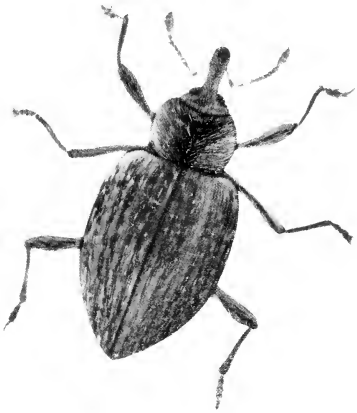
N 484 JANUARY, 1953

Montana Insect Pests
1951 - 1952



ADULT ALFALFA WEEVIL

Thirty-Fourth Report of the State Entomologist

MONTANA STATE COLLEGE
AGRICULTURAL EXPERIMENT STATION
BOZEMAN, MONTANA

Bozeman, Montana

To His Excellency
Governor J. Hugo Aronson
State House
Helena, Montana

My Dear Governor Aronson:

I am submitting herewith the Thirty-Fourth Report of the State Entomologist of Montana. This report contains information concerning insect control programs, the status of the more important and unusual insects, and a report of the goat weed beetle introduction program.

During the last biennium increasing demands have been made upon this office. For example, 98 educational and/or demonstrational meetings were held with a total attendance of 5,548 persons; 1,947 inquiries concerning insect identification, control, and general information were answered; and 186 publications, articles, and radio scripts were issued. This is a substantial increase over the previous biennium. In addition, three educational motion picture films have been produced.

Since 1945 the demands and requests upon this office have been gradually increasing and most of these requests have been met. It is anticipated that very little further expansion of the activities of this office will be requested or occur during the next biennium.

Respectfully submitted,
James H. Pepper
State Entomologist

MONTANA INSECT PESTS

1951 and 1952

Thirty-Fourth Report Of The State Entomologist

J. H. Pepper J. P. Corkins L. N. Graham
D. R. Merkley N. L. Anderson[1]

INTRODUCTION

Most of the major insect pests with the possible exception of alfalfa weevils have been at a general low ebb during the biennium. However, the overall insect damage to Montana agriculture was not appreciably reduced principally due to the increasing occurrence and activities of several insects which were formerly considered to be minor pests. General expansion and intensification of agricultural programs are expected to cause new insect problems to develop. Such new insect pests may include those introduced from other areas as well as native insects which are adapting themselves to our changing agricultural conditions. Continued research, vigilance, and the use of modern control methods should help to prevent serious reverses in our agricultural economy from new insect pests as well as from those which are already established.

In past years range and cropland grasshoppers have been the undisputed leading insect pests of Montana's agriculture. During the biennium grasshoppers have been at a near historical low point in occurrence and damage caused. In spite of the reduced infestations, more than 50,000 acres were treated in 1952 alone. In the event that conditions, which are unknown as yet, favorable to the rapid build-up of these insects should occur, outbreaks could be expected to materialize within a relatively short period of time. The ultimate objective of the range grasshopper investigations currently being carried out by this office, in cooperation with the Agricultural Experiment Station at Montana State College, is to determine how grasshopper outbreaks occur and how to prevent such occurrences. A bulletin in which preliminary studies on this problem are summarized is now in press. We are now equipped with the information from these studies to enable us to carry out a better program of grass protection.

Surveys, and reports from inspections at terminal elevators, indicate that a serious problem of grain contamination exists in Montana. The Federal Food and Drug Administration is currently conducting a program the objective of which is to eliminate con-

[1]State Entomologist; Assistant State Entomologist; Assistant State Apiarist; Assistant Entomologist, Montana Agricultural Experiment Station; Assistant State Entomologist.

tamination of cereals to be used for human consumption. The federal regulations which currently apply to other human foods in intra-state shipment are now being applied to wheat. This office along with the Montana Agricultural Extension Service has been called upon to develop a program of preventing contamination of stored grain. It has been found that the principal sources of contamination to these grains are rodents, birds, insects, and other animals. Such contamination can be largely eliminated by a program of proper storage and sanitation.

Recent research on Montana mosquitoes has provided information which indicates that area-wide mosquito control under Montana conditions may be practicable in the near future. Large-scale mosquito control can be realized only if an educational program is successfully conducted. This office is currently planning such programs to meet this need.

GENERAL FEEDERS

GRASSHOPPERS

1951 SEASON

Grasshopper populations in 1951 were generally lower than in 1950. Scattered localized infestations of range and crop grasshoppers did occur so that some economic damage was experienced in nearly every county. Grasshopper control is now the complete responsibility of individual land owners except in cases where public domain is involved. Therefore, more intensive educational programs were conducted. A total of 53 educational meetings were undertaken which were attended by 2,263 people. In addition, educational programs were carried out through newspapers, radio, and bulletins. It is estimated that 120,000 acres of cropland and 80,000 acres of rangeland were treated for grasshopper control during this year.

Melanoplus bivitattus in eastern Montana and *Melanoplus bivitattus* and *Melanoplus mexicanus* in western Montana were the principal species involved in damage to cropland. A somewhat spotted but relatively intense early season outbreak of *Aeropedellus clavatus* occurred in northcentral Montana causing considerable early damage to grain crops.

As compared to the previous two years, *Melanoplus mexicanus*, *Metator pardalinus*, *Aulocara elliotti*, and *Drepanopterna femoratum* were generally present in much lower populations. *Camnula pellucida* appeared to be increasing particularly in Meagher and Judith Basin counties.

1952 SEASON

This was a relatively low grasshopper year. A few scattered light to moderate infestations of range and crop hoppers occurred. Most of these infestations were localized in nature. Populations of *Melanoplus mexicanus*, *Metator pardalinus*, *Aulocara elliotti*, and *Drepanopterna femoratum* appeared to be below those experienced during the previous three or four years. *Melanoplus bruneri*, *Camnula pellucida*, and *Chorthippus longicornus* appeared to be present in increased numbers as compared with the previous three or four years. An infestation of *Bruneria brunnea* occurred in the Dryhead area of Big Horn and Carbon counties. An infestation of *Asemoplus montanus* occurred at approximately 6,000 feet on the forest preserve in southern Ravalli County. The *Asemoplus montanus* appeared to be feeding on *Stipa comata*, *Poa pratensis* and *Bromus* sp.

OUTLOOK FOR 1953

It would appear that we are either approaching or experiencing a general low point in grasshopper infestation cycles. Unfortunately, grasshopper infestations are as yet largely unpredictable. On the basis of past history of Montana grasshopper cycles, only scattered light infestations are expected in 1953. If conditions, which are as yet unknown, favorable to rapid grasshopper population increases should occur, the potential to start an outbreak is now present.

OTHER IMPORTANT PESTS

MORMON CRICKETS (*Anabrus simplex*)

Only one infestation of Mormon crickets was found or reported in 1951. This was a moderate non-gregarious infestation in Chouteau County, north of Shonkin, involving three to four sections. This infestation was re-checked in 1952 and it was found that approximately the same area was infested; however, populations of crickets were much lighter and those present were for the most part confined to the coulee bottoms.

Three light to moderate Mormon cricket infestations were found on and along the Big Horn Mountains in Big Horn and Carbon counties in 1952. These infestations included about two sections just north of Pryor gap, one section just south of Dryhead Creek, and two sections on Grapevine Creek.

Several gregarious bands of Mormon crickets were reported in the upper Blackfoot River Valley in the general area around Ovando, Helmville, and Lincoln in 1952. Unfortunately, these reports were received late, and the area was not surveyed early

enough in the season to provide proper diagnosis of the situation.

