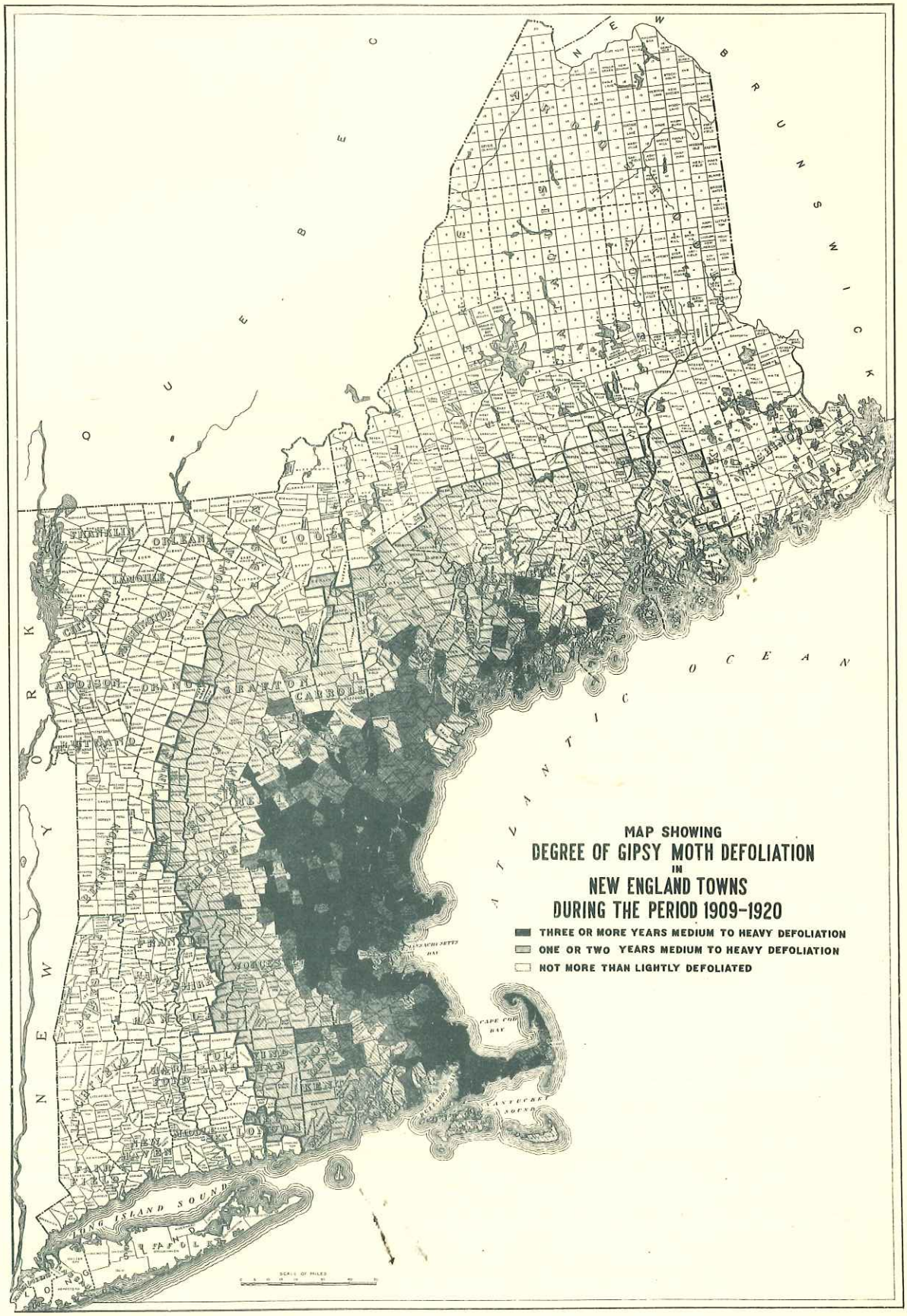

MAP SHOWING
DEGREE OF GIPSY MOTH DEFOLIATION
IN
NEW ENGLAND TOWNS
DURING THE PERIOD 1909–1920
THREE OR MORE YEARS MEDIUM TO HEAVY DEFOLIATION
ONE OR TWO YEARS MEDIUM TO HEAVY DEFOLIATION
NOT MORE THAN LIGHTLY DEFOLIATED
NEW BRUNSWICK
QUEBEC
ATLANTIC OCEAN
NEW YORK
LONG ISLAND SOUND
CAPE COD BAY
NANTUCKET SOUND
FRANKLIN
ORLEANS
ESSEX
CALEDONIA
WASHINGTON
LAMOILLE
ADDISON
ORANGE
GRAFTON
CARROLL
WINDSOR
WINDHAM
BENNINGTON
RUTLAND
FAIRFIELD
NEW HAVEN
NEW LONDON
SCALE OF MILES

Fig. 3.

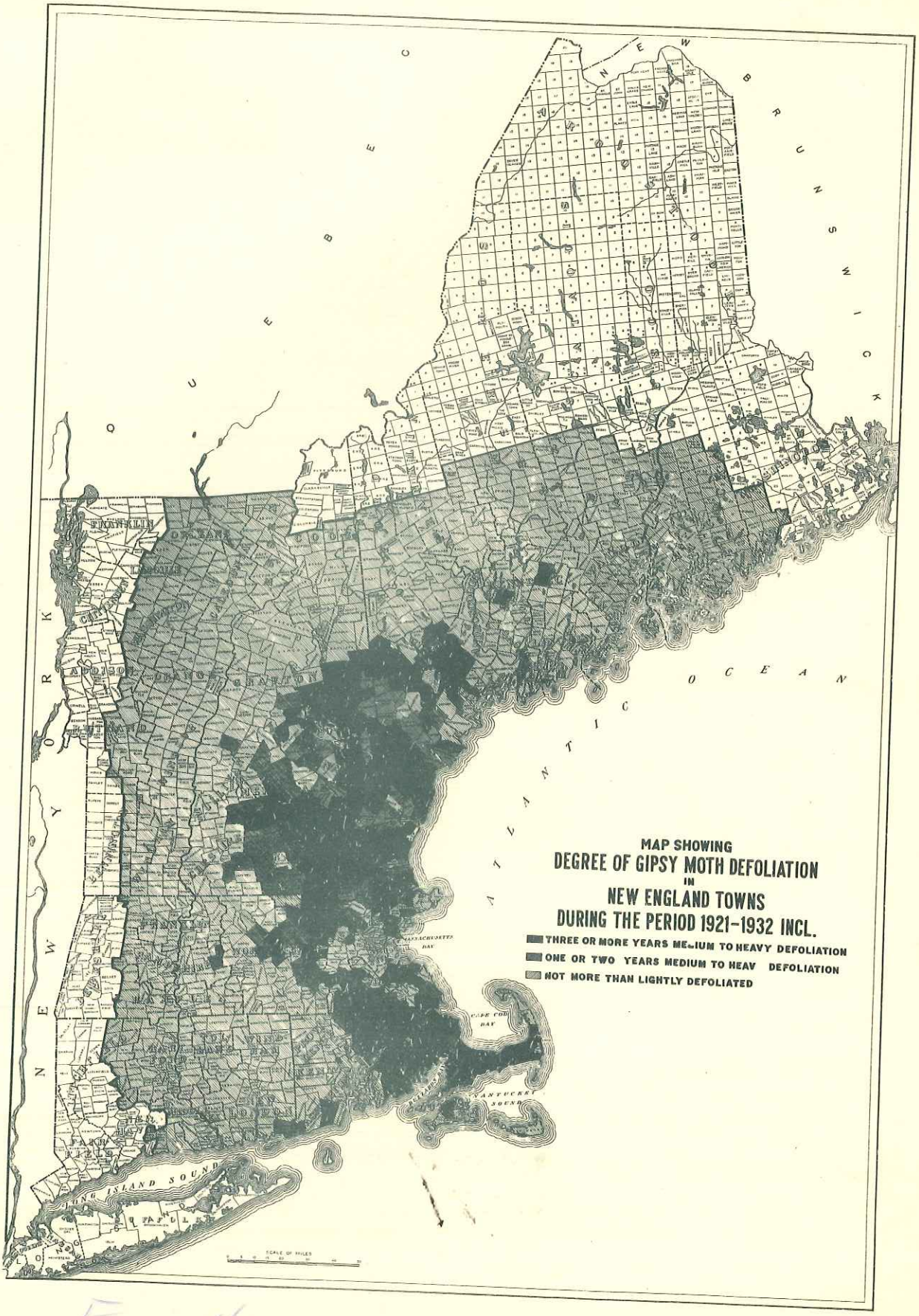
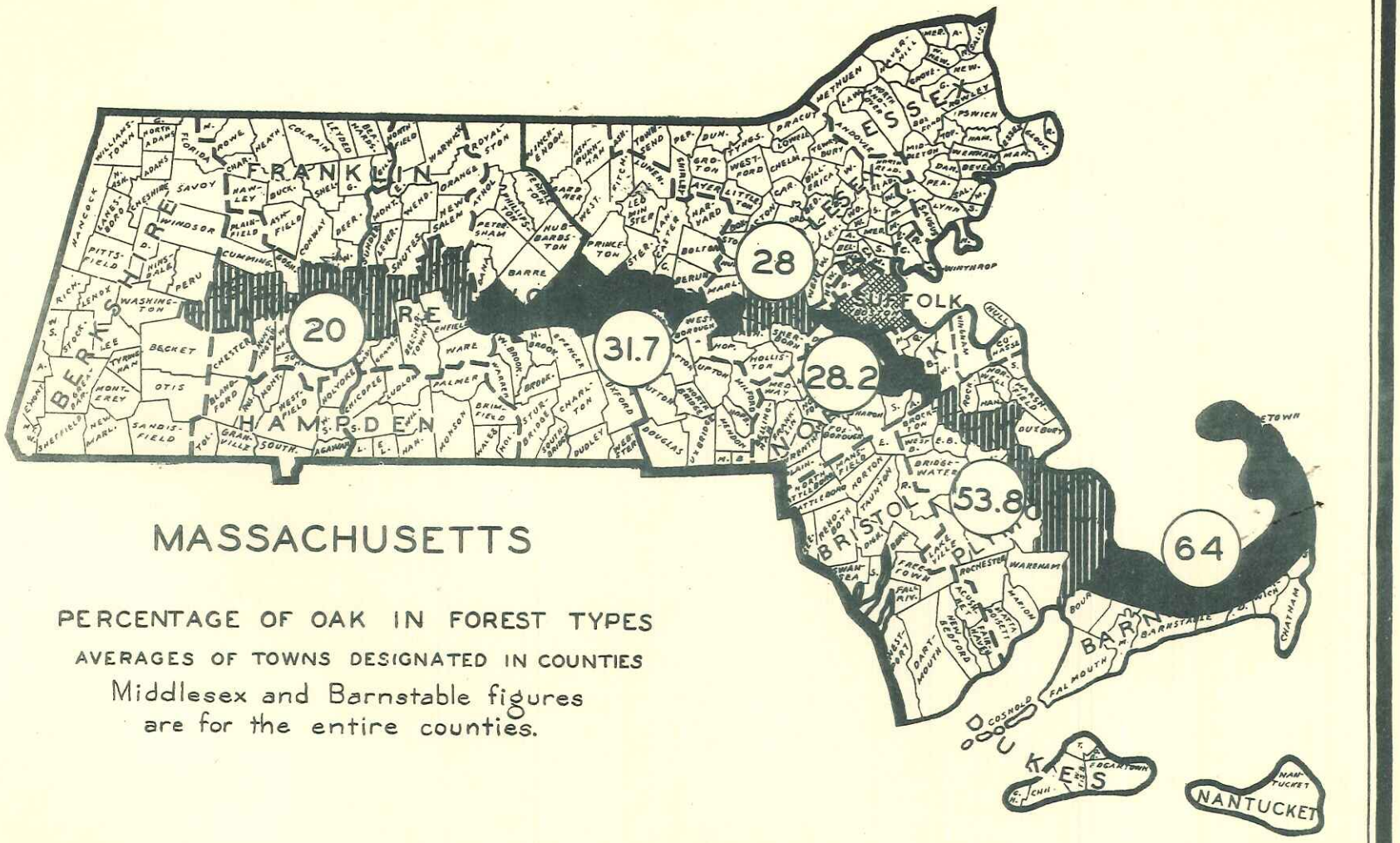

QUEBEC
NEW BRUNSWICK
ATLANTIC OCEAN
NEW YORK
FRANKLIN
LONG ISLAND SOUND
MASSACHUSETTS BAY
CAPE COD BAY
NANTUCKET SOUND
MAP SHOWING
DEGREE OF GIPSY MOTH DEFOLIATION
IN
NEW ENGLAND TOWNS
DURING THE PERIOD 1921-1932 INCL.
THREE OR MORE YEARS MEDIUM TO HEAVY DEFOLIATION
ONE OR TWO YEARS MEDIUM TO HEAV DEFOLIATION
NOT MORE THAN LIGHTLY DEFOLIATED

Fig. 4.



