Bulletin 368 March, 1935

CONNECTICUT STATE ENTOMOLOGIST
THIRTY-FOURTH REPORT
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W. E. BRITTON, PH.D.
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CONNECTICUT STATE ENTOMOLOGIST

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W. E. Britton

ENTOMOLOGICAL FEATURES OF 1934

The winter of 1933-34 was unusually severe in Connecticut, probably the most so of any winter since 1917-18. There was abundant precipitation with frequent and sustained sub-zero temperatures. The average mean temperature for February was 14° F., exactly half the normal. The precipitation was considerably above normal for the months of January, April, May, June, September and November, but was somewhat below normal for February, March, July, August and October.

After such a severe winter it is with more than the usual amount of interest that one examines a record of the prevalence or scarcity of the usual insect pests. It is fair to expect that a large proportion of the individuals of certain species might be killed by the prevailing low temperatures.

Thus in 1934, most kinds of aphids were comparatively scarce. This was true of aphids on vegetable crops and also of the rosy apple aphid, *Anuraphis roseus* Baker, in apple orchards. On the other hand the green apple aphid, *Aphis pomi* DeG., was scarce in winter and early spring, but in June became more abundant and increased to such an extent as to damage the fruit in certain orchards in Hartford and New Haven Counties. Laboratory examinations of San José scale, *Aspidiotus perniciosus* Comst., showed a winter mortality of about 75 per cent. The European elm scale, *Gossyparia spuria* Mod., was nearly all killed and reported from only a few nurseries by the nursery inspectors, whereas for the past few years it has been found in nearly every nursery where elms were grown. The euonymus scale, *Chionaspis euonymi* Comst., was also much less destructive than usual, and evidently was checked by a high winter mortality.

From an examination of many pine shoots, it was estimated that between 80 and 90 per cent of the larvae of the European pine shoot moth, *Rhyacionia buoliana* Schiff., had been killed by the winter. This reduction by natural causes, together with the artificial check resulting from clipping

and burning the infested shoots, has so lessened the pest that only light infestations were found in pine plantations and in nurseries late in the season. The light-loving grapevine beetle, *Pachystethus lucicola* Fabr., the corn ear worm, *Heliothis obsoleta* Fabr., and the juniper webworm, *Dichomeris marginellus* Fabr., were distinctly less abundant than in 1933. The elm leaf beetle, *Galerucella luteola* Müll., the tulip tree scale, *Toumeyella liriodendri* Gmel., were less abundant, and the Mexican bean beetle, *Epilachna corrupta* Muls., was also slightly less destructive than in 1933.

Likewise a beneficial insect, the Chinese praying mantid, *Tenodera sinensis* Sauss., was scarce in 1934, and only a few examples were observed and reported from localities where there were hundreds in 1933.

However, some insects were not greatly injured by the winter, and were perhaps more destructive than usual. Thus the fall canker worm, *Alsophila pometaria* Harr., was very abundant and stripped many unsprayed fruit, shade and woodland trees in Fairfield, Middlesex and New Haven Counties. The adult moths were extremely abundant late this fall in these areas as well as in certain portions of Hartford County and it is to be expected that the insect will cause wide-spread destruction next May. All choice fruit and shade trees subject to infestation should be sprayed with lead arsenate.

The eastern tent caterpillar, *Malacosoma americana* Fabr., was also extremely prevalent and nests were conspicuous on unsprayed apple and wild cherry trees in May. They were also present on other kinds of fruit trees and occasionally on oak and other native trees in the woodlands. This insect has periods of great abundance varying from eight to twelve years apart and at present it has very nearly reached its height of abundance. Probably it will be prevalent next season and then decline. In 1934 it was perhaps the least in evidence near the shore, and the most prevalent in Litchfield County and in the northern portion of the State.

Another insect that has been unusually prevalent in 1934 is the pine needle scale, *Chionaspis pinifoliae* Fitch. Infestations of red, Scotch, Austrian and mugho pines in nurseries, forest and ornamental plantings have seemingly increased markedly within the last two or three years. The spruce mite, *Paratetranychus ununguis* Jacobi, infests nearly all kinds of conifers and was very prevalent in 1934. Specimens were received from 16 localities in Connecticut. Another pest that was more prevalent than usual was the twig pruner, *Hypermallus villosus* Fabr., usually in oak twigs. This insect or evidence of its work was received from nine localities. The barberry webworm, *Omphalocera dentosa* Grote, an insect noticed only in occasional seasons, was present on barberry plants or hedges in seven different localities.

The monarch or milkweed butterfly, *Danaus menippe* Fabr., was very common and in August spent the night by the thousands clustered on trees along the coast just before migrating southward. The plum curculio, *Conotrachelus nenuphar* Hbst., the pear psylla, *Psyllia pyricola* Först., and the apple maggot, *Rhagoletis pomonella* Walsh, were all common and took their annual toll in full measure from the orchards.

The Oriental fruit moth, *Grapholitha molesta* Busck, was present as usual. There seemed to be little winter mortality. But, as peach buds were all

killed and there was no fruit, the larvae remained in the twigs until the end of the season.

There was severe injury to early sweet corn by the first generation larvae of the European corn borer, *Pyrausta nubilalis* Hübn., particularly near the coast and in the river valleys. There was also considerable injury to later corn by the larvae of the second generation. The fall webworm, *Hyphantria cunea* Drury, was present throughout Connecticut but the nests were unusually common and conspicuous in late summer in the northern and eastern portions of the State. The imported willow leaf beetle, *Plagiodera versicolora* Laich., injured smooth-leaved willow trees throughout the State. Mr. Zappe observed the forest tent caterpillar, *Malacosoma disstria* Hbn., to be very abundant on deciduous trees in Hubbard Park, Meriden, June 5.

The white pine weevil, *Pissodes strobi* Peck, was common although checked in forest plantations by cutting and burning the infested leaders, and the black vine weevil, *Brachyrhinus sulcatus* Fabr., caused the usual amount of injury. *Brachyrhinus ovatus* Linn., commonly known as the strawberry root weevil, caused severe damage by the grubs or larvae eating off the roots of hemlock and blue spruce in a nursery in Rocky Hill. Some 75,000 hemlock and several hundred thousand blue spruce seedlings were destroyed. The Japanese weevil, *Pseudocneorrhinus setosus* Roe., was again found feeding upon the leaves of flowering shrubs in New Haven. This time it was chiefly rhododendron, mountain laurel and Deutzia that were injured.

Autoserica castanea Arrow, was found in several new localities and various plants had been injured. The Asiatic beetle, *Anomala orientalis* Waterh., has continued to injure lawns in New Haven and West Haven, and has spread to new localities in these towns and into some of the surrounding towns.

The Japanese beetle, *Popillia japonica* Newm., has increased in abundance and in the older infestations of Stamford, Bridgeport and Hartford, severe damage by the adults may soon be expected. There was some damage to grapevines, roses, and flowering plants in Bridgeport in 1934, and beetles were found in Ansonia and Wallingford for the first time. The insect is now distributed in nearly all sections of the State and in a few years, after the beetle population has had time to build up, severe damage to fruit and shade trees, flowering shrubs, and certain vegetable and flowering plants may be expected.

The gipsy moth, *Porthetria dispar* Linn., has built up a number of rather large colonies in woodlands that were not discovered until the woodland areas were scouted last winter by the unemployed under emergency relief appropriations. Federal forces took all of the territory between the Connecticut River and the barrier zone, and under the Public Works Appropriation scouted a large portion of the woodland areas and found several large infestations. The area east of the Connecticut River was in charge of state men under Mr. Ashworth. Some 340 CWA men were employed for a portion of the time, from November 15 to March 29. These men had to be trained and organized into scouting crews each with a regular trained scout as foreman. This emergency force was well under

way when the appropriation was discontinued and the work left uncompleted. However, it did uncover rather large infestations in several towns.

Two unusual pests are the pickle worm, *Diaphania nitidalis* Stoll, that infested summer squashes in Guilford, and the bagworm, *Thyridopteryx ephemeraeformis* Haw., that had partially defoliated several Norway maple street trees in Bridgeport, before it was discovered.

Much was accomplished in 1934 by men employed under Federal emergency relief appropriations and supervised by members of this department. The salt marsh areas remaining unditched November 1, 1933, have now all been ditched except in the town of Stratford where the work has not been completed. Many other improvements relating to dikes, tide gates and widening and deepening of outlets have been made, and altogether should greatly diminish the mosquito nuisance in the shore region of Connecticut. Other emergency relief projects have aided in checking the white pine weevil, the European pine shoot moth and the gipsy moth.

The following insects have been found in Connecticut during 1934 for the first time: The beech scale, *Cryptococcus fagi* Baerens., in Hartford; a Dermestid beetle, *Dermestes peruvianus* Cast., in Bridgeport; and the holly leaf miner, *Phytomyza ilicis* Curt., in Hartford and Newington.

A summary of the more important entomological features of the season would include: Outbreak of the fall canker worm; abundance of eastern tent caterpillar, twig pruner, pine needle scale, and spruce mite; damage to sweet corn by the European corn borer, and to hemlock and blue spruce seedlings by the strawberry root weevil; injury to summer squash by the pickle worm, and to Norway maple trees by the bagworm; discovery of important gipsy moth infestations; decrease in abundance of the European pine shoot moth, European elm scale, euonymus scale, juniper webworm and the comparative scarcity of aphids; aid from Federal emergency relief appropriations for mosquito elimination, and forest insect control; discovery of the beech scale in Connecticut.

Some of the more important features are described in greater detail in separate notes and articles printed elsewhere in this report. The following list will serve as an insect pest survey for the season:

INSECT RECORD FOR 1934

Fruit Insects

Name	Locality, host, date and remarks

Aegeria exitiosa, peach borer. The usual amount of damage to peach trees throughout the state. Injured trees, Manchester, Dec. 28, 1933.

Alsophila pometaria, fall canker worm. Severe outbreak in southwestern portion of the state, where many unsprayed fruit and other trees were defoliated in May. Severe damage to unsprayed apple tree in Hamden. Egg-mass, Greenwich, Dec. 5, 1933; egg-mass and adults, New Haven, May 5.

Alypia octomaculata, eight-spotted forester. Larvae on grape, Hartford, June 9.

Fruit Insects—*(Continued)*

Name — Locality, host, date and remarks

Anuraphis roseus, rosy apple aphid. Scarce in most orchards and no damage from it was observed or reported.

Aphis pomi, green apple aphid. Eggs scarce in early spring but in May this aphid became abundant in some orchards and continued throughout the season. It injured the fruit in Hartford and New Haven Counties.

Aspidiotus perniciosus, San José scale. Scarce in early spring and about 75 per cent winter mortality. However, some fruit was badly scale-spotted at harvest time.

Cacoecia argyrospila, fruit tree leaf roller. Certain Wallingford orchards were heavily infested, and the pest was present in surrounding orchards.

Cacoecia rosaceana, oblique-banded leaf roller. Present in apple orchards and caused a peculiar side-injury to fruit.

Carpocapsa pomonella, codling moth. Rather more prevalent than usual throughout the state.

Colaspis favosa, a Chrysomelid beetle. Adults on dewberry, Stratford, June 27.

Conotrachelus nenuphar, **plum curculio.** Adults severely damaged apples in orchards interplanted with peaches. Scars on fruit, Norwalk, Dec. 14, 1933; scars on apple, pear and plum, New Canaan, June 15.

Cotalpa lanigera, goldsmith beetle. Adult found in orchard, Northford, June 29.

Dasyneura pyri, pear leaf midge. More abundant than heretofore in several orchards in New Haven County, June 23.

Datana ministra, yellow-necked caterpillar. Less common than usual. Larvae on apple, North Haven, July 12.

Eriosoma lanigera, woolly apple aphid. Galls around injuries, Bristol, Jan. 22.

Euphoria inda, bumble flower beetle. Adults on apple, Litchfield, Sept. 24.

Euthisanotia grata, pearl wood-nymph. Adults on grape, Woodbury, June 27.

Grapholitha molesta, Oriental fruit moth. Present as usual but on account of the absence of fruit, larvae remained in the twigs.

Hemerocampa leucostigma, white-marked tussock moth. Not very common. Egg-masses on apple and quince, Hartford, Jan. 4.

Hylemyia rubivora, raspberry cane maggot. Infested raspberry tips, Southbury, May 25.

Lagoa crispata, crinkled flannel moth. Larva on pear, Hartford, Sept. 7

Lasioptera vitis, grapevine tomato gall. Galls on grape, New Haven, June 16; Wallingford, June 23.

Macrodactylus subspinosus, rose chafer. Adults damaged apple and grape in June in eastern Connecticut. Adults on grape, Hartford, June 9.

Fruit Insects—(*Continued*)

Name — Locality, host, date and remarks.

Malacosoma americana, **eastern tent caterpillar.** Nests exceedingly abundant on apple and cherry throughout the state, and particularly so in Fairfield and Litchfield Counties. Egg-clusters on apple twigs, Wilton, Mar. 19; Guilford, July 5; Hamden, July 10; Bridgeport, Greenwich, July 14; New Haven, July 19; Newtown, Aug. 22; Hartford, Sept. 21.

Oxyptilus periscelidactylus, grape plume moth. Less abundant than usual.

Pachystethus lucicola, light-loving grapevine beetle. Much less prevalent than in 1933. Adults, New Haven, June 21; Milford, June 27.

Paratetranychus pilosus, European red mite. Eggs scarce but survived the winter. Severe outbreaks occurred in midsummer nearly all over the state.

Pelidnota punctata, spotted grapevine beetle. Not troublesome. Adult on grape, Springfield, Mass., July 13.

Phylloxera vitifoliae, grape phylloxera. Grape leaf with characteristic galls, Bristol, Aug. 22.

Psyllia pyricola, pear psylla. Fully as prevalent as usual. Severe infestation in pear orchards in New Haven County. On pear, Hamden, July 16.

Rhagoletis pomonella, apple maggot. Unusually prevalent throughout the state. Infested fruit, Norwalk, Dec. 14, 1933; Canaan, Feb. 21; Milford, Sept. 5.

Samia cecropia, cecropia moth. Larva on elderberry, Fairfield, Aug. 22; on apple, New Haven, Sept. 12; cocoon, Hartford, Sept. 21.

Schizura concinna, red-humped caterpillar. Present in about the usual numbers. Larvae on apple, Waterbury, July 17; Sound View, Aug. 14.

Scolytus rugulosus, shot-hole borer. Not much in evidence. Larvae in apple twig, Lewisboro, N. Y., Mar. 26.

Sibine stimulea, saddle-back caterpillar. Larva on cherry, Meriden, Aug. 27.

Sphecodina abbotii, abbot sphinx. Larva on grape, Hamden, July 9.

Syntomaspis druparum, apple seed chalcid. In apple, Wilton, June 25.

Tolype velleda, a lappet moth. Adult, Prospect, Sept. 20; cocoon, Norwichtown, Oct. 8.

Trioza tripunctata, blackberry psyllid. On blackberry, Middletown, July 16.

Typhlocyba pomaria, white apple leafhopper. Scarce early in the season but became abundant and injured the foliage in September and October.

Vegetable Insects

Anasa tristis, squash bug. Present in fully the usual numbers and killed squash plants on at least one truck farm.

Vegetable Insects—*(Continued)*

Name	Locality, host, date and remarks.

Autoserica castanea, Japanese garden beetle. Adults injured vegetable plants, Danbury, July 11.

Chelymorpha cassidea, argus tortoise beetle. Adults on corn, Danbury, July 18; adults, Windsor, May 18.

Cutworms, were present and caused the usual amount of damage.

Diabrotica vittata, striped cucumber beetle. Present in the usual numbers. Injured squash plants, Winsted, June 12.

Diaphania nitidalis, pickle worm. Uncommon in Connecticut but caused damage in 1931. Larvae in summer squash, Guilford, Sept. 5.

Empoasca fabae, potato leafhopper. Present in most fields and in some cases caused severe tip burn. Also injured some fields of beans in the southern portion of the state.

Epicauta cinerea var. *marginata*, margined blister beetle. Adults injured beet, egg-plant and certain other vegetables in July in New Haven County.

Epilachna corrupta, Mexican bean beetle. Present on beans in all portions of the state, and slightly less destructive than in 1933.

Epitrix cucumeris, potato flea beetle. Normally abundant

Heliothis obsoleta, corn ear worm. Present but less common than in 1933. Larvae on corn, Glastonbury, Hamden and Stratford, July 23.

Hylemyia brassicae, cabbage maggot. Present in Southington and caused some damage but not unusually abundant.

Hylemyia cilicrura, seed corn maggot. Larvae injured tobacco in Windsor and East Hartford.

Illinoia solanifolii, potato aphid. More abundant than usual in the Connecticut River Valley. Severe outbreaks were prevented by natural enemies. Avon, June 25.

Julus hortensis, garden millipede. Present in garden, Hartford, May 9.

Leptinotarsa decemlineata, Colorado potato beetle. Present in fully the usual numbers. Larvae, New Haven, July 10.

Lixus concavus, rhubarb curculio. Injury to rhubarb, Thomaston, July 12.

Lygus pratensis, tarnished plant bug. Adults on potato, Newington, June 18; Avon, June 25.

Macrodactylus subspinosus, rose chafer. Adults on potato, Newington, June 18.

Mamestra picta, zebra caterpillar. Larvae on beet, Milford, June 27; on corn, North Plain, July 5; on spinach and castor bean, Bristol, July 7.

Melittia satyriniformis, squash borer. Caused the usual amount of damage. Larvae in Hubbard squash, Bloomfield, July 24.

Vegetable Insects—*(Continued)*

Name — Locality, host, date and remarks

Papaipema nitela, stalk borer. Present in the usual numbers. Larva in corn, Plainfield, June 27.

Papilio polyxenes, celery worm. Normally abundant. Larvae on carrot, Milford, June 27; Waterbury, July 6.

Pegomyia hyoscyami, spinach leaf miner. Not abundant but more so than for two or three years. In beet leaves, West Haven, June 9.

Phlegethontius quinquemaculata, tobacco worm. Pupa, Collinsville, May 8; larva on tomato, Springdale, Aug. 15.

Poecilocapsus lineatus, four-lined plant bug. Adults, New Haven, June 5; New Milford, June 7.

Pyrausta nubilalis, **European corn borer.** Abundant and damaged early sweet corn and infested the stalks of early potatoes near the coast and up the river valleys, particularly in the East Hartford-Glastonbury region. Larvae in weeds, East Hartford, Jan. 22.

Wireworms, present in usual numbers. Reported from Windsor and Melrose in soil of tobacco field in May and June.

Shade and Forest Tree Insects

Acrosternum hilare, green stink bug. Nymph and adult on linden, Westport, Aug. 20.

Adelges abietis, **spruce gall aphid.** Common on Norway spruce throughout the state. Hamden, May 2; Winsted, May 24; Manchester, June 5; New Haven, June 9; Waterbury, June 13.

Adelges pinicorticis, pine bark aphid. Common on white pine but less prevalent than usual in nurseries. Litchfield, Feb. 6.

Adelges strobilobius, larch woolly aphid. Common on larch. Wallingford, May 31.

Agrilus bilineatus, two-lined chestnut borer. Larvae common in oak in southern Connecticut.

Alsophila pometaria, **fall canker worm.** Very abundant in the southwestern portion of the state in 1934, and defoliated many fruit, shade and woodland trees in Fairfield, Middlesex and New Haven Counties in May. Injured maple and black birch, Wallingford, May 31; larva on elm, Old Lyme, June 1; larvae on elm and willow, Hamden, June 4; larva, Norwalk, June 11.

Amphibolips inanis, larger empty oak apple. Gall on oak, Plantsville, Aug. 30

Andricus seminator, wool sower. Gall on white oak, Scotland, June 11

Anisota rubicunda, **green striped maple worm.** Seldom injures trees in Connecticut. Larvae on red maple over a large area and several small trees defoliated, Warren, Aug. 8.

Anisota senatoria, orange-striped oak worm. Common on oak throughout the state. Larva on white oak, Stony Creek, Branford, Aug. 3.

Shade and Forest Tree Insects—*(Continued)*

Name	Locality, host, date and remarks.

Apatela rubricoma, a dagger moth. Larvae on hackberry, Farmington, Sept. 20.

Aphrophora parallela, pine spittle bug. On white pine, New Britain, June 11.

Argyresthia thuiella, arborvitae leaf miner. Mined leaves, Cheshire, Sept. 20.

Asterolecanium variolosum, pit-making oak scale. Very abundant on chestnut oak, Danbury, Oct. 8.

Automeris io, io moth. Larva on locust, Hamden, Aug. 10.

Brachyrhinus ovatus, strawberry root weevil. Grubs destroyed large numbers of hemlock and blue spruce seedlings in a commercial nursery in Rocky Hill.

Buprestid beetle. Larva in maple, Newington, June 14.

Calaphis castaneae, aphid. On chestnut, Hamden, July 28.

Calligrapha philadelphica, a Chrysomelid beetle. Adult, New Milford, July 21.

Caryomyia caryaecola, hickory seed gall. On hickory, Milford, July 11.

Chionaspis pinifoliae, pine needle scale. Common throughout the state and unusually abundant in nurseries in 1934. Seemingly on the increase. On mugho pine, Old Lyme, Jan. 9; Manchester, Oct. 29; on Scotch pine, Southport, Mar. 26; on red pine, Wallingford, May 31; New Haven, Aug. 27; on pitch pine, Hartford, Aug. 30; Windsor, Oct. 6.

Cincticornia pilulae, oak pill gall. Galls on pin oak, Bloomfield, June 27; Hamden, July 12; Ridgefield, July 31; Bridgeport, Aug. 15; New Britain, Sept. 22.

Cincticornia sp. Galls on pin oak, Plymouth, Aug. 16; Orange, Aug. 22; Riverside, Sept. 10.

Citheronia regalis, hickory horned devil. Larva on hickory, Derby, Aug. 10.

Coleophora laricella, larch case bearer. Injured larch leaves, Wallingford, May 31; New Haven, June 1; Litchfield, July 6.

Conotrachelus juglandis, walnut weevil or curculio. Characteristic injury on pecan, Mystic, July 12.

Corythucha arcuata, oak lacebug. On chestnut oak, Newtown, Aug. 22.

Cryptococcus fagi, beech scale. This European scale was found in Connecticut for the first time. On beech, Hartford, Sept. 13.

Cryptorhynchus lapathi, poplar and willow curculio. Scars on willow twig, Rockville, Aug. 21.

Cyllene robiniae, locust borer. Adult in locust, Cornwall Bridge, Sept. 12.

Datana ministra, yellow-necked caterpillar. Larvae on oak, Lakeville, Aug. 2.

Diapheromera femorata, walkingstick. Adult female, Norwichtown, Oct. 8.

Diaspis carueli, juniper scale. On juniper, East Norwalk, May 7.

Dichelonyx elongata, a Scarabaeid leaf beetle. Adults on birch, Marlborough, June 12.

Shade and Forest Tree Insects—*(Continued)*

Name — Locality, host, date and remarks

Dilachnus sp. Eggs on needles of red pine, South Willington, Feb. 24.

Drepanaphis acerifoliae, aphid on maple. Avon, Aug. 28

Erineum caused by mites, on maple, Cromwell, July 14.

Eriophyes sp., a mite. On pin oak, Litchfield, July 20.

Eriosoma americana, a woolly aphid. On elm, Torrington, June 7; New Preston, June 15.

Eriosoma sp., a woolly aphid. On elm, Hartford, July 27.

Eucosma gloriola, white pine tip moth. Injury to white pine, Greenwich, July 9.

Eulia pinatubana, pine tube moth. Injury on white pine, Thompson, Jan. 15.

Euphoria inda, bumble flower beetle. Adult on willow, Falls Village, May 24.

Fenusa pumila, birch leaf mining sawfly. Common throughout the state. Injury to gray birch, Glastonbury, July 19.

Fiorinia japonica, an imported scale. On hemlock, Cold Spring Harbor, N. Y., Aug. 3.

Galerucella luteola, elm leaf beetle. Present throughout the state but probably less abundant than in 1933. Adults, Westport, Apr. 28; Weston, May 8; New Canaan, June 11; injured leaves, Easton, July 20; Hartford, July 28; West Hartford, July 28; Wallingford, Aug. 18; adults and larvae on Chinese elm, Broad Brook, Sept. 11.

Gillettea cooleyi, blue spruce gall aphid. Common throughout the state. On blue spruce, New Haven, June 9; Waterbury, June 26, Sept. 20; Litchfield, Aug. 15; on Douglas fir, New Britain, June 11.

Haltica ulmi, green elm beetle. Injured elm leaves, Kensington, Aug. 29.

Hamadryas antiopa, spiny elm caterpillar, mourning cloak butterfly. Larvae, on elm, Hartford, June 7; Hamden, June 12; on hackberry, Westerly, R. I., June 28.

Hemerocampa sp., a tussock moth. Egg-mass on oak, New Fairfield, Dec. 23, 1933.

Hypermallus villosus, twig pruner. Unusually prevalent throughout the state. In oak twigs, Plainville, June 28; West Hartford, July 6; Colchester, July 9; Orange, Wallingford, July 10; Cornwall, July 11; Wolcott, July 10, 13; Newtown, July 24; Winsted, July 25.

Hyphantria cunea, fall webworm. Very abundant in eastern portion of the state.

Itycorsia sp., false pine webworm. On red pine, South Kent, April 17, Aug. 3.

Kermes sp., an oak gall scale. On white oak, Springfield, Mass., June 28; New Haven, July 9.

Lecanium fletcheri, arborvitae soft scale. More common than usual. On arborvitae, Southport, June 21; Chester, July 3; Madison, July 19; Cheshire, Sept. 20.

Lepidosaphes ulmi, oyster-shell scale. Egg stage on willow, New Haven, Mar. 22; on ash, Southington, Aug. 31.

Shade and Forest Tree Insects—*(Continued)*

Name — Locality, host, date and remarks.

Leucaspis japonica, a Japanese scale. On Japanese maple, New Haven, June 9

Longistigma caryae, a large twig aphid. On beech, Rochester, N. Y., Sept. 10; on birch, Bridgeport, Sept. 12.

Macrobasis torsa, a southern blister beetle. One adult on an unidentified semi-tropical tree, Darien, June 26.

Malacosoma americana, eastern tent caterpillar. Abundant on cherry and apple throughout the state, particularly in Fairfield and Litchfield Counties. (See Fruit Insects).

Malacosoma disstria, forest tent caterpillar. Larvae very abundant, June 5, on maple, oak and other deciduous trees in Hubbard Park, Meriden; also in small numbers, Stamford, June 22.

Mite galls on elm leaves, Winsted, Aug. 3.

Neodiprion lecontei, red-headed pine sawfly. Larvae on pine, Woodmont, June 30.

Neodiprion pinetum, black-headed pine sawfly. Larvae on white pine, Hartland, July 24.

Nepticula sericopeza, Norway maple leaf-stalk borer. Moderately abundant in the Stamford region.

Nerice bidentata, a Notodontid moth. Larva on elm, Chaplin, July 17.

Papilio glaucus turnus, tiger swallow-tail butterfly. Pupa on liquidambar, Ridgefield, June 28; larva, Hamden, July 30.

Paratetranychus bicolor, oak mite. On pin oak, Plymouth, Aug. 16; New Britain, Sept. 22.

Paratetranychus pilosus, European red mite. On elm, Groton, Aug. 8.

Paratetranychus ununguis, spruce mite. Increasingly prevalent throughout the state, infests nearly all kinds of conifers, and in some cases causes severe injury; abundant in many nurseries. On arborvitae, Bloomfield and Meriden, June 27; Chester, July 3; Wethersfield, July 12; Madison, July 19; Windsor, July 21; Cheshire, Sept. 20; on hemlock, Middle Haddam, June 26; New Haven, Apr. 5, June 6 and 9; on juniper, East Norwalk, May 7; eggs on red pine seedlings, Warrensburg, N. Y., Mar. 2; on Retinospora, Wethersfield, July 2; on spruce, Woodbridge, July 2; Bridgeport, July 5; Ridgefield, July 17.

Paria canellus var. *atterrimus,* a Chrysomelid beetle. Adults on butternut, West Cornwall, May 17.

Paria canellus var. *quadriguttatus.* Adults on butternut, West Cornwall, May 17; on oak, Bridgeport, May 24.

Philonix pezomachoides, oak pea gall On pin oak, Norwalk, June 27.

Philonix sp., a gall On pin oak, Litchfield, July 20

Phyllaphis fagi, beech aphid. On purple beech, Wallingford, May 31, June 11

Phyllocoptes aceris-crumena, maple spindle gall. On maple, Litchfield, July 20.

Shade and Forest Tree Insects—*(Continued)*

Name	Locality, host, date and remarks.

Phyllocoptes quadripes, maple bladder gall. On silver maple, Waterbury, May 25; Kent, May 26; Branford, Madison, May 28; Niantic, June 1; Newington, July 12.

Physokermes piceae, spruce gall scale. On spruce, Winsted, June 22.

Pissodes approximatus, a pine weevil. Larvae in red pine, New Haven, May 22; Stamford, July 24; New Bedford, Mass., Sept. 26.

Pissodes strobi, white pine weevil. In white pine, Bethel, July 27; in Norway spruce, Stamford, Aug. 18; in blue spruce, Ridgefield, June 22.

Plagiodera versicolora, imported willow leaf beetle. Larvae on willow, Wallingford, May 31; Old Lyme, July 9; New Milford, July 21; Bridgeport, July 25; New Haven, Aug. 4.

Popillia japonica, Japanese beetle. Adult on Japanese elm, Bridgeport, Aug. 13; larva, Watertown, Aug. 24.

Porthetria dispar, gipsy moth. Larva on Persian walnut, Mystic, July 12; egg-mass, larva and pupa, Stafford Springs, Aug. 17.

Prionoxystus robiniae, carpenter worm. Larvae in oak, South Norwalk, Aug. 25.

Prionus laticollis, broad-horned prionus. Larva in oak, South Norwalk, Aug. 25.

Prociphilus tessellatus, woolly alder aphid. On cut-leaf maple, Litchfield, June 28; Chester, Hartford, July 3.

Psyllia negundinis, box-elder psyllid. On box-elder, Meriden, June 6

Rhyacionia buoliana, European pine shoot moth. A large proportion of the larvae in the shoots were killed last winter. Much less prevalent in 1934 than in 1933.

Rhyacionia comstockiana, a pine shoot moth. Infested shoots of red pine, East Hartland, Jan. 18.

Rhyacionia frustrana, Nantucket pine moth. Injured red pine shoots, Wallingford, Aug. 20.

Saperda calcarata, poplar borer. Adult, Waterbury, Aug. 3

Sawfly larvae on arborvitae, Chester, July 3.

Sawfly larvae on various kinds of pine. Common in nurseries in Sept. and Oct.

Sawfly larvae on white oak, Scotland, June 11.

Scolytid or curculio larvae under bark of Sycamore, Branford, July 18.

Scolytus quadrispinosus, hickory bark beetle. Adults in hickory, South Lyme, Sept. 4.

Stilpnotia salicis, satin moth. Larva on poplar, West Hartford, June 27; adults, West Haven, July 9; egg-mass, Bridgeport, Aug. 15.

Tetralopha robustella, a moth whose larvae form balls of frass. On red pine, Amherst, Mass., Oct. 23; on mugho pine, Avon, Oct. 15; Manchester, Oct. 29.

Thecodiplosis liriodendri, tulip spot gall. On leaves of tulip tree, Guilford, Sept. 21.

Shade and Forest Tree Insects—*(Continued)*

Name	Locality, host, date and remarks.

Thyridopteryx ephemeraeformis, bagworm. Injured several Norway maples, Bridgeport, Aug. 6.

Tomostethus bardus, a sawfly. Larvae on ash, Hartford, May 29; pupae, New Haven, June 6.

Tortrix quercifoliana, an oak leaf roller. Larvae on oak, Bridgeport, May 24

Toumeyella liriodendri, tulip tree scale. New Haven, Aug. 9.

Xylotrechus colonus, a long-horned beetle. Adult from maple, New Haven, Mar. 13.

Insects of Ornamental Shrubs and Vines

Aphis pomi, green apple aphid. On hawthorn, Litchfield, July 20.

Brachyrhinus sulcatus, black vine weevil. Larvae injured *Taxus* roots, Wallingford, Sept. 29.

Callosamia promethea, promethea moth. Cocoons on lilac, New London, Jan. 17.

Chionaspis euonymi, euonymus scale. Heavy winter mortality lessened the destructiveness of this insect in 1934. On *Euonymus radicans,* Waterbury, Dec. 8, 1933.

Cingilia catenaria, chain-dotted geometer. Larvae on bayberry, Norwich, July 20.

Conistra indirecta, a Noctuid moth. Larvae on witch-hazel, East Haddam, June 27.

Dendrothrips ornatus, on California privet, Bridgeport, Aug. 13; West Haven, Aug. 17.

Dichomeris marginellus, juniper webworm. Much less prevalent than in 1933.

Eriophyes cucricotes, galls on matrimony vine, Stamford, June 22.

Harpipteryx xylostella, a leaf roller. Larvae injured honeysuckle, Windsor, Oct. 1.

Hemaris thysbe, a clear-wing sphinx moth. Adult, Bristol, July 31.

Heterodera radicicola, root knot eelworms. Galls on roots of Forsythia, Thompsonville, Jan. 23.

Lasioptera clavula, dogwood club gall. On dogwood twigs, South Carolina, Mar. 6.

