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South Dakota State University Agricultural  
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## Four Injurious Insects

D.A. Saunders

*South Dakota Agricultural College*

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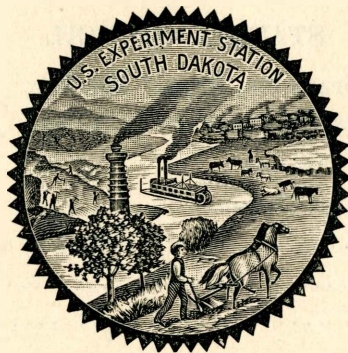
February, 1898.

Bulletin 57

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U. S.  
EXPERIMENT STATION,  
SOUTH DAKOTA.



IN CONNECTION WITH THE  
SOUTH DAKOTA AGRICULTURAL COLLEGE.

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FOUR INJURIOUS INSECTS.

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Department of Botany and Entomology.

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BROOKINGS, SOUTH DAKOTA.

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# Four Destructive Insects.

D. A. SAUNDERS, Entomologist.

During the past season a large number of reports and inquiries came to the Experiment Station in reference to insect ravages. As much time as could be spared was spent in visiting the infected regions and giving such help and advice as was possible. The larger part of the month of June was spent in visiting regions where the Rocky Mountain Locusts had appeared and in helping the farmers in constructing the "hopper dozers." During the month of August the region infested with the Green Plant Bug was visited and as much information as possible was gathered in reference to it.

Acknowledgment is due to Dr. L. O. Howard, U. S. Entomologist, Washington, D. C., for the identification of several insects; the Entomologist, U. S. Experiment Station, Lincoln, Neb., for the loan of several cats; the North-Western railroad, for transportation, and the Chicago, Milwaukee & St. Paul R'y. especially, for the free transportation of crude petroleum used in the "hopper dozers."

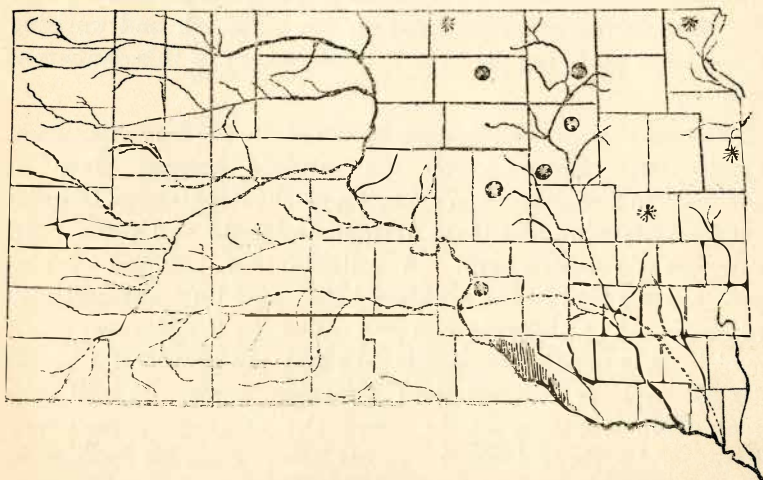


PLATE I.—Vertical lines, distribution of Green Plant Bug, fall of '96 and spring of '97; dotted line, present distribution; dots, outbreaks of the Rocky Mountain Locusts; asterisks, localities from which the Grain Aphis was reported as destructive.

## UHLER'S GREEN PLANT BUG.

*Lioderma Uhleri*, STAHL. (Plates I. and II.)

About the first of July word was received from Mr. E. L. Senn, of Edgerton, Chas. Mix county, to the effect that a certain "green bug" was doing a great deal of damage to both farm and garden crops. Specimens were asked for and soon submitted by Mr. Senn. At about the same time word was received from Dr. Howard, chief of the United States Division of Entomology, that he had received reports of the ravages of the same or a similar bug at Nieveen, a town a few miles west of Edgerton. From specimens received Dr. Howard at once identified the bug as *Lioderma Uhleri*, Uhler's Green Plant Bug.

Several of the devastated farms were visited in July, and living specimens were obtained for further study. Mr. E. L. Senn, a careful and enthusiastic observer, who has had two years' practical experience with the bugs, agreed to submit as complete an account as possible of his experience and observations on the bug. He not only submitted the report, but compiled the table showing the damage done, and outlined the map showing the distribution. Acknowledgment is here due to Mr. Senn for his assistance and for his unselfish and untiring efforts to do all in his power to rid the district of this dangerous pest.