MASSACHUSETTS

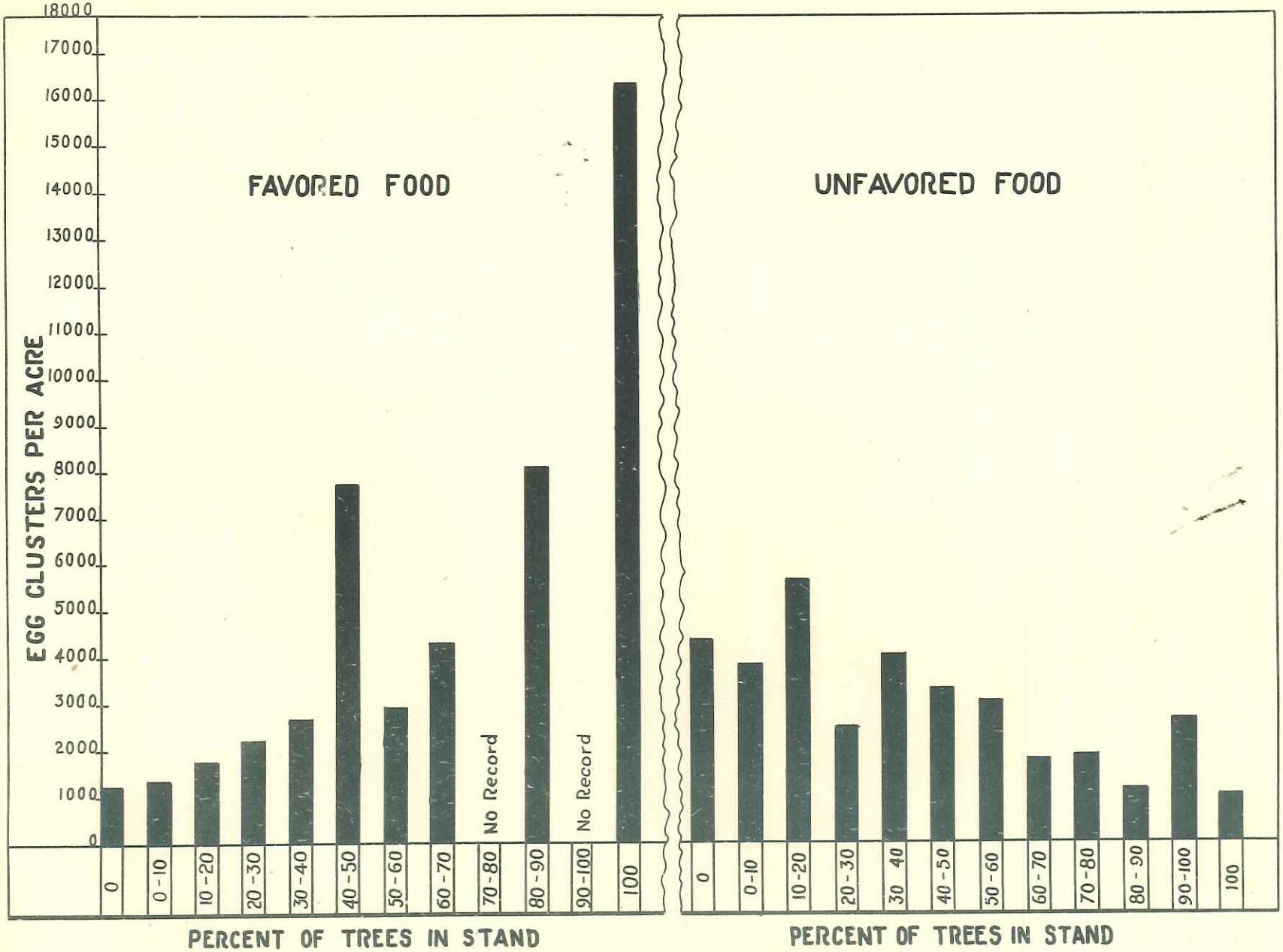
PERCENTAGE OF OAK IN FOREST TYPES

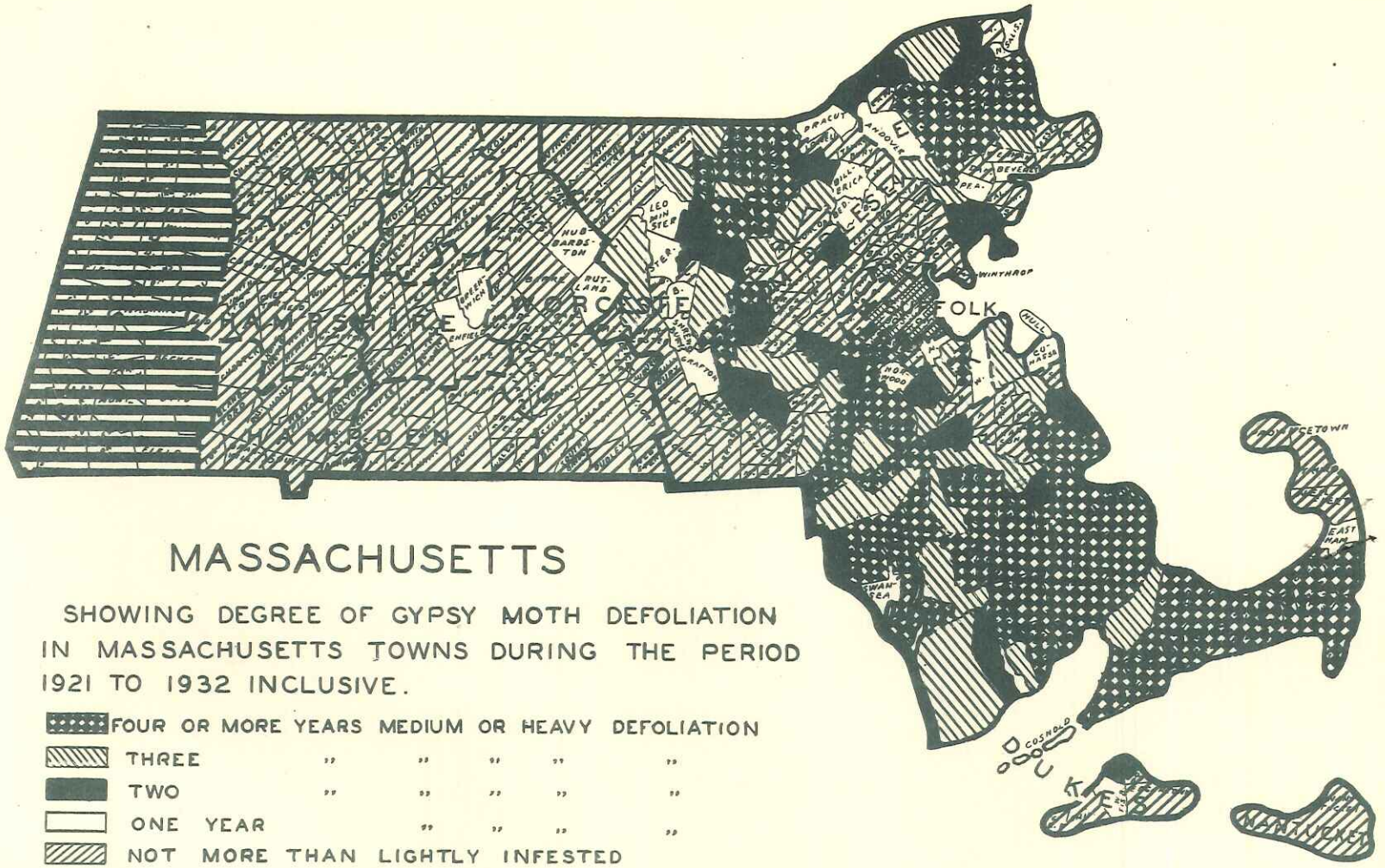
AVERAGES OF TOWNS DESIGNATED IN COUNTIES

Middlesex and Barnstable figures are for the entire counties.

B.E.& P.Q. 1-2-35 ENH

CORRELATION BETWEEN INTENSITY OF GIPSY MOTH INFESTATION AND THE PROPORTION OF FAVORED OR UNFAVORED FOOD PLANTS IN STAND



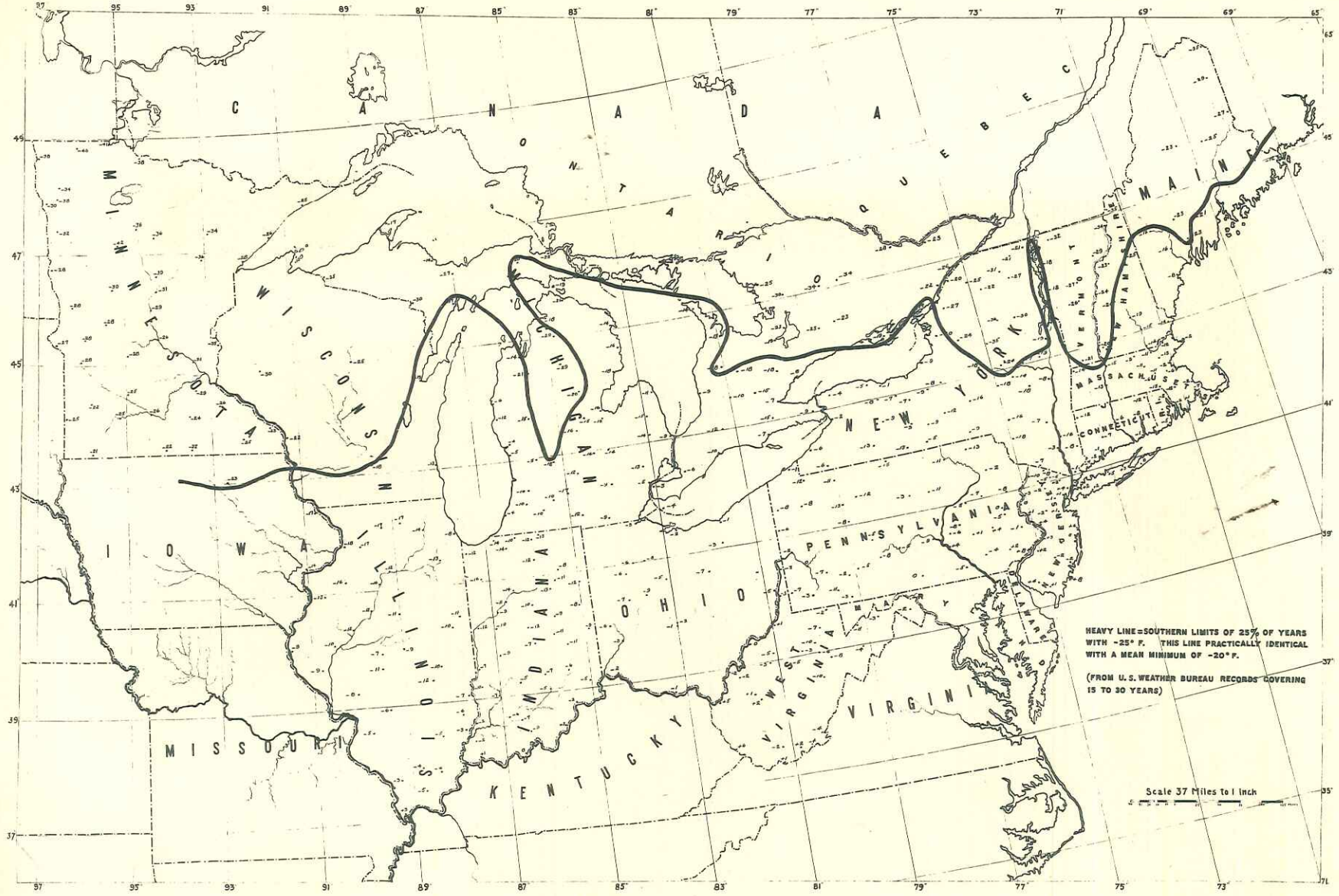


MASSACHUSETTS

SHOWING DEGREE OF GYPSY MOTH DEFOLIATION IN MASSACHUSETTS TOWNS DURING THE PERIOD 1921 TO 1932 INCLUSIVE.

- FOUR OR MORE YEARS MEDIUM OR HEAVY DEFOLIATION
- THREE " " " " "
- TWO " " " " "
- ONE YEAR " " " "
- NOT MORE THAN LIGHTLY INFESTED
- VERY LIGHT INFESTATION

B.E.&P.Q. 1-2-35 ENH


CANADA
ONTARIO
QUEBEC
MAINE
NEW HAMPSHIRE
VERMONT
MASSACHUSETTS
CONNECTICUT
NEW YORK
NEW JERSEY
PENNSYLVANIA
MARYLAND
DELAWARE
WISCONSIN
MICHIGAN
OHIO
INDIANA
ILLINOIS
IOWA
MISSOURI
KENTUCKY
WEST VIRGINIA
VIRGINIA
HEAVY LINE=SOUTHERN LIMITS OF 25% OF YEARS WITH -25° F. THIS LINE PRACTICALLY IDENTICAL WITH A MEAN MINIMUM OF -20° F.
(FROM U. S. WEATHER BUREAU RECORDS COVERING 15 TO 30 YEARS)
Scale 37 Miles to 1 Inch

1934 Correspondence

July 19, 1934

Fitzhenry-Guptill Co.,
Cambridge, Mass.

Gentlemen:-

As you know, we own a Fitzhenry-Guptill fire pump purchased several years ago. It is the three piston type driven by a one-cylinder engine. I should like to inquire if this could be used, either as is or with certain minor changes, for use in spraying arsenate of lead in gipsy moth control, and, if so, whether the regular rubber-lined hose used in fire fighting also may be used for spraying. Any information in this connection will be greatly appreciated.

Yours very truly,

A. C. Cline
Assistant Director

THE GIPSY MOTH

The unusually heavy defoliation of roadside and forest trees by the gipsy moth is at present attracting attention in Athol and neighboring towns. In many instances large patches of woodland are browned through the complete loss of leaves, at a distance presenting the appearance of a burn.

The defoliation is caused by the caterpillars feeding on the leaves from the time the eggs hatch in May until the caterpillars have reached full size in early July. At this stage it is sometimes confused with the apple tree tent caterpillar and the forest tent caterpillar, both of which are common in this locality this year. The gipsy moth caterpillar may be distinguished by five pairs of blue dots on the segments nearest the head, followed by seven pairs of red dots, and by prominent tufts of hairs along either side of the body. The full grown caterpillar is about two inches long.

After feeding is completed the caterpillar enters a dormant (pupal) stage lasting from one to two weeks, following which it emerges as an adult moth. The female gipsy moth is flightless, and, remaining near the spot where she emerged from the pupa, she mates, lays her eggs, and then dies. The female is about one and one-half inches long, with wings folded, and the wings are white with dark, wavy markings. The male moth is smaller, dark brown in color, and a strong flier. During the month of July the females deposit eggs in clusters of four hundred or more and covers them with buff-colored hair. Usually, the eggs do not hatch until the following spring, and it is during the egg stage that the creosoting of the clusters has been carried out by the local moth wardens. In the case of severe outbreaks this method of control is inadequate, and, where funds are available, is supplemented by the use of poison sprays

applied to the foliage soon after the tiny caterpillars start feeding. At the present time feeding is about completed, and the insect is entering the pupal stage.

Although the gipsy moth was accidentally introduced into this country some sixty years ago, and has done great damage in the eastern part of the State, this is the first time it has reached alarming proportions in this locality.

J. W. Johnston, Jr.
Harvard Forest, Petersham

1935 Correspondence

February 1, 1935.

Mr. H. B. Peirson,
Maine Forest Service,
Augusta, Maine.

Dear Doc:

It has occurred to me to write you in connection with your Section committee report on forest insect control. The matter of controlling the gipsy moth is one which I believe requires airing. I was very much impressed by an article in the last issue of "American Forests" which dealt with the Washington conference in early December on the blister rust, Dutch elm disease, and gipsy moth.

The reporter stated that Dr. Craighead and Mr. Collins were not in favor of large federal appropriations for gipsy moth control, but that all others present were in favor. Here is a situation where the leading experts have the courage to tell the propagandists that the expenditure of large funds is not justified, and yet I haven't the slightest doubt but that this advice was thrown aside in the eagerness to get some easy money. Furthermore, I heard today that certain representatives of the gipsy moth organization are trying to take over entirely the work of a considerable number of C.C.C. camps situated within the so-called barrier zone. I can't help but agree with Craighead in thinking that a great deal of money can be wasted in direct methods of control, such as creosoting and spraying.

My own observations prompt me to believe that in the long run the best method of handling this pest is to so alter the composition of the forest as to eliminate concentrations of the favored food trees. In other words, we come back to the old method of silvicultural control, such as you recommended in the case of the weevil. I wonder if you agree with me that this is a subject which has been pretty much overlooked in gipsy moth control work.

Very sincerely yours,

ACC.C

Assistant Director

P.S. Ashnold not want to have this letter incorporated in your report, as is, but am willing to have my name mentioned as one who believes that the Section should interest itself in present policies of gipsy moth control.

NEIL L. VIOLETTE
FOREST COMMISSIONER
HENRY B. PEIRSON
FOREST ENTOMOLOGIST
WALTER O. FROST
BLISTER RUST AGENT

State of Maine
Forest Service
(LAND OFFICE)
Augusta

February 4, 1935.

Mr. A. C. Cline,
Harvard Forest,
Petersham, Mass.

Dear Al:-

The subject of Gipsy Moth Control is, I am afraid, somewhat misunderstood by some officials, and I do not think that it would be worthwhile to bring it up at this time. As near as I can make out, entomologists are overwhelmingly in favor of the present gipsy moth policy. I have the utmost faith in Mr. Burgess, who unquestionably knows more about the true situation than anyone else. Under the new proposed policy even the parasite laboratory at Melrose Highlands is to be discontinued. Although I was in Washington at the time of the hearings, I purposely stayed away from this one, as I do not want to get drawn into the under-current that seems to be running.

To my mind, there are only two things to choose between: (1) Drop the barrier zone and let the outbreak run wild into the South and West, then spend millions controlling it in cities, around lake property, and in valuable woodlands, as will have to be done, for in heavy outbreaks there is no enjoying outdoor life, to say nothing of the killing of trees. (2) Spend what I believe is a lesser yearly amount and at the present time use the C.C.C. camps to push the line further east.

I agree with you as to the need for silvicultural control, but what are you going to do in country such as Worcester and Berkshire Counties, the Adirondacks and Catskills, the wooded section of New Jersey abounding in oaks, and the mountainous forested regions of Penn? It is my belief that all we should try for is a mixed forest which

still leaves oak. In our management policy, we should work for the protection against all forest insects, not one specific type. It is dead wrong to cut out spruce favoring balsam fir to control the white spruce sawfly, for such a policy invites the budworm, and yet such policies are advocated. This is merely given as an example. What I believe we should strive for is the mixed forest.

May I ask you to keep this letter personal?

Very sincerely yours,

H B Peirson

HBP/R

State Entomologist.

February 7, 1935.

Mr. H. B. Peirson,
Maine Forest Service,
Augusta, Maine.

Dear Doc:

I greatly appreciate your good letter of the 4th in regard to the gipsy moth. You certainly are in a position to know a great deal more about the situation than I, and I am changing my ideas accordingly. Perhaps there will be an opportunity at Springfield for us to talk over conditions as they exist in Petersham. The infestation has now reached the point here where it is causing more concern than at any time in the past, and I feel that we should have the very best advice obtainable. As stated in my last letter, it seems to me that the most promising way out for us is to gradually alter the composition of our hardwood stands in favor of the least preferred food plants. Otherwise I can foresee an endless battle and a great expense in the employment of such control measures as creosoting and spraying.

