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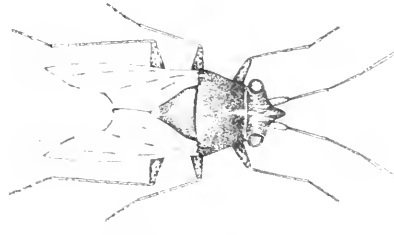

False chinch bug (*Nysius ericae* Schill)

BY
R. A. COOLEY

Sixteenth Annual Report of the State Entomologist of Montana

NOTES ON INSECT PESTS OF 1918

THE MITES AND TICKS (ACARINA)

Red Spider (*Tetranychus bimaculatus* Harvey).—Red spiders were reported from several counties as injuring the foliage of raspberries and currant bushes.

Pear-Leaf Blister-Mite (*Eriophyes pyri* Pagnat).—Fruit growers in the Bitter Root district each year report that the blister-mite is their biggest problem in insect control. While this mite was present in smaller numbers in 1918 than for several years previously, yet considerable injury was done in orchards that did not receive the lime-sulphur spray early in the spring.

CRICKETS AND GRASSHOPPERS (ORTHOPTERA)

Black Cricket (*Gryllus assimilis* Stew.).—During the late summer and early fall the common black cricket became so abundant in parts of Big Horn County that it attracted considerable attention from farmers, who feared the destruction of their crops. In some localities the ground was black with crickets. Flax and oats were badly injured by their eating into the boll and the kernel. This is the first report of serious cricket injury that has come to the State entomologist's office.

Coulee Cricket (*Peranabrus scabricollis* Thom.).—This large, repulsive-looking insect was again present in injurious numbers near Ronan on the Flathead Indian Reservation. Large, migrating armies of what was probably the same species were reported along the southern boundary of Gallatin County.

Grasshoppers (*Melanoplus* sp.).—Grasshopper injury was much less severe than in 1917. Great damage was done locally on many farms but no outbreaks occurred over large areas.

Yellow-Winged Grasshopper (*Camnula pellucida* Scud.).—

This species was unusually abundant in the upper Bitter Root valley and in many local outbreaks in other parts of the State. In no instance, however, was it reported as migrating.

THE TRUE BUGS (HEMIPTERA)

False Chinch Bug (*Nysius ericae* Schill).—Farmers have repeatedly mistaken this bug for the chinch bug and its unusual abundance during the past season caused considerable alarm. Letters and telegrams were received, stating that chinch bugs were invading grain fields, but in every case the false chinch bug was the cause of the scare. No damage to grain crops was found but gardens were very badly injured.

Cabbage Aphis (*Aphis brassicae* L.).—Cabbages, rutabagas, and rape in all parts of the State suffered from the attacks of the cabbage aphis, which was more abundant than for several years. Spraying with Black Leaf 40 and soap will control this serious pest of garden and field crops.

Elm Gall Louse (*Schizoneura americana* Riley).—Elm trees in all parts of the State suffered from the attacks of this pest. In the Gallatin Valley the returning fall migrants from the service-berry swarmed to the elm trees by the millions, indicating that the injury will be worse than ever next year.

Fall-Grain Aphis (*Macrosiphum* sp.).—Many letters were received during the fall months concerning an aphid which covered the heads of grain at harvest time. This plant louse attracts attention each fall but apparently appears too late to injure the crop of the present year and does no appreciable damage to fall-seeded grain.

Sugar-Beet Root-Louse (*Pemphigus betae* Doane).—This was not as abundant as usual, but nevertheless caused considerable damage in the beet-growing sections of the State. Experiments conducted in the Yellowstone Valley show that the injury can be very greatly reduced by frequent irrigations.

Green Apple Aphis (*Aphis pomi* De G.).—This aphis was present in considerably less than normal abundance.

Grain Root Aphis (*Forda occidentalis* Hort.) was reported from many parts of the State as abundant on roots of small grains and grasses. No proof of its injuring grain has been established.

MOTHS AND BUTTERFLIES (LEPIDOPTERA)

Sugar-Beet Webworm (*Loxostege sticticalis* Linn.).—The out-

standing entomological feature of the year was an unprecedented outbreak of the sugar-beet webworm. During the first three weeks in August millions of webworms appeared in the northern and central counties of the State. Beets, beans, corn, and garden crops were all seriously damaged. Not only were crops injured but houses were infested and wells were contaminated by the millions of crawling worms. Fortunately, grain crops were not molested. Russian thistle and pigweed are favorite food plants of this insect and much of the damage done in gardens was due to the presence of weedy areas which had attracted the moths for egg-laying and in which millions of webworms were hatched out.

White-Lined Morning Sphinx (*Deilephila lineata* Fab.).—The large green larvae of this beautiful moth were reported as very abundant near Columbus. Weeds were mainly fed upon and no damage to crops was reported.

Imported Cabbage Worm (*Pontia rapae* Linn.).—As usual, the cabbage worm was highly destructive throughout the State and numerous letters were received from owners of war gardens who were anxious to learn the best method of getting rid of this pest. Like the potato beetle, this is one of the insects that has to be fought every year.