Lepidosaphes ulmi, oyster-shell scale. On lilac, Bridgeport, Apr. 9; on Persian lilac, Wallingford, Apr. 23.

Lygaeus kalmii, milk-weed bug. Adult, New Haven, Aug. 7.

Omphalocera dentosa barberry webworm. Larvae on Japanese barberry, Waterbury, Aug. 7; Hamden, Aug. 18. Also observed in five nurseries in Branford, Bridgeport, Hamden, Orange and Woodmont, in one instance on Mahonia.

Pachystethus lucicola, light-loving grapevine beetle. Much less prevalent than in 1933. Adult on rose, East Haven, June 26.

Insects of Ornamental Shrubs and Vines—*(Continued)*

Name — Locality, host, date and remarks.

Papilio troilus, green swallow-tail butterfly. Larvae, on spice bush, Hamden, Aug. 3; without food plant, Bantam, Aug. 14.

Phytomyza ilicis, holly leaf miner. In leaves of *Ilex glabra*, Newington, Apr. 26; in holly leaves, Hartford, July 18.

Pseudocneorrhinus setosus, a Japanese weevil. Now present in New Haven and West Haven. Injures various deciduous and evergreen shrubs. Adults on rhododendron, New Haven, June 11.

Psyllia buxi, box psyllid. Injured box leaves, Old Lyme, Feb. 5

Sawfly larvae (unidentified). On dogwood and hawthorn, Rockville, Sept. 14.

Sphecodina abbotii, abbot sphinx moth. Larvae, Hartford, Wethersfield, July 13; New Haven, July 16.

Insects of Flowers and Greenhouse Plants

Anomala orientalis, Asiatic beetle. Adult in hollyhock flower, New Haven, July 9.

Aphids (unidentified). On calendula, West Hartford, Sept. 25; on verbena, New Haven, July 27.

Autoserica castanea, Japanese garden beetle. Adults injured petunia, zinnia, chrysanthemum, heliotrope, and other flowering plants in several gardens in New Haven in 1934.

Brachyrhinus sulcatus, black vine weevil. Larvae had injured roots of begonia, New Haven, Dec. 8, 1933; Danielson, Jan. 16.

Cosmopepla bimaculata, a Pentatomid bug. Adults on columbine, New Haven, June 23.

Diabrotica duodecimpunctata, twelve-spotted cucumber beetle. Adults injured dahlia and chrysanthemum flowers, New London, Oct. 19; South Norwalk, Oct. 20.

Epicauta pennsylvanica, black blister beetle. Common on aster, Mt. Carmel.

Lagoa crispata, crinkled flannel moth. Adult on hollyhock, Norwich, June 7.

Lycophotia margaritosa saucia, variegated cutworm. Larvae, New Haven, June 5.

Macrosiphum rudbeckiae, golden glow aphid. On stems of golden glow, Bridgeport, Aug. 13.

Metriona bicolor, golden tortoise beetle. Adult on morning glory, Westerly, R. I., Aug. 31.

Mites on *Euphorbia corollata* (unidentified). Stamford, Aug. 30.

Monychus vulpeculus, iris weevil. On iris, New Milford, June 7.

Olethreutes hebesana, a Tortricid moth. Larva boring in stems of *Physostegia*, New Haven, June 26; Woodbridge, July 28.

Insects of Flowers and Greenhouse Plants—*(Continued)*

Name — Locality, host, date and remarks.

Pachystethus lucicola, light-loving grapevine beetle. Less prevalent than in 1933. Adult on hollyhock, New Haven, July 9.

Papaipema nitela, stalk borer. Larva in dahlia, West Haven, June 8; larva in ageratum, Old Lyme, July 19.

Papaipema purpurifascia, columbine borer. Larva in columbine, Washington, July 26.

Popillia japonica, Japanese beetle. Adults on dahlia, New Haven, July 17, 31; on canna, Milford, July 23.

Pseudococcus adonidum, long-tailed mealybug. On Boston fern, New Haven, Feb. 16.

Pyrausta nubilalis, European corn borer. Larvae caused severe damage to dahlia and certain other flowering plants. Larva in hollyhock, New Haven, July 16.

Taeniothrips gladioli, gladiolus thrips. Prevalent on gladiolus throughout the state. Branford, Ivoryton, Aug. 25.

Tarsonemus pallidus, cyclamen mite. On larkspur, New Haven, May 29; West Hartford, Sept. 25; in chrysanthemum buds, Pittsfield, Mass., Oct. 31.

Tetranychus telarius, common red spider. On salvia, West Hartford, Sept. 25.

Trialeurodes vaporariorum, greenhouse whitefly. All stages on fuchsia, New Haven, July 19.

Thrips (unidentified). On dahlia, New Haven, July 6; Bridgeport, Hamden, July 9.

Thrips (unidentified). On *Dianthus*, Ridgefield, July 25.

Thrips (unidentified). On Japanese iris, Hartford, July 9.

Insects of Soil and Lawn

Anomala orientalis, Asiatic beetle. Many lawns in New Haven and West Haven damaged by the grubs. Grubs, New Haven, Apr. 24, May 1, 14, Aug. 14, 15, Sept. 20; West Haven, Apr. 30, June 30.

Ants, several species, are abundant in lawns.

Autoserica castanea, Japanese garden beetle. Grubs present in lawns on several premises in New Haven, May 23, Sept. 25; adults, Danbury, July 11.

Blissus leucopterus, chinch bug. This bug occasionally becomes very abundant and kills the grass in spots. Greenwich, June 30; New Haven, Sept. 11.

Cutworms (unidentified). In golf green, Westport, July 26

Osmoderma scabra, a Scarabaeid beetle. Larvae in soil, Branford, June 14

Phyllophaga sp., June beetle. Larvae in soil, West Haven, May 23.

Popillia japonica, Japanese beetle. Grub in lawn, Hamden, Sept. 27; Watertown, Aug. 24; adults, New Haven, July 2, 17, 31; Milford, July 23; Bridgeport, Aug. 13.

Insects of Soil and Lawn—*(Continued)*

Name	Locality, host, date and remarks.

Pseudolucanus capreolus, stag beetle. Adults in lawn, New Haven, July 14.

Serica sp., a brown Scarabaeid beetle. Larvae in soil of flower garden, New Haven, May 16.

Sphecius speciosus, cicada killer. Nests in hard ground, Newtown, July 20.

Wireworms in lawn, New Haven, July 14.

Insects Infesting Stored Food Products

Acanthoscelides obtectus, bean weevil. Adults in stored beans, New Britain, Jan. 23.

Dermestes peruvianus, an European Dermestid. Adults, larvae and pupae in the packing material in a case of stout, Bridgeport, Jan. 9.

Lasioderma serricorne, cigarette beetle. Adults in tobacco warehouse, West Hartford, Dec. 18, 1933.

Lathridius liratus, minute brown scavenger beetle. Adults in tobacco warehouse, West Hartford, Dec. 18, 1933.

Oryzaephilus surinamensis, saw-toothed grain beetle. Adults in pantry, New Haven, July 9.

Pterodela pedicularis, a Psocid. In cereal, Hartford, Sept. 15, 21.

Sitophilus granaria, granary weevil. Adults in chicken feed, Hamden, Apr. 27.

Household Insects

Anthrenus scrophulariae, carpet beetle. Larvae in house, Gaylordsville, Nov. 21, 1933; New Haven, Apr. 3, Sept. 10; West Hartford, Oct. 19; Waterbury, Oct. 29.

Ants (unidentified). In house, Branford, June 1; Hamden, July 16.

Attagenus piceus, black carpet beetle. Larvae in house, Gaylordsville, Nov. 21, 1933; New Haven, Mar. 11; West Haven, Apr. 3; Stamford, July 16.

Cimex lectularius, bed bug. In house, New Haven, Nov. 14, 1933; Cheshire, May 1.

Ctenocephalus canis, fleas. In house, Willimantic, Apr. 17.

Dermestes lardarius, larder beetle. Larvae in house, Hartford, June 26.

Periplaneta americana, American cockroach. Adults in house, Hamden, July 27.

Thermobia domestica, fire brat. Adults in house, New Britain, Mar. 24; Hartford, Oct. 6, 11.

Tinea pellionella, case-bearing clothes moth. Cases and damage to stuffed furniture, West Haven, July 9.

Insects Infesting Timbers and Wood Products

Name — Locality, host, date and remarks.

Callidium frigidum, a long-horned beetle. Adults in white pine box boards, Waterbury, May 24.

Camponotus herculeanus, carpenter ant. Tunneling in porch, New Haven, July 24.

Cyllene caryae, hickory borer. Adults in houses, and probably emerged from fuel wood, Norwichtown, Mar. 7; Middletown, May 5; New London, May 9.

Dorcus parallelus, a Lucanid beetle. Larvae in rotten log, New Haven, June 8.

Lyctus linearis, one of the powder post beetles. Injured oak floor, Norwalk, June 5.

Neoclytus acuminatus, a long-horned beetle. Adults in houses and probably emerged from fuel wood, Hamden, Jan. 15, Sept. 25.

Phymatodes variabilis, a long-horned beetle. Adults in house and probably emerged from fuel wood, New Haven, Apr. 23.

Phymatodes varius, a long-horned beetle. Adults in house and probably emerged from fuel wood, New Haven, Apr. 23.

Reticulitermes flavipes, termites or white ants. Tunneled in trim or construction timbers of buildings, Westport, Mar. 7; Stamford, Apr. 17; New Haven, May 2; North Madison, May 3; Hamden, May 8; Newtown, Sept. 14.

Miscellaneous Insects

Acroneuria abnormis, a stone fly. Adult, West Cornwall, July 9.

Acucephalus nervosus, a leafhopper. Hamden, July 16.

Alaus oculatus, eyed elater. Adult, Morris, July 2.

Allocapnia pygmaea, a stone fly. Adult, Greenwich, Mar. 14.

Bibio sp., a march fly. Larvae in compost heap, Hamden, Mar. 26.

Bittacomorpha clavipes, a crane fly. Adult, Bridgeport, July 10.

Blatta orientalis, Oriental cockroach. Nymph, Westport, Feb. 16.

Catocala epione, epione underwing moth. Larvae on pecan, Mystic, July 12.

Cerastipsocus venosus, a Psocid. Nymphs and adults, Westerly, R. I., Aug. 7.

Chauliodes sp., a fish fly. Egg-masses on elm, Greenwich, June 18.

Chrysochus auratus, green gold beetle. Adults on spreading dogbane, and thought to be the Japanese beetle, Orange, July 7.

Corethrine larvae in drinking water, New Haven, July 7.

Corydalis cornuta, hellgramite or dobson fly. Adult, West Cornwall, July 9; egg-masses, New Milford, July 25.

Danaus menippe, monarch butterfly. Chrysalis on fence, Falls Village, Sept. 14.

Miscellaneous Insects—*(Continued)*

Name	Locality, host, date and remarks.

Ecpantheria deflorata, a large Arctiid moth. Adult on lawn, Milford, June 8.

Euclea chloris, a slug caterpillar moth. Adult, Milford, July 10.

Euphoria fulgida, a green Scarabaeid beetle. Adult, Union, May 16.

Euxesta notata, an Ortalid fly. Adult in house, New Haven, Feb. 6.

Glischrochilus quadriguttatus, a sap beetle. In fermenting oak sap, Wallingford, July 26.

Hypera punctata, clover weevil. Adult hibernating in trim of building, Westport, Mar. 7.

Lethocerus americanus, giant water bug. Adult, Danbury, N. H., July 27.

Lucilia sericata, a scavenger fly. Reared from maggots in bottle of milk, Hartford, July 7.

Myrmeleon immaculatus, ant-lion. Larvae, Northford, Aug. 29; Southington, Oct. 18.

Panchlora cubensis, a tropical green cockroach. Adult in bananas, New Haven, May 1.

Perlesta placida, a stone fly. Adults, West Cornwall, July 9.

Porcello scaber, a sowbug or pillbug. Westport, Mar. 29.

Pyrophila pyramidioides, a Noctuid moth. Adults on tree, Woodbridge, Aug. 11.

Sira nigromaculata, a springtail. Numerous in house, Bridgeport, May 3.

Tabanus atratus, black horse fly. Adult, Westport, Mar. 29.

Tibicen canicularis, a cicada. Adult, Milford, Aug. 6.

Tropaea luna, luna moth. Adult, North Woodbury, June 2.

Tropical cockroach (unidentified). Nymph on bananas, New Haven, May 24.

Beneficial Insects

Acholla multispinosa, an assassin bug. Egg-cluster on elm, West Haven, May 9

Apanteles congregatus, a Braconid parasite. Cocoons on tomato worm, Springdale, Aug. 15.

Calosoma calidum, a large ground beetle. Adult in soil, Milford, June 8.

Carabid larva, in garden, Southport, June 14.

Casnonia pennsylvanica, an ant-like ground beetle. Adult, Stratford, July 21.

Chrysopa oculata, aphis lion. Adult, New Haven, Aug. 18.

Coccinella transversoguttata, five-spotted ladybeetle. Adults, Milford, June 27.

Beneficial Insects—*(Continued)*

Name — Locality, host, date and remarks.

Erax aestuans, a robber fly. Adult, New Britain, June 25.

Gynandropus hylacis, a ground beetle. Adults on trees, Newington, Jan. 13.

Hippodamia convergens, convergent ladybeetle. Larvae on potatoes, Sterling, July 27.

Ladybeetle (unidentified). Pupae on box elder, Meriden, June 6.

Megarhyssa lunator, lunate long sting. On maple, New Haven, July 27; Westerly, R. I., Aug. 9.

Parasite (unidentified) of *Olethreutes hebesana,* New Haven, June 26.

Podisus maculiventris, a pentatomid bug predaceous on other insects. Adults, Hamden, June 4; Middletown, Aug. 21.

Sinea diadema, an assassin bug. Nymph on elm, Hartford, July 28.

Syrphid fly. Larva on *Artemisia,* New Haven, June 26.

Tenodera sinensis, Chinese praying mantid. **Much less common than in 1933.** Egg-mass on twig, Stamford, Feb. 21; Greenwich, May 11; adults, West Haven, Oct. 15, 18, also New Canaan.

Triphleps insidiosus, an Anthocorid bug. On dahlia, Bridgeport, July 9.

CONFERENCE OF CONNECTICUT ENTOMOLOGISTS

The eleventh annual conference of entomologists working in Connecticut was held in Room 429, Beach Building, at the Connecticut State College, Storrs, on Friday, October 26, 1934. Dr. R. B. Friend was elected chairman and 74 persons were present. A cafeteria luncheon was served in the college dining hall. Professor Crandall and Mr. Worthley were unable to be present but both submitted papers. Professor Crandall's paper was read by Professor J. A. Manter, and Mr. Worthley's paper was read by H. N. Bartley. It was the opinion of several present that this was one of the most interesting and successful of all the meetings held.

The following program was carried out:

GREETING, President Charles C. McCracken, Storrs

SOME RECENT INVESTIGATIONS OF THE HONEY BEE, Prof. L. B. Crandall, Storrs

ENTOMOLOGICAL FEATURES OF THE SEASON OF 1934, Dr. W. E. Britton, New Haven

PRESENT STATUS OF SALT MARSH MOSQUITO DITCHING IN CONNECTICUT, R. C. Botsford, New Haven

STATUS OF THE JAPANESE BEETLE IN THE UNITED STATES, L. H. Worthley, Harrisburg, Pa.

GIPSY MOTH CONDITIONS IN 1934, A. F. Burgess, Greenfield, Mass.

EFFECT OF WEEVIL INJURY ON WHITE PINE, Dr. R. B. Friend, New Haven

CONTRIBUTIONS OF ENTOMOLOGY TO SOCIOLOGY, Dr. J. L. Hypes, Storrs

ENTOMOLOGICAL WORK IN THE ORIENT (Motion picture), Charles A. Clark, Melrose Highlands, Mass.

THE HICKORY HORNED DEVIL (Motion picture), Prof. J. A. Manter, Storrs

LUNCHEON

THE DUTCH ELM DISEASE MENACE TO OUR ELM TREES, Dr. E. P. Felt, Stamford

NOTES ON INSECTS CONCERNED WITH DUTCH ELM DISEASE STUDIES IN CONNECTICUT, Dr. B. J. Kaston, New Haven

GENERAL STATUS OF THE ORIENTAL FRUIT MOTH IN CONNECTICUT, Dr. Philip Garman, New Haven

BREEDING AND DISTRIBUTION OF *Perisierola angulata*, an Australian Parasite of the Oriental Fruit Moth, J. C. Schread, New Haven

MASS PRODUCTION OF *Macrocentrus ancylivorus*, W. T. Brigham, New Haven

APPARATUS FOR DUSTING SULFUR ON PLANTS IN CONTROLLED AMOUNTS, AND METHOD OF TESTING FOR MINUTE QUANTITIES, M. V. Anthony, New Haven

TOXICITY OF PURE NICOTINE AND PURE ANABASINE FOR *Aphis rumicis*, Dr. Philip Garman, New Haven

EUROPEAN CORN BORER:

THE EUROPEAN CORN BORER AS A PEST OF DAHLIAS, Dr. C. H. Batchelder, New Haven

THE PROBLEM OF WEED INFESTATION IN CONNECTICUT, Neely Turner, New Haven

ENFORCING THE COMPULSORY CLEAN-UP IN CONNECTICUT IN 1934, M. P. Zappe, New Haven

DAMAGE TO EARLY SWEET CORN IN CONNECTICUT IN 1934, J. P. Johnson, New Haven

INSPECTION OF NURSERIES, 1934

W. E. Britton and M. P. Zappe

On July 2, the annual inspection of nurseries, as provided in Section 2136 of the General Statutes, was commenced. This work was in charge of Mr. Zappe, who was assisted during July and August by A. F. Clark, W. T. Rowe and R. J. Walker. Most of the larger nurseries had then been inspected, and Mr. Zappe inspected the remaining ones during September but was assisted in special cases by Neely Turner. In certain cases nurseries were again visited one or more times to make sure that the pests had been eradicated.

In general the nurseries were found to be in fully as good condition as usual, although some had been neglected. Due to the unusually severe winter and the cutting and burning of infested shoots during the fall and winter, the European pine shoot moth was much less prevalent than in 1933. On the other hand, there was a marked increase in the pine needle scale, and this season many nurserymen had to eradicate it before receiving their certificates. In 1934 there were 21 nurseries in which no pests were found. Altogether about 117 different insect pests and 60 different plant diseases were found in nurseries. These pests cannot all be mentioned here but some of the more important are shown, with their records for the past ten years, in the following table:

Table 1. Ten-Year Record of Certain Nursery Pests

Pest	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Oyster-shell scale	38	39	45	57	78	86	73	68	78	104
San José scale	32	19	16	30	22	8	11	10	13	19
Spruce gall aphids[1]	27	42	82	120	147	99	124	141	231	244
White pine weevil	5	8	17	19	37	66	74	70	61	67
Pine leaf scale	4	5	6	13	13	10	20	26	46	66
European pine shoot moth	0	0	1	7	7	17	32	77	137	120
Poplar canker	34	32	39	35	37	35	23	40	34	39
Pine blister rust	7	9	9	5	7	7	13	12	11	7
Nurseries uninfested	34	46	37	18	13	18	32	24	22	21
Number of nurseries	151	162	191	228	266	302	327	351	362	381

Each year there has been an increase in the number of nurseries, and therefore the increase in the number of pests may not mean that a larger percentage are infested than heretofore. In fact, the percentage is smaller in some cases.

Number and Size of Nurseries

The list of nursery men for 1934 contains 381 names, an increase of 19 over 1933. A classification on account of size may be indicated as follows:

[1] Includes both *Adelges abietis* and *Gillettea cooleyi*.

Area	Number	Percentage
50 acres or more	20	5
10 acres to 50 acres	42	11
5 acres to 10 acres	33	9
2 acres to 5 acres	89	24
1 acre or less	197	51
	381	100

Of the 381 nurseries listed for 1934, six new nurseries registered during the winter and were inspected before the spring shipping season and again in the fall. These nurseries are marked (2) after the name, because each was given two inspections and two certificates were issued to each during the year. Six nurseries holding certificates in 1933 failed to register before July 1, 1934, and, as provided in Section 2137 of the General Statutes, were required to pay the costs of inspection. Consequently, the sum of $45 was collected from them and turned over to the Treasurer of the Station to be deposited in the State Treasury.

The area of Connecticut nurseries in 1934 is 4,659 acres, an increase of 14 acres over 1933. Altogether, 37 new names have been added and 18 have discontinued business since last year. Twenty nurseries on the list for 1933 are now included under different names. The new list contains 381 names, an increase of 19 over last year. The nursery firms granted certificates in 1934 are as follows:

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1934

Name of firm	Address	Acreage	Certificate date	Certificate number
Ackerman, H. S. (2)	West Hartford	2	Oct. 9	2742
Adamec, Evergreen Nursery, George	East Haven	1	Oct. 3	2724
Aiken Nurseries	Norwalk	1	Nov. 27	2813
Aldrich Gardens	Guilford	1	Aug. 30	2579
Allara, Emanuel	Hamden	1	July 26	2483
Allen, Henry L.	Pawcatuck	1	Aug. 18	2540
Amelunxen & DeWyn	Yalesville	4	Sept. 6	2603
Ampelopsis Nurseries	Groton	1	June 7	2456
Anderson Avenue Nursery	West Haven	1	Sept. 29	2706
Andover Gardens	Andover	1	Aug. 31	2586
Anstett, Louis	Norfolk	1	Sept. 6	2606
Arnold of Orange	Orange	2	Sept. 29	2716
Artistree Nursery	Branford	3	Nov. 13	2792
Aunt Cotton's Nursery	Westport	1	Dec. 29	2828
Austin, M. E.	Clinton	1	Aug. 30	2580
Backiel, Adolf	Southport	1	Dec. 31	2827
Baldwin, Linus	Middletown	1	Nov. 13	2793
Barnes Bros. Nursery Co., The	Yalesville	140	Aug. 30	2571
Barnes Eastern Nurseries	Wallingford	15	Aug. 30	2572
Bartolotta, S.	Cromwell	1	Aug. 30	2578
Barton Nursery	Hamden	1	Sept. 19	2655
Beach, Roy G.	Forestville	1	Nov. 17	2800
Beattie, W. H.	New Haven	1	Sept. 22	2672
Bedford Gardens	Plainville	1	Sept. 26	2697
Beers, H. P.	Southport	1	Nov. 10	2789
Belltown Nurseries	Stamford	4	Aug. 23	2554

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1934—(*Continued*)

Name of firm	Address	Acreage	Certificate date	Certificate number
Benbow, Abram	Norfolk	1	Sept. 6	2607
Beran, Andrew, Pequot Florist	New London	1	Aug. 18	2528
Berkshire Gate Nurseries	Danbury	1	Sept. 24	2682
Bertolf Bros., Inc.	Old Greenwich	45	Aug. 7	2506
Blue Hills Nurseries	Hartford	26	Sept. 24	2680
Boggini, Louis	South Manchester	1	July 7	2457
Bolton Perennial Gardens	South Manchester	1	July 20	2470
Bonnie Brook Gardens	Rowayton	2	Oct. 9	2740
Booy, H. W.	Yalesville	4	Sept. 10	2627
Brack Nursery, Ernest	Brookfield	1	Sept. 24	2684
Brainard Nursery & Seed Co.	Thompsonville	20	Aug. 2	2489
Brandriff's Rock & Perennial Gardens	Branford	1	Oct. 5	2731
Branford Nurseries	Branford	6	Oct. 4	2727
Bretschneider, A.	Danielson	1	Aug. 18	2531
Bridgeport Hydraulic Co.	Bridgeport	15	Nov. 9	2786
Brimfield Gardens Nursery	Wethersfield	8	Sept. 14	2634
Bristol Nurseries, Inc.	Bristol	55	Aug. 7	2503
Brooklawn Conservatories, Inc.	Bridgeport	1	Oct. 24	2767
Brooklawn Nursery	Bridgeport	2	Aug. 23	2553
Brooks, Howard P.	West Haven	1	Nov. 22	2809
Brookside Nursery	Ridgefield	2	Sept. 1	2589
Brouwer's Nurseries	New London	20	Sept. 22	2671
Brouwer's Nursery, Peter	New London	3	Aug. 23	2549
Bulpitt, Henry F.	Darien	4	Aug. 2	2490
Bureau of Trees	New Haven	7	Aug. 8	2508
Burke the Florist	Rockville	1	July 17	2468
Burnside Avenue Greenhouse and Nursery	East Hartford	4	Aug. 23	2552
Burr, Morris L.	Westport	1	Oct. 5	2729
Burr & Co., Inc., C. R.	Manchester	500	July 25	2482
Burwell, E. E.	New Haven	1	Oct. 8	2738
Busch, A. H.	Greenwich	1	Aug. 8	2509
Byram Evergreen Nursery	East Port Chester	1	Aug. 20	2545
Candee, Hollis S.	Hartford	7	Dec. 31	2832
Cant, Alexander	Springdale	1	Aug. 23	2556
Cardarelli, E. J.	Cromwell	5	Sept. 17	2646
Carlson, John B.	Newington	1	Sept. 8	2622
Case, Mrs. Louis L.	Simsbury	1	Sept. 14	2638
Cherry Hill Nursery Co.	Rockfall	36	Sept. 8	2621
Chesman, Joseph	East Haven	1	Sept. 21	2665
Chiapperini, Michele	Groton	1	Aug. 18	2527
Chippendale Nurseries, Inc.	Old Lyme	2	Oct. 20	2762
Choate School, The	Wallingford	4	Sept. 26	2693
City Line Florist	Bridgeport	1	Oct. 11	2749
Clark, Raymond H.	Milford	1	Nov. 8	2783
Cleary, Arthur R.	Bethel	1	Sept. 19	2657
Clinton Nurseries	Clinton	60	Oct. 3	2723
Clyne Nurseries	Waterbury	6	Oct. 3	2726
Cobb, Levi S.	Bridgeport	1	Oct. 24	2768
Collington, E. H.	West Mystic	1	Aug. 18	2542
Conine Nursery Co.	Stratford	75	Aug. 4	2491
Conn. Agr. Expt. Sta. (W. O. Filley, Forester)	New Haven	1	Sept. 14	2639
Conn. Forestry Dept.	Hartford	8	Sept. 25	2686
Conn. Forestry Nurseries	Deep River	16	Dec. 31	2831
Conn. State College (S. P. Hollister)	Storrs		Aug. 4	

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1934—(*Continued*)

Name of firm	Address	Acreage	Certificate date	Certificate number
Conn. State Highway Dept.	Hartford	18	Oct. 9	2744
Conn. Valley Nurseries	Manchester	25	July 30	2485
Conn. Valley Nursery	East Hartford	1	Nov. 3	2775
Corrigan's West Haven Nurseries	West Haven	1	Sept. 29	2711
Couture, E. R.	Westport	2	Aug. 17	2523
Covey, Mrs. Arthur	Harwinton	1	Sept. 6	2608
Cragholme Nurseries, Inc.	Greenwich	4	Aug. 20	2546
Cromie, G. A.	New Haven	2	Aug. 4	2502
Cronamere Alpine Nurseries, Inc.	Greens Farms	3	Sept. 24	2679
Culver, W. B.	Suffield	1	July 10	2465
Curtiss, C. F.	Plantsville	2	Dec. 24	2825
Daisy Hill Gardens	Derby	1	Sept. 29	2709
Dallas, Inc., Alexander	Waterbury	2	Aug. 8	2507
Damen, Peter J.	Foxon	2	Sept. 29	2704
Darien Nurseries	Darien	6	Oct. 31	2773
Dawson, Florist, Wm. A.	Willimantic	1	Dec. 13	2818
Daybreak Nurseries	Westport	3	Dec. 8	2817
Dearden Bros.	East Hartford	5	Sept. 13	2632
Deepstrom, Leon E.	Fairfield	3	Nov. 8	2784
DeMars, F. H.	Winsted	1	Sept. 6	2609
Devon Nursery	Devon	1	Oct. 18	2759
Dewey, V. E.	Groton	2	Nov. 7	2778
Dietrich & Son, Nursery, B	Greenwich	8	Sept. 6	2604
Dillon, Thomas	Greenwich	1	Nov. 22	2807
Dingwall, Joseph N.	West Haven	1	Sept. 29	2717
Doane, David F.	Haddam		Aug. 30	2581
Doebeli, Charles A.	Bridgeport	1	Sept. 26	2696
Donovan, William H.	Talcottville	1	Sept. 24	2676
Donovan, Wm. J.	North Haven	1	Nov. 22	2808
Dowd, Inc., F. C.	Madison	1	Dec. 15	2822
Drescher, John	Sharon	1	Sept. 6	2610
Dunlap, Daniel S.	Cromwell	3	Sept. 4	2592
Dunn, James F.	Stamford	4	Dec. 29	2829
Eager, E. M.	Bridgeport	1	Sept. 7	2618
East Haven Nursery	East Haven	1	Sept. 29	2703
Edendale Gardens	Winsted	1	Sept. 6	2611
Edgewood Nurseries	New Haven	1	Sept. 29	2707
Eells' Sons	Manchester	1	July 17	2467
Elfgren Nurseries	East Killingly	3	Aug. 28	2566
Ellington Evergreen Nurseries	Ellington	5	July 20	2471
Elm City Nurseries	New Haven	1	Nov. 19	2803
Elmgren, C. J.	Cromwell	1	Oct. 5	2732
Elm Grove Cemetery Association	Mystic	1	Aug. 24	2558
Evergreen Nursery Co.	Wilton	25	July 17	2469
Eyberse's Nursery	Norwich	1	Aug. 18	2530
Farmington Valley Nursery	Avon	5	Sept. 11	2628
Fern Hill Nursery	Hartford	3	Oct. 6	2733
Fletcher, Walter G.	Guilford	5	Sept. 17	2645
Flower City Rose Co.	Manchester	23	July 7	2458
Follett Nursery	Westport	10	Aug. 30	2575
Folly Farm, Inc., The	Greens Farms		May 1	2452
Ford, George R.	Farmington		Sept. 26	2691

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1934—(*Continued*)

Name of firm	Address	Acreage	Certificate date	Certificate number
Franklyn Nursery (2)	Rockville	2	July 9	2459
Fraser's Nurseries & Dahlia Gardens	Willimantic	3	Sept. 1	2588
Galligan, C. W.	New Haven	1	Nov. 22	2811
Gallup, Amos M.	Pawcatuck	1	Aug. 18	2534
Garden of Romance	Old Saybrook	2	Dec. 14	2819
Gardner's	Berlin	1	Sept. 26	2695
Gardner's Nurseries	Rocky Hill	250	Aug. 28	2564
Geduldig's Greenhouses	Norwich	6	Aug. 28	2567
Giant Valley Nursery	Mount Carmel	1	Sept. 5	2596
Gilbert, Henry G.	Danielson	2	Sept. 10	2624
Glastonbury Gardens	Glastonbury	3	July 23	2472
Glenbrook Greenhouses	Glenbrook	2	Aug. 17	2524
Glen Terrace Nurseries	Hamden	60	Nov. 17	2798
Godfrey's Stratfield Nurseries	Bridgeport	50	Dec. 14	2820
Golden Hill Nurseries	Shelton	3	Nov. 14	2796
Goodwin Nurseries	Bloomfield	7	July 23	2473
Goshen Nurseries	Goshen	5	Sept. 20	2662
Green Acre Farms, Inc.	Waterford	1	Dec. 19	2823
Green, Martin A.	Danbury	1	Nov. 14	2797
Griswold, George	Old Lyme	1	Sept. 10	2626
Gunn, Mrs. Charles	Kent	1	Sept. 17	2651
Haas, Florist, E.	Milford	1	Oct. 9	2739
Hall, Henry A. L.	West Haven	1	Sept. 29	2712
Hamden Nursery	Hamden	1	Aug. 9	2510
Hammonassett Gardens	Madison	3	Sept. 5	2597
Hansen Florist & Nursery	Fairfield	5	Aug. 17	2519
Happy Days Farm	Norwalk	10	Sept. 15	2642
Hawes, Frank M.	West Hartford	1	Oct. 16	2757
Hearn, Thomas H.	Washington	3	Sept. 21	2669
Heath & Co.	Manchester	25	July 9	2460
Henninger, Christ.	New Britain	1	Sept. 26	2700
Hildebrand's Nursery	Norwich	1	Aug. 24	2560
Hillcrest Gardens	Woodbridge	3	Oct. 10	2748
Hilliard, H. J.	Sound View	1	Nov. 7	2779
Hinckley Hill Nursery	Stonington	1	Aug. 18	2541
Hiti Nurseries	Pomfret Center	11	Aug. 4	2494
Hofmann, Henry F.	Cromwell	1	Aug. 20	2544
Holcomb, Ernest L.	Granby	1	Sept. 14	2636
Holcomb's Evergreen Nursery	Winsted	4	Sept. 24	2681
Holdridge & Son, S. E.	Norwich	5	Aug. 18	2529
Hope Street Nursery	Springdale	1	Aug. 23	2551
Horan, James F.	Hartford	1	Nov. 3	2777
Horan, Kieran W.	West Hartford	1	Nov. 3	2776
Horowitz, Ben (2)	East Hampton	1	Aug. 18	2532
Houston's Nurseries	Mansfield	13	Oct. 17	2758
Hoyt, Charles E.	Bethel	25	Aug. 24	2559
Hoyt's Sons Co., Inc., Stephen	New Canaan	500	Aug. 17	2517
Intravaia & Sons, J.	Middletown	1	Oct. 1	2719
Jennings, Mrs. George S.	Southport	2	Oct. 6	2734
Joel Nursery Co.	Yalesville	10	Aug. 30	2573
Johnson's Nursery	South Meriden	1	Sept. 8	2623
Johnson, Tom	Stratford	1	Sept. 7	2617
Judd, T. H.	Danbury	1	Dec. 1	2815