Reports from other states indicate that Mormon crickets are on a general upward trend throughout the western outbreak areas of the United States and several outbreaks have already occurred. All of the evidence indicates that Mormon cricket outbreaks may occur in Montana within the next few years.

GARDEN SLUGS (*Agriolimax* sp.)

Garden slugs continue to be an important pest to home gardens, particularly in the western three quarters of the state. They are either becoming more numerous or people are becoming more cognizant of slug infestations. Baits containing metaldehyde are the primary recommendation for slug control.

WHITE GRUBS (*Phyllophaga* sp.)

Occasional infestations of white grubs in gardens were reported from various areas of the western half of the state during the biennium. No cases of infestations attacking field crops were reported. A soil treatment with either DDT or chlordane is currently recommended for white grub control.

ARMY CUTWORMS (*Chorizagrotis auxiliaris*)

In 1951 small localized infestations occurred in Liberty, Choteau, Judith Basin, Fergus, Phillips, and Prairie counties. Similar infestations occurred in Toole, Pondera, Hill, Cascade, and Yellowstone counties in 1952. Wherever infestations were severe enough to warrant control, spray applications using 1½ to 2 pounds of toxaphene per acre were used with apparent good success.

PALE WESTERN CUTWORMS (*Agrotis orthogonia*)

No cases of pale western cutworm infestations were reported or observed during the biennium.

RED-BACKED CUTWORMS (*Euxoa ochrogaster*)

In 1951 the red-backed cutworm occurred in damaging numbers in sugar beet fields, grain fields, and gardens throughout parts of western Montana. Damaging infestations were reported in an alfalfa field in Prairie County, an alfalfa field in Mineral County, and a grain field in Glacier County in 1952. A late afternoon spray application of two pounds of toxaphene per acre was reported to give satisfactory results.

WIREWORMS (Elateridae family)

Reports of severe damage to small grains, winter wheat in particular, have been received from nearly all counties in the state during the reporting period. In addition, a few reports of damage to potatoes have been received from the northcentral and western areas of the state.

Seed treatment applying one ounce of lindane per acre to spring seeded wheat has proved to be an effective control. In addition, recently completed tests indicate that the same treatment is also effective on fall seeded winter wheat.

BLISTER BEETLES (Meloidae family)

Scattered cases of damage to sugar beets, alfalfa, gardens, and ornamental shrubbery occurred in many parts of eastern Montana during 1951. No field crop damage and very little garden or ornamental damage by blister beetles was reported in 1952. DDT spray application appears to be controlling the blister beetles under all circumstances of occurrences.

FLEA BEETLES (*Epitrix* sp. and *Systena* sp.)

Severe infestations of the potato flea beetle *Epitrix* sp. occurred in the spring of 1951 on seedling sugar beets in Blaine, Phillips, Richland, Dawson, Prairie, Rosebud, Custer, Treasure, Big Horn, and Yellowstone counties. The application of 12 to 15 pounds of 5 percent DDT dust per acre resulted in erratic control. Where 5 percent DDT dust was used at 20 pounds per acre, economic control was more consistent. In 1952 severe damage to seedling sugar beets occurred in Richland County with less severe damage occurring in Blaine, Prairie, Rosebud, and Carbon counties. Five percent DDT dust applied at the rate of 20 pounds per acre was used in Richland County in 1952 with consistently good results.

The banded flea beetle, *Systena* sp., was not reported in economic numbers in 1951. In 1952 unusually large populations of banded flea beetles occurred during June and early July in many alfalfa fields of southcentral and southeastern Montana. Numerous cases of the flea beetles causing serious defoliation were observed.

THISTLE BUTTERFLY CATERPILLARS (*Vanessa cardui*)

This insect did not occur in appreciably large numbers in 1951. In early June of 1952 many large flights of painted lady butterflies were observed over various parts of the western three-quarters of Montana. By late June, the caterpillars or larval form of this insect were abundant in many localities. Larval feeding was largely confined to various species of thistles; however, reports were received of severe damage to beans, potatoes, clover, corn, cabbage, and hollyhocks. Toxaphene sprays were successfully used for control.

FIELD CRICKETS (*Acheta assimilis*)

Occasional cases of field crickets damaging alfalfa seed in the shock occurred during the biennium in northeastern Montana. In

1952 an early spring field cricket infestation occurred in a localized area of Big Horn County involving approximately four farms. The crickets were moving from stubble fields into the winter wheat fields and seriously damaging the crop. A combination spray of toxaphene and chlordane controlled this infestation. The insecticides were used in a combination of ½ pound of chlordane per acre and one pound of toxaphene per acre.

EUROPEAN EARWIGS (*Forficula auricularia*)

This unsightly insect is now common in all of Montana west of the Continental Divide and in the southwestern portion of Montana east of the Continental Divide. Unusually severe populations occurred in the late summer of 1952 in many homes and gardens of northwestern Montana. Both chlorinated hydrocarbon insecticidal sprays and baits were used to combat these infestations.

SPITTLEBUGS (Cercopidae family)

In 1952 spittlebugs became quite prevalent over much of Montana west of the Continental Divide. For the most part their activities were confined to weeds; however, occassionally gardens were invaded with some damage resulting. They were also observed to be present in alfalfa fields. No cases of damage to field crops were reported.

WESTERN CHINCH BUGS (*Blissus occiduus*)

During the reporting period, the western chinch bug occurred only in 1951 where it caused damage to crested wheat grass in Teton County and to several barley fields in Fergus County. These infestations were localized but the damage was severe.

INSECTS DESTRUCTIVE OF FIELD CROPS

SMALL GRAINS

CRESTED WHEAT PLANT BUGS (*Labops hesperus*)

In 1951 five or six spring and winter wheat fields in Choteau County received severe marginal damage from crested wheat plant bugs which had moved from adjacent crested wheat grass fields. Similar situations were reported near Pryor, Montana, in 1938. Similar damage also occurred in several scattered areas throughout Montana in 1952. Such infestations were readily controlled with a marginal spray application of two to three pounds of DDT per acre.

Extremely severe damage to crested wheat grass plantings occurred in Ravalli, Missoula, and Cascade counties in 1952. In some cases the damage was so severe that when accompanied by grazing it resulted in crested wheat grass plantings being killed.

WESTERN WHEAT APHID (*Brachycolus tritici*)

In 1951 the western wheat aphid was reported only in southern Broadwater County. Control measures were attempted by the aerial application of one pound of parathion per acre. These measures were unsuccessful. The leaf sheaths of the wheat plants were curled by the time the insecticide was applied. This provided protection for the aphids which were present inside of the sheath. Most of the farmers worked their summer fallow so as to keep it free from volunteer wheat, barley, and grasses. This practice prevented over-wintering aphid colonies from establishing themselves in the fields and resulted in only spotted light infestations in this area in 1952.

Other spotted infestations were reported in 1952 in southwestern Choteau County and eastern Richland County.