Cutworms (*Noctuidae*).—Although no wide-spread outbreak of army cutworms occurred, yet cutworms were more abundant throughout the State as a whole than for several years. War gardens in many communities suffered severe setbacks, corn, peas, and beans having to be replanted several times in order to get a stand. In several counties, grain crops and alfalfa were badly injured.

Webbing Clothes Moth (*Tineola biselliella* Hummel).—Clothes moths were unusually abundant during the summer months. In some instances, larvae were found in great abundance and doing damage in November.

Mourning Cloak Butterfly (*Euvanessa antiopa* L.).—The larvae of this butterfly, commonly known as the spiny elm caterpillar, have been reported many times as working on elm and willow foliage and during the past season have worked on cottonwood foliage as well.

Tortoise-Shell Butterfly (*Eugonia californica* Bois).—Residents in the western end of the State reported great swarms of these butterflies, particularly in Sanders County. Farmers feared that

their presence in such large numbers forecast a brood of injurious caterpillars but such was not the case. This species is not known to be injurious to plants of value.

Luna Moth (*Tropaea luna* Linn.).—The County Agent of Richland County reported that the larvae of this beautiful moth stripped the foliage from the box-elder trees.

FLIES (DIPTERA)

Wheat Stem Maggots.—Early in the spring numerous complaints were received from grain growers in southern and eastern Montana, stating that a small, white maggot was destroying both winter and spring wheat by boring through the central stem. An investigation showed that two species of maggots, hitherto unknown in Montana, were doing the damage.

Onion Maggot (*Phorbia cepavum* Meade).—Like the cabbage maggot, this insect is becoming more abundant and destructive each year.

Cabbage Maggot (*Phorbia brassicae* Bouche).—Each year the cabbage maggot becomes more troublesome to gardeners, especially in the northern parts of the State. Turnips, rutabagas and radishes are also attacked.

Nose Fly (*Gastrophilus haemorrhoidalis* Linn.).—The nose fly has now spread throughout the State and is a constant source of irritation to horses during the hot summer months.

Currant Fruit Fly (*Epochra canadensis* Loew.).—Owing to the total failure of the currant crop in many parts of the State, fewer inquiries than usual were received concerning this pest of the currant and gooseberry.

Mosquitoes (*Culicidae*).—Several requests for aid in mosquito control campaigns were received but, because of lack of funds and the pressure of other work, no help could be given.

THE BEETLES (COLEOPTERA)

Pea Weevil (*Bruchus pisi* Linn.).—It is now definitely established that the pea weevil can breed rapidly in Montana. Weevil-infested peas planted by a farmer in the Yellowstone Valley yielded a badly infested crop last year and again this year. It is to be regretted that this enemy of the seed pea industry has now become established within the State.

Colorado Potato Beetle (*Leptinotarsa decemlineata* Say).—Potato beetles were more plentiful than for several years. Their unusual abundance, coupled with the scarcity of Paris green, caused considerable loss in some districts. Calcium arsenate and zinc arsenite were used with good success in place of Paris green.

Flea Beetles (*Epitris* sp.).—Flea beetles were very abundant, causing considerable anxiety to owners of war gardens during the spring months. In most cases the injury was outgrown before the growing season was over.

Nuttall's Blister Beetle (*Cantharis nuttalli* Say).—This brightly colored beetle was reported as cutting the blossoms and buds of beans. Some damage was also done to alfalfa.

Wireworms (*Elateridae*).—Wireworms were more abundant than usual, attacking many different kinds of crops. Wireworm injury of an uncommon sort was reported from Three Forks where sprouting peas were riddled so badly that a very poor stand was secured.

Sunflower Beetle (*Chrysomela exclamationis* Fab.).—For the past two seasons, both wild and cultivated sunflowers have been attacked by this beetle.

BEES AND WASPS (HYMENOPTERA)

Currant Sawfly (*Gymnonychus appendiculatus* Hartig).—The larvae of this sawfly were reported as defoliating currants and gooseberries.

Leaf-Cutter Bees (*Megachile* sp.).—Each year numerous letters are received concerning this interesting although destructive bee. In the shelter-belt plantings in eastern Montana it is a very serious pest, as it nearly defoliates the ash tree, which otherwise is one of the most desirable trees that can be planted in the plains area.

REVIEW OF THE YEAR 1918

Each year has its outstanding entomological incidents or features. In addition to certain insects which are regularly present and destructive, there are those that come unexpectedly, and it is often impossible for us to determine in advance what the principal interests are to be. The season of 1918, on the whole, was an active one, there being many pests that were brought to our attention and a few that were widespread and very injurious.