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1934—(*Continued*)

Name of firm	Address	Acreage	Certificate date	Certificate number
Kateley, Milton M.	East River	1	Aug. 30	2582
Kelley & Son, James J.	New Canaan	6	Oct. 6	2737
Kellner, Arthur H.	Norwalk	1	Nov. 10	2791
Keogh, H. W.	Norwalk	2	Nov. 10	2790
Keser's Sons, Inc., Otto	Portland	1	Nov. 7	2781
Key Rock Gardens	Newtown	1	Oct. 2	2721
Keystone Nurseries	Danbury	1	Sept. 19	2659
Knapp's Perennial Gardens	Plainville	1	Oct. 10	2746
Kosty's Perennial Garden Nurseries	Clintonville	1	Nov. 7	2782
Lanedale Farm Nursery	New Canaan	10	Sept. 6	2602
Langstroth Nurseries	Danbury	6	Sept. 28	2702
Laviola Nursery	New Haven	1	Sept. 22	2673
Lawrence Greenhouses	Branford	1	Nov. 22	2810
Leghorn's Evergreen Nurseries	Cromwell	25	Sept. 11	2629
Lewis Gardening Service	Kensington	1	Aug. 25	2562
Lewis & Valentine, Inc. (Construction Department)	Darien	9	Oct. 19	2760
Loring Nursery, Inc., The Robert	Yalesville	2	Sept. 4	2590
Lowescroft Gardens	Manchester	1	May 15	2453
Luckner, Jr., Wm.	Stepney	1	Sept. 25	2688
Lynch, Mrs. John H.	Ridgefield	3	Sept. 5	2599
Main, Walter G.	North Stonington	1	Aug. 18	2536
Mallett Nursery	Bridgeport	6	Sept. 26	2692
Maplewood Nursery Co.	Norwich	2	Dec. 28	2826
Marigold Farm Nursery	New Canaan	20	Aug. 13	2512
Mather Homestead	Darien	1	Aug. 23	2550
Mayapple Nursery	Stamford	1	Oct. 9	2741
McCarthy, John P.	Danbury	1	Sept. 19	2658
McConville, John	Manchester	2	July 9	2461
Meier, A. R.	West Hartford	1	Oct. 11	2753
Melville Nurseries	Bridgeport	1	Oct. 4	2728
Merwin Lane Nursery	East Norwalk	3	Oct. 11	2751
Meyer, Carl H. H.	Riverside	10	July 30	2486
Meyer Nursery, Ludwig	Bridgeport	4	Oct. 27	2771
Middeleer, Inc.	Darien	28	Oct. 22	2765
Midvale Nursery	Manchester	1	Nov. 20	2804
Milford Nursery	Milford	2	Oct. 27	2770
Millane Nurseries & Tree Experts Co., Inc.	Cromwell	35	Sept. 26	2690
Mill River Nursery	Fairfield	12	Aug. 23	2548
Millstone Garden	Terryville	1	July 23	2474
Minge, G. H.	Rocky Hill	1	Aug. 28	2563
Montgomery Evergreen Nursery, Inc.	Cos Cob	5	Aug. 4	2496
Moraio Bros.	Old Greenwich	5	Aug. 13	2515
Morgan & Sons, Wm. F.	North Stonington	2	Aug. 18	2535
Mountain Farm Nursery	West Hartford	2	Oct. 11	2752
Mountain Grove Cemetery Association	Bridgeport	1	Oct. 3	2725
Mount Airy Gardens	Stamford	1	Nov. 10	2788
Mount Carmel Nursery	Mount Carmel	1	Nov. 19	2802
Munro, Florist	New Haven	1	May 23	2454
Napolitano, Alfonso	Cromwell	1	Nov. 3	2774
Newell Nurseries, The	Bloomfield	6	Sept. 24	2675

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1934—(*Continued*)

Name of firm	Address	Acreage	Certificate date	Certificate number
New Haven Park Commission	New Haven	10	Aug. 17	2525
Newington Gardens & Nurseries	Newington Junction	1	Sept. 22	2670
New London Cemetery Association	New London	1	Aug. 31	2584
New London County Nurseries	New London	5	Nov. 8	2785
Newton's Nursery	West Granby	1	Sept. 14	2637
New York, New Haven & Hartford R. R. Co.	Bridgeport	4	Sept. 11	2631
Niantic Bouquet Shoppe	Niantic	1	Aug. 18	2526
Nicolson & Thurston	Litchfield	1	Sept. 6	2612
North Avenue Nursery	Bridgeport	1	Sept. 7	2619
North-Eastern Forestry Co.	Cheshire	96	Aug. 7	2505
Northville Gardens	New Milford	1	July 25	2477
Norwood Nursery	Hamden	1	Sept. 17	2648
Nyveldt, Albert	New London	1	Aug. 18	2533
Oakland Nurseries	Ellington	40	July 9	2462
Oakwood Novelty Gardens	East Hartford	1	Aug. 4	2499
Oldfield Nursery	Stratford	1	Sept. 25	2687
Old House Gardens, The	Yalesville	1	Aug. 25	2561
Old Orchard Nursery	Norwalk	4	Oct. 9	2745
Outpost Nurseries, Inc.	Ridgefield	635	Aug. 24	2557
Ouwerkerk, D. K.	Yalesville	10	Aug. 30	2577
Over-the-Garden-Wall	West Hartford	3	Sept. 26	2701
Ox Yoke Farm Nursery	Bridgeport	1	Oct. 6	2736
Palmieri Nursery & Florist	New Haven	1	Nov. 20	2805
Parfitt, Mary T.	New Milford	1	July 25	2478
Park Place Nurseries	Marion	2	Sept. 20	2663
Paton, Wm. D.	Mount Carmel	2	Aug. 28	2568
Patrick, Charles	Bridgeport	2	Sept. 19	2660
Peatt, Wm. T.	Ridgefield	1	Sept. 6	2600
Pedersen, Anthon, Nurseryman	Stamford	3	Aug. 20	2543
Peschko, Robert	Danbury	1	Sept. 6	2605
Pestretto, Frank	West Hartford	1	Sept. 24	2677
Pestretto, Salvatore	Hartford	1	Sept. 26	2694
Pflomm, Charles W.	Bridgeport	1	Sept. 25	2689
Phelps & V. T. Hammer Co., The J. W.	Branford	2	Oct. 1	2720
Piemontese, Dominick	Foxon	1	Sept. 21	2664
Pierson, Inc., A. N.	Cromwell	250	Aug. 17	2520
Pinchbeck Bros., Inc.	Ridgefield	10	Sept. 4	2595
Pinecrest Gardens	Wapping	1	Sept. 13	2633
Pine Hirst Gardens	Guilford	1	Aug. 30	2583
Pine Plains Greenhouse, Inc.	Norwich	2	Sept. 7	2614
Polish Orphanage	New Britain	1	Sept. 26	2698
Pomeroy Blue Spruce Gardens	New Milford	5	Aug. 13	2513
Prospect Nurseries, Inc.	Cromwell	25	Aug. 28	2565
Putzig, Adolf	Stamford	1	Dec. 29	2830
Q Garden Farm	Milford	1	Nov. 9	2787
Quinebaug Forestry Co.	Stafford Springs	2	July 31	2487
Rabinak, Louis	Deep River	3	Sept. 4	2594
Race Brook Gardens, Inc.	Orange	1	Sept. 29	2708
Reliable Nursery, The	East Hartford	2	Sept. 19	2661
Rengerman's Garden	Granby	1	Sept. 14	2635

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1934—(*Continued*)

Name of firm	Address	Acreage	Certificate date	Certificate number
Reveley, F. J.	Clinton	2	Nov. 7	2780
Reynolds Farms	South Norwalk	1	July 25	2476
Richmond, Gordon L.	New Milford	12	July 25	2479
Ridgewood Nurseries	Milford	1	Nov. 24	2812
Rockfall Nursery Co.	Rockfall	30	Sept. 17	2647
Rose Hill Nursery	Gildersleeve	3	Sept. 25	2685
Rosery Rest, The	Bridgeport	5	Dec. 15	2821
Russell St. Perennial Garden (2)	South Manchester	1	July 9	2463
Sachem Forest Landscape Service	New Haven	1	Sept. 21	2666
Sage, Hollister	North Woodbury	1	Sept. 5	2598
Sakson's Nursery	Greenwich	1	Aug. 17	2521
Sandelli's Greenhouse	New Britain	1	Sept. 26	2699
Sasco Hill Evergreen Nursery	Southport	1	Aug. 4	2500
Saxe-Floto	Waterbury	1	Aug. 13	2514
Scarano, Alphonso	Groton	1	Aug. 18	2539
Schaeffer Bros.	Norwich	4	Aug. 30	2576
Schafrik, George H. (2)	Meriden	1	Sept. 10	2625
Schaghticoke Farm Nursery	Bridgewater	4	Sept. 29	2705
Schleichert Nursery	Bridgeport	1	Sept. 7	2616
Schneider, Godfrey	West Haven	1	Sept. 29	2713
Schulze, Edward E.	Bethel	3	Oct. 6	2735
Schulze Nursery, C. T.	Bethel	3	Nov. 19	2801
Scott's Nurseries	Bloomfield	10	Aug. 11	2511
Selleck, Joel F.	Nichols	1	Sept. 17	2649
Seltsam's Pequonnock Gardens	Bridgeport	1	Nov. 14	2794
Seymour's Hemlock Nursery	Riverton	1	Sept. 6	2613
Silver City Nursery	Meriden	3	Sept. 24	2678
Silvermine Nurseries	Norwalk	1	Sept. 11	2630
Simonsen, H. C.	Plainville	3	Oct. 25	2769
Sipocz Arrowhead Farm	Fairfield	1	Dec. 4	2816
Smith & Son, Edward A.	Mystic	1	Aug. 18	2538
Soltes Nursery, M. J.	Shelton	2	Sept. 18	2653
Southington Nursery, Inc.	Southington	25	Aug. 4	2493
Southport Nursery	Southport	35	Aug. 20	2547
South Wilton Nurseries	Wilton	5	Aug. 4	2495
Spring Nursery	Bristol	3	Sept. 29	2718
Stack, Charlotte E.	New Milford	1	July 25	2480
Stafford Conservatories	Stafford Springs	2	July 9	2464
Stalzer & Son, John	Brooklyn	1	Aug. 31	2587
Stannard, E. H.	Wilton	2	Sept. 15	2641
State Street Nursery	Hamden	2	Sept. 24	2683
Steck Nursery	Bethel	4	Nov. 14	2795
Steck, Sarah B.	Bethel	1	Sept. 4	2591
Steck & Sons, Inc., C. A.	Newtown	12	Sept. 19	2654
Steele's Nurseries, Charles	Greenwich	2	Aug. 7	2504
Strayer Nursery, Paul	Stratford	1	Sept. 19	2656
Sunridge Nurseries	Greenwich	75	Dec. 1	2814
Thomas & Sons, Inc., W. D.	Hamden	1	July 26	2484
Torizzo, P. A.	West Hartford	5	Sept. 21	2667
Tower Crispette Co.	Guilford	1	Sept. 21	2668
Tow Path Gardens	Hartford	15	Oct. 22	2764
Triangle Nursery	Yalesville	1	Sept. 6	2601
Turchi, Nazareno	Orange	1	Sept. 29	2715

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1934—(*Continued*)

Name of firm	Address	Acreage	Certificate date	Certificate number
Uplands Flower Gardens	Woodbury		Aug. 28	2570
Valentine, William	Pomfret Center		Aug. 4	2498
Valley View Nursery	Southington	1	Nov. 17	2799
Van der Bom, F.	Bethel	5	Oct. 23	2766
Vanderbrook & Son, C. L.	Manchester	50	July 25	2475
Van Wilgen Nurseries	Branford	22	Oct. 10	2747
Van Wilgen, Wm.	Branford	1	Oct. 5	2730
Vasileff, Nicholas	Greenwich	4	Aug. 17	2522
Verkade's Nurseries	New London	60	Sept. 4	2593
Vernick, John H.	Bridgeport	2	Aug. 8	2555
Wallace Nursery	Wallingford	5	Aug. 31	2585
Wallingford Nurseries (of Barnes Nursery & Orchard Co.)	Wallingford	75	Sept. 17	2644
Ward & Son, J. F.	Windsor	1	July 10	2466
Water Bureau of the Metropolitan District	Hartford	50	Oct. 27	2772
Watertown Nurseries, Inc.	Watertown	1	Aug. 28	2569
Wayside Farm Gardens	Thomaston	2	Aug. 16	2516
Westerly Nursery	Pawcatuck	2	Aug. 30	2574
West Hartford Gardens	West Hartford	3	Oct. 15	2756
Westover Nurseries	Stamford	1	Nov. 22	2806
Westville Nurseries, Inc.	New Haven	3	Dec. 22	2824
Wethersfield Nursery	Wethersfield	2	Sept. 8	2620
Wheeler, Charles B.	Stonington	1	Aug. 18	2537
Whittemore Co., J. H.	Naugatuck	3	Sept. 7	2615
Whittle, John	Mystic	1	Oct. 20	2763
Wightman, Elton G.	Wethersfield	1	Oct. 15	2755
Wildflower Nursery, The	Brookfield	1	July 25	2481
Wild's Nursery, Henry	Norwalk	30	Aug. 4	2497
Wilridge Nurseries	Ridgefield	5	Aug. 17	2518
Wilson, Michael L.	Litchfield	3	Sept. 17	2652
Wilson & Co., Inc., C. E.	Manchester	125	July 31	2488
Woodbridge Nurseries	New Haven	4	Oct. 19	2761
Woodcrythe	New Canaan	1	Sept. 15	2640
Woodmont Gardens	Woodmont	1	Sept. 29	2714
Woodmont Nurseries	Woodmont	83	Oct. 11	2750
Woodruff, C. V.	Orange	2	Oct. 9	2743
Woody Crest Rock Garden	Woodmont	1	Oct. 11	2754
Woody Tree Nursery	Woodmont	1	June 2	2455
Wyllie, David	Hamden	1	Sept. 29	2710
Yacko, Stephen	Clinton	2	Sept. 17	2650
Yale University Forest School Nursery	New Haven	1	Sept. 24	2674
Yale University Landscape Department	New Haven	6	Aug. 4	2501
Young's Nurseries	Wilton	1	Sept. 15	2643
Zack Co., H. J.	Deep River	10	Oct. 3	2722
TOTAL	381 nurseries	4,659 acres		

The cost of inspecting these nurseries in 1934, including additional inspection and rechecking because of European pine shoot moth and to make sure that pests had been eradicated, was approximately $1,926.

Other Kinds of Certificates Issued

During 1934, 112 duplicate certificates were issued to Connecticut nurserymen to be filed in other states. Altogether 123 dealer's permits were issued to registered dealers who do not grow the stock that they sell. Shipper's permits were issued to nurserymen in other states, who wish to ship stock into Connecticut, to the number of 152. Altogether 237 parcels of nursery stock were inspected and certified for shipment to accommodate individuals.

To meet the requirements of Federal Quarantine No. 62, 125,000 narcissus bulbs were inspected in the field in May, and 9,000 inspected when dug for shipment, and 16 certificates issued. There were also issued 131 miscellaneous certificates and special permits. Of other certificates issued, 1,772 were for shipments of shelled corn and other seeds, 85 for freedom from European corn borer, and 127 were blister rust control area permits.

Inspection of Imported Nursery Stock

A larger number of shipments containing a smaller number of plants entered Connecticut in 1934 from foreign countries than in 1933. As in other years, this stock entered the United States under specifications and permits of the Federal Bureau of Plant Quarantine, and at ports of entry was released for transit to destination points, where it was examined by state inspectors.

In 1933-1934 there were 24 shipments containing 108 separate cases and 751,475 plants, all of which were rose stocks. The inspections were made by Mr. Zappe, B. W. McFarland and L. A. Devaux. This stock was imported by four commercial rose growers: One had nine shipments containing 468,775 plants; one had eight shipments containing 160,000; one had six shipments containing 86,300, and one had one shipment containing 36,400. This stock came from the following sources:

Country	No. shipments	No. plants
Holland	21	676,475
England	2	45,000
France	1	30,000
	24	751,475

This stock consisted of *Rosa manetti,* 715,075, and *R. multiflora,* 36,400 plants.

The time required to inspect this imported rose stock was equivalent to 16 days of work for one man, and together with the cost of travel, 1,497

miles, and other necessary expenses, made a total cost of approximately $242.

In addition to the shipments of rose stocks mentioned above, there were 11 shipments of perennial and other plants, including iris, orchids, dahlia, apple and evergreens, altogether 1,093 plants of new varieties, and five shipments containing 56 pounds of tree seeds, that were examined at the Bureau of Plant Quarantine, Washington, D. C., and were not inspected in Connecticut. Reports of the 24 shipments inspected were sent to the Federal Bureau of Plant Quarantine.

Results of Inspection

Of the 24 shipments inspected, eight shipments, or 33.3 per cent, were found infested with insects or plant diseases as follows:

Insects	
Emphytus cinctus Linn.	8 shipments
Plant Diseases	
Crown gall	1 shipment

INSPECTION OF APIARIES, 1934

W. E. Britton

In 1934, the apiaries were inspected in the same manner and by the same men as in preceding years. Altogether, 1,429 apiaries, containing 7,128 colonies, were inspected in 1934, as against 1,342 apiaries and 10,927 colonies in 1933. The inspections were made by H. W. Coley of Westport, and A. W. Yates of Hartford. The total cost of inspection of apiaries in 1934 was $1,998.67.

It may be noted that these apiaries averaged 4.98 colonies each in 1934, in comparison with 8.1 colonies each in 1933. American foul brood was discovered in 27 apiaries, where 55 colonies were infested, the disease occurring in each county in the State. European foul brood was found only in one colony each in two apiaries, one in Hartford County and one in New London County.

Table 2 shows the number of apiaries and colonies inspected, the average number of colonies per apiary, and the average cost of inspecting each apiary and colony for each year since inspection began in 1910.

Table 2. Twenty-Five Year Record of Apiary Inspection in Connecticut

Year	Number apiaries	Number colonies	Average No. colonies per apiary	Average cost of inspection Per apiary	Per colony
1910	208	1,595	7.6	$2.40	.28
1911	162	1,571	9.7	1.99	.21
1912	153	1,431	9.3	1.96	.21
1913	189	1,500	7.9	1.63	.21
1914	463	3,882	8.38	1.62	.19
1915	494	4,241	8.58	1.51	.175
1916	467	3,898	8.34	1.61	.19
1917	473	4,506	9.52	1.58	.166
1918	395	3,047	7.8	1.97	.25
1919	723	6,070	11.2	2.45	.29
1920	762	4,797	6.5	2.565	.41
1921	751	6,972	9.2	2.638	.24
1922	797	8,007	10.04	2.60	.257
1923	725	6,802	9.38	2.55	.27
1924	953	8,929	9.4	2.42	.25
1925	766	8,257	10.7	2.45	.22
1926	814	7,923	9.7	2.35	.24
1927	803	8,133	10.1	2.37	.234
1928	852	8,023	9.41	2.12	.225
1929	990	9,559	9.55	2.19	.227
1930	1,059	10,335	9.76	2.01	.206
1931	1,232	10,678	8.66	1.83	.212
1932	1,397	11,459	8.2	1.60	.195
1933	1,342	10,927	8.1	1.69	.208
1934	1,429	7,128	4.98	1.40	.28

In 1934, apiaries were inspected in 164 towns. Inspections were made in 1934 in the following 19 towns not visited in 1933:

Fairfield County: Brookfield, Darien; New Haven County: Ansonia, North Branford, Seymour, West Haven; Middlesex County: Westbrook; Litchfield County: Kent, Sharon, Warren, Washington; Hartford County:

East Hartford, East Windsor, Enfield, Manchester, Marlborough, South Windsor, Suffield, Windsor Locks.

On the other hand, in the following four towns visited in 1933, no inspections were made in 1934:

New Haven County, Derby; New London County, Lyme; Hartford County, Hartford; Tolland County, Coventry.

There were two apiaries infested with European foul brood, one apiary infested with sacbrood, one apiary infested with bee paralysis, and 27 apiaries infested with American foul brood.

In 1934, European foul brood was discovered in the following towns:

New London County, North Stonington; Hartford County, Avon.

In 1934, American foul brood was discovered in the following 20 towns:

Fairfield County: Bridgeport, Greenwich, New Fairfield, Redding, Stamford; New Haven County: Cheshire, Guilford; Middlesex County: Middletown; New London County: East Lyme, Ledyard, Norwich; Litchfield County: Cornwall, Morris, Sharon; Hartford County: Bloomfield, Farmington, Glastonbury; Tolland County: Tolland, Vernon; Windham County, Windham.

Statistics of Inspection

The statistics of apiary inspection by towns and counties are given on the following pages, with summary on page 187:

INSPECTION OF APIARIES, 1934

Town	Apiaries		Colonies	
	Inspected	Diseased (Am. f. b.)	Inspected	Diseased (Am. f. b.)
Fairfield County				
Bethel	9	—	34	—
Bridgeport	2	2	9	3
Brookfield	1	—	2	—
Danbury	10	—	78	—
Darien	5	—	15	—
Easton	5	—	47	—
Fairfield	8	—	42	—
Greenwich	26	1	130	2
Monroe	1	—	3	—
New Canaan	3	—	16	—
New Fairfield	16	1	93	1
Newtown	8	—	55	—
Norwalk	2	—	8	—
Redding	9	2	51	4
Ridgefield	4	—	30	—
Shelton	1	—	16	—
Sherman	4	—	46	—
Stamford	29	1	100	1
Stratford	4	—	16	—
Trumbull	18	—	79	—
Weston	2	—	13	—
Westport	7	—	51	—
Wilton	13	—	145	—
	187	7	1,079	11

Town	Apiaries Inspected	Apiaries Diseased (Am. f. b.)	Colonies Inspected	Colonies Diseased (Am. f. b.)
New Haven County				
Ansonia	4	—	19	—
Bethany	1	—	8	—
Branford	2	—	9	—
Cheshire	10	2	71	11
East Haven	1	—	5	—
Guilford	2	1	11	1
Hamden	8	—	51	—
Madison	1	—	4	—
Meriden	12	—	122	—
Middlebury	5	—	44	—
Milford	1	—	14	—
Naugatuck	5	—	34	—
New Haven	1	—	3	—
North Branford	1	—	24	—
North Haven	3	—	19	—
Orange	1	—	8	—
Oxford	6	—	48	—
Prospect	3	—	13	—
Seymour	5	—	20	—
Southbury	4	—	161	—
Wallingford	4	—	177	—
Waterbury	6	—	22	—
West Haven	2	—	13	—
Wolcott	4	—	14	—
Woodbridge	4	—	21	—
	96		935	12
Middlesex County				
Chester	4	—	17	—
Clinton	3	—	15	—
Cromwell[1]	10	—	57	—
Durham	8	—	72	—
East Haddam	5	—	70	—
East Hampton	9	—	58	—
Essex	13	—	43	—
Haddam	2	—	34	—
Killingworth	2	—	5	—
Middlefield	4	—	114	—
Middletown[2]	13	2	81	5
Old Saybrook	7	—	29	—
Portland	8	—	35	—
Saybrook	4	—	17	—
Westbrook	1	—	8	—
	93	2	655	5
New London County				
Bozrah	1	—	35	—
Colchester	18	—	122	—
East Lyme	7	1	29	4
Franklin	1	—	3	—

[1] Two apiaries inspected twice.
[2] One colony with bee paralysis.

Town	Apiaries Inspected	Apiaries Diseased (Am. f. b.)	Colonies Inspected	Colonies Diseased (Am. f. b.)
New London County—*Continued*				
Griswold	4	—	67	—
Groton	10	—	50	—
Lebanon	10	—	124	—
Ledyard	2	2	4	4
Lisbon	4	—	27	—
Montville	5	—	78	—
New London	3	—	15	—
North Stonington[1]	4	—	60	—
Norwich[2, 3]	9	1	359	3
Old Lyme	2	—	29	—
Preston	3	—	66	—
Salem	2	—	7	—
Sprague	6	—	28	—
Stonington	7	—	33	—
Voluntown	2	—	11	—
Waterford	11	—	86	—
	111	4	1,233	11
Litchfield County				
Barkhamsted	10	—	21	—
Bethlehem	10	—	55	—
Bridgewater	4	—	39	—
Canaan	1	—	2	—
Colebrook	5	—	19	—
Cornwall	7	1	13	1
Goshen	9	—	38	—
Harwinton	9	—	13	—
Kent	9	—	40	—
Litchfield	10	—	57	—
Morris	9	1	13	3
New Hartford	20	—	22	—
New Milford	18	—	95	—
Norfolk	9	—	16	—
North Canaan	4	—	54	—
Plymouth	8	—	18	—
Roxbury	8	—	23	—
Salisbury	11	—	38	—
Sharon	14	1	119	1
Thomaston	14	—	33	—
Torrington	20	—	76	—
Warren	2	—	9	—
Washington	8	—	30	—
Watertown	17	—	58	—
Winchester	17	—	52	—
Woodbury	9	—	39	—
	262	3	992	5
Hartford County				
Avon[1]	11	—	23	—
Berlin	20	—	60	—
Bloomfield	17	1	109	2

[1] One colony with European foul brood.
[2] One apiary inspected twice.
[3] One sacbrood.

Town	Apiaries Inspected	Apiaries Diseased (Am. f. b.)	Colonies Inspected	Colonies Diseased (Am. f. b.)
Hartford County—(*Continued*)				
Bristol	12	—	33	—
Burlington	12	—	30	—
Canton	14	—	42	—
East Granby	9	—	16	—
East Hartford	15	—	36	—
East Windsor	13	—	28	—
Enfield	10	—	23	—
Farmington	14	2	33	2
Glastonbury	23	2	90	2
Granby	12	—	45	—
Hartland	5	—	25	—
Manchester	19	—	51	—
Marlborough	2	—	27	—
New Britain	27	—	108	—
Newington	18	—	48	—
Plainville	12	—	29	—
Rocky Hill	3	—	11	—
Simsbury	9	—	10	—
Southington	25	—	126	—
South Windsor	14	—	45	—
Suffield	17	—	41	—
West Hartford	23	—	87	—
Wethersfield	19	—	49	—
Windsor	23	—	67	—
Windsor Locks	3	—	15	—
	401	5	1,307	6
Tolland County				
Andover	3	—	5	—
Bolton	2	—	3	—
Columbia	10	—	69	—
Ellington	10	—	56	—
Hebron	8	—	25	—
Mansfield	23	—	65	—
Somers	12	—	39	—
Stafford	18	—	21	—
Tolland	10	1	35	2
Union	3	—	-	
Vernon	17	1	54	1
Willington	13	—	32	—
	129	2	405	3
Windham County				
Ashford	17	—	50	—
Brooklyn	10	—	86	—
Canterbury	5	—	28	—
Chaplin	2	—	10	—
Eastford	6	—	12	—
Hampton	12	—	22	—
Killingly	20	—	44	—
Plainfield	19	—	67	—
Pomfret	9	—	28	—

Town	Apiaries Inspected	Apiaries Diseased (Am. f. b.)	Colonies Inspected	Colonies Diseased (Am. f. b.)
Windham County—(*Continued*)				
Putnam	3	—	11	—
Scotland	7	—	30	—
Sterling	4	—	8	—
Thompson	10	—	34	—
Windham	15	1	35	2
Woodstock	11	—	57	—
	150	1	522	2

SUMMARY

County	Number towns	Apiaries Inspected	Apiaries Diseased (Am. f. b.)	Colonies Inspected	Colonies Diseased (Am. f. b.)
Fairfield	23	187	7	1,079	11
New Haven	25	96	3	935	12
Middlesex[1]	15	93	2	655	5
New London[2, 3]	20	111	4	1,233	11
Litchfield	26	262	3	992	5
Hartford[2]	28	401	5	1,307	6
Tolland	12	129	2	405	3
Windham	15	150	1	522	2
	164	1,429	27	7,128	55

	Number apiaries	Number colonies
Inspected	1,429	7,128
Infested with American foul brood	27	55
Percentage infested	.019	.0077
Colonies treated		30
Colonies destroyed		25
Infested with European foul brood	2	2
Average number of colonies per apiary		4.99
Cost of inspection	$1,998.67	
Average cost	1.40	$.28

[1] One colony with bee paralysis.
[2] One colony with European foul brood.
[3] One sacbrood.

Financial Statement

RECEIPTS

Appropriation year ending June 30, 1934	$2,000.00

EXPENDITURES

Salaries	$ 971.52
Travel expense (outlying)	1,017.40
Miscellaneous	9.75
Total	$1,998.67
Balance on hand July 1, 1934	1.33*
GRAND TOTAL	$2,000.00

*Reverts to State Treasury.

Registration of Bees

Section 2129 of the General Statutes provides that each beekeeper shall register his bees on or before October 1 of each year with the town clerk of the town in which the bees are kept, and that each town clerk, on or before December 1, shall report to the State Entomologist whether or not any bees have been registered, and if so, shall send a list of the names and number of colonies of each. In 1934, 1,429 apiaries containing 7,128 colonies were inspected. There were registered 642 apiaries and 4,311 colonies in 1934, and after checking the registrations and inspections, and deducting the duplications, the following figures show that at least this number of apiaries and colonies were kept in Connecticut in 1934:

	Apiaries	Colonies
Inspected	1,429	7,128
Registered but not inspected	269	1,278
Total	1,698	8,406

REPORT ON CONTROL OF THE GIPSY MOTH, 1934

W. E. Britton and John T. Ashworth

For many years efforts to suppress the gipsy moth in Connecticut have been expended in collaboration with the Bureau of Entomology and Plant Quarantine of the United States Department of Agriculture, and thanks for hearty coöperation is hereby tendered to A. F. Burgess, H. L. Blaisdell and S. S. Crossman of the Federal gipsy moth control organization at Greenfield, Mass.

It was possible for the Federal organization to employ additional men under a grant for the purpose from the Public Works Appropriation, and the territory adjoining the barrier zone was examined through Connecticut, Massachusetts and Vermont. Consequently, in planning the control work in Connecticut for 1933-34, it was agreed that the Federal forces cover the area west of the Connecticut River and that the state forces cover that portion of the State east of the Connecticut River. Neither state nor Federal forces fully attained their objectives. The areas were not entirely covered.

Some additional help was received, both east and west of the Connecticut River, from men in the Civilian Conservation Corps Camps in charge of A. F. Hawes, State Forester, and thanks and appreciation are herein expressed for his cordial coöperation. Also east of the Connecticut River additional help was received through the employment of untrained men under the Civil Works Appropriation, which became available November 15, 1933, and terminated March 29, 1934. These men had to be given a short period of training by the regular scouts, then formed into crews, each with a regular scout as foreman. Soon after these CWA men were trained and were nicely started on this work the project came to an end. However, these crews did discover several large infestations in woodlands which probably would not otherwise have been found. Some of these

infestations were sprayed by regular state employees in May and June.

This report covers all gipsy moth suppression work in Connecticut, under whatever agency it was conducted.

New Equipment

As the 1931 Chevrolet sedan used in this work had been driven approximately 78,000 miles, it was thought best to exchange it for a new one. This was done on September 14, 1933. In April, 1934, a new Fitzhenry-Guptill 1,000-lb. pressure sprayer mounted on a Ford chassis was purchased. (See Figure 13) It is like the sprayer purchased in

FIGURE 13. New Fitzhenry-Guptill Power Sprayer with Ford Chassis

1931, except for a few improvements. Both of the old Netco truck sprayers, one purchased in 1918 and the other in 1920, were disposed of after a long and satisfactory period of service. A few small tools, such as wrenches and screw drivers that were either worn out or broken, have also been replaced.

Results of Scouting

Eastern District

In the territory east of the Connecticut River, before the CWA work was started, state crews had completed work in seven towns, and had done some work in each of nine other towns in New London and Windham Counties. In East Windsor and Manchester in Hartford County, no trace of the gipsy moth was found. In East Hartford, a rather large

colony of 113 egg-clusters was discovered in oak woodland owned by Arthur Ulric, near Pewterpot Brook, in the southern central portion of the town. Here about four acres of woodland were sprayed early in June. This was the largest infestation found in Hartford County, east of the Connecticut River.

The towns of Andover and Bolton in Tolland County were scouted by state crews and four infestations were discovered in each town. In Andover, the largest infestation was in the southern end of the town near the Columbia-Hebron town line, and contained 2,342 egg-clusters. The largest infestation in Bolton contained 170 egg-clusters and was near the center of the town on land owned by S. M. Alvord.

As soon as the egg-laying season was over, a crew was put to work in Groton at the large infestation where some 30 acres of woodland were defoliated last year, and were kept there until November 24, when CWA work was started. Then all state men were needed elsewhere for the training and supervision of the CWA men. After a short period of training, crews were organized and put to work in each of the following towns: Ashford, Brooklyn, Canterbury, Eastford, Killingly, Plainfield, Pomfret, Putnam, Sterling, Thompson, Windham and Woodstock in Windham County; Colchester, Griswold, Groton, Lebanon, New London, North Stonington, Norwich, Salem, Stonington and Waterford in New London County. Infestations were discovered in each of these towns.