You may be assured that the contents of your letter will be treated as confidential.

Very sincerely yours,

ACC.C

Assistant Director

July 22, 1935

Written for the Athol Daily News
by
A. C. Cline, Assistant Director of the Harvard Forest.

The increased amount of defoliation of forest and roadside trees by the gipsy moth, as compared with last season, is a source of growing concern to woodland owners in this locality. During the past year the Harvard Forest has made a special study of the situation as it exists on its Petersham tracts, and very recently it cooperated with Government entomologists in a survey of conditions throughout the town of Petersham. Eighty-two separate areas, of one-quarter acre or more in size, where defoliation was so heavy as to give the appearance of a burn when viewed at a distance, were examined, and observations made on the percentage of the different tree species present and the amount of defoliation on each. It is believed that the findings will be of particular interest to owners of sizeable tracts of woodland where direct control measures are too costly.

The outstanding observation was that, in every one of the 82 areas examined, there were concentrations of certain well known favored food plants, namely, gray birch, alder, poplar, or oak. The most common condition in the town was pure stands of gray birch, usually not more than a few acres in extent. In other cases gray birch was growing with poplar, or with poplar and oak; and not infrequently a group of large sized oaks along the roadside was the source of trouble. In no case of complete stripping was there a preponderance, or even a large percentage of other tree species in the main stand. Furthermore, while gray birch, poplar, and red and white oak tended to be completely defoliated, other tree species commonly growing with them were, with the exception of pine, either not fed on at all, or only partially stripped. White ash was scarcely touched, even when surrounded by defoliated trees of the favored species, and red maple,

hard maple, black and pin cherry, black and yellow birch, and elm, were usually seldom more than one-half defoliated. Paper birch was more favored than the last mentioned species but less favored than gray birch. It was also noted that where the "peckets" of gray birch or other favored food plants gave way to neighboring stands composed of other hardwood species, the defoliation came to almost an abrupt stop, thus giving further evidence that the gipsy moth, in this locality at least, will not seriously damage other than a certain few of the hardwood species. Special reference should be made to white pine and other conifers which, when growing with favored food plants or on immediately adjoining areas, may be completely defoliated and killed. The study showed a wide range in the amount of defoliation on pine, depending upon its location with respect to favored hardwoods. To most forest owners it is the threat to pine which will cause most concern, for gray birch, alder, and poplar are of little value, and most stands of pure oak grow on dry and exposed situations where the growth rate and quality are too poor to permit economical sawtimber production. Entomologists have shown that newly hatched gipsy moth caterpillars cannot feed successfully on pine, but are obliged to get their start on the favored hardwoods. Later, after they have attained some size, they will attack pine, and, in fact, the oldest caterpillars feed on it as freely as on the most favored hardwoods. They do not, however, migrate long distances from the point of their origin, and sizeable areas of pure pine are not subject to serious damage, except along their margins where they adjoin heavily attacked areas of favored hardwoods.

In view of the observations made in Petersham and the opinions expressed by several entomologists who have seen the conditions, the writer believes that a satisfactory degree of permanent control may be effected on the Harvard Forest by clear cutting any remaining pure stands or

mixtures of gray birch, poplar, and oak, reducing the proportion of oak (probably to less than 50 per cent) in the better quality hardwoo stands which are being developed for sawtimber, and removing these same favored species wherever they happen to occur in coniferous plantations. The latter will be accomplished in the course of weeding, which is essential in all plantations on cutover land in order to prevent the hardwoods from choking out the planted conifers. Admittedly, such a method of control be eliminating or reducing the favored food plants of the gipsy moth will require considerable time, perhaps a number of years of intermittent work on a large tract, a greatddeal of cutting of trees which in some case may not be saleable, even as cordwood, and a direct outlay of funds for the establishment of plantations on such areas as have to be clear cut. Also, such a plan is not feasible with large roadside trees, which no one wishes to see cut down, and which might better be saved by spraying. But, on the other hand, it does offer the owner of forest properties of special value or which are being managed for future income reasonable assurance of permanent relief from recurrent infestations and losses in years to come,- a permanency of control which does not at present seem to be assured by the better known methods of creosoting and spraying, except at a great expense which may be all out of proportion to the value of the material being saved.

THE AMHERST RECORD

Amherst, Massachusetts

WALTER A. DYER
Consulting Editor

August 1, 1935.

Mr. A. C. Cline,
Harvard Forest,
Petersham, Mass.

Dear Sir:-

The citizens of Amherst and surrounding towns are naturally becoming anxious concerning the devastation which has been wrought this year by the gypsy moth in our woods and are praying that something may be done to stem the tide before another year. Realizing that it is desirable to capitalize this interest in seeking local cooperation for the more extensive projects, we are publishing in the Amherst Record letters and interviews on the subject of gypsy moth control and have promised more. If you feel like sending me a letter for publication, giving your opinion as to what can be done in the crisis, we shall greatly appreciate it. Mr. C. Edward Behre, director of the forestry station at New Haven, suggested my writing to you.

Very truly yours,
Walter A. Dyer.

August 5, 1935.

Mr. Walter A. Dyer, Consulting Editor,
The Amherst Record,
Amherst, Mass.

My dear Mr. Dyer:

I have your letter of the 1st in regard to preparing an article on the gipsy moth for the Amherst Record. I shall be very glad to do this, but before preparing it I wish to consult with certain entomologists from the Gipsy Moth Laboratory with whom we have been cooperating in a study of the moth situation in the town of Petersham. The field data will be analyzed shortly, and I expect that our detailed findings will be ready for release within a week or two.

Very truly yours,

ACC.C

Assistant Director

Infestation of Gypsy Moth Causes Great Anxiety

Deadly Menace Attracting Attention of Foresters and Scientific Observers

The seriousness of the gypsy moth infestation in this section of the state is attracting the attention of foresters and scientific observers elsewhere, and it is the consensus of opinion that only by active cooperation can an even more deadly menace be averted next year. The following letter has been received by Mrs. Anson D. Morse of Grey Rocks, Pelham, from C. Edward Behre, director of the Northeastern Forest Experiment Station of the United States Forest Service, now located in New Haven. Mr. Behre was formerly stationed in Amherst and was a member of the board of selectmen of Pelham.

Dear Mrs. Morse:

Both the State and Federal governments make appropriations for work on the gypsy moth, but I doubt if any practical measures can be adopted to materially alter the course of the infestation which is now at its height in Pelham and other parts of Massachusetts. The moths are so numerous that the cost of a campaign to materially affect this heavy and widespread infestation would be prohibitive.

I do not think you need fear any serious or permanent effect upon local water supply. Most of the hardwood species can withstand repeated defoliation without serious mortality. Experience in the past indicates that in the natural course of events defoliating insects like the gypsy moth come and go in cycles. After building up to rather serious proportions, the insects give way to the ravages of parasites and disease, and after a few years return to normal and unobjectionable conditions.

For a number of years the work of the Federal government has been divided into two fields. First and most extensive has been its effort to maintain a barrier zone along the state line between New York and Connecticut, Massachusetts, and Vermont, in order to prevent the spread of the gypsy moth to the west. It has long been recognized that east of this line the gypsy moth is so firmly established that it has to be dealt with on the same basis as other native insects.

The second field of Federal activity has been in research. The Bureau of Entomology has studied all phases on areas where no effort is called for, and it has not proved a dependable means of detecting and checking incipient outbreaks.

It is my personal belief that the money appropriated for gypsy moth work in Massachusetts might be more effectively used if it were all administered by the State rather than the towns, and if the control work of painting egg clusters in the fall were based on automobile reconnaissance of the entire State during the summer, at which time areas of serious defoliation can be easily detected and spotted on the map. Control work would then be concentrated on areas where serious defoliation indicates an incipient outbreak, rather than dissipated ineffectively over the entire State.

Furthermore, under this system the control crews, although recruited locally, would always be operating under the supervision of trained and experienced foreman. Also under this system a major effort would be made in a town like Pelham, whereas no money would be expended in adjacent towns which have not suffered defoliation. An act of the legislature would be required to adopt this system, but it is probable that a more effective job could be done at very much less than the cost of the present program.

Very sincerely yours,

C. Edward Behre.

Subsequently the following supplementary letter was received from Director Behre by the **Record**:

Dear Mr. Dyer:

I have your letter of July 23 and am glad to know that the Amherst **Record** is interested in the gypsy moth campaign in Massachusetts.

I have no objection to your printing my letter to Mrs. Morse. However, that letter does not cover the field fully. I directed my comments solely to possible strengthening of the campaign of control through painting of egg clusters in periods of normal infestation. I did not go into the possibilities of reducing the danger of serious infestation through forest management.

Although the gypsy moth feeds on almost anything, certain species are more favored for food than others, and there is considerable evidence to indicate that serious infestations build up only in areas where these favored food species occur considerable quantities. The elimination of favored food species, particularly gray birch and poplar, would handicap the development of moth populations and, in very large measures, would serve to improve the composition of young forest stands of the state.

I believe a large part of the work

a barrier zone along the state line between New York and Connecticut, Massachusetts, and Vermont, in order to prevent the spread of the gypsy moth to the west. It has long been recognized that east of this line the gypsy moth is so firmly established that it has to be dealt with on the same basis as other native insects.

The second field of Federal activity has been in research. The Bureau of Entomology has studied all phases of the insect's life intensively for a number of years. Methods of control in orchards or on ornamental trees are well understood. Parasites have been introduced in large numbers and have been effective in the control of gypsy moth populations in the past. Programs to detect and control incipient outbreaks, and methods of forest management to reduce the proportion of favorite food species in the woods have been suggested.

The State of Massachusetts makes an annual appropriation for gypsy moth control and requires each town to do likewise. The system in use has been to employ a crew of three or four men for a few weeks each fall to go over the town roads and borders of fields, hunting for egg clusters and painting those located with creosote. This may be criticized as being an inefficient and wasteful system of handling the job because in normal times much time and money is spent

and there is considerable evidence to indicate that serious infestations build up only in areas where these favored food species occur considerable quantities. The elimination of favored food species, particularly gray birch and poplar, would handicap the development of moth populations and, in very large measures, would serve to improve the composition of young forest stands of the state.

I believe a large part of the work of the CCC camps for gypsy moth control might well be directed toward forest improvement work of this sort rather than the painting of egg clusters. It is also possible that under the present legislation the gypsy moth appropriation in each town might bring better results in this way than when used solely for the painting of egg clusters as in the past. Because of the difficulty of providing technical supervision, however, I hesitate to recommend such a program without further consideration.

If money is to be spent on the elimination of favored food species, I believe it would be desirable to girdle the trees by stripping off the bark rather than by cutting. Experiments which we now have under way in New Hampshire indicate that, in the case of popple at least, trees girdled by stripping the bark will die without sending up sprouts or roots suckers which would require subsequent and repeated treatment if control were attempted by cutting.

If this campaign gets to the point of working for a modification of existing gypsy moth legislation in Massachusetts, I suggest that you enlist the support of the Massachusetts Selectmen's Association and of the Massachusetts Forestry Association.

Very sincerely yours,

C. Edward Behre.

Realizing that the anxiety of the citizens of Amherst and surrounding towns has been aroused by this summer's wide-spread manifestation of gypsy moth destruction in this vicinity, the **Record** hopes to publish further letters on the subject from recognized authorities which will serve to inform the public as to the habits of the insect and the approved methods of control, in the hope that something definite may be done before another year to save the forests on our surrounding hills.

LEVERETT

HARDWOODS BREED GYPSY MOTH

Harvard Forest Expert Reveals Experiments

The increased amount of defoliation of forest and roadside trees by the gipsy moth, as compared with last season, is a source of growing concern to woodland owners in this locality. During the past year the Harvard Forest staff has made a special study of the situation as it exists on its Petersham tracts, and very recently it cooperated with government entomologists in a survey of conditions throughout the town of Petersham.

Eighty-two separate areas, of one-quarter acre or more in size where defoliation was so heavy as to give the appearance of a burn when viewed from a distance, were examined, and observations made on the precentage of the different tree species present and the amount of defoliation on each. It is believed that the findings will be of particular interest to owners of sizeable tracts of woodland where direct control measures are too costly.

Written for the Athol Daily News
by
A. C. Cline, assistant director of the Harvard Forest

Favorite Foods

The outstanding observation was that, in every one of the 82 areas examined, there were concentrations of well known favored food plants, namely, gray birch, alder, popular, or oak. The most common condition in the town was pure stands of gray birch, usually not more than a few acres in extent. In other cases gray birch was growing with poplar, or with poplar and oak; and not infrequently a group of large sized oaks along the roadside was the source of trouble. In no case of complete stripping was there a preponderance, or even a large percentage of other tree species in the main stand. Furthermore, while gray birch, poplar, and red and white oak tended to be completely defoliated, other tree species commonly growing with them were, with the exception of pine, either not fed on at all, or only partially stripped. White ash was scarcely touched, even when surrounded by defoliated trees of the favored species, and red maple, hard maple, black and pin cherry, black and yellow birch, hickory, and elm usually were not more than one-half defoliated. Paper birch was more favored than the last mentioned species but less favored than gray birch. It was also noted that where the "pockets" of gray birch or other favored food plants gave way to neighboring stands composed of other hardwood species, the defoliation came to an almost abrupt stop, thus giving further evidence that the gipsy moth, in this locality at least, will not seriously damage other than a certain few of the hardwood species.

Special reference should be made to white pine, and other conifers which, when growing with favored food plants or on immediately adjoining areas, may be completely defoliated and killed. The study showed a wide range in the amount of defolia-

(Continued on Page 8)

Athol Daily News - July 23, 1935

THE AMHERST RECORD

Amherst, Massachusetts

WALTER A. DYER
Consulting Editor

August 7, 1935.

Dear Mr. Cline:-

I have your note of the 5th and am very glad to know that you will prepare something for publication in the Amherst Record on the gypsy moth situation as soon as the data to which you refer has been analyzed. The Record this week contains two letters from Mr. Behre which we are publishing as part of our campaign to keep the public interest alive. I will try to remember to send you a copy.

Sincerely yours,

Walter A. Dyer.

The Amherst Record.

AMHERST, MASS., WEDNESDAY, AUGUST 7, 1935 NO. 25

...yden Appointed to ...y Committee of ...dministration

...Headmaster of ...d graduate ...he class of ...t Roose- ...4 repre- ...agricul- ...ons to ...mittee ...h Ad- ...e are ..., A. ...New ...of ...or, ...che ...enn ...la.; ...ss.; ...ca, ...ged re- ...late

Work Relief Funds Are Allocated For Gypsy Moth Control

While the cooperation of state and local agencies is being sought in an effort to eradicate the gypsy moth in this section, the Federal authorities are going ahead with definite plans for the campaign. Director Albert F. Burgess of the U. S. Department of Agriculture office in Greenfield, in charge of gypsy moth control, has announced that work relief funds have been allocated to this purpose and operations will be begun shortly to combat the infestation in Franklin County and Hampshire County east of the Connecticut river, where forest conditions are said to be worse than ever before. At the beginning about 100 Franklin County residents will be given employment, to work in conjunction with the CCC camps in this section. This crew will be selected from those registered in the National reemployment office in Greenfield, prefernce being given to those on the relief lists. Whether additional recruits will be sought in Hampshire county has not yet been announced.

Grange Lecturers to

Millerton, N. Y.,
August 28, 1935

Mr. Walter A. Dyer,
The Amherst Record,
Amherst, Massachusetts.

Dear Mr. Dyer:

Please do not think that I have forgotten my promise to prepare an article on the gipsy moth for The Amherst Record. Delay is caused by the number of interests involved. The study of the moth in Petersham last month was a cooperative one between the Harvard Forest and the Gipsy Moth Laboratory at Melrose Highlands. It was my policy, however, to let the Laboratory publish the findings and to work up an official press release. The first draft of such a release was prepared, and a copy sent to me recently for criticism. I suggested a number of changes, and to date nothing further has been heard. My thought was that this press release would be a substitute for any article which I might write on the Petersham study. However, if the Laboratory does not come through within a reasonable length of time with a popular account of our observations, I shall be glad to do it for you myself.