GRASSHOPPERS IN 1918

In view of the extensive damage caused by grasshoppers in 1917 we were on the alert in the spring of 1918, looking for any outbreaks which might occur in any part of the State. Our attention was especially directed toward those localities which had suffered most heavily in the previous year. As mentioned on page 207 of my last report, it was feared the species of grasshopper which had appeared in great numbers was none other than the Rocky Mountain migratory locust which some fifty years ago had wrought such serious and extensive damage over a large part of the United States and that we might reasonably expect a repetition of the devastation wrought in the earlier years. On the whole, grasshopper damages were less severe than in 1917, but there were reports from numerous widely separated parts of the State, most of which were looked into by representatives from this office. The particular long-winged species resembling, if not identical with, the Rocky Mountain migratory locust which had prevailed in 1917 appeared again in some localities but, for the most part, the damage in 1918 was caused by miscellaneous resident species which are always present in greater or less numbers. Among these were the Yellow-Winged Locust or the Warrior Locust (*Camnula pellucida* Scud.), the Two-Striped Locust (*Melanoplus bivittatus* Say), the Big-Headed Grasshopper (*Aulocara elliotti* Thomas), and various others.

The species resembling the Rocky Mountain locust was abundant and injurious in a region extending through the southern portion of Broadwater and the eastern portion of Gallatin counties. In this region, which also had been visited by this insect the previous season, some thousands of acres of wheat were seriously damaged. Some fields were completely eaten off. The farmers were energetic in their efforts to control the outbreak and poison bran mash and 'hopper catching machines were used. This locality was visited by Mr. J. R. Parker and myself in September and we found that the insects had very largely disappeared without laying eggs. While earlier in the year the long-winged grasshopper had prevailed throughout this region, at the time of this visit the grasshoppers that were present were of other species.

Parasitic flies (*Sarcophaga* spp.) were present in great profusion and we believe that in this locality, as in western Montana in 1917, these parasites were very effective in the prevention of what

easily might have become a veritable plague of grasshoppers. As may be inferred from the above, little damage from grasshoppers occurred this season in the region extending through parts of Flathead, Missoula, and Sanders counties, where in 1917 serious losses were occasioned.

In the upper part of the Bitter Root Valley, in Ravalli County, there was an outbreak of considerable importance which when investigated was found to be due to the warrior grasshopper mainly, though some other species were sparingly represented. Other counties where grasshoppers were reported are Rosebud, Madison, Fergus, Sweetgrass, Meagher, and Cascade.

The use of poison bran mash was recommended and it was much used throughout the State; the catching machine, designed to catch the living grasshoppers, also was generally used.

A circular entitled "Grasshopper Control in Montana" was issued early in the present season. This circular (No. 76) discusses the subject of grasshopper control, gives the results of our experience in the previous year, and contains seventeen new illustrations.

CUTWORMS IN 1918

The office received many complaints of cutworm troubles, coming mainly in May and June. It was on the whole one of the worst cutworm years we have had. Specimens sent in were in many instances reared to the adult or moth condition and were found to belong mainly to the species *Euxoa ochrogaster* Guen. The species was present and quite injurious for upwards of two months, and in this respect differed strikingly from *Chorizagrotis auxiliaris* Grote, the army cutworm which, when it comes, appears in excessive numbers in May and then suddenly disappears. This species, known as the red-backed cutworm, has never been known to become exceedingly abundant in Montana and take on the army habit. A peculiarity is that it keeps under the ground more than the other species and is more apt to cut plants off beneath the surface.

This insect was particularly troublesome in gardens, where practically all kinds of cultivated plants were eaten. Many gardens were injured for the season by cutworms destroying the stands of such crops as carrots, spinach, beets, and radishes, which were sown in the drill row, and cabbages, cucumbers, and others planted or set in hills. The attacks were by no means confined to gardens.

however, for many fields of spring wheat and fall wheat, as well as of other grains, were damaged.

This is one of the species about which we need more information and research is now being conducted under the Adams fund.

THE COLORADO POTATO BEETLE

In view of the urgent feeling of necessity for producing as much food material as possible this season, the unusual abundance of the common potato beetle was especially noticeable. Early in the season before the new plants had broken through the ground the adult beetles, which had passd the winter in hibernation in the soil, were much in evidence and when the young plants appeared they were set upon at once. Many people in the State resorted to hand picking and in view of the desirability of prompt action and the scarcity of insecticides it was probably the best thing that could be done on small patches. Large fields are not generally attacked by enough of the adults in the early spring to do serious harm to the plants. This is explained by the fact that the beetles congregate from the surrounding territory and the larger the field the larger the number of plants for them to spread out upon. When the larvae or slugs appeared later in the season it became evident that we were confronted by an unusual abundance of these insects. Steps had already been taken to aid the farmers in having available a supply of poison and attention was called to the fact through the press that arsenite of zinc, which was cheaper and entirely satisfactory, was available in place of Paris green and arsenate of lead, both of which contain chemicals of much importance in the war industries.

A LITTLE KNOWN STEM MAGGOT OF WHEAT

One of the most interesting features of the season's work was the occurrence in May of a maggot in the stems of young winter wheat plants at a number of widely separated points in Montana. Specimens were sent in with inquiries and maggots were reared in the insectary with the result that a very unusual fly was secured. The specimens were examined by Dr. J. M. Aldrich, a specialist in the Diptera, who found them to be *Hylemyia cerealis* (Gillette), an insect which Professor Gillette reared from wheat in Colorado and about which he wrote very briefly in Bulletin 91 of the Colorado Experiment Station, December, 1904, pp. 14, 15.