Thus the employment of CWA men gave us an opportunity to obtain a check on conditions over the eastern third of the State, which would not have been possible inasmuch as the appropriation for the biennial period was materially reduced so that it became necessary to discharge some of the regular trained men. Although the scouting work was completed in only four of the towns mentioned above, and two of these were finished by state men after the CWA work ceased in March, the results of the scouting work done in this territory brought to light several large infestations. It proved, what had been suspected, that colonies, which must be reckoned with later, are building up in the woodlands in this section of the State. Unless larger appropriations are forthcoming, extensive defoliation may be expected in some localities within the near future.

Scouting work was completed in the towns of Groton and New London, in New London County, and in Plainfield and Windham, in Windham County. As has already been mentioned, much work was done at the large Groton Long Point infestation. Early in the fall, arrangements were made with State Forester Hawes, in charge of the CCC camps in Connecticut, to have a force of men from Camp Chapman cut and burn brush in and around the infested area. These men kept busy until the arrival of the CWA men, when they were returned to their camp. State and CWA men then finished the work, and altogether 284,664 egg-clusters were found and creosoted at this infestation and more than a ton of lead arsenate was used to spray the area. Most of the territory around this infestation has already been scouted this season and we are pleased to report that there will be nearly 280,000 fewer egg-clusters this year than were found last year. However, some of the trees defoliated there in 1933 did not put out leaves in 1934, as may be seen in Figure 14, photographed in July.

The towns along the eastern border of Connecticut were found to be generally infested, and in Stonington and North Stonington heavy feeding by the caterpillars was observed in certain localities in July. Heavy infestations also occurred in portions of Colchester, Columbia, Ellington, Lebanon, Mansfield, Stafford and Union. The table of statistics shows that several thousand egg-clusters were destroyed in each of these towns.

So far as gipsy moth suppression is concerned, it is to be regretted that the life of the CWA project was so short. It required about two of the four months, or half its life, to assemble, equip and train the men before they could do this work efficiently. However, the results accomplished may be considered well worth the efforts expended.

FIGURE 14 View of Trees at Groton, Defoliated by Gipsy Moth Caterpillars in 1933. Some of these Trees did not Leaf out in 1934. Photo June 14, 1934.

After the CWA work ceased late in March, the regular scouts reassembled and carried forward the work in some of the towns where the CWA men had left off, and continued scouting until the spraying season opened. At the close of the spraying season, they scouted for caterpillars and pupae around infestations that had just been sprayed. Infestations in 12 towns west of the Connecticut River were visited, and in eight of these towns, 1,621 larvae and pupae were destroyed. In the territory east of the Connecticut River, 11 towns were visited and 11,520 larvae and pupae were found and destroyed.

Western District

In the territory west of the Connecticut River, all scouting and spraying was done by PWA and CCC men under Federal supervision. Altogether,

36 towns were completely scouted and 32 towns partially covered. The gipsy moth was found to be present in 35 of these towns. More than 1,000 egg-clusters were creosoted in each of four towns as follows: Canton, 1,572; Granby, 10,661; Middletown, 1,462 and Wolcott, 2,670. Under the system of "block scouting", or scouting everything between roads, approximately 417,274 acres of woodland were examined in addition to all scattered trees in the open country.

The most heavily infested of these was Granby, where about two-fifths of the town was covered and about 9,007 acres of woodland, and 28 miles of roadside in the western portion of the town were examined. Most of the infestations were in the southwest corner which is generally infested, and the scouts found scattered egg-clusters nearly everywhere. Altogether, 10,661 egg-clusters were creosoted in Granby.

In Wolcott, the second most heavily infested town, 7,821 acres of woodland were scouted and 470 acres sprayed. Altogether, 2,670 egg-clusters were creosoted; 2,590 of these were in and around last year's infestation, and the others were in two small colonies outside of that area.

Canton was the third town most heavily infested, and in it 1,572 egg-clusters were found and creosoted. These were in eight colonies scattered over the northern third of the town, and the largest colony in the northeast corner near the Granby-Simsbury line contained 1,300 egg-clusters.

Middletown was the fourth most heavily infested town, and in it four infestations were discovered, altogether containing 1,462 egg-clusters. Two of these were large and particularly dangerous because they were both situated on high elevations with great possibilities of wind spread. One, on a wooded ridge in the northwest corner of the town near the Berlin line, contained 771 egg-clusters. The other was just west of the city proper, on willow trees along the Air Line Railroad, and contained 655 egg-clusters. Altogether, 12,046 acres of woodland were scouted in Middletown and 483 acres were sprayed.

Guilford and Killingworth were found infested this year for the first time. In Guilford the scouting revealed two infestations containing 92 egg-clusters; 203 acres of woodland were sprayed by Federal men. In Killingworth a colony of 36 egg-clusters was discovered.

Durham and North Branford were completely scouted and no traces of the gipsy moth were found. In Cheshire, Chester and Wallingford, scouting was confined to the territory around former infestations, and no gipsy moths were discovered.

Thus in 1933-34, work was done in 107 towns; 453 infestations were found; 434,410 egg-clusters creosoted; 13,125 larvae and pupae killed; 47 infestations, including 3,045 acres of woodland and 1,721 separate trees, sprayed; 4,252 miles of roadside and 435,581 acres of woodland were scouted. In addition 13,828 acres of open country were scouted by CCC men. In the spraying operations state men used 7,500 pounds of lead arsenate. Federal men applied 37,425 pounds in the barrier zone and 62,910 pounds between the barrier zone and the Connecticut River. This makes a grand total of 107,835 pounds, or 53.9 tons of lead arsenate.

The statistics of the infestations in these towns are given on the following pages, with a summary on page 195.

STATISTICS OF INFESTATIONS, 1933-34

Town	Infestations found	Egg-clusters creosoted	Infestations sprayed	Poison used (lbs.)	Larvae and pupae killed	Roadside scouted (miles)	Woodland scouted (acres)
Windham County							
Ashford	1	256	0	0	0	0	50
Brooklyn	5	5,701	0	0	3,243	2	382
Canterbury	18	1,322	0	0	0	13	168
Eastford	2	1,884	0	0	0	0	376
Hampton	3	27	0	0	0	1	34
Killingly	24	3,647	4	53	1,677	3	1,031
Plainfield	68	11,012	12	116	3,351	97	446
Pomfret	8	1,182	0	0	0	13	124
Putnam	16	6,761	0	0	0	11	874
Sterling	14	1,268	1	15	0	4	506
Thompson	4	2,484	0	0	585	0	403
Windham	6	4,370	3	270	0	72	2,056
Woodstock	2	2,510	0	0	0	4	263
	171	42,424	20	454	8,856	220	6,713
New London County							
Colchester	1	4,461	0	0	0	0	444
East Lyme	0	0	0	0	0	16	0
Griswold	11	831	0	0	0	64	159
Groton	13	286,651	3	2,655	184	107	2,239
Lebanon	4	10,008	0	0	0	4	824
New London	1	9,210	0	0	95	17	24
Norwich	5	1,500	0	0	640	66	50
No. Stonington	10	5,521	2	143	0	9	408
Preston	6	2,889	0	0	62	16	1,354
Salem	5	541	4	535	77	0	103
Stonington	1	6,792	1	750	0	11	13
Waterford	3	92	1	143	36	77	1,531
	60	328,496	11	4,226	1,094	387	7,149
Tolland County							
Andover	4	2,561	2	1,275	0	40	96
Bolton	4	363	3	540	0	58	0
Columbia	17	17,705	0	0	1,570	20	1,552
Ellington	4	907	2	360	0	0	299
Mansfield	1	1,760	1	10	0	1	0
Stafford	33	16,983	3	290	0	66	1,521
Tolland	2	11	1	105	0	0	614
Willington	9	1,461	2	15	0	0	363
	74	41,751	14	2,595	1,570	185	4,445
Middlesex County							
Chester[1]	0	0	0	0	0	17	9,771
Clinton[1]	0	0	0	0	0	29	4,175
Cromwell[1]	0	0	0	0	0	38	2,948
Durham[1]	0	0	0	0	0	59	6,330
East Hampton[1]	0	0	0	0	0	1	998
Haddam[1]	1	1	0	0	0	85	23,020
Killingworth[1]	1	36	0	0	0	86	14,238
Middlefield[1]	3	77	310 acres	0	0	37	3,688
Middletown[1]	4	1,462	483 acres	0	0	136	12,046

[1] Indicates work performed by men under Federal supervision.

Town	Infestations found	Egg-clusters creosoted	Infestations sprayed	Poison used (lbs.)	Larvae and pupae killed	Roadside scouted (miles)	Woodland scouted (acres)
Middlesex County—(*Continued*)							
Old Saybrook[1]	0	0	0	0	0	36	2,655
Saybrook[1]	0	0	0	0	0	36	4,410
Westbrook[1]	0	0	0	0	0	9	3,905
	9	1,576	793 acres	0	0	569	88,184
Hartford County							
Avon[1]	0	0	0	0	0	10	873
Berlin[1]	2	34	32 acres	0	0	58	5,236
Bristol[1]	0	0	0	0	0	80	6,993
Burlington[1]	4	296	18 acres	0	176	76	12,078
Canton[1]	8	1,572	0	0	0	68	6,861
East Granby[1]	6	189	0	0	0	26	6,192
East Hartford	1	113	1	105	0	65	0
East Windsor	0	0	0	0	0	61	0
Enfield	2	47	1	120	0	92	5
Farmington[1]	3	59	0	0	0	78	8,284
Granby[1]	20	10,661	0	0	0	28	9,007
Hartford[1]	0	0	0	0	0	16	41
Hartland[1]	24	872	0	0	351	55	16,112
Manchester	0	0	0	0	0	81	0
Marlboro	1	15	0	0	0	54	3
New Britain[1]	2	558	29 acres	0	9	50	2,400
Newington[1]	1	30	0	0	0	37	3,635
Plainville[1]	0	0	0	0	0	26	2,290
Rocky Hill[1]	1	7	0	0	0	39	3,442
Simsbury[1]	4	425	0	0	7	31	6,475
Southington[1]	2	64	40 acres	0	0	109	10,207
Suffield[1]	1	26	0	0	0	25	1,200
West Hartford[1]	1	6	0	0	0	47	890
Wethersfield[2]	1	641	0	0	554	41	1,388
Windsor[1]	2	27	0	0	0	55	4,445
Windsor Locks[1]	0	0	0	0	0	28	1,187
	86	15,642	2 col. 119 acres	225	1,081	1,336	109,244
New Haven County							
Ansonia[1]	0	0	0	0	0	10	873
Beacon Falls[1]	0	0	0	0	0	3	890
Branford[1]	2	40	1,721 trees	0	0	58	6,185
Cheshire[1]	0	0	0	0	0	9	1,029
Derby[1]	0	0	0	0	0	1	155
Guilford[1]	2	92	203 acres	0	0	119	18,079
Madison[1]	0	0	0	0	0	85	22,815
Meriden[1]	1	326	375 acres	0	0	110	4,174
North Branford[1]	0	0	0	0	0	39	9,427
North Haven[1]	0	0	0	0	0	69	3,213
Orange[1]	0	0	0	0	0	0	25
Prospect[1]	0	0	0	0	0	2	196
Seymour[1]	0	0	0	0	0	3	270
Southbury[1]	0	0	0	0	0	35	3,544
Wallingford[1]	0	0	0	0	0	1	451
Waterbury[1]	0	0	0	0	0	136	2,003

[1] Indicates work performed by men under Federal supervision.
[2] 194 egg-clusters, 554 larvae and pupae killed by state men; other work in Wethersfield done by Federal men.

Town	Infestations found	Egg-clusters creosoted	Infestations sprayed	Poison used (lbs.)	Larvae and pupae killed	Roadside scouted (miles)	Woodland scouted (acres)
New Haven County—(*Continued*)							
Wolcott[1]	3	2,670	470 acres	0	0	52	7,821
Woodbury[1]	0	0	0	0	0	1	50
	8	3,128	1,048 acres 1,721 trees	0	0	733	81,200
Litchfield County							
Barkhamsted[1]	10	369	0	0	432	73	12,614
Canaan[1]	10	125	347 acres	0	0	37	11,440
Colebrook[1]	1	1	0	0	46	60	16,114
Cornwall[1]	5	28	87 acres	0	0	43	9,495
Harwinton[1]	3	75	62 acres	0	0	84	10,425
Kent[1]	1	36	124 acres	0	0	25	6,994
New Hartford[1]	3	138	39 acres	0	46	84	13,780
Norfolk[1]	4	411	254 acres	0	0	20	6,797
North Canaan[1]	2	89	172 acres	0	0	24	2,887
Plymouth[1]	0	0	0	0	0	57	6,638
Roxbury[1]	0	0	0	0	0	1	150
Salisbury[1]	0	0	0	0	0	10	3,798
Sharon[1]	0	0	0	0	0	15	3,117
Thomaston[1]	0	0	0	0	0	49	3,976
Torrington[1]	0	0	0	0	0	114	10,836
Warren[1]	5	115	0	0	0	38	6,880
Winchester[1]	1	6	0	0	0	87	12,655
Woodbury[1]	0	0	0	0	0	1	50
	45	1,393	1,085 acres	0	524	822	138,646

Summary of Statistics

County	Towns covered	Infestations found	Egg-clusters creosoted	Infestations sprayed	Poison used (lbs.)	Larvae and pupae killed	Roadside scouted (miles)	Woodland scouted (acres)
Windham	13	171	42,424	20	454	8,856	220	6,713
New London	12	60	328,496	11	4,226	1,094	387	7,149
Tolland	8	74	41,751	14	2,595	1,570	185	4,445
Middlesex	12	9	1,576	793 acres	0	0	569	88,184
Hartford	26	86	15,642	2 119 acres	225	1,081	1,336	109,244
New Haven	18	8	3,128	1,048 acres	0	0	733	81,200
Litchfield	18	45	1,393	1,085 acres	0	524	822	138,646
	107	453	434,410	47 3,045 acres 1,721 trees	7,500 100,335[2]	13,125	4,252	435,581 13,828[4]

[1] Indicates work performed by men under Federal supervision.
[2] Federal men applied 37,425 pounds of lead arsenate in barrier zone and 62,910 pounds between barrier zone and the Connecticut River.
[4] CCC workers scouted 13,828 acres of open country.

Financial Statement

RECEIPTS

Appropriation year ending June 30, 1934	$39,430.00
June 28, 1934, transferred from Insect Pest Appropriation	600.00
	$40,030.00

EXPENDITURES

Salaries	$12,377.75
Labor	18,745.08
Stationery and office supplies	75.74
Insecticides	1,026.50
Small hardware	17.22
Automobile oil	97.75
Telephone	86.45
Travel expense (outlying)	275.84
Travel expense (gasoline for automobiles)	956.45
Freight and express	14.71
Fuel	42.50
Electricity	23.00
Automobiles (new)	4,600.90
Automobiles (repairs)	382.10
Other equipment (new)	380.81
Other equipment (repairs)	20.82
Rent of land, storehouse	418.50
Insurance	399.02
Medical supplies	5.30
Scientific supplies	22.50
Fees	13.50
Miscellaneous contingent expenses	46.95
Total Disbursements	$40,029.39*
Balance on hand July 1, 1934	.61**
	$40,030.00

*In addition to this amount, $170.25 was paid out of Insect Pest Appropriation.
**Reverts to State Treasury.

Quarantine Changes

During the year the only quarantine changes affecting Connecticut were made in Federal Quarantine No. 45, involving the three towns of Montville, Salem and Waterford in New London County. These towns for several years have been considered as being lightly infested and were in the green area on the Federal quarantine map. Becoming effective October 2, 1934, these towns were transferred to the generally infested area and are shown on the accompanying map, Figure 15.

Parasites

Little work was done on parasites by the state staff in 1933-1934. Some egg-clusters, larvae and pupae were collected in Thompson, and sent to the Gipsy Moth Laboratory, 1156 Main Street, Melrose Highlands, Mass. Mr. C. W. Collins has reported on this material as follows: Of 24 egg-clusters examined, 9.84 per cent of the eggs had been parasitized by *Anastatus disparis* Ruschka, formerly known as *Anastatus bifasciatus;*

71 third instar larvae, no parasitism; 100 fifth instar larvae, 26 per cent parasitized by the two-winged fly, *Compsilura concinnata* Meig.; from 34 male and 35 female pupae, three maggots of the two-winged fly, *Sturmia scutellata* Rob.-Desv., were reared from the female pupae; of 206 pupal remains, 11.16 per cent showed that the pupae had been destroyed by the European Calosoma or ground beetle, *Calosoma sycophanta* Linn., which is not a parasite but a predator. These records show that natural enemies are present in Thompson, where little control work has been done for several years, and evidently destroy 40 per cent or more of certain stages of the gipsy moth.

Recommendations

The present gipsy moth conditions are set forth in the preceding pages. In view of the fact that former appropriations have permitted roadside

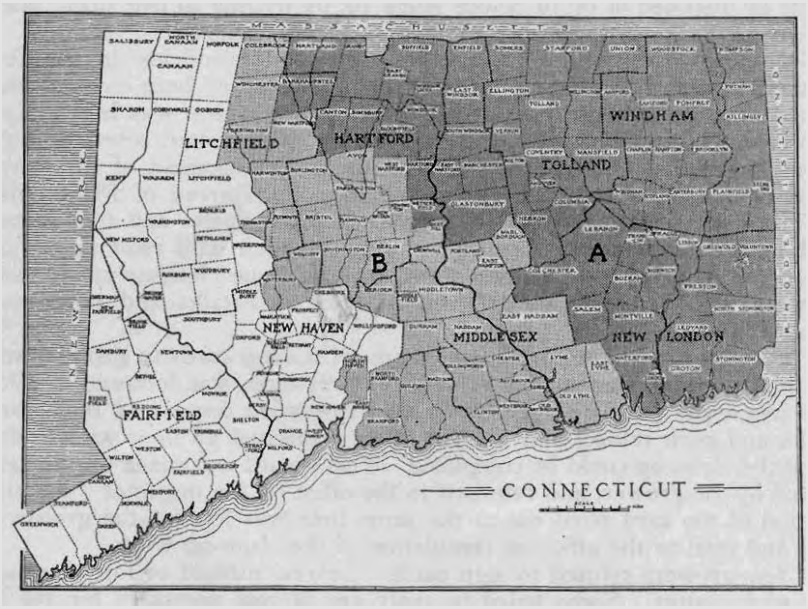

FIGURE 15. Map of Connecticut Showing Areas Regulated by Federal and State Quarantines, because of the Gipsy Moth. A, Generally Infested; B, Lightly Infested.

and open scouting on only a portion of the territory that needed to be covered; that several large woodland infestations have been discovered; that there is reason to expect that infestations have been building up in other towns, although not yet discovered; we recommend that the appropriation for the biennial period of 1935-1937 be increased to $100,000, or $50,000, annually.

THE EUROPEAN CORN BORER IN CONNECTICUT, 1934

W. E. Britton, M. P. Zappe, J. P. Johnson and N. Turner

This paper is a report for 1934 on: The European corn borer compulsory clean-up, in charge of Mr. Zappe; surveys of damage to early and late sweet corn, degree of infestation by first and second generation borers, in charge of Mr. Johnson; and infestation conditions in certain weed areas, the information for which was supplied by Mr. Turner.

Spring Enforcement of the Compulsory Clean-up

The compulsory clean-up was enforced under the provisions of Section 2125 of the General Statutes. On February 13, Director Slate issued the clean-up order requiring that all cornstalks, stubble, and the larger weeds be disposed of on or before April 10, by feeding to live stock, burning, or plowing under cleanly to a depth of six inches.

Beginning April 18, 22 inspectors canvassed cornfields in the four southern counties of the State. After this territory had been covered, they moved into the four northern counties where the season was later. Each inspector was supplied with a motor vehicle and allotted seven or eight towns, depending on the size and agricultural development of the towns. Most of the motor cars were borrowed from the Bureau of Plant Quarantine of the United States Department of Agriculture, and this Station paid for their operation. Inspectors were supplied with road maps, and instructed to drive over all roads and see and issue clean-up cards to all growers who had not yet disposed of their cornstalks and other corn material.

The system in vogue for several years, of issuing cards to growers who still had cornstalks or stubble present on their land, was followed in 1934. The inspectors gave instructions to the growers to dispose of their cornstalks and corn refuse, and in most cases requested an approximate date when the clean-up could be completed. This record was made on the card, signed by the grower, and returned to the office by the inspector. Another portion of the card filled out at the same time was left for the grower to sign and mail to the office on completion of the clean-up work.

A few growers refused to sign cards. Several mislaid or lost them and replied by letter. Some failed to reply and it was necessary for the inspector to visit them again. Altogether, 4,853 order cards were issued by the inspectors, and 3,736 replies (or 77 per cent) returned to the office stating that the clean-up had been completed. There were no replies received from 1,117, or 23 per cent, of the order cards issued.

It was discovered that some growers had returned their cards before they had disposed of their cornstalks, stubble and weeds. In such cases the inspectors visited the growers again and warned them that they must finish the clean-up work immediately or legal measures would be taken to force them to do so.

On account of the abnormal rainfall the land was unusually wet and could not be plowed. Some fields were under water until after the first of May. Consequently, many extensions of time were requested by growers, and granted. In general the farmers were willing to coöperate with the

inspectors, but there are always a few who either refuse or fail to do so. After warning such persons two or three times without results, 20 growers were arrested. All were found guilty. Some were given small fines and costs and others were assessed only costs; some were fined and the fines remitted if the clean-up was completed by a definite date. In all cases the courts required the growers to clean up the land and the inspectors notified the courts when the clean-up had been completed.

The entire cost of the spring clean-up was about $5,156.21.

Fall Clean-up Campaign

Because of the difficulties encountered in obtaining a satisfactory disposal of cornstalks, stubble and weeds before the time of emergence of adult moths in May, it was thought best to try beginning inspections in the fall in certain heavily infested areas. Consequently, the clean-up order was issued on September 24, 1934, by Director Slate. It included rules and regulations regarding close cutting, plowing under of stubble before December 1, and the disposal of cornstalks, cobs and the larger weeds on or before April 10, 1935. In other words this clean-up order covered both late fall and early spring operations, and the printed order contained the statement that "this will be the only notice given to the owner".

On September 27, 10 inspectors were sent into the field to talk with the growers and to persuade them to have all stubble plowed under before December 1, and to dispose of all cornstalks, weeds, flower stems and other material subject to infestation by the European corn borer, before April 10, 1935. In case corn had not been harvested, the inspectors were instructed to persuade the growers to cut the stalks flush with the ground, so that early spring plowing would not be necessary for the control of the European corn borer.

As it was manifestly impossible to cover the entire area of the State in six or eight weeks with this number of men, the inspectors were sent into the principal corn growing sections, particularly where there had been heavy infestation by the European corn borer. The inspectors, therefore, covered the southern, central and southwestern portions of the State, and no work was done in the northeastern or northwestern portions where inspections will undoubtedly be made next spring.

The inspectors were permitted to use their own cars, for which they were remunerated on a mileage basis. Their work ceased at the end of November. Altogether, 5,796 notices were issued to growers in the towns covered, which are about half the number of towns in the State.

Instead of the return post card notices formerly used, a new form of notice printed on one side of a sheet was adopted. The top half of the sheet was a blank for registering the grower, to be filled out by the inspector with name, address, date, location, acreage and uses of corn, kind of corn, acreage of weed areas, owner or tenant, and instructions for clean-up. When filled out, the inspector placed a piece of carbon paper under it and made a carbon copy for the office files. The sheet was signed by both the inspector and the grower. The original sheet was left with the grower, and on the lower half was printed the clean-up order with rules and regulations, and the law, Section 2125.

The results of this fall clean-up campaign have been rather encouraging. The weather during October and November was favorable for plowing and clean-up work and many fields have been cleaned up and plowed that ordinarily would have been left until spring. Second visits were not made, but if any corn refuse remains after April 10, 1935, the owners or managers may be prosecuted without further warning.

The cost of this fall clean-up campaign was approximately $3,510.48.

Damage to the Corn Crop

Notwithstanding the compulsory clean-up, which for five years has been enforced as thoroughly as was possible at reasonable cost, there was severe damage to the sweet corn crop in certain sections of Connecticut in 1934. This was particularly noticeable in the Hartford area on early sweet corn. Consequently it seemed advisable to make damage surveys in certain areas of heavy infestation, and the methods and results of these surveys are described in the following pages.

Damage to Early Sweet Corn by First Generation Borers

The corn borer damage survey was conducted in a manner similar to that used during the season of 1933. Three men were engaged to collect the field data from the growers. The actual number of ears damaged and the resulting loss in dollars and cents were obtained from the information received from the growers and by checking the fields. This included the number of ears that were discarded because of injury, or that could not be sold because of the borer infestation. The prices used to compute the financial loss were those existing on the day or days the information was obtained. These prices included wholesale as well as retail sales. As a great many of the growers have roadside stands, it was very simple to obtain prevailing retail prices, while a check was made in the markets for prevailing wholesale prices.

By questioning growers, information was obtained concerning fields where the corn borer infestation was heavy enough to cause damage. Many other sources were also used in collecting information concerning fields where corn borer damage had occurred. On the whole, only those growers whose farms were heavily infested were visited to obtain the commercial losses. The figures presented below are not average figures for a given section, but represent actual losses to the growers interviewed. The losses varied from six dollars ($6.00) to several hundred dollars each for individual growers. The authors do not claim that these figures are the total losses for the year in Connecticut, but are those which occurred on one hundred and seventy-nine (179) farms visited. If more men had been employed in gathering this information, more farms could have been visited, and the total damage observed and recorded would have been increased. There is no question that the figures presented represent only a portion of the total losses of the growers of sweet corn in the State of Connecticut during the season of 1934.

TABLE 3. DAMAGE BY FIRST GENERATION BORERS

County	Locality	No. Farms	No. Acres	Commercial Loss	Roadside Stands Without Acreage	Loss to Roadside Stand Owners
Hartford						
	Wethersfield	4	2.89	$164.90		
	Windsor	12	17.92	738.72		
	Rocky Hill	7	14.89	1,350.60		
	Manchester	4	18.35	440.75		
	Glastonbury	6	13.38	614.55		
	Southington	2	2.25	44.33		
	New Britain	3	5.00	196.75		
	Enfield	3	6.00	376.35		
	East Hartford	23	37.53	2,421.84		
	West Hartford	5	15.00	508.50		
	Bloomfield	6	12.25	480.00		
	Total	75	145.46	$7,337.29		
New Haven						
	Northford	1	10.00	129.60		
	Milford	15	29.08	1,819.45	2	$23.15
	Wallingford	1	.37	7.14		
	Hamden	16	44.56	1,878.50	3	83.81
	North Branford	5	11.11	495.85		
	New Haven	1	1.25	37.50		
	Seymour	1	1.50	91.70		
	Orange	1	.19	6.00	2	60.84
	East Haven	3	6.00	583.50		
	Cheshire	4	6.00	308.70		
	North Haven	17	34.60	2,144.90		
	Clintonville	3	4.50	63.08		
	Total	68	149.16	$7,565.92	7	$167.80
Middlesex						
	Middletown	5	6.00	195.25		
	Portland	4	3.76	358.90		
	Total	9	9.76	$554.15		
Windham						
	Putnam	1	1.00	50.00		
	Woodstock	2	5.00	465.00		
	Willimantic	3	7.00	105.00		
	Total	6	13.00	$620.00		
Fairfield						
	Stratford	7	14.75	555.83		
	Westport	4	9.00	401.25		
	Brookfield	1	2.50	18.60		
	Trumbull	1	2.00	36.00		
	Danbury	2	2.40	73.60	1	75.00
	Norwalk	—	— —	— —	1	15.00
	Bridgeport	—	— —	— —	1	78.75
	Total	15	30.65	$1,085.28	3	$168.75

TABLE 3. DAMAGE BY FIRST GENERATION BORERS—(*Continued*)

County	Locality	No. Farms	No. Acres	Commercial Loss	Roadside Stands Without Acreage	Loss to Roadside Stand Owners
Litchfield						
	New Milford	5	18.50	$561.25		
New London						
	Stonington	1	1.00	$120.00		
	Grand Total	179	367.53	$17,843.89	10	$336.55

Table 3 indicates that there was an average loss of $48.55 an acre for the 367.53 acres investigated on 179 farms by the first generation corn borer. It was noticed during the season, where extensive damage occurred, that the districts extended over a much larger area than in 1933. This was true in the Hartford and New Haven market gardening sections, and damage was also noticeable in southern Fairfield County and in the Windsor section of Hartford County. As yet, comparatively little damage has occurred around Danbury and that portion that lies north of it in Fairfield and Litchfield Counties.

TABLE 4. DAMAGE BY SECOND GENERATION BORERS

County	Locality	No. Farms	No. Acres	Commercial Loss
Hartford				
	East Hartford	4	4.82	$253.61
	Wethersfield	5	13.95	272.50
	Glastonbury	7	11.85	185.65
	Manchester	1	.50	10.00
	Rocky Hill	1	4.00	96.00
	Bloomfield	2	4.00	84.00
	West Hartford	1	1.00	84.00
	Total	21	40.12	$985.76
New Haven				
	Branford	5	11.50	$316.50
	Guilford	2	3.00	105.00
	Northford	1	.35	6.80
	North Haven	2	8.03	61.40
	Total	10	22.88	$489.70
Middlesex				
	Middletown	1	.63	28.00
	Grand Total	32	63.63	$1,503.46

As in the preceding year, it was rather difficult to obtain information on a large scale basis concerning damage done by the second generation borer to the late sweet corn, due to the scarcity of large fields of late corn. However, the survey results, as shown in Table 4, indicate that

there was an average loss of $23.63 an acre to 63.63 acres, on the 32 farms visited.

Ensilage corn was heavily infested in many districts and stalk breakage was observed in a number of fields.

TABLE 5. REDUCTION IN ACRES DUE TO HEAVY INFESTATION

County	Locality	Acres Reduced	Total
New Haven			
	North Haven	19.50	
	New Haven	2.50	
	Milford	8.00	
	Clintonville	1.50	
	Cheshire	2.50	
	East Haven	12.00	
			46.00
Fairfield			
	Stratford	5.00	
	Westport	10.00	
			15.00
Hartford			
	East Hartford	80.00	
	Glastonbury	26.00	
	Bloomfield	8.25	
	Southington	2.00	
	South Windsor	5.60	
	Enfield	7.75	
	New Britain	1.50	
			131.10
Middlesex			
	Portland	1.50	
	Middletown	2.40	
			3.90
Windham			
	Woodstock	1.00	
	Willimantic	4.50	
	Putnam	1.00	
			6.50
New London			
	Stonington	1.00	
			1.00
	Grand Total		203.50

When growers were interrogated on the damage survey, they were asked if they had reduced the number of acres planted to sweet corn because of the European corn borer infestation the previous season. The figures in Table 5 show that there was a reduction of 203.50 acres planted in 1934 under those planted in 1933. Estimating a conservative yield of 6,000 ears, or 500 dozen per acre, at an average price of 20 cents

per dozen, there is an added loss to the growers' income of $20,350.00, because of the reduction in the acreage planted to sweet corn.

Increase in Degree of Infestation

A survey to determine the degree of infestation in various corn-growing areas in Connecticut has been made each year for the past four years, beginning in 1931. In certain sections the survey covers only three years. So far as possible, the same farms were visited and the corn examined was either in the same fields or on fields not far distant.

When the survey was being made on the first generation corn borer damage in early sweet corn, it was found that the borer population was as high as 1,810 borers per 100 stalks, or 351,140 borers to an acre. This occurred in a field of sweet corn in East Hartford. There were many fields in this town, as well as others, where it was found that the borer population was over 1,000 to 100 stalks.

The fall borer population survey, or what might properly be called the second generation survey, was made in Glastonbury, Wethersfield, Milford, Orange, Woodbridge, Groton, Ledyard, Montville, New London, Stonington and Waterford. The figures obtained are shown in Table 6.

It will be noted in Table 6, that a great increase in infestation over that of 1933 was reported in every town except New London where a slight decrease was noted. This survey was made in fields of sweet, flint, dent, and ensilage corn, and it was made near or on the farms surveyed in 1933. The approximate cost of this survey of cornfields was $917.59.

Weed Survey

Late in the season it became evident that weed infestation has an important bearing on the corn borer situation, and a survey of weed infestation, particularly in the Connecticut River Valley, was undertaken. Preliminary observations made in Danbury, Westport, Groton and Hamden showed that the population of borers in weeds was unimportant in these towns. Extensive examinations of weed areas in East Hartford showed that on waste land in the Connecticut River meadows as many as 28,000 borers to the acre were present in weeds. Weeds growing in cornfields contained from 100,000 to 212,000 borers to the acre. Corn itself contained as many as 218,000 borers to the acre. Land out of cultivation showed from 9,000 to 77,000 borers to the acre.

In Glastonbury, weeds on waste land had 8,000 borers, weeds in cornfields 43,000, and corn itself 54,000 borers to the acre. In Wethersfield, field corn had 23,000 borers, weeds in the field, 26,000, and weeds on the meadows, 15,000, to the acre. A small weed area in Rocky Hill had 19,000 borers to the acre. In South Windsor, no borers were found in weeds in 10 different localities.