The bug was first described by Stahl, in 1872, in his "Enumeratio Hemiptorum," and the original habitat given as Mexico. It has since been reported to the department of entomology at Washington from Arizona, Colorado and Utah. Mr. Senn, in his report, says: "A reliable lady resident of this county states that in her childhood the same bug was destructive to wheat in California and was called the 'California chinch bug.'" It is perhaps from this fact that the people of Charles Mix county have adopted the Californian name. It will save much confusion, however, to adopt the common name given above. "Another resident reports letters from his brother in Colorado, stating the same bug has been doing much damage there for several seasons past." Prof. Toumey, of the Arizona

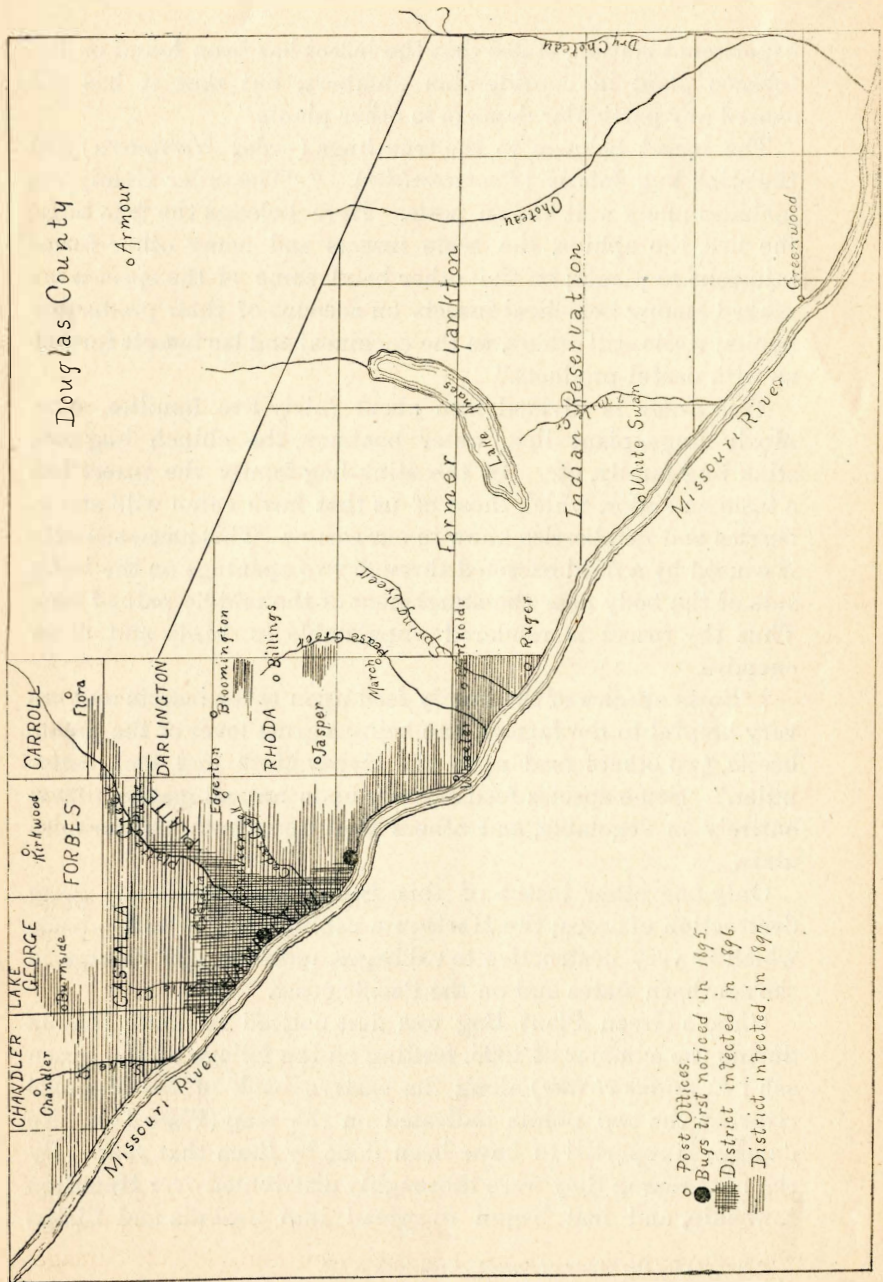


PLATE II.—Map of Charles Mix county, showing distribution of Green Plant Bug. Compiled by Mr. E. L. Senn, of Bloomington; Miss Emma Williams, del.

experiment station, states that the insect has been found on the tobacco plant in considerable numbers, but that it has not caused any particular damage to other plants."

The insect belongs to the true bugs (order *Hemiptera*) and the stink bug family (*Pentatomidae*). \* "The order Hemiptera includes many well known pests. Here belongs the true bugs, the lice, the aphids, the scale insects and many other forms injurious to plants; on the other hand, some of the species are ranked among beneficial insects on account of their predacious habits; while still others, as the cochineal and lac insects furnish us with useful products."

This order is divided into about thirty-five families, e. g. Mealy bugs, plant lice, water boatmen, the chinch bug and stink bug family, etc. In the stink-bug family the insect has a taste and odor, which those of us that have eaten wild strawberries and raspberries know to our sorrow. This nauseous odor is caused by a fluid excreted through two openings on the lower side of the body near the attachment of the middle pair of legs. Thus the insect is rendered unpalatable to birds and other enemies.