It is too early to state how serious this pest may become but it is certainly serious, and rather extensive damage was done this year. Further studies on this insect are to be made next year if it is present.

THE SUGAR-BEET WEBWORM

An outbreak of small striped caterpillars appeared about the 10th of August throughout the major part of the State east of the continental divide. Letters and telegrams came in rapidly from farmers and county agents. While no great amount of damage, excepting in gardens, was finally done, the fact that the caterpillars were generally scattered throughout grain fields, where they were feeding on weeds, caused much uneasiness among the farmers who feared that when the weeds were gone the grain would be attacked. The insects continued in abundance for about ten days. The species concerned was found to be one which has been known as the sugar-beet webworm (*Loxostege sticticalis* L.). This insect is a very general feeder. During this season it was reported on corn, cabbage, beets, alfalfa, gooseberry, and currant bushes, among cultivated plants, but weeds were particularly mentioned and the Russian thistle standing in grain crops was often spoken of. In view of the shortage of hay and other feeds for stock in some parts of the State some farmers were planning to cut Russian thistle as feed but were prevented by the insects which ate down this weed completely. Pigweed (*Chenopodium*), is a favorite also, and spinach, onions, celery, and tomatoes have been mentioned by other writers as being food plants.

These caterpillars were present in incredible numbers. They moved about to some extent and devoured the vegetation as they advanced. It was reported repeatedly that they were "eating everything green." It was also reported to us that they had stopped railway trains, which is entirely possible and would be due to the crushing of their bodies on the rails, thereby making such a slippery track that the locomotives could not pull the trains. Circular 12 of this station (June, 1914), entitled "The Sugar-beet Webworm" by J. R. Parker was sent out very generally and the remedies proposed were effective.

It is not necessarily true that this insect will return next season. Parasites are very effective in its control and judging by past

experience in Montana it is not expected that the webworm will be more than usually abundant in 1919.

THE FALSE CHINCH BUG

Again and again we have had reports of the supposed occurrence of the chinch bug (*Blissus leucopterus* Say) in various parts of Montana but in nearly every case the insect concerned has been the false chinch bug (*Nysius ericae* Schill). This very common insect, a drawing of which appears on the cover page of this report, in size and habits resembles somewhat the very destructive true chinch bug which we believe does not occur in Montana except scatteringly in a few counties in north central Montana where it has been present several years to our knowledge but without being very injurious.

The false chinch bug was injurious mainly to garden plants which were attacked by great numbers of the insects clustering on the terminal growth and sucking out the juices. Some measure of alarm was felt by farmers as it was feared that extensive damage to grain and corn might result from the excessive numbers of the false chinch bug. No damage was done to field crops, however, so far as we can judge from the reports that reached us.

According to Milliken, ("Nysius ericae, The False Chinch Bug," in Journal of Agricultural Research, Vol. XIII, No. 11, p. 571, 1918) there are in Kansas six or seven generations of this insect per year. This writer found that about a month is required to complete one life cycle at a temperature of 79.78 degrees Fahrenheit. We cannot state definitely how many generations there are in Montana but it is clear there are several. These insects multiply with rapidity and it is not surprising that such great numbers appear. We have often found them congregated in large numbers on and under weeds during hot days. The carpet weed, or purslane, is a favorite food and shelter and often touching such a weed with the foot will cause hundreds of these small insects to scurry away in all directions. Mr. J. R. Parker, while traveling in Flathead County on August 5, 1910, found various plants, including potatoes, carrots, raspberry bushes, turnips, and strawberry plants being damaged by great numbers of these insects which clustered on the growing terminals, causing them to wilt. Potatoes were particularly in danger as the adults had settled upon them in great numbers. Beets are

known to be a favorite food plant and in view of its great power of multiplying it would not be surprising if the false chinch bug were to become a serious pest of the sugar beet in Montana.

The control methods are much the same as for the true chinch bug, and were brought to the attention of those who inquired.

ALFALFA WEEVIL QUARANTINE

An effort was made last December (1917) by growers of salt grass hay in Utah to induce us to suspend or modify our quarantine of hays in force because of the alfalfa weevil, and allow salt grass hay to be shipped in for use as packing in place of excelsior. It became evident in the course of the correspondence that we did not possess sufficient information to deal intelligently with the situation and that what we needed was first-hand facts. Accordingly a conference of representatives from the various interested western States was called by Governor Bamberger of Utah. Representatives were present from Colorado, Idaho, California, and Montana. We met at Salt Lake on June 20th and 21st and were welcomed by Governor Bamberger in the Senate Chamber of the Utah State Capitol, following which a chairman and secretary were elected. In the afternoon of the first day we were taken on a tour of inspection into the territory where salt grass is grown and the method of handling it was explained. It had been represented to us previously that no alfalfa was grown in the flats where this salt grass abounds, but in the course of the afternoon's trip it was found that on the drier spots alfalfa was being grown and this in close proximity to where salt grass was cut and stacked. Alfalfa weevils were here in abundance in and near the alfalfa fields. It was very evident that the weevils could easily make their way to the neighborhood of the stacks where, as the salt grass is baled like ordinary hay, the weevils could easily be included in the bales. The delegates agreed, therefore, that it was not safe to allow the importation of this material and it appearaed for a time that nothing could be done to relieve the situation for Utah. It is quite possible that much of the salt grass hay is cut in localities remote from where alfalfa is grown, and conceivably from such localities the hay could be packed with safety to our interests, but there was no way to distinguish in a regulation between safe and dangerous localities.