The infested weeds were mostly smartweed (Polygonum, several species), ragweed (*Ambrosia artemisiifolia*), giant ragweed (*Ambrosia trifida*), pigweed (*Amaranthus retroflexus*), lambs quarters (*Chenopodium album*) and cocklebur (Xanthium sp.).

TABLE 6. INCREASE IN DEGREE OF INFESTATION, 1931 TO 1934

Towns		Acres Surveyed	Per cent of Infestation	Average No. Borers per. Inf. Plant	Maximum Borers per Plant	Borers per 100 Plants Inf. or Uninfested	Borers per Acre[1]
Hartford County							
Glastonbury	1934	4.61	88.00	8.52	21	749.76	145,453
	1933	4.59	49.80	7.80	26	388.40	75,349
	1932	6.6	42.40	5.47	13	231.93	44,994
Wethersfield	1934	5.30	82.40	9.46	34	778.50	151,029
	1933	25.60	83.00	6.10	14	506.30	98,222
	1932	12.71	47.40	8.60	53	407.64	79,082
New Haven County							
Milford	1934	9.32	89.20	7.46	20	665.43	129,093
	1933	21.24	87.20	4.56	13	397.60	76,124
	1932	16.88	35.40	1.58	7	55.93	10,850
	1931	14.26	24.00	3.00	10	72.00	13,967
Orange	1934	12.53	93.12	9.24	20	860.42	166,921
	1933	11.05	61.80	3.90	16	241.00	46,754
	1932	14.38	20.80	2.04	8	42.43	8,231
	1931	2.33	4.88	1.74	8	8.49	1,643
Woodbridge	1934	9.28	55.60	4.46	19	247.98	48,108
	1933	13.39	13.60	1.82	8	24.75	4,792
	1932	9.00	7.6	1.87	3	14.21	2,757
New London County							
Groton	1934	9.87	74.4	7.30	14	547.5	106,215
	1933	13.69	80.8	5.92	20	478.3	92,790
	1932	2.91	75.6	3.76	8	284.26	55,146
	1931	2.39	62.32	7.14	27	444.96	85,883
Ledyard	1934	7.73	77.00	5.10	11	398.80	77,378
	1933	2.52	39.00	2.24	9	87.36	16,948
	1932	3.06	37.00	2.08	6	76.96	14,930
	1931	6.00	26.96	2.64	13	68.48	13,308
Montville	1934	10.92	76.8	7.10	21	551.40	109,416
	1933	3.83	35.6	2.44	9	86.86	16,851
	1932	2.82	24.8	1.60	4	39.68	7,698
	1931	6.50	17.52	3.58	20	62.72	12,158
New London	1934	2.20	86.00	6.52	13	560.7	108,776
	1933	.15	100.00	6.8	8	680.0	131,920
	1932	Back Yard	60.00	2.6	5	156.00	30,264
	1931	1.04	69.84	7.5	17	523.8	101,738
Stonington	1934	28.91	72.8	8.16	14	594.04	115,243
	1933	3.37	70.6	3.30	11	232.98	45,188
	1932	4.09	46.8	2.28	12	106.7	20,700
	1931	6.57	44.08	5.48	35	241.56	46,841
Waterford	1934	8.54	73.00	5.70	14	416.1	80,723
	1933	7.49	89.6	4.08	8	365.5	70,907
	1932	4.85	63.00	3.08	7	194.04	37,644
	1931	8.18	35.04	2.82	10	98.81	19,185

[1]Average based on 19,400 plants per acre.

This survey showed that weeds were infested with borers in several towns, but that only East Hartford, Glastonbury, Rocky Hill and Wethersfield had weed areas heavily infested. In these towns the most heavily infested weeds were in the cornfields and these will be destroyed by regular clean-up measures. Weeds on land out of cultivation and on waste land in the river meadows were less heavily infested, but contained many borers. In the other towns surveyed, weed infestation by the European corn borer was unimportant. The cost of this weed survey was approximately $450.

JAPANESE BEETLE WORK IN CONNECTICUT, 1934

J. Peter Johnson

Scouting

Scouting began on July 9, and ended September 8. There were three crews each consisting of one foreman and two scouts, stationed in Bridgeport, Hartford and New Haven, and one crew consisting of one foreman and one scout was placed at Storrs. Four Chevrolet half-ton trucks were furnished by the United States Department of Agriculture for transportation. Each crew was furnished with an itinerary for the summer's work and each classified establishment was scouted on an average of three times. There was a total of 86 establishments scouted, many of which were subdivided, meaning that more than 86 areas were scouted within the State. The minimum distance scouted around each firm was 500 feet. A total of 131 beetles was found.

The premises of 29 dealers in sand, soil and manure, were scouted from one to three times.

Summary of Beetles Found

Location	Dates found	No. of beetles
Branford	July 14—Aug. 23	50
East Hartford	July 23—Aug. 8	4
Norwalk	Aug. 10	2
Norwich	July 18, 30—Aug. 11, 23	35
New Canaan	July 31—Aug. 6, 7	3
New London	July 11, 24—Aug. 6, 18	22
Ridgefield	July 24—Aug. 10	13
Shelton	Aug. 15	1
West Haven	Aug. 21	1
Total beetles found		**131**

Mr. Gray of 249 Millville Avenue, Naugatuck, Conn., gave a beetle found on his premises to F. M. Brooks, inspector. It was identified as a female Japanese beetle. This was the first time beetles were reported from Naugatuck.

Trapping

Japanese beetle traps baited with liquid bait composed of geraniol and euginol were placed in the field, beginning July 2, to learn whether or not these beetles were present. Ninety-six traps were placed in New

Milford, 100 in Winsted and 94 in Ansonia. Upon positive capture of Japanese beetles, the traps were removed and placed in another town. Records so obtained indicate the spread of the Japanese beetle within the State and assist the inspectors in determining how to proceed with the inspection and certification of products from the surrounding district.

Positive beetle captures were made in Ansonia, and on July 27, 25 traps were removed to Clinton. The remaining traps, together with 20 from Winsted and 9 from New Milford, totaling 100 in all, were placed in Wallingford and Cheshire. Twenty-five were placed in Cheshire and 75 in Wallingford. On August 13, because of beetle captures, 25 traps were removed from Wallingford and placed in Windsor, and on August 15, 25 more traps were removed from Wallingford and placed in Norfolk. Trapping activities ended September 8. The results of trapping will be found below:

Locality	Date	No. of beetles
Ansonia	July 11—July 28	172
Wallingford	July 31—August 27	13
Total beetles caught in traps		**185**

Inspection and Certification

Because of the large area under quarantine on account of the Japanese beetle, the farm products quarantine inspection work dwindled to such an extent that the district inspectors were able to take care of it with very little interference to their routine nursery and greenhouse work. Practically all of the shipments were made by non-commercial shippers.

As can be seen by the table below, the farm products work amounted to only a very small portion of the total work carried on in Connecticut. It was not necessary to make additions to the force as the regular personnel could make all inspections.

Inspection points were located as follows:

Location	No. of inspectors
New Haven	3
Manchester	1
Middletown	1
Willimantic	1
Westerly, R. I.	1
Total	7

Kind and amount of products certified:

Products	No. of packages
Corn	24
Beans	262
Apples	1
Huckleberries	1
Cut flowers	532
Total	820

The total number of plants inspected and certified for shipment to other states and foreign countries was 1,484,138, while twelve carloads of sand

and two and one-half carloads of manure were shipped to other states.

The number of certificates issued is shown below:

Kind	Farm products	Cut flowers	Nursery and Ornamental stock	Soil, sand	Manure	Total
'A'		514	32,687	55		33,256
'B'	8		1,507	77	8	1,600
Stamp	39	18	4,175	33		4,265
Total	47	532	38,369	165	8	39,121

Japanese beetles were more numerous during the summer season of 1934 in the old centers of infestation—Bridgeport, New Haven, Stamford and Hartford—and small increases were noted in many other communities. As yet we have no knowledge of Japanese beetles being common in any of the rural sections.

It was noted during the past season, that the peak infestation of the Japanese beetle was approximately ten days to two weeks earlier than normally. Usually this peak is in the latter part of July and the first week in August. This year, however, Japanese beetles were very numerous during the third and fourth weeks of July where old infestations occurred, and very few could be found after the first week in August. There were exceptions in some small infestations, where beetles were present late in August. After September 1, it was rather difficult to find beetles present.

PRESENT STATUS OF SALT MARSH MOSQUITO DITCHING IN CONNECTICUT

R. C. Botsford

The greatest advancement in so short a period in mosquito control work in Connecticut was accomplished during the past eleven months with the use of Federal funds under the CWA and FERA projects, supervised by the Connecticut Agricultural Experiment Station.

Labor drawn from the ranks of the unemployed was first put to work cutting ditches in the remaining unditched salt marshes. As the salt marsh work was completed, the workers were transferred to fresh water swamps, mosquito breeding streams and construction work such as dikes, tidegates and culvert outlets.

Twenty-seven towns in Connecticut contain salt marsh areas totalling about 20,000 acres. In the period of the past 29 years, from 1904 to 1933, about 11,000 acres of salt marsh have been ditched and approved for state maintenance. The remaining 9,000 acres of salt marsh, with the exception of small areas in Stratford, Milford, North Haven and Saybrook, where work is now in progress, have been ditched since November, 1933, under our state-wide project. Altogether 1,478,756 feet of ditches have been installed to date and 259,825 feet of stream banks cleaned.

Many of the ditched areas are protected from high tides by dikes and tidegates, which were originally built by the landowners to protect the hay crop. These have always been in a bad state of repair and funds have never been sufficient to prevent the breeding of mosquitoes. With the

use of labor paid by CWA and FERA funds, two dikes with tidegates have been completed, three are under construction and three more contemplated.

A tidegate at Morris Creek in East Haven and New Haven was constructed as an auxiliary outlet to a large salt marsh and allows the water level in the marsh to be lowered about three feet below the old level. This lowering of the water level allows the installation of a main drainage ditch about 22,000 feet long, which will facilitate run off from a watershed of about five square miles. It will eliminate mosquito breeding in about 500 acres of both salt and fresh water swamps, relieve storm drains and do away with many insanitary conditions.

The creek was dredged for a distance of 8,400 feet with a dredge borrowed from the New Haven Park Department, the operator was paid from an unused mosquito fund in the New Haven Chamber of Commerce; labor was paid from CWA funds; materials and small tools were supplied jointly by the City of New Haven and the Town of East Haven, and the job was supervised by the Experiment Station. This is but one example of many drainage projects under way whose costs are far more than any municipality or town could ordinarily afford. At the same time such projects are of unquestionable importance to health and property value.

In all this work the towns supplied the tools, the boots for the men and materials where necessary. The Connecticut Agricultural Experiment Station requisitioned the men from the local FERA administrator according to a money allotment set aside in that town for our project, compiled the payroll and supervised the work.

All the work was done through close coöperation with the local officials. Although we supervised projects in 25 different towns, no difficulties or misunderstandings occurred that were not quickly and satisfactorily ironed out.

Last January, 1,056 men were employed on ditching work, but at present our projects employ 360 laborers, 18 field supervisors, 2 blacksmiths, 4 administrators and 7 engineers. There are also 112 additional employees paid from town relief funds, making a total of 503 persons.

Since the beginning of the CWA ditching work up to October 1, $287,299.22 of Federal funds have been expended for wages to unemployed. The estimated state and town contributions to the project for tools, equipment, transportation and materials, amount to $34,729.06.

The present status of salt marsh ditching in Connecticut shows the work nearly completed over the 20,000 acres. The remaining work to be done in Milford, North Haven and Saybrook can be completed this winter, but the large area in Stratford may take another year. The continued repair of dikes and tidegates is imperative, and the construction of more dikes and tidegates and jetties at the salt marsh outlets into the sound will reduce the future cost of maintenance of the salt marsh ditches, and aid in the prevention of shore erosion.

Mosquito control in fresh water swamps should be mentioned. Important improvements have been under way in Guilford, East Haven, Norwalk, New Canaan, Southington, Manchester, Derby, Ansonia, New London, Waterford, and Groton. Many more towns and cities have requested drainage work under our project, and it seems apparent that the mosquito control project will continue as long as Federal funds can be allotted to the work.

TESTS OF APPLE SPRAYS

M. P. Zappe and E. M. Stoddard

Tests of various sprays for the control of apple insects and diseases have been carried on for several years in the Experiment Station orchard at Mount Carmel. During the summer of 1934, only four materials were tried, some of which had proved valuable in previous years. Liquid lime-sulfur, which was a standard fungicide for many years, has been largely discarded by the commercial fruit growers of Connecticut. Many other forms of sulfur have been recommended as a substitute for this material because liquid lime-sulfur, of itself, has a tendency to cause burning on leaves and fruit, especially on the Baldwin variety.

Two rather new fungicides were tried this year, magnetic sulfur and flotation sulfur, neither of which caused any appreciable amount of leaf or fruit burn. In 1933, flotation sulfur was used with good results and was again included in the 1934 tests.

The orchard used for the tests contains many varieties of apples and is not particularly good for experimental work. It is practically impossible to arrange the plots so that all varieties are represented in all the plots.

The season of 1934 promised to be a year of heavy curculio damage on account of the severe winter of 1933–34, which killed practically all of the fruit buds in an adjoining peach orchard. As a result it was expected that the curculios which would normally breed in the peach orchard would attack the fruit in the adjoining apple orchard. This proved to be true because the check trees in the apple orchard showed an average of about 75 per cent curculio injury on the apples at harvest time.

The orchard was divided into four plots, each sprayed as outlined in the succeeding paragraphs:

The largest plot, containing the largest number of varieties, was sprayed with the following materials:

Lead arsenate	3 lbs.	Fish oil	1 qt.
Hydrated lime	10 lbs.	Water	100 gals.

(Fish oil was not readily obtainable at the time; therefore linseed oil was substituted after the calyx spray.)

This combination has given consistently good results for several years, particularly in the control of plum curculio, which is a serious pest in this orchard. However, we have felt that on varieties susceptible to apple scab, such as McIntosh, it was not completely successful in controlling this disease when used throughout the entire spraying season. When pre-blossom sprays of lime-sulfur were applied to McIntosh, followed by lead, lime and fish oil, the treatment was satisfactory.

The other three plots had McIntosh trees in them and were used to compare the efficiency of dry lime-sulfur, flotation sulfur and magnetic sulfur in controlling apple scab. These materials were used in the following combinations:

Row F.	Dry lime-sulfur	6 lbs.
	Lead arsenate	3 lbs.
	Water	100 gals.

Row G.	Flotation sulfur (dry)	5 lbs.
	Lead arsenate	3 lbs.
	Water	100 gals.
Row H.	Magnetic sulfur	5 lbs.
	Lead arsenate	3 lbs.
	Water	100 gals.

Spraying operations began on May 7, on the McIntosh variety only, for scab control. The calyx spray was applied to all McIntosh trees on May 15. All other varieties in all plots received their first spray on May 23 and 24. On May 24, the McIntosh trees received the seven-day spray. On June 1 and 8 all varieties were sprayed again and the last spray was applied July 12, to all varieties. All spraying was done with a quad spray gun from the top of a tower mounted on the spray truck.

Results at Harvest Time

The crop of fruit was very light in 1934. Sprayed fruit was of fair quality except that most varieties had rather more curculio injury than usual. This happens whenever the crop of fruit is light. In addition, as mentioned before, there was no fruit in the adjacent peach orchard.

TABLE 7. RESULTS OF SPRAY TREATMENT

CHECKS
(no spray)

	Baldwin	Greening	Russett	Fall Pippin	McIntosh	Average of all varieties
Good	1.12	1.72	3.3	1.6	31.5	1.43
Curculio	78.94	84.8	93.3	50.	54.4	74.99
Codling moth	18.74	18.34	13.3	2.61	2.6	15.23
Other chewing insects	38.74	49.72	16.6	30.52	13.8	40.04
Scab		1.86		52.81	5.9	11.37
Blotch	62.12	28.04				38.11

LEAD ARSENATE, LIME AND FISH OIL

	Baldwin	Green-ing	Russett	Fall Pippin	Northern Spy	Sutton	King	Av. of all va-rieties
Good	61.15	61.96	56.55	70.09	80.77	73.31	61.58	65.2
Curculio	35.93	34.22	42.46	17.42	16.13	25.69	35.57	31.4
Codling moth	.11	.12	.15	.27		.07	.43	.13
Other chewing insects	2.62	1.88	.86	.76	2.46	.71	2.49	1.91
Scab	.62	.69		14.36	.76	.51	.68	1.37
Blotch		2.17						.68

DRY LIME-SULFUR, LEAD ARSENATE

	McIntosh	Stark	Gravenstein	Average of all varieties
Good	79.46	81.29	60.13	71.69
Curculio	16.9	15.03	37.27	25.1
Codling moth	.30	.07	.03	.14
Other chewing insects	2.37	3.39	2.63	2.70
Scab	1.16	.21	.59	.71

FLOTATION SULFUR, LEAD ARSENATE

	McIntosh	Wealthy	Average of all varieties
Good	95.17	56.93	68.86
Curculio	3.26	6.86	5.75
Codling moth			
Other chewing insects	.91	1.92	1.60
Scab	.60	.41	.47
Rust		35.53	24.43

MAGNETIC SULFUR, LEAD ARSENATE

	McIntosh	Fall Pippin	Average of all varieties
Good	86.1	59.6	69.79
Curculio	12.98	34.71	26.36
Codling moth		.99	.61
Other chewing insects	.23	1.14	.78
Scab	.91	5.4	3.67

This year there was not very much difference between the dry lime-sulfur plot and the fish oil plot. In other years the fish oil plot gave much better curculio control than any other treatment used. The flotation sulfur plot had the smallest amount of curculio damage of any of the plots. This was also true with previous trials of this material and suggests the possibility of its possessing some merit for the control of this insect.

Most of the other pests were controlled fairly well with any of the treatments. Flotation sulfur also had less apple scab than either dry lime-sulfur or magnetic sulfur, although scab was not very serious on either plot, and even on the McIntosh checks scab was present on less than 6 per cent of the fruit. There was considerable cedar rust on the Wealthy variety, but according to all investigators, there is no good, known remedy for this disease. Sooty blotch was well controlled by all the treatments.

OUTBREAK OF CANKER WORMS

W. E. Britton

Mention has already been made in this report of the great abundance of canker worms in Connecticut in 1934. They were prevalent in the towns bordering on Long Island Sound, and particularly so in Fairfield County, in the southwestern corner of the State. Many unsprayed fruit trees were stripped by June 1, and there were areas of native woodland, several acres in extent, that were completely defoliated. When the caterpillars were feeding, one could hear the pellets of excrement dropping, like a shower of rain. Street and roadside shade trees that had not been sprayed were stripped in many localities. When disturbed, the caterpillars spin downward on delicate silk threads and a person passing under infested trees becomes covered with the slender loopers, commonly called inch worms, or measuring worms.

There are two kinds of canker worms in Connecticut. One is known as the spring canker worm, because the eggs are laid in the spring, and the other, the fall canker worm, because most of the eggs are laid in the fall, although some of the females do not emerge and lay eggs until March. Both kinds have wingless females and a single generation each year. The caterpillars of both kinds are often found feeding together and do the same kind of injury. The fall canker worm is far more abundant and is usually responsible for the defoliation in Connecticut.

The Fall Canker Worm, *Alsophila pometaria* Harr.

On the warm foggy days of November and December the adult moths emerge from the ground, mate, and the wingless females crawl up the trees and deposit their eggs in irregular, compact clusters. The eggs are grayish brown, cylindrical, are fastened by one end to the bark and are closely set side by side. The diameter of the top is sometimes greater than that of the base, which no doubt is the reason that some authors have described the eggs as flower-pot-shaped. The base is rounded, but the top is nearly flat. On the flat top of each egg there is a dark concentric ring with diameter about two-thirds that of the egg. In the center of this ring there is a very small depression, or pit. The top of each egg resembles a jar fitted with circular cover, inside a circular, protruding flange. In truth, this cover lifts and comes off on the hatching of the eggs in spring. The egg-clusters vary in size, and may contain from 50 to 300 eggs each, perhaps averaging about 100.

The female has a rather large, smooth, gray body with prominent legs and antennae, but no wings. The males are brownish gray, with rather feeble markings on the wings, and have a wing spread of from one to one and one-fourth inches. A lighter spot usually occurs on the margin of the fore-wings, about two-thirds the distance from base to apex. The males fly about and may often be seen in large numbers at rest on the trunks of trees, with wings folded and flattened against the bark. They are attracted by automobile headlights and other lights near the ground.

The eggs usually hatch during the last few days of April or early in May, depending upon weather conditions. The tiny larvae soon begin to

feed upon the tender unfolding leaves. They eat holes entirely through the leaves and may devour all the green tissue except the veins. Later, when the foliage becomes firmer and more mature, they often leave a greater portion of the network which turns brown. Unsprayed apple trees in June often look as if a fire had gone through the orchard.

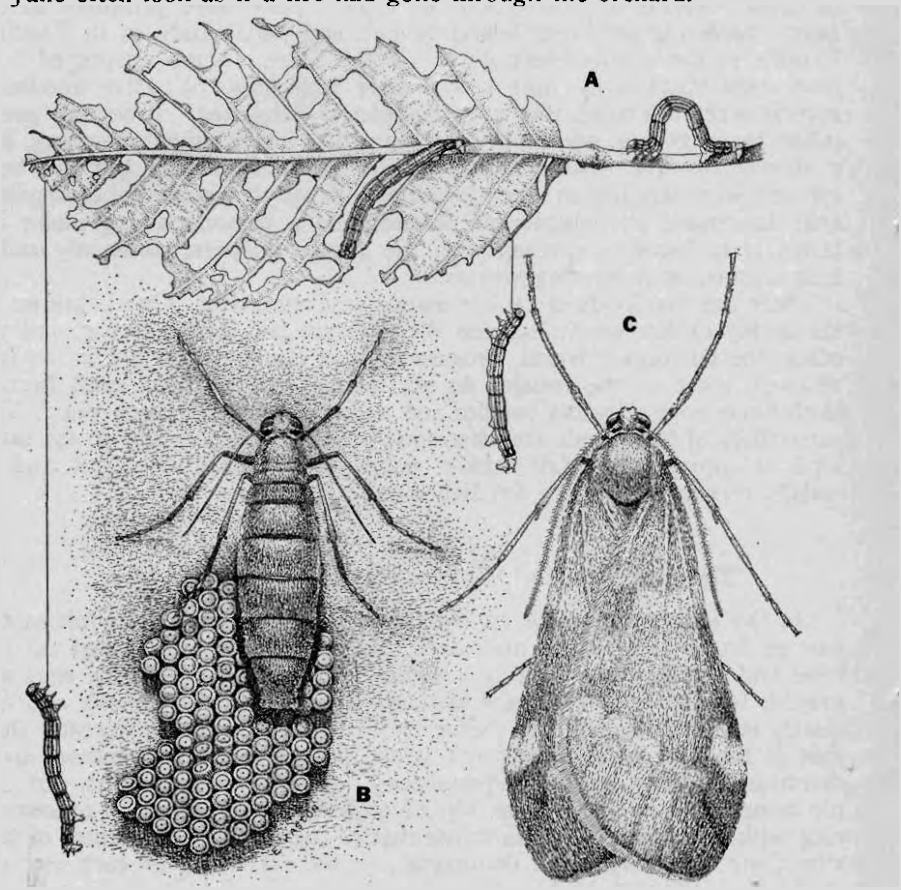

FIGURE 16. Eggs, Larvae, Male and Female Moths of the Fall Canker Worm, and Elm Leaf Injured by the Caterpillars. A, Leaf and Full Grown Caterpillars about Natural Size; B, Eggs, and Female Moth; C, Male Moth; both about Five Times Enlarged

Some of the caterpillars are pale green when fully grown; many are dark gray, brown or nearly black, and all are striped longitudinally with narrow, whitish lines. Both light green and dark brown caterpillars may emerge from the same egg cluster. Caterpillars of the fall canker worm have three pairs of false legs, or pro-legs, the pair on the eighth segment being smaller than the others. The caterpillars are three-fourths or seven-eighths of an inch long when fully grown.

Usually by the end of the first week of June, the caterpillars have reached maturity. They go into the ground to pupate in earthen cells in which

particles of soil are firmly held together by silk threads to form a cocoon which is not easily crushed. The pupa is dark brown, one-third of an inch or less in length, with apex rather blunt and with apical spine decurved and always forked. The adults emerge late in the fall.

FIGURE 17. Cocoons and Pupae of the Fall Canker Worm. Twice Natural Size.

The eggs, larvae, male and female moths of the fall canker worm, and elm leaf injured by the caterpillars, are shown in Figure 16, and the pupae in Figure 17.

The Spring Canker Worm, *Paleacrita vernata* Peck

The eggs are light brown, oval, two-thirds as broad as long, and are usually laid in March in loose, irregular clusters in the crevices of the bark, as shown in Figure 18. Each cluster may contain from 17 to 119

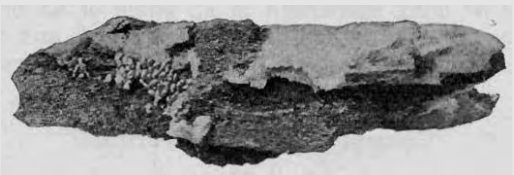

FIGURE 18. Egg-Cluster of the Spring Canker Worm. Twice Natural Size.

eggs, and the average is 47. The shells are more or less iridescent and are thin and much less firm than those of the fall canker worm. The eggs hatch at about the same time as those of the fall species and the larvae of both are often found feeding together on the leaves. The larvae are dark gray or brownish, longitudinally striped with narrow pale lines. They can be distinguished from those of the fall canker worm by the entire absence of pro-legs on the eighth segment. In other words, there are only two pairs of pro-legs.

The female has a body that is somewhat shorter and more hairy than the fall canker worm. It is generally gray in color, with a black or dark

brown longitudinal, dorsal stripe. The two-jointed ovipositor can be exserted and is then rather conspicuous. Like the fall species, the female is wingless.

The male has thin, brownish gray, semitransparent wings, without prominent markings. There are three rather indistinct dark lines on the fore-wings with a dark line bisecting the apical angle. There is no whitish spot on the costal margin as in the fall canker worm.

The pupa is light brown, somewhat more slender than the fall species, length one-third of an inch or less, the apex more sharply pointed. The male pupa is tipped with an apical spine that is generally simple. The pupal cells are less firm and more easily broken than those of the fall species.

Food Plants and Injury

Canker worms seem to prefer apple, elm and oak, but also feed on nearly all kinds of fruit trees, hickory, birch, maple and in fact almost all kinds of trees and shrubs. The tulip tree and the Norway maple are perhaps as nearly immune as any. Frequently, when abundant, the caterpillars eat the leaves as fast as they grow, so the trees really have no foliage until after the canker worms have become mature and entered the ground to pupate, when new leaves will form. It weakens trees materially to grow two crops of foliage in a season, and such conditions should not be permitted to occur. Late in May, 1934, the writer observed oak and elm trees where every green leaf had been eaten by canker worms. Some of the mid-ribs and other veins had not been devoured, but these turned brown and gave the trees a decidedly brownish appearance. A strong northwest wind blew unpleasantly, and hundreds of canker worms dangled on their slender threads from each tree. Evidently they had either been dislodged by the wind or else they had exhausted their food supply, and spun downward seeking other worlds of foliage to devour. The wind blew so strongly that many of these threads were twisted together like twine, and stood or hung suspended at an angle of 45 or more degrees from the main trunk. Sometimes the threads break and the caterpillars drift some distance and find food on trees not hitherto infested.

Control of Canker Worms

Spraying

Perhaps the best method of control is to spray the trees thoroughly with lead arsenate. The chief difficulty arises from the fact that when numerous, the canker worms eat the leaves as fast as they develop, and there is little or no foliage surface to receive and hold the poison. The writer believes that the addition of one pint of a 40 per cent nicotine solution to 100 gallons of the poison spray will kill by contact many of the young caterpillars that are hit by it. Even if all canker worms are killed by an application early in May, and a fair growth of foliage develops, the trees may become reinfested by wind drift or by caterpillars crawling up the trunks of the trees. In such cases a second application may be necessary or advisable.

It is known that certain oil sprays containing 6 to 8 per cent of oil, and also lime-sulfur and nicotine sulfate, applied to the dormant trees, will

kill 80 per cent or more of the canker worm eggs that are well soaked by the spray.

Banding the Trees

Partial and fairly good control may be obtained on isolated shade and ornamental trees by the application of sticky bands. This method can also be adopted for rows of shade trees that stand by themselves with no other trees near them. Banding is not advised for coppice and woodland areas containing underbrush and vines by means of which the caterpillars can crawl into the trees above the bands. In such areas spraying is the proper treatment and all undergrowth should be covered. It is hardly worth while to band the trees in apple orchards, because such trees need spray treatment for the control of other insects. Moreover, banded trees may become lightly or moderately infested by wind-drifted caterpillars, and usually show more or less leaf injury by their feeding. In fact, some writers do not recommend banding at all, except where it is not possible to spray the trees that were known to be infested the preceding season.

The practice of banding is based on the fact that the female moths are wingless and must crawl up the trunks in order to lay their eggs in the trees. The bands should be applied just before the time for the emergence of the adults, and kept in sticky condition during the entire emergence period, in which case large numbers of eggs will be laid below the bands. Otherwise, some of the females will ascend the trees and lay their eggs above the bands. The bands should also be in a sticky condition at the time the eggs hatch, otherwise the young caterpillars may crawl over the bands and ascend the trees. Failure to maintain the bands in effective condition, either during the egg-laying period or the hatching period, will render them useless. In the vicinity of New Haven the bands should be applied the last of October and kept sticky during November and December, for it is during the warm days of these two months that most of the eggs of the fall canker worms are laid. Emergence and egg laying usually cease with heavy freezing weather in December. Again the bands should be in a sticky condition during April and May. Should there be much warm and thawing weather in March, some eggs of both the fall and spring species may be laid, and the bands should be rendered effective at this time instead of waiting until April.

The sticky material has a tendency to harden on the surface if storms and low temperatures prevail; leaves and other litter may blow around and stick on the bands, and particularly the male moths become stuck on the bands in such numbers as to bridge them. (See Figure 19). If any of these things occur, the females in late fall, or the young caterpillars in early spring, can crawl over the bands and render them futile as a protection of the foliage. When the bands reach such a condition, they should be combed or stirred so as to present a sticky surface, which will make them effective for another period.

Applying the Bands

The sticky bands are often applied directly to the bark without injuring the vitality of the tree. However, they will disfigure it and the writer

does not recommend the practice. It is far better, on choice trees, to apply the sticky material to a removable band encircling the trunk, that can readily be taken off as soon as the danger is over, and leave the trees without disfiguring marks. Such a banding method was devised at this Station many years ago and is as follows:

Place a two-inch strip of cheap cotton batting around the trunk, to prevent the insects from crawling under the band in the crevices of the bark. Over the cotton batting, wrap firmly a four- or five-inch strip of single ply, tarred paper tacked into the tree where the ends lap, and so

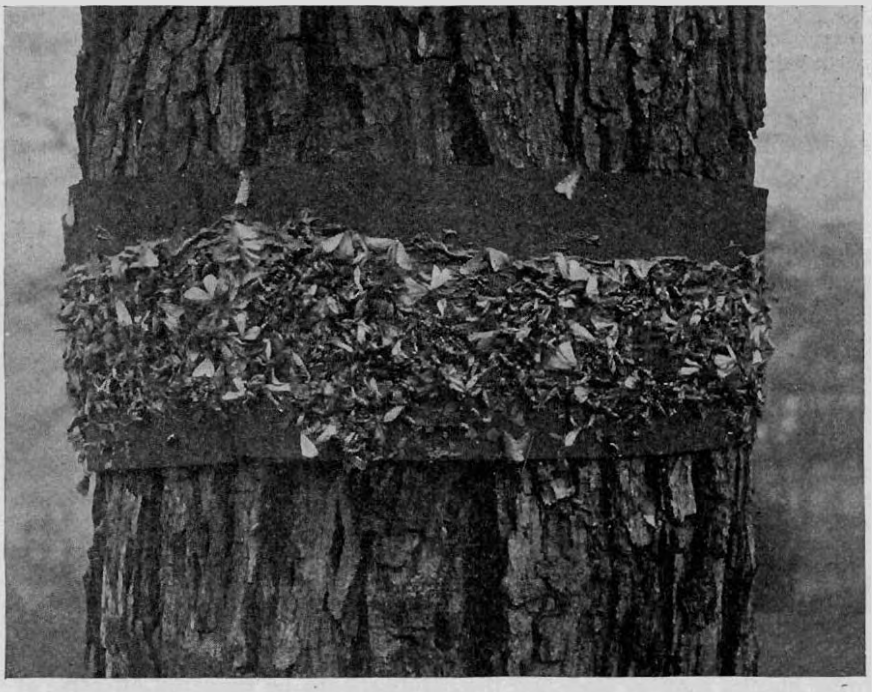

FIGURE 19. Male and Female Canker Worm Moths and Egg-Clusters on Sticky Band

placed that none of the white cotton batting is visible. Use narrow bands on small trees and wider ones on trees of large trunk diameter. Over the upper half of the band smear a layer of "Tree Tanglefoot", a quarter of an inch in thickness. Thus, if the Tanglefoot should liquefy and run downward on warm days, the lower half of the band would absorb it. If placed near the lower edge of the band, some may run down upon the bark. A wood paddle about 12 inches long, with thin blade about two and one-half inches wide, is very satisfactory for applying the Tanglefoot, and such a paddle can readily be made from a shingle. A similar paddle with sharp, half-inch teeth cut across the end of the blade, makes a satisfactory comb for stirring up the Tanglefoot when it becomes hardened or filled with litter.

