



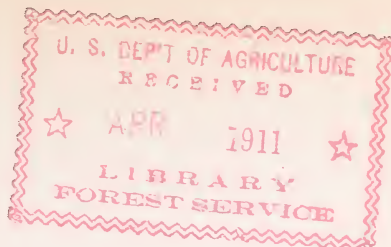


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En82C  
no. 137



Issued April 20, 1911.

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U. S. DEPARTMENT OF AGRICULTURE,  
BUREAU OF ENTOMOLOGY—CIRCULAR No. 137.

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# THE ALFALFA WEEVIL.

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# United States Department of Agriculture,

## BUREAU OF ENTOMOLOGY.

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### THE ALFALFA WEEVIL.

(*Phytonomus murinus* Fab.)

By F. M. WEBSTER.

In Charge of Cereal and Forage Insect Investigations.

#### INTRODUCTION.

The alfalfa weevil (*Phytonomus murinus* Fab.) is not native to America, but has been accidentally introduced from Europe, western Asia, or northern Africa, where it is common, and where, while more or less destructive to alfalfa, it is probably prevented by its natural enemies from working serious and widespread ravages. Just where or in what manner it was brought to this country no one knows, but it was first discovered in the spring of 1904 in a small field of alfalfa near Salt Lake City, Utah, and attention promptly called to its presence there by the entomologist of the Utah Agricultural Experiment Station.<sup>a</sup>



#### THE FULLY DEVELOPED INSECT.

The beetle itself (fig. 1) is usually less than one-fourth of an inch in length, varying from one-eighth to three-sixteenths inch, and when freshly emerged from the cocoon (fig. 5, much enlarged), within which it passes from the larva (fig. 6, much enlarged) to the pupa (fig.

FIG. 1.—The alfalfa weevil (*Phytonomus murinus*): Adults clustering on and attacking sprig of alfalfa. About natural size. (Original.)

<sup>a</sup> Utah Agricultural College Experiment Station, Bulletin 110. The Alfalfa Leaf-weevil, by E. G. Titus, Logan, Utah, September, 1910.

7, much enlarged), is of a plain brown color. In a few days this brown becomes darker, mixed with black and gray hairs, which give it a spotted or mottled appearance, as shown, much enlarged, in figure 3. Gradually these scales and hairs become rubbed off, so that in spring we frequently observe individuals that appear almost entirely black, with small, irregular gray spots upon them.



FIG. 2.—The alfalfa weevil: Larvæ attacking a sprig of alfalfa. Natural size; larva at right much enlarged. (Original.)

ants about an ant hill. It has been estimated that fully 80 per cent of the beetles that go into winter quarters in the fall live through until spring. With the coming of spring the beetles make their way forth from their hiding places and attack the young growth of alfalfa as soon as there is sufficient food for them. In ordinary seasons they may be expected to appear the latter part of March, and the egg-laying period usually lasts from early April until early July.

#### WHERE THE EGGS ARE LAID.

In very early spring, before the plants have made much growth, the beetles often push their eggs down between the leaves, the usual place of oviposition, however, being in punctures made in the stem (fig. 2), and some damage occurs at the very beginning of the season on account of the beetles puncturing the young stems and

#### WHERE IT WINTERS.

The insect winters entirely in the beetle stage, seeking shelter, before the frosts of autumn commerce, either in the crowns of alfalfa plants, close to the surface of the ground in the field, or under leaves, matted grass, weeds, and rubbish along ditch banks, haystacks, and strawstacks. Indeed, it is oftentimes found in barns where the hay is kept over winter. When this hay is being put into the barn in late summer, one side of the barn has been observed to be almost covered with adults, and in winter and spring, when the hay is being fed out, the floor of the barn will often be swarming with the beetles, like



FIG. 3.—The alfalfa weevil: Adult. Much enlarged. (Original.)



killing them in their efforts to oviposit in them. Some idea of the abundance of these eggs and the extent to which the pest may breed in vacant lots and other waste lands where alfalfa has escaped from cultivation and grows as a weed may be obtained from the fact that in one case a single plant has been found to contain 127 of these egg punctures in the midst of the egg-laying season, with the punctures fresh and new. As one puncture may contain anywhere from a few to over 30 eggs, probably 10 or 15 on the average, this single plant presumably contained between 1,200 and 1,300 eggs at the time it was observed. If these hatched and half of them developed into female beetles and 80 per cent of the latter passed the winter, this plant might in a year give rise to over 150,000 beetles.



FIG. 4.—The alfalfa weevil: Eggs. Greatly enlarged. (Original.)

