North Ridgeville, Ohio, 80 per cent; at Morgantown, W. Va., 95 per cent; and at Dickinson, N. Dak., 94 per cent.

In accordance with recent legislation the Secretary of Agriculture has issued an order requiring that Turkestan and South African alfalfa seed be stained red to the extent of 10 per cent as being unadapted for general agricultural use in the United States.

Canadian seed satisfactory

Canadian seed has been coming into the United States in considerable quantity for the past few years. Most of this seed is of the hardier types such as Grimm and Canadian Variegated, and as it has been produced under conditions at least as severe as the winters in our Northern States, it is highly regarded and has proved as satisfactory in the northeastern part of the United States as our domestic strains.

Other countries from which imports of alfalfa have been received from time to time are Germany, France, Italy, and Spain. Although seed from these countries has given variable results, that from Italy and Spain generally produces plants that are nonhardy in our Northern States, since the seed is produced under mild climatic conditions; whereas that from Germany and from certain parts of France where the winters are more severe withstand more cold in the United States, though in general not sufficiently hardy for our most trying conditions.

H. L. Westover.
overgrown with tumbleweeds and drifted full of sand, men and
women plodded toward the gap between two gray hills, riding when
they could and when their horses failed toiling afoot. For that
dim track meant water. Where a trickle of water from a spring in
the hills moistened a little of the desert they planted their precious
seeds. When summer dried up the springs, the tender crops brought
from the old home died, but the alfalfa lived; with the tenacity bred
of a thousand rainless summers its roots followed the retreating
moisture into the earth and held on. It wintered the herds when
they came home from the summer range, and helped to fatten the
cattle, the only product which could be marketed. It escaped from
the fields and flourished in roadsides, streets, gardens, and the grave-
yards where the pioneers were laid.

Today the railroads and the great irrigation projects are here,
and no one travels the old roads to hidden springs in the hills.
Alfalfa still fights back the desert and maintains the herds, and it
also produces forage for the cattle of the Corn Belt itself.

Farmers Surprised at Damage

Alfalfa grows so luxuriantly that most insect pests make little
impression upon it. It is no wonder that farmers had come to
regard it as immune to attacks of that sort and were disturbed to
see their crops being destroyed by the alfalfa weevil after that insect
was introduced from the Old World. The green larvae appeared in
the tips of the plants in countless thousands, feeding at first in tun-
nels in the heart of the terminal bud and later spreading out over
the leaves. Every day brought a fresh horde of newly hatched larvae,
which always first attacked the buds, where they could do the most
harm. Once the buds were killed by these small larvae, the older
ones soon stripped the green tissue from the leaves, and the field,
unable to produce new growth, first took on a gray tinge and then
turned white as if frostbitten. The longer the crop was left stand-
ing, the worse became its condition, until, in extreme cases, even the
skin covering the stems was eaten away, and of the whole plant
nothing remained but a handful of woody fibers, crumbling to dust
and worthless as forage.

After the wreckage of the first cutting had been removed, the
larvae, many of which were left in the field, cleaned up the scattered
foliage of the stubble and then turned their attention to the sprouts
which were already starting from buds near the surface of the
ground, and destroyed them almost at once. As fast as other sprouts
pushed up from below they were treated in the same way, and for
about three weeks, or until the larvae had finished feeding and pre-
pared for their final transformation into the adult beetles, there
was no chance for the second crop of alfalfa to begin growth.

This period of three weeks is about the term required for the
production of the second cutting. Although this period ended the
ravages of the pest for the year, the later cuttings being unmolested
and the egg laying of the new generation of beetles deferred until
late fall and the following spring, the total damage amounted to
nearly half the annual yield, even in the comparatively well-watered
districts near Salt Lake City, where the damage was first felt.
In the surrounding valleys, where, because of higher altitude or scarcity of late-season water, no more than one or two cuttings could ever be obtained, the alfalfa crop might be almost a total loss. In addition, in the latter localities livestock was the principal product and could not be wintered without forage.

Control Methods

Altogether it was clear that controlling this insect was a problem beyond the reach of the individual farmer, and an appeal was made to State and Federal agencies for help. The Utah Experiment Station speedily ascertained the main facts in the life cycle of the insect and provided an emergency remedy known variously as the "brush-drag," "cultivation," or "dust-mulch" method, by which the farmer, using materials already at hand, could greatly reduce the inroads upon the second cutting.

The Federal Bureau of Entomology took up investigations into the fundamental relations of the insect to its surroundings as a basis for future control experiments, and at the same time tested the more obvious expedients, including substitution of crops, cultivation methods, irrigation, and pasturing. With the cooperation of the Office of Farm Management it selected as the most promising measure the poisoning of the alfalfa-weevil larvae with arsenical sprays applied to the first crop, and in a series of experiments lasting six years it developed what is now the standard method of controlling the pest.

While engaged in the development of the spraying method the Bureau of Entomology, acting upon a theory that the comparative freedom of European fields from the ravages of this insect was caused by the prevalence of parasites which preyed upon it, imported for study and possible colonization many predacious and parasitic species. One of these, an ichneumon fly which destroys the larvae, has been established in America and is being studied to determine whether it exercises any practical control of the pest. At the same time other beneficial species are being introduced.

Spread of the Weevil

The alfalfa weevil has not waited idly while the entomologists of the State and Federal Governments proceeded with plans for its overthrow. It has spread slowly but steadily and now has colonies in seven States, as shown by the map (fig. 8) of the infested territory at the close of the season of 1926. The infested counties are as follows:


**Wyoming.**—Carbon, Converse, Fremont, Goshen, Laramie, Lincoln, Natrona, Sweetwater, and Uinta.

**Colorado.**—Delta, Gunnison, Moffat, Montrose, Ouray, Rio Blanco, and Routt.
Oregon.—Malheur, Baker, and Union.
California.—Lassen, Plumas, and Sierra.

In its advance into new territory the alfalfa weevil has encountered varied climatic and cultural conditions and has accordingly modified its habits. For example, in the long spring season which is usual in western Idaho the feeding period is so lengthened that two sprayings of the first crop are sometimes necessary; while in the short cold spring which is often experienced in Utah the egg laying, and consequently the number of larvae, may be so reduced that no spraying is needed. The latter condition, although it is in itself a relief, may conceal a menace, as it has often led whole communities to neglect preparations for spraying, to their eventual loss.

In the absence of any known method of preventing the continued spread of the insect, it may be assumed that it will reach all the alfalfa-growing regions of this continent; and as its destructiveness is governed by natural conditions which are imperfectly understood, it would seem that improvements in the control of this pest are to be sought in improved knowledge of those conditions in order that attacks may be foretold with greater certainty and the methods already available more successfully applied.

GEORGE I. REEVES.

ALKALI in Irrigated Districts

The occurrence of alkali salts on the surface or in the root zone of irrigated soils is an abnormal condition indicating that the irrigation water is not passing downward through the soil. These alkali salts are easily dissolved in the soil moisture, so that if there is a gradual or even an occasional movement downward of the soil solution, the dissolved salts are carried with it below the root zone. This is the only way that alkali salts can be removed from the soil.