ENGLISH GRAIN APHID (*Macrosiphum granarium*)

Late June and early July of 1951 were relatively cool and wet in western Montana. By early July, English grain aphid populations had built up to alarming numbers in Ravalli, Missoula, Sanders, Lake, and Flathead counties. Heavy flights occurred generally throughout this area in mid-July, and specimens were picked up by aircraft as high as 8,000 feet altitude. Some controls were attempted using aircraft application, applying ½ pound of parathion and one gallon of oil per acre. For the most part these control measures were successful but tended to be somewhat erratic. In the latter part of July the weather in western Montana turned hot and dry allowing predators, principally syrphid fly larvae, to rapidly reduce grain aphid populations. In mid-August the weather turned damp and cool in an area involving parts of Glacier, Toole, Pondera, and Teton counties. By the first of September, alarming populations of English grain aphids were present in many of the grain fields, and some shriveling of kernels was already evident in the ripening grain. Airplane spraying was immediately initiated applying 3/8 of a pound of parathion in two gallons of diesel oil per acre. The resulting control was excellent.

In 1952 alarming numbers of English grain aphids appeared in Daniels, Sheridan, and northern Valley counties following a cool wet period in late July. Early August turned hot and dry resulting in the aphid population rapidly falling below the economic level principally due to the activities of ladybird beetles.

WHEAT STEM SAWFLY (*Cephus cinctus*)

The 1951 wheat stem sawfly survey indicated that severe infestations occurred in Teton, Pondera, Glacier, Toole, Lincoln, Chouteau, Cascade, and Daniels counties, with lesser infestations

in most of the other major wheat growing counties east of the Continental Divide. An estimation of losses was prepared by the Bureau of Entomology and Plant Quarantine of the United States Department of Agriculture. According to this estimate, a loss of approximately 1,422,751 bushels of wheat was attributed to the wheat stem sawfly in Montana during this season.

At the time of this writing, the 1952 sawfly survey was not completed. However, it does appear that in general the sawfly infestation was similar to that of 1951.

WHEAT STEM MAGGOT (*Meromyza americana*)

Scattered infestations of wheat stem maggots occurred in Fallon, Wibaux, Prairie, Dawson, McCone, Richland, Daniels, and Lake counties in 1951 and in Sweetgrass, Stillwater, Phillips, Toole, Daniels, Sheridan, Richland, McCone, Dawson, Wibaux, and Custer counties in 1952. In all cases less than 5 percent of the plants were infested with average infestations of from 1 to 2 percent.

WHEAT JOINTWORM (*Harmolita tritici*)

A few scattered light infestations of wheat jointworm occurred in Yellowstone and Stillwater counties in 1951. In 1952 the wheat jointworm was more prevalent in northern Sweetgrass and Stillwater counties where it inflicted severe damage. This jointworm also occurred in Phillips and Daniels counties in 1952. In the event that damage of the type that occurred in northern Sweetgrass and Stillwater counties in 1952 should become more widespread, this insect could become one of the leading pests of wheat.

GRAIN THRIPS (*Limothrips cerealium*)

Spotted moderate to severe infestations of grain thrips in oats occurred in Stillwater County in 1951. This is the only outbreak reported or observed during the biennium.

A WHEAT HEAD ARMYWORM (*Faronta* sp.)

Numerous infestations of a wheat head armyworm occurred in Chouteau, Cascade, and Fergus counties, during late July and early August of 1952. In most cases the worm was not observed until found in the harvested wheat. This insect was feeding on the mature, or nearly mature, wheat kernels. In all cases observed, the insects were not prevalent enough to cause damage of economic importance. This insect was not reported or observed during 1951.

A WHEAT LEAF SAWFLY (Tenthredinidae family)

Extensive infestations of a wheat leaf sawfly were found in

Broadwater County during June 1952. The infestations were largely on winter wheat and in all cases the wheat was far enough advanced so that the leaf feeding damage inflicted by the sawfly was not of economic importance. This was the only known occurrence of this insect during the biennium.

CORN

EUROPEAN CORN BORER (*Pyrausta nubilalis*)

The first known occurrence of European corn borer in Montana was discovered October 20, 1951, in a corn house near Savage. Corn borer larvae were found to be tunneling the cobs of this seed corn.

A survey in 1952 revealed very light infestations of European corn borers in irrigated corn in Prairie, Dawson, and Richland counties. No borer infestations were found in dryland corn. To date the borer has not been found in alarming numbers. An extension program is being organized to advise farmers what to look for in determining the presence of corn borers and to acquaint farmers with methods of handling corn fields and products from those fields in such a manner as to prevent the borers from overwintering successfully.

CORN EARWORM (*Heliothis armigera*)

The corn earworm was not prevalent during the first year of the biennium. In late July of 1952 numerous moderate to severe infestations were found on irrigated field and garden corn in the southeastern, southcentral, and western parts of the state.

BUMBLE FLOWER BEETLE (*Euphoria inda*)

A single infestation of bumble flower beetles occurred on corn in Cascade County during the late summer of 1951. Considerable damage to the corn ears was experienced. This was the only infestation observed or reported during the biennium.

ALFALFA AND CLOVER

ALFALFA SEED CHALCID (*Bruchophagus gibbus*)

Very light and widely scattered infestations of alfalfa seed chalcid occurred over most of the alfalfa seed producing areas in the state during the biennium. No inquiries were received regarding this insect, and no extremely severe infestations are known to have occurred.

ALFALFA WEEVIL (*Hypera postica*)

All, or parts of, Madison, Park, Sweetgrass, Stillwater, Carbon, Golden Valley, Fergus, Phillips, Petroleum, Garfield, Mus-

selshell, Yellowstone, Big Horn, Treasure, Rosebud, Powder River, Custer, and Prairie counties are now known to be infested with economic populations of alfalfa weevils. During the past two years, this pest has consistently caused more damage to alfalfa than any other insect. During the biennium, the alfalfa weevil has been one of the more important economic insect pests to Montana agriculture. The early spring chlordane treatment recommended in 1951 was effective where used properly, but its use was limited due to the relatively high cost per acre for treatment. During the fall of 1951 a 20-minute, 16 mm. color sound motion picture entitled "Alfalfa Weevil Control" was prepared by this office in cooperation with the Agricultural Experiment Station at Montana State College. In 1952, the film was used by this office at 22 alfalfa weevil control meetings which were attended by 1,258 people. In addition, it had 9 other showings to a total attendance of 809 people. This educational effort along with the lower cost of dieldrin application resulted in a large percentage of the infested acreage being treated with dieldrin in the early spring of 1952.

In general, the alfalfa weevil infestation and damage appeared to be moderate in 1951. In 1952 consistently higher populations and more than average damage was noted. For the first time in 1952 it was evident that extremely high populations of adults caused damage to the alfalfa largely through their egg-laying activities. The newly recommended early spring dieldrin treatment was very successful, and it has resulted in large returns in terms of alfalfa production at a relatively low cost of treatment per acre.

LYGUS BUGS (*Lygus* sp.)

All alfalfa seed areas observed in 1951 had economic infestations of Lygus bugs during mid and late summer. The same was true in 1952 except that Lygus populations in southeastern Montana appeared to be unusually high. Most alfalfa seed growers are now using DDT and toxaphene spray treatments for the control of this sucking insect pest.

SWEETCLOVER WEEVIL (*Sitona cylindricollis*)

Scattered moderate to heavy infestations of sweet clover weevils occurred over many areas of the state in 1951 with a few cases of marginal damage to alfalfa being reported. In the spring of 1952, severe defoliation by adult sweetclover weevils was evident in nearly all parts of the state; again a few cases of marginal damage to alfalfa occurred.

CLOVER APHID (*Anuraphis bakeri*)

Economic populations of clover aphids were present in most

seed clover fields of western Montana during the biennium. In addition, an infestation was reported in a seed clover field in Yellowstone County in 1952. This insect seems to occur in economic numbers in seed clover fields frequently enough to justify a preventative benzene hexachloride spray program.