† "Some species of the family feed upon other insects and are very helpful to the farmer, one being a great lover of the potato beetle, two others feed upon the Gypsy Moth and tent caterpillar." Some species feed entirely upon animal matter, others entirely on vegetable, and others feed upon both indiscriminately.

Only one other insect of this family has caused any great destruction of crops; the Harlequin cabbage bug or calico-back, which is very destructive to cabbages, radishes and turnips in the southern states and on the Pacific coast.

Uhler's Green Plant Bug was first noticed in South Dakota during the summer of 1895, feeding on the foliage of the green ash (*Fraxinus viridis*) along the eastern bank of the Missouri river at the two points indicated on the map (Plate II). No damage is reported to have been done by them that year. By the next season they were thoroughly distributed over Hamilton township, and had begun to spread into Castalia and Platte,

\* Manual for the Study of Insects, Comstock p. 120.

† Rep. Mass. Board of Agr., Gypsy Moth, Com., 1897, p. 51.

especially along Platte creek (see Plate II). Considerable damage was done by them, but not enough to cause any great complaint. They increased so rapidly, however, that soon after the opening of the spring of 1897 they appeared in great numbers over the shaded portion of the county (see Plates 1 & 2). They have continued to increase with great rapidity, and to spread north and east until they are now distributed over at least ten counties adjacent to Charles Mix (see Plate I., dotted line). Their migration to the other counties took place so late in the season that they caused no apparent damage and were hardly noticed by the inhabitants.

The last of March and the first of April large numbers of the mature bugs appeared under Russian thistles and other weeds and rubbish. In a few days they began laying eggs, each female depositing twenty-five to fifty eggs in a cluster. The eggs are laid on almost anything, with perhaps a slight preference for the Russian thistle. Inside of two weeks the eggs were hatched and the young began to feed mostly on the young Russian thistles which are very succulent. By the middle of June the bugs, being now about half grown and their wings beginning to appear, began to migrate in great droves "on foot" toward the cultivated fields. Mr. Senn estimates that they would make about one-half mile in a little less than a day across cultivated fields; they covered garden vegetables "showing special liking for turnips, radishes, potato blossoms and young sweet corn. About fifty would gather around the top of every turnip, underneath the leaves, and soon suck the juice from it, causing the top to wilt and die. Cabbages, beets and rutabagas were also attacked but not well liked; onions, parsnips, lettuce, tomatoes, carrots and vines (water melons and cucumbers) were hardly touched. Twenty-five or more would gather around a stalk of field corn as near the ground as possible and in a few hours it would wilt and break off where they had perforated it; stalks one and one-half inches in diameter were thus killed. It is in their immature stage that the greatest damage is done to corn; later when they can fly the bugs do not disturb it."

By July 10th the wings were mature and the insects began to fly to the wheat fields. The young wheat kernels, while in the milk stage, they prefer beyond anything else. "Twenty-five or more would gather on a single head making it look as large as



one's thumb." When through with a head there is nothing left but the empty, shrunk hull which does not fill again. When able to fly they are less voracious and more erratic. They will leave everything else for the wheat fields. "They will alight in a wheat field and feed for a day and then go on a few miles in search of new feeding grounds. Thus they have distributed themselves over at least the southern part of the state east of the Missouri river."

About the first of August a second lot of eggs were laid on Russian thistles, wheat and corn stalks. "In some sections last August the Russian thistles, in and along wheat fields, were so completely covered with eggs that from a distance they seem to be white." The bugs began to hatch in a few days and by the first of September were well developed. "A reliable friend told me that he helped stack wheat that was full of eggs; that early in September he helped thresh the same wheat and that the grain, as it came from the machine, was alive with the matured bugs. The inference is, that during the heat of sweating they made a more rapid growth."

About the middle of September live bugs were received from Mr. Senn and placed in breeding cages for further study. The first part of November a third litter of eggs were laid on the sides of the cages and on the plants supplied as food.

This would indicate that the number of broods is not constant; that each brood, soon after it reaches maturity, lays another "litter" which hatches within a few days and matures in from four to twelve weeks, and so on until the food supply is cut off or the weather becomes unfavorable.

The bugs pass the winter by burrowing in the ground, as is shown by Senn's report: "As early as September the bugs, both mature and immature, begin to burrow under rubbish, into crevices and loose ground, into manure piles, under the bark of posts and other lodging places. One man, on a well seeded farm, reports plowing up large numbers with his potatoes at a depth of eight inches; another, in digging holes, finds them at a depth of one and one-half feet—doubtless in a crevice in the ground; still another has found them three feet under the surface of a manure pile. But as a rule they appear to burrow but a few inches beneath the surface in the soft earth under weeds and rubbish.

**THE EGGS.**—The eggs are laid one layer deep in clusters of from twenty to fifty; they are usually arranged in rows, each egg resting on its smaller end and attached to those next to it and to the substratum by means of a cement-like substance; each egg is ellipsoidal, a little broader at the top than bottom and about 1 mm long and .8 mm wide (1.25 in. long by 1.30 in. broad), the shell is white and perfectly smooth, the spines found on the other species being entirely absent; on one side the shell is considerable thinner and at the top is marked by three colorless concentric lines; around the outside of the second of the lines occurs the splitting by which is formed a lid or cap when the young emerge (Plate III. Fig. 1). The cells of the thinner part of the shell and the concentric rings are marked by the absence of crystals with which the remainder of the cells of the shell are densely packed (Plate III. Fig. 2).