Very sincerely yours,

Acting Director
Harvard Forest

THE AMHERST RECORD

Amherst, Massachusetts

WALTER A. DYER
Consulting Editor

August 30, 1935.

Dear Mr. Cline:-

Thank you for your note of the 28th and for keeping the Amherst Record in mind. I shall be glad to receive the press release or a special article from you whenever you feel that the time is ripe to send it.

Sincerely yours,

Walter A. Dyer

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF ENTOMOLOGY & PLANT QUARANTINE
DIVISION OF FOREST INSECTS

GIPSY MOTH, BROWN-TAIL MOTH, AND OTHER
FOREST INSECT INVESTIGATIONS

GIPSY MOTH LABORATORY
1156 MAIN STREET
MELROSE HIGHLANDS, MASS.

August 30, 1935

Mr. A. C. Cline
Harvard Forest
Petersham, Mass.

Dear Mr. Cline:

Thank you for your letter of August 21. Baker and I appreciate your critical examination of the write-up and feel sure that your comments will improve it greatly. Baker has re-written it and we have sent it to Dr. Craighead for release to the press. I am enclosing a copy for you. You will note that we have taken into consideration your comments in the enclosed write-up.

Thanking you very much, I am

Very sincerely yours,

R C Brown

R. C. Brown
Entomologist in Charge

RCB:dm
enc.

For Co-Exp. No. 35-1
Plot No. —

Severe Gipsy Moth Infestations Are Able to Develop Only in Stands Containing a Major Proportion of Certain Common Forest Trees.

For the past 25 years considerable research work has been done by experts of the United States Bureau of Entomology and Plant Quarantine in determining what species of forest trees in New England produce foliage suitable as food for the gipsy moth, one of the major forest insect pests of North America. For the greater part of this time it has been recognized that certain species were consistently more heavily fed upon than others. At the same time, however, it has been observed that practically any species may be fed upon under certain conditions.

From a study conducted over a 10-year period in more than 100 woodland plots, representing a wide variety of forest conditions, data were obtained which suggested beyond reasonable doubt that despite the apparent cosmopolitan feeding habits of the insect only a comparatively few species were abundantly present where heavy infestations prevailed. This led to a conclusion long suspected that the degree of infestation likely to occur in any forest stand was proportional to the percentage of one or more of these highly favored tree species in the stand. As a result of this accumulation of evidence concerning the habits of the insect and the possibilities of revised method of control, it was planned to survey a region this season and determine the species present in all severely defoliated areas contained therein.

The season of 1935 offered an exceptional opportunity for conducting such a survey, because of the sudden appearance for the first time of the gipsy moth in outbreak form in central Massachusetts, a region for many years very lightly infested. In traveling through this region innumerable browned areas

were to be seen scattered over the countryside; some few of which, especially in the region immediately east of the Connecticut river, were of wide extent, while the majority were in the nature of "pockets" - less than 5 acres in size. These pockets occurred indiscriminately both along wood edges and within wooded areas. Often such defoliations seemed to end abruptly. On noting this situation the logical assumption was that either the insect was present only in scattered pockets or was generally present and had been able to increase to damaging numbers only in certain well prescribed localities. Subsequent observations in the town of Petersham showed it to be present everywhere in the town, inasmuch as it was almost impossible to find a favored food tree in the town non-infested, regardless of where it occurred. Since this was the first generally heavy outbreak of the insect in central Massachusetts, it was realized that a study of the species present in those browned areas would furnish considerable evidence as to the types of growth necessary for rapid increase of the insect.

With this objective in mind the Bureau of Entomology and Plant Quarantine and the Harvard Forest, which is located in the heart of this region, joined in a cooperative effort to survey a portion of the region; whereby it was planned to visit every browned area within the prescribed region and obtain actual records of the proportions of all species of tree in each heavily defoliated stand. The town of Petersham, Mass. was selected for the survey, inasmuch as numerous browned areas were visible in the town and the Harvard Forest property was contained within the borders of the town.

The forests of the Petersham region are, as a whole, even-aged and of a weedy character; and are mostly situated on what were once open fields, pastures or clear cuttings. As a result there has been a tremendous increase

in abundance of certain light-demanding and light seeded species, such as gray birch and poplar. Also because of an unusually heavy cut of second growth white pine during the World War, a large acreage formerly in softwoods has been converted to hardwoods. Recent investigations of the Harvard Forest show that over three-quarters of the cut-over pine land in this region has come into mixed hardwood stands in which (in the absence of weedings or improvement cuttings) red oak, a highly favored species for the gipsy moth, predominates. The general picture drawn is that the forests of the region for a great many years have gradually been changed into forests containing a constantly increasing proportion of favored food species. Red oak is generally present in the town but occurs, however, rarely in comparatively few pure stands. White oak, which is occasionally found, is of minor importance. Such a condition is, however, not typical of the region westward towards the Connecticut river, or southward where extensive oak stands are frequent. For the specific purpose of correlating heavy defoliations with tree species this is not significant.

During the height of the gipsy moth feeding season a period of two weeks was spent in surveying Petersham. A total of 82 heavily defoliated stands were located, 81 of which were visited. Thus in a 38 square mile area containing upwards of 17,000 acres of forested land every heavily defoliated stand, save one, was visited from which records of the percentage of trees of all species in the stands were obtained. In numerous instances heavy defoliations were seen to end abruptly. In 13 such cases data on the percentage of each species of tree present in the heavily defoliated stand and also in the non-defoliated bordering stand were obtained for comparison.

When analyzed the data from the 81 defoliated stands showed a heavy preponderance of one or more of the following common species of trees in all the stands: gray birch, quaking and large-toothed aspen, red and white oak, and speckled alder. Moreover, in 70% of the stands it was either gray birch and aspen alone, or in combination that predominated. Red oak, the only commercially important tree in Petersham falling in the above list, predominated in less than 3% of the stands. Thus, it was the presence of stands of commercially inferior species that accounted for more than 97% of the heavy defoliations in Petersham in 1935. These stands averaged less than 4 acres in size.

An analysis of the data secured in the adjoining stands of heavily defoliated and non-defoliated trees showed that favored species constituted 90% of the heavily defoliated stands, and unfavored species 90% of the non-defoliated stands - positive assurance that it was the presence or absence of certain species of trees that controlled the abundance of the insect.

The findings in Petersham are of utmost significance to woodland owners in central New England. They strongly suggest the possibilities of permanent control of the gipsy moth through programs of forest management. Since 97% of the heavily defoliated stands in Petersham in 1935 were comprised of commercially inferior species, the wise policy would be to remove such breeding grounds by clear-cutting the stands. The sites occupied by the present susceptible and inferior species might as easily be converted by planting into more immune and valuable stands of mixed hardwoods and conifers. A survey of the Petersham region would show that some of the cut-over lands have soil conditions admirably suited for hardwood plantings. On the richer soils immune hardwoods in mixture with conifers could be planted to advantage.

There are, also, hardwood stands mostly under 30 years of age, having a preponderance of red oak, which have developed through the absence of weedings or improvement cuttings. Such stands afford an opportunity for gipsy moth control through the reduction of the proportion of red oak by increasing the proportions of white ash, hard maple, etc. Records obtained by the Bureau of Entomology and Plant Quarantine suggest that any stand containing less than 40% favored food trees is relatively immune to the insect. Such stands, it is true, could and probably would continue to support light gipsy moth infestations, but the chances for rapid increase would be practically eliminated. The average woodland owner in striving to protect his property need not strive to eradicate the pest if in a region where it is already successfully established.

No attempt is made here to discuss the situation where extensive areas of pure oak stands are to be found. Such stands present a special problem and require further investigation before recommendations can be made. However, in the northern portion of the gipsy moth infested region pure stands of oak are relatively infrequent and of limited size. If silvicultural methods of control were employed in the remaining susceptible localities the vast majority of this region now subject to gipsy moth attack would be relieved, leaving only the infrequent stands of pure oak. It is highly probable, moreover, that some of these pure oak stands occupy unsuitable sites and could more profitably be transformed into stands of immune and more valuable species; especially those occupying dry ridge tops.

Any other type of artifical control in a region where the gipsy moth is already firmly established is only palliative and is of questionable value to the average woodland owner. It is a constantly recurring item of expense,

and as the typical susceptible stand in such a region as Petersham is comprised of inferior tree species the possibility of eventually obtaining a profit from the investment would be seriously jeopardized. Silvicultural control, on the other hand, would be permanent and, while eliminating the gipsy moth hazard, such a program of control would, at the same time, increase the value of the property.

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF ENTOMOLOGY& Plant Quarantine
DIVISION OF FOREST INSECTS

GIPSY MOTH, BROWN-TAIL MOTH, AND OTHER
FOREST INSECT INVESTIGATIONS

GIPSY MOTH LABORATORY
1156 MAIN STREET
MELROSE HIGHLANDS, MASS.

September 17, 1935

Mr. A. C. Cline,
Harvard Forest,
Petersham, Mass.

Dear Mr. Cline:

I am enclosing a copy of Baker's write-up on the comparison between the composition of defoliated areas in Petersham and the non-defoliated margins. Reference to these marginal areas was made in a press release but no tables were shown.

I have your letter of September 13th. We should be very glad to discuss the problem of gypsy moth control with Mr. Winsor.

Very sincerely yours,

R C Brown

Entomologist In Charge.

RCB:CT
Encl.

Mr. Cline

Comparison of the Composition of "Browned" Woodland Areas in Petersham, Mass. with their Non-defoliated Margins, in 1935

By W. L. Baker

During the survey of all heavily defoliated areas in Petersham, Mass. in 1935 it was frequently observed that stripping conditions abruptly ended. When seen from a distance such a phenomenon is rather striking as the line of demarcation between stripped and non-defoliated areas is often so sharp. To be sure all "browned" areas eventually end, but it is most often a gradual change; not an abrupt one.

As our purpose in visiting the stripped areas was to study the composition of the stands involved in order to determine the correlation existing between such heavy defoliations and the percentage of favored food trees in the stands, it was thought that an excellent opportunity was provided for comparing their composition with the composition of such contiguous non-defoliated areas, in order to determine the difference in composition, if any, existing between them.

A total of 12 different examples were surveyed. This does not represent the entire lot of possible examples but it is believed that enough were surveyed to give an accurate picture of the situation.

The records of composition and defoliation were obtained in the same manner both in the heavily defoliated stands and the adjoining heavily foliated ones. Thus comparable data for the contiguous areas are available and are summarized in the following tables.

Table 1. Marginal Plots, Petersham, Mass.

Location	Favored Species		Unfavored Food		Weighted Mean Defoliation of Plot
	Mean % Comp.	Mean % Defol.	Mean % Comp.	Mean % Defol.	
Nichewaug Road (72)	15.0	8.0	85.0	4.9	5.76%
Margin 71	5.0	100.0	95.0	10.8	15.26
Margin 51	35.0	13.6	65.0	8.9	10.75
" 42	51.0	25.5	49.0	2.9	14.43
" 41 S (N E)	10.0	36.3	90.0	17.1	19.38
" " " (W)	16.0	36.6	84.0	14.6	16.92
" 40	32.0	43.7	68.0	6.1	18.13
" 39	1.0	0.0	99.0	0.0	0.00
" 24	15.0	23.9	85.0	5.9	8.12
" 38	19.0	9.7	81.0	0.0	1.84
" 16	21.0	90.7	79.0	11.4	28.05
" 11	12.0	32.8	88.0	5.4	8.69
Mean	19.33		80.66		
Weighted Mean		30.63%		7.46%	11.94%

Table 2. Defoliated Areas in Petersham, Mass. 1935
(It was beside these plots that marginal data was taken as shown in table 1.)

Plot Number	Favored Species		Unfavored Species		Weighted Mean % Defoliation of Plots
	Mean % Comp.	Mean % Defol.	Mean % Comp.	Mean % Defol.	
11	86.0	86.7	14.0	37.2	79.77
16	86.0	90.7	14.0	57.9	86.11
24D	87.0	100.0	13.0	53.9	94.01
38	92.0	100.0	8.0	46.7	95.74
39	95.0	100.0	5.0	100.0	100.00
40	97.0	84.5	3.0	75.0	84.22
41B	91.0	98.9	9.0	50.0	94.50
42	90.0	96.0	10.0	34.1	89.81
51	91.0	100.0	9.0	72.2	97.50
71	83.0	100.0	17.0	54.2	92.21
72	87.0	87.1	13.0	54.8	82.90
Mean	89.5		10.5		
Weighted mean		84.97		53.95	81.71

The features of greatest contrast between the adjoining areas are seen to be the difference in percentage of favored food plants in the two types, and also the difference in degree of defoliation between them. In table 1 it is observed that favored food trees comprised 90% of the composition of the heavily defoliated stands; whereas, table 2 shows that they comprised only 20% of the composition of the adjoining heavily foliated stands. Table 1, also, shows that the favored food trees averaged 85% defoliated and the unfavored 54% in the heavily defoliated areas; whereas, table 2 shows the favored food trees were only 30% defoliated and the unfavored 12% in their heavily foliated borders.

The following table shows a comparison between the composition of a defoliated area estimated to be 20 acres in size and an "island" of green, heavily foliated trees near its center. This island was entirely surrounded by the extensive gray birch area.

Table 3. Table Showing Comparison between the Composition and Defoliation of a Heavily Defoliated Stand and an "Island" of trees surrounded by and contiguous with the Defoliated Trees.

	Gray Birch	Red Maple	White Ash	Red Oak	Hop Hornbeam	White Pine	Paper Birch	Pin & B. Cherry	Beech
Percentage composition in heavily defoliated area	87	3	1	4	0	5	0	0	0
Percentage composition in "Island" of heavily foliated trees	5	60	0	5	10	7	1	10	2
Percent defoliation in heavily defoliated area	100	25	0	50-100	-	50-100	-	-	-
Percent defoliation in "Island" of heavily foliated trees	50	10	-	25	25	50-75	25	10	10

Mean percent defoliation of all trees in
Heavily defoliated area - 94.50%
Heavily foliated "island"-18.08%

Table 3 shows that a very great difference in composition existed between the heavily defoliated stand and the "island" of much lighter defoliated trees surrounded by and contiguous with the heavily defoliated area. It will be observed, however, that the trees in this so-called island were fed upon, and some of them rather heavily. This is explained by the fact that enormous numbers of larvae migrated into this stand after stripping all the foliage from the surrounding gray birch and were forced to feed on the unfavored growth. It might be stated here that after larvae have developed through three or four stages their antipathy for some of the species classified as unfavored is decidedly reduced. For instance, after the third stage both Beech and White Pine are highly favored as food. It is in the first two or three stages that such species are shunned. In case no favored species, as gray birch, poplar or the oaks are present to tide the larvae over these early stages they would be unable to attack white pines or beech, as well as most of the other unfavored species. With other species such as red maple, elm, hickory, the cherries etc. even the earliest stage larvae will feed very lightly. As a result of this light feeding development is retarded and the vast majority of larvae die before pupating. It is because of the possibility of light feeding and slow development that it is usually possible to find an occasional egg cluster even in red maple swamps. It is also because of this that no damage ever results in such places when they are isolated from more highly desirable food.

In the cases reported on here the unfavored stands were not isolated but contiguous with highly favored stands. This resulted in some feeding on certain species by the larvae that crawled into the unfavored stands from the surroundings. Tests have shown that last stage female larvae may migrate to a distance of 450 feet from the edge of a defoliated woodland. However, it is probable that only

those feeding at the wood-edge crawled such a distance. Those from farther in perished before escaping from the defoliated area, and it is only the larvae from the periphery of a defoliated area that offer any danger from migration.

NEIL L. VIOLETTE
FOREST COMMISSIONER
HENRY B. PEIRSON
FOREST ENTOMOLOGIST
WALTER O. FROST
BLISTER RUST AGENT

State of Maine
Forest Service
(LAND OFFICE)
Augusta

November 6, 1935

Dr. A. C. Cline,
Harvard Forest,
Petersham, Mass.

Dear Cline:

I appreciate your autographed bulletin. This seems very much worth while to me and I have had copies ordered for distribution. We will find it of particular value in our C.C.C. work. Copies have been sent to my four Superintendents.