LESSER CLOVER LEAF WEEVIL (*Hypera nigrirostris*)

During the biennium, the lesser clover leaf weevil continued to be present in economic numbers in the seed clover fields of western Montana.

In 1952 this weevil was found to be present in some irrigated pastures in Big Horn and Yellowstone counties where it was causing severe defoliation to the clover and greatly reducing the food value of the infested pastures. Control measures under these particular circumstances have not as yet been worked out.

SMALL MILKWEED BUG (*Lygaeus kalmii*)

The small milkweed bug has been observed to be present in insignificant numbers in many southeastern Montana alfalfa fields. A severe infestation of this insect occurred in early June of 1952 in an alfalfa field in Treasure County. They were reported to be killing the alfalfa plants.

POTATOES

COLORADO POTATO BEETLE (*Leptinotarsa decemlineata*)

Scattered moderate to heavy infestations of Colorado potato beetles occurred in most of the potato growing areas of the state during the biennium. Many of the potato growers are somewhat reluctant to carry out an insecticidal control program; consequently, in most cases only the more severe infestations were treated.

Aerial spraying for Colorado potato beetle control was tested on three fields in the Gallatin Valley in 1952. The spraying was accomplished with an Aeronca Champion spray plane applying one pound of DDT per acre with diesel fuel as a solvent at a total volume of one gallon per acre. The fields had moderate to heavy infestations of potato beetles and this spray application eliminated the infestation. Some foliage burning was noted; however, this burning was not extensive enough to affect yields. The potato plants in the test fields were somewhat smaller than average for late summer and the rows were not closed in as would normally be the case. A total volume of one gallon per acre appeared to be adequate for Colorado potato beetle control on these smaller potato plants.

POTATO PSYLLID (*Paratrioza cockerelli*)

A severe infestation of potato psyllid was observed in Dawson

County in 1951. This is the only infestation observed or reported during the biennium.

SUGAR BEETS

SUGAR BEET ROOT MAGGOT (*Tetanops aldrichi*)

Several infestations of sugar beet root maggots were reported in Richland County and in western Montana in 1952. This is the only occurrence reported or observed during the biennium. Seed treatment with aldrin appears to control this pest.

SUGAR BEET ROOT APHID (*Pemphigus betae*)

No economic infestations of sugar beet root aphids were reported or observed during the biennium.

BEET WEBWORM (*Loxostege sticticalis*)

Only one infestation of beet webworm was reported or observed during the biennium. This single occurrence was a moderate infestation found on sugar beets in Prairie County in late August 1952. In this particular case the beets were far enough advanced so that control measures were not advisable.

SPINACH CARRION BEETLE (*Silpha bituberosa*)

No economic infestations of spinach carrion beetles were reported or observed during the biennium.

SPINACH LEAF MINER (*Pegomya hyoscyami*)

Light to moderate infestations of spinach leaf miners occurred on sugar beets in Yellowstone County during June of 1952. Control measures were not attempted, and this is the only known occurrence of this insect during the biennium.

PEAS AND BEANS

PEA APHID (*Macrosiphum pisi*)

Several fields of canning peas in Carbon County were moderately to heavily infested with this sucking insect in 1951. Control measures with tetraethyl pyrophosphate were instigated. Other than normal populations in alfalfa fields, no further infestations were reported or observed during the biennium.

PEA WEEVIL (*Bruchus pisorum*)

No economic infestations of pea weevils were observed or reported during the biennium.

INSECTS DESTRUCTIVE OF GARDEN AND TRUCK CROPS

CRUCIFERAE

CABBAGE MAGGOT (*Hylemya brassicae*)

Reports and observations indicate that the occurrence of cab-

bage maggot during the biennium was neither more nor less severe than in previous years. This garden pest appears to be common throughout the entire state and is readily controlled with a chlordane treatment at the time of planting.

IMPORTED CABBAGEWORM (*Pieris rapae*)

No severe outbreaks of this pest of cruciferae were reported or observed during 1951. This insect did occur over most of the state causing considerable damage, particularly in many western Montana gardens, in 1952.

ROOT CROPS

ONION MAGGOT (*Hylemya antiqua*)

Reports and inquiries indicate that onion maggot infestations in gardens were normal during the biennium. Chlordane treatment at the time of planting appears to be successful in preventing onion maggot damage.

ONION THRIP (*Thrips taboci*)

Onion thrips were present in Ravalli County during the summer of 1952. They were not found to be causing economic damage.

ASPARAGUS

ASPARAGUS BEETLE (*Criocerus asparagi*)

During 1952 asparagus beetles were found and reported to be causing economic damage to asparagus plantings in western Montana, particularly in Ravalli and Lake counties. No reports were received during 1951.

INSECTS DESTRUCTIVE OF FRUIT CROPS

ORCHARDS

BLACK CHERRY FRUIT FLY (*Rhagoletis fausta*)

1951

In 1951 there was a limited sweet cherry crop. Therefore, no extensive control or trapping program was conducted by the growers. Experimentation comparing the efficiency of trap board and attractant type traps as well as various cherry fruit fly controls was conducted.

1952

In 1952 the sweet cherry crop was above average. An intensive trapping program was conducted to determine emergence dates and adult populations. In addition, two types of insecticidal controls were compared. For these purposes two orchards with histories of fruit fly infestations were selected. One of the orchards

was in the southern area and the other in the northern area of the east shore of Flathead Lake.

One orchard was sprayed with two applications of parathion and one application of tetraethyl pyrophosphate. Individual counts of 10,136 cherries showed no fruit fly infestation.

The other orchard was dusted with lead arsenate and sulphur. Individual counts of 7,243 cherries showed 30 fruit fly infested cherries.

A survey to determine the incidence of black cherry fruit fly in bitter cherry, a native wild cherry, was conducted. Individual counts of 5,016 fruits were made with negative results.

RUST MITE (*Phyllocoptes* sp.)

Populations of rust mites in the sweet and sour cherry trees of western Montana were below economic levels in 1951 and 1952.

PEAR SLUG (*Caliroa cerasi*)

Light to moderate infestations of pear slugs occurred in many commercial and home orchards throughout western Montana during the first year of the biennium. Reports indicate that this insect pest of stone fruits was even more prevalent and caused more extensive damage in 1952. Post-harvest toxaphene sprays were used to combat this pest.

BLACK CHERRY APHID (*Myzus cerasi*)

No reports of black cherry aphid infestations were received in 1951. In 1952 moderate to severe infestations occurred in the sweet and sour cherry growing areas of Ravalli and Lake counties. Early spring delayed dormant oil sprays will control this pest.

CODLING MOTH (*Carpocapsa pomonella*)

No unusual outbreaks of codling moth were reported or observed during the biennium. Reports and inquiries indicate that normal infestations occurred in orchards and back yard plantings where preventative control measures with DDT sprays were not practiced.

APPLE APHID (*Aphis pomi*)

No reports of apple aphid infestations were received in 1951. Generally moderate to severe infestations occurred in apple orchards throughout most of western Montana in 1952.

WOOLLY ELM APHID (*Eriosoma americanum*)

Woolly elm aphids were abnormally numerous over most of the state in 1951, inflicting damage to elm and apple trees. Several reports of infestations in western Montana orchards were received in 1952.