**THE YOUNG** (Plate III. Fig. 3) are at first ovate in form, 1.5-2 mm long by 1 mm wide (1.18 to 1.12x1.25 in.); the head and thorax are dark brown, the abdomen light brown with three narrow dark bands extending two-thirds of the way across its central part; the body wall of the thorax and abdomen extend beyond the body into a narrow transparent band which is of equal width throughout; the head is appressed to the thorax, wider than long, and bears two large compound eyes. The antennae are four-jointed; basal joint stout, nearly concealed beneath the margin of the head; second joint, cylindrical, three times as long as the basal joint; third joint, slightly delated upwards, two-thirds as long as the second; fourth joint, club-shaped, twice as long as the third; the entire antennae is dark brown except for a narrow space at the union of the second and third joints which is transparent; all the joints bear scattered hairs. The under surface of the abdomen is a reddish brown; the legs of the same color, but somewhat darker; tarsi two jointed; beak, extending to the middle of the abdomen between the posterior pair of legs and of the same color.

**SECOND STAGE**, (Plate III, Fig. 6).—In two weeks the insect becomes considerably changed in shape; the abdomen becomes proportionately larger and more pointed posteriorly; it is light colored except for the three central longitudinal bands which are dark brown; the thorax is darker than in the last stage—

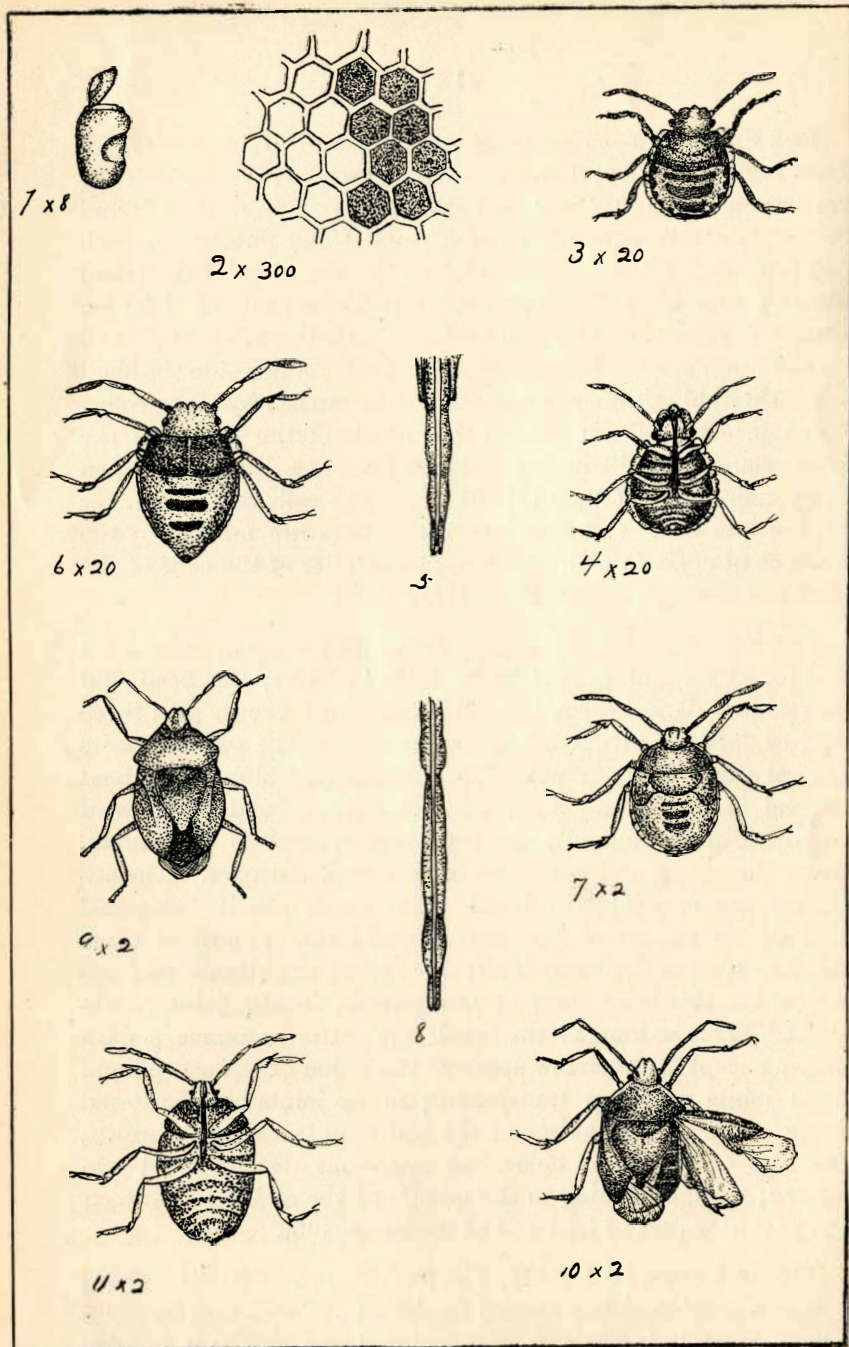


PLATE III.—*Lioderma Uhleri*. Figs. 1 and 2, eggs; 3 and 4, one week old; 6, two weeks old; 5, Proboscis of two-weeks' old insect; 7, ten weeks old; 8, Proboscis of mature insect; 10 and 11, mature insect. Miss Emma Williams, del.