#### THE YOUNG.

Most of these eggs (fig. 4, greatly enlarged) hatch in about 10 days after being deposited, and the minute young, almost white in color, make their way to the leaves, first eating holes therein, soon assume a decidedly green color, and when full grown are about one-fourth of an inch long, with a white stripe along the back and the somewhat hooked appearance shown by some of those in the illustration (fig. 2). The attack

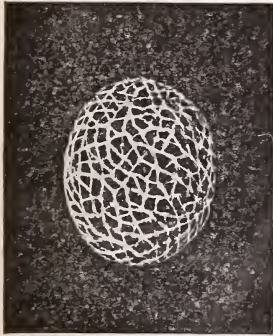


FIG. 5.—The alfalfa weevil: Cocoon. Much enlarged. (Original.)

is now confined to the young leaves and the crown of the plant, thus preventing its growth, and a badly infested field of alfalfa will frequently attain no greater height than about 6 inches, too short to mow at all. If the field is mown over most of the larvæ will of course be shaken off and drop to the surface of the ground. While some of these perish, those that survive and live upon the fresh growth, together with those hatching from eggs deposited after the mowing, develop sufficient numbers to overwhelm and destroy the second crop. The larvæ continue to attack the plants, being most abundant during May and gradually becoming less abundant throughout the month of June. As these transform, the adults become more and more abundant as the season advances, and not only do they feed upon the fresh growth, but they also eat the bark from the stems, and thus, where excessively abundant, totally destroy the



FIG. 6.—The alfalfa weevil: Larva. Much enlarged. (Original.)

second crop. Eggs have, however, been found as late as October 31 and larvæ as late as the middle of November.

The entire life of the insect, from the deposition of the egg to the emergence of the adult, may be anywhere from 40 to 70 days, while the beetle itself may live, including the winter, from 10 to 14 months.

In the first four years following its discovery the alfalfa weevil has spread over a total area of fully 100 square miles of territory. (See map, fig. 8.) So rapid has been its diffusion and so destructive its effects upon alfalfa that in the fall of 1909 the governor of Utah appealed to the Secretary of Agriculture for help in the investigation of the pest and in experimentation, with the hope of finding some measures of relief. At the present time it is known to occur from Salt Lake City southward as far as Provo and northward probably to Ogden, as it has been found within a few miles of that city. It occurs westward to Tooele and eastward, at any rate, as

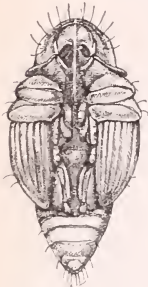


FIG. 7.—The alfalfa weevil: Pupa. Greatly enlarged. (Original.)

far as Echo City. It will not be at all surprising if by another spring it is found in southwestern Wyoming, southern Idaho, Nevada, and perhaps Colorado. The beetles have been repeatedly observed in cars on railway trains passing in and out of Salt Lake City. In one instance 27 were taken in the vestibule of one sleeping car on a train in Salt Lake City one day in July of last year, and have been found on freight cars within sight of the Idaho line. There does not appear to be any reason why it may not be carried in the same way over the San Pedro, Los Angeles and Salt Lake Railroad and left in the alfalfa fields of southern California, while by similar modes of distribution it may be carried by the Oregon Short Line Railroad into Idaho and by the Union Pacific Railroad eastward into the alfalfa fields of Wyoming and Colorado. (See fig. 9.) It is within the range of probabilities that it may find an eastern outlet over the Denver and Rio Grande Railroad into southern Colorado and western Kansas. When we come to take into consideration the fact that alfalfa escapes from cultivation, and in many cases grows as a weed along these railways and roadsides, we can well understand how easily these insects might be transported by the railways and, losing their hold, drop off along the way and find ample food in this alfalfa that has escaped from cultivation.

Besides railways, there is another possible means of dispersion. The beetles may, like those of some of the eastern species, be washed into the tributaries of streams and, floating down, become established in alfalfa fields along their borders. (See fig. 8.)