During the discussion at the Senate Chamber the next day it

was learned from Mr. Reeves of the Bureau of Entomology that the alfalfa weevil becomes inactive when the temperature falls below 60 degrees F. A considerable amount of research along this line had been done by the Bureau. This served as a suggestion to the conference that the salt grass might be raked, stacked, baled, and shipped with safety between October 1st and April 1st, provided this was done only on days when the temperature fell below 60 degrees. After extended deliberations the following resolution was passed:

Resolved, That the material known locally in Utah as "Salt Grass Packing" be admitted into the states now maintaining a quarantine against alfalfa, straw, and other hay from Utah because of the presence of the alfalfa weevil, provided that such material be cut only between the dates of October 1 and April 1, and that the raking, shocking, stacking, baling and shipping of this material, as a commercial product, be allowed only after the maximum daily temperature of the season has fallen below 60 degrees F.

Provided, further, that a certificate from the Crop Pest Inspector of the State of Utah, showing that these requirements have been met, accompany each shipment.

Provided, further, that no salt grass packing shall be held over in the field from one season to another.

Be it further resolved, That the use of such salt grass hay as a packing material in shipments of fruits, crockery, and other materials be permitted, provided it has been cut and removed from the field between October 1 and April 1, as above specified, and stored in warehouses remote from alfalfa fields, alfalfa hay, or other suspected materials.

Upon returning to Montana Mr. A. L. Strausz, State horticulturist, and the writer recommended that our quarantine be modified to agree with the resolution and to cover new territory known to be infested with the weevils and also to cover a change in the requirements regarding emigrants' movables, as recommended by the conference. The quarantine as now in force, therefore, reads as follows:

QUARANTINE NO. 4

WHEREAS, It has become known to me that an injurious insect, popularly called the alfalfa weevil, and scientifically known as "**Phytonomus posticus,**" exists and is dangerously injurious to alfalfa in the State of Utah, and in certain counties in the State of Idaho, to-wit: Bingham, Cassia, Bear Lake, Oneida, Bannock, Franklin, Power and Payette; and in certain counties in the State of Wyoming, to-wit: Unida and Lincoln; and in a certain county in the State of Colorado, to-wit: Delta;

NOW, THEREFORE, I, S. V. Stewart, Governor of the State of Montana, under and by virtue of the authority conferred upon me by Chapter 61 of the Session Laws of the Thirteenth Legislative Assembly, do hereby declare and proclaim a quarantine against the said State of Utah, and said counties of Bingham, Cassia, Bear Lake, Oneida, Bannock, Franklin, Power and Payette in the State of Idaho; and the counties of Unida and Lincoln in the State of Wyoming; and the county of Delta in the State of Colorado, and forbid the importation into Montana of the following agricultural products and other articles, excepting under conditions and regulations as specified:

1. Alfalfa hay and other hays of all kinds and cereal straws, excepting the material known locally in Utah as salt grass packing hay, which shall be admitted into Montana provided that such material be cut only between the dates of October 1 and April 1, and that the raking, shocking, stacking, baling or shipping of this material as a commercial product be allowed only after the maximum daily temperature of the season has fallen below sixty degrees Fahrenheit.

   Provided further that a certificate be required from the Crop Pest Inspector of the State of Utah showing that these requirements have been met, which certificate shall accompany each shipment. Provided further that no salt grass packing hay shall be held over in the field from one season to another. The use of salt grass hay as a packing material in shipments of fruit, crockery and other materials is permitted, provided said salt grass has been cut and removed from the field between October 1 and April 1 as above specified and stored in warehouses removed from alfalfa fields, alfalfa hay or other suspected materials.

2. Fresh fruits and vegetables, exclusive of potatoes, excepting under the following regulations:

   a. Shipments for Montana to be made only from points designated by the recognized State Pest Inspection Officers of the State shipping into Montana, said officers to notify the State Horticulturist of the State of Montana by registered mail or by telegraph of the designation of all shipping points in the aforesaid State of Utah, or counties of Bingham, Cassia, Bear Lake, Oneida, Bannock, Franklin, Power and Payette in Idaho; or counties of Unida and Lincoln in Wyoming; and the county of Delta in Colorado; said notification to be sent and its receipt to be acknowledged before any shipments are made to the State of Montana from said designated points.

   b. Shipments to be repacked from orchard or field boxes into new, clean boxes or other fresh containers.

   c. All wagons or other conveyances used in hauling to the place where repacking is conducted to be kept free from alfalfa hay or other hays, straw, and all other means of contamination.

   d. All packing houses to be at all times free of alfalfa hay, other hays, straw, and other means of contamination.

   e. Each lot shipment shall bear an official certificate of the State from which the shipment originates stating that it has been inspected and passed in compliance with these regulations and stating where it was repacked and inspected.