almost black; the lines separating it into prothorax, mesothorax, and metathorax have almost entirely disappeared. There is also a faint medium sulcus; the transparent lateral plate or band is still prominent around the thorax as in the last stage, around the anterior part of the abdomen it is barely visible and disappears entirely posteriorly. The head is still short and thick, the bill or sucker (Plate III. Fig. 5) consists of an indistinctly jointed cylinder about two-thirds of a millimeter ( $1/35$  in.) in length; the first or basal and the third joints are of about equal length and a little shorter than the second or fourth which are also approximately of equal length. One or two stages in the bug's development were missed.

The next material obtained was when the bug was about ten weeks old (Plate III. Fig. 7.) The body is oval and very thin, length 8 mm ( $1/3$  in.); color light green throughout, appendages darker; the head is more elongated; the three parts of the thorax are entirely ankylosed and the wings and scutellum have begun to grow; the three lines on the abdomen are still visible but not so prominent as in the earlier stages; the transparent band around the side of the insect is present but relatively much narrower. It is at this stage that the insect begins its migrations on foot and to feed voraciously.

In from ten to fifteen days from this stage the bug reaches the mature state (Plate III. Figs. 9, 10 and 11). It is 12 to 18 mm long by 6 to 8 mm ( $1/2$  to  $3/4$  in. by  $1/4$  to  $1/3$  in.) wide, oblong, gradually tapering anteriorly to a somewhat pointed or conical head. The color is uniformly green throughout with a few white flakings over the upper part of the body except the end of the scutellum and a narrow band around the sides of the thorax which is a light straw color. The wings reach a millimeter or two beyond the body. The antennae are prominent, dark brown 5-jointed, the terminal joint club-shaped. The legs are the same color as the body or a little deeper.

The above description of the color applies only early in the season; later the body is first light olive or straw color, then light red and finally a dark magenta with occasionally one or more indefinite patches of black on the thorax. The value of these changes to the insect is obvious. In the spring and summer the host plants are green; in the fall, as they ripen, they become tinged with light olive; later some of the host plants at

least take on a reddish tint; and finally, as the bug goes into the ground for the winter, it is so dark it could hardly be distinguished from a chunk of dirt. It is, in other words, a very perfect example of "protective resemblance." The bug changes its color to correspond with its environment and thus it is better hidden from or less visible to its enemies.

The insect inserts its bill beneath the epidermis of the soft succulent part of the plant and draws so much nourishment therefrom that, especially where the bugs are abundant, the plant seldom recovers. Wheat is not disturbed until it is in the milk, the bugs then attack it in great numbers, twenty-five or more to a single head. A careful examination of many heads of wheat obtained from the infected regions fails to show any kernels that were missed by the bugs. The destroyed heads of wheat are as light as straw, there being nothing left in the chaff but the shrunken and shriveled hull of the grain. Sections made of such grains, the central part of which, in healthy grains, is densely packed with starch, is entirely empty and the gluten-containing cells contain but a few scattered grains.

The corn stalk is attacked early in the season; when it is a foot or two in length is when the greatest damage is done to it. In fact, if the bugs are numerous it is entirely destroyed. Later in the season they also attack the young ears, but at this time are not so destructive.

Mr. Senn, in speaking of the damage, says: "The damage in 1895 was not perceptible. In 1896 several hundred acres were destroyed in Hamilton township (Plate II). But as this is a secluded part of the county and those losing made no noise it was unknown to the general public."

"But in the early spring of 1897 the writer and others living in or near this district saw from the eggs that were laid that there was trouble in store. Some of us burned thistles and rubbish under which bugs could be scooped up by the handful. But as others made no effort the spring hatch was large. The small grain and much of the corn in the heavily shaded section were destroyed. On becoming mature the spring hatch spread over the lighter shaded section, destroying in all at least four thousand acres of grain."

Mr. Senn visited as many farmers as possible, obtaining an accurate account of *total* loss. But owing to the lack of time

and distance of some of the farmers not all the losses are given below. He states that he has "offhand reports showing that there are at least one thousand acres more not included in the table." To this must be added partial losses or damage done by the insects where they did not appear until later in the season, in order to reach a fair estimate of total loss caused by this bug.