Bands properly applied not later than November 1 probably may need combing once or twice during the egg-laying period, and again once or

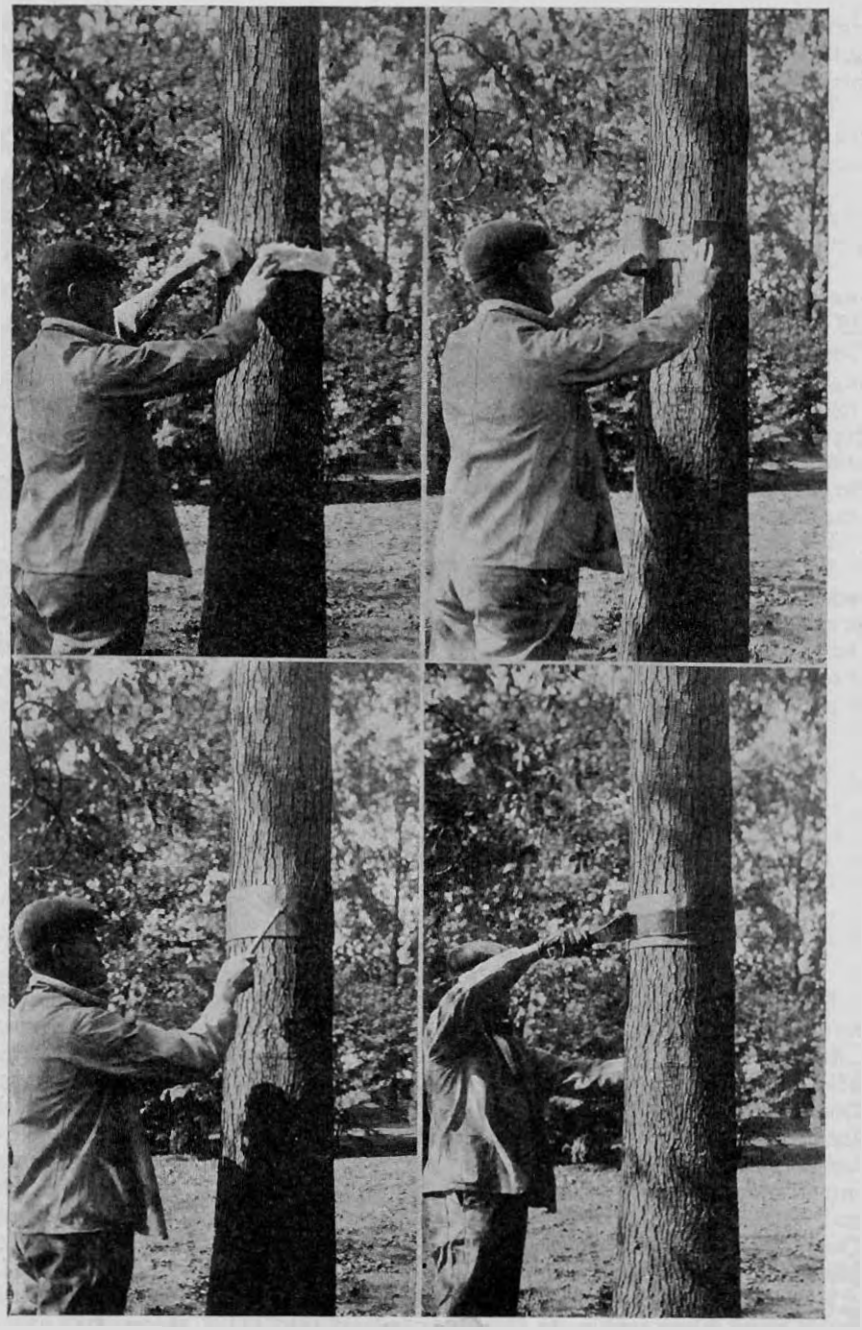

FIGURE 20. Method of Applying Sticky Bands to Protect Trees from Injury by Canker Worms.

twice in the spring. Usually the original application of Tanglefoot will suffice for a season if occasionally combed, but in some instances it may be necessary to add fresh Tanglefoot in the spring.

If desired, these bands may be entirely removed by the middle of June, leaving no disfiguring marks upon the trees, although many property owners permit them to remain for service the following season.

The bands should be placed far enough from the ground to prevent persons and domestic animals from coming in contact with them, and yet within easy reach without climbing.

"Tree Tanglefoot" is similar to the adhesive on "Tanglefoot Fly Paper", but comes in the form of a paste or salve, and may be obtained in 5, 10, 25 and 100 pound cans. It is manufactured by the O. and W. Thum Company, Grand Rapids, Mich., and it is either sold by, or may be ordered from, all dealers in insecticides and garden supplies. This firm now manufactures canker worm bands in which the cotton batting is replaced by a wood fiber material attached to the tarred paper, and both trimmed to the same width. As the wood fiber material is light buff and the tarred paper dark brown or black, the edges of the fiber show more or less above and below the band.

Figure 20 shows the method of applying canker worm bands.

Banding of trees to control canker worms is not recommended as a substitute for spraying, but serious defoliation to many trees has been prevented by the intelligent use of bands, especially where it is not practicable to spray the trees. As a rule, banded trees are not deprived of their early leaves, but if they should later become infested by wind drift, a poison spray should be applied.

THE BEECH SCALE IN CONNECTICUT

Cryptococcus fagi Baerensprung

W. E. Britton

On September 13, 1934, Dr. Rush P. Marshall brought to the office some pieces of bark from beech trees on the grounds of the Mark Twain Library, Farmington Avenue, Hartford, infested with the beech scale. Microscope preparations of this insect were studied to verify its identity. Doctor Friend, in company with Dr. H. J. MacAloney of the Federal Bureau of Entomology and Plant Quarantine, visited the place on September 18 and found the scale on beech trees along Woodland Street northerly into Keney Park, a distance of some two miles. Later, J. E. R. Holbrook and C. L. Griswold of the Federal Bureau of Entomology and Plant Quarantine, stationed at the Gipsy Moth Laboratory, Melrose Highlands, Mass., made an extensive examination of the area in and around Hartford.

Altogether 23 towns besides Hartford were visited. The only infested beech trees discovered were those in the area mentioned above, and numbered 138. Of these, 37 were in Keney Park and 101 were outside the park and mostly on private premises. Doctors Marshall and MacAloney

have watched for this insect and have examined many beech trees in their journeys about the State during the past two years, without finding it.

Through correspondence, the infestation was reported to the Superintendent of Parks of the City of Hartford, who gave assurance that the infested trees on public grounds would be sprayed before growth starts next season. On December 4, at his office, the matter was discussed, and he expressed the opinion that probably every property owner having beech trees infested with beech scale would have them sprayed. The latest information regarding treatment was sent to each of the four leading tree spraying firms in Hartford, so that in case they are called to treat any of these infested beech trees they will know what to use as a spray.

The appearance of this insect on the bark is shown in Figure 21, and structural details may be seen in Figure 22.

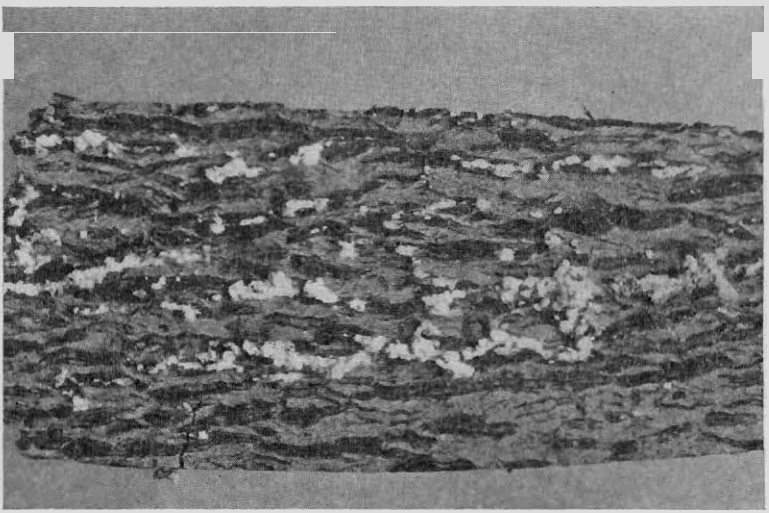

FIGURE 21. General Appearance of the Beech Scale on the Bark. Twice Enlarged.

History in North America

Apparently the first evidence of the presence of this insect in America came to Dr. C. Gordon Hewitt,[6] * Dominion Entomologist of Canada, at Ottawa, in August, 1911, when specimens were received by him from Bedford, near Halifax, Nova Scotia. Careful investigations revealed that both the native forest beeches and the ornamental European beeches in the vicinity of Halifax were infested by this scale, which had been present for a number of years. The Superintendent of Public Gardens, Halifax, in September, 1911, sent specimens and stated that he had known of the pest for the last 20 years, and had kept it in check on purple beeches by spraying.

In October, 1913, the manager of the Canadian Davey Tree Expert Company of Montreal sent to the headquarters office of the firm at Kent,

*See bibliography at the end of the chapter.

Ohio[1], specimens of this insect, evidently taken near Halifax, because the letter stated that "the trouble is noticeable all through the woods in the vicinity of Halifax, N. S.". The specimens were submitted to Dr. L. O. Howard, Chief of the Bureau of Entomology at Washington, D. C., who shortly reported it as *Cryptococcus fagi* Baerens.

For about 10 years after the publication of the discovery of the beech scale in Canada, there were few references to the insect in the literature

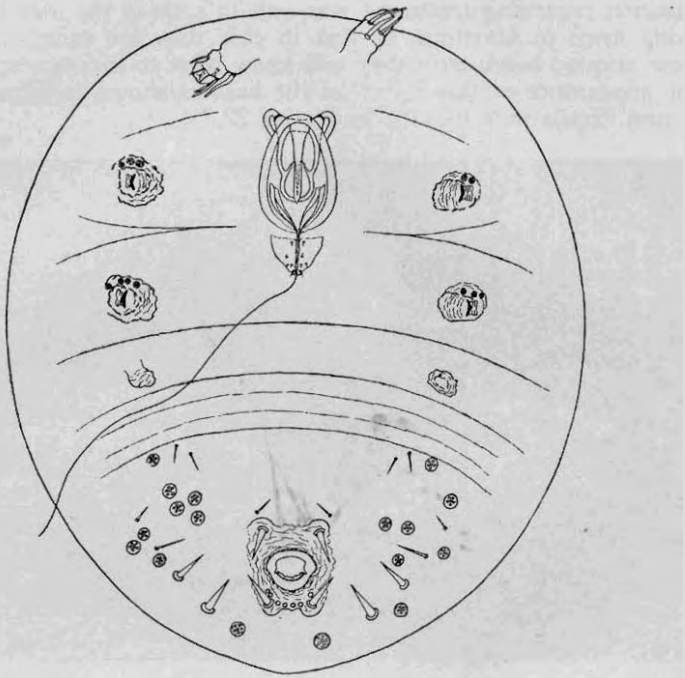

FIGURE 22. Diagram of Ventral Aspect of Beech Scale Insect, Showing Structures. Outline about 200 Times Enlarged. Structures of Anal Area about 500 Times Enlarged. Transverse Lines on Thorax Represent Wrinkles and not Segmentation.

of American economic entomology. Within the past few years several notes and articles have appeared calling attention to the presence and spread of this insect and its effect upon the trees.

This scale was first recognized in the United States at the Arnold Arboretum, Boston, Mass., in 1929[2]. In 1931, the Gipsy Moth Laboratory at Melrose Highlands, Mass., began investigations to determine the distribution of the insect, and scouted most of the towns in Connecticut, Massachusetts and Rhode Island, and those in the southern half each of Maine and New Hampshire. The Maine Forest Service, Massachusetts Department of Conservation and the State Entomologist of New Hampshire coöperated in this scouting work.

At the present time the beech scale is known to occur in the United States as follows: Maine—57 towns: 27 towns in Washington County in

the southeastern corner of the state, seven towns in Hancock County, three towns in Aroostook County, seven towns in Penobscot County, seven in Waldo County, two in Knox County, two in Lincoln County and two in York County in the southwestern corner of the state near the New Hampshire border; New Hampshire—three towns: one town in Strafford County and two towns in Rockingham County; Massachusetts—14 towns: five towns in Essex County, five in Middlesex County, three in Norfolk County and one in Suffolk County; Connecticut—one town, Hartford, in Hartford County; New York—three towns: all in Westchester County.

Many of the infested trees in the Maritime Provinces of Canada and some of them in Maine, have died.

History in Europe

From all accounts the beech scale is widely distributed throughout central Europe and Great Britain, being present in England, Scotland, Wales, Ireland, France, Holland, Belgium, Germany, Switzerland, Denmark, Sweden and Czechoslovakia. Many notes and articles have been published about it during the past 85 years. At first it was thought to be a fungus until Baerensprung in 1849 described it as *Coccus fagi*. Both in England and on the Continent many fine old beech trees have died.

Life History

Apparently the life history of the beech scale has not been thoroughly investigated in this country. According to Brown[2], "in the vicinity of Boston, egg deposition begins about June 15 and reaches a maximum in July". About August 1, the eggs begin to hatch, and hatching continues into September. The young crawlers are, therefore, present in August and September, and are readily blown about by the wind. Many of them crawl under the felted secretion of the female scales and remain upon the same tree. When a suitable location has been found, the crawler attaches itself to the bark by inserting its proboscis, becomes quiescent, and begins to secrete the wax fibers that cover the insect for the remainder of its life. It is in this stage that the scale passes the winter. In May it transforms to the pre-adult stage and about two weeks later it reaches maturity. Males are unknown and the species is probably wholly parthenogenetic. There is one generation each year.

Effect Upon the Trees

Most writers seem to agree that the beech scale of itself does not cause death or severe injury to the trees. Infestation by the insect does, however, afford a point of entrance favorable to various infectious organisms. For instance, spots of "slime flux" are very common on infested trees and not on healthy trees. Several fungi are usually present, but according to Ehrlich[5], the trees are killed by a variety of *Nectria coccinea* (Pers.) Fries. The scale punctures the living tissues of the bark and sucks the sap, causing the death of punctured cells. The death of large groups of such cells causes a shrinkage that often ruptures the bark, and this is the

main point of entrance of the fungus. Experiments of Ehrlich[5] indicated that the Nectria fungus could infect only such trees as had some mechanical injury, and trees infested by the beech scale furnish satisfactory conditions for the entrance of the fungus, usually two or three years after the tree first became infested by the scale. So far the Nectria has not been found in connection with the scale in Massachusetts or in Connecticut.

Control

The beech scale is apparently readily killed by contact sprays. Various soap emulsions have been used in England. In North America, Ehrlich[5] has used kerosene-soap emulsion, a commercial oil, and nicotine solution; of these materials, the most effective in controlling the scale was the oil. Mr. Collins writes in a letter that satisfactory control has been obtained by spraying with liquid lime-sulfur, 7 gallons in 93 gallons of water, or dry lime-sulfur, 17 pounds in 100 gallons of water. He also states that the scale can be killed with the oil sprays, but as the beech is rather susceptible to oil injury, his office is not recommending oil sprays at present.

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THE SQUASH BUG IN CONNECTICUT

(*Anasa tristis* DeGeer)

D. C. Elliott

This work was carried out during the summer of 1934, in an effort to find a more efficient method of controlling the squash bug than any commonly recommended to date.

The squash bug has been a pest of cucurbits in the United States for many years. It was first described by DeGeer in 1773 and has been found

everywhere in this country, from Canada to Central America, where its host plants are grown. In Connecticut it has been numerous enough in recent years to cause serious injury to summer squash.

Host Plants

The squash bug has been known to attack practically all of the plants in the squash family, (Cucurbitaceae). This includes many farm and garden crops such as squash, cucumber, pumpkin, melon, and others. The bug ordinarily confines its feeding to this group of plants, and has a decided preference for a few of them, but we have one case reported where it was found feeding on the leaves and fruit of the fig (Rosewall 1920).

In an endeavor to find which plants were preferred in Connecticut, a series of cucurbits were planted. These included squash, pumpkin, cucumber, citron, watermelon, and muskmelon. It was found that summer squash, Hubbard squash, and pumpkin were the favored host plants. All of these were attacked in the field and eggs were deposited upon them, while the remainder of the group were not attacked at all. Attempts to rear young nymphs upon cucumber, citron, and melon, all failed. The insects fed very little and died in the second or third instar.

Feeding Habits and Injury

As soon as the young plants come up in the spring they are attacked by the adult bugs which have hibernated the preceding winter. These plants are often killed outright at this stage, as the feeding of the bugs seems to have a decided "burning" effect. Heavy feeding causes the young plants to wilt, and in a few days they are completely dead. Mild winters permit a relatively high survival of the hibernating adults and in the following season the damage to young plants is especially severe.

The feeding of a single nymph is not very detrimental, but the congregation of nymphs upon the leaves soon causes the latter to wilt or "burn" in the area where feeding occurs. The plants are seldom killed outright because they are fairly large by the time the nymphs appear in great numbers, but sometimes the infestation is so heavy that the crop is a total loss. One small field of squash under observation this season was almost entirely killed by July 20, about one month after the beginning of oviposition.

Description of the Stages

Eggs: The eggs of the squash bug are deposited in irregular clusters on the leaves of the host. Ordinarily they are placed at the base of the under side of the leaves near the larger veins, but they may occur out near the edge or even on the upper side. When first deposited they are pale, almost yellow, but darken with age until they are dark brown before hatching. The eggs are oval in shape and are about one-sixteenth of an inch long. They are attached along one side to the leaf surface. Their large size and brown color make them very conspicuous on the green leaves of the plants.

Nymphs: Upon hatching, the young nymphs are brilliantly colored, the antennae, head, thorax, and legs being bright crimson and the abdomen green. After a few hours the parts of the body colored crimson turn black. In this instar, however, the abdomen remains green. These young nymphs are gregarious and, unless disturbed, will feed near one another on the under side of the leaf.

When the first molt is completed, the same portions are again crimson and later turn black, as in the first instar. The abdomen, however, does not remain green but becomes a dusky, greenish gray. This instar shows very little evidence of wing pads and, being very little larger than the first, is not difficult to distinguish.

The third, fourth, and fifth instars may be distinguished from one another by their size and the relative development of the wing pads. The

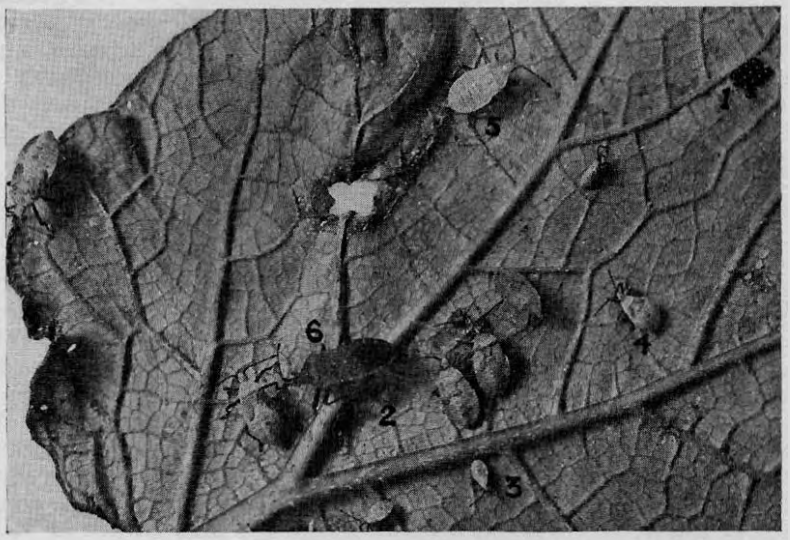

FIGURE 23. Different Stages of Squash Bug on Leaf of Summer Squash
1, Egg-Cluster; 2, Second Instar; 3, Third Instar; 4, Fourth Instar; 5, Fifth Instar; 6, Adult. All About Natural Size.

third instar attains a length of about one-fourth inch and has very rudimentary wing pads. The fourth instar attains a length of about five-sixteenths of an inch and the wing pads are noticeably developed, while the fifth instar has well developed wing pads and is about the size of the adult. All instars, after the first, have bodies that are mottled light gray in color.

Adults: The adult bug is about three-quarters of an inch long, the male being slightly smaller than the female. In color it is mottled dark brown, with the wing membranes black.

The accompanying photograph (Figure 23) shows most of the stages.

Life Cycle

There is a single generation of the squash bug each year in Connecticut. All of the nymphs during any one summer originate from eggs deposited

by adults which developed the preceding fall and wintered over. As the egg-laying season extends over a period of about six or seven weeks, nymphs of all sizes may be found in the field at the same time.

The time required for the completion of the life cycle, from oviposition until the adults emerge, compares favorably with that observed in Massachusetts and other localities (Worthley 1923). The data given for Connecticut in the following table were obtained from insectary rearings carried on from June 20 into August, 1934.

TABLE 8. LENGTH OF DEVELOPMENTAL STAGES IN CONNECTICUT AND OTHER LOCALITIES

	Connecticut		Massachusetts	New Hampshire	Washington, D. C.	Kansas
Stage	Time (days)	Av.	Time	Time	Time	Time
Egg	9–12	10	13.7	11	9–10	7–17
1st instar	3	3	3.3	3	3	2.1–5.2
2nd instar	6–11	7	6.6	9	8–9	6.2–9.2
3rd instar	5–9	7	6.6	8	7–8	8.1–13
4th instar	6–16	8.3	6.4	7	6	10
5th instar	7–17	9	16.6	9	8	12
Total	36–67	44.3	53.2	47	41–44	45.4–66.4

The oviposition trend for the season was determined by collecting and counting, at weekly intervals, all of the eggs deposited on a sample plot of 68 hills of summer squash composing two rows in the middle of a half-acre field. The data are given in Figure 24.

During the summer a total of 431 egg-clusters collected in the field contained 7,285 eggs, an average of approximately 17 eggs per cluster. The size of the clusters ranged from as few as three eggs to as many as 44. One female bug lays about 150 eggs during its life (Girault 1904). These are deposited over a period of six or seven weeks, but in Connecticut most of them are deposited during the month of July. Out of 984 eggs kept under observation, 946 (about 96 per cent) hatched.

Oviposition by adults during the same season as that in which they develop has not been observed. On September 18 a number of adults were dissected and the reproductive organs examined. These were all incompletely developed, indicating that a second generation did not occur.

Control

Natural Enemies: Although the squash bug has only a few natural enemies, it is not entirely without them. The most important one of these in Connecticut is the parasitic Tachinid fly, *Trichopoda pennipes* Fabr., which develops within the body of the bug. There are two generations of this parasite in Connecticut, the first generation coming out as adults in the spring. These deposit their eggs upon the bodies of the adult bugs that have come out of hibernation. The first generation of parasites is perhaps initially of little importance in controlling the pest because, although parasitized, the bugs are still able to lay some of their eggs before they die. The second generation of flies emerges during late summer and

deposits eggs upon the adults and larger nymphs that have developed during the current season. These parasitized bugs have been found to be unable to survive the winter and deposit their eggs the following year. Undoubtedly this fly is an important factor in reducing the number of bugs that successfully pass the winter, but due to its scarcity during the fall it cannot, at present, be considered a controlling factor.

Two small parasites have been reported to attack the eggs of the squash bug. These are two small wasps, *Hadronotus anasae* Ashm. and *Hadronotus carinatifrons* Ashm. Neither of these parasites was encountered in this work but both may, at times, be important in squash bug control.

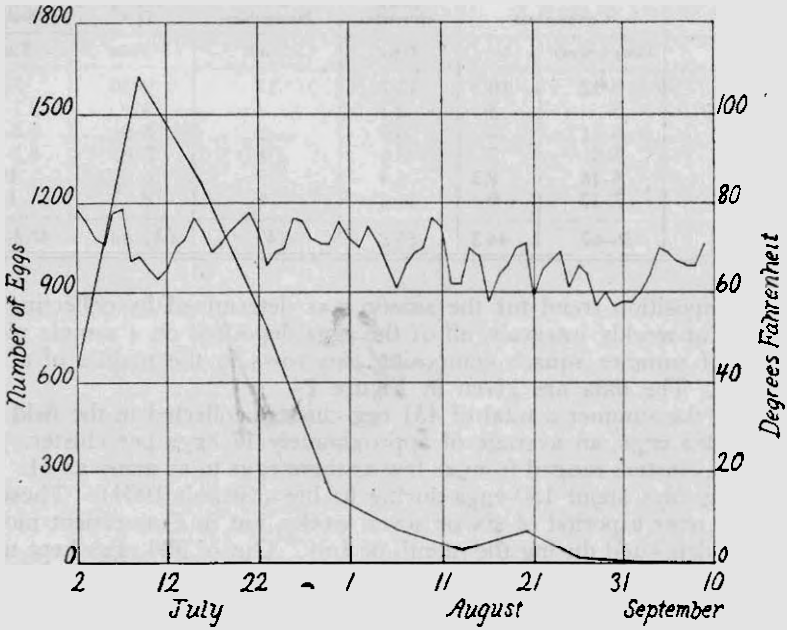

FIGURE 24. Chart Showing Egg Deposition of the Squash Bug

Mechanical Methods of Control: Due to the difficulty of killing the bugs with sprays or dusts, mechanical means of control have played an important part in the fight against this insect from the beginning. In the past, chemical methods of control have been mentioned as unsatisfactory, or not even mentioned at all in some cases. On the other hand, practically every paper giving information upon control advised some mechanical means of combating the pest.

The mechanical methods of control used on the squash bug may be classed as (1) hand picking (2) trap boards (3) trap crops and (4) clean farming. Hand picking is a good method where only a few plants are concerned. The adults may be caught or the egg-clusters may be gathered and destroyed. This method takes too much time to be practical for commercial growers.

The trap board is used in connection with hand picking and simplifies the gathering of the adults. Taking advantage of their habit of hiding under any available rubbish during the night, boards may be placed near the plants. By visiting these boards early in the morning the bugs may be easily collected and destroyed. This is particularly applicable early in the season to capture adults that have hibernated the previous winter.

Trap crops of early squash are sometimes planted among other, later crops of cucurbits which are less attractive to the pest. In this way the main crop is saved from serious damage.

Clean farming should be practiced regardless of insect pests. As the bugs hibernate in rubbish, all old vines and other material should be plowed under or burned in the fall, as soon as the crop is harvested. This makes hibernating quarters harder to find and, if done early enough, destroys many of the late nymphs.

Chemical Methods of Control: Much work has been done in the past in an effort to find a spray or a dust which would effectively control this pest. Much of this has been discouraging because of the resistance of this insect to insecticides. When insecticides first came into prominence, kerosene emulsion was recommended for most sucking insects including the squash bug. Later nicotine sulfate was recommended at 1 to 400. This latter substance is still used generally but gives very poor results on other than the first instar.

Of all the substances tried in this work, a kerosene extract of pyrethrum has given the best results. It has given good results upon the first three instars at 1 to 800, and by spraying periodically with it the nymphs may be controlled.

Tests were made on a number of insecticides, including both dusts and sprays. Of the dusts, cyanogas gave the most promising results. It was used in the concentrated form or diluted with nicotine dust or gypsum. Fair results were obtained when the conditions were such that it could be applied when no breeze was blowing. In most cases, however, when the dust was applied in the field the results were poor. Pyrethrum dust under field conditions killed about 30 per cent of the third instar nymphs, while rotenone dust killed only about 25 per cent of the third instar.

Each of the sprays was given a laboratory test and if it showed merit a field trial followed. The nicotine sprays were disappointing. It was not possible to kill all of the second instar individuals with nicotine sulfate at a dilution of 1 to 200, while nicofume gave very poor results at any dilution. Anabasine sulfate, an isomer of nicotine, gave much better results than the nicotine sulfate, killing about 75 per cent of the third instar nymphs at 1 to 200. Very poor results were obtained with Penticide and carbon disulfide emulsion, while Rotecide was effective on the second instar at 1 to 100, and Grasselli Contact Insecticide No. 1 was effective on these two instars at 1 to 500. Pyrethrum extracted in kerosene gave the most promising results of any of the insecticides. This pyrethrum spray should give good results under regular field spraying conditions.

SPRAY FORMULA

1. For 1 gallon of spray:

Kerosene extract of pyrethrum containing 2.15% pyrethrins	1½	teaspoonfuls
Potash soap containing 40% soap	20	cc.
or laundry soap	1	ounce
Water	1	gallon

2. For 50 gallons of spray:
   Kerosene extract of pyrethrum containing 2.15% pyrethrins .. ½ pint
   Potash soap containing 40% soap ..... 1 pint
   or laundry soap ..... 1½ lbs.
   Water .....50 gals.

The following table shows the results that were obtained with this material under both laboratory and field conditions. The figures are in each case the total of three trials, each trial having given similar results.

TABLE 9. RESULTS OBTAINED WITH PYRETHRUM SPRAY AT 1 TO 800

	Laboratory Test			Field Test		
Stage	No. of Insects	Killed	%	No. of Insects	Killed	%
1st instar	1	1 } 22	100	11	11 } 28	96.4
2nd instar	21	21 }		18	17 }	
3rd instar	12	11	92	42	34	80.9
4th instar	18	13	72	46	31	71.3
5th instar	11	5	43	78	36	39.7

Preparation and Application of Spray

The kerosene extract will not mix directly with water, but must be first emulsified with part of the soap. This may be accomplished by adding a little water to the soap, making a very thick solution. Add the extract, a little at a time, to this soap solution while it is being stirred vigorously, (a small electric mixer is excellent for making small quantities.) The result should be a thick, milky emulsion that will mix readily with water. The preparation of this emulsion is very important because, if not properly done, part of the kerosene will float on the surface rather than mix properly. For best results the emulsion should be prepared immediately before using, as soap has a detrimental effect upon pyrethrum if it is left standing.

Since the average time spent in the first instar is three days, and in the second instar seven days, if the plants are sprayed once every ten days practically all of the nymphs will be in the first or second instar when sprayed. The first application should be made when the nymphs first begin to hatch in the field (about July 1 in Connecticut). Three more applications made at ten day intervals will carry the spray program through the month of July, and as practically all of the eggs are deposited in this one month (see Figure 24), these four sprays should be sufficient.

Care should be taken to wet all of the insects. A thorough application must be made and the spray nozzle should be directed so as to hit the under side of the leaves with the spray. Pyrethrum kills the insects by its action upon the nervous system. It does not kill immediately, but when wet with the spray, the bugs drop to the ground in a stupor where they remain for as long as 40 hours before finally succumbing. Some of the

larger nymphs will recover from the effects of the pyrethrum, but the younger ones will be killed if thoroughly wet.

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REPORT ON PARASITES OF THE ORIENTAL FRUIT MOTH

PHILIP GARMAN AND J. C. SCHREAD

Propagation of parasites of the Oriental fruit moth continued in 1934 with the following results.[1] More Macrocentrus larval parasites were reared than ever before. Nineteen colonies of *Perisierola angulata* were distributed evenly over the State. (Figure 25) A few colonies of Ascogaster were placed in orchards but it appears that this species is the same as our native American form. (See note, page 252)

Trichogramma production was carried on with funds furnished by the growers, and 105 subscribers were supplied at a cost of about $475. About 11 million were distributed but more than 16 million were reared. A total of 1,566 new parasites (8 species) were placed by the Federal Bureau of Entomology in 10 colonies. Two of the most promising of these are

[1]All breeding work was handled by J. C. Schread, W. T. Brigham and George R. Smith.

now being reared and increased at the Experiment Station for liberation in 1935.

TABLE 10. PARASITE RECORD FOR JUNE TO SEPTEMBER, 1934

	Reared	Liberated
Ascogaster quadridentata	1,197	895
Macrocentrus ancylivorus	33,143	24,400
Perisierola angulata	4,148	3,433
Trichogramma	16,400,000	11,000,000
Other parasites[1]	.....	1,566

Collections in different locations in the State revealed that Macrocentrus is still scarce in some orchards. Notable among these localities are the higher elevations in Glastonbury and Somers. After two years' liberations at the Connecticut State College at Storrs, however, Macrocentrus now

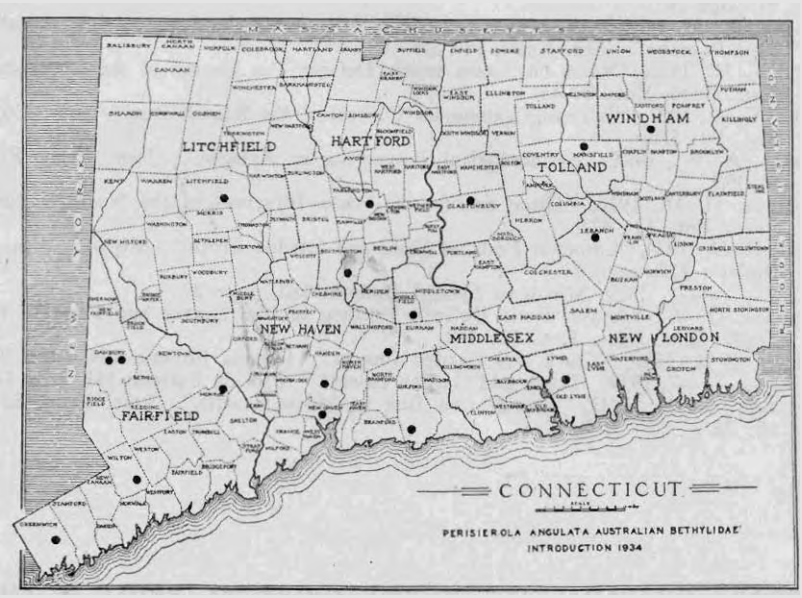

FIGURE 25. Map of Connecticut Showing where Colonies of *Perisierola angulata* were Liberated in 1934.

appears fairly well established. In certain orchards in the center of the State the parasitism of the second generation was high in spite of the cold weather during the winter which apparently had little or no effect upon the parasites. It remains to be seen, of course, whether the parasitism will remain at its present level in 1935, following a no-crop year.