3. Potatoes unless accompanied by an official certificate signed by the recognized State Pest Inspection Officer of the State from which such shipments of potatoes originate, setting forth that the potatoes have

been passed over a screen, placed in fresh, clean sacks and packed in cars that are free of alfalfa hay or other means of contamniaton.

4. All nursery stock, unless accompanied by special certificate setting forth that such nursery stock has been fumigated for the alfalfa weevil in an airtight enclosure subsequent to being boxed, baled or packed for shipment, with cyanide of potassium or cyanide of sodium at the rate of one ounce to each one hundred cubic feet of enclosed space.

5. That no shipment of household or emigrants' movables originating in any State or county designated as infested with the alfalfa weevil shall be brought into the State of Montana by any common carrier, person or persons, unless such shipments be accompanied by a copy of a sworn statement made in duplicate by the owner or shipper after the following forms on blanks which will be furnished to applicants by the State Horticulturist of Montana. Copy No. 1 to be mailed to the State Horticulturist, Missoula, Montana, and Copy No. 2 to be delivered to the common carrier agent, with a special certificate appended, to attach to waybill.

State of..... } ss.
County of..... }

I hereby solemnly swear that I was present during the preparation for shipment of the household or emigrants' goods which this affidavit accompanies; that the goods were delivered to the

..... at..... on
(Railroad) (Station)

.....constituting (less than) a carload
(Month, day, year)

.....
(If carload, write initials and car No. here)

to be shipped to.....
(Name of consignee)

at..... via.....
(Destination) (Give initials of other lines)

that no nursery stock, vegetables or fruit is included in the shipment and that no hay or straw (except as provided for under Part No. 1 of this Quarantine) is included for packing material, or any other purpose, except as food necessary for the livestock in transit to the Montana State line; that the shipment is made up of the following: Household goods, farm implements, tools, harness, farm wagons, automobiles, stands of bees, livestock (draw a line through items not

included) .....
(Specify)

feed for animals in transit.....
(Specify kinds and amount of each)

and .....
(Specify any items not included in previous classification)

.....
(Shipper or owner)

Subscribed and sworn to before me.....

a Notary Public in and for the State of.....

County of.....this the.....day of

.....19....

.....
(Notary Public)

My commission expires..... 19.....
The special certificate from the owner or shipper to be appended to Copy No. 2 of the sworn statement shall be after the following form:

I hereby agree to observe explicitly the requirements of the Montana Quarantine Order with regard to hay or straw (included as stock feed for use before reaching the Montana State line); household and emigrants' goods and other materials, and hereby certify that I have mailed this day one copy of the foregoing affidavit to the State Horticulturist, Missoula, Montana.

.....
(Signature)

6. All railway shipments of livestock unless shipped in cars that are free of alfalfa hay, all other hays and cereal straws, throughout all that portion of the journey that is within the State of Utah, and counties of Bingham, Cassia, Bear Lake, Oneida, Bannock, Franklin, Power and Payette in Idaho; and counties of Unida and Lincoln in Wyoming; and the county of Delta in Colorado.

All Horticultural Inspectors of the State of Montana are hereby instructed and required to refuse admission into the State of Montana of all such articles as are herein designated from the said State of Utah; and counties of Bingham, Cassia, Bear Lake, Oneida, Bannock, Franklin, Power and Payette in Idaho; and counties of Unida and Lincoln in Wyoming; and the county of Delta in Colorado, except under the conditions herein enumerated. If any such articles as are hereinbefore listed be shipped into the State of Montana in violation of this Quarantine they must be at once destroyed or returned to the shipper at his expense.

This Quarantine shall not be construed to interfere with shipments of products to the Yellowstone National Park over the Oregon Short Line Railroad, and to Idaho points via Montana over the Gilmore and Pittsburg Railroad.

This Quarantine shall take effect and be in force on and after the fifteenth day of July, A. D. 1918.

It is specifically understood and intended that this Quarantine Proclamation shall revoke all previous Proclamations on this subject by me made.

IN WITNESS WHEREOF I have hereunto set my hand and caused the Great Seal of the State to be affixed. DONE at the (Seal) City of Helena, the Capital, this the sixth day of July, in the year of our Lord one thousand nine hundred eighteen.

S. V. STEWART.

By the Governor:

C. T. STEWART,
Secretary of State.

WHITE PINE BLISTER RUST QUARANTINE

An exceedingly destructive disease of pine is prevalent in some parts of the East which, if introduced into Montana, would almost certainly do great damage to our forests of pine. This disease has not yet reached Montana. It is hoped that by prohibiting the importation of pines and of currants and gooseberries, which are alternate hosts of the disease, white pine blister rust may be delayed or even entirely prevented from gaining admittance into Montana. The quarantine follows:

QUARANTINE PROCLAMATION

Whereas, The fact has been determined that a dangerously injurious disease known as the White Pine Blister Rust (**Peridermium strobi** Kleb.) exists and is prevalent in portions of the eastern part of the United States as far west as and including Minnesota; and

Whereas, There is danger of the introduction of this disease into the great white pine forests of the State of Montana through shipments of five-leaved pines and currants and gooseberry plants:

NOW, THEREFORE, I, S. V. Stewart, Governor of the State of Montana, under and by virtue of the authority conferred upon me by Chapter 61 of the Session Laws of the Thirteenth Legislative Assembly, do hereby declare and proclaim that a quarantine be and hereby is established against the importation into the State of Montana of white pine (**Pinus strobus**), stone pine (**P. cembra**), limber pine (**P. flexilis**) and any other five-leaved pines, and currants and gooseberry plants (**Ribes** and **Grossularia**) from any part of the United States

east of and including the States of Minnesota, Iowa, Missouri, Arkansas and Louisiana.