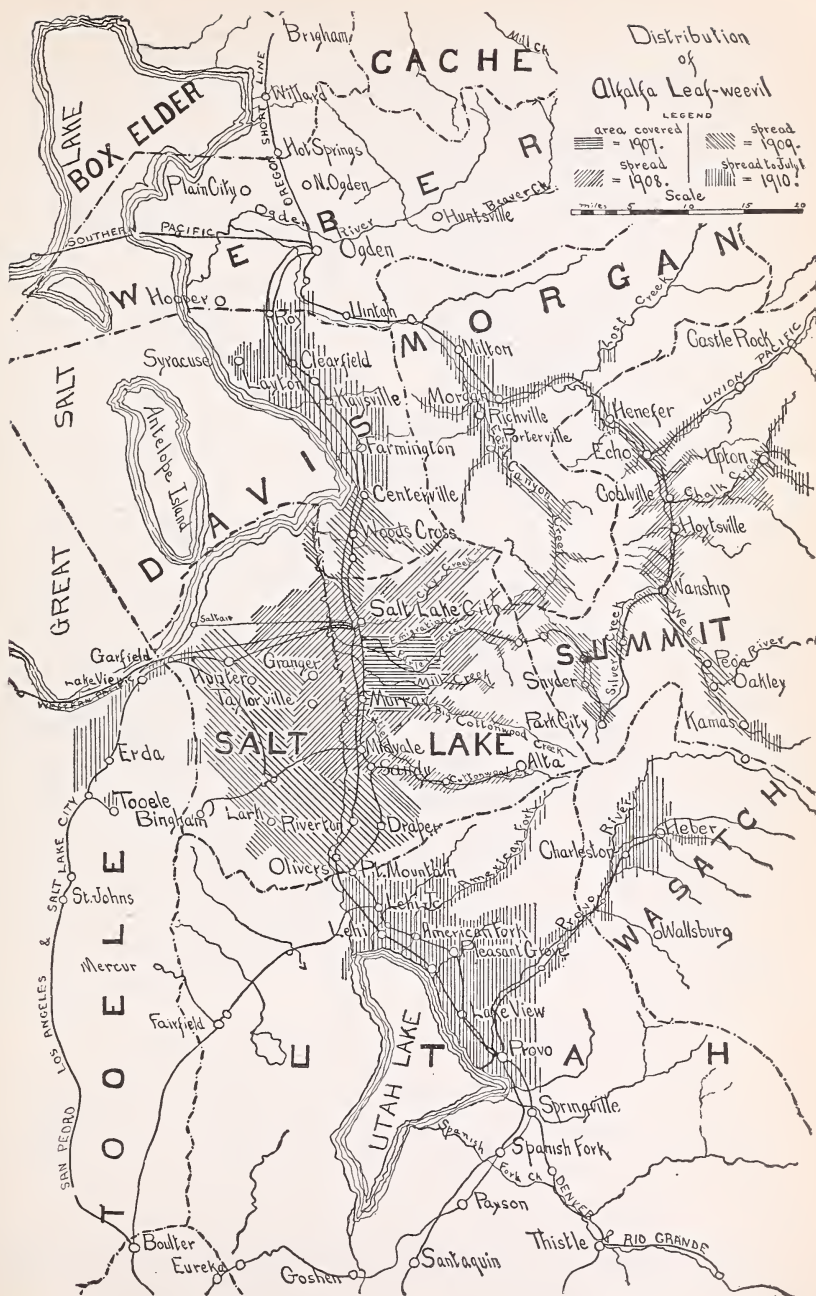


FIG. 8.—Map showing spread and area covered by the alfalfa weevil in Utah up to July 1, 1911. (From Titus.)