PEAR LEAF BLISTER MITE (*Eriophyes pyri*)

Infestations of pear leaf blister mite were reported in Lewis and Clark County in 1951 and Gallatin, Lake, Ravalli, Missoula, and Mineral counties in 1952.

SMALL FRUITS

MILLIPEDES (Diplopoda class)

Millipedes continued to be a frequent pest of strawberries throughout the state during the past two years. Rotenone or DDT dusts effectively control these pests.

CURRANT FRUIT FLY (*Epochra canadensis*)

The currant fruit fly is widely distributed throughout the state. It was, however, only reported in Cascade and Gallatin counties in 1951 and Gallatin, Missoula, Roosevelt, and Garfield counties in 1952. The current control recommendations are a spray application using 3 pounds of 50 percent DDT wettable powder to each 100 gallons of water when 80 percent of the blossoms have withered or fallen. This is followed by a second similar spray application 10 days later.

WESTERN RASPBERRY FRUITWORM (*Byturus bakeri*)

Infestations of western raspberry fruitworms were reported in Silverbow County in 1951 and Missoula County in 1952. The current control recommendations are to spray in the cluster bud stage with 3 pounds of 50 percent DDT wettable powder to each 100 gallons of water.

RASPBERRY CANE BORER (*Oberea bimaculata*)

Two infestations of raspberry cane borers were reported in Lake and Yellowstone counties in 1951. No infestations were reported or observed in 1952.

STRAWBERRY LEAF ROLLER (*Ancylis comptana fragariae*)

Two infestations of strawberry leaf rollers were reported in Lake and Stillwater counties in 1952. This pest of strawberries was neither reported nor observed in 1951.

INSECTS DESTRUCTIVE OF ORNAMENTALS

DECIDUOUS

BOXELDER BUG (*Leptocoris trivittatus*)

Reports and inquiries regarding boxelder bugs were infrequent during the biennium. However, this insect was observed in many areas throughout the state where boxelder trees are grown.

ASH BORER (*Podosesia syringae fraxini*)

Moderate to severe infestations of ash borers were found in Roosevelt, Richland, and McCone counties in 1951, and in Sheridan and Richland counties in 1952. Two to three paint brush ap-

plied treatments of paradichlorobenzene-linseed oil solutions have apparently successfully controlled this insect.

GREEN ASH APHID (*Prociphilus venafuscus*)

Few infestations of green ash aphids were reported during the biennium. Infestations occurred in Yellowstone County in 1951, and in Ravalli County in 1952.

ASH FLOWER GALL (*Eriophyes fraxiniflora*)

Only one infestation of ash flower gall was reported during the biennium. This occurred in Musselshell County in 1952.

WILLOW LEAF GALL (*Pontania* sp.)

The willow leaf gall which is caused by a hymenopterous sawfly appears to have been prevalent during the biennium. Numerous reports and inquiries were received regarding this pest. There are no known control measures at the present time.

POPLAR BORER (*Saperda calcarata*)

A single infestation of poplar borers reported during the biennium occurred in Lake County in September of 1951.

COTTONWOOD LEAF-STEM GALL (*Pemphigus populi-transversus*)

Two infestations of cottonwood leaf-stem gall aphids were reported during the biennium. These were in Cascade and Yellowstone counties in 1951.

VAGABOND GALL (*Mordwilkoja vagabunda*)

Infestations of vagabond gall aphids were reported in Pondera and McCone counties in 1951 and Pondera and Glacier counties in 1952.

COTTONWOOD LEAF BEETLE (*Chrysomela scripta*)

A single infestation of cottonwood leaf beetle was reported in Sanders County in 1952. This is the only known occurrence during the biennium.

ELM LEAF CURL APHID (*Eriosoma americanum*)

Elm leaf curl aphids were reported in 1951 from Phillips, Wibaux, Valley, and Dawson counties. The only infestation reported in 1952 occurred in Chouteau County.

SPIDER MITES (Acarina group)

Many moderate to severe infestations of spider mites occurred on raspberries, mountain ash, coniferous trees, and other ornamentals over most parts of the state during the biennium. Such infestations were generally more severe during the late summer months. Tetraethyl pyrophosphate sprays were used in control programs.

SPRING CANKERWORM (*Paleacrita vernata*)

Localized outbreaks of this pest occurred in central Carbon County, southern Rosebud County, and southeastern Valley County in 1951. These outbreaks were largely confined to native trees on creek bottoms and few control measures were initiated. An infestation was reported in Chouteau County in 1952.

A TENT CATERPILLAR (*Malacosoma* sp.)

Only one infestation of tent caterpillars (at Bozeman) was reported in 1951. In 1952, light to moderate infestations occurred over much of western and southcentral Montana with the principal damage being to apple trees and roses. A DDT spray provided excellent control.

COTTONY MAPLE SCALE (*Pulvinaria vitis*)

Only a single infestation of this pest was reported during the biennium. This occurred in 1952 in Lincoln County.

OYSTERSHELL SCALE (*Lepidosaphes ulmi*)

Oystershell scale is commonly present in most unsprayed orchards and on back yard fruit trees. In 1952 it was found to be extremely prevalent on Cotoneaster shrubs in most of western and parts of eastern Montana. This scale can be controlled with dormant sprays.

BIRCH SKELETONIZER (*Bucculatrix canadensisella*)

A moderate to severe outbreak of birch skeletonizer occurred in Lewis and Clark County in 1951. This chewing lepedopterous pest of birch trees was not reported or observed in 1952.

COTTONWOOD-LEAF MINER (*Proleucoptera albella*)

This insect pest probably occurs throughout the entire state along with cotton wood trees. Several cases of severe damage have been reported from the northcentral section of the state during both years of the biennium. This pest is frequently heavily parasitized so that extensive damage is not expected to be re-occurrent for long periods of time. No practical control measures are known at present.

A LEAF ROLLER (*Archips* sp.)

A tree leaf roller was found and reported to be causing extensive damage to Russian olives, caragana, and apples in northcentral and northwestern Montana during June of 1952. This is the only occurrence of this insect reported during the biennium.

CARPENTERWORM (*Prionoxystus robiniae*)

Only a single infestation of these borers of living trees was reported during the biennium. This occurred in 1951 in Broadwater County.

ELM SAWFLY (*Cimbex americana*)

The elm sawfly, a defoliating pest of elm trees, was reported only once during the biennium. This occurrence was in Wibaux County in 1952.

VIRGINIA CREEPER LEAF HOPPER (*Erythroneura ziczac*)

The hosts of this sucking insect pest are Virginia creeper, raspberry, apple, and some other plants. The principal occurrence of this leaf hopper has been on Virginia creeper vines and other ornamental plants grown nearby. It is wide-spread throughout Montana and has caused considerable concern to many gardeners. The Virginia creeper leaf hopper has been successfully controlled with DDT sprays and dust.

ROSE CURCULIO (*Rhynchites bicolor*)

The rose curculio seems to be rather widespread throughout Montana. Reports of occurrence and injuries from this pest came from McCone County in 1951, and from Sanders, Roosevelt, and Lewis and Clark counties in 1952.

LILAC BEETLE (*Brachyrinus meridionalis*)

Lilac beetle infestations and damage continued to occur at Hamilton in Ravalli County during the biennium.

CONIFERS

BLUE SPRUCE GALL APHID (*Adelges cooleyi*)

Unsightly pine-cone-like galling of spruce trees has been observed over most of the state during the biennium. Inquiries were received only from Yellowstone County in 1951, and from Gallatin, Lake, Glacier, and Deer Lodge counties in 1952. Timely spraying with benzene hexachloride has controlled this pest successfully.