All quarantine guardians and deputy State horticultural inspectors are hereby instructed and required to refuse admission into Montana of any shipments of any of the five-leaved pines above mentioned, and currants and gooseberry plants. It shall be the duty of the deputy horticultural inspectors, or other quarantine guardians, to deport immediately such shipments or destroy them by burning. All expenses incurred in deporting or destroying such shipments shall be paid by the consignor.

Any person who sells or offers for sale within the State of Montana pine seedlings, currants and gooseberry plants from the above quarantined area in violation of this quarantine order shall be liable to prosecution under the State laws of Montana.

It is specifically understood and intended that this quarantine proclamation shall revoke all previous proclamations on this subject by me made.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the Great Seal of the State to be affixed.

DONE at the City of Helena, the Capital, this the third
(Seal) day of July, in the year of our Lord one thousand nine hundred seventeen.

(Signed) S. V. STEWART.

By the Governor:
C. T. Stewart,
Secretary of State.

BARBERRY QUARANTINE

For many years it has been known that the common barberry bush serves as an alternate host for stem rust of wheat, probably the most destructive of all plant diseases. A law passed in Denmark in 1903, prohibiting the growing of barberry bushes, has had such remarkable results in controlling rust in the grain fields of that country that plant pathologists in the United States have been making extensive studies to determine whether similar legislation would not solve the wheat rust problem in the Great Plains section of this country. As a result of their findings there was launched early in 1918 a campaign for barberry eradication in our great wheat-growing States. As a preliminary to this campaign of eradication, a quarantine prohibiting the importation of barberry bushes into Montana was issued, which reads as follows:

QUARANTINE PROCLAMATION

WHEREAS, the fact has been determined that a dangerously injurious plant disease known as Wheat Rust is disseminated and carried by means of Barberry bushes (**Berberis vulgaris**), both of the green and purple form; and

WHEREAS, there is danger of the introduction of this disease into the great wheat fields of Montana through shipments of said Barberry bushes and a further dissemination of said wheat rust through the agency of Barberry bushes;

NOW, THEREFORE, I, S. V. Stewart, Governor of the State of Montana, under and by virtue of the authority conferred upon me by Chapter 61 of the Session Laws of the Thirteenth Legislative Assembly, do hereby declare and proclaim that a quarantine be and hereby is established against the importation into the State of Montana of Barberry bushes (**Berberis vulgaris**) and plants from any point without the said State of Montana.

All quarantine guardians and deputy State horticultural inspectors are hereby instructed and required to refuse admission into Montana of any shipments of Barberry bushes (**Berberis vulgaris**) or plants. It shall be the duty of the deputy horticultural inspectors, or other quarantine guardians, to deport immediately such shipments or destroy them by burning. All expenses incurred in deporting or destroying such shipments shall be paid by the consignor.

Any person who sells or offers for sale, in the State of Montana, Barberry bushes (**Berberis vulgaris**) or plants contrary to this quarantine order shall be liable to prosecution under the laws of the State of Montana.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the Great Seal of the State to be affixed.

DONE at the City of Helena, the Capital, this the twenty-fourth day of April, in the year of our Lord one thousand nine hundred eighteen.

(Signed): S. V. STEWART.

By the Governor:
C. T. STEWART,
Secretary of State.

UNIFORM CONTROL METHODS FOR COUNTY AGENTS

To meet the conditions in the counties, to give thorough and up-to-date information in regard to insect pests, as well as to bring about uniformity in instructions given out by the various county agents, this office during the past year has entered upon a project for furnishing to all county agents mimeographed sheets of instructions concerning our more important pests. These have been furnished to all of the county agents' offices, bound in a good loose-leaf

binder. The book is given the title of "Standard Control Methods, Insect Pests of Montana." Following are the introductory paragraphs of the book:

STANDARD CONTROL METHODS FOR THE MORE IMPORTANT INSECT PESTS OF MONTANA

The purpose of this loose-leaf notebook is to facilitate the work of the county agents in the State of Montana and to bring about a reasonable degree of uniformity in the recommendations for the control of insect pests made in the several counties. It would be too much to expect the county agents to be especially informed in all the branches of technical agriculture and this is particularly true with such subjects as entomology, plant pathology, veterinary science, etc. This book contains the experience of the entomologists of the Department of Entomology, accumulated through a considerable number of years, and the information contained is in harmony with the most recent publications. It is our purpose to revise it from time to time, sending out new sheets and recalling old ones, as progress in entomology is made and the changes become desirable.