Improved breeding methods accounted for the large increase of Macrocentrus available this year. The total production of live adults between January 1, 1934, and August 31, 1934, was 41,000. Some of these data were presented to the American Association of Economic Entomologists, Eastern Branch. The cost of breeding remains relatively high, but reduction of the work to routine procedures will, it is believed, bring the

[1] *Bassus diversus, Dioctes molestae, Macrocentrus thoracicus, Phanerotoma grapholithae, Orgilus* sp. *Apanteles* sp., *Elodia* sp., *Pristomerus vulnerator* and *Cremastus* sp. Additional liberations by the U. S. Bur. of Ent. bring the total to 16 colonies of 1,864 individuals.

expense of laboratory bred parasites to a figure comparable with field collected material.

As a result of tests over the winter it was determined that Oriental fruit moth larvae reared at 60° F., and then placed in storage at temperatures not below freezing, wintered as well as could be expected. (Table 11) Larvae placed in the insectary in October showed a tendency for the moths to pupate, but loss of parasites was not increased. During November, survival of both moths and parasites was good. In all cases, the larvae were placed in common storage after a short period in the insectary. The same procedure was followed in December and January with disastrous results. The loss of larvae increased to 53 and 78 per cent, and the percentage of parasite emergence (per cent of total reared) dropped accordingly. It is apparent that the method will yield nearly 30 per cent of the total in parasites if breeding conditions are favorable and the temperature does not drop too low after the larvae have spun. Thus in February, larvae reared at 60° F. and placed in common storage at a temperature above freezing wintered nearly as well as those obtained in November when conditions in our insectary were apparently suitable for hibernation purposes. It is evident, however, that undersized larvae are frequently lost during hibernation, so that feeding must also be considered of considerable importance.

TABLE 11. SHOWING RESULTS OF HIBERNATION TESTS.

COUNTS SHOWING EMERGENCE OF MOTHS AND PARASITES AT THE END OF THE SEASON

Month reared	Total	Dead fruit moth larvae	No. moths emerging	Dead Macro.	No. Macro. emerging	% Macro.[1] emergence
October	632	304	175	7	146	23.1
November	1,570	120	930	9	511	32.4
December	2,308	1,802	388	5	113	4.9
January	2,737	1,440	865	32	400	14.6
February	1,479	323	684	49	423	28.5

During the summer, J. C. Schread and W. T. Brigham made a series of collections in commercial peach orchards, in order (1) to recover, if possible, foreign parasites that were liberated in 1933, and (2) to learn more accurately the extent of native parasitism, as well as (3) to study the situation regarding Macrocentrus. The compiled results appear in the following table. The total average parasitism of Macrocentrus was 32 per cent. July parasitism in several cases, however, was much higher, reaching 86 to 91 per cent of the total larvae collected. The second most important parasite is Glypta, which in some orchards accounts for the only parasitism of any value.

[1]Per cent of total larvae reared.

TABLE 12. ORIENTAL FRUIT MOTH AVERAGE SEASONAL PARASITISM, 1934

Orchard	Location	Situation	Parasitism					
			Macrocentrus ancylivorus	Glypta rufiscutellaris	Cremastus sp.	Eubadizon sp.	Opheltes sp.	Total
Rogers	Southington		11.76					11.76
Rogers	Middletown		85.71		3.57			89.28
Lyman	Middlefield	Upper orchard	57.22	1.06		3.27		61.55
Lyman	Middlefield	Lower orchard	39.20	1.01	2.02			42.23
Kneuer	Guilford	North orchard	7.93			6.41		14.34
Kneuer	Guilford	South orchard	14.55	9.48		1.86	.92	26.81
Root	Farmington		91.43					91.43
Scaglia	Glastonbury	North orchard	26.06	2.63				28.69
Scaglia	Glastonbury	House orchard	7.14					7.14
Scarrone	Glastonbury			25.09				25.09
Malnati	Glastonbury			7.41				7.41
Zola	Glastonbury							0.
Farm	Mount Carmel		18.40	22.66		11.17		52.23
College	Storrs		2.85					2.85
Mt. View	Somers			4.00				4.00
Smith	Hebron		25.00					25.00
		Average	**32.27**	**9.16**	**2.79**	**5.67**	**.92**	**30.60**

LEAD ARSENATE SUBSTITUTES

PHILIP GARMAN

Lead arsenate substitutes continued to occupy our attention in 1934. Experiments were conducted along two lines: (1) an effort to correct burn caused by calcium arsenate, (2) continued study of synthetic cryolite.

In the case of calcium arsenate, zinc sulfate was used as a corrective and severely russeted the fruit. The cryolite used was ineffective against codling moth and plum curculio, which may have been due to (1) mixture with lime which is said to render it less toxic, or (2) to the physical characteristics of the material which appeared to be inferior to that of the brand used in 1933. As in 1933, however, there was no foliage burn from the use of cryolite, flotation sulfur, and lime, and some control was secured but not as much as with lead arsenate. For apple maggot (Table 14), however, control continues to appear promising and to compare favorably with that of lead and calcium arsenate. For purposes of comparison, the percentage of maggoty Mother apples should be compared with Hurlbut, which ripened almost at the same time in our orchard. Control of this insect with all poisons was unsatisfactory in our orchard in 1934. A large number of codling moth "stings" were seen on apples sprayed with cryolite, which were not evident in the lead arsenate or calcium arsenate plot.

TABLE 13. GENERAL SUMMARY OF RESULTS WITH CRYOLITE, CALCIUM ARSENATE AND LEAD ARSENATE FOR CONTROL OF APPLE INSECTS EXCEPTING APPLE MAGGOT

Orchard	Treatment	Curculio %	Codling moth %	Good fruit* %	Notes
Experiment Station Farm, Mount Carmel	Cryolite (1)	23.9	11.9	46.6	Little or no russet.
	Calcium arsenate (2)	21.4	.9	43.8	19.5% of fruit rejected because of russet.
	Lead arsenate (3)	17.6	.6	75.2	Little or no russet.
	None—check	48	11.5	1.0	Little or no russet.
Connecticut State College, Storrs	Cryolite (1)	34.5	2.6	46.6	The amount of curculio injured fruit here was influenced to some extent by location of the treated trees.
	Lead arsenate (3)	8.4	.2	81.2	

(1) Cryolite-flotation sulfur-lime. 4 lbs. cryolite per 100 gallons.
(2) Calcium arsenate-zinc sulfate-lime. Last two sprays omitting zinc sulfate and substituting bentonite. 3 lbs. calcium arsenate per 100 gallons.
(3) Lead arsenate-flotation sulfur and lime. 3 lbs. lead arsenate per 100 gallons.

*Count of good fruit excludes maggot of which there was little or none in fruit from the Connecticut State College. For results at the Experiment Station farm at Mount Carmel, see Table 14.

In addition to the test at Mount Carmel, Professor S. P. Hollister had his men apply cryolite at the college orchard at Storrs, using for this purpose four rows across the north end of the orchard. Examination of drop fruits by C. O. Dunbar, early in the summer at thinning time, indicated inferior control for cryolite. A check-up of picked fruit at the end of the season gave similar results and showed an increase of both codling moth and curculio where cryolite was used. The same formula (4 pounds lime, 4 pounds cryolite and 4 pounds flotation sulfur) was used in both orchards, although the number of applications was different.

The russet produced by zinc sulfate was of the same order as that produced by Bordeaux mixture and eliminates the possibility of using this material on apple trees.

Thanks are due to Professor Hollister and Mr. Dunbar for their very cordial coöperation in this project.

TABLE 14. CONTROL OF APPLE MAGGOT
Experiment Station Farm, Mount Carmel, 1934

Variety	Total fruits	Number cut open*	Number maggoty	Estimated number of total fruits maggoty	% maggoty
		SYNTHETIC CRYOLITE			
Stark	2,893	505	151	543	18.7
Baldwin	10,662	1,568	250	1,577	14.8
Mother	3,364	739	236	1,000	29.7
		LEAD ARSENATE			
Greening	3,815	501	189	1,616	42.3
Hurlbut	6,499	1,537	1,168	3,551	54.6
		CALCIUM ARSENATE			
Greening	5,227	859	624	2,977	56.9
Hurlbut	1,745	272	158	678	38.8
		CHECK—NO TREATMENT			
Greening	915	227	183	676	73.8

*A sample from each lot of fruits was examined by cutting open and the percentage maggoty applied to that lot only. By estimating the probable number maggoty on the basis of the sample and adding the numbers obtained for the different lots, the total number of maggoty fruit may be obtained. This appears under "Estimated number of total fruits maggoty". The procedure was followed because there is frequently a larger percentage of maggoty fruit among the drops and windfalls than in the picked fruit.

FURTHER TESTS WITH ZINC SULFATE AS A CORRECTIVE FOR LEAD ARSENATE BURN ON PEACHES

PHILIP GARMAN

Field tests with zinc sulfate corrective in 1933 appeared so promising that experiments with it were conducted again in 1934. Early sprays applied June 1 and 14, 1934, however, began to show burn and leaf drop about the first of July. A series of 14 different combinations were then applied on the remainder of the orchard to learn what was the cause of the trouble and whether any combination of materials was responsible.

Pure zinc sulfate, U.S.P. grade, was compared with the technical grade used earlier in the summer. Various combinations of lead arsenate with lime; lime, flotation sulfur and lead arsenate; lime, bentonite and lead arsenate; were compared with one another and with cryolite and barium fluosilicate. Counts of leaf scars and remaining leaves on new growth were made September 7 with a view to finding which combinations were best. As indicated in the table, the best lead arsenate combination in these tests apparently consisted of (1) 4 pounds zinc sulfate, 4 pounds lime, 3 pounds lead arsenate and 4 pounds dry flotation sulfur; and (2) a combination of 4 pounds zinc sulfate, 4 pounds lime, 3 pounds lead arsenate, to which were added 2 pounds bentonite and 1 pound Casco "waterproof glue". Only in the case of the plots sprayed with barium fluosilicate and cryolite, however, did results equal that of check trees. Increased lime was also of some benefit in the combinations containing lead arsenate.

In view of the results this year, it appears advisable to add a wettable sulfur to zinc sulfate when it is used as a corrective for lead arsenate burn. Glue-bentonite buffer is also promising, and further work should be done with barium fluosilicate and cryolite as substitutes for lead arsenate.

In view of the danger of burn from lead arsenate combinations, it is recommended that this material be used in Connecticut only where curculio threatens the crop, and that whatever formula is used should include a wettable sulfur similar to the one used. It also seems advisable to use at least eight pounds of hydrated lime in the mixture.

TABLE 15. COUNT OF LEAVES AND LEAF SCARS ON TREES AT MOUNT CARMEL FARM SPRAYED WITH VARIOUS POISONS AND CORRECTIVES

Plot	Materials	Total leaves remaining	% leaf drop
I	Zinc sulfate (U.S.P.) 4, lime 4, lead arsenate 3 lbs. —100 gallons	754	22.2
II	Zinc sulfate (Tech) 4, lime 4, lead arsenate 3 lbs. —100 gallons	1005	16.5
III	Zinc sulfate (Tech) 4, lime 4, lead arsenate 3 lbs. —100 gallons	712	10.3
IV	Zinc sulfate (Tech) 4, lime 8, lead arsenate 3 lbs. —100 gallons	919	6.7
V	Zinc sulfate (Tech) 4, lime 4, lead arsenate 3, flotation sulfur 4 lbs.—100 gallons	794	5.8
VI	Zinc sulfate (Tech) 4, lime 4, lead arsenate 2 lbs. —100 gallons	761	9.5
VII	Zinc sulfate (Tech) 4, lime 6, lead arsenate 2 lbs. —100 gallons	811	8.7
VIII	Zinc sulfate (Tech) 4, lime 4, lead arsenate 2, bentonite 2 lbs.—100 gallons	810	10.0
IX	Check—no treatment	866	1.7
X	Lime 4, cryolite 4, flotation sulfur 4 lbs.—100 gallons	875	2.0
XI	Zinc sulfate (Tech) 4, lime 4, lead arsenate 4, bentonite 2, glue 1 lb.—100 gallons	929	6.1
XII	Barium fluosilicate 4, lime 4 lbs.—100 gallons	961	2.9
XIII	Zinc sulfate (Tech) 4, lime 4, lead arsenate 3, bentonite 2 lbs.—100 gallons	758	12.8
XIV	Check—no treatment	220	2.7

Note counts of leaves on at least four trees of uniform vigor in each plot. Variety Elberta. Sprays applied July 10 and July 26.

TOXICITY OF PURE ANABASINE AND PURE NICOTINE FOR *Aphis Rumicis*

PHILIP GARMAN

During the winter of 1934, pure nicotine was obtained from Dr. G. W. Pucher, of the Connecticut Agricultural Experiment Station, Department of Biochemistry, who isolated it from the tobacco plant. At the same time Dr. H. J. Fisher, of the Department of Analytical Chemistry, isolated pure anabasine from anabasine sulfate supplied by the Department of Entomology.

Since the commercial products containing nicotine or anabasine are both more or less impure, it was considered worth while to compare the two

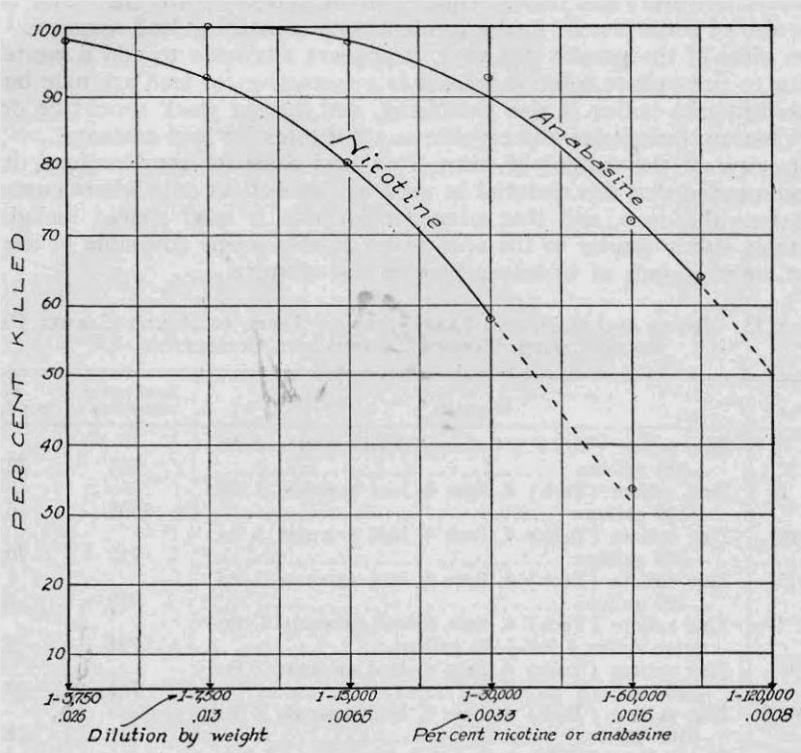

FIGURE 26. Chart Showing Toxicity of Pure Nicotine and Pure Anabasine to *Aphis rumicis*.

alkaloids in water solution to learn which is the more effective killing agent for *Aphis rumicis*.

Dilutions were made carefully on a weight basis and spraying of the aphids as well as subsequent handling of the insects was done under as carefully controlled and comparable conditions as possible. Only mature wingless agamic females were counted in each experiment. C. P. sodium oleate, 1 to 1000, was used as a spreader.

The percentage killed in every case was better with anabasine than with nicotine. and dilutions of anabasine. three to four times as great as nicotine. gave the same kill.

Thus from data that we have secured so far there appears little doubt that anabasine is the stronger killing agent for the aphids on which it has been tested and is probably so for other species. Figure 26 gives a general picture of the results with pure alkaloids. Table 16 gives results of tests from which the curves were drawn.

TABLE 16. RESULTS OF SPRAYING *Aphis rumicis*[1] ON NASTURTIUM LEAVES WITH PURE ANABASINE AND PURE NICOTINE

Dilution	Nicotine sulfate				Anabasine sulfate			
	Dead	Moribund	Alive	Per cent dead and moribund	Dead	Moribund	Alive	Per cent dead and moribund
1–3,750	113	2	2	98.2				
1–7,500	108	13	10	92.3	154	1	0	100.0
1–15,000	97	26	30	80.3	104	2	1	99.0
1–30,000	86	42	86	59.7	130	15	11	92.9
1–60,000	67	8	146	33.6	227	34	101	71.9
1–90,000					73	15	49	64.2
	Check—no treatment				Sodium oleate—1–1000			
	3	0	143	2.3	36	3	103	27.4

[1]Sprayed at 10 pounds pressure; DeVilbiss nozzle nine inches from leaf, length of exposure to spray uniform. Aphids kept under battery jars with saturated salt solution maintaining humidity at about 70 per cent.

CONTROL EXPERIMENTS AGAINST THE WHITE APPLE LEAFHOPPER

PHILIP GARMAN

The white apple leafhopper became abundant enough in 1934 to warrant further tests with control measures. Field experiments were conducted on trees at the Mount Carmel farm using (1) nicotine sulfate 1-800 (2) nicotine sulfate 1-800 and three pounds of flake soap per 100 gallons (3) anabasine sulfate 1-800, with and without the addition of three pounds of soap per 100 gallons. Two pyrethrum compounds were used, both having stood for one year before application. It will be seen from Table 17 that there was no advantage from the addition of three pounds of soap to nicotine or anabasine sulfate. Neither of the pyrethrum compounds appeared to be equal in toxicity to either nicotine sulfate or anabasine sulfate. Counts were made by Mr. Townsend before and after treatments, without knowledge regarding which trees were sprayed and which were unsprayed.

TABLE 17

Treatment		Nymphs per 100 leaves before spraying	Nymphs per 100 leaves after spraying	Percentage reduction
Nicotine sulfate Flake soap	1 pint to 100 gals. 3 lbs. to 100 gals.	261[1] 479	10.2 53	96.8 88.9
Nicotine sulfate	1 pint to 100 gals.	222 417	10 2.5	95.5 99.6
Anabasine sulfate Flake soap	1 pint to 100 gals. 3 lbs. to 100 gals.	142 375	1.3 2.5	99.1 99.3
Anabasine sulfate	1 pint to 100 gals.	227 440	.6 0.0	99.7 100.0
Penetrol extract pyrethrum Plus penetrol	1 pint to 100 gals. 1 quart to 100 gals.	279 292	120.0 27.0	57.0 90.7
Pyrethrum soap	6 lbs. to 100 gals.	280 282	7.0 36.0	97.5 87.2
Check—no treatment	(Av. 15 trees) (Av. 3 trees)	138 241	171.0 161.0	00.0 33.1[2]

[1]Average of 2 or 3 trees.
[2]Probably due to emergence of adults from nymphal stage.

In addition, an experiment was made with a view to determining whether reduced nicotine sulfate would be effective and whether the reduced charge would be more effective with soap than without. This is shown in Table 18, and indicates that there is no advantage in immediate kill with the soap content used. Counts were made on the morning of September 11. The sprays were applied between 1 and 3 P. M. the same day, and the follow up counts made the morning of September 12. The spraying was done with a power sprayer maintaining 300-310 pounds pressure at the pump and was applied with the same length hose and a quad nozzle in both cases. One-half pint of nicotine sulfate per 100 gallons was used in each test. Soap was used at the rate of three pounds flake soap per 100 gallons, completely dissolved in hot water. The materials were thoroughly applied to all parts of the tree.

It appears from this and previous work that (1) nicotine sulfate affords good protection at 1-800 without soap, (2) that anabasine sulfate is at least as effective for leafhoppers as nicotine sulfate and in some cases more effective.

It would appear also that supposed liberation of nicotine by the soap is a disadvantage in leafhopper control since part of the insecticidal action is residual. More inert spreaders, therefore, would probably be advantageous in control of this insect.

TABLE 18

Treatment	Tree No.	Nymphs per 100 leaves before spraying	Nymphs per 100 leaves after spraying	Per cent reduction
Nicotine sulfate No soap	G. 1	138	10	
	2	295	15	
	3	213	21	
	4	255	14	
	5	375	27	
	6	335	31	
	7	238	22	
	8	180	28	
	Totals	2,029	168	
	Av. per tree	253.6	21.0	91.7
Nicotine sulfate plus soap	H. 1	88	7	
	2	240	43	
	3	230	14	
	4	133	4	
	5	180	23	
	7	235	17	
	8	88	14	
	Totals	1,194	122	
	Av. per tree	170.5	17.4	89.8
Check—no treatment	H. 6	253	188	25.7

OBSERVATIONS ON TERMITE DAMAGE IN CONNECTICUT

NEELY TURNER, J. F. TOWNSEND AND M. P. ZAPPE

The eastern subterranean termite, *Reticulitermes flavipes* Kollar, has been common in stumps and logs in Connecticut woodlands for many years. However, damage to buildings was not commonly reported until 1932. The first report of infestation in a building was received in 1909, and during the period between 1909 and 1932, three reports were received. It is evident that termite injury to buildings in Connecticut has increased during the past three years. In 1932, seven cases were investigated; in 1933, 13 cases; and in 1934, 24 cases. For many years property owners have been under the impression that termites were injurious only in tropical and sub-tropical regions. Since they have realized that termites occur in Connecticut and frequently damage buildings, more reports of injury have been received.

This report includes the records of 24 cases of termite injury investigated as a result of requests made by property owners. In addition, 22 unsolicited examinations were made to determine whether or not termites

were present. These examinations were made at random and usually in localities from which no reports of termite injury had been received. These locality records are as follows:

Town	Termites present	Termites not present
New Haven	10	3
Hamden	4	2
Branford	1	0
Madison	0	1
Saybrook	0	1
	15	7

In eight instances the termites found were in buildings and had caused some damage. In seven cases, termites were present in posts, fences and the like on the property.

These examinations were not extensive, but they showed a very large percentage of properties where termites were present. Since the observations were made at random it would appear that termite infestations are common in Connecticut, and that there is a possibility of damage to a large percentage of buildings.

The 24 requests for examinations to determine the presence of termites were located as follows:

Town	No. infested buildings	Town	No. infested buildings
New Haven	10	North Madison	1
Hamden	2	Bristol	1
Meriden	2	Easton	1
Milford	2	Weston	1
Westport	2	Stamford	1
Newtown	1		
	Total	24	

Three cases of termite infestation were found in houses more than 75 years old, seven occurred in houses from 25 to 50 years old, and the remaining 14 infestations were in houses of modern construction. Some of the older houses had wood touching the soil in many places and were, therefore, very susceptible to termite infestation. The classified list is as follows:

Point of entry	No. of cases: Modern houses	Old houses
Direct contact between wood and soil		
Sills, cellar windows, etc. on soil	2	4
Sill underneath porch or terrace in contact with fill	7	0
Through cracks in foundation and floor		
Entering cellar door casing or bulkhead	1	4
Entering sills	1	2
Entering through cracks in concrete floor	3	0
Miscellaneous	2	0
	16	10

Wood in contact with soil. In one modern house joists were in contact with soil under a portion where the soil had not been excavated. The other

modern house had too high a grade on one side and the soil was in contact with the sheathing and siding. In an old house in Newtown, the wooden basement floor was laid directly on soil. In an old house in North Madison, the sills were in contact with the soil in several places. A wooden porch was infested in a house in New Haven, and in a house in Meriden the cellar window frames were in contact with the soil.

Underneath terrace or porch. Many modern houses have concrete or stone porches or terraces laid over cinder, dirt or gravel fills. In a majority of these houses the fill comes in contact with the sill and offers an excellent opportunity for termites to enter the house. Five of the seven houses in this group had no other termite-susceptible points except under such a terrace. In the other instances, soil was poorly graded around one, allowing direct contact between soil and sheathing, and termites were entering the cellar bulkhead in the other.

Through foundation into cellar door casing. Frequently termites entered through cracks in the foundation near an outside basement entrance. They entered the wooden door casing or the wooden portion of the bulkhead and worked up into the sill. Four such cases were observed in old houses, and one in a modern house. In three of the five cases, serious damage had been done to the sills.

Through cracks in foundation. The one modern house in this group was built in woodland which offered ideal conditions for termite development. Termites were abundant in the locality, and the use of stumps and wood scraps in a large fill resulted in establishment of a termite colony within a few feet of the house foundation. Termites had entered through the foundation, which was stone laid in lime and cement mortar. Some damage was found in the sill and in other wood portions of the house. This house was new and well constructed, and in a locality where termites were less abundant would not have been damaged.

The two other houses in this group were colonial houses. One of these had been remodeled several years ago. Old termite injury was evident in the house and in two old barns near by. Since the house has been heated during the winter, the termites have extended their activity both in the original house and in two wings added during rebuilding. They had entered at numerous places through the old foundation, which was of stone laid in lime mortar. Termites were also entering through the foundation for the fireplaces. The new wings were built without excavation of the soil, and termites had built tubes along the inside of the foundation walls and had entered sills, joists and studding. Pine paneling and trim was ruined in several places in the house.

The second of these colonial houses had been purchased for remodeling. Termites had entered the sills in numerous places through the stone foundation, which was stone laid in cement mortar. There was much evidence of termite damage extending over a period of years. About 35 years ago the house was repaired and new joists had been set in place beside the old ones. These older joists had been badly damaged by termites. It appeared that termite injury had made the use of additional joists necessary. When the house was examined these additional joists were found to be infested by termites. The fireplace foundation was also

a source of entry. This foundation was made of large timbers and stone laid in lime mortar.

Cracks in concrete floors. In two of these cases winged termites were coming out of cracks in concrete floors. In one instance there was no evidence of termite injury, since no wood had been used in constructing the basement of the building. In the other case the building was made of brick, and the only wood was a door frame. In the remaining case in this group, termites had entered through a crack in a concrete floor and had partially destroyed an oak floor laid over the concrete on sleepers.

Miscellaneous. In one of these cases termites had damaged posts in the lawn, but had not entered the house. This house was practically termite-proof. In the other instance termites had ruined a trellis near a garage and were entering the garage through a direct soil contact resulting from improper grading.

Discussion. These records show that both old and modern houses are susceptible to termite attack. In both classes of houses the most frequent source of entry was in wood in actual contact with soil. In old houses this contact resulted from improper construction and included sills, cellar window frames and wooden porches in direct contact with soil. In modern houses, this type of difficulty was more common underneath stone or concrete porches or terraces. The type of construction commonly used allowed direct contact between the fill and the sill or easy access from the fill to the sill. As a rule the foundations of modern houses were more resistant to termite entry than foundations of old houses. The older types of foundation were usually of stone or brick laid in lime mortar. Such foundations were commonly entered by termites.

Damage caused by termites. It is very difficult to obtain an accurate estimate of the loss caused by termites. In the 24 cases investigated during the past year, it has been possible in three instances to obtain accurate figures as to the actual cost of replacement of seriously injured timbers and changes in construction necessary to avoid further damage. On the basis of these figures, estimates have been made for the other 21 cases. The accompanying table gives these figures, together with an estimate of the amount of money spent:

TABLE 10. COST OF REPAIRS BECAUSE OF TERMITE DAMAGE

Location	Number of cases	Estimated cost of repairs and termite-resistant construction	Estimated amount actually spent
New Haven	10	$1,510	$ 880
Hamden	2	100	10
Meriden	2	750	100
Milford	2	550	150
Westport	2	400	400
Newtown	1	1,500	200
Bristol	1	250	250
Weston	1	1,250	1,250
Stamford	1	100	100
North Madison	1	250*	0
Easton	1	250*	0
		$6,910	$3,340

*House to be remodeled, cost estimated in addition to remodeling.

The amount actually spent is less than the estimated cost, since several property owners decided to stop entry of termites in the parts of the houses now affected without making the rest of the house termite-proof. It is probable that in many cases the rest of the buildings will require protection within a few years.

CONTROL OF INSECTS OF ORNAMENTAL PLANTS, 1934

NEELY TURNER

Growth of Asters and Dahlias Under Shade

A small shade tent was constructed for the purpose of controlling yellows on asters and mosaic on dahlias. Both of these diseases are carried by leafhoppers. Late varieties of asters (wilt resistant) were planted both under shade and in the open on June 8.

The shaded plants grew much more rapidly than the plants in the open, and produced about twice as many blooms. The flowers were slightly larger under shade, and the colors were richer. Due to wind storms, the tent was torn and leafhoppers entered carrying in yellows. At no time was the yellows as prevalent in the tent as it was in the open. Furthermore, the blister beetles which damaged field-grown plants did not enter the tent. In this season, at least, growth of asters under shade was highly successful.

The dahlias grew well under shade and produced larger blooms of delicate hues. However, although no mosaic developed under the tent, there was no marked advantage in dahlia culture under shade. Some tent cloth was furnished for C. Louis Alling of West Haven. Mr. Alling was able to grow very fine dahlias under shade, but the plants were tender and the growth almost too succulent. The damage from the European corn borer was much less under shade than in the open.

TESTS ON THE CONTROL OF CERTAIN VEGETABLE INSECTS

NEELY TURNER

Mexican Bean Beetle

The study of the effect of spacing of bean plants on injury by the Mexican bean beetle, *Epilachna corrupta* Muls., was completed in 1934. The total yield was largest on plants spaced two inches apart in the row, and the yield decreased as the spacing was increased to four, six and eight inches. However, the yield per plant, size of the pods and percentage of uninjured pods increased with wider spacing. More bean beetle injury

was noticed on the plots in which the spacing was two inches than on the other plots. Sprays were more efficient when the plants were spaced four inches or more apart in the row.

Insecticide investigations showed that one application of derris dust containing .6 per cent rotenone, or pyrethrum dust containing 50 per cent pyrethrum, controlled a light infestation of bean beetles. Three applications of derris dust containing .4 per cent rotenone, or pyrethrum dust containing 25 per cent pyrethrum, controlled a moderate infestation of bean beetles and also reduced the injury caused by the bean leafhopper (*Empoasca fabae* Harr.). Both of these dusts controlled bean beetles as efficiently as two sprays of magnesium arsenate at the rate of three pounds in 100 gallons of water.

Bordeaux mixture (4-4-50) applied to lima beans three times during the season, was slightly less effective in controlling bean beetles than copper-lime-calcium arsenate dust applied once and followed by two applications of derris dust containing .6 per cent rotenone. Two applications of magnesium arsenate dust (one pound magnesium arsenate and five pounds lime), or of copper-lime-calcium arsenate dust controlled bean beetles on horticultural beans.

Potato Flea Beetle

Further tests were made on Irish Cobbler potatoes to control the potato flea beetle (*Epitrix cucumeris* Harris), with the following results:

Treatment	Number of applications	Calculated acre yield-bushels
Lead arsenate 3 lbs., fish oil 1 qt., water 100 gals.	4	225
Bordeaux mixture, 4-4-50	4	217
Barium fluosilicate dust (1 lb.—3 lbs. lime)	5	189
No treatment	—	149

For the third year in succession the lead arsenate and fish oil spray was slightly more effective than Bordeaux mixture. The barium fluosilicate dust controlled flea beetles but did not produce as high a yield as either of the two sprays.

On Green Mountain potatoes, tests were made with the following results:

Treatment	Number of applications	Calculated acre yield-bushels
6-6-50 Bordeaux mixture	8	538
6-6-50 Bordeaux mixture plus 1½ lbs. calcium arsenate	8	463
Barium fluosilicate dust (1–3) followed by 6-6-50 Bordeaux mixture	2 6	567
Barium fluosilicate dust (1-3)	6	272
No treatment	—	261

In this test the barium fluosilicate dust applied in June, followed by Bordeaux mixture in July, August and September, produced the highest yield. The dust used throughout the season was not effective because it did not control leafhoppers. The delayed application of Bordeaux mixture in the combination treatment was effective in leafhopper control. The

reduced yield from the addition of calcium arsenate to Bordeaux mixture was unexpected and is certainly not due to the calcium arsenate.

Onion Thrips

Dusts of crude chipped naphthalene, ground and mixed with lime at the rate of 40 pounds naphthalene and 60 pounds lime, were used in tests to control the onion thrips, *Thrips tabaci* Linde. Applications were made three times on set onions and four times on seed onions. There was no evidence of any control, and the dusted plots appeared less healthy than the check plots.

Control of Leafhoppers on Dahlias

Through the coöperation of George A. Hopson, sprays were applied to pompon dahlias for control of leafhoppers. These leafhoppers (*Empoasca fabae* Harris) caused severe tipburn, some leaf curl, some dwarfing, and much mosaic. During the season of 1933, repeated applications of nicotine sulfate and soap failed to give any permanent relief. The plants improved markedly for a few days following spray application, but were injured by migrating leafhoppers.

