MASSACHUSETTS SOCIETY FOR PROMOTING AGRICULTURE.

RESULTS OF SPRAYING EXPERIMENTS

AGAINST

CATERPILLARS OF THE GYPSY AND BROWN-TAIL MOTHS

MAY, 1905

See last page of the cover

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ARNOLD ARBORETUM, HARVARD UNIVERSITY.

JAMAICA PLAIN, MASS., June 8, 1905.

TO THE TRUSTEES OF THE MASSACHUSETTS SOCIETY FOR PROMOTING AGRICULTURE:

Dear Sirs:—Your committee appointed to consider methods for the suppression of the gypsy and browntail moths in Massachusetts make the following report:

The possibility of killing these moths by poisoning the foliage of the plants on which they feed not having, it appeared, been fully recognized in this State, your Committee arranged in May for a public exhibition of this method of insect destruction on a scale large enough to be conclusive.

The trial was made on May 22nd and continued through four days, and on May 31st and June 1st was supplemented by an additional application of poison to prevent invasion from unsprayed woods and trees in the neighborhood. The work was done under the direction of Mr. J. A. Pettigrew, Superintendent of the Boston Park System, whose report on the details of the work with its cost is appended.

The piece of land in Melrose selected for the experiment, 11.4 acres in extent (the area as given by the engineers of the Metropolitan Park Commission), was covered with a growth of White Pines, Oaks, Beeches, Apple-trees, Willows and Hop Hornbeams, and with a dense undergrowth of Alders, Sumachs, Barberries, Witch Hazel and seedling trees of several species. All the trees were badly infested with the nests of the browntail moth and the egg-clusters of the gypsy moth, and old walls and

piles of stone gave safe and convenient shelter for egg-clusters. No work of suppression of any sort had been attempted on this land which appeared to your Committee to be as badly infested as any piece of land of similar size that could be found in the state.

The difficulty and expense of thoroughly poisoning the foliage on this particular piece of land was increased by the thick growth of trees and shrubs and by the unusual height of many of the trees. Several Pines and Elms exceed a height of seventy to eighty feet, and could be covered with poison only by the use of a forty to sixty foot ladder, the average size of all the trees being probably much above that of the forest growth in the infested region. Spraying operations were simplified by the fact that every part of the land could be reached by hose from the pump stationed on a highroad, and by the convenient access to water. Setting the height of the trees, their number and the dense undergrowth against the exceptionable facilities for operating the pump and obtaining a supply of water, the cost of the first four days' work ($21.87 per acre), exclusive of the cost of the machine and hose, can perhaps be safely taken as a fair average cost per acre of thoroughly spraying woods in any part of the infested region. More powerful machinery, better adapted to spraying on a large scale, and some cheaper form of poison may, however, be expected to reduce the cost of the operation.

A careful inspection of the sprayed area made on June 7th showed that the foliage had not been destroyed. Only a few half-dead caterpillars, too feeble to be dangerous and soon to die, could be found on the leaves, while piles of dead caterpillars on the ground showed the effect of the

poison. Trees in the neighborhood that had not been sprayed, and on which no work of suppression had been done, were on June 7th entirely denuded of leaves. So far therefore as killing the caterpillars on this piece of ground is concerned the experiment has been entirely successful. It shows:—

First, that it is practicable to apply poison to the foliage of trees crowded in woods in sufficient quantities to insure the death of all insects feeding on it; and that it is not necessary to try other means of destruction if the spraying is done effectively and at the right time.

Second, that this method of destruction of the gypsy and browntail moths is cheaper and more effective than any of the methods which have been in general use for the destruction of these insects.

Third, that this method makes possible the preservation of the young trees and shrubs neccessary for the perpetuation and beauty of the forest, previous attempts to destroy the gypsy moth on trees growing in woods being dependent on the destruction of all small plants able to afford them shelter and retreat.

Of the possibility of the easy destruction of the caterpillars of the browntail moth by arsenical poison when they are fully grown in spring or in September when they are first hatched there is no question. Our experiment has shown that it is practicable to kill by arsenical poison the caterpillars of the gypsy moth when they are first hatched, but it is still to be demonstrated that poisoning is effective against the full grown caterpillar, and it is evident that the mature caterpillars entering a sprayed territory will not be killed by poison applied six weeks earlier to trees which have produced new leaves since the application was made.

Spraying, to be really effective, must be general, or, if it is not general, sprayed ground must be protected from invasion by some mechanical device.