It is intended that this book shall contain the State standard methods and a greater degree of uniformity is therefore expected in the recommendations which we make and a greater degree of accuracy, also, in the information which we give to farmers regarding the habits of such insects. The need of greater uniformity will be apparent when it is realized that in the past county agents, who have been trained in widely separated states, have been called upon to make recommendations for the control of insects with which they are not very familiar and species which in many instances have been recently the subject of research in one state or another.

The various sheets are grouped by subjects and the various subjects are separated by tab-labeled sheets which will facilitate the filing of new sheets and the every-day use of the book. The headings of the book are as follows:

Insects of Grain and Corn
Insects of Field and Root Crops
Insects of Grasses and Forage Crops.
Insects of Garden Crops
Insects of Small Fruits

Insects of Tree Fruits
Insects of Shade Trees and Ornamentals
Parasites on Domestic Animals
Insects Affecting the Health of Man and Animals
Household Insects
Insects in Stored Seeds and Foods.

HOW COUNTY AGENTS SHOULD HANDLE INSECT PROBLEMS

If the insect is recognized beyond a doubt, recommend the standard method of control which has been worked out for Montana conditions and is given in this book.

If the insect is not readily recognized, secure specimens and send them to the Department of Entomology at the Agricultural College. We will immediately determine them and advise control methods. Specimens to be sent through the mail should be enclosed in a tin box, together with a quantity of their food plant. In most cases no dirt should be put into the box, nor it is necessary to punch holes in the box. Never send insects in letters.

In case any insect becomes unusually abundant or is doing wide-spread injury, notify the Department of Entomology at once. In most cases we will be able to send a man to demonstrate control methods and to aid in organizing a control campaign.

ORGANIZATION

Mr. H. L. Seamans, who has held the position of assistant State entomologist, resigned to take a position as field assistant in the Bureau of Entomology on May 30th, 1917, and Mr. A. L. Strand, a graduate in entomology from Montana State College, became assistant on June 1st, 1917.

Mr. Strand went into military service in June, 1918, but his position is held for him. This position has been unoccupied since his departure. Because of the pressure on our fund, arrangements were made with the Bureau of Entomology and Mr. Strand temporarily vacated his position as assistant State entomologist in 1918 and accepted an appointment as field assistant with headquarters at Bozeman. In this position he continued to do work that was very similar to what he had done as assistant State entomologist. This arrangement continued until Mr. Strand went into the military service.

Upon the departure of both Mr. Seamans and Mr. Strand, to

enable us to meet a difficult situation, Mr. J. R. Parker, assistant entomologist in the Experiment Station, usually occupied with research work, was temporarily removed from his regular duties and placed in charge of the State work for the control of insects and also of rodents. This arrangement was continued during the critical period when insect pests were most injurious.

COOPERATION WITH BUREAU OF ENTOMOLOGY, UNITED STATES DEPARTMENT OF AGRICULTURE

By act of Congress, under provision of the Food Production Act to stimulate agricultural production, the Bureau of Entomology secured funds which enabled it to place in the field a number of extension entomologists. This work was carried on in cooperation with the agricultural colleges and experiment stations and under definite project agreements. Montana was fortunate in securing the services of two representatives of the Bureau to demonstrate the control of insects affecting cereal and forage crops. These men were placed under the direction of the State Entomologist and were of great assistance in the campaign against the wheat stem maggot and in demonstrating grasshopper control. A representative of the Bureau of Entomology also spent several months in Montana demonstrating the most approved methods of beekeeping.

This cooperation with the Bureau of Entomology was a very satisfactory one for Montana, as we were enabled to do much more than our limited funds would otherwise have allowed. In Montana at least there can be no doubt that the purpose of the Food Production Act was accomplished in that thousands of dollars' worth of agricultural products were saved from destruction by insect pests.

NEEDS AND PLANS FOR THE COMING TWO YEARS

No important changes or enlargements in the scope of the work of the State entomologist's office are contemplated for the coming two years. Our work under this fund is marked out for us by the developments of each season. No year passes without some one or several pests becoming destructive and it is necessary to have an assistant in the field and to pay his traveling expenses. It is also necessary to conduct minor investigations at the laboratory in Bozeman and to verify and supplement these studies by observations in the fields where the insects are, wherever in the State this may be.

The sum of money which this office uses is surprisingly small

compared with the amount of saving to the agricultural interests of the State that is effected. During the past two years we have had several very important pest outbreaks. In 1917 there was the most extensive and destructive grasshopper outbreak that has been known in the State for upwards of twenty-five years. We had serious cutworm troubles in both 1917 and 1918 and in 1918 we had webworms by the millions in many counties. In 1918 we had very extensive troubles from the false chinch bug. In both of these years we have had many pests of lesser importance here and there throughout the State. The value of the crops saved by the activities of the State entomologist's office during these outbreaks was many times greater than the total appropriations received.

Our expenses, per year, for the coming biennium are estimated to be as follows:

Salary of asssistant	$1,500
Traveling expenses	800
Labor	500
Supplies and laboratory expenses	700
Total	$3,500