I wish it were going to be possible to attend the Gypsy Moth hearing before the Mass. Forestry Assoc. I am afraid there is quite a lot of misunderstanding on this subject. We are carrying on some silvicultured control measures but find areas where they can be carried out are very much in the minority. Larvae can, of course, mature on ground shrubs. We have nearly 800 men on Gypsy Moth work and I know that thorough work can be done for areas we have gone over during the past two years are free from defoliation this year.

A fairly exhaustive study was made of this subject, the result of which appeared as U.S.D.A. Bulletin 484 (Professional paper) control of the Gypsy Moth by Forest Management.

Very sincerely yours,

H. B. Peirson

H. B. PEIRSON
State Entomologist

1936 Correspondence

NEIL L. VIOLETTE
FOREST COMMISSIONER
HENRY B. PEIRSON
FOREST ENTOMOLOGIST
WALTER O. FROST
BLISTER RUST AGENT

State of Maine
Forest Service
(LAND OFFICE)
Augusta

January 13, 1936

Mr. A. C. Cline,
Harvard Forest,
Petersham, Mass.

Dear Cline:

In our forest insect report for the New England section, I would like to include a brief statement of the Gypsy Moth silvicultural control work you have started. Will you send me a brief statement?

Very sincerely yours,

H. B. PEIRSON
State Entomologist

January 17, 1936.

Mr. H. B. Peirson,
Maine Forest Service,
Augusta, Maine.

Dear Doc:

I have your letter of the 13th asking for a brief statement of the gipsy moth control work we have been doing lately.

I shall be very glad to comply with your request, and you may depend upon receiving a write-up within a couple of weeks.

Very sincerely yours,

Assistant Director

January 31, 1936.

Mr. H. B. Peirson,
Maine Forest Service,
Augusta, Maine

Dear Doc:

The following is a brief account of silvicultural work done last year on the Forest along the line of gypsy moth control.

Weeding Coniferous Plantations - 125 acres. This includes both pure and mixed plantations of such species as red and white pine, Norway and white spruce, and European and Japanese larch on both open and cutover land, chiefly the latter. On the cutover lands the favored food species consisted of sprouts of both red and white oak and seedlings of gray birch and poplar which came in after logging. On the comparatively small area of old fields included herein, the favored species were gray birch and poplar. In many cases the stands were in need of weeding from ordinary standpoints; but contrary to ~~the best~~ past practice we made it a point last year to cut out a good many favored food trees which otherwise would have been left as filler. This means, of course, that the quality of the crop may suffer to some slight extent; but this consideration was outweighed by the danger of defoliation to the conifers. The treatment was most drastic in places where gypsy moth feeding was observed earlier in the season.

Mixed Conifer - Hardwood Stands - 9 acres. This applies to young mixed stands where red oak and occasionally white oak form part of the hardwood element. In this case no attempt was made to eliminate the oak, but rather to reduce the volume of foliage to approximately one-half or less of the total for all hardwoods. Gray birch and poplar had been pretty well eliminated in earlier weedings, leaving only oak as the dangerous element.

Mixed Hardwood Stands - 24 acres. In two of our best mixed hardwood stands under 20 years of age, we thought it advisable to reduce the amount of red oak, especially in certain portions of the stands which ran strongly to that species. For the most part the trees were felled and lopped of branches so that the boles came in close contact with the ground. In a few cases where felling could not be done without damage to neighboring trees, girdling was resorted to. The manner of treatment differed from the regular improvement cutting applied to such stands only in that a larger percentage of oak was removed than ordinarily. There had been some

defoliation in the stand during the year, and at the time of cutting, egg masses were quite plentiful. The result of the treatment will be an increased proportion of white ash, hard maple, and paper birch. Since a considerable number of red oaks were rather too coarse to make good crop trees anyway, I am confident that the treatment will prove of great benefit from the standpoints of both moth control and crop improvement.

Cordwood Cuttings - 9 acres. Several small stands composed largely of favored food trees were cut clear for cordwood with the idea of conversion to conifers by planting. This sort of thing has been done ever since the Forest was started, and I believe that all of such cordwood areas are now about cleaned up.

Releasing Pine from Gray Birch - 4 acres. Included here are two stands, one of them an underplanting of white pine and the other composed of natural pine reproduction under birch. In both cases the birch overstory was completely removed.

Cutting Gray Birch and Poplar in Middle-aged Mixed Stands - 5 acres. In a number of stands located around the Tom Swamp Pond gray birch and poplar were growing in mixture with other hardwood, and to a lesser extent with pine and hemlock. Through cordwood sales to local residents and the efforts of our own crew, we are now attempting to get rid of these weed species, especially where they are in intimate association with pine and hemlock or in pockets where destructive gypsy moth colonies may develop. As a matter of fact, one stand of popple was stripped last year, and there are plenty of egg masses elsewhere in the neighborhood. I had taken an order for a considerable quantity of poplar lumber; but upon cutting the trees we found they were very defective and of little or no value for that purpose.

It might be pointed out that the Forest has less than its share of gray birch and poplar because of the fact that these have always been regarded as weed species and treated as such in our weeding operations. The work listed above is by no means all that should be done to safeguard the Forest from gypsy moth attack, but it represents, I believe, a very substantial contribution toward that objective. Naturally we are concentrating our efforts on the conditions which we consider to be in greatest need of attention.

Very sincerely yours,

ACC.C

Assistant Director

WALDO N. SEAVEY
FOREST COMMISSIONER
HENRY B. PEIRSON
FOREST ENTOMOLOGIST
WALTER O. FROST
BLISTER RUST AGENT

State of Maine
Forest Service
(LAND OFFICE)
Augusta

February 1, 1936

Mr. A. C. Cline, Assistant Director,
Harvard Forest,
Petersham, Mass.

Dear Al:

I appreciate your letter of January 31st, telling of the Gypsy Moth control work you have been doing. A letter from MacAloney, which has just been received, states that a Mr. Baker is going to give a report on the Gypsy Moth work in Petersham, and requests that I call on him after giving our Forest Insect Report. I am wondering if Mr. Baker's report may not cover the work which you have been doing. If that is the case, you may not want to incorporate it into the Forest Insect Report. Have you any information on this point?

Very sincerely yours,

H. B. Peirson

H. B. PEIRSON
State Entomologist

February 4, 1936

Mr. H. B. Peirson,
State of Maine Forest Service,
Augusta, Maine.

Dear Doc:

The report which Baker and I are preparing for the Section meeting covers only the study which was made last June (By Baker, MacAloney and myself) of the gypsy moth infestation in the Town of Petersham, together with some general conclusions on possible methods of control (in the Town) through alteration or conversion of stand composition. A copy of this report will be sent you just as soon as we have it finished.

The information which I sent you recently covers actual protective measures carried out on the Forest, largely as a result of last June's study, and this will not form part of the other report. Please do as you think best about presenting the figures on areas treated on the Forest. Probably they would not mean much to any one not familiar with conditions on the Forest. You might hold them in reserve in case some one should ask what we are doing in control work.

Very sincerely,

DEPARTMENT OF ENTOMOLOGY
W. E. BRITTON, PH.D.
STATE AND STATION ENTOMOLOGIST

OFFICE AND LABORATORIES
123 HUNTINGTON ST.
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MT. CARMEL

THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION

NEW HAVEN, CONNECTICUT

April 9, 1936.

Mr. A. C. Cline,
Harvard Forest,
Petersham, Massachusetts.

Dear Mr. Cline:

Harris A. Reynolds, of the Massachusetts Forest and Park Association, has requested that I call a meeting of the Committee on Gypsy Moth Control to consider the general efficiency of control measures as now practised. I would like to have this Committee meet in the near future, and, if possible, at your office in Petersham as that will be equally convenient for MacIntyre and myself. I think it would be well if we had two meetings of the Committee, the first to go over the general situation as far as we have any knowledge of it, and to determine what information is essential before any recommendations can be made. After obtaining this information and getting the necessary data, we could meet and arrive at some decision. Possibly more than two meetings will be necessary.

If it is convenient for you to have us meet in Petersham this month, would you be so kind as to set some date? I am free Wednesday and Thursday of any week, but would prefer to have the meeting on a Thursday if possible. As soon as I hear from you I will get in touch with MacIntyre regarding the matter.

With the kindest regards, I remain,

Yours very truly,

Roger B. Friend

Roger B. Friend,
Assistant Entomologist.

H

April 10, 1936

Dr. Roger B. Friend,
The Connecticut Agricultural Experiment Station,
New Haven, Connecticut.

Dear Dr. Friend:

I have your letter of the 9th suggesting a meeting of the Committee on Gypsy Moth Control. It will be a pleasure to have you and Mr. McIntyre meet with me here, and I would suggest April 23rd as a date.

It has been rather difficult for me to see just what our committee can accomplish at this time, particularly as regards my own contribution to our deliberations. My knowledge of the situation is pretty much limited to this portion of Massachusetts, although I am intensely interested in knowing more about conditions elsewhere. I am of course only too willing to expound my views on the possibilities of silvicultural control, so-called, but you and McIntyre will have to be the ones to furnish information on the general situation with respect to present control methods and policies.

Very sincerely yours,

Assistant Director

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THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION

NEW HAVEN, CONNECTICUT

April 15, 1936.

Mr. A. C. Cline,
Harvard Forest,
Petersham, Massachusetts.

Dear Mr. Cline:

I am writing to McIntyre asking if he can be present at the Harvard Forest for the Committee Meeting on April 23, as you suggest, and will let you know as soon as I hear from him.

As to what we can accomplish, it seems to me that Reynolds was more concerned about efficiency of the control methods as carried out by the CCC as much as anything else. However, I think that any suggestions that we can make should not specifically indict any particular organization engaged in control but should be along the lines of what we think is practicable at the time. If a sylvicultural control system can be worked out which could be applied locally or even over considerable areas, that certainly would be of some value. The whole question, in my mind, regarding gypsy moth control operations is whether the present system as carried out by any organization in certain well infested areas can be justified by the expense involved. That is to say, we may have in some parts of the country a condition whereby the gypsy moth will appear sporadically in outbreaks which may or may not be really serious to the forest as a whole. However, I will talk over the matter with you later.

Please accept my thanks for your cooperation.

Yours very truly,

Roger B. Friend

Roger B. Friend,
Assistant Entomologist.

H

DEPARTMENT OF ENTOMOLOGY
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THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION

NEW HAVEN, CONNECTICUT

April 20, 1936.

Mr. A. C. Cline,
Harvard Forest,
Petersham, Mass.

Dear Mr. Cline:

I have received a letter from McIntyre in which he states that Thursday, the 23rd, is a satisfactory time for him to come to Petersham. I have, therefore, written him that we shall meet at your office at 10:30 in the morning on that day.

Yours very truly,

Roger B. Friend

Roger B. Friend,
Assistant Entomologist.

H

May 6, 1936

SILVICULTURAL CONTROL OF THE GYPSY MOTH

Distribution and Importance

Feeding Habits

Control

Forest Regions in Relation to Gypsy Moth Control

- Northern Hardwood Region
- Central Hardwood Region
- Cape Cod Region
- White Pine Region

Basis for Silvicultural Control

- Successional Trends Have Favored Gypsy Moth
- Forest Improvement Generally Provides Protection from Gypsy Moth

The Application of Silvicultural Measures of Control

- Principles
- Priorities
- Coniferous Plantations
- Coniferous Understories
- Isolation Strips for Coniferous Stands
- Mixed Conifers and Hardwoods
- Mixed Hardwoods of Commercial Importance
- Non-commercial Hardwoods

Conclusion

DEPARTMENT OF ENTOMOLOGY
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THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION

NEW HAVEN, CONNECTICUT

May 13, 1936.

Mr. A. C. Cline,

Harvard Forest,

Petersham, Mass.

Dear Mr. Cline:

I enclose a copy of the proposed report of the Committee on Gypsy Moth Control. This is, of course, tentative only, so please feel free to make any changes, additions or subtractions you may desire. I am sending a similar copy to McIntyre with the same request. If you will be so kind as to return the copy to me at some future date, I will be much obliged. I shall attempt to incorporate the opinions of all the members of the Committee, after receiving the copy back from McIntyre and yourself, and will send you a revision before it goes any further.

Very truly yours,

Roger B. Friend

Roger B. Friend,
Assistant Entomologist.

s

The control of the gypsy moth on shade trees should be divorced from the general control program for forest areas and should be handled as part of the shade tree protection against insects and diseases. Direct control measures are the customary procedure in this field; but the removal of trees susceptible to gypsy moth attack from roadsides and other public places may often be advisable as at least a supplementary measure. In some parts of New England the tree wardens are not permitted to cut or allow to be cut roadside trees above a certain diameter limit, except through rather involved legal procedure. While such a safeguard is recognized as being generally desirable, the Committee recommends the abolishment of legal restrictions on the size of trees in the case of highly favored food trees of inferior species not well suited to roadside use. With the reduction or elimination of such species, direct control measures may then be limited to highly favored food trees of desirable shade tree species, thus greatly reducing the expense. It is recognized that the combination of direct and indirect control herein advised for roadsides must be competently supervised, and it is recommended that provisions be made for local tree wardens and moth superintendents to cooperate with and act under the guidance of the proper state and federal officials.

The present system of local gypsy moth control under which towns are required by law to make an annual appropriation is by its very nature inefficient and wasteful. The Committee recommends that such a system be abolished and that the general plan of control and the responsibility for its execution be placed in the hands of a centralized state organization, which can concentrate its efforts in those parts of the state where work is most needed.

May 22, 1936.

Dr. Roger B. Friend,
Agricultural Experiment Station,
New Haven, Conn.

Dear Dr. Friend:

I am very much pleased with your first draft of the proposed report by the Committee on Gypsy Moth Control, which accompanied your letter of the 13th.

The only important change I am suggesting has to do with the first two paragraphs on page 4. My feeling is that there is some possibility of changing the present shade tree laws, particularly in this state, to the extent that certain highly favored food trees of the inferior species, like gray birch and poplar, may be cut regardless of size. It is extremely doubtful though that the public would consent to the cutting of the larger roadside oaks, and for these I would suggest spraying when necessary. In both cases I think that the work should be supervised by men trained in gypsy moth control, rather than give too much authority to local tree wardens or moth superintendents, many of whom know very little about any form of roadside treatment. I have often been told by representatives of concerns doing roadside pruning for telephone or power companies that the main concern of most tree wardens is to collect their fees from the utility companies.

Other than these changes on page 4, I have done nothing more than substitute a word here and there or perhaps add a few words to make the meaning more clear. The report as written sounds first rate to me, and I am sure that McIntyre will find it equally satisfactory.

Very sincerely yours,

ACC.C

A. C. Cline

LITHGOW OSBORNE
COMMISSIONER
JOHN T. GIBBS
DEPUTY COMMISSIONER
JOHN L. HALPIN
SECRETARY

STATE OF NEW YORK

DIVISION OF LANDS AND FORESTS
WILLIAM G. HOWARD, DIRECTOR

CONSERVATION DEPARTMENT

ALBANY

IN REPLYING PLEASE REFER TO FILE NO.

.310

May 25, 1936

Mr. A. C. Kline,
Director, Harvard Forest,
Petersham, Mass.

Dear Mr. Kline:

While traveling through Greenfield Friday, May 22, I stopped at the Federal Office for the purpose of discussing present phases of pest control, particularly Gipsy Moth with Mr. Burgess. In our conversation, Mr. Burgess inquired whether or not I had any information regarding a new bulletin pertaining to Gipsy Moth Control that was being published in New Haven. My reply was that at the meeting of the Gipsy Moth Investigation Committee, you had a copy of the manuscript of that bulletin, which I had the privilege of looking over. When Mr. Burgess found that I knew a little something about this publication, we discussed it somewhat, particularly the comments with regard to gipsy moth food plants, which you no doubt recall was given some attention at our meeting. While it is not my intention to suggest changes in a publication sponsored by others, I do feel that as you are co-author and as the food plant problem will be referred to in our Committee report, I am taking the liberty of writing you concerning the comments in that bulletin about favored food plants.