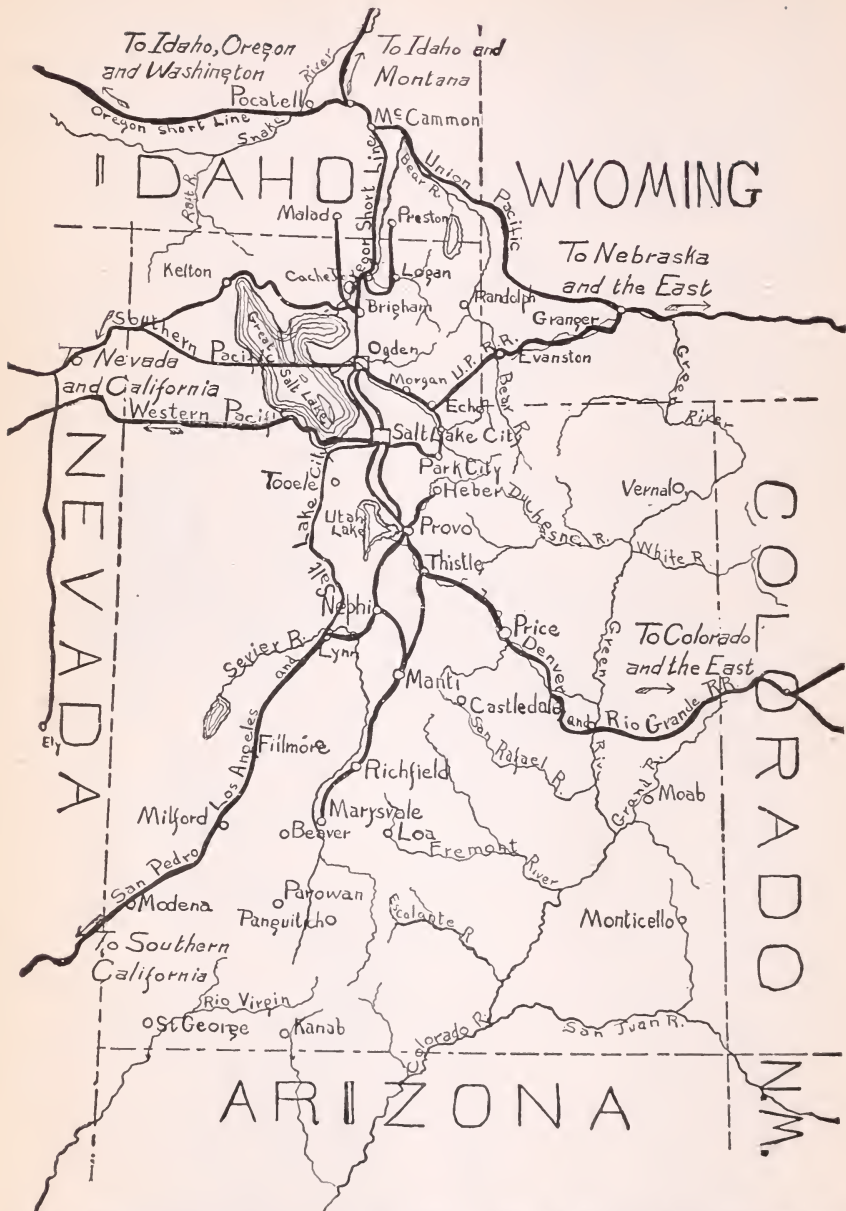


FIG. 9.—Map showing principal railroad lines in Utah. Note: The four main lines all pass through the region infested by the alfalfa weevil. (From Titus.)

Besides the two modes of diffusion previously mentioned (that is, by rail and by water), there is a third, which, while perhaps not disseminating the insect so far in any given time, is certainly a method of dispersion of the greatest importance. This is the migration of the adult insects, which occurs from about the middle to the 20th of June in the vicinity of Salt Lake City, after nearly all of the larvæ or worms have developed to adults. About this time great numbers of the insect seem to take wing and scatter from the fields where they have originated, being aided and their course shaped by every strong wind or gale that happens to occur at this time. As illustrating the importance of this habit of the beetles, on June 18, 1910, with a strong wind from the south, both the Government and station entomologists observed the air to be full of adults moving with the wind. Just how high these insects fly would of course indicate whether they can be carried by air currents over the mountain ranges or whether they must follow up and down the canyons. This, as well as the question as to how far they can fly with the aid of the wind, is a matter that has not yet been definitely determined. As a matter of course, the dispersion of the insect occurs almost entirely in the adult stage. Larvæ can only be carried in numbers from one field to another by the flowing water in the irrigation ditches that runs through or beside fields badly infested with the pest. They have been found floating along with the current in this way.

It must not be inferred from what has been said of this migration that all of the beetles leave the alfalfa fields in summer. It seems that these voyagers constitute only what might be termed the overflow. Vast numbers remain in the alfalfa fields, and while they do not eat the crown of the plant, as do the larvæ or young, they gnaw off and devour the outer surface of the stem, thus skeletonizing and killing the plants, giving a field thus attacked much the appearance of having been scorched by fire. If at this time a field is mown off, or when the plants have all been destroyed, leaving no more food for them, the remainder move out of the field, evidently seeking new food supply.

#### FUTURE INVESTIGATIONS.

As will be observed from a study of the map (fig. 10), the pest has become established in the midst of the alfalfa region of the West, where this is by far the most important crop grown. From what is known of the insect in Europe, and in the light of its behavior since its discovery in this country, there seems little hope for anything from it but dispersion and destruction. It has no natural enemies except frogs and toads, both of which are by far too few in numbers to restrict its ravages to the slightest degree.

The Utah Agricultural Experiment Station during the season of 1910 carried out a great number of field experiments with different methods of controlling the weevil, but none of these has so far given entirely satisfactory results. Besides, measures that are practicable in one locality may be impracticable in another.