On August 9 an application of 4-4-50 Bordeaux mixture was made. The sprayed plants showed improvement immediately. The tipburn did not occur on the new growth and leafhoppers were much less abundant. On August 30 a second application of 4-4-50 Bordeaux mixture was made. Following this spray the plants improved remarkably and blossomed normally. This was the first time in three years that these pompons had produced blossoms in normal numbers. The results would have been even more striking if spraying had been done in July as well, but it was very apparent that the Bordeaux mixture sprays were highly effective in preventing injury from leafhopper attacks.

EUROPEAN PINE SHOOT MOTH AND WHITE PINE WEEVIL CONTROL BY THE CIVILIAN CONSERVATION CORPS AND THE CIVIL WORKS ADMINISTRATION

R. B. Friend

The control of the European pine shoot moth and the white pine weevil in certain forested areas of the State was undertaken by the Civilian Conservation Corps under the direction of A. F. Hawes, State Forester. General supervision was given this control work by the offices of the forester and entomologist of the Agricultural Experiment Station.

The European pine shoot moth control operations covered practically all of the red pine plantations in the State which could be worked except those in Fairfield County, and were carried out between October 1, 1933, and January, 1934, and between April 10 and June 15, 1934. The object was to eliminate the insect as far as possible from the area involved by

clipping off infested tips and burning them. This can obviously be done only in stands where all parts of the trees can be reached from the ground. Young trees are, however, much more susceptible to shoot moth injury and much more heavily infested as a rule than trees which have reached a height sufficient to close the stand. The insect normally spreads rather slowly and it takes from three to five years to build up a bad infestation after the insect is introduced. The severely cold weather of the winter of 1933-34 markedly reduced the shoot moth population and thus tended to increase the efficiency of the control operations. In Fairfield County the general infestation in years past has been so heavy and many of the plantations were, as a consequence, so severely injured that no control operations were undertaken there by men from the CCC camps.

Between October 1, 1933, and January, 1934, 4,033 acres were covered. Between April 10 and June 15, 1934, 3,501 acres of the above were reworked and an additional 2,567 acres covered for the first time. The trees on 112 ornamental plantings near forest plantations were also gone over thoroughly. Crews from 13 camps were employed.

In addition to this work, crews of men employed under the CWA carried out control operations of a similar nature on about 1,800 acres of forest plantations and on several ornamental plantings in New Haven, Fairfield and Litchfield Counties. The forest plantations covered were, in general, immediately south of the area covered by the CCC crews and were aimed at supplementing this work. In Fairfield County, for example, the work was confined to the northeastern sections. The operations on ornamental plantings were confined to a row of towns east and north of the border of that part of the State most heavily infested by the insect. It was necessary to stop the CWA work before all plantations scheduled for control operations were covered, but much excellent work was accomplished. This project was under the immediate direction of John Wulff, a forester temporarily employed by the Experiment Station for this purpose.

Between the effect of the low temperature during the winter of 1933-34 and the control operations, the shoot moth population was noticeably depressed. An examination of about 50 plantations scattered over much of the control area in the fall has shown either the absence of the insect or the presence of a very light infestation.

The white pine weevil control operations were carried out by the Civilian Conservation Corps primarily for the protection of the public forests in the State. It is useless to attempt weevil control in a small area, so no total area of less than 100 acres was considered. This meant control operations on a few privately owned stands adjacent to the state forests and parks. Crews from 10 camps covered a total area of 5,017 acres and removed and burned 127,481 infested white pine leaders. This work was carried on between the middle of June and the first part of August. In the eastern part of the State there was approximately four times as much infested pine as in the western part. In the former region the net area of white pine covered was about five times that in the latter. In 1933, crews from seven camps covered a much smaller net area of white pine stands and removed 35,000 infested leaders (Plumb and Hicock, Jour. Econ. Ent. 27: 344-345). The 1934 operations included all of the area covered in 1933. The infestation in some areas in 1934 was less than that

of 1933 and in some areas more, according to reports made by the foremen in charge of the crews. Weevil control is essentially a silvicultural operation which should be carried out every year in Connecticut white pine stands.

All insect control operations by the Civilian Conservation Corps must be approved by the Federal Bureau of Entomology, and the coöperation of Dr. H. J. MacAloney of this Bureau has been appreciated by those connected with the work.

MISCELLANEOUS INSECT NOTES

Holly Leaf Miner in Connecticut. On April 26, leaves of *Ilex glabra* infested by the holly leaf miner, *Phytomyza ilicis* Curt., were received at the Station from Newington. On July 18, leaves of holly, *Ilex opaca,* similarly infested were received from Hartford. This insect has one annual generation and the larvae pass the winter in the leaves. Doctor Felt[1] recommends spraying the foliage, soon after the mines have first become noticeable, with nicotine solution and soap or some other spreader.

[W. E. Britton]

Forest Tent Caterpillar. While collecting insects in company with Neely Turner of the Entomology Department of this Station, at Hubbard Park, Meriden, on May 29, 1934, the presence of great numbers of larvae of the forest tent caterpillars, *Malacosoma disstria* Hubn., was noticed. The caterpillars were nearly full grown, were feeding on oak and maple, and many of the trees had lost about half their foliage. On June 20, a few full-grown caterpillars were observed on oak, maple and wild cherry at the Highland Golf Club in Meriden. No marked defoliation was noticeable. [M. P. Zappe]

Summer Squash Injured by Pickle Worm. On September 5, 1934, larvae boring in summer crookneck squash were received from Guilford, as shown in Figure 27. The insect causing the injury is the pickle worm, *Diaphania nitidalis* Stoll. A more extended account of this insect may be found in Bulletin 338 of this Station, page 584. The office of State Entomologist was established in 1901, and since that time the only injury by this insect, observed by members of this department or called to their attention, occurred in 1931 and in 1934. The pickle worm is a southern insect rarely causing damage in Connecticut, but in 1931 it injured cucumber and squash in eight towns near the coast. [W. E. Britton]

Green Striped Maple Worm. On August 8, specimens of the green striped maple worm, *Anisota rubicunda* Fabr., on red maple were received from Warren, where the caterpillars were observed on red maple over a large area, and several small trees had been entirely defoliated. The caterpillars are pale yellowish green, striped longitudinally with darker

[1] Manual of Tree and Shrub Insects, page 109. 1924.

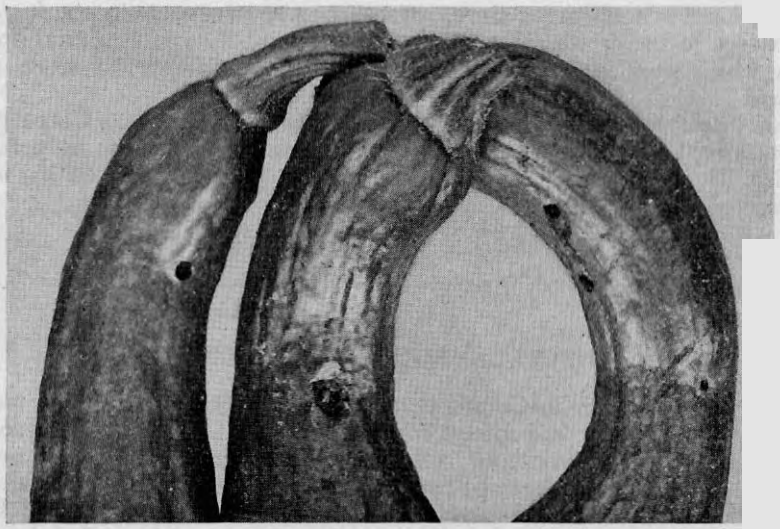

FIGURE 27. Injury to Summer Squash by Pickle Worm About Natural Size.

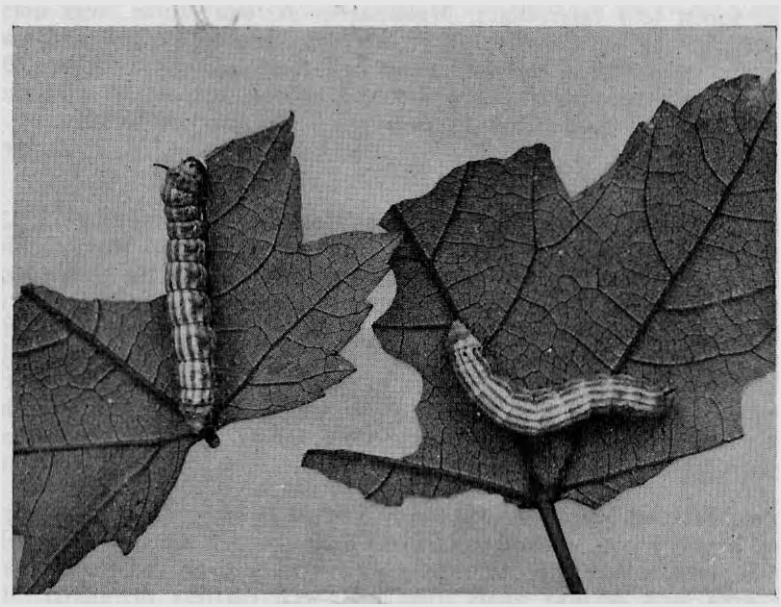

FIGURE 28. The Green Striped Maple Worm. Natural Size

green, and reach a length of about one and one-half inches. The second segment near the head bears two slender black spines with two lateral rows of shorter spines. The adult moth is rose pink with each front wing crossed by a broad yellowish band, and has a wing spread of about two inches. The caterpillar stage is shown in Figure 28. Spraying with lead arsenate will protect the foliage. [W. E. Britton]

FIGURE 29. Monarch Butterflies Clustered Upon the Branch of a Tree

Great Abundance of the Monarch Butterfly. The monarch or milkweed butterfly, *Danaus menippe* Fabr., was unusually common in Connecticut in 1934. In August the butterflies congregated in large numbers, as is their habit preparatory to migrating southward. Mr. Norman Bryant observed thousands of them clustered on trees along the shore at Sachem

Head, Guilford, August 20. They alighted at dusk between 7:00 and 7:30 o'clock P. M., and resumed their flight the next morning. In the early morning Mr. Bryant took some snapshots, one of which is shown in Figure 29. These migrating swarms have been seen by other observers in other seasons. Photographs of the butterflies have also been made, and nearly all are underexposed as is Mr. Bryant's, because the light conditions are very poor while the butterflies are clustered on the trees.

[W. E. Britton]

A New Dermestid Beetle in Connecticut. On January 9, some beetles were brought to the Station from a store in Bridgeport, where they were found in the packing of a case of stout from Sweden. Mr. Schread of this department visited the store and found large numbers of adults, larvae and pupae in the grooves and holes of single faced, corrugated, strawboard wrappers placed around the bottles. Specimens were sent to the Bureau of Entomology at Washington, where they were identified as *Dermestes peruvianus* Cast., a European species which has been recorded from several localities in the United States. It is not known whether this insect will become established in Bridgeport, or if it does, how much trouble it may cause. [W. E. Britton]

Control of Clothes Moths. Tests of "moth-proofing" materials were made using wool flannel exposed to larvae of the webbing clothes moth, *Tineola biselliella* Hum. Three materials were tested: (1) rotenone in carbon tetrachloride at the rate of 1-1000 (2) "Larvex", a proprietary compound containing sodium aluminum silicofluoride and (3) "Konate", a proprietary compound containing cinchona alkaloids. The rotenone solution was not satisfactory in the tests made.

The two proprietary compounds were very effective in half-disc and whole-disc tests in petri dishes. The "Konate" discolored the white flannel which was used, and when used according to the manufacturer's directions left an oily residue on the fabric. Rug-pads were tested for resistance to clothes moths, and under the test conditions moth larvae did not survive in any of four types of pads. Some of the samples were not labelled as moth-proofed, but these, as well as "moth-proofed" brands, resisted clothes moth attack. [Neely Turner]

Note on the Supposed Indentity of *Ascogaster carpocapsae* (Vier.) and *A. quadridentata* Wesm. During 1934, parasitized codling moth larvae were obtained through the courtesy of Dr. H. N. Worthley of Pennsylvania State College. From this material there emerged a single *Ascogaster carpocapsae* female. Having on hand a stock of *A. quadridentata* obtained from imported stock of the Federal Bureau several years ago, the female was confined with a male *quadridentata* in a small glass vial. Mating took place immediately and the female was then isolated with eggs of the Oriental fruit moth for oviposition. As a result, 31 male Ascogaster and 26 females were reared. In an attempt to determine whether normal parthenogenesis (thelyotoky[1]) occurs in the genus, several unmated females of *quadridentata*

[1]Or deuterotoky.

were then confined separately with fruit moth eggs and from these a total of 30 males (no females) were obtained. These observations tend to support the contention of some entomologists that the two species are identical.
[Philip Garman and W. T. Brigham]

A Springtail Troublesome in Houses. On May 3, specimens of a spotted springtail were received from Bridgeport with the statement that they were numerous around the windows on the outside of the house. Whenever a window was raised they came inside. Some even gained entrance when the windows were closed. The owner used liquid sprays and insect powder, or pyrethrum, and although the insects that were hit by the spray were killed, and probably some were killed by the powder, others came in such numbers that they constituted a real nuisance. Specimens were sent to Dr. J. W. Folsom who identified the insects as *Sira* (*Seira*) *nigromaculata* Lubb., a common species in this country and in Europe. It feeds upon decaying vegetable matter and often occurs in large numbers around compost heaps and garbage cans, and commonly enters houses. A spray of nicotine solution and soap for the outside of the house, and pyrethrum powder dusted freely around the rooms - inside, were recommended. [W. E. Britton]

Sulfur Dusts Effective Against Thrips in Greenhouse (*Heliothrips femoralis* Reut. and *Thrips tabaci* Linde.) In a test in which Pinto bean plants were dusted weekly with Magnetic Dusting Sulfur,[1] and then placed at random among undusted plants, it was observed that adult thrips were definitely repelled by sulfur dusts. Counts made on two different occasions, eight days apart, revealed for seven check plants a total of 89 and 125 adult thrips as compared with 11 and 3 on seven dusted plants. Three weeks after the first dust application, the first and second leaves from each plant were removed and the larval and adult thrips counted. On the check leaves there was a total of 917 thrips and on the dusted, 94. The test was repeated, using different grades of sulfur dusts and ten plants for each grade. The same quantity of sulfur by weight was used in each case. There was a correlation between fineness of particles and effectiveness of control, the plants dusted with the finer dusts having fewer thrips. Analogous results were obtained against the same thrips on peanuts and on four o'clocks growing in the greenhouse. Success of treatment depends largely upon repellency of adults and death of young larvae, so for effective control the plants must be kept covered with dust.
[M. V. Anthony]

Note on the Winter Breeding of the Apple Maggot (*Rhagoletis pomonella* Walsh). Continuous breeding of the apple maggot appears possible during the winter months, if favorable conditions for this development are maintained. Flies were brought to our breeding room laboratory during the summer of 1934, and were fed according to the method of Fluke.[2] Temperature in the breeding room varies from 75 to 80° F., and is held most of the time at 75–76°. Humidity varies between 60-70 per cent. Flies were kept alive for a maximum of four months, the

[1] Furnished by National Sulphur Co. Inc., N. Y. City. 300 mesh, 99.8 per cent Sulfur.
[2] Jour. Econ. Ent. 26: 1111-1112. 1933.

average maximum for five cages (194 flies) being 93 days. Fifty per cent were dead in three cages after 42 days. Oviposition begins in about 10 days, continues regularly under these conditions, and has been observed to last in some of the cages from 40 days to more than two months. Development of the larvae takes place readily in green, immature fruit, and a total of 900 flies emerged from larvae bred in the laboratory between September and January 1. Between January 1 and February 15, 1934, 861 flies emerged from laboratory bred stock. The larvae were placed in jelly glasses in moist sand, and kept in a room maintained at 75–80° F. with about 40 per cent relative humidity. [Philip Garman]

The Pear Leaf Midge, *Dasyneura* (*Perrisia*) *pyri* Bouché. Our attention was first called to this insect by A. T. Henry who observed it

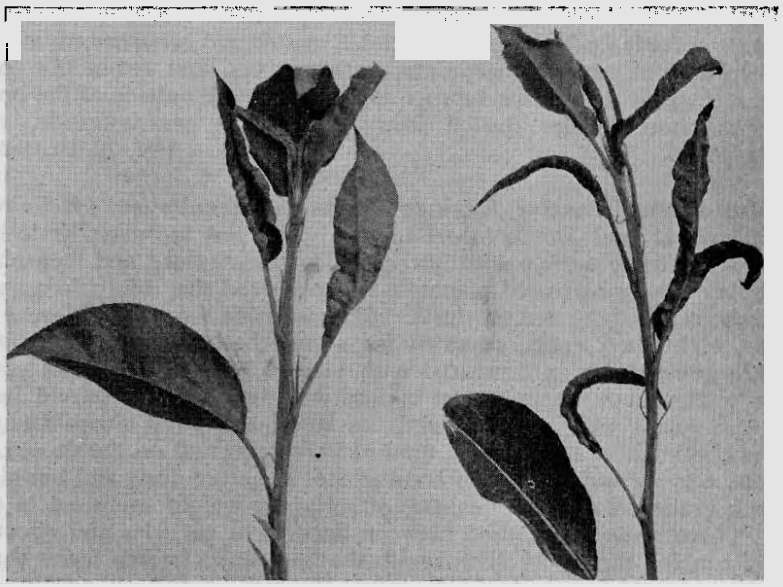

FIGURE 30. Tender Pear Leaves Injured by the Pear Leaf Midge. About Two-Thirds Natural Size.

injuring pear terminals on his place in 1933. Dr. Felt reports having observed similar damage at Stamford in 1929, but the first published report was made by Mundinger[1] who observed it in New York. Since the first observation, the pear leaf midge has been noticed in a number of New Haven County orchards and seems to be increasing in numbers on our trees at Mount Carmel. The leaves of rapidly growing shoots are curled and distorted by the maggots which live within the curled portion. (See Figure 30) After development, the larvae drop to the ground to transform, the total larval period being about 18 days, according to Mundinger. The edges of the leaves are rolled parallel to the midrib, so there is little chance for development after they become infested. The affected leaves finally turn black. The pear leaf midge is known to occur in Europe (Italy to

[1] Jour. Econ. Ent., **25**; 728-729. 1932.

Sweden) and has been observed in New Zealand since 1920. Damage is said to be severe to young trees and nursery stock in the latter country and control measures have not been completely satisfactory. Some parasites have been introduced from Europe. Mundinger[1] suggests the use of lime sulfur (1 to 8) early in the season (cluster bud stage) to control the pear leaf midge, but the effectiveness of this treatment is not known. Among the various remedies tried in New Zealand, distribution of calcium cyanide under the trees, at the rate of 1½ pounds to 200 square feet, is said to be one of the most effective. The more important parasites in Europe are listed by Ferriere.[2] [Philip Garman]

Dermestids Troublesome in Houses. Late in November, 1934, two complaints were received at the Station concerning New Haven houses infested by beetles. Upon investigation the beetles proved to be one of the skin, or larder beetles, *Dermestes nidum* Arrow. This insect is rather new to Connecticut, as the first specimens recorded from the State were found in a house in Norwalk in 1930. The larvae feed upon scraps of meat, skins and furs. In each of the infested houses an incinerator had been built in the basement for the disposal of rubbish and garbage by burning. Constructed of brick and cement, there were places where particles of food might lodge on projecting bricks or between the bricks where the mortar had fallen out. Evidently the fires were not sufficiently hot to consume all of the garbage nor to heat the bricks to a temperature high enough to kill the beetles, their eggs, larvae and pupae that were present. Furthermore they were not cleaned out often enough. When such incinerators are thoroughly cleaned of all refuse once a week, the nuisance has usually subsided. A hot fire of burning papers, kindling wood, or litter once each week would probably kill all insects. In constructing incinerators, architects should see that the interior walls are perfectly smooth so there will be no place for the lodgment of animal material. Lining with smooth fire tiles or a plaster coat of cement will obviate this difficulty. Nevertheless, it would still be necessary to heat it to a rather high temperature or thoroughly clean it once a week to prevent these insects from breeding on the floor of the incinerator.

[M. P. Zappe]

The American Cockroach, *Periplaneta americana* Linn., in a Dump. On July 27, specimens of the American cockroach, *Periplaneta americana* Linn., were brought to the Station with the information that a number of these insects had been found in the basement of a new house located in Treadwell Street, Hamden. Four to six specimens would be found and destroyed during the day, and the following day as many more were present. The occupants had treated the floor with sodium fluoride, and a few dead roaches were found, but it was feared that the pest would become established in the house. It was learned that there was a public dump a short distance from the house, and this was suggested as the probable source of the roaches. In addition to the continued use of the sodium fluoride, screening the door and windows of the basement was advised. Early in September, another report was received regarding the presence of roaches

[1] Jour. Econ. Ent., 25: 728-729. 1932.
[2] Bul. Ent. Research, XVII: 421-422. 1927.

in this section and the dump was visited September 11. Although the small German cockroach was abundant, only a few of the American cockroaches were found. One of the residents in the vicinity informed us that this large cockroach was much more abundant in 1933 than it had been during 1934. The American cockroach is a tropical or sub-tropical insect, and in this locality can probably live through the winter only where there is artificial heat, plenty of moisture and organic refuse for food. When this infested debris is taken to the dump during warm weather, the cockroaches will continue to thrive until freezing weather. In 1921 the American cockroach was found in a dump in New Haven.[1] The most effective treatment tried was to spray with kerosene oil and burn as much of the rubbish as possible. [B. H. Walden]

Another Probable Carrier of the Dutch Elm Disease. The Dutch elm disease caused by the fungus, *Graphium Ulmi,* has already infected many elm trees in New Jersey, New York and Connecticut and thousands

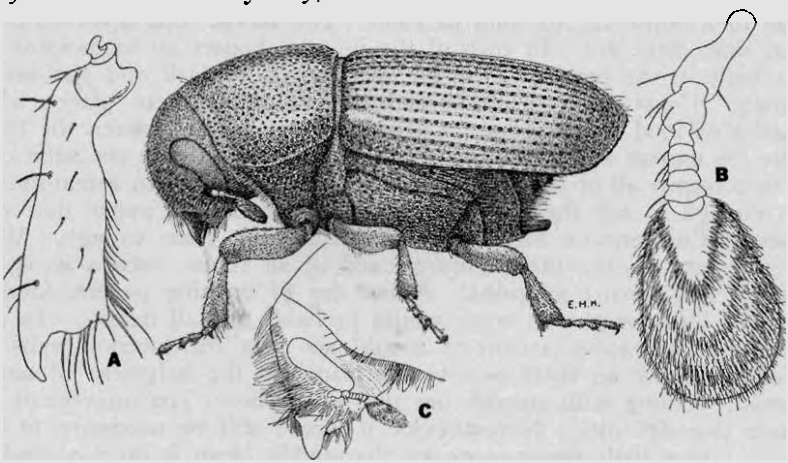

FIGURE 31. The Lesser European Bark Beetle, *Scolytus multistriatus,* female, lateral view, about 23 times enlarged. A, left fore tibia, posterior aspect; B, left antenna, lateral aspect; both about 76 times enlarged. C, head of male, lateral aspect, about 23 times enlarged.

of trees have been removed and burned, including 57 in Connecticut. The lesser European bark beetle, *Scolytus multistriatus* Marsh., shown in Figure 31, has been found on most of the diseased trees and is considered to be the principal carrier of the fungus in this country. Bulletin 360 of this Station, page 477, contains a note about this insect with localities where, up to that time, it had been found in Connecticut. In scouting for the Dutch elm disease in Connecticut in August and September, 1934, Station men discovered one Dutch elm diseased tree in Old Lyme at least 50 miles distant from the nearest known infested locality in Fairfield. The lesser European bark beetle did not seem to be present in the locality, and there was no evidence of its presence on the diseased tree, but there was heavy infestation by a native Scolytid or bark beetle, *Hylurgopinus rufipes*

[1] Conn. Agr. Exp. Sta. Bul. 234, p. 188. 1921.

(Eich.), the appearance of which is shown in Figure 32. This beetle was found to eat into the axils of elm twigs in much the same manner as *Scolytus multistriatus*. Moreover, when these beetles were placed in Petri dishes of sterilized cultured media, by Dr. McCormick of the Botany Department, a beautiful growth of *Graphium Ulmi* followed. Also the surfaces of healthy cut elm twigs were sterilized, and each twig placed in a test tube with a beetle, and in most cases the beetle gnawed into the bark and 75 per cent of the twigs produced the coremial stage of the fungus.[1] Although little is known about its life history and habits, these facts indicate that *Hylurgopinus rufipes* may be a carrier of the Dutch elm disease.

[W. E. Britton]

Bagworm in Bridgeport. On August 6, Mr. Schread brought to the Station some specimens of the bagworm, *Thyridopteryx ephemeraeformis* Haw., feeding on Norway maple. The superintendent of parks had called his attention to the matter. The writer, happening to drive through Bridgeport later that same day, stopped and examined the trees.

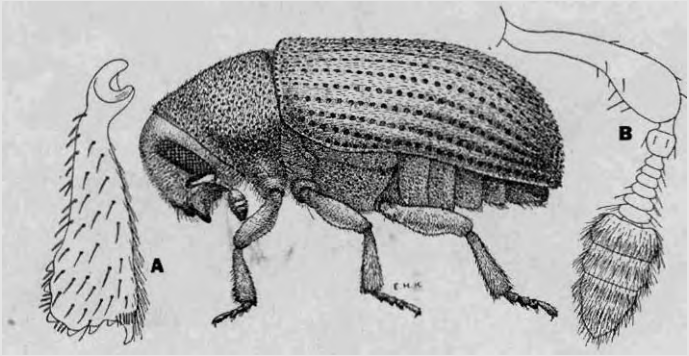

FIGURE 32. The Native Elm Bark Beetle, *Hylurgopinus rufipes*, lateral view, about 23 times enlarged. A, left fore tibia, posterior aspect; B, left antenna, lateral aspect; both about 76 times enlarged.

These trees had a trunk diameter of about six inches and had been planted as street trees between curb and sidewalk on Washington Avenue near the corner of Coleman Street. Some three or four of these trees were partially riddled at the top and at the ends of those branches extending over the street. Each bagworm lives within a silken case to which are attached small particles of leaves of its food plant, and the case is dragged by the larva as it crawls about and feeds. When mature as a larva, the case is fastened to a twig and serves as a cocoon. After pupation, the male emerges as a winged moth. The female has no wings and never leaves the cocoon but deposits several hundred eggs in the case. In this way the insect passes the winter. There is only one generation each season. The eggs hatch the following May or June and the young larvae at once spin silken cases for themselves. They feed upon more than twenty different kinds of trees including all of the common ones. Arborvitae is a pre-

[1] Science, Vol. 81, page 68. Jan. 18, 1935.

ferred food plant and the cases covered with bits of arborvitae leaves present a somewhat different appearance from those covered with fragments of maple or elm leaves. The appearance of these bagworms on Norway maple is shown in Figure 33. The principal injury caused by this insect is the defoliation of the trees, but a secondary form of injury is the girdling of the twigs where the cases are fastened by the strong silk threads. It is almost impossible to break them off. This insect is not

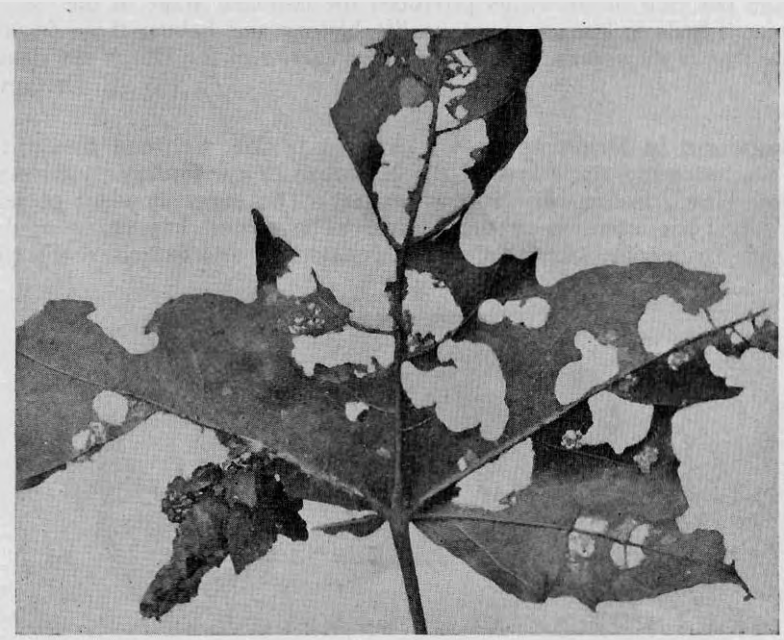

FIGURE 33. Bagworm and Injured Leaf on Norway Maple
Natural Size.

usually destructive in Connecticut but has been found frequently on small nursery trees brought into the State in the spring from points to the southward. Possibly this infestation in Bridgeport may have had a similar origin. One or more egg-sacs may have been brought into the neighborhood on small trees, from which the bagworms made their way to the larger street trees. Spraying with lead arsenate will prevent defoliation.

[W. E. Britton]

FINANCIAL STATEMENT

Insect Pest Appropriation

(Section 2124 of General Statutes, Revision of 1930)

July 1, 1933—June 30, 1934

RECEIPTS

Insect Pest Appropriation	$ 46,807.00	
Contribution from peach growers for peach moth parasite work	200.00	
		$47,007.00
Less transfer to Gipsy Moth Appropriation, June 28, 1934		600.00
		$46,407.00

DISBURSEMENTS

Salaries	$ 26,983.27
Labor	8,656.59
Stationery and office supplies	390.50
Scientific supplies (chemicals)	14.53
Scientific supplies (other laboratory supplies)	158.42
Scientific supplies (photographic supplies)	66.57
Feeding stuffs	1.00
Insecticides, fungicides, etc.	177.46
Lumber and small hardware	4.62
Miscellaneous supplies	224.40
Automobile oil	195.04
Fertilizer	11.68
Telegraph and telephone	531.99
Postage	396.85
Travel (outlying investigations)	1,650.48
Travel (meetings, conferences, etc.)	149.20
Travel (gasoline for automobiles)	1,077.96
Transportation of things, (freight, express and parcel post)	18.76
Transportation of things, (other expenses)	28.80
Publications (reprints, etc.)	284.75
Gas and electricity	235.64
Water	49.10
Furniture and fixtures (new)	291.99
Furniture and fixtures (repairs)	37.85
Library (books and periodicals)	262.75
Library (binding)	41.50
Scientific equipment (new)	228.60
Scientific equipment (repairs)	49.95
Automobiles (repairs)	604.45
Tools, machinery and appliances (new)	891.77
Tools, machinery and appliances (repairs)	10.70
Buildings (repairs and alterations)	55.39
Rent of building	11.00
Insurance (automobile)	343.96
Taxes (check tax)	.68
Miscellaneous contingent expenses	33.00
Total disbursements	$44,171.20
Balance on hand June 30, 1934	2,235.80*
	$ 46,407.00

*Reverts to State Treasury.

EXPENDITURES CLASSIFIED BY SUBJECTS
(Approximate)

General	$ 22,559.99
Nursery Inspection	3,471.73
Japanese Beetle	6,361.64
European Corn Borer	5,334.64
Oriental Fruit Moth Parasites	5,668.50
European Pine Shoot Moth	774.70
Total	$ 44,171.20

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Tobacco Insects in 1933. In Bul. 359, 377; 5½ pp., 1 fig. May, 1934.

SUMMARY OF OFFICE AND INSPECTION WORK

Insects received for identification	751
Nurseries inspected	395
Regular nursery certificates granted (381 nurseries)	386
Duplicate nursery certificates for filing in other states	112
Miscellaneous certificates and special permits granted	131
Nursery dealer's permits issued	123
Shipper's permits issued to nurserymen in other states	152
Certification and inspection	
Parcels of nursery stock	237
Narcissus bulbs (in field 125,000) for sale (16 certificates)	9,000
Corn borer certificates	85
Packages of shelled corn and other seeds	1,772
Blister rust control area permits issued	127
Japanese beetle certificates issued for the shipment of nursery and floral stock and farm products	39,086
Japanese beetle certificates issued for the shipment of soil, sand and manure	172
Orchards and gardens examined	169
Shipments of imported nursery stock inspected	24
Number cases	108
Number plants	751,475
Apiaries inspected	1,429
Colonies inspected	7,128
Apiaries infested with American foul brood	27
Apiaries infested with European foul brood	2
Towns covered by gipsy moth scouts	107
Infestations found	453
Egg-clusters creosoted	434,410
Larvae and pupae killed by hand	13,125
Infestations sprayed	47
Lead arsenate used (pounds)	7,500
Miles of roadside scouted	4,252
Acres of woodland scouted	435,581
Acres of open country scouted by CCC men	13,828
Letters written[1]	5,320
Circular letters issued	1,134
Bulletins and circulars mailed	8,499
Packages sent by mail and express	203
Post cards	235
Lectures, papers and addresses at meetings	64

ILLUSTRATIONS

The illustrations used as figures in this bulletin are from the following sources: Figure 22 from a drawing by G. H. Plumb; Figures 16, 31 and 32 from drawings by Elizabeth H. Kaston; Figure 24 from a drawing by R. B. Friend; Figure 25 from a drawing by J. C. Schread; Figure 26 from a drawing by Philip Garman; Figure 15 from a drawing by B. H. Walden; Figure 29 from a photograph by Norman Bryant; all others from photographs by B. H. Walden.

[1]Includes 883 written from the Japanese beetle office, 269 from the CWA office, 337 from the FERA office and 174 from the gipsy moth office at Danielson.

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