In many instances it is intimated that a stand can have as high as 50% favorable food plants and still be immune from serious attack by the Gipsy Moth. My personal thought is that 50% favorable food plant is entirely too high a percentage to leave in a stand and consider it rather immune from attack by Gipsy Moth. I have no paper records that would indicate that 50% favorable food plants is too high a percentage to leave in a stand. On the other hand, observance over a period of years does teach something and it is on the latter that my conclusion is based.

Personally, I would not consider a stand immune from serious affect by gipsy moth if it contained over 25% or 30% at the very outside of favorable food plants. In fact, if I were treating my own property looking toward immunity, I would reduce the favorable food plant to at least 15 or not more than 20% of the stand.

I have a suspicion that some of this data may be tabulated from indoor feeding (so-called Tray experiments). If ofcourse I misjudge the situation and there is accurate data that a stand containing 50% favorable food plants is immune from serious attack by gipsy moth, there is ofcourse no reason why it should het be published. It certainly will simplify forest management in relation to gipsy moth control.

Mr. A. C. Kline

In view of the fact that our report may deal somewaht with this food plant situation, I felt that it might be well to call the above thought to your attention. I trust, therefore that you will feel that the same is offered in a spirit of cooperation rather than criticism.

I have received a rough draft of the Committee report from Dr. Friend. I am returning it with my comments today.

Very truly yours,

H. L. McIntyre

Superintendent of Forest Pest Control.

HLM/MW

DEPARTMENT OF ENTOMOLOGY
W. E. BRITTON, PH.D.
STATE AND STATION ENTOMOLOGIST

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THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION

NEW HAVEN, CONNECTICUT

May 28, 1936.

Mr. A. C. Cline,
Harvard Forest,
Petersham, Massachusetts.

Dear Mr. Cline:

I have corrected the report of the Committee on Gypsy Moth Control according to the suggestions made by McIntyre and yourself. A copy is enclosed, together with the report originally sent to you, so that you may compare it with the corrected form.

I have inserted all the corrections you suggested, with one exception. On page 3 you wished to add the words "composition of" and "habits of the", referring to the forest and insect. I left these out because not only the composition of the forest and the habits of the insect but other factors might be involved, the problem being ecological in nature.

You will note on page 4 that McIntyre's suggestion has been added. This refers to the matter of eliminating local control. McIntyre seemed to think that it would be much better to make a suggestion to the State Conservation Department rather than recommend nothing but abolishment.

On page 1 McIntyre has suggested that we eliminate the sentences referring to the impracticability of shifting the barrier zone. He seems to think a slight shift in certain areas is possible.

Will you please return the revised report together with a statement as to its acceptability and any other changes you wish to make?

Thanking you for your prompt attention to the matter, I remain,

Yours very truly,

Roger B. Friend

Roger B. Friend,
Assistant Entomologist.

H
Encs.

June 2, 1936

Dr. Roger B. Friend,
The Connecticut Agricultural Experiment Station,
New Haven, Conn.

Dear Dr. Friend:

Many thanks for your letter of May 28th with enclosed revision of the report of the Committee on Gypsy Moth Control.

I have read over the report carefully and am wholly in accord with its contents, as it now stands. It will of course be difficult to set up the necessary new machinery to carry out our recommendations, but I am thoroughly convinced that we are on the right track and that the reasonableness of our suggestions will appeal to any one familiar with the situation.

Very sincerely yours,

June 2, 1936

Mr. H. L. McIntyre,
State Conservation Department,
Albany, N. Y.

Dear McIntyre:

This is the first opportunity I have had to get after my correspondence in nearly a week. Many thanks for your good letter of the 25th in regard to the bulletin on Gipsy Moth Control now in process of writing by Behre, Baker and myself.

I have read over carefully your comments on a "safe" proportion of highly favored food plants, and also copies of correspondence between Mr. Burgess and Mr. Brown on this same subject. As far as the authors of the bulletin are concerned, we must depend largely on Mr. Baker's advice which, in turn, will undoubtedly be influenced by the opinions of Mr. Brown, Mr. Burgess and others in the Bureau as well as by the data collected in past experiments in feeding habits. I am sure that, when the manuscript is finally ready for publication, all of the various opinions will have been duly recognized and incorporated.

I want to point out that the figure of fifty per cent or less applies only to certain specified mixtures of hardwood. For pure oak stands of young ages we have recommended clear-cutting by groups followed by planting of unfavored hardwoods; for pure oak stands of old ages, clear-cutting followed by planting of unfavored hardwoods and conifers, accepting a certain minor proportion or oak not to exceed one-half the total of the coniferous foliage. In all mixtures where conifers are an important element, we have recommended reducing highly favored foliage to one-half or less than that of the conifers, or of conifers and unfavored hardwoods combined. My feeling is that while our recommendations do not go the whole distance in preventing defoliation, a great deal of good will come from their application, and owners will be inclined to do more than if much more drastic treatments were held necessary. This bulletin, which is to be published by the Massachusetts Forest and Park Association, is intended for the use of private owners, and the subject matter is presented from the standpoint of probability of loss in relation to investment or timber values involved. From what I have seen in this locality, and particularly in the eighty cases of complete defoliation which I personally studied in Petersham last year, I am confident that our recommendations will prevent injurious defoliation in the great majority of cases. We have made special recommendations in the cases of releasing conifers from overstories of highly favored hardwoods, the cutting of hardwood filler of such hardwoods from coniferous plantations, the clearing of isolation strips around coniferous stands, and the treatment of group-wise mixtures of hardwoods and conifers. I am quite sure that when you see the finished manuscript you will agree that

the carrying out of our proposals will involve a very great deal of work and effect a very great improvement in the present situation, even though it will by no means eliminate all defoliation or solve all our problems in gipsy moth control. We have not touched upon the shade tree problem at all, nor have we tried to discourage the use of direct methods in the Barrier Zone ar elsewhere where the problem is quite different from that on the average privately owned woodland.

I appreciate very much your writing me about our manuscript, and I assure you that our final recommendations will be carefully weighed and checked against the best information available, and duly safeguarded by such qualifying statements as will prevent the reader from being mislead into thinking that more benefits will result than is actually the case.

Very sincerely yours,

Assistant Director

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
NORTHEASTERN FOREST EXPERIMENT STATION

ADDRESS REPLY TO
DIRECTOR
AND REFER TO

335 PROSPECT STREET.
NEW HAVEN, CONN.

R - NE
Cooperation
Bureau of Entomology

June 23, 1936

Mr. A. C. Cline,
Harvard Forest,
Petersham, Mass.

Dear Mr. Cline:

I am enclosing four copies of the gypsy moth manuscript for your transmission to Mr. Reynolds for publication.

Very sincerely yours,

C. EDWARD BEHRE, Director

By M. Westveld
Acting

Enclosures (4)

June 25, 1936.

Mr. M. Westveld,
335 Prospect Street,
New Haven, Conn.

Dear West:

I have received the four copies of the gypsy moth manuscript and will forward one to Mr. Reynolds at once for his final consideration before publishing.

Very sincerely yours,

ACC.C

Assistant Director

DEPARTMENT OF ENTOMOLOGY
W. E. BRITTON, PH.D.
STATE AND STATION ENTOMOLOGIST

OFFICE AND LABORATORIES
123 HUNTINGTON ST.
(P. O. BOX 1106)
FARM
EVERGREEN AVENUE
MT. CARMEL

THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION

NEW HAVEN, CONNECTICUT

June 30, 1936.

Mr. A. C. Cline,
Harvard Forest,
Petersham, Massachusetts.

Dear Mr. Cline:

I am enclosing a final copy of the report of the Committee on Gypsy Moth Control which has been sent to Mr. Harris A. Reynolds, together with a copy of my letter to him. The letter is self-explanatory.

Yours very truly,

Roger B. Friend

Roger B. Friend,
Assistant Entomologist.

H
Enc.

June 30, 1936.

Mr. Harris A. Reynolds,
Massachusetts Forest and Park Association,
3 Joy Street,
Boston, Massachusetts.

Dear Mr. Reynolds:

I enclose a copy of the report of the Committee on Gypsy Moth Control. This report was completed some time ago, but I wanted to talk the matter over with Messrs. A. F. Burgess and R. C. Brown of the United States Department of Agriculture before sending it to you. Mr. Brown considered the report satisfactory from his viewpoint, but Mr. Burgess made one or two suggestions which I have not incorporated in the report itself because I feel that they are outside of the scope of the Committee and apply more to the method of carrying out the suggestions made. In regard to the section recommending the abolishment of local control units and the establishment of a centralized control operation in certain parts of New England, Mr. Burgess seemed to feel that this would be very difficult to carry out for various obvious reasons. This, of course, applies more particularly to the Massachusetts situation than to the situation elsewhere. However, I feel that the recommendation of the Committee is sound. At the same time I realize that we are suggesting a change which may give rise to a rather delicate situation as this Committee has no official status with either the state or the federal governments. The handling of this matter is something outside of the work of the Committee. Mr. Burgess also seemed to think that the recommendation that individual property owners be subsidized in planting operations and in some way compensated for loss of stumpage value by the government, if any expense is involved on their part in the attempt to alter the stand composition, would be setting up a dangerous precedent. It has never been the policy of the federal or state governments to pay for any losses caused by insect outbreaks nor for any loss to the owner brought about by control operations carried on on his or her property. However, inasmuch as this is a general forest improvement operation I believe that his objection could be overcome.

I am not sure just what is to become of this report, but I believe it would be desirable, in view of the fact that Messrs. Burgess and Brown are federal employees, not to use their names in any way in

June 30, 1936.

- - -

connection with it.

Any questions you may have regarding the meaning of any part of the report I shall be pleased to attempt to answer.

Yours very truly,

Roger B. Friend,
Assistant Entomologist.

H
Enc.

COPY FOR INFORMATION OF Mr. Cline

R - NE
Cooperation
Bureau of Entomology

July 2, 1936

Mr. Harris A. Reynolds, Secretary
Massachusetts Forest and Park Association
3 Joy Street
Boston, Massachusetts

Dear Mr. Reynolds:

I am writing to acknowledge your letter of June 30, addressed to Mr. Behre, who, unfortunately, is on leave in the west and will not return to New Haven until around the middle of next month.

In view of this circumstance, I took the liberty of telephoning Mr. Brown and reading to him your letter. He stated that he did not believe an explanatory note such as you outlined is needed, at least not one which states "that the bulletin is an outgrowth of a meeting of officials from various states in which the gypsy moth has appeared and at which an effort was made to determine a better method of dealing with this pest." Mr. Brown states that the studies which form the basis of the present bulletin were started long before this meeting and that even if such a meeting had not taken place, his Department would, in all probability, have prepared such a bulletin. Mr. Brown also stated that he thought Mr. Cline would probably be the person to decide this point.

I do not personally know of any special agencies to whom this bulletin should be sent with the hope that they may possibly be in the market for acquiring a considerable number of the bulletins. Mr. Brown stated that his Department would probably be in the market for a considerable number but how many they could purchase, he was unable to state at the present time. He will, however, get in touch with Doctor Craighead and let me know how many copies he is authorized to purchase. This Station will probably take a limited number of these bulletins somewhat in the same quantity as the purchase we made of the

H. A. R. -2.

Fire Weather Bulletin.

Your letter will be brought to Mr. Behre's attention on his return to New Haven.

Mr. Brown's office has just called me up to inform me that they may possibly purchase several hundred of the bulletins.

Very sincerely yours,

C. EDWARD BEHRE, Director

By

Acting

PWS:LM

July 3, 1936

Dr. Roger B. Friend,
Connecticut Agricultural Experiment Station,
New Haven, Conn.

Dear Dr. Friend:

I am very glad to have a copy of the final report of our Committee on Gypsy Moth Control, and of your letter of transmittal to Mr. Reynolds. Your letter setting forth certain opposition opinions was very appropriate, I thought, and in this connection I am sure that the Committee is taking the right stand in recommending what may appear to be drastic changes in the Massachusetts situation. I had a fine visit with Mr. Burgess here not long ago, and we discussed the whole matter at length. It is of course true that it will be a very difficult matter to change the old, firmly rooted practices, and that centralized control has its weaknesses, but it is equally true that the present system is thoroughly unsound. As to the dangers involved in compensating owners for stumpage values removed, or in aiding them in planting, I cannot see that this would be essentially different from other sorts of subsidy now in force or in prospect, such as practice payments being currently made to farmers under the amended Soil Conservation Act.

Very sincerely yours,

Mr. Harris A. Reynolds, Secretary,
Massachusetts Forest and Park Association,
3 Joy Street,
Boston, Massachusetts.

Dear Mr. Reynolds:

The Committee on Gypsy Moth Control met at the Harvard Forest, Petersham, Mass., April 23, 1936. You requested this Committee to consider the gypsy moth situation and make any suggestions which, in its opinion, would aid the general control program. In submitting the following report no criticism is implied of any organization or person heretofore or now engaged in control work. This report concerns (1) the present and probable future status of the gypsy moth, and (2) the suggested general control policy. It is recognized that four fields of operations exist, (a) the forests of the generally infested area in New England, (b) the shade trees in that area, (c) the barrier zone, (d) isolated infestations west of the barrier zone.

At the present time a large amount of money is being expended by local, state and federal agencies on gypsy moth control, and it is the opinion of the Committee that greater emphasis should be placed on certain control measures not now widely practised and less emphasis on others to which much effort is now being devoted. The Committee believes that such a change in the control program would result in greater efficiency at less ultimate cost.

Status of the Gypsy Moth

It is recognized that the gypsy moth is permanently established as a forest and shade tree pest in the generally infested area in New England. It cannot be eradicated from this area by any practicable measures. Any attempt to decrease the present generally infested area to a significant extent by the methods of control now commonly practised cannot be economically justified. Such methods are expensive and have no permanent value because they will not prevent reinfestation.

Local sporadic outbreaks of the insect may be expected in the future wherever the insect is present and environmental conditions are favorable. It is only outbreaks of sufficient magnitude to injure trees that need concern us. The presence of the gypsy moth in small numbers is not, in itself, dangerous. Granted that what has been said above is true, then the problem in New England is the prevention of severe outbreaks and of injurious defoliation, not the extermination of the insect from the whole or any large part of the region.

Control Policy

Any control program should be permanent in nature, as far as any permanency is possible, and economical in operation.

It has been the experience of those working on the gypsy moth problem that outbreaks of the insect develop in those areas where favored food plants occur. The Committee is of the opinion that an effort should be made to reduce the abundance of these favored food plants to such an extent that the danger of a severe outbreak no longer exists. This applies particularly to the infested area in New England and the barrier zone. Inasmuch as this obviously would require a number of years to accomplish, and since absolute immunity to injury by the insect is difficult to obtain, such a program will have to be supported, for some time at least, by direct control measures aimed at suppressing dangerous local outbreaks.

In the generally infested forest areas in New England the Committee recommends that suitable forest type maps be prepared showing the composition of the major stands in respect to trees favored or not favored by the gypsy moth. At the same time sites should also be classified, so that the particular species of trees best adapted to them can be determined. A system of management should be planned and put into operation as soon as possible under which the present forest composition becomes changed to one relatively immune to gypsy moth attack. This policy should involve both public and private lands. Direct control measures should be limited to the support of this system by suppressing serious local outbreaks. Inasmuch as private owners of forest land may well be unwilling to remove trees susceptible to gypsy moth, or otherwise to alter the stand composition, if any expense is involved, such individuals should be compensated for loss of stumpage value and subsidized in planting operations, where necessary, by the state or federal government.

It will be necessary to keep track of the gypsy moth population in susceptible stands, as long as such exist, in order to control the insect directly. Direct control operations in forest stands where an outbreak will not occur are unnecessary and can be dispensed with. An economical procedure for direct control should be based on a knowledge of the forest and the insect that would permit a prediction of an outbreak and the application of an effective control operation.

The publicly supported planting program should be adjusted so that areas from which stands of susceptible trees are clean cut are given preference over areas on which no trees are growing at the present time.

In view of the present gypsy moth situation it is recommended that the above plan be put into operation at once in western Massachusetts, particularly in localities where outbreaks have recently occurred, and that the zone of operations extend from there north, east and south. It is not implied that operations should not be started at once in other parts of the area if means are available. The Civilian Conservation Corps is authorized to carry on forest pest control operations on both public and private lands and should be requested, through the proper authorities, to include as much of the above program as possible in its activities. This

organization is particularly capable of carrying out necessary cutting to effect conversion or alteration of susceptible stands and planting.