It would seem, therefore, that the efforts of the Bureau of Entomology should be, first, to endeavor to restrict the pest as effectually

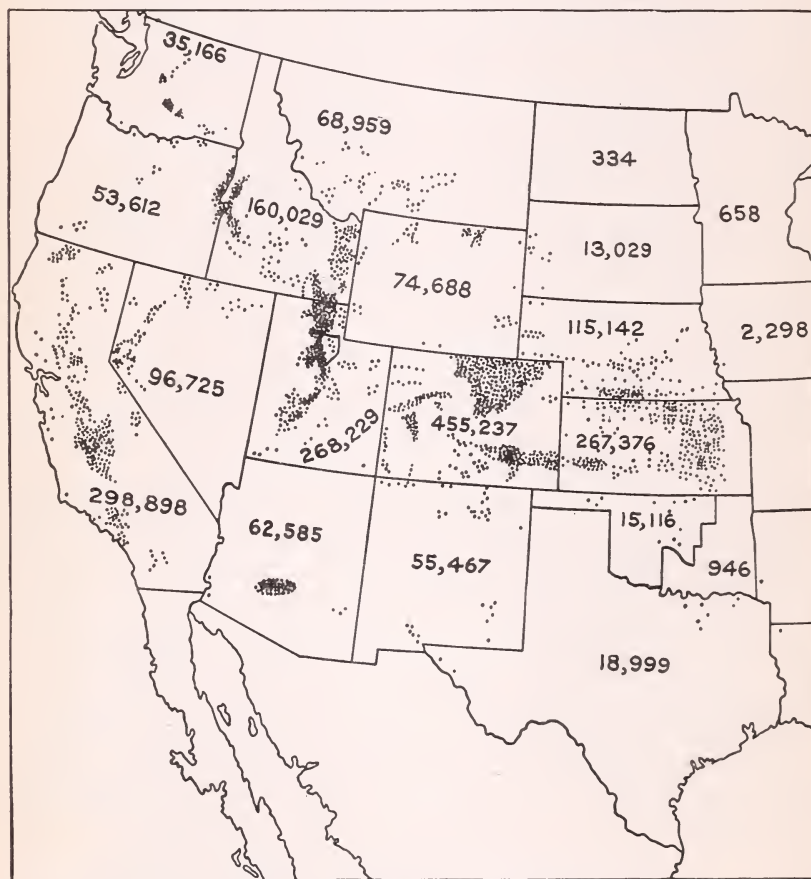


FIG. 10.—Map showing area in Utah infested by the alfalfa weevil with reference to alfalfa culture in the western half of the United States in the year 1899. Note: The numerals indicate the acreage devoted to the culture of alfalfa in each State. (From Westgate, Farmers' Bul. 339.)

and as long as possible to its present area of infestation, and, second, to use every means in its power to control it, in the meantime, within this area. In the first instance, the bureau experts will have the cooperation of the Utah Agricultural Experiment Station, as during the past year (1910), but in the very important part of this work, namely, the introduction and colonization of natural enemies, both



native and foreign, the Federal authorities can treat the infested section as a whole, regardless of State boundaries, and thus work without handicap.

Quarantine between the different States is, in the case of the alfalfa weevil, wholly useless on account of the agency of the railroads and winds as factors in the dispersion of the beetles. There is danger of dispersion in shipments in interstate commerce, but in the case of what is perhaps the most dangerous medium, that of baled hay, owing to the ravages of the pest, the movements of shipments are fortunately toward instead of from the infested area. As to other articles entering into interstate commerce, it would be impossible to guard against the beetles concealing themselves in almost any sort of a box, bale, or package of whatever shape, size, or nature.

The most inexpensive and practical means of controlling introductions of the pest by railroads appears to be in the close surveillance of the railroad right of way and the stamping out of incipient outbreaks as soon as discovered. This, too, seems a duty likely, at least for the present, to devolve upon the Federal authorities, as nearly all of the States adjoining Utah are without the means of carrying such a plan into operation, and a year at least would be required to put into operation the legislative measures necessary to meet the situation. Therefore, the greatest assistance can be afforded by the growers of alfalfa personally, especially along railways and near towns and villages, by keeping close watch of their fields and promptly notifying the Government or State authorities of the occurrence of any insect resembling this alfalfa weevil, as described and illustrated herein. It is chiefly for the purpose of reaching such persons and of promptly obtaining information as to the first appearance of the pest in any locality that this circular is published.

Approved:

JAMES WILSON,  
*Secretary of Agriculture.*

WASHINGTON, D. C., *February 25, 1911.*