Of the value of spraying against these insects on isolated street or orchard trees there can be no question. For such trees no matter what their size may be, it is effective and cheap. A comparison now of some of the large Elm trees on the sprayed territory on Wyoming Avenue with the Elm trees of similar size on many streets of the infested district will show the value of arsenical poison. In many cases these street trees have been carefully and laboriously cleared of egg-clusters and nests, but the impossibility of getting the last cluster or the last nest is shown by the presence on these trees of enough caterpillars to defoliate them. The impossibility of destroying all the egg-clusters of the gypsy moth in any given locality is well shown, too, at this time in the Middlesex Fells where thousands of the caterpillars can be seen on trees in regions from which all undergrowth has been removed and where it was believed every egg-cluster had been killed.

C. S. SARGENT,
JOHN LOWELL,
H. S. HUNNEWELL,
} Committee.

BOSTON, June 6, 1905.

Professor CHARLES S. SARGENT, President,
Mass. Society for Promoting Agriculture,

Dear Sir:

Agreeably to your request that I take charge of an experiment proposed by your Society for the suppression of the gypsy and brown-tail moths, by spraying the foliage

attacked by them with an arsenical solution, I arranged for the mounting of a Worthington steam pump, of 35 gallons per minute capacity, on the frame of a portable steam boiler of 8 horse power, the whole costing $485.00 which attached to an ordinary 600-gallon street sprinkler, made an apparatus capable, under a pressure of 120 lbs. per square inch in the pump chambers of projecting two streams from 3/16 inch diameter nozzles to a height of fifty to sixty feet. Another stream conducted through a perforated pipe into the sprinkling tub served as an agitator for the poisonous solution used. 200 feet of 1 1/2 inch diameter hose was used as a main supply for the two distributing hose, which were each 200 feet in length, the first 100 feet being of one inch diameter while the second 100 feet of each was 3/4 of an inch in diameter, on the ends of which were the nozzles. An additional street sprinkler of 600 gallons capacity was used as an alternate to keep the pump in constant use. A single horse supply wagon, three sets of 40-foot extension ladders, and a corps of eight men, one foremen, two teamsters, and an engineer completed the equipment.

The piece of woodland selected by you was located at the junction of Ravine Road and Wyoming Avenue, adjoining the Middlesex Fells Reservation, being entirely bounded by these roads and containing 11.4 acres. It is filled with a heavy and tall growth of pines and deciduous trees, which were badly infested with gypsy and brown-tail moths.

When the work of spraying commenced, on May 22, the gypsy larvae were about 3/8 of an inch long, and the brown tail larvae about 5/8 to 1 inch long. The spraying was completed in four days. Subsequently, a lighter gasoline machine of three and one-half horse power,

and four men were employed for 4 days from May 31 in adding a second coat of the solution, at the edge of the woodland to a depth of fifty or seventy-five feet, to meet the present invasion of brown-tail larvae from the woods across the boundery roads, and of the gypsy larvae later.

Disparene, a composition of arsenate of soda and acetate of lead, was used in the proportion of ten pounds of the solution to one hundred gallons of water. At least two-thirds of the area had to be sprayed from ladders, on account of the height of the trees about 160 of them being 60 feet high and upwards. When conditions were favorable, foliage seventy-five feet distant laterally could be covered with fine spray. To make the solution more adhesive to the foliage, flour, molasses, and glucose were each tried in turn, being mixed with the solution: the result in each case was satisfactory.

The net cost of first spraying was $249.09, or at the rate of $21.87 per acre. With the supplemental spraying of the borders included, the net cost was $338.04, or $29.65 per acre. The total cost of the work was $394.34. This includes cost of transport of equipment to and fro, and for time lost by men working so far from home, which is deducted as not being a legitimate charge in the cost of the work.

The poison was found to be effective against the gypsy larvae on the second day, many being dead, others appearing sick and torpid. In a week the effect was much more noticeable, the larger and stronger brown-tail larvae being also similarly affected, while nearly all of the larvae of the gypsy moth were dead.

Very Respectfully submitted,

J. W. Pettigrew.

BROWN-TAIL MOTHS.

March 18th. The caterpillars begin to leave nests, and commence eating.

June 10th. Commence to spin cocoons and pupate.

July 1st. The white moths, with a brown tail, commence to emerge from the pupal stage, and soon begin to lay eggs. The eggs hatch in from 15 to 20 days.

July 20th. They begin to feed about this time, and feed for about six weeks.

Sept. 1st. They begin to form their winter nests.

GYPSY MOTHS.

April 30th. Egg-clusters commence to hatch, and caterpillars begin to feed about this time.

July 15th. They commence to pupate about this time.

July 25th. The moths commence to appear, and soon commence laying egg-clusters.