SPRUCE LEAF-TIER (*Epinotia nanana*)

Two cases of spruce leaf-tier infestations were reported in Gallatin and Madison counties in 1951. Only one report from Roosevelt County was received in 1952. This insect pest of spruce trees undoubtedly exists more generally throughout the state, but its damage is either unnoticed or is not reported.

PINE LEAF SCALE (*Chionaspis pinifolioe*)

Infestations of pine leaf scale were reported in Yellowstone and Missoula counties in 1951 and in Yellowstone, Beaverhead, Carbon, Ravalli, Silver Bow, and Gallatin counties in 1952. From the standpoint of observations it would appear that this pest is far more prevalent than indicated by these reports.

DESTRUCTIVE HOUSEHOLD INSECTS

CLOVER MITES (*Bryobia praetiosa*)

Clover mites continued to represent a perennial household pest throughout most of the state during the biennium. The best treatment currently known is one of prevention by application of summer oil emulsions or tetraethyl pyrophosphate outside of the house before the mites make their semi-annual migration into the dwelling.

CLOTHES MOTHS (Tineidae family)

Clothes moths are a common pest throughout the state. Only two inquiries were received regarding the control of this insect during the biennium. It appears that the chlorinated hydrocarbon insecticides are successfully holding this insect in check.

SILVERFISH (*Lepisma saccharina*)

No inquiries were received regarding silverfish during the biennium, though they are known to occur commonly throughout the state.

DERMESTIDS (Dermestidae family)

Reports or inquiries regarding dermestids were received from Silver Bow, Toole, Park, and Beaverhead counties in 1951; from Madison, Yellowstone, Fergus, and Phillips counties in 1952. In contrast with silverfish and clothes moths, inquiries on dermestids were far more frequent. Infestations have been observed where it is doubtful that chlorinated hydrocarbon insecticides would be effective because they could not be applied to the infested areas. Cases of this type have been handled with cyanide fumigation.

TERMITES (Isoptera order)

Termite inquiries were received from Beaverhead, Yellowstone, Big Horn, Dawson, and Lewis and Clark counties in 1951; from Lewis and Clark and Yellowstone counties in 1952. Field observations have indicated certain tendencies of termite infestations in Montana. Extensive damage of the type that is noticeable and reported is almost always found in the older residential dwellings usually involving houses built in the late 1800's or early 1900's. In some cases the infestations appear to be intense in localized areas within these older residential districts. These intense localized infestations sometimes involve only several lots but occasionally involve several blocks.

CEREAL INSECTS (Coleoptra and Lepidoptera orders)

Stored grain insects were prevalent in many parts of Montana in 1951. This was principally due to the unusually high moisture content of much of the grain harvested that year. Continued turn-

ing of the grain and fumigation was necessary in many cases. Treatments with pyrethrum synergist dust were also effective. In 1952 the grain was harvested in normally good condition and less difficulties with stored grain pests are anticipated.

Extensive programs were conducted during the second year of the biennium in cooperation with the Food and Drug Administration's program of preventing animal contamination of cereal and cereal products to be used for human consumption. These extension programs were carried out through regional meetings and publications of proper methods of handling stored grain.

Frequent inquiries were received regarding the control of household cereal insects. These infestations are readily eliminated by destroying the infested cereals, cleaning up the storage areas, and spraying these areas with either DDT or chlordane.

ANTS (Formacidae family)

Ant infestations which occur generally in and around households throughout the state are readily controlled with 3 to 5 percent chlordane sprays. Spray application on the outside of the foundation around the house in the early spring and again in midsummer with 5 percent chlordane has been found in most cases to effectively prevent ant infestations inside of the house throughout the entire summer.

FLIES (Muscidae family)

There is more evidence, though not conclusive, that resistant strains of flies are occurring in Montana. Reports of resistant flies have been received from commercial exterminating companies. Some of these have been checked and at least in some cases poor control is the result of normal late season influxes of fly populations. This was particularly evident in 1952 when a comparatively long warm fall season was experienced.

COCKROACHES (Blattidae family)

Only a single inquiry regarding cockroaches was received during the biennium. This inquiry was from Lewis and Clark County in 1951. Apparently, as is the case with several household insects, the chlorinated hydrocarbons are doing such a good job of cockroach control that inquiries are few in spite of the prevalence of the insect.

BED BUGS (*Cimex lectularius*)

Three infestations of bed bugs were reported in 1951; these occurred in Blaine, Hill, and Jefferson counties. No reports were received during 1952. It is assumed from past experience that bed bugs are far more prevalent in the state than these reports would indicate.

POWDER POST BEETLES (Coleoptera order)

Two cases of powder post beetle infestations were reported in Cascade and Flathead counties in 1952. One infestation involved damage to a wooden desk, the other infestation to woodwork in a home. These insects were not reported or observed in 1951.

STRAWBERRY ROOT WEEVILS (*Brachyrhinus ovatus*)

Several cases of strawberry root weevils infesting homes, particularly basements, have occurred during the biennium. Apparently this insect, which is destructive to strawberries, is not harmful in the household where it may be seeking shelter. Occurrences of this type were reported in Lake and Glacier counties in 1951, and in Flathead County in 1952.

INSECTS DESTRUCTIVE OF MAN AND ANIMALS

MOSQUITOES (Culicidae family)

Contrary to popular opinion, studies have indicated that the more important mosquito species present in Montana do not breed in permanent pools. Instead, these species breed in semi-permanent standing water which generally accumulates from three different sources: spring run-off, run-off from rain showers, and irrigation. Attempts to control mosquitoes by spraying adult mosquitoes in towns and cities have largely been unsuccessful, particularly in heavy mosquito areas. It is apparent that if mosquito control, under Montana conditions, is to be successful the mosquitoes must be controlled in their larval stage in the intermittent pools or puddles or such intermittent water must be eliminated. More information on the problem is necessary before large-scale successful mosquito control can be accomplished. An investigational project was set up in Blaine County in the late spring of 1952 with the objective of obtaining this fundamental information. Cooperating in this project are the United States Public Health Service, the Montana State Board of Health, the Agricultural Experiment Station at Montana State College, the people of Blaine County as represented by their mosquito committee, and the Office of the State Entomologist.

Concurrent with the establishment of the investigational program the Junior Chamber of Commerce at Miles City with the support of the City of Miles City and its citizens decided to attempt mosquito control in hopes of preventing mosquito infestations within the city during the summer of 1952. This test project was conducted by Mr. John P. Cunningham, the County Sanitarian. In so far as possible all intermittent standing water within about a three-mile radius of Miles City was surveyed frequently for the presence of mosquito larvae. Whenever mosquito larvae

were found to be present, the water was treated with insecticides. This control program was successful and Miles City enjoyed a near mosquito-free summer.

Many additional areas, principally towns and cities, are requesting mosquito control programs. In view of the successful test at Miles City and with more fundamental information being made available from the investigational work in Blaine County, it appears that these requests are justifiable. The principal difficulty now confronting such a program is enablement for localities including towns, cities, and counties to establish and carry out mosquito control programs.