The table contains only the acreage of crops that were a total loss. The wheat and oats are reported together; of the total 20 per cent of small grain was oats; 80 per cent wheat.

Township—	Small grain, Acres.	Corn, Acres.
Hamilton.....	457	160
Signal.....	372	149
Platte.....	480	
Castalia.....	975	10
LaRoche.....	400	8
Jackson.....	25	
Roda.....	20	
Carroll.....	57	
	2786	327
Estimated, not reported.....	714	473
Total.....	3500	800

Mr. Senn estimated that "the average wheat yield would have been about 14 bu., the oat yield about 30 bu. Using these figures we get a total loss on 2800 acres of wheat of 39,200 bushels, and on 700 acres of oats 21,000 bushels."

"The loss on corn is very hard to get at. The reports in the above table include only fields wholly destroyed or badly damaged. They shew only a fraction of the total. Many fields, owing to favorable weather, recovered and made a light crop. Of such no report can be made. In the aggregate they would give many thousand bushels. The corn average was about 30 bushels per acre. 800 acres of this average would amount to 24,000 bushels.

In November there occurred another loss that is also to be attributed to these bugs. A number of cattle died in Hamilton township showing symptoms of poisoning; they would stagger around for a few days and then die. On opening the stomach of one of the cattle that died in that way more than a quart of

these young bugs were found. The animal was evidently poisoned by the animal fluids of the insects' body, especially the odorous fluid of the "stink gland." The bugs which hatched from the last litter of eggs, not being old enough to bury in the ground, had taken refuge in great numbers in the corn husks and the curled up corn leaves. The cattle, when turned into the corn fields, took them into their stomachs with the forage.

The bugs thrive the best and increase the fastest in hot, dry weather. "Cold, wet weather is against them; they cease to eat, grow thin and, if unsheltered, soon die. Heavy storms will destroy myriads of them by burying them under clods and in crevices which they have sought for shelter. A corn field, that contained at least twenty to a stalk, had the next morning after a heavy shower only now and then a straggler.

In small fields and garden patches millions have been destroyed by hand picking and smashing between the fingers. In this way one man who had a truck garden estimated that he and one assistant destroyed in the neighborhood of a million a day for about two weeks. Millions of the bugs were destroyed last spring by burning waste fields, roadsides and all other places where weeds and rubbish had grown or accumulated. Many people, however, apparently slow in realizing the danger, let their fields go unburned and thus lessened the good done.

At the present time in the settled parts of Charles Mix and some of the adjacent counties the ground in the waste and cultivated fields is well stocked with both mature and immature bugs. If they increase and spread next spring as they have for the last two seasons, the crops in the southern part, if not in the whole state will be in great danger. The Experiment Station has under consideration two methods of combating the bugs which will be tried as soon as the spring opens. These, however, will only be supplementary to the work required of every farmer in the infected region in order to save his crops, not only for the present season, but for years to come. *Undoubtedly the best thing to do is to thoroughly and systematically burn every waste field, weed patch and all cultivated ground.*

The native prairie need not be feared, for as far as known the bugs have not burrowed there. Around every manure pile bunches of straw should be placed at intervals of a few feet;

the infected field should be thoroughly raked early in spring, all the rubbish being gathered up into small piles which are placed a few feet apart. Where straw is cheap and accessible it will be a great help if small bunches of straw are also scattered over the field. These bunches of rubbish should now be left until the bugs have come out of the ground and collected under them. More thorough work can be accomplished by waiting until the bugs have begun to lay or at least until they show signs of migrating. In other words, the burning should be delayed until the bugs have all come out of winter quarters, unless the early comers begin to migrate.

If the town or county commissioners could be prevailed upon to appoint a committee to go over each precinct and superintend the work, more efficient and systematic work could be accomplished. When the work is not being properly done he could give suggestions; where there are vacant farms or farms that are neglected he should be empowered to burn it. The expense could be charged to the county in the former case and to the individual in the latter.

The Experiment Station is willing and anxious to do all possible toward the extermination of this formidable pest; but it can accomplish little without the hearty co-operation of every farmer in the infected region.

### THE ROCKY MOUNTAIN LOCUST.

*Melanopus spretus*.—Figs. 11, 12, 13 and 14.

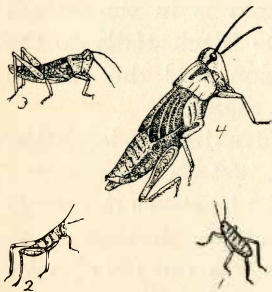


FIG. 11.—Rocky Mountain Locust, immature forms.

The grasshopper that did the damage in South Dakota during the past season, was the Rocky Mountain Locust. This locust is a resident of the Rocky Mountains and the adjoining plains. The permanent breeding ground extends from southern Colorado north to a little beyond the Saskatchewan, from the western edge of the Rockies to north-western Kansas, western Nebraska, and central North and South Dakota. While not always found in dangerous numbers over this whole region it breeds and thrives here from year to year.