The control of the gypsy moth on shade trees should be divorced from the general control program for forest areas and should be handled as part of the shade tree protection against insects and diseases. Direct control measures are the customary procedure in this field; but the removal of trees susceptible to gypsy moth attack from roadsides and other public places may often be advisable at least as a supplementary measure. In some parts of New England the tree wardens are not permitted to cut or allow to be cut roadside trees above a certain diameter limit, except through rather involved legal procedure. While such a safeguard is recognized as being generally desirable, the Committee recommends the abolishment of legal restrictions on the size of trees in the case of highly favored food trees of inferior species not well suited to roadside use. With the reduction or elimination of such species, direct control measures may then be limited to highly favored food trees of desirable shade tree species, thus greatly reducing the expense. It is recognized that the combination of direct and indirect control herein advised for roadsides must be competently supervised, and it is recommended that provisions be made for local tree wardens and moth superintendents to cooperate with and act under the guidance of the proper state and federal officials.

The present system of local gypsy moth control under which towns are required by law to make an annual appropriation is by its very nature inefficient and wasteful. The Committee recommends that the matter be referred to the proper State department with the suggestion that such a system be abolished and that the general plan of control and the responsibility for its execution be placed in the hands of a centralized state organization, which can concentrate its efforts in those parts of the state where work is most needed.

For many years the federal Bureau of Entomology and Plant Quarantine has been engaged in the importation and establishment of parasites and predators of the gypsy moth in New England. Although the presence of such enemies cannot be expected to result in the extermination of the gypsy moth, nor will it prevent local outbreaks from occurring at times, the Committee nevertheless feels that this so-called biological control work has shown results, is of a permanent nature, and should be continued until the authorities in charge feel that its possibilities have been exhausted.

In the barrier zone the Committee recommends that the present plan of eradicating at once each infestation found be continued and that the general procedure of type mapping and alteration of stand composition as outlined above for forest areas be incorporated with it. Such a procedure would increase the efficiency of the work in the zone and make the zone itself a more effective barrier. The sentiment of states west of New England is strongly in favor of the maintenance of this zone.

As long as the present gypsy moth situation continues, the eradication of local infestations west of the barrier zone

is advisable. If the plan for control in forest areas in New England is successfully carried out, even to a limited extent, then a basis for a change of policy in respect to infestations outside of New England will be established.

The Committee fully realizes the difficulties in the way of carrying out the program suggested. This report does not go into details of operation, for such details should be worked out by those in charge of the program. In the past millions of dollars have been spent in an attempt to directly control this insect and to prevent its spread. The results have been a temporary alleviation of the situation with the necessity of constant repetition of control operations in many areas. Such operations with their necessary expenditure of money cannot continue indefinitely. Control operations must be based on the ecology of the insect and should aim to improve the forest in respect to its resistance to injurious insects and diseases. Much of the work necessary to the accomplishment of this end will be of great value in improving the forests, outside of its use in gypsy moth control. Considerable foresight must be exercised in carrying out any such permanent policy in order to avoid serious outbreaks of pests other than the one of immediate concern.

The Division of Forest Insects of the Bureau of Entomology and Plant Quarantine has accumulated much biological and ecological information on the gypsy moth and should be requested to obtain the additional needed data. The successful carrying out of the program is based on a knowledge of the factors listed below. This list is not necessarily complete.

A. Gypsy Moth
   1. Reproductive potential.
   2. Factors affecting reproductive potential.

      a. Number of eggs laid by adults from larvae feeding on various food plants.
      b. Survival of larvae on various food plants, survival of pupae and adults from these larvae.
      c. Differential sexual mortality on various food plants.
      d. Distance larvae will crawl to food after hatching and during later larval life.
      e. Location of egg-masses in relation to available food supply.
      f. Location of eggs and pupae in relation to mortality.
      g. Temperature and humidity requirements for hatching, larval and pupal development, mating and oviposition.
      h. Effect of low temperature on eggs.
      i. Wind drift of larvae as regards distance, survival, and proportion of larvae leaving area.
      j. Mortality of all stages in stripped area and number of eggs deposited by females in such an area.

k. Synchronization of hatching with development of new foliage on normal and stripped areas.
l. Susceptibility of young sprout growth to attack.

3. Proportion of favored food plants in outbreak areas.
4. Interval of time between incidence of insect in an area and development of outbreak in stands of different compositions.
5. Rate of dispersion.
6. Means of estimating population.
7. Population necessary to defoliate stands of different compositions.
8. Duration and recurrence of outbreaks in one area.
9. Population fluctuations over entire region.
10. Effect of diseases, parasites and predators; relative rise and decline of gypsy moth and enemies.
11. Future status as a pest.
12. Prediction of outbreaks.
13. Most effective and economical means of direct control.

B. Forestry

1. Present composition of forests (type maps).
2. Site classification.
3. Future composition.

a. As affected by cutting to alter composition.
b. " " " planting.

4. Market for material removed in cuttings.
5. Care of stands.
6. Effect of defoliation on trees.

Respectfully submitted,

A. C. Cline,
H. L. McIntyre,
R. B. Friend, Chairman.

MASSACHUSETTS FOREST AND PARK ASSOCIATION

(1898-1932 MASSACHUSETTS FORESTRY ASSOCIATION)

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A Voluntary Organization for the Protection and Improvement of Forests, the Establishment and Proper Development of Parks and the Preservation of Natural Scenery

3 JOY STREET, BOSTON, MASS.

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TEL. LAFAYETTE 2715

July 14, 1936

Mr. A. C. Cline,
Harvard Forest,
Petersham, Mass.

Dear Cline:

Enclosed is the first report of the Committee on Gypsy Moth Control Policy, appointed by the conference held last November in the State House, Boston. I am sending one copy to each agency represented at the conference, and if others from your department attended the conference, please see that they have an opportunity to read it.

Criticisms and suggestions I am sure will be welcomed by the committee, and should be sent direct to the chairman. Please send a copy of the same to this office.

If conditions warrant, another conference will be held this fall.

Yours truly,

Harris A Reynolds

Harris A. Reynolds,
Secretary

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STATE OF NEW YORK

DIVISION OF LANDS AND FORESTS
WILLIAM G. HOWARD, DIRECTOR

IN REPLYING PLEASE REFER TO FILE NO.

269.2

CONSERVATION DEPARTMENT

ALBANY

July 15, 1936.

Copy for information of Mr. Cline

Harris A. Reynolds, Secretary,
Massachusetts Forest and Park Association,
3 Joy Street,
Boston, Mass.

Dear Reynolds:

Thank you for your letter of July 14 enclosing copy of the first report of the Committee on Gipsy Moth Control policy.

You have asked for criticisms and suggestions. It seems to me that the Committee has done an excellent job in rendering such a report. The outline for future studies I consider to be most comprehensive, and it seems that only good can result from getting additional information on these various points.

There is one thing that it seems to me should be qualified, and that is the statement at the end of the second paragraph on Page 2, which reads:

> "Inasmuch as private owners of forest land may well be unwilling to remove trees susceptible to gipsy moth, or otherwise to alter the stand composition, if any expense is involved, such individuals should be compensated for loss of stumpage value and subsidized in planting operations, where necessary, by the state or federal government."

I have discussed this point with Mr. McIntyre, and he tells me that direct pecuniary reimbursement is not intended, but rather that assistance will be given the private landowner in the form of labor, either C. C. C. or other, to carry on certain of the control operations like the removal of undesirable species and the planting of desirable species, and that assistance will also be given in helping the owner find markets for the material removed in connection with control operations.

I am very glad to learn this, for I think it would be a mistake to make a recommendation for pecuniary reimbursement. On the other hand, in view of the possible ambiguity of the statement as it appears in the report, it seems as though this should be

changed in any future report.

I am sending copies of this letter to the members of the Committee, in accordance with your suggestion.

Very truly yours,

W. G. Howard

Director, Lands and Forests.

WGH/RM
RBF
ACC

STATE OF NEW HAMPSHIRE
FORESTRY AND RECREATION DEPARTMENT
CONCORD

COMMISSION
W. R. BROWN, BERLIN
B. K. AYERS, CONCORD
HARRY K. ROGERS, SUNCOOK
JOHN H. FOSTER,
STATE FORESTER

ADDRESS REPLY TO
STATE FORESTER
CONCORD, N. H.

July 22, 1936

Mr. A. C. Cline,
Harvard Forest,
Petersham, Mass.

Dear Mr. Cline:

I have read with interest a copy of the report of your committee on gypsy moth control which Harris Reynolds has just sent to me.

It seems to me your committee has given very thoughtful study to the subject and that your conclusions are the inevitable ones which one would reach if he knew the whole situation intimately. I have no criticism to make and I hope the report will be generally examined by State and Federal officials connected in any way with this work so that the report may lead to some necessary and economical changes in present procedure.

Very sincerely yours,

John H. Foster

State Forester

JHF/CSP

July, 25, 1936

Mr. John H. Foster, State Forester,
New Hampshire Forestry and Recreation
Department,
Concord, N. H.

Dear Mr. Foster:

I am deeply appreciative of your letter of the 22nd containing your comments on the report of the committee on gypsy moth control policy. The report was prepared largely by Dr. Roger B. Friend of Connecticut, and I think he did an exceptionally fine job of expressing the opinions of the committee.

It is certainly to be hoped that the present wasteful methods of direct control will eventually give way to the indirect silvicultural methods, but of course you realize that it may be a long time before any drastic changes will be made. Here in this state the township system of control by direct methods only is very firmly established.

With kind personal regards,

Yours very sincerely,

July 25, 1956

Mr. John H. Foster, State Forester
New Hampshire Forestry and Recreation
Department
Concord, N. H.

Dear Mr. Foster:

I am deeply appreciative of your letter of the 22nd containing your comments on the report of the committee on spray moth control policy. The report was prepared largely by Dr. Roger B. Friend of Connecticut, and I think he did an exceptionally fine job of expressing the opinions of the committee.

It is certainly to be hoped that the present wasteful methods of direct control will eventually give way to the indirect silvicultural methods, but of course you realize that it may be a long time before any drastic changes will be made. Here in this state the township system of control by direct methods only is very firmly established.

With kind personal regards,

Yours very sincerely,

August 11, 1936.

Mr. C. C. Granger
U. S. Forest Service
Washington, D. C.

Dear Chris;

I am enclosing a dummy copy of the gypsy moth bulletin I told you about. This bulletin is, in my opinion, a fundamental contribution to the problem. I hope that you, Morrell, and any others who can influence the development of the program can find time to study it. It seems to me an admirable opportunity to make use of the C.C.C. in this new type of control.

When your plans are arranged I hope you will let me know in advance when you and Evans can come to Petersham. It is probable that I shall be away from Petersham from about the 21st until early in September. If that is the only time you can come, I shall arrange to have Cline or Hosley show you about, though I should be greatly disappointed to miss your visit.

Sincerely yours,

Director

THE NEW YORK STATE COLLEGE OF FORESTRY
AT SYRACUSE UNIVERSITY
SAMUEL N. SPRING, DEAN

EXTENSION DEPARTMENT
FRANK B. MEYERS, DIRECTOR
G. A. WHIPPLE
F. E. CARLSON
R. F. BOWER

SYRACUSE, NEW YORK

Sept. 2, 1936.

Mr. A. C. Cline
Harvard Forest
Petersham, Mass.

Dear Al:

I read with considerable interest your joint contribution to the article entitled - "Gipsey Moth in the Town of Petersham, Massachusetts, in 1935". This article is very interesting indeed and I congratulate you upon it.

Kindest, personal regards.

Very truly yours,

Frank B. Myers

FRANK B. MYERS
Director of Forest Extension

THE NEW YORK STATE COLLEGE OF FORESTRY
AT SYRACUSE UNIVERSITY
SAMUEL N. SPRING, DEAN

EXTENSION DEPARTMENT
FRANK B. MEYERS, DIRECTOR
G. A. WHIPPLE
F. E. CARLSON
R. F. BOWER

SYRACUSE, NEW YORK

Sept. 9, 1936.

Mr. A. C. Cline
Harvard Forest
Petersham, Mass.

Dear Al:

Thanks very much for the copy of the publication on control of gypsy moth. I find it of great interest and appreciate your thoughtfulness in sending it on to me.

Kindest, personal regards.

Sincerely yours,

Frank B. Myers

FRANK B. MYERS
Director of Forest Extension

STATE OF CONNECTICUT

STATE PARK AND FOREST COMMISSION

AUSTIN F. HAWES,
STATE FORESTER
STATE FOREST FIRE WARDEN
OFFICE:
165 CAPITOL AVENUE
P. O. DRAWER 1558

File

HARTFORD, Oct. 2, 1936

Professor Ward Shepard, Director,
Harvard Forest,
Petersham, Mass.

Dear Shepard:-

It is certainly very thoughtful of you to write complimenting me on the data I have colleted on the gipsy moth. I had no thought of making any great splurge with this memorandum, but it has been received with surprising appreciation.

I would like to correct one statement which I made about spraying. Mr. Ashworth, who has had charge of the gipsy moth work here in Connecticut, and who, I believe, has done excellent work in controlling the insect, tells me that my figures on spraying, which I secured from Mr. Crossman, are somewhat low because of the fact that I omitted cost of repairing the spray outfits and certain other minor charges. He has found that spraying can be done on the easiest land for $11.00 per acre, but that on the more difficult land where a long line of hose is required, it costs about 50% more, or say $16.00 per acre. I do not think this materially changes my conclusion that spraying is the cheapest method of control for badly infested areas.

Sincerely yours,

A. F. Hawes

State Forester

AFH/OC

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
NORTHEASTERN FOREST EXPERIMENT STATION

ADDRESS REPLY TO
DIRECTOR
AND REFER TO

335 PROSPECT ST.
NEW HAVEN, CONN.

R - NE
Pi-1

October 2, 1936

Mr. A. C. Cline
Harvard Forest
Petersham, Mass.

Dear Mr. Cline:

I am sending you herewith a copy of "Outline for Cooperative Study of the Application of Silvicultural Control of the Gypsy Moth."

Very sincerely yours,

C. EDWARD BEHRE, Director

By M. Westveld Acting

Enclosure

Copy for information of:
Mr. A. C. Cline, Asst. Director
Harvard Forest
Petersham, Mass.

R - NE
Pi-1

OUTLINE FOR COOPERATIVE STUDY OF THE APPLICATION OF SILVICULTURAL CONTROL OF THE GYPSY MOTH

The Northeastern Forest Experiment Station has assigned Frank Smith, with headquarters at Greenfield, Massachusetts, to work with the office of Gypsy Moth Control in the application of silvicultural measures as part of the control program being carried out through the CCC Camps in the Connecticut River Valley.

The work of the Experiment Station will be divided into two parts:

(1) Type mapping of an extensive area in a continuous block to determine the proportionate area where resistance of the forest to gypsy moth can be increased by silvicultural operations and the character and extent of the work required;

(2) Direct cooperation with the gypsy moth organization in the application of silvicultural measures on areas where infestations have been found or where minimizing the danger of infestation seems particularly urgent.

Detailed instructions for the type mapping are included in a separate memorandum dated October 12. A crew of about ten CCC enrollees will be needed for this survey. This crew will be assigned directly to Mr. Smith who will assume full responsibility for the conduct of the work. The type mapping will not be initiated until the direct cooperation in silvicultural control has been gotten under way.

Cooperation in Silvicultural Control

Selection of Areas for Treatment

Areas to be given silvicultural treatment will be selected by representatives of the office of Gypsy Moth Control and of the Northeastern Forest Experiment Station working together in consultation with camp superintendents. Two areas have already been selected for the initial work.

One of these is on state forest land not far from the Wendell Camp. This stand is adjacent to a birch-popple area which was completely defoliated in 1936. It was subject to considerable

feeding this year and will require treatment to protect the young growth of white pine which occupies the lower portion of the stand. This young white pine is overtopped by an open stand of gray birch, paper birch, oak and red maple. It is believed that it can be rendered quite safe in one operation.