CATTLE GRUBS (*Hypoderma lineatum* and *Hypoderma bovis*)

Since the last printing of this report, Montana State College Agricultural Experiment Station bulletin 471 (technical) entitled "Cattle Grubs — Their Biologies, Their Distribution, and Experiments in Their Control" dated December 1950, has been published. The data presented in this bulletin provide further evidence that the present known methods of treatment fall far short of the desired results in bringing about economic control of cattle grubs. Cattle grubs continue to be an important economic pest of cattle but treatment in many cases has been discontinued, due to the practical experiences of many stockmen and the evidence presented from the research mentioned above.

CATTLE LICE (Anoplura and Mallophaga orders)

Cattle lice continued to be one of the more serious insect pests of cattle during the reporting period. The two sucking species *Haematopinus eurysternus* and *Linognathus vituli* and the one biting species *Bovicola bovis* are the only species known to be present in Montana. It appears that more cattlemen are recognizing the importance of cattle lice as insect pests to cattle and more treatment programs are evident. Extensive efforts have been carried out to direct these treatment programs along lines which would bring about desirable results. These efforts include meetings with stockmen using a silent motion picture film prepared by the Assistant State Entomologist on the topic of proper spraying for control of cattle lice and the circulation of publications, newspaper stories, and radio talks.

SHEEP TICKS (*Melophagus ovinus*)

The sheep tick, which is actually a parasitic fly and not a tick, is common in all of the sheep-raising areas of the state. Fall dipping with a rotenone suspension seems to be the most practical means of combating this problem.

HORN FLIES (*Siphona irritans*)

A practical demonstration test of the South Dakota type of

backrubber was set up near Cascade, Montana, in 1952. This particular test did not produce satisfactory horn fly control. It is possible that more of the backrubbers were needed, or that the brush in this particular range area competed with the backrubber so that the cattle were rubbing on the brush far more frequently than they were on the backrubber. This demonstrational test will be pursued further in hopes of developing a satisfactory method of this type under Montana conditions.

The incidence of horn flies appeared to be about normal during the biennium except that in 1952 the horn fly season was somewhat longer than normal due to an abnormally warm fall period.

MISCELLANEOUS

THE GOAT WEED BEETLE PROGRAM

INITIAL INTRODUCTIONS

Prior to 1951 several introductions of goatweed beetle colonies had been made into western Montana principally through the efforts of Mr. James K. Hollaway, Entomologist for the United States Department of Agriculture, Bureau of Entomology and Plant Quarantine. Of these several introductions, those that have been kept under observation were a 1948 planting of *Chrysolina hyperici* in the Charlos Heights area of Ravalli County and a 1949 planting of *Chrysolina gemellata* in the Charlos Heights area of Ravalli County. Also 1949 plantings of *Chrysolina hyperici* in Sanders County on the O. J. Murray Ranch, on the Forest Service mule pasture just north of Thompson Falls, on the bison range, and in Flathead County on the north fork of the Flathead River were observed.

Obeservations through the 1950 growing season yielded little or no evidence which would indicate that these plantings would establish themselves strongly enough to provide for redistribution throughout western Montana and biological control of goatweeds.

The above colonies were introduced under rather adverse conditions. In each case several days had elapsed between the time of collection in California and the time of release in Montana. Consequently, the beetle colonies were in a weakened state at the time of introduction.

1951 INTRODUCTION

In the winter of 1950 the Western Montana Weed Control Committee in surveying the goatweed problem found the following estimated infestations: Missoula County, 1 acre; Lincoln County, 40 acres; Flathead County, 60 acres; Mineral County, 420

acres; Ravalli County, 1,615 acres; Lake County, 10,150 acres, and Sanders County, 141,600 acres with a total of 153,986 acres. As a result of the survey the Western Montana Weed Control Committee requested that an organized goatweed beetle introduction program be carried out as soon as possible. This introduction was organized by the Office of the State Entomologist and carried out with the cooperation of the Montana Agricultural Extension Service, the Agricultural Experiment Station at Montana State College, the United States Bureau of Entomology and Plant Quarantine, the Western Montana Weed Control Committee, the United States Forest Service, the United States Fish and Wildlife Service, and others. It was decided to introduce the species *Chrysolina gemellata* inasmuch as various investigations indicated that this species would be more apt to become established under Montana conditions. Introductions were planned so as to cover as many of the different ecological habitats in which goatweed occurred in Montana as was possible. The program was organized in such a manner as to provide liberation as soon as possible after collection. The beetles were collected in California by two individuals hired for that purpose. They were then mailed air express to Missoula, Montana, so as to arrive in the early morning the second day following collection. At Missoula, Montana, the beetles were fed goatweed and immediately transported by aircraft to various points where cooperators would receive the beetles and accomplish their release by early afternoon of the same day. A total of 56 colonies of *Chrysolina gemellata* were introduced with the following disposition:

51 colonies in Sanders County	2 colonies in Flathead County
2 colonies in Lake County	1 colony in Gallatin County

The total cost for the operation was $355.86, or approximately $6.35 per colony.

SURVEY AND REDISTRIBUTION IN 1952

Surveys of beetle release sites were started on May 20, 1952. In the Charlos Heights area of Ravalli County only three adult beetles could be found in the 1948 *Chrysolina hyperici* release area, and no evidence of beetles could be found in the 1949 *Chrysolina gemellata* release area. In Sanders County on May 26, the 1949 *Chrysolina hyperici* release area on the O. J. Murray Ranch showed a few adults and numerous larvae. The other 1949 *Chrysolina hyperici* release area just north of Thompson Falls showed evidence of considerable feeding, and a few adults but no larvae were found. Occasional adults and no larvae were found on several of the 1951 *Chrysolina gemellata* release areas observed in Sanders County. The Charlos Heights release area in Ravalli

County was reexamined on May 29, 1952, and the *Chrysolina hyperici* area showed a few adults and numerous larvae. This survey indicated the possibility that it was being conducted too early in the season for observation of adult beetle populations.

A second survey was conducted June 19, through 23, 1952. The 1948 *Chrysolina hyperici* colony at Charlos Heights showed well established adult populations as did two 1949 *Chrysolina hyperici* colonies in Sanders County. The 1949 *Chrysolina gemellata* colony at Charlos Heights in Ravalli County did not show evidence of establishment. However, the various 1951 *Chrysolina gemellata* colonies observed showed good evidence of establishment.

Twelve colonies of adult beetles were redistributed in June of 1952 from the established 1948 *Chrysolina hyperici* colony in Ravalli County, the 1949 *Chrysolina hyperici* colonies in Sanders County, and the 1951 *Chrysolina gemellata* colony in Lake County. This redistribution program included two colonies to Mineral County, one colony to Gallatin County, one colony to Ravalli County, two colonies to Sanders County, four colonies to Lincoln County, and two colonies to Lake County. In addition, the United States Fish and Wildlife Service imported seven colonies of *Chrysolina gemellata* from California which were planted on the Bison Range in Sanders County on May 31 to June 1, 1952.

FUTURE PROGRAM

On the basis of the evidence to date, it appears that many of the 1951 *Chrysolina gemellata* colonies will be established and ready for redistribution in the spring of 1953. It is anticipated that the larger portion of this redistribution program will be carried out by individual ranchers. Therefore, an educational program to be conducted by the Office of the State Entomologist and the Montana Agricultural Extension Service is being planned. For this purpose a short 16 mm. motion picture film covering the mechanics of collection and planting of goatweed beetles has been prepared by this office. Educational meetings for the purpose of organizing individual rancher distribution of goatweed beetles are planned for the spring of 1953.