Just east of its permanent range there is a strip of country about a hundred miles wide east and west which is called the "sub-permanent" region. Here the locust is quite often found breeding and it seems to thrive well for several generations. Sooner or later they die out and their numbers are renewed from the permanent region.

Extending east of the sub-permanent region to the Mississippi river and south to the Mexican boundary is the "temporary" region. In this region the locust does not usually breed; the region, however, is occasionally visited by moving swarms of locusts and great damage is done.

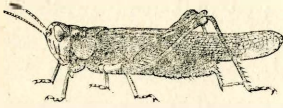


FIG. 13.

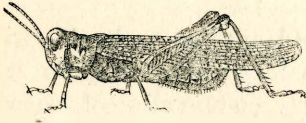


FIG. 14.

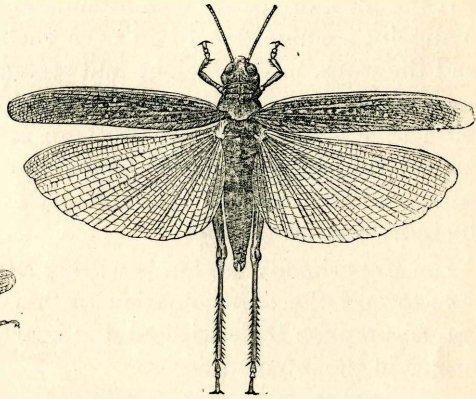


FIG. 12.

FIGS. 12, 13, 14.—Rocky Mountain Locust, mature forms.

The Black Hills region of South Dakota is in the eastern edge of the permanent region. From the Black Hills to the Missouri river is the sub-permanent region, and the eastern half of South Dakota is in the temporary region.

The locust appeared in 1897 in at least five distinct localities, in the James and in the Missouri valley, just on the western edge of the temporary region. In all of the localities the insect hatched about the middle of May in immense numbers. The breeding ground in most of the localities was not over a mile wide and one or two miles long, and in some localities considerably less. The eggs were laid in fields that had not been harvested the year before and had grown up to volunteer grain and to weeds. In three of the localities the breeding ground had been "hailed out" late the previous summer. This gave a

late volunteer growth of wheat. The locusts migrating eastward in the fall in search of food were attracted by these green patches and alighting fed for a few days and filled the ground with their eggs. In one locality a large swarm was observed by the farmers in August, coming from the west; the locusts were abundant for a few days and then disappeared.

The young locusts appeared in such numbers that they fairly covered the breeding ground. They soon migrated to the adjoining grain fields, across which they moved like an army, taking everything in sight.

Large numbers were destroyed by burning over the breeding ground before the grasshoppers began to migrate. When used before the grasshoppers begin to fly, the "hopper dozer" is a very effective means of destruction. One of the most efficient

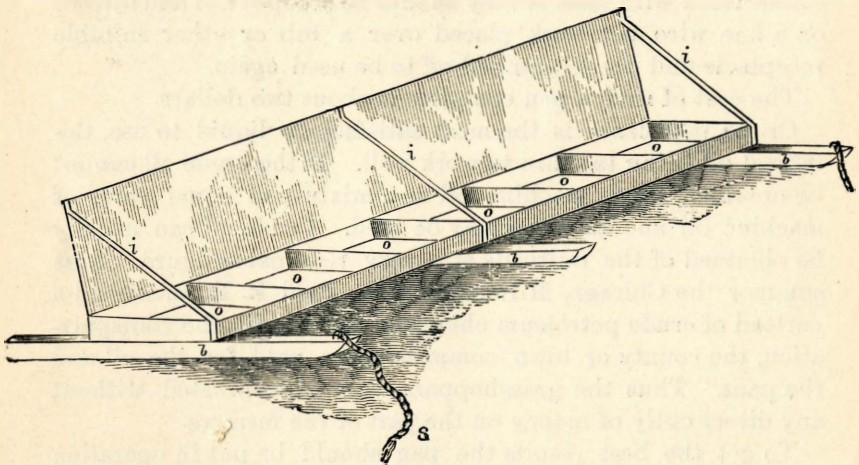


PLATE IV.—Price Oil Pan.

and cheapest of these "hopper dozers" is known as the Price oil pan (Plate IV). A modification of this pan was recommended by this department and was used with good result in at least two of the affected regions. The pan is made as follows:

Take a sheet of galvanized iron or similar material, turn it up three inches all around and rivet and solder at the corners; put in about four cross partitions at equal distances from one another to prevent the oil from slopping. A frame is made of three 2x4s, cut so as to extend about two feet in front of and behind the pan; across the runners nail a strip of 1-inch lumber

just beneath the front and another beneath the back of the pan. Fasten the pan to this frame by a nail through either corner. To prevent the insects from jumping over the pan nail three laths to the back, one at either end and one in the middle; across the top of the lath nail a narrow strip of light lumber of any kind; to this frame tack a strip of heavy sheeting stretched as tightly as possible. This frame should be made solid by running a wire from each lath to the front runner and fastening as solidly as possible. Ropes are attached to the runners in front, the pan is filled about half full of oil and is drawn slowly either by hand or by horses across the field. The locusts, frightened by the approaching object, jump into the air and fall into the pan; the cloth at the back should be kept wet with oil so that all insects that strike the back will be smeared. When the oil becomes thick with insects they should be scooped out and thrown on a fine wire net work placed over a tub or other suitable receptacle and the oil drained off to be used again.