The upper part of the stand is a dense, old field growth of gray birch, paper birch, red maple and oak, with a heavy undergrowth of mountain laurel and practically no conifers. The initial treatment will probably not render this portion of the area completely safe from defoliation, but its resistance can be built up and its potential productivity greatly increased. The suggested treatment will include removal of practically all the popple and gray birch, saving most of the red maple, some of the paper birch and the best formed stems of oak. Spots where only favored food species occur should be clear cut, and provision should be made for planting four year old transplants of red pine or white pine in the openings after cutting back the mountain laurel.

The second area selected is on Clarksvale Farms in the Town of Deerfield. Only a few egg clusters were found in this stand following a clean-up job last winter. The stand is of mixed hardwoods from 1" to 8" in diameter and 40' to 50' tall. The proportion of ash and maple is sufficiently high to permit a reduction of favored food species to not more than one-third of the total in a single operation. A few openings may be created by elimination of groups of pure popple, but a regrowth of more valuable species, including a satisfactory proportion of unfavored foods, may be expected from advance reproduction already underground.

The selection of additional areas for treatment will be made as the work progresses, and will depend in a large measure upon the areas of infestation requiring treatment, which are discovered by the scouting crews. It is suggested that infestations on oak ridges or in other stands where protection through silvicultural measures will be a long, slow process be designated for spraying next season and that infestations in mixed growth, where considerable protection can be obtained promptly through silvicultural means, be subjected to such treatment during the winter.

Treatment

The representative of the Northeastern Forest Experiment Station will examine each area suggested for treatment, and before any work is undertaken he will prepare a written memorandum describing the area and outlining in detail the work which should be undertaken. This memorandum should cover the following points: location, sketch map, area in acres, composition, age, size, density and condition of timber, origin, previous defoliation, abundance of egg clusters, previous gypsy moth treatment, outline of cultural

work recommended, specifying species and character of trees to be reserved, approximate proportion of stand to be removed and approximate composition of residual stand, additional work recommended such as cutting of underbrush, planting, pruning, etc.

The recommendation will also include an estimate of the number of man days which will be required for the suggested treatment and the time when the job should be done. These items will be worked up in consultation with the camp superintendent.

Responsibilities

When the recommendations for each tract have been prepared, they should be taken up with the owner of the land in order to obtain permission for conduct of the work. Contact with the owners should preferably be made by the representative of the Northeastern Station and camp superintendent together. The Station representative should participate in practically all these contacts in order that the forestry aspects of control and silvicultural needs of the individual woodlot may be competently discussed. A copy of the printed bulletin on silvicultural control of the gypsy moth should be presented to each owner visited.

When permission to undertake treatment has been obtained, the Station representative will designate the trees to be cut by appropriate marks which can be readily identified by the CCC crew. The recommended treatment and the silvicultural needs of the stand will be discussed with the superintendent or foreman in charge of the work so that he will understand fully what the objective is for each stand.

Actual conduct of the work will be the responsibility of the Gypsy Moth Control Office through the CCC camps. The Station representative will keep in as close contact with the actual operations as possible, and will lend all assistance he can in training the crews and inspecting the results.

The Station representative will not have authority over any of the direct control measures ordinarily used in the gypsy moth project. Such direct control measures may or may not be undertaken in stands subjected to silvicultural work at the discretion of the office of Gypsy Moth Control provided, however, that the Station representative should be consulted whenever additional clean-up work is to be undertaken in order to prevent vitiating the benefit of silvicultural work through destruction of desirable young growth.

Records

In addition to the written recommendations outlined above a record will be obtained of the composition of each stand by species and size classes before and after treatment. This record

will be obtained from strip tallies laid out to sample all the significant variations which occurred in each stand. The ends of these strips will be prominently marked on the ground, and the location will be fully covered and referenced by survey notes. In stands averaging less than 6" in diameter strip tallies will usually be one-half chain wide and in stands of larger timber one chain strips will be the rule. Strip samples will generally be at least two chains in length and seldom will it be necessary to tally more than ten chains in any one stand. In any event, separate tally sheets should be kept for each two chain length of strip.

C. Edward Behre, Director

CEB:GM
(Dictated by Mr. C. Edward Behre, Director,
signed in his absence to avoid delay.)

LITHGOW OSBORNE
COMMISSIONER
JOHN T. GIBBS
DEPUTY COMMISSIONER
JOHN L. HALPIN
SECRETARY

IN REPLYING PLEASE REFER TO FILE NO.

STATE OF NEW YORK

CONSERVATION DEPARTMENT

ALBANY

DIVISION OF LANDS AND FORESTS
WILLIAM G. HOWARD, DIRECTOR

October 9, 1936.

Mr. A. C. Cline,
Harvard Forest,
Petersham, Mass.

Dear Al:-

Thank you for the copies of the bulletins just out on "Silvicultural Control of the Gipsy Moth" and "A Study of the Gipsy Moth in the Town of Petersham".

I look forward to studying these with particular interest since the talk you and I had about this matter last winter.

With best regards,

Very truly yours,

W. G. Howard

Director, Lands and Forests.

WGH/RM

Lakeville Conn.
Oct. 10 '36

Mr. A. C. Cline
Harvard Forest
Petersham Mass.

Dear Mr. Cline—

The two Gypsy Moth publications are received, and I thank you for undertaking to supply me direct. We in the Barrier Zone want to be aware of the most effective silvicultural controls, while we have time to choose our course in advance.

Sincerely yours

Lowell F Bradley

GREEN TOP
PETERSHAM
MASSACHUSETTS

Dear Mr Cline:

Thank you
for the monograph
just received on
the Gypsy moth.
It is much appreciated

Oct 19th

Sincerely yours
Henry Jewett Greene

CABLE ADDRESS "ADAHALA" BOSTON

INGERSOLL BOWDITCH
TRUSTEE AND AGENT
111 DEVONSHIRE STREET
BOSTON, MASS.

November 4, 1936.

Mr. A. C. Cline
Harvard Forest
Petersham, Mass.

Dear Mr. Cline:

Thank you very much for sending me a copy of your two articles on gypsy moths. I shall take great pleasure in reading them.

I hope this year to finish releasing the pine trees on the lot which you saw at Chocorua. Last year I cleared nearly one-half of the lot, and it looks very well.

Very sincerely yours,

Ingersoll Bowditch

IB/L

THE AMHERST RECORD

Amherst, Massachusetts

WALTER A. DYER
Consulting Editor

November 17, 1936.

Dear Mr. Cline:-

Thank you very much for the copies of the pamphlets on the gypsy moth. Mr. Behre had already sent me one of them, but I had not seen the other. It seems clear that the experts are not very hopeful of good results from local and temporary treatment, while on the other hand the farmer is not in a position to undertake extensive forestry reforms. It is quite a problem for the average individual. I am happy to say that my own trees in Pelham have thus far escaped serious infestation.

Sincerely yours,

Walter A. Dyer.

HF 1935-01

1937 Correspondence

MASSACHUSETTS FOREST AND PARK ASSOCIATION

(1898-1932 MASSACHUSETTS FORESTRY ASSOCIATION)

A Voluntary Organization for the Protection and Improvement of Forests, the Establishment and Proper Development of Parks and the Preservation of Natural Scenery

3 JOY STREET, BOSTON, MASS.

TEL. LAFAYETTE 2715

June 15, 1937

Mr. A. C. Cline,
Harvard Forest,
Petersham, Mass.

Dear Mr. Cline:

Mr. Reynolds is out in the field with Mr. Wharton today visiting state forests and CCC camps.

I have found the original drawings for the gypsy moth bulletin in our files and am enclosing them herewith.

If Mr. Reynolds said once that we could present the members of the Water Works Association with free copies of the bulletin, that statement probably still holds good, but I will ask him tomorrow. We expect to send you the final copy of the fire report then, and he can give you the definite word at that time.

Sincerely yours,

Florence B. Clapp

P. S. The cuts were mailed last night from here, so that you should have received them by this time.

HALE AND DORR

RICHARD W. HALE
GEORGE D. BURRAGE
FRANK W. GRINNELL
ROGER D. SWAIM
WOODBURY RAND
JOHN M. MAGUIRE
REGINALD H. SMITH
DUDLEY H. DORR
GEORGE W. WIGHTMAN
VIRGIL C. BRINK
JOSEPH N. WELCH
DANIEL L. BROWN
GRAFTON L. WILSON
LAWRENCE E. GREEN
LUCIUS E. THAYER

GEORGE H. B. GREEN
DAVID BURSTEIN

ANTHONY BRAYTON
EDMUND BURKE
PAUL G. KIRK
A. FREDERICK RICHARD
J. LINDSAY WARE
RAYMOND B. ROBERTS
EDWARD J. KEELAN, JR.
HORACE G. CROCKETT, JR.

TELEPHONE HUBBARD 3300

CABLE ADDRESS "HAFIS"

60 STATE STREET, BOSTON

November 21. 37

Deer. Sir !-

The. current. Herverd. Alumni Bulletin leeds me. to inflict thes letter on yr. about gypsy moth.

I have to do with a. great part of the woodlands in. Dover. Westwood Medfield and. north part of Wolpole. Mass

On some I. pruned out the favored species white oak. birch. aspen. many years ago.

But my advesrs of that time presumably Mass. State Forester told me the red oak. was sufficently unpopular. to be retained.

I write principally to ask. if this be so in whole or in part

Incidentally. I assert that in S. W. Dover a bad infestation and defoliation 1937 appears to have cured itself by disease or parasites. The nests are only scattering & are substantial in size

Yours

Richard Hale

November 24, 1937

Mr. Richard W. Hale
60 State Street
Boston, Massachusetts

My dear Mr. Hale:

In reply to your letter of the 21st in reference to an article on the gypsy moth in the current Harvard Alumni Bulletin, I would inform you that red oak is among the species highly favored as food by this insect. It is true that white oak is somewhat more susceptible to complete stripping than red oak, but for all practical purposes all the species of oak may be considered highly favored food plants.

Under separate cover I am sending you a copy of a bulletin on Silvicultural Control, and also a reprint of an article dealing with the gypsy moth infestation of 1935 in the town of Petersham. We fully recognize that the so-called silvicultural control measures do not apply very well to stands composed very largely of oak, except in cases where there is an understory made up of some of the resistant species such as maple. As a matter of fact, many oak stands do have understories containing high proportions of resistant species, and my thought is that over a period of years the composition of the stand may gradually be altered through selective cutting to render it more nearly moth-proof.

We are cooperating with the Division of Forest Insects of the U. S. Bureau of Entomology and Plant Quarantine in studying the moth populations in relation to climatic conditions, natural enemies, etc., and you might be interested to stop in at the Forest during the gypsy moth feeding season to learn some of the results of our work.

Very truly yours,

Assistant Director

1938 Correspondence

WS

The Commonwealth of Massachusetts
Department of Conservation
Division of Forestry

20 Somerset St., Boston

Notes with interest. Better send him something more on plantings! WS

Great Barrington, Mass.
September 9, 1938

Dear Mr. Cline,

That is an excellent bulletin on the gypsy moth and a fine, sensible approach to the subject. More power to you in your attack on this foolish, expensive and property-invading nuisance.

It should be against the law for any one, under whatever pretext, to scar or deface specimen trees on private property.

Your thesis is developed with great lucidity. Of course the matter is adjustible from a silvicultural angle, which is the only sound approach in that it attacks the cause, and does not offer a mere useless palliative.

I think the poisoning of woods along the highway is another outrage, equivalent to the pollution of our streams. Woods labelled with poison signs are more ominously repellant in my view than a few defoliated trees.

Other species that are able to stand the gaff will, as you point out, fill the gaps left by the susceptible species. It is better to relinquish the unfit species than have a poisoned roadside, like riding along between rows of medecine bottles.

Personally, I cannot enjoy the scenery, much less feel the true charm of the woods, under such conditions.

Your visit gave me a great deal of pleasure, and profit too. Come again!

Yours very sincerely,

Earle Stafford

I'd like a lot of people - especially in Washington - to see your bulletin and some shots along the Housatonic lines. E.S.

IN RE

CABLE ADDRESS "MUSEOLOGY NEW YORK"

THE AMERICAN MUSEUM OF NATURAL HISTORY

CENTRAL PARK WEST AT 79TH STREET

NEW YORK, N. Y.

April the eleventh
Nineteen hundred thirty-eight

Dear Mr. Cline:

Very many thanks for your nice letter and your paper on the gypsy moth. I shall read it with a great deal of interest.

I have some property in Colebrook, Connecticut, just over the Massachusetts line and we are just beginning to have gypsy moths there.

Very sincerely yours,

Roy Chapman Andrews

Mr. A. C. Cline
Petersham
Massachusetts

66 Perkins Hall
Cambridge, Massachusetts
May 16, 1939

Mr. A. C. Cline, Assistant Director
Harvard Forest
Petersham, Massachusetts

Dear Mr. Cline:

I am making a study of the Washington-Field Office relationships in the Bureau of Entomology and Plant Quarantine. The particular function on which I am concentrating is Gypsy Moth Control, with some attention to quarantine and inspection. After getting into the subject, it has become clear that a clean-cut pattern was not going to be easy to get. Mr. Burgess, at Greenfield, has given me a great deal of help on the work done by him. Mr. Ramsey, Chief Moth Suppressor for Massachusetts has also been very cooperative. However, getting a total picture is still difficult--there is the work by WPA in the cities and towns, the work done by CCC camps (more last year than this), work done by the Park Service, etc. Since one of my approaches to the problem is through the fiscal operations, I am trying to trace down the total amount of money spent and by whom on Gypsy Moth for the fiscal year 1938. Maybe someone at the Harvard Forest has done some research on this problem. All of the information I can get will certainly be helpful.

Another phase which seems to be important, is just how the human race should go about combating the Gypsy Moth. Mr. Perkins of the CCC pointed out that some of the camps last year under the direction of Burgess engaged in "silvicultural work", meaning the removal of favorite food trees of the Gypsy Moth. What is the relative advantage of this approach to the creosoting, spraying, and burlapping methods?

Mr. Ramsey made the statement that the work on Gypsy Moth was of suppression and control rather than extermination. Obviously, it would be a great boon to the general public to be rid of the expense of suppression. Why can there not be extermination?

Well, I've let loose a great many questions. Any consideration which you can give to them will be deeply appreciated. The thesis on which I am working is under the direction of J. D. Black, Morris B. Lambie, and A. N. Holcomb.

Sincerely yours,

Theodore W. Taylor

Theodore W. Taylor

May 19, 1939

Mr. Theodore W. Taylor
66 Perkins Hall
Cambridge, Mass.

Dear Mr. Taylor:

I have your letter of the 16th informing me of the study you are making of the Washington-Field Office relationships in the Bureau of Entomology and Plant Quarantine and of your particular interest in the gypsy moth control program.

I fear it will be impossible for me to deal adequately with this subject by correspondence, and I hope very much it will be possible either for you to come up here sometime at your convenience or to meet me at some other place which you might suggest. Gypsy moth control is a matter of great interest to me, and I should like to be able to go into it with you as fully as my knowledge permits.

You are doubtless aware of the large control organization financed by the federal government and of the activities of the several New England States and New York along similar lines of direct control, and of the lack of confidence on the part of the research staff of the Division of Forest Insects in the methods which have been followed these many years past with apparently meager results. While I presume that the Massachusetts township plan of gypsy moth control is not part of your study, it is nonetheless a particularly sore spot. Perhaps you already know that the annual expenditure for control work in a town is based on its assessed valuation, more specifically, 1/25 of one percent of its assessed valuation. It is obvious that there is no relation between the occurrence of afforest insect and the valuation of a town, unless it be in an inverse ratio, by which I mean that the more timberland the town has the lower its valuation.

May I suggest that you pay a visit to Mr. Harris A. Reynolds, Secretary of the Massachusetts Forest and Park Association, 3 Joy Street, Boston, who has been long acquainted with the gypsy moth problem and who undoubtedly can assist you in getting at certain information on current expenditures.

I am enclosing a copy of a bulletin on "Silvicultural Control of the Gypsy Moth" and a reprint of "A Study of the Gypsy Moth in the Town of Petersham, Mass., in 1935," which I hope you will find of interest in connection with the plan of control which I personally feel is the only economical one to be applied in these rural communities.

Very truly yours,

Enc. 2

Assistant Director