Some redistribution of goatweed beetles in the spring of 1953 to be carried out by the Office of the State Entomologist is also planned. Such redistribution will principally involve plantings in relatively inaccessible areas where goatweed has become established. These plantings will be conducted by aircraft drop, a technique which was worked out by the Office of the State Entomologist during the summer of 1952. In addition it is also anticipated that the United States Forest Service will conduct some redistribution programs in 1953.

BIENNIAL REPORT OF THE MONTANA STATE APIARIST

1951 and 1952

During recent years the Montana beekeeping industry has been undergoing a gradual change. Many small scale and amateur beekeepers are selling out to larger commercial beekeepers with a few inexperienced replacements entering the industry. Small scale operators typically lack the interest necessary for proper disease and swarm control and many appreciate the opportunity to sell their operation to a commercial beekeeper. During the biennium, inspection efforts of the Assistant State Apiarist have been concentrated on locating and destroying or cleaning out disease in the smaller apiaries. Such an inspection program was carried out because it appears that many of these smaller apiaries act as infection centers for large areas.

The registration of bee locations in accordance with the state law is necessary so that inspection of all apiaries can be accomplished. Many previously unregistered locations have been found during the biennium and legal registration was accomplished.

The number of colonies inspected annually is limited by the available personnel. Consequently this report does not show a true picture of the disease problem of Montana's beekeeping industry. Many of the larger and presumably disease free or nearly disease free apiaries have not been inspected or have only been spot checked. If these larger apiaries could have been included in the inspections, the percentage of infected colonies would have been considerably less. The disease problem in Montana is unique in that much of the disease is harbored in and around rimrocks, old buildings, and trees which were previously inhabited by diseased bees. Under these conditions it is doubtful if the disease can ever be entirely eliminated, particularly in certain areas. The problem is therefore one of control rather than elimination.

Several western Montana beekeepers have experienced severe damage to yards located in outlying areas due to the activities of bears. There is a need for a cooperative program with government trappers and the issuance of permits for beekeepers to destroy such bears.

The results of honey bee pollination programs in California, Utah, and Nebraska have caused considerable interest on the part of farmers in Montana. Conditions in the aforementioned areas are widely different from the conditions existing in Montana's alfalfa and clover seed growing areas. Extensive experimentation in Alberta and Saskatchewan under conditions more similar to Montana's indicates that honey bees are of little value for alfalfa and red clover pollinization and that certain species of wild bees are

the principal pollinators. Investigational work along these lines has been initiated in Montana. However, recommendations cannot be made until more is known about pollinating activities under our conditions.

Some areas have experienced considerable difficulties with damage to bees caused by the application of toxicants for pestiferous insect control. Such has not been the case in Montana principally because of cooperation between spray operators and beekeepers on proper measures to be taken to prevent bee losses.

During the biennium honey crops have tended to be erratic. At least one of the reasons for this has been the change in agricultural practices which has eliminated or reduced plants either permanently or temporarily during critical periods. The honey crops during both years of the biennium appear to be slightly below average. The reported state average for the 1951 honey crop was 72 pounds per colony. The figures are not as yet compiled for 1952, but the crop was probably slightly less than in 1951. During both years of the biennium some high and some low individual honey yields were experienced.

Many areas of the state are overcrowded by bees. This, along with other circumstances, has brought about a gradual reduction of the number of registered colonies of bees in Montana. The bee population has been reduced from about 65,000 colonies registered in 1948 to 58,719 colonies registered in 1952. The recent increased price support of honey may tend to level off or even increase the number of commercial colonies during the next biennium.

TABLE OF AMERICAN FOUL BROOD INCIDENCE IN COLONIES INSPECTED BY THE ASSISTANT STATE APIARIST

County	Total colonies in county	Colonies inspected	No. diseased colonies	No. destroyed
	1951			
Beaverhead	1,606	25	0	0
Bighorn	3,084	35	2	2
Blaine	3,565	33	0	0
Broadwater	1,859	21	0	0
Carbon	2,751	0	0	0
Carter	120	0	0	0
Cascade	1,892	72	2	0
Chouteau	13	0	0	0
Custer	393	14	0	0
Dawson	760	16	4	4
Fallon	58	0	0	0
Fergus	1,679	0	0	0
Flathead	1,617	60	2	0
Gallatin	4,611	65	6	6
Glacier	202	0	0	0
Golden Valley	330	0	0	0
Granite	373	0	0	0
Hill	100	0	0	0
Jefferson	595	72	3	0
Judith Basin	504	0	0	0
Lake	3,517	147	4	4
Lewis & Clark	1,335	402	16	3
Lincoln	60	0	0	0
Madison	3,770	480	14	1
McCone	630	40	1	0
Meagher	350	25	0	0
Mineral	5	5	0	0
Missoula	500	340	4	4
Musselshell	209	0	0	0
Park	2,852	302	19	12
Petroleum	424	0	0	0
Phillips	891	206	5	0
Pondera	1,122	0	0	0
Powder River	767	166	32	32
Powell	144	0	0	0
Prairie	186	15	0	0
Ravalli	2,615	25	0	0
Richland	1,801	25	1	0
Roosevelt	1,119	0	0	0
Rosebud	541	0	0	0
Sanders	925	402	32	28
Silver Bow	7	0	0	0
Stillwater	1,644	0	0	0
Sweetgrass	2,050	0	0	0
Teton	4,523	86	0	0
Treasure	161	52	3	3
Valley	1,470	260	6	0
Yellowstone	1,963	302	15	12
Wheatland	950	0	0	0
TOTAL	62,643	3,696	171	111

TABLE OF AMERICAN FOUL BROOD INCIDENCE IN COLONIES INSPECTED BY THE ASSISTANT STATE APIARIST

County	Total colonies in county	Colonies inspected	No. diseased colonies	No. destroyed
	1952			
Beaverhead	977	0	0	0
Big Horn	3,365	87	17	17
Blaine	3,575	0	0	0
Broadwater	1,690	26	0	0
Carbon	2,493	58	4	4
Carter	124	0	0	0
Cascade	1,874	0	0	0
Chouteau	9	0	0	0
Custer	575	10	0	0
Dawson	838	21	0	0
Fallon	15	0	0	0
Fergus	937	20	0	0
Flathead	966	140	8	2
Gallatin	2,502	136	2	0
Glacier	202	0	0	0
Golden Valley	318	0	0	0
Granite	415	0	0	0
Hill	100	0	0	0
Jefferson	557	119	7	5
Judith Basin	515	0	0	0
Lake	4,302	820	34	29
Lewis and Clark	1,358	45	2	2
Lincoln	10	10	0	0
Madison	2,352	202	35	30
McCone	700	43	0	0
Meagher	350	32	0	0
Mineral	5	5	2	2
Missoula	596	23	3	2
Musselshell	233	25	0	0
Park	2,809	0	0	0
Petroleum	549	186	4	4
Phillips	875	0	0	0
Pondera	711	86	3	3
Powder River	926	8	0	0
Powell	180	0	0	0
Prairie	218	12	0	0
Ravalli	3,408	863	138	138
Richland	2,200	23	0	0
Roosevelt	1,270	46	5	0
Rosebud	683	26	0	0
Sanders	966	200	14	6
Silver Bow	7	0	0	0
Stillwater	1,085	0	0	0
Sweetgrass	1,199	0	0	0
Teton	4,161	105	0	0
Treasure	415	15	0	0
Valley	1,540	308	2	0
Yellowstone	2,511	114	12	12
Wheatland	1,050	56	0	0
TOTAL	58,719	3,870	287	256

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