The cost of such a pan complete is about two dollars.

Crude petroleum is the most satisfactory liquid to use, the refined oil being too thin to work well. If the crude oil cannot be obtained, black machine oil or a mixture of equal parts of machine oil and kerosene may be used. Crude oil can usually be obtained of the railroads at a very reasonable figure. Last summer the Chicago, Milwaukee & St. Paul R. R. furnished a carload of crude petroleum charging nothing for the transportation, the county or town commissioners paid for the oil and the pans. Thus the grasshoppers were exterminated without any direct outlay of money on the part of the farmers.

To get the best results the pan should be put in operation before the locusts begin to fly which is about six weeks after they hatch.

## THE GRAIN APHIS.

*Siphonophora avenae.* (Fig. 15.)

The grain aphis was reported to this department as doing considerable damage in four localities in the northern and eastern part of the state.

\*"This insect is found all over Europe and in this country

\* Annual report Dept. of Agr., 1889, p. 349-

occurs from Canada to North Carolina and perhaps farther south. It is found all through the western grain growing states and is reported as doing some damage in California.'

It is ordinarily kept in check by its numerous enemies; occasionally, however, in seasons that are unfavorable to the development of the insects that feed on the aphid it becomes very troublesome for a season or so.

The aphids or plant lice are minute insects barely visible to the eye of the casual observer; the body is soft and is composed of somewhat distinct segments; there are both the wingless and the winged form; the food is taken by a sucker somewhat similar to that of the

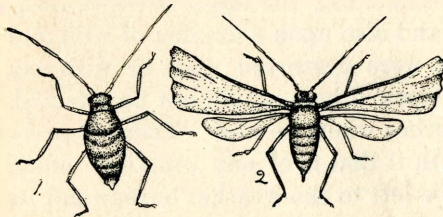


FIG. 15.--Grain Aphid, winged and wingless forms.

of the Green Plant Bug; \* "On the back of the sixth abdominal segment there is in many species, a pair of tubes through which a sweet transparent fluid is excreted. The fluid is known as honey dew. It

is sometimes produced in such quantities that it forms a glistening coating on the leaves of the branches below the plant lice. This honeydew is fed upon by the bees, wasps and ants. The bees and wasps take the food where they find it, paying little, if any, attention to its source; but the ants recognize in the plant lice useful auxiliaries and often care for them as men care for their herds."

It is impossible to give any estimate of the amount of damage done by the aphid in this state the past season. From Vernon, Roberts county, they were reported as "from ten to forty on each head, said bug doing a large amount of damage." From Gary, Deuel county, another correspondent who was asked for an estimate of the damage done wrote, "I will say that to give a correct estimate of the damage done by this insect would be impossible owing to the fact that not only the lodged grain is injured but also a good share of that standing. I think this to be the reason for the light yield; some fields which look as if thirty bushels might be expected, averaged only seven

\* Manual for the Study of Insect, Comstock, p. 157.

or eight." From Eureka, McPherson county: "It was reported that grain fields affected by the aphid would not average over a bushel per acre."

The following paragraph from the report of the entomologist in the report of Secretary of Agriculture for 1889, p. 854, is as true now as when written nearly nine years ago:

"Working, as this insect does, all through a close growing field of wheat, acres in extent, the application of insecticide mixtures is out of the question and to experiment with them as some entomologists have done, is a mere waste of time. We know that a dilute kerosene emulsion will kill them, but it cannot be practically applied. Then, too, the insect lives as readily upon oats, barley or rye and also upon a number of wild and cultivated grasses, and if it were destroyed upon or with any one food plant its numbers upon others would not be affected. We agree with Professor Forbes when he says: 'There is probably nothing to be done with it that is of any practical value; so sensitive a creature can be left to the weather bureau and its natural enemies.'"

### THE SPOTTED BLISTER BEETLE.

*Epicauta maculata.* (Fig. 16.)

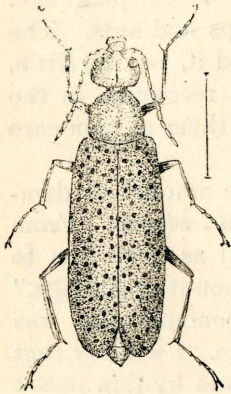


FIG. 16. — The Spotted Blister Beetle.

Several times during the summer we were informed that "a gray bug" or a "striped bug" was eating the leaves of potatoes, clovers, sugar beets, etc. In many cases no specimens were enclosed and it was impossible to give the exact identity of the insect; when specimens were enclosed they proved to be the spotted blister beetle. They were very abundant on the clover plats of the Experiment Station and on potato vines, but did the most damage to the sugar beet leaves, especially in the